Aquarius Platinum (South Africa) (Pty) Ltd

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PROPOSED EXTENSION OF MINING OPERATIONS (PROJECT FAIRWAY) AT EVEREST PLATINUM MINE

ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME

SUBMITTED IN SUPPORT OF EXISTING MINING RIGHTS IN TERMS OF SECTION 39 AND OF REGULATIONS 50 AND 51 OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (ACT NO. 28 OF 2002) (THE ACT)

AND

AS REQUIRED IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998), AS AMENDED AND THE ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS, 2010

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IDENTIFICATION OF THE REPORT

Herewith I, the person whose name and identity number is stated below, confirm that I am the person authorised to act as representative of the applicant in terms of the resolution submitted with the application, and confirm that the above report comprises EIA and EMP compiled in accordance with the guideline on the Departments official website and directive in terms of Sections 29 and 39(5) in that regard.	
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PROPOSED EXTENSION OF MINING OPERATIONS (PROJECT FAIRWAY) AT EVEREST PLATINUM MINE

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ACRONYMS AND ABBREVIATIONS

List of acronyms and abbreviations used in this report.

Acronyms / Abbreviations	Definition
ABA	Acid Base Accounting
AER	Acceptable Environmental Risk
AMD	Acid Mine Drainage
AP	Acid Potential
AQPSA	Aquarius Platinum (South Africa) (Pty) Ltd
ARL	Acceptable Risk Level
BEE	Black Economic Empowerment
BGIS	National Biodiversity GIS Database
BMR	Base Metal Refinery
Ca	Calcium
CEC	Cation Exchange Capacity
Cl	Chlorine
CIS	Computerized information system
CO	Carbon monoxide
CO2	Carbon dioxide
CPA's	Community Property Associations
Cr	Chromium
DALA	Department of Agriculture and Land Administration
DEA	Department of Environmental Affairs
DEAT	Department of Environment, Agriculture and Tourism
dBA	Ambient noise (Average level dBA)
DDF	Depth-duration-frequency
DEDET	Department of Economic Development, Environment and Tourism
dHu	Hutton hayfield/Hutton suurbekom
DMR	Department of Mineral Resources
dSdHu	Shortlands groothoek/Shortlands sebati
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWEA	Department of Water and Environmental Affairs
EC	Electrical Conductivity
EDM	Ehlanzeni District Municipality
EIA	Environmental Impact Assessment
EMLM	Elias Motsoaledi Local Municipality
EMP	Environmental Management Programme
ERD	Effective Rooting Depth
FEPA	Freshwater Ecosystem Priority Areas
FET	Further Education and Training
GCS	Groundwater Consulting Services
HCs	Hydrocarbons
GGP	Gross Geographic Product

Acronyms / Abbreviations	Definition
GSDM	Greater Sekhukhuni District Municipality
ha/LAU	Large Animal Unit
HR	Hazardous rating
IAPs	Interested and/or affected parties
IDP	Integrated Development Plan Review
IDW	Inverse Distance Weight
IWWMP	Integrated water and waste management plan
K	Potassium
KaRg	Katspruit lammermoor
LC	Lydenburg centre of endemism
LHDs	Load Haul Dump Units
M	Metres
Mamsl	Metres above mean sea level
MAP	Mean annual precipitation
MAR	Mean annual runoff
MBCP	Mpumalanga Biodiversity Conservation Plan
Mbgl	Meters below ground level
MBSP	Mpumalanga Biodiversity Stewardship Programme
MEE	Metago Environmental Engineers
Mg	Magnesium
mHu	Hutton hayfield/Hutton suurbekom
MPRDA	Mineral and Petroleum Resources Development Act
MNCA	Mpumalanga Nature Conservation Act
MSDS	Material Safety Data Sheets
MTPA	Mpumalanga Tourism and Parks Agency
Na	Sodium
NAAQS	South African National Ambient Air Quality Standards
NAG	Net Acid Generating
NEMA	National Environmental Management Act
NEM:BA	National Environment Management: Biodiversity Act
NEM:PAA	National Environmental Management: Protected Areas Act
NEM:WA	National Environmental Management: Waste Act
NFA	National Forests Act
NHRA	National Heritage Resources Act
NLA	Newton Landscape Architects CC
NWA	National Water Act
Ni	Nickel
NNP	Net Neutralising Potential
NO	Nitrogen monoxide
NO2	Nitrogen dioxide
NOx	Nitrogen oxides
NP	Neutralising Potential
P	Phosphorus
PCD	Pollution control dams
PES	Present Ecological State

Acronyms / Abbreviations	**Definition**
PGMs	Platinum Group Metals
POC	Probability of Occurrence
PRECIS	National Herbarium Pretoria (PRE) Computerized Information System
PrSciNat	Professional Natural Scientist
QDS	Quarter-Degree Square
RMF	Regional Maximum Flood
RDL	Red Data Listed
RP	Return periods
ROM	Run of mine
RWQO	Receiving water quality objectives
SACNSP	South African Council for Natural Scientific Professions
SAHRA	South African Heritage Resources Agency
SANBI	South African National Botanical Institute
SANS	South African National Standards
SAR	Sodium Absorption Ration
SAS	Scientific Aquatic Services CC
SAWQG	South African Water Quality Guidelines
SAWS	South African Weather Services
SCPE	Sekhukhuneland Centre of Plant Endemism
SHE	Site Safety, Health, Environment
SKC	Sekhukhuneland Centre of Endemism
SLP	Social and labour plan
SMS	Short text message
SPL	Sound power level
SO_2	Sulphur dioxide
SO_4	Sulphate
TCLM	Thaba Chweu Local Municipality
TDS	Total Dissolved Solids
TSP	Total suspended particulates
TSF	Tailings Storage Facility
TWQR	Target Water Quality Range
US-EPA	United States Environmental Protection Agency
UV	Ultraviolet
VIS	Vegetation Index Score
VOC	Volatile Organic Carbons
WC	Wolkberg centre of endemism
WHO	World Health Organisation
WR	Water resources
WUL	Water Use Licence

EXECUTIVE SUMMARY

Introduction

Aquarius Platinum (South Africa) (Pty) Ltd (AQPSA) has an existing platinum group metals operation, the Everest Platinum Mine (Everest), near Lydenburg in Mpumalanga. The existing Everest mine infrastructure is located on the farms De Kafferskraal 53-JT, Sterkfontein 52-JT and Sterkfontein 749-JT. Underground mining currently takes place on the farms De Kafferskraal 53-JT, Sterkfontein 52-JT and Sterkfontein 749-JT. The current operations at Everest Mine comprise an underground mine, a mineral processing plant, a tailing storage facility, water management infrastructure and various support services and networks. In the past, the mine has undertaken open pit mining but these areas have been mined out and rehabilitated.

Overview of the project

AQPSA is in the process of acquiring the southern portion of the Booysendal mining block from Northam Platinum Limited (Northam). The Booysendal south mining block is located within the Groot Dwars River valley, immediately west of Everest's operations. In order to facilitate the underground mining of a portion of this block, AQPSA is planning to establish four new box cuts to provide additional access to the underground reserves. In addition to the proposed box cuts, the proposed project (Project Fairway) aims to develop a new tailings storage facility, increase the capacity of the existing processing plant, establish a new access road into the valley and to extend various services and develop new infrastructure to support the project. The above-mentioned infrastructure is to be developed on portions of the farms Sterkfontein 52-JT, Sterkfontein 749-JT, De Kafferskraal 53-JT and Buttonshope 51-JT.

Legal framework and process

Everest operates under a converted new order mining right (original mining license number: ML14/18/2/5071). AQPSA also holds a converted prospecting right (DMR Reference No.: MP30/5/1/1/2/1051PR, Prospecting Right No.: 132/2007CPR) for the farm Hoogland 38-JT and the remaining extent of Portion 1 of the farm De Kafferskraal 53-JT (referred to in this report as the Hoogland prospecting right area). There is an approved environmental impact assessment (EIA) and environmental management programme (EMP) report (Metago, January 2003) and two approved EMP amendments (Metago, April 2009 and Metago, June 2009) for the current mine site. This document is the EIA and EMP report for the proposed Project Fairway as it relates to the existing mining operations.

Independent environmental impact assessment practitioner

Metago Environmental Engineers (Pty) Ltd, part of the SLR group (Metago SLR), is the independent firm of consultants that has been appointed by AQPSA to undertake the EIA and related processes. The EIA and EMP report is the product of the EIA process and provides a detailed description of the project, presents the results of specialist investigations, identifies and assesses potential impacts and mitigation measures should the project be approved.

As part of the EIA process, a stakeholder engagement process was conducted comprising:

- newspaper advertisements;
- site notices;
- a background information document;
- various focussed and general stakeholder meetings; and
- distribution of reports and report summaries for review.

All issues, concerns and comments raised by IAPs have been addressed in the EIA and EMP report.

Environmental setting

A summary of the environmental aspects that describe the pre-mining environment as informed by specialist studies are listed below.

- The UG2 reef of the southern part of the eastern Bushveld Complex outcrops along the western side of the Groot Dwars River valley for over 20 km. The main Everest South ore body is as an elongate erosional remnant that projects eastwards under the Groot Dwars River and is preserved within a basin-like structure. On the western part of the southern flank, the UG2 reef is downthrown along a fault, and the western side of the resource, where the reef passes under the Groot Dwars River and merges with the rest of the UG2 reef that underlies the entire western side of the river valley which constitutes the Project Fairway target ore body. For Project Fairway, the UG2 and Merensky Reef outcrops on the surface on the farms Booysendal in the north and Sterkfontein in the south. The two reefs outcrop in the Groot Dwars River Valley for approximately 12.5 km.
- The mean annual precipitation for the site is approximately 640 mm/year. Temperatures in the region tend to be warm to mild with average temperatures ranging between highs of 18.3°C - 25.9°C in the warmer summer months and lows of 2.7°C - 14.7°C in the winter months. In general, the wind field is dominated by south-easterly winds with more than 12% frequency of occurrence. The slope of the terrain accounts for the increased frequency of occurrence of northerly and north-westerly wind during the day-time and increased south-easterly winds during the night-time. Wind speeds between 3 and 10 metres per second (m/s) dominate with exceedances of 10 m/s occurring less than 1% of the time.
- There is a great change in altitude in the Groot Dwars River valley and slope gradients are generally steep. The highest point is the De Berg peak in the Steenkampsberge which rises to 2 331 m above mean sea level (mamsl). The current mine is located on a terrace in the upper reaches of valley, at about 1 720 mamsl, where slope gradients are relatively gentle (about 1:30). The proposed box cuts and associated infrastructure is located near the bottom of the valley which has an altitude of 1 220 mamsl, with the valley access road providing access from the terrace. The proposed TSF is located in close proximity to the existing TSF on the terrace.

- Soil forms at the mine, including Project Fairway, can be divided into four broad groups: soils with high agricultural potential (Hutton, Shortlands and Clovelly forms on the terrace), shallow rocky soils (Glenrosa, Mispah and rocky outcrops mostly in the valley), shallow to medium-deep structured soils (Shortlands soil form on the terrace and in the valley) and hydromorphic (wetland) soils (on the terrace and in the valley). Land capabilities at the mine, including Project Fairway, are a mixture of arable, grazing, wilderness and wetland.
- Natural vegetation within the areas associated with the current Everest mine operations have been significantly degraded through their destruction by the placement of surface infrastructure. The Groot Dwars River valley is considered to be highly sensitive with respect to flora and fauna (with particular reference to invertebrates). Several wetland systems associated with perennial and non-perennial tributaries were identified. Water quality within the riverine systems was very good, however there was evidence of impacts from current mining activities on these systems.
- The mine and project site fall within quaternary catchment B41G, which is situated in the Olifants River Water Management Area. Mean annual runoff, normal dry weather flow, peak flows and floodlines were determined. Detail on this is provided in the EIA and EMP report. Surface water quality can be described as neutral (pH levels were between 6.41 and 8.26) and non-saline or low salinity. Salt, nutrient and heavy metal concentrations were found to be very low, however aluminium, iron and manganese levels were detected to be elevated, but these concentrations were also comparatively low with no associated health effects if consumption. Most people living on the terrace obtain water from springs, streams and boreholes. Surface water is also used by the aquatic ecosystems present along the streams. The Der Brochen Dam is located downstream of the mine on the Groot Dwars River, over 10 km north of the mine. Identified wetland features include riparian wetlands associated with the Groot Dwars River riverine system and associated floodplain, riparian wetlands associated with the non-perennial and perennial drainage lines in the Groot Dwars River valley; and the Valley bottom wetland complex in the vicinity of the proposed TSF.
- The main aquifers are the Upper Weathered Material Aquifer and Lower Fractured Rock Aquifer. The fractured rock aquifer includes the contact aquifer which was identified in the original EIA and EMP report. Information from the original EIA and EMP indicates that the depth to groundwater level varies between near surface to 100 m below ground level (mbgl) and the mean depth of groundwater level was 8 mbgl. For the Project Fairway hydrocensus, the depth to groundwater level ranged between surface (i.e. springs) and 20 mbgl. Generally, the groundwater levels in the area mimics the topography and flows are directed from the high lying areas towards the valleys. The groundwater quality in general is good with almost all samples having elements within the relevant drinking water quality standards, however some samples did have elevated concentrations of iron and manganese. Comparison to groundwater qualities measured during pre-development studies at Everest show that aluminium, copper, and manganese are naturally elevated in the study area. Data from the original EIA and EMP shows that aluminium and copper concentrations naturally exceed the aquatic standards.

- The current mine site and proposed activities are located in a region where existing ambient air concentrations are influenced by nearby existing mining operations (downstream of Everest in the valley), agricultural activities as well as vehicle entrainment on unpaved road surfaces. Dust fallout concentrations within the existing Everest mine are generally kept within the SANS dust fallout guideline limits. These guideline limits have however been exceeded during certain periods.
- The mine and project study area is located in a district where in large areas the ambient noise still has a rural character. Apart from zones along the main roads, one area where this rural character has to some degree been degraded is the immediate surroundings of the mine.
- When considering landscape character, scenic quality, visual resource, sense of place and visual receptors the study area includes three distinct areas of distinct visual value. The Steenkampsberg Mountains and Groot Dwars Valley have a high visual value. The terrace on which the current mine infrastructure is located has a moderate to low visual value. Current mining activities have already impacted on the available visual resources.
- Land uses on and adjacent to the project area mainly comprise of agricultural (grazing and crop farming, tourism related activities and mixed land uses (typically a combination of grazing and tourism related activities). Agricultural land use is made up of grazing and crop production while tourism consists of trout dams and accommodation facilities. Some of the adjacent farm portions may in the future form part of the Mpumalanga Biodiversity Stewardship Programme and therefore have protected status in the future.
- Heritage and cultural resources in the form of hamlets and a graveyard have been identified within the project area. These sites are important to the history and culture of South Africa and are protected by national legislation. In terms of paleontological resources, there is a limited to no potential for these resources to occur on site.
- The rate of employment within Mpumalanga is low with approximately 36% of the working-age population employed. The percentage of employed people in the Thaba Chweu Municipality is higher at about 45 %. Mining employs 9% of the people in Mpumalanga and 13% (in 2010) in the Thaba Chweu Municipality. In the project area, services such as police stations, high schools, post offices, hospitals and waste collection are absent. There is no public transport and the local community are dependent on the nearest town, Lydenburg for services.

Summary of environmental impacts

Potential environmental impacts were identified by Metago SLR in consultation with IAPs, regulatory authorities, specialist consultants and the AQPSA technical team. All identified impacts are considered in a cumulative manner such that the impacts of the current baseline conditions on and surrounding the site and those potentially associated with the project are discussed and assessed together. A summary of the potential impacts (as per Section 7 of the EIA and EMP report) report), in the unmitigated and mitigated scenarios is presented below.

TABULATED SUMMARY OF POTENTIAL CUMULATIVE IMPACTS

Section	Potential impact	Significance of the impact (the ratings are negative unless otherwise specified)							
		Construction		**Operation**		**Decommissioning**		**Closure**	
		Unmitigated	**Mitigated**	**Unmitigated**	**Mitigated**	**Unmitigated**	**Mitigated**	**Unmitigated**	**Mitigated**
Geology	Loss and Sterilisation of Mineral Resources	No impacts expected							
Topography	Hazardous Structures / Excavations / Surface Subsidence	High	Medium – Low	High	Medium – Low	High	Medium – Low	High	Medium – Low
Soils and land capabilities	Loss of soil resources and land capability through pollution	High	Low	High	Low	High	Low	High	Low
	Loss of soil resources and land capability through physical disturbance	High	Medium	High	Medium	High	Medium	High	Medium
Biodiversity	Physical destruction of biodiversity (terrestrial and aquatic) in the Groot Dwars River Valley	High	High - Medium	High	High - Medium	High	High - Medium	High	High - Medium
	Physical destruction of biodiversity (terrestrial and aquatic) on the Terrace	High	Low	High	Low	High	Low	High	Low
	General disturbance of biodiversity	High	Medium	High	Medium	High	Medium	High	Medium
Surface water	Pollution of surface water resources	High	Low	High	Low	High	Low	High	Low
	Alteration of natural drainage patterns	High	Medium	High	Medium	High	Medium	Medium	Medium
Groundwater	Contamination of groundwater	High	Medium	High	Medium	High	Medium	High	Medium
	Dewatering impacts affecting third party users	No impacts expected							
	Dewatering impacts affecting base flow	Low	Low	High	Medium	High	Medium	High	Medium

Section	Potential impact	Significance of the impact (the ratings are negative unless otherwise specified)							
		Construction		**Operation**		**Decommissioning**		**Closure**	
		Unmitigated	**Mitigated**	**Unmitigated**	**Mitigated**	**Unmitigated**	**Mitigated**	**Unmitigated**	**Mitigated**
Air quality	Increase in air pollution	High	Low	Medium	Low	High	Low	High	Low
Noise	Increase in disturbing noise levels	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Visual impacts	Negative landscape and visual impact	Medium	Medium	High	High	Medium	Medium	Medium	Medium
Heritage (and cultural)	Destruction of heritage, palaeontological and cultural resources	High	Low	High	Low	High	Low	High	Low
Socio-economic impacts	Economic impact (positive and negative)	High +	High +	High +	High +	High +	High +	High +	High +
	Inward Migration	High	Medium	High	Medium	High	Medium	High	Medium
Land use	Land use impacts	High	Medium	High	Medium	High	Medium	High	Low
	Change in land values	High	Medium - Low	High	Medium - Low	High	Medium - Low	High	Medium - Low
	Blasting damage	High	Low	Medium	Low	High	Low	No impacts expected	
	Project-related road use and traffic	High	Medium	High	Medium	High	Medium	No impacts expected	

Issue: Loss and Sterilisation of Mineral Resources

Sterilisation may occur in the event that Everest develops or decommissions infrastructure in a manner that it prohibits the mining of feasible resources, or where it disposes of feasible mineral resources onto waste facilities in a manner that makes it difficult or impossible to access the resources. No assessment of this impact is given, as the changes described above will not result in notable negative environmental impacts and Everest will ensure that provision is made to extract all minerals possible prior to final disposal onto the mineralised waste facilities.

Issue: Hazardous Structures/Excavations/Surface Subsidence

This includes structures that can fail and structures into or off which third parties and animals can fall and be harmed. Most of the identified hazardous excavations and infrastructure present a potential risk of injury to both animals and/or third parties. The significance of this potential impact is therefore high. Related mitigation measures focus on infrastructure safety as well as on limiting access to third parties and animals. With the implementation of the above-mentioned mitigation, the significance reduces to medium to low in all project phases.

Issue: Loss of Soil Resources and Land Capability through Pollution

Soils are a significant component of most ecosystems. As an ecological driver, soil is the medium in which most vegetation grows and a range of vertebrates and invertebrates exist. Potential pollution sources which may compromise soil and related land capability include spills during material handling and potential seepage and/or dirty runoff from residue waste stockpiles. The unmitigated significance is high for all phases. With the implementation of the mitigation measures, which focuses on pollution prevention, the significance is reduced to low.

Issue: Loss of Soil Resources and Land Capability through Physical Disturbance

Soil resources can be lost through physical disturbance during the construction, operational and decommissioning phases, which in turn, could result in a loss of the natural capability of the land. The closure phase will present final land forms that may be susceptible to erosion. Project Fairway will disturb approximately 360 ha of soil resources with a range of natural capabilities. The majority of the area to be disturbed comprises arable (in the vicinity of the proposed TSF), grazing and wilderness. Areas with a wetland land capability will be disturbed by the placement of the TSF. In the unmitigated scenario, the significance of potential impacts is high. In the mitigated scenarios, the significance is reduced to medium through limiting the disturbance footprint and implementing a site-specific soil management procedure that is aimed at conserving soil resources for re-use in rehabilitation of disturbed areas. At closure, the land capability of approximately 110ha comprising the TSF will be changed in perpetuity.

Issue: Physical Destruction of Biodiversity (Terrestrial and Aquatic)

The proposed project will be located within areas ranging from previously disturbed (habitats located on the terrace) to pristine and highly sensitive (within the Groot Dwars River valley) when considering vegetation communities, vertebrate and invertebrate fauna. Aquatic habitats identified include riparian and wetland habitats associated with the Groot Dwars River and perennial and non-perennial tributaries within the project area. There are a number of activities/infrastructure in all phases that have the potential to destroy biodiversity through loss the physical destruction of habitat. Disturbance of the more sensitive communities is unavoidable given their spatial extent and predominant occurrence across the project site. The significance of potential impacts in the unmitigated scenario is high. With mitigation as outlined in the EMP, that focuses on developing and implementing a biodiversity management plan, limiting the disturbance footprint, planning on flora and fauna removal and/or relocation and obtaining the necessary permits for disturbing protected species the significance is reduced to low for activities on the terrace. Due to the uncertainty as to whether the pre-mining ecology and species diversity within the Groot Dwars River valley can be restored following rehabilitation, the significance for activities in the valley may reduce to medium.

Issue: General Disturbance of Biodiversity

Biodiversity can be compromised through general disturbance by mining-related activities. Related mitigation measures focus on biodiversity management and disturbance prevention particularly in the high biodiversity areas. In the unmitigated scenario, the general disturbance of biodiversity will have a high significance. In the mitigated scenario, many of these disturbances can be prevented or mitigated to acceptable levels. However, given the uncertainty of the potential impacts on the cicada *Pynca Sylvia*, the mitigated severity is considered to be medium.

Issue: Pollution of Surface Water Resources

In the unmitigated scenario, especially in the construction, operation and decommissioning phases, surface water (from rainfall) may collect contaminants (hydrocarbons, salts, chemicals, metals) from mine activities and infrastructure and flow into the nearest surface water resources. At closure, the proposed TSF may have the potential to contaminate surface water through long term seepage and/or run-off. At elevated pollution concentrations these contaminants can be harmful to third party users, including biodiversity. The significance of potential impacts is high if third parties are exposed to the potential pollution (depending on the concentration and duration of exposure). With mitigation as outlined in the EMP that focuses on pollution prevention, good housekeeping, stormwater control, professionally designed facilities, monitoring of the process water circuit, and emergency response the significance of potential impacts reduces to low in all phases.

Issue: Alteration of Natural Drainage Patterns

The reduction in volume of run-off into the downstream catchments and proximity of surface infrastructure to wetlands and flood lines associated with watercourses will result in an alteration of natural drainage patterns. During the construction, operation and decommissioning phases, project-related infrastructure will occupy portions of land and clean stormwater controls will be in place diverting as much clean water as possible around the site. The construction of the proposed TSF will also destroy a portion of an already disturbed wetland. During the closure phase, final landforms such as the TSF will remain. In the unmitigated scenario, impacts on perennial and non-perennial drainage systems and the associated wetland systems is considered to have a high significance in all phases prior to closure, while at closure the significance is considered to be medium. Related mitigation measures focus on minimising the footprint areas associated with containing rainfall and runoff and on diverting clean rainfall, runoff and contained water to the surface water drainage systems and the significance is reduced to medium for all phases.

Issue: Contamination of Groundwater

In the unmitigated scenario, pollution of groundwater from numerous pollution sources has the potential to negatively impact downstream water users. The most significant potential pollution is associated with the TSF. From the information made available, it is considered that there is no material risk of acid mine drainage. However, until such time that the anticipated quality of seepage emanating from the proposed TSF is confirmed through additional laboratory test work and simulation modelling, it is assumed that there is potential for groundwater contamination associated with the proposed TSF. Therefore surrounding surface water resources (namely the West Stream) may potentially be contaminated because of the identified link between ground and surface water and because of the predicted pollution plume concentrations in the unmitigated scenario. This is a high significance in the unmitigated scenario. With mitigation as outlined in the EMP which focuses on professionally engineered facilities with pollution control measures, good housekeeping, maintaining an up to date groundwater model, monitoring groundwater qualities on site and at third party boreholes, the significance if potential impacts reduces to medium.

Issue: Dewatering Impacts on Third Party Borehole Users

As no third party boreholes users have been identified within the zone of dewatering from the underground mine workings, no impacts on third party borehole users are expected from the current or proposed Project Fairway dewatering activities.

Issue: Dewatering Affecting Baseflow of Rivers

Dewatering of the underground mining works where groundwater is pumped to surface from the workings to ensure a safe working environment is the main activity that may potentially result in a reduction of groundwater levels affecting the baseflow of rivers, particularly the Groot Dwars River. As a result of the dewatering of the underground mining works it can be expected that there will be some water seeping from the river to the underlying excavations. The drawdown of groundwater levels caused by dewatering of the underground mine workings will impact upon flows of the Groot Dwars River through some seepage from the river into the mine workings and interception of groundwater which would otherwise contribute to the baseflow to the river. During the construction phase, although groundwater levels will be breached during excavations for the box cuts, the effect on the baseflow of the Groot Dwars River is expected to be small. During operation, it can be expected that the drawdown of groundwater levels caused by dewatering of the underground mine workings will impact upon flows of the Groot Dwars River, particularly during the dry-season and towards the end of the operational phase. After closure, once dewatering activities cease, the inflows from the Groot Dwars River will reduce over time (approximately 75 years). In the construction phase, even in the unmitigated scenario, the impact has a low significance. In the unmitigated scenario the significance is high for the operational, decommissioning and closure phases. The significance of impacts on the baseflow of rivers in the operational, decommissioning and closure phases can be reduced to medium through the implementation of a discharge programme to compensate for mine dewatering losses to the surface water system.

<u>Issue: Air Pollution</u>

With projects of this nature (similar to the existing mine operations), the main emissions include: inhalable particulate matter less than 10 microns in size (PM10), larger total suspended particulates (TSP), and gas emissions (such as sulphur dioxide, oxides of nitrogen, carbon monoxide, from vehicle exhausts and blasting). The extent of emissions during the construction, decommissioning and closure phases will vary substantially from day to day and will be dependent on the level of activity, the specific operations being undertaken and the prevailing meteorological conditions. For the operational phase, the main sources of particulate emissions due to unmitigated operations were windblown dust from the tailings facilities, crushing and screening activities and vehicle entrainment. The gaseous CO, NOx and SO2 emissions are due to vehicle exhaust emissions. The predicted PM10 impacts and CO, NOx and SO2 ground level concentrations due to Project Fairway operations are within the relevant evaluation criteria. As the current draft standards for $PM_{2.5}$ emissions are subject to comment, they may change prior to their enactment and therefore cannot be meaningfully assessed in this assessment. In the unmitigated scenario the significance of potential impacts is high for the construction, decommissioning and closure phases and medium for the operational phase. With mitigation, as outlined in the EMP, the significance will be reduced to low for all phases through developing and implementing an air quality management plan, establishing dust control measures, implementing dust suppression techniques and monitoring the potential impact (PM_{10} and dust fallout).

<u>Issue: Noise Pollution</u>

Current mine activities have significantly increased the ambient noise baseline noise levels. Modeling and monitoring has shown that current mine noise sources result in disturbance and nuisance noise impacts in exceedances of the SANS guideline limit for rural areas for the nearest residential receptors. There are a range of project activities that have the potential to cause general noise disturbance or noise nuisance for sensitive receptors. The more significant impacts are expected to occur at night when ambient noise levels are lower and the sensitivity of the environment increases. Noise pollution will have different impacts on different receptors because some are very sensitive to noise and others are not. In the unmitigated scenario, potential noise impacts will have a medium significance during all phases for the nearest receptor sites. In the mitigated scenario, the significance remains the same. Possible mitigation includes the maintenance of equipment and machinery, establishing noise berms, establishing acoustic barriers, personnel training, monitoring of potential impacts at noise receptor sites, include noise suppression measures and material specifications for into the design of infrastructure and implementing a grievance procedure.

Issue: Visual Impacts

Visual impacts will be caused by activities and infrastructure in all project phases. These activities will be visible, to varying degrees from varying distances around the project site. The more significant structure is considered to be the TSF. In the unmitigated scenario, the visual intrusion of the proposed project will be high as the proposed TSF is established in the operational phase. The unmitigated significance for the remaining phases and remaining project infrastructure in all the phases is medium. With mitigation the significance of the visual impact will remain high in the operational phase and medium in the construction, decommissioning and closure phases. Proposed mitigation includes limiting the disturbance footprint, dust control, good housekeeping, correct lighting and rehabilitation of disturbed areas and final land forms.

Issue: Destruction of Heritage, Palaeontological and Cultural Resources

Heritage resources include sites of archaeological, cultural or historical importance. No heritage resources will be impacted on by the positioning of project-related infrastructure. However, heritage resources have been identified within proximity of project infrastructure include two historical hamlets and a graveyard. In the unmitigated scenario, these heritage resources may potentially be disturbed. In the unmitigated scenario the significance of potential impacts is high. With mitigation as outlined in the EMP which includes exhumation and relocation of graves in line with regulatory requirements (if required), establishing barriers for heritage sites that will remain on site, providing access to relatives as and when required, personnel awareness and training and emergency response, the potential significance reduces to low.

Issue: Economic Impact

The development of the mine as a whole has the potential to impact on the economy both positively through the creation of employment opportunities, generation of taxes and levies and benefits through the implementation of the SLP and negatively through the potential loss of existing economic activities (agriculture and tourism). The project is located in area where the land uses in the surrounding area are mainly agriculture, tourism and mixed-use (generally a combination of grazing and tourism). As a cumulative issue, in the unmitigated scenario, the economic benefits of the mine are predicted to outweigh the potential losses to agriculture and tourism. The significance of potential impacts, in the unmitigated scenario, is therefore a positive high in all phases. With mitigation as outlined in the EMP which includes appointing a competent management team to implement the mitigation measures, proper closure planning in a timeously manner, minimising negative environmental impacts through the implementation of mitigation measures and environmental monitoring included in the EIA and EMP report, enhancing positive impacts by working together with regulatory bodies and community structures and monitoring compliance with the commitments in the EIA and EMP report, the significance can increase further.

Issue: Inward Migration

Mines tend to bring with them an expectation of employment in all project phases prior to closure. This expectation can lead to the influx of job seekers to an area which in turn increases pressure on existing communities, housing, basic service delivery and raises concerns around safety and security. In general, both increased movement of poor people into an area and informal settlements are associated with poor standards of living which can promote disease, crime and a general threat to the safety and security of an area. Linked to this influx of people is the ability of receiving areas to supply basic services such as water, food, electricity and sanitation. In the unmitigated scenario, the significance of potential impacts is high. With mitigation as outlined in the EMP which includes setting up and participating in a law enforcement forum, a clear and effective recruitment and training policy, a clear and effective housing policy, and a clear and effective transport policy the significance of potential impacts reduces to medium.

Issue: Land Use Impacts

The range of environmental impacts that could occur as a result of the project which are taken into account when considering impacts on surrounding land use. These include: groundwater, air quality, noise and visual. With this in mind, the main activities that could have an impact on existing land uses is the dewatering of the underground mine works, establishment of the proposed TSF and the associated potential ground water contamination impacts, construction and operation of noise-generating infrastructure and the establishment of the site infrastructure resulting in visual impacts. These activities will commence in the construction phase and continue for the planned life of the project (10 – 15 years). At closure, the site will be rehabilitated and the final landforms will remain. Although it is unlikely that the current state of the site will be re-instated, the rehabilitation measures will minimise the potential for significant post-closure impacts. The unmitigated significance is high. With mitigation as outlined in the EMP which focuses on purchasing/leasing the three farms that form part of the application boundary, effectively mitigating impacts on the environment and if, despite the implementation of remedial steps, the land use impact cannot be addressed, Everest will compensate the relevant land owners accordingly, the significance of potential impacts reduces to medium prior to closure and to low post closure.

Issue: Change in Land Values

The mine development as a whole has the potential to impact on land values and associated economic activity. The impact on land values could be affected both positively and negatively. It is assumed that there is less concern where the situation results in an increase in land values, therefore the assessment considers the possibility of land devaluation. In the unmitigated scenario, land surrounding the project site will experience unacceptable impacts which are likely to cause a loss in land values and/or economic activity. The significance of potential impacts will be high. Mitigation as outlined in the EMP includes establishing a base valuation prior to the start of the project, effective implementation of mitigation measures included in the EIA and EMP report. Prior to project construction, an independent valuator acceptable to all stakeholders will be appointed to carry out a base case valuation of farmland surrounding the project site, the cost of which will be for the account of Everest. This valuation will provide a basis for future discussions if it is established that mine related impacts have caused a decrease in productivity from the affected farmland and as a direct result thereof, a decrease in land value, in which event, Everest will compensate the relevant land owners accordingly. With the above mitigation in place, the significance of potential impacts reduces to medium-low.

Issue: Blasting Damage

For the proposed Project Fairway, surface blasting will be required during the construction phase for the establishment of the proposed box cuts and the establishment of the proposed Valley access road. Once the box cuts are established and underground mining commences, all blasting activities will be undertaken underground. During the decommissioning phase, blasting may be potentially required to aid the removal of infrastructure. Blasting activities have the potential to impact on people, animals, plants and structures located in the vicinity of the operation through ground vibration, airblast, fly rock, blast fumes and dust (considered as part of the air quality study). In the unmitigated scenario, ground vibrations and airblasts can cause damage to third party structures and can be a nuisance for animals and people, within the zone of influence. When considering fly rock, in the unmitigated scenario, fly rock has the potential to cause injury and death to people and animals and damage to plants and structures. In the unmitigated scenario the significance of potential impacts is high in the construction and decommissioning phases and medium in the operational phase. With mitigation as outlined in the EMP which includes undertaking a pre-blast survey, implementing a design blast that meets recommended threshold criteria, restricting daily blasts, creating public awareness, monitoring on site and at third party structures and compensation (if mine-related blasting causes damage after mitigation), the significance reduces to low.

<u>Issue: Traffic Impacts</u>

The project will make use of the surrounding road network and existing mine access road. Traffic on the existing road network is a combination of existing mine traffic, private, community access, small businesses and tourism-related traffic. An increased traffic on existing public road networks can result in an inconvenience to current road users, greater accidents (for people and animals) and/or increased road damage. This in turn can put pressure on the relevant roads authority to increase the maintenance programmes and/or upgrade the roads. In the unmitigated scenario if any injury or death of third parties occurs as a result of an accident, this is considered to be of high significance. With mitigation as outlined in the EMP which includes ensuring mine vehicles are not overloaded and monitoring the emergency response and compensation (if mine-related traffic causes disturbance after mitigation) the significance reduces to medium.

Conclusion

This document presents the project plan as defined by AQPSA, presents findings of specialist studies, identifies and assesses potential impacts on the receiving environment in both the unmitigated and mitigated scenarios, including cumulative impacts, and identifies measures together with monitoring programmes to monitor and mitigate potential impacts.

A summary of the potential impacts (as per Section 7 of the EIA and EMP report), associated with the proposed project, in the unmitigated and mitigated scenarios for all project phases is included in the table above. The assessment of the proposed project presents the potential for significant impacts to occur on the bio-physical, cultural and socio-economic environments both on the site and in the surrounding area.

The economic impact assessment concluded that the development of Project Fairway is the preferred economic land use alternative and that the economic benefits of the project are significantly positive.

Provided that the EMP is implemented there is no environmental reason why the project should not proceed.

PROPOSED EXTENSION OF MINING OPERATIONS (PROJECT FAIRWAY) AT EVEREST PLATINUM MINE

INTRODUCTION AND LEGAL FRAMEWORK

Introduction to the proposed project and this document

Aquarius Platinum (South Africa) (Pty) Ltd (AQPSA) is planning to extend the mining operations at its Everest Platinum Mine (Everest), near Lydenburg in the Mpumalanga Province (Figure 0-1). Existing Everest mine infrastructure is located on the farms De Kafferskraal 53-JT, Sterkfontein 52-JT and Sterkfontein 749-JT, in the Thaba Chweu Local Municipality within the Ehlanzeni District Municipality (refer to Figure 0-1 and Figure 0-2). Underground mining currently takes place on the farms De Kafferskraal 53-JT, Sterkfontein 52-JT and Sterkfontein 749-JT. The current operations at Everest Mine comprise an underground mine, a mineral processing plant, a tailing storage facility, water management infrastructure and various support services and networks. In the past, the mine has undertaken open pit mining but these areas have been mined out and rehabilitated.

In order to continue the operation of Everest Platinum mine, AQPSA is in the process of acquiring the southern portion of the Booysendal mining block from Northam Platinum Limited (Northam). The Booysendal south mining block is located within the Groot Dwars River valley, immediately west of Everest's operations (Figure 0-2). It is proposed to mine the new block using underground mining methods only. In order to facilitate the underground mining of this block, AQPSA is planning to establish new box cuts to provide additional access to the underground reserves, develop a new tailings storage facility, increase the capacity of the existing processing plant, establish a new access road into the valley and extend various services and infrastructure to support the project. The above-mentioned infrastructure is to be developed on portions of the farms Sterkfontein 52-JT, Sterkfontein 749-JT, De Kafferskraal 53-JT and Buttonshope 51-JT (Figure 0-2).

The mine operates with a converted mining right and approved EMP documentation. Further detail is provided in the section below. This document, compiled by Metago Environmental Engineers (Pty) Ltd, part of the SLR Group, (Metago SLR), is the fourth amendment to the mine's existing EMP report and concerns the establishment of Project Fairway. In addition, this document consolidates the proposed project with the approved EMP and amendments.

FIGURE 0-1: REGIONAL SETTING

FIGURE 0-2: LOCAL SETTING

Overview of Everest's operations and approvals

The mine operates under a converted new order mining right issued in October 2006 in terms of the Mineral and Petroleum Resources Development Act (MPRDA), (Act 28 of 2002). The original mining license (ML14/18/2/5071) in terms of the old Minerals Act (Act 50 of 1991), was issued in July 2003. AQPSA also holds a converted prospecting right (DMR Reference No.: MP30/5/1/1/2/1051PR, Prospecting Right No.: 132/2007CPR) for the farm Hoogland 38-JT and the remaining extent of Portion 1 of the farm De Kafferskraal 53-JT (referred to in this report as the Hoogland prospecting right area).

There is an approved environmental impact assessment (EIA) and environmental management programme (EMP) report (Metago, January 2003) and two approved EMP amendments (Metago, April 2009 and Metago, June 2009) for the current mine site (Table 0-1). Through a separate Section 102 application and EIA and EMP amendment process, AQPSA is in the process of incorporating the Hoogland prospecting right area into its mining right area as well as propose additional open pit mining operations.

In terms of the National Environmental Management Act (NEMA), 107 of 1998, the mine operates with an environmental authorisation issued by the Department of Economic Development, Environment and Tourism (DEDET) for various listed activities associated with the development of the valley project. Through a separate application and EIA process, AQPSA is applying for several activities listed in terms of the NEMA and supporting regulations.

TABLE 0-1: SUMMARY OF DEVELOPMENTS AT THE MINE AND ASSOCIATED ENVIRONMENTAL PROCESSES AND DECISIONS

Project	**Main infrastructure components**	**Relevant documentation**	**Approvals**
Original mine development	Establishment of the Everest operation included: • Underground and opencast mining operations; • Topsoil and overburden stockpiles; • Mineral processing operations; • A tailings dam; • Water management infrastructure; and • Various support services and networks.	Original EIA and EMP (Metago, January 2003)	DME – June 2003
Changes to surface mine layout	Following a subsidence event above the original decline, changes were made to the mine's surface infrastructure layout to provide access to the underground mine. Project entailed: • The original decline to be backfilled and used for ventilation purposes only; • Two additional box cuts/declines were developed to access the northern and southern mining areas; • The original ventilation shafts were moved to service the above-mentioned additional decline positions;	EIA and EMP amendment (Metago, April 2009)	DMR – December 2009

Project	Main infrastructure components	Relevant documentation	Approvals
	• A small open pit above the existing decline was to be mined out; and • Existing support services (such as haul roads, water and power supply, air supply, conveyor systems and offices) would be extended to service each of the declines.		
Valley project	To facilitate mining of the underground reserves, surface infrastructure at the mine was expanded. This included: • construction of an additional decline in the valley with associated infrastructure and extending existing support services and networks at the mine to service the decline.	EIA and EMP amendment (Metago, July 2009) Basic Assessment report (Metago, April 2010)	DMR – May 2010 DEDET – May 2010
Hoogland opencast project	To provide additional ore reserves through: • Establishment of two open pit mining areas; • Waste / overburden and soil stockpiles; • Water management controls; • A haul road / services corridor; and • Support infrastructure and services.	In progress	EIA finalisation pending

The water uses associated with the original mine activities were authorised by a Water Use Licence (WUL) issued by the Department of Water Affairs (DWA) in 2006 (licence number 24073173). To cater for additional water uses associated with changes to the mine surface layout and valley project, AQPSA submitted a WUL amendment application and updated integrated water and waste management plan (IWWMP) to DWA in October 2010. A decision on this from the DWA is still pending.

Legal framework for Project Fairway

Prior to the commencement of the proposed project, an environmental assessment process must be followed in order to comply with specific legislation requirements. Metago Environmental Engineers (Pty) Ltd, part of the SLR group (Metago SLR), is the independent firm of consultants that has been appointed by AQPSA to undertake the environmental assessment for the proposed Project Fairway. The above-mentioned environmental process is required in terms of the following legislation:

- An environmental decision from the Mpumalanga Department of Mineral Resources (DMR) in terms of the Mineral and Petroleum Resources Development Act (MPRDA) (Act 28 of 2002) is required. In this regard a Section 102 application was submitted to the DMR by AQPSA in October 2011 to amend the mine's approved EMP to incorporate the proposed Project Fairway.
- Environmental Authorisation is required from the Mpumalanga Department of Economic Development, Environment and Tourism (DEDET) in terms of the National Environmental Management Act (NEMA) (Act 107 of 1998). The project incorporates several listed activities in terms the Environmental Impact Assessment (EIA) Regulations, 2010 (Government Notices No. 543, 544, 545 and 546 of 18 June 2010) (see Section 2.5). An application was submitted by Metago SLR to DEDET on 16 August 2011 and accepted by the department. A copy of the application and department acknowledgment of receipt is included in Appendix B.

Given the above legal framework, this EIA and EMP report was done in accordance with what is prescribed by Regulations 50 and 51 of the Mineral and Petroleum Resources Development Regulations (Government Notice No, 527 of 23 April 2004), as well as Regulations 28(2) and 33 of the EIA Regulations, 2010 (Government Notice No. 543 of 18 June 2010). These regulations were promulgated in terms of the MPRDA and NEMA, respectively.

In terms of the above regulations, Table 0-2 provides a guide to the relevant sections where the information is contained.

TABLE 0-2: LEGISLATIVE REQUIREMENTS FOR EIA AND EMP REPORTS

Mining Regulation 527	**EIA Regulations, 2010 (Government Notices No. 543 of 18 June 2010)**	**Section in report**
Regulation 50 - Environmental Impact Assessment	**Regulation 31 – Content of Environmental Impact Report**	
-	Details of the EAP who compiled the report, and his/her expertise to carry out an environmental impact assessment	Table 0-4
-	Detailed description of the proposed activity(ies)	Section 2.3
-	Description of the property and location of the activity on the property	Section 1.3
Assessment of the environment likely to be affected by the proposed mining operation, including cumulative environmental impacts	A description of the environment that may be affected by the proposed activity	Section 1
Assessment of the environment likely to be affected by the identified alternative land use or developments, including cumulative environmental impacts	-	Section 4, Section 5
Details of the public engagement process and identification of how all issues raised have been addressed	Details on the public involvement process including –compliance with the PSS, IAP database, issues table, additional comments/objections	Section 10
-	Comment on the need and desirability of the proposed activity(ies) in the context of alternatives	Section 4
Comparative assessment of land use and development alternatives regarding environment, social and cultural impacts	Description and comparative assessment of alternatives identified during the EIA	Section 5
-	Methodology used to determine impact significance	Section 7.3
--	Summary of findings and recommendations of specialist reports	Section 1.1, Section 1.3, Section 7
Assessment of the nature, extent, duration, probability and significance of the identified potential environmental, social and cultural impacts of the proposed mining operation, including the cumulative environmental impacts	Description of environmental issues, assessment of significance, and extent to which these can be mitigated	Section 7
Determine appropriate mitigatory measures for each significant impact. Describe arrangements for monitoring and management of impacts	Assessment to include: cumulative impacts, nature, extent, duration, probability, reversibility of resource loss, mitigation	Section 7, Section 19, Section 21

Mining Regulation 527	**EIA Regulations, 2010 (Government Notices No. 543 of 18 June 2010)**	**Section in report**
Knowledge gaps, adequacy of predictive measures, assumptions and uncertainties	Description of assumptions, uncertainties and knowledge gaps	Section 11
-	Environmental impact statement – summary of key findings and comparative assessment of the positive and negative implications of the activity and alternatives	Section 27
Include appendices for supporting and technical information	Specialist reports as appendices	Appendices F - U
Regulation 51 - Environmental Management Programme	**Regulation 33 - Environmental Management Programme (EMP)**	
-	Details of the person who compiled the EMP, and his/her expertise	Table 0-4
-	Detailed description of the activity aspects covered in the EMP	Section 2.3
Description of the appropriate technical and management options chosen for each environmental impact, socio-economic condition and historical and cultural aspect for each phase of the mining operation	Details on the management/mitigation measures from planning and design stages through to closure (where relevant)	Section 7, Section 19
Action to achiever the objective and specified goals which included time schedule	Time frames for implementation where appropriate	Section 19
-	Identification of responsible persons for implementation	Section 19
Planned monitoring and EMP performance assessment	Details of the proposed mechanisms for monitoring compliance with and performance assessment against the EMP	Section 21
-	Measures to rehabilitate the environment affected by the undertaking of any listed activity to its natural or predetermined state or to a land use which conforms to sustainable development, including concurrent or progressive rehabilitation measures	Section 7, Section 19
Description of objectives and specific goals for mine closure, and management of environmental impacts, socio-economic conditions (SLP), historical and cultural aspects	Environmental modification, remediation and control of any activity which causes pollution or environmental degradation, as well as a remedy that is in compliance with any prescribed environmental management standards or practices	Section 15 Section 16 Section 17 Section 19
-	The process for managing environmental damage, pollution or ecological degradation	Section 19
Environmental awareness plan	Environmental awareness plan describing the environmental risk information given to employees and the steps taken to avoid pollution or the degradation of the environment	Section 23
Financial provision for remediation and closure – quantum and method of provision	Closure plans and closure objectives	Section 22
Signed undertaking to comply with the provisions of the Act and Regulations	-	Section 26
Appendices for supporting information	-	Appendices A - U

Secondary approvals / permits

Secondary approvals/permits needed for the project are listed below. In this regard, there are other approvals that are required prior to construction and/or commissioning of project-related activities. This list does not cover occupational health and safety legislation requirements.

- Prior to conducting any water uses as defined in Section 21 of the National Water Act (NWA), (Act 36 of 1998), AQPSA will submit an amendment to its water use license (WUL) to the Department of Water Affairs (DWA). The proposed project incorporates additional water uses identified in terms of the NWA as well as exemptions required in terms of Regulation 704. The water uses include: 21(a) taking water from a water resource; 21(c) impeding/diverting flow of watercourse, 21(g) disposing/discharge of waste water, 21(i) altering banks of watercourse and 21(j) mine dewatering. The exemptions include: 4(a) infrastructure within floodlines; 4(b) the tailings storage facility will be located at the headwaters on a drainage line and 5 use of waste rock for construction and fill. The amendment to the WUL is being compiled by Metago SLR and will be submitted following the EIA process.
- A waste license for general and hazardous waste-related activities is required from the Department of Environmental Affairs (DEA) in terms of NEMA: Waste Act, 59 of 2008. The project includes several listed activities in terms of Government Notice No. 718 of 3 July 2009 (see Section 2.5). An application was submitted by Metago SLR to DEA on 16 August 2011 and accepted by the department. A copy of the application and department acknowledgment of receipt is included in Appendix B.
- All dams with both a wall greater than 5 m and a capacity of 50 000 m^3 must be registered as safety risk dams with DWA in terms of the NWA.
- Prior to damaging or removing heritage resources including graves, permissions are required in terms of the National Heritage Resources Act (Act 25 of 1999) (NHRA), the Ordinance on Exhumations, 12 of 1980, and the Human Tissues Act (Act 65 of 1983).
- Prior to operating the sewage plant, AQPSA or its contractor will obtain a registration of both the sewage plant and the required personnel from DWA in terms of Regulation 2834 of 27 December 1965.
- Prior to removing or damaging any protected plant species, the necessary permits will be obtained from DWA in terms of the National Forests Act (Act 84 of 1998), the Mpumalanga Nature Conservation Act (Act 10 of 1998) and the National Environmental Management: Biodiversity Act (Act 10 of 2004).
- Prior to storage, handling, transportation and disposal of explosives the relevant licenses and written permissions are required in terms of the Explosives Act (Act 25 of 1956), and the Mine Health and Safety Act (Act 29 of 1996), as amended.

EIA approach and process

A summary of the approach and key steps in the combined EIA process and corresponding activities are outlined in Table 0-3 below. A detailed description of the stakeholder engagement process is included in Section 10.

TABLE 0-3: EIA PROCESS

Objectives	Corresponding Activities
Project initiation and application phase (July - October 2011)	
• Notify the decision making authority of the proposed project. • Initiate the environmental impact assessment process.	• NEMA application and a waste license application submitted to MDEDET and DEA, respectively, on 16 August 2011. Applications accepted. • AQPSA submitted a S102 MPRDA application to Limpopo DMR in October 2011. The DMR file has recently been transferred back to Mpumalanga DMR.
Scoping phase (August – October 2011)	
• Identify interested and/or affected parties (IAPs) and involve them in the scoping process through information sharing. • Identify potential environmental issues associated with the proposed project. • Consider alternatives. • Identify any fatal flaws. • Determine the terms of reference for the EIA phase.	• Notify IAPs of the project and environmental assessment process (social scans, distribution of BIDs, newspaper advertisements, telephone calls and site notices) (September 2011). • First round of focussed and public scoping meetings with stakeholder groups (September - October 2011). • Submission of draft scoping report to DMR (October 2011) • Distribute draft scoping report to IAPs and other regulatory authorities for review (October 2011). • Record written comments (October 2011 to December 2011). • Notify IAPs of availability of final scoping report (December 2011 and early January 2012). • Submit final scoping report to MDEDET and DEA (December 2011) • Record additional written comments (end January 2012).
Detailed specialist investigations (November 2011 to February 2012)	
• Describe the affected environment. • Define potential impacts. • Give management and monitoring recommendations.	• Investigations by technical project team and appointed specialists (see Table 0-4) of issues identified during the scoping stage including investigations into alternatives.
EIA and EMP phase (December 2011 – March 2012)	
• Assessment of potential environmental impacts. • Design requirements and management and mitigation measures. • Receive feedback on application	• Compilation of draft EIA and EMP report. • Distribute draft EIA and EMP report to IAPs, DMR and other regulatory authorities for review (March 2012). • Feedback open days with IAPs (May 2012). • Record comments (May 2012). • Notify IAPs of availability of final EIA and EMP report (May 2012) including 21 day review period. • Forward final EIA and EMP report to MDEDET and DEA for review (May 2012). • Forward IAP comments to DMR (May 2012). • Circulate record of decisions to all registered IAPs registered.

EIA team

Metago SLR is the independent firm of consultants that has been appointed by AQPSA to undertake the environmental assessment process. Nicholas Arnott is the Project Manager, with an Honour's Degree in Environmental Management and over five years of relevant experience. Alex Pheiffer (reviewer) has over ten years of relevant experience and is registered with the South African Council for Natural Scientific Professions (SACNSP) as a professional natural scientist (PrSciNat) (Environmental Management).

Neither Nicholas, Alex nor Metago SLR have any interest in the project other than fair payment for consulting services rendered as part of the environmental assessment process. The environmental project team comprises Metago SLR's environmental assessment practitioners, specialist consultants and the technical feasibility team (refer to Table 0-4).

TABLE 0-4: PROJECT TEAM

Team	Name	Designation	Tasks and roles	Company
Project management	Nicholas Arnott	Project manager	Management of the assessment process, stakeholder engagement and report compilation.	Metago SLR
	Victoria Tucker	Project assistant		
Project management	Alex Pheiffer	Project reviewer	Report and process review	Metago SLR
Specialist investigations	Renee von Gruenewaldt	Air Quality specialist	Air Quality Assessment	Airshed Planning Professionals
	Stephen Van Staden	Ecological specialist	Terrestrial ecological assessment	Scientific Aquatic Services
	Martiens Prinsloo	Groundwater specialist	Groundwater impact assessment and tailings backfill study	Future Flow Groundwater and Project Management Solutions
	Stephen van Niekerk and Paul Klimczak	Engineer and hydrologist	Hydrology and design of water facilities	Metago SLR
	Ben van Zyl	Noise specialist	Noise study	Acusolv
	Marine Pienaar and Stephen Van Staden	Land Use Specialist	Soil, Land Capability and Land Use	Scientific Aquatic Services in association with Terra-Africa Consultant
	Dr Julius Pistorius	Heritage consultant	Heritage study	Private Consultant
	Gerrie Muller	Economist	Economic Assessment	Strategy4Good
	Naomi Brehm and Eon Reyneke	Social Specialists	Socio-economic baseline	EVA Solutions
	Graham Young and Mitha Cilliers	Visual impact specialist	Visual impact assessment	Newtown Landscape Architects

SECTION 1 – ENVIRONMENTAL IMPACT ASSESSMENT

1 DESCRIPTION OF THE BASELINE ENVIRONMENT

Given that this report is a consolidation of the existing operation's approved EMP reports together with the proposed Project Fairway, this section provides a description of the current baseline conditions of the project site and the pre-mining baseline conditions of the existing Everest mine site. Each discussion provides a link to anticipated impacts and highlights the relevance of the information provided, identifies how data was collected (either by the specialist and/or Metago SLR) to inform the baseline description, provides the results/outcomes of research and/or studies undertaken for Project Fairway and concludes with the main findings as relevant to the impact assessment and management plan.

The environmental aspects are discussed as follows:

- baseline description of bio-physical environment (Section 1.1)
- baseline description of land uses, socio-economic conditions, heritage and cultural aspects (Section 1.3).

Key environmental aspects requiring protection or remediation are identified in Section 1.2. Maps showing environmental features on and off site are included in Section 1.4 and cross-referenced in the relevant baseline descriptions. A list of supporting specialist information used in the baseline description is included in Section 1.5. Assumptions and uncertainties identified by the specialist studies are outlined in Section 11.

1.1 ON-SITE ENVIRONMENT RELATIVE TO SURROUNDING ENVIRONMENT (BIO-PHYSICAL)

1.1.1 GEOLOGY

This section should be read with reference to Figure 1-1 (geology) and Figure 1-2 (structural features) (Section 1.4).

Introduction and link to impact

As a baseline, the geology and associated structural features provides a basis from which to understand:

- the potential for sterilisation of mineral reserves; and
- the faults, fissures and other lineaments which can act as preferential flow paths of groundwater and which therefore relate both to the dispersion of potential pollution plumes and the inflow of water into underground workings.

Geological processes also determine soil forms (see Section 1.1.4) and potential palaeontological resources (see Section 1.3.3). The geochemistry of the underlying geology and related potential for the pollution of water from mineralised waste facilities and stockpiles is discussed further in Section 3.3.

To understand the geological basis of existing mine impacts and potential impacts associated with Project Fairway, a baseline analysis is described below.

Data collection

Information on geology was extracted from the approved EMP reports for the current mine infrastructure (approved July 2003, December 2009 and May 2010) and updated where relevant with information from the project-specific groundwater study undertaken by Future Flow GPMS (2012). (Appendix J). Regional geological data collection was done through review of available studies and topographical maps. Geophysical surveys were conducted to identify potential geological lineaments such as faults, dykes and/or anomalous zones.

Results

Regional and local geology

Everest is situated in the Bushveld Igneous Complex. The Bushveld complex is an intrusive igneous body, extending about 400 km from east to west and about 350 km from north to south. It comprises a series of ultramafic-mafic layers and a suite of associated granitoid rocks. There are four main limbs to the complex, namely the Northern Limb, the Eastern Limb, the Southern Limb and the Western Limb. Everest is located in the Eastern Limb. The ultramafic-mafic rocks of the Bushveld Igneous Complex are known as the Rustenburg Layered Suite. The Rustenburg Layered Suite is further subdivided into the Marginal, Lower, Critical, Main and Upper zones. Rocks in the Rustenburg Layer Suite range from ultrabasic pyroxenites and norites in the lower parts to norite, gabbro and magnetite gabbro in the upper parts. The Critical Zone pyroxenites, norites and anorthosites host all of the significant Platinum group Metals (PGM) and chromite deposits. The Lower, Critical and Main Zones become attenuated towards the southern end of the Eastern Limb of the Bushveld Complex. For this reason, the Lower and lower Critical Zones are absent at Everest.

The Bushveld floor rocks at Everest are mainly sandstones of the Steenkampsberg Formation, Transvaal Supergroup. These erosion-resistant rocks form much of the Steenkampsberg mountain range located to the east of the mine (unit Vsq on Figure 1-1). Pre-Bushveld sills and the Marginal Zone have intruded these rocks in places. A large sill (over 200 m thick) forms part of the Steenkampsberg.

The main resource area for the current operations at Everest consists of an elongate basin shape structure on the eastern side of the valley with an axis plunging at 9° to the west-south-west below the river. The resource then outcrops along the western side of the Groot Dwars River valley for over 20 km. The UG2 reef dips gradually becoming steeper; from 9° along the what? axis to 18-22° in the near surface around the southern flank, but much flatter, between 10 to 15°, along the northern side of the basin. This arrangement has been attributed to a pronounced antiform (a convex geological fold facing upwards) along the southern flank with steep dips and a subdued antiform along the northern side. The average reef dip for the entire resource is about 15°.

With respect to Project Fairway, the UG2 and Merensky Reef outcrops on the surface with a north / south strike direction on the farms Booysendal in the north and Sterkfontein in the south. The main economic horizons in the Southern Upper Critical and Main Zones are the PGMs located in the Merensky Reef and the underlying UG2 Chromitite Reef. The two reefs outcrop in the Groot Dwars River Valley for approximately 12.5 km. The reefs strike is north-south while it dips between 10° and 12° to the west.

The reef occurs as outcrop and subcrop around almost the entire perimeter of the basin, with the exception of the western part of the southern flank, where the UG2 reef is downthrown along a fault, and the western side of the resource, where the reef passes under the Groot Dwars River and merges with the rest of the UG2 reef that underlies the entire western side of the river valley. Depth-contour plans of the Main resource show that it can be divided into two distinct blocks separated by a saddle. In the eastern block, the UG2 reef reaches a maximum depth of 240 m. In the western block, the maximum depth is 200 m. Along the saddle the reef is up to 80 m deep. Depths along the entire southern dip slope are very shallow, at no more than 10-15 m. The northern part of the resource is also characterized by a relatively large area of shallow reef, at depths of less than 50 m.

Associated with Everest, is the Hoogland ore body, which presents as two separate outliers, namely the north-eastern and south-western ore bodies, separate of the main Everest ore body. The Hoogland ore body is subject to a separate application.

The underlying geology at the existing plant and tailings dam consists mainly of the Marginal Zone and Critical Zone rocks of the Rustenburg Layered Suite. The Marginal Zone consists of fine-grained gabbro and norite. Large detached fragments of Transvaal Supergroup sediments are locally present in this unit. The Marginal zone mainly underlies the plant and the southern part of the tailings dam. Most of the tailings dam is underlain by mostly norite of the Critical Zone. At the new proposed TSF area the geology is mainly comprised of Quaternary surficial deposits, alluvium and scree, while to the west of the valley the geology comprises of medium- to course-grained gabbro and norite with subordinate anorthosite of the Dsjate Subsuite of the Rustenburg Layered Suite of the Bush veld Complex.

Lineaments

The occurrence of dykes, sills and faults within the ore body impact the Everest mining works. These geological features are described further below (refer to Figure 1-2).

Dykes

Six main, post-Bushveld dolerite dykes were identified in the Everest ore body (original EIA and EMP report, Metago 2003). These all have a north to north-northeast strike. Other dykes have been identified from aerial photographs and from outcrop and float identified in the field.

In addition to this, a ground geophysical survey was performed in the Groot Dwars River valley near the proposed Buttonshope North and South and Waterfall box cuts (FutureFlow GPMS, 2012). The results of the survey show the presence of a number of geological lineaments, mainly dykes and faults in the valley floor and are mostly vertical to sub-vertical in angle and their strikes are mainly in the north-south direction.

Faults

One significant fault was identified near the southern margin of the Main Zone (original EIA and EMP report, Metago 2003). A fault zone west of the proposed TSF site has also been identified. A geophysical survey was performed around the perimeter of the proposed TSF area and indicated the presence of a number of fault zones and dyke intrusives, as well as weathering zones that could act as preferential groundwater flow pathways.

Two major faults are located within the Project Fairway resource area (FutureFlow GPMS, 2012). These are the St. George's fault which has a downthrow towards the east of an unknown quantity and a graben structure with a downthrow of 100 m. Towards the south of the proposed Project Fairway area the geological structure is extremely complex with development of several synforms and antiforms (downward and upward closing geological folds).

Potholes

The UG2, chromatite and the Merensky Reefs contain geological structures known as potholes. These are typically structures where the reef has slumped and caused the reef horizons to be lower than they normally occur. This geology affects the mining because the potholes vary in diameter and depth from 10's to 100's of meters, and where they overlap their shape becomes irregular.

Potholing was identified at Everest (original EIA and EMP report, Metago 2003). Furthermore, a hangingwall shear appears be present throughout the resource and ranges from 4 m below top of reef to 5 m above. It is estimated that the resultant hangingwall dilution will range from 0 to 1.2 m, with an arithmetic mean of 0.2 m.

Baseline conclusion

Where infrastructure is placed within close proximity to mineable ore there is the possibility that sterilisation can occur. Given the current layout of the existing mine and the layout of the proposed Project Fairway surface infrastructure, in relation to the depth to the ore body, the sterilisation of mineral resources as a result of infrastructure placement is considered unlikely.

Various geological lineaments including dykes and faults have been identified within the mine and project area. These lineaments may act as preferential flow paths for contamination and therefore they must be carefully considered when determining the potential contamination of groundwater resources, particularly with respect to the structures identified within the proposed TSF area.

1.1.2 CLIMATE

This section should be read with reference to Figure 0-1 (regional setting) (Section 1.4).

Introduction and link to impact

As a whole, the various aspects of the climate that are discussed influence the potential for environmental impacts and related mine design. Specific issues are listed below:

- Rainfall influences erosion, evaporation, vegetation growth, rehabilitation planning, dust suppression, and surface water management planning;
- Temperature influences air dispersion through impacts on atmospheric stability and mixing layers, vegetation growth, and evaporation which influences rehabilitation planning; and
- Wind influences erosion, the dispersion of potential air pollutants, and rehabilitation planning.

To understand the basis of existing mine impacts and potential impacts associated with Project Fairway, a baseline analysis is described below.

Data collection

Information in this section was extracted from the approved EMP reports for the current mine infrastructure (approved July 2003, December 2009 and May 2010), the air quality study conducted (Airshed, 2012) and surface water study (SLR, 2012) conducted for Project Fairway.

No on-site weather station is present at Everest. A number of weather stations within 22 km of the mine and project site were therefore reviewed by the hydrology specialist as part of this study. In addition, there is a rainfall gauge located at the mine at the EnviroServ site office located near the existing TSF.

Relevant rainfall, evaporation and temperature data was sourced as follows (further detail is provided in the hydrology report):

- Mean annual precipitation and evaporation data, was sourced from the Department of Water Affairs and the Water Resources of South Africa 2005 Study (WR2005) prepared by the Water Research Commission;
- Monthly rainfall was sourced from a rainfall gauge at the EnviroServ offices at the mine and the Roossenekal weather station (DWAF No. B4E004; SAWS No. 553762 W) weather station;
- Monthly evaporation was sourced from Roosenekal weather station;
- Rainfall depths were sourced from the Design Rainfall Estimation Software for South Africa (Smithers and Schulze technique) (using the 90% Upper Confidence limit); and
- Temperature data was sourced from Lydenburg.

For wind-related data, meteorological data was sourced by the air quality specialist (Airshed, 2012) from available meteorological data sets, specifically the calculated MM5 meteorological data for the period 2010 (specific to the mine site). The MM5 data also provides temperature data, used for comparison to the Lydenburg weather station.

Results

Regional climate

Everest mine is located on the eastern escarpment, on the border of the Highveld and Northern Transvaal climatic zones (Schulze, 1974, as cited in SLR, 2011).

Average rainfall

Data sourced from the WR2005 indicates that the mean annual precipitation (MAP) for the site is approximately 640 mm/year with a range in annual evaporation for the site of between 1800 – 2000 mm (A-Pan estimate) and between 1400 – 1500 mm (S-Pan estimate).

The average monthly rainfall record at Roossenekal ranges between 3.1 mm (in July) and 123.8 mm (in November) per annum with an annual record of 683 mm (Table 1-1). Evaporation ranges from 56.2 mm (in July) to 118.2 mm (in January) with an annual evaporation of 1101.4 mm. It is clear from the data that evaporation greatly exceeds rainfall in the area both on a monthly and annual basis. The more significant rains occur in summer.

TABLE 1-1: MONTHLY RAINFALL AND EVAPORATION DISTRIBUTION (DWAF STATION NO. B4004)

Month	Rainfall (mm)	Lake Evaporation (mm)
January	120.9	118.2
February	93.4	110.4
March	74.0	103.1
April	34.6	83.8
May	13.4	71.2

Month	Rainfall (mm)	Lake Evaporation (mm)
June	7.3	56.2
July	3.1	58.4
August	7.4	73.9
September	17.4	94.1
October	68.8	107.9
November	123.8	108.0
December	117.0	116.0
Total	**683.0**	**1101.4**

Rainfall data records for the 2008/2009 hydrological year obtained from the rain gauge at the mine indicate a total rainfall of 1067 mm for this period. The highest rainfall recorded occurred during the month of November 2008 and February 2009, when 298 and 286 mm were recorded respectively.

Maximum 24-hour rainfall depths for various recurrence intervals were used for all hydrological calculations (TABLE 1-2) (Metago SLR, 2012).

TABLE 1-2: 24-HOUR STORM DEPTHS

Return period (yrs)	Average 24-hour rainfall depth (mm)
2	29.8
5	39.6
10	46.6
20	53.9
50	63.9
100	72.4
200	81.3

Temperature

From the Lydenburg weather station data, temperatures in the region tend to be warm to mild with average temperatures ranging between highs of 18.3°C - 25.9°C in the warmer summer months and lows of 2.7°C - 14.7°C in the winter months (TABLE 1-3). The annual average temperatures range between 9.5°C and 22.9°C. Data (MM5) sourced by the air quality specialist shows temperatures typically range between 14°C and 22°C during summer months, with daily-averages in the order of 17.5°C. During winter months, temperature ranges of between 6°C and 15°C are typical, with average temperatures of 9°C having been recorded.

TABLE 1-3: TEMPERATURE DATA (LYDENBURG)

Month	Temperature[#]		
	Average maximum (°C)	Average minimum (°C)	Average (°C)
January	25.9	14.7	20.3
February	25.5	14.2	19.8
March	24.8	12.9	18.8
April	22.6	10.0	16.3
May	20.8	6.0	13.4
June	18.3	2.8	10.6

July	18.8	2.7	10.7
August	20.9	4.8	12.8
September	23.6	8.1	15.9
October	24.0	10.8	17.4
November	24.2	12.7	18.4
December	25.2	14.1	19.6

<u>Wind</u>

In general, the wind field is dominated by south-easterly winds with more than 12% frequency of occurrence (Figure 1-4) (Airshed, 2012). Thermo-topographical induced flow is anticipated to represent an important component in the airflow over the study area with significant differences evident between day-time and night-time wind field characteristics. The slope of the terrain accounts for the increased frequency of occurrence of northerly and north-westerly wind during the day-time and increased south-easterly winds during the night-time. The differential heating and cooling of the air along a slope typically results in down-slope flow at night, with low-level up-slope airflow occurring during the day.

Wind speeds between 3 and 10 metres per second (m/s) dominate with exceedances of 10 m/s occurring less than 1% of the time. In general, particles from the tailings material (of 100 µm in diameter and smaller) can be lifted with wind speeds in excess of 11.6 m/s, while particles from the topsoil stockpiles (of 100 µm in diameter and smaller) can be lifted with wind speeds in excess of 8.7 m/s.

The atmospheric boundary layer constitutes the first few hundred metres of the atmosphere. This layer is directly affected by the earth's surface, either through the retardation of flow due to the frictional drag of the earth's surface, or as result of the heat and moisture exchanges that take place at the surface. During the daytime, the atmospheric boundary layer is characterised by thermal turbulence due to the heating of the earth's surface and the extension of the mixing layer to the lowest elevated inversion. The radiative flux divergence during the night usually results in the establishment of ground-based inversions and the erosion of the mixing layer. The night times are characterised by weak vertical mixing and the predominance of a stable layer. These conditions are normally associated with low wind speeds, hence less dilution potential.

The mixed layer ranges in depth from a few metres (i.e. stable or neutral layers) during night times to the base of the lowest-level elevated inversion during unstable, daytime conditions. Elevated inversions may occur for a variety of reasons and on some occasions as many as five may occur in the first 1000 m above the surface.

Baseline conclusion

Everest Mine is characterised by seasons with heavy thunderstorms that last for short periods at a time. High evaporation rates reduce infiltration rates, while the high rainfall levels can increase the erosion potential and the formation of erosion gullies. The presence of vegetation does however allow for surface infiltration thereby reducing the effects of erosion. The mixing of layers resulting in the formation of temperature inversion and the presence of cloud cover limits the dispersion of pollutants into the atmosphere. In general wind speeds are between 3 and 10 m/s and not able to carry all types of dust particles, however this is dependent on the material type, as tailings dust can be carried by winds speeds less than 5.4 m/s. These climatic aspects need to be taken into consideration during rehabilitation and surface water management planning.

1.1.3 TOPOGRAPHY

This section should be read with to Figure 1-3 (topography) (Section 1.4).

Introduction and link to impact

Mine-related activities have altered the topography of the area through the establishment of both temporary (such as processing infrastructure and support facilities) and permanent (such as the tailings storage facility) infrastructure. Changes to the topography through the development of the proposed project infrastructure will impact on surface water drainage (Section 1.1.7), visual aspects (Section 1.1.11) and the safety of both people and animals. To understand the basis of existing impacts and potential impacts associated with Project Fairway, a baseline analysis is described below.

Data collection

The main source of data collection was a series of site visits by the EIA project team, review of topographical maps and a review of the approved EMP reports for the current mine infrastructure (approved July 2003, December 2009 and May 2010).

Results

The Everest mine site can be divided into four distinct topographical features, as outlined below (Figure 1-3).

- The first topographical feature is the Groot Dwars River valley, located to the west of the current mine infrastructure. From west to east, the steep valley ranges in altitude from 1 220 metres above mean sea level (mamsl), at bottom of the valley by the Groot Dwars River, to 1 760 mamsl, at the edge of the ridge on the eastern side of the valley. The average gradient of the slopes is 1:5. The majority of the proposed Project Fairway surface infrastructure is located within the Groot Dwars River valley on “flattish” areas on the either side of the Groot Dwars River.

- The second feature is a ridge, which defines the eastern edge of the valley and western edge of the terrace area (see third topographical feature) above the valley. The highest point on the ridge is 1 782 mamsl. From the crest of the ridge, the topography slopes moderately down towards the terrace to the east reaching an altitude of 1 720 mamsl at the base of the ridge.
- The third feature is a terrace or bench area located 4 km east of the Groot Dwars River. It is a subdued valley with a gently undulating landform between the steep slopes of the Steenkampsberge and the ridge leading into the Groot Dwars River valley. The terrace has elevations of between 1 600 and 1 700 mamsl. The current Everest mine infrastructure is located on this terrace near to the foot of the De Berg peak. The slopes in the vicinity of the existing mine infrastructure have a gradient of 1:30. The proposed South box cut with associated support facilities, DMS plant and tailings storage facility are located on the terrace, with the TSF positioned north of existing mine infrastructure, close to the edge of the above-mentioned ridge.
- The fourth feature of the project area is the Steenkamspberge mountain range. This is a curvilinear erosional feature over 25 km long and located up to 7 km east of the Groot Dwars River. The slopes on the Steenkampsberge above the terrace have an average gradient of 1:5.

Baseline conclusion

Mining activities and infrastructure (including Project Fairway) have the potential to alter the topography and the natural state of undisturbed areas. The design of infrastructure should be such that any changes to topography result in stable topographic features which do not pose significant risk to third parties, limit alterations of drainage patterns (including erosion) and limit impacts on the visual character of the area.

1.1.4 SOILS

This section should be read with reference to Figure 1-5 (land types) and Figure 1-6 (soils) (Section 1.4)

Introduction and link to impact

Soils are a significant component of most ecosystems. As an ecological driver, soil is the medium in which most vegetation grows and a range of vertebrates and invertebrates exist. In the context of mining operations, soil is even more significant if one considers that mining is a temporary land use where-after rehabilitation (using soil) is the key to re-establishing post closure land capability that will support post closure land uses.

Mining projects have the potential to damage the soil resource through physical loss of soil and/or the contamination of soils, thereby impacting on the soils ability to sustain natural vegetation and altering land capability. Contamination of soils may in turn contribute to the contamination of surface and groundwater resources. Loss of the topsoil resource reduces chances of successful rehabilitation and restoration.

At the mine, soil resources at the site of existing mine infrastructure have been disturbed by activities on site. In most instances, this has been done in line with the mine's soil conservation procedure (approved as part of the original EIA and EMP report, Metago 2003).

To understand the basis of existing impacts and potential impacts associated with Project Fairway, a baseline analysis is described below.

Data collection

Information on the existing mine site was extracted from the approved EMP reports for the current mine infrastructure (approved July 2003, December 2009 and May 2010).

For Project Fairway, a project-specific soil and land capability study was undertaken by Terra-Africa Consult CC and Scientific Aquatic Services (2012) (Appendix F). Data was obtained through the review of a selection of literature and maps in order to gain a better understanding of the conditions of the area, as well as literature regarding some general aspects of the agricultural potential of the study area. Land Type data as provided by the Institute for Soil, Climate and Water were studied as well as the original EIA and EMP report (Metago, 2003) for the existing Everest Mine. A field survey was undertaken to determine the soil forms and current land capability of the project area with sampling points between 50 and 100 m apart on study area. Observations were made regarding soil texture, structure, organic matter content and slope of the area. Soil samples for chemical analysis were also taken. Samples were analysed for pH, phosphorus content, macro nutrients (calcium, magnesium, and potassium), micro elements (iron, zinc, copper, etc.), organic carbon and electrical conductivity (resistance).

The identification and classification of soil profiles were carried out using the Taxonomic Soil Classification System.

Results

<u>Land Types</u>

Determination of the Land Type provides an indication of the broad soil groups, clay percentage as well as other information regarding the project area to assist the interpretation of soil classification results.

Land types occurring on the terrain at the mine include Land type Fa343b (at the crest of the Steenkampsberge), Land Type Fa327a (at the footslopes of the Steenkamspberge), Land Type

Ab29a (on the terrace) and Land Type Ib154b on the ridge and slopes of the Groot Dwars River valley (Metago, 2003). The following information was deduced from the land type information:

- Most of the ridge above the ore body is rock with limited soil, with only a small percentage (5 %) of the farm with shallow soil in rock.
- The terrace is composed mainly of massive or structured soils with low to medium base status. Most of these soils (about 80 %) are 600 – 1 200 mm deep with no mechanical limitations to agriculture. These soils are predominantly of the Hutton and Shortlands forms, with patches of Arcadia and Bonheim soils associated with drainage lines. A small percentage (13 %) consists of shallow soils on rock and an even smaller percentage (6.5 %) consists of rock with limited soil.
- Many different soil types occurred along the access road to the mine. On the east side of the Steenkampsberge, the dominant soils are of the Hutton and Shortlands forms (200 to 1200 mm deep). On the Steenkampsberge, rock and shallow Mispah prevail. Patches of shallow (100 to 500 mm) Glenrosa, Shortlands and Hutton soils occur at the foot of the Steenkampsberge. Arcadia soils are common in drainage lines.

For Project Fairway, the proposed location of the new TSF comprises a single Land Type - Ab29 (same to that found at existing mine infrastructure sites). The texture classes of this Land Type range from sandy clay-loam to clay-loam, while slopes range between 0 to 15%. The soil is underlain by gabbro and norite of the Rustenburg complex. Soils in this Land Type can generally be described as red-yellow apedal freely-drained soils.

In the valley area, two different Land Types were identified - Ib31 and Ib154. The Ib31 Land Type is generally confined to the lowering lying slopes and the valley floor. It consists of rock with limited soil and shallow soil forms and is thus dominated by the Mispah soil form. Most areas in this land type have slopes ranging from 3% to 50% with clay content in the shallow topsoil ranging between 1-3%. The Ib154 Land Type is generally situated on the higher-lying slopes of the valley and consists of a combination of shallow rocky soil of the Mispah and Glenrosa soil forms while terraces are composed mainly of massive or structured soils with low to medium base status. Soils in this Land Type have higher clay content of up to 40%.

Soil forms

Soils types identified at the existing mine site were found to vary from shallow, rocky, sandy loams to dominantly deep, weakly structured, sandy clay loam soils (Metago, 2003). Seven soil map units were identified at the mine site (TABLE 1-4). These included Rock (0.1 to 1.2 m deep), Mispah myhill (0.1 to 0.3 m deep), Hutton hayfield/Hutton suurbekom (shallow – 0.2 to 0.4 m deep), Katspruit lammermoor (0.2 to 1.2 m deep), Hutton hayfield/Hutton suurbekom (medium depth – 0.4 to 0.7 m deep), Hutton hayfield/Hutton suurbekom (deep – 0.7 to 1.2 m deep), Shortlands groothoek/Shortlands sebati (0.7 to 1.2 m deep) and streambeds (Figure 1-6).

TABLE 1-4: SOILS OCCURRING AT THE SITES OF EXISTING MINE SURFACE INFRASTRUCTURE

Map unit	Soil forms	Depth (m)	Description
Hu	Hutton	0.8->1.2	Consist of an orthic A horizon on a red apedal B horizon overlying unspecified material. There are no restrictive layers and the soils are structureless or have very weakly developed structure. The red apedal B1-horizon has more or less uniform "red" soil colours in both the moist and dry states and has weak structure or is structureless in the moist state. The red apedal soils have generally developed on meta-sandstone/quartzite parent material, which has a low content of weatherable minerals and thus low clay forming potential. These soils have occasionally also developed on ferricrete parent material, which has a moderate content of weatherable minerals and thus a moderate clay-forming potential. Textures are coarse to medium sand to sandy-loam in the topsoil and medium to fine sandy-loam in the subsoil. Structure is weak blocky (dominant) or apedal in all horizons. The high quality orthic A and red apedal B-horizons make it a suitable soil form for annual crop production (good rooting medium) and use as “topsoil‟, having favourable structure (weak blocky to apedal) and consistence (slightly firm to friable).
Sd	Shortlands	>0.6 (at TSF) 0.25-0.5 (in valley)	Consist of an orthic A horizon on a red structured B1 horizon. The structure of the B1 horizon is more strongly developed than that of the red apedal B horizon present in the Hutton soil form. The transition between the A and B1 horizon is gradual and not abrupt as is often the case with underlying cutanic horizons. The pedality of this horizon is the result of a sufficient amount of clay and the presence of 2:1 clay minerals. Small rocks are present. The depth of these soil profiles are restricted by rock or weathered rock layers The soil form has a high agricultural production potential and although it is moderately structured, it is not a physical barrier for penetration by crop roots.
Cv	Clovelley	0.6->1.5	Texture is fine sandy to sandy-loam to loam for all horizons. The high to moderate quality orthic A and yellow-brown apedal B-horizons are suitable materials for annual cropping (good rooting medium) and use as “topsoil‟, having favourable structure (apedal) and consistence (friable). An orthic A horizon overlying a yellow-brown apedal B1-horizon with unspecified material underneath the apedal horizon. The unspecified material does not have any signs of wetness. The orthic A-horizon is either between 100 mm and 300 mm deep or absent due to earlier crop cultivation practices. The yellow-brown apedal horizon has more or less uniform "yellow-brown" soil colours in both the moist and dry states and has weakly developed blocky structure or is structureless in the moist state.
Ka	Katspruit	-	Comprises of an orthic A-horizon overlying a G-horizon with the orthic horizon between 15 and 30 cm deep and the G-horizon thicker than 100 cm. G-horizons develop when water saturation for long periods gives rise to gleying with the reduction of ferric oxides and hydrated oxides. The G-horizon is dominated by grey, low chroma colours, usually with marked clay illuviation. These soils occur in the seasonal to permanent zone of wetlands.
Kd	Kroonstad	-	Differs from the Katspruit form in that the G-horizon is overlain by an E horizon that occurs underneath the orthic A horizon. This soil form also indicates seasonal to permanent wetland zones.

Map unit	Soil forms	Depth (m)	Description
Gs/Ms/R	Glenrosa, Mispah and Rocky outcrops	-	These shallow rocky soils have clay-loam texture, while topsoil structure ranges from apedal to weakly blocky and the profiles are very shallow (as shallow as 0.15 m of soil on a rocky layer). The orthic A-horizon of the lithic soil group is unsuitable for annual cropping or forage plants (poor rooting medium since the low total available moisture causes the soil to be drought prone). These poor topsoils are not ideal for rehabilitation purposes for they are too shallow and/or too rocky to strip unless it can be recovered by a screening process.
Ar/Rg	Arcadia and Rensburg	-	Although not all Rensburg and Arcadia soils can be classified as wetland soils, these soils showed signs of wetness and are associated with drainage lines. The vertic soils have A-horizons that have both a high clay content and a predominance of smectitic clay mineral that possess the capacity to swell and shrink markedly in response to moisture changes. They have a characteristic appearance where the structure is strongly developed, ped faces are shiny, and consistence is highly plastic when moist and sticky when wet. Swell-shrink potential is manifested typically by the formation of conspicuous vertical cracks in the dry state and the presence, at some depth, of slickensides (polished or grooved glide planes produced by internal movement). However, the presence of these planes is apparently also a function of vertical thickness, being dependent on the total volume of the material which swells and shrinks

Soils were classified according to the South African Soil Classification System (Soil Classification Working Group, 1991).

At the proposed TSF site, the Project Fairway specialist study identified five different soil forms (refer to Figure 1-6). The identified soil forms can be divided into two groups; soil with high agricultural potential (Hutton, Shortlands and Clovelly forms) and hydromorphic (wetland) soils (a mixture of Kroonstad and Katspruit forms). In the valley where infrastructure is proposed, five different soil forms were identified that can be divided into three broad groups: shallow rocky soils (Glenrosa, Mispah and rocky outcrops), shallow to medium-deep structured soils (Shortlands soil form) that were identified in areas with plateaus or valley bottoms and hydromorphic (wetland) soils (Arcadia and Rensburg soils).

Chemical characteristics

For the existing mine site, the properties of the soil units indicated:

- a moderate natural fertility except for Katspruit lammermoor (KaRg) which had a low natural fertility;
- moderate erodibility for all soil forms;
- very low dryland crop production potential and soil irrigation potential except for Hutton hayfield/Hutton suurbekom (mHu) which had a moderate potential and Hutton hayfield/Hutton suurbekom (dHu) and Shortlands groothoek/Shortlands sebati (dSdHu) which had a high potential.

The high agricultural potential of the Hutton (dHu) and Shortlands (dSdHu) soil forms was attributed to a combination of the mean annual rainfall, other climatic conditions and soil depth. The soil structure varies between structureless, weakly structured to moderately structured. Soil structure affects root penetration and development, soil preparation and water penetration. Strong structure restricts root development and water absorption is slow, leading to water runoff and consequent soil erosion. Weakly structured soils have better root and water penetration.

TABLE 1-5: PROPERTIES OF SOILS OCCURRING AT THE EXISTING MINE INFRASTRUCTURE

Map unit	Dominant soil form and family	Natural fertility	Erodibility	Dry land crop production potential	Soil potential for irrigation
RS	Rock	Moderate	Moderate	Very low	Very low
MsR	Mispah myhill	Moderate	Moderate	Very low	Very low
sHu	Hutton hayfield, Hutton suurbekom	Moderate	Moderate	Very low	Very low
KaRg	Katspruit lammermoor	Low	Moderate	Very low	Very low
mHu	Hutton hayfield, Hutton suurbekom	Moderate	Moderate	Moderate	Moderate
dHu	Hutton hayfield, Hutton suurbekom	Moderate	Moderate	High	High
dSdHu	Shortlands groothoek, Shortlands sebati	Moderate	Moderate	High	High

** The Katspruit lammermoor soil type was classified as a wetland because of the shallow water table, free water on the surface and hydromorphic soils present.*

TABLE 1-6: PROPERTIES OF SOILS OCCURRING AT THE PROJECT FAIRWAY PROPOSED INFRASTRUCTURE

Map unit	Dominant soil form and family	Natural fertility	Erodibility	Dry land crop production potential	Soil potential for irrigation
Sd	Shortlands	Medium	Medium	High	High
Hu	Hutton	Medium	Medium	High	High
Cv	Clovelly	Medium	Medium	High	High
Gs/Ms/R	Glenrosa/Mispah/Rock	Low	High	Low	Low
Ar/Rg	Arcadia/Rensburg	Low	Low	Low	Low
Ka/Kd	Katspruit/Kroonstad	Low	Low	Low	Low

<u>Soil salinity/alkalinity</u>

In general, it is accepted that the pH of a soil has a direct influence on plant growth. This may occur in a number of different ways, which include:

- The direct effect of the hydrogen ion concentration on nutrient uptake;
- Indirectly through the effect on major trace nutrient availability; and
- Mobilising toxic ions such as aluminium and manganese, which restrict plant growth.

Most soils have a pH in the range of 4 to 10. A pH range of between 6 and 7 most readily promotes the availability of plant nutrients to the plant. However, pH values below 3 or above 9, will seriously affect, and reduce the nutrient uptake by a plant. The pH of the analysed soil samples from the proposed project area range between 5.3 and 5.6 and can therefore be described as strongly acid.

<u>Other soil elements</u>

Soil fertility describes the potential of land for successful crop production. This fertility is the combined result of the cation exchange capacity (CEC) of the soil, as well as the exchangeable bases namely Ca (calcium), Mg (magnesium), K (potassium) and Na (sodium).

Potassium (K) is extremely mobile within the plant and helps regulate the opening and closing of stomata in the leaves as well as the uptake of water by root cells. It is also essential for photosynthesis, protein synthesis and starch formation. Potassium levels are generally deficient ranging from 19 to 93 mg/kg. Potassium uptake by plants is further decreased by the dominance of the cation complex by high calcium and magnesium levels.

The phosphorus (P) level measured is 2 mg/kg. Although this seems very low for a crop production situation, it is normal for South African veld conditions. The cation chemistry (Ca, Mg, K, Na) for the Project Fairway project area is typical of the soil forms in the area. Very high levels of calcium (1413 to 2678 mg/kg) and magnesium (437 and 706 mg/kg) will suppress low levels of potassium (19 – 93 mg/kg) during nutrient uptake by plants.

Baseline conclusion

Soil forms at the mine, including Project Fairway, can be divided into four broad groups: soils with high agricultural potential (on the terrace), shallow rocky soils (mostly in the valley), shallow to medium-deep structured soils (on the terrace and in the valley) and hydromorphic (wetland) soils (on the terrace and in the valley). These soils will require appropriate management measures during construction and operation to prevent the loss of soil resources through pollution and erosion as soil resources form a crucial role during rehabilitation.

1.1.5 LAND CAPABILITY

This section should be read with reference to Figure 1-7 (land capability) (Section 1.4).

Introduction and link to impact

The land capability classification is based on the soil properties and related potential to support various land use activities. Mining operations in general have the potential to significantly transform the land capability. At the current mine site, land capabilities have been disturbed through the establishment of existing mine infrastructure. However, where rehabilitation has taken place, such as the mined out open pit areas, land capabilities are being restored in line with the approved EMP report (Metago 2003). To understand the basis of existing impacts and potential impacts associated with Project Fairway, a baseline analysis is described below.

Data collection

Information on the existing mine site was extracted from the approved EMP reports for the current mine infrastructure (approved July 2003, December 2009 and May 2010).

For Project Fairway, a project-specific soil and land capability study was undertaken by Terra-Africa Consult CC and Scientific Aquatic Services (2012) (Appendix F). Land capability within the surface use area was classified into different classes namely, wetland, arable land, grazing and wilderness by applying the classification system in terms of the South African Chamber of Mines Land Capability Rating System (1981).

Results

Most of the land (54%) at the sites of existing mine infrastructure was classed as arable (Figure 1-7). The soils were found to be of high to moderate potential for agricultural use, due to their natural fertility, weak soil structure, soil chemical properties and soil depth. Climatic conditions were identified to be favourable for agricultural use. Some areas were classed as having grazing (20%) or wetland type (26%) capability. The wetland type capability was due to the presence of hydromorphic soils on a shallow water table with free water on the surface.

For Project Fairway, the following land capabilities were identified (Figure 1-7):

- Arable land capabilities at the TSF site - this area is suitable for both irrigated and dryland crop production.
- Grazing land capability in the valley areas - generally confined to the valley bottoms on plateaus within the Groot Dwars Valley. The suitably of these areas for grazing is as a result of the slightly deeper soil profiles and is suitable for cattle and game farming.
- Wilderness land capability in the valley areas – this comprises the majority of the Groot Dwars Valley due to the very shallow, rocky nature of soil forms present as well as the steep slopes. This land capability is best suited to conservation due to the biodiversity present.
- Wetland capability – dominated by hydromorphic soils that are often structured and plant life that is associated with aquatic processes. This land capability is best suited for conservation and grazing purposes. These areas were identified at the proposed TSF site, as well as being associated with drainage lines and marshy areas within the Groot Dwars Valley.

TABLE 1-7: AREA OF IDENTIFIED LAND CAPABILITIES WITHIN THE PROJECT AREA

Land Capability	Area (ha)	Percentage of Total Project Area
Arable Land Capability	100.3	27.14%
Wetland Capability	33.9	9.17%
Wilderness Capability	210.5	56.97%
Grazing Land	24.8	6.71%
Total	**369.5**	100%

Baseline conclusion

Land capabilities at the mine, including Project Fairway, are a mixture of arable, grazing, wilderness and wetland. The land capability will be changed with the placement of infrastructure. Therefore, impact management and rehabilitation planning are required to achieve acceptable post rehabilitation land capabilities.

1.1.6 BIODIVERSITY

This section should be read with reference to Figure 1-8 (vegetation types) (Section 1.4).

Introduction and link to impact

In the broadest sense, biodiversity provides value for ecosystem functionality, aesthetic, spiritual, cultural, and recreational reasons. The known value of biodiversity and ecosystems is as follows:

- Soil formation and fertility maintenance;
- Primary production through photosynthesis, as the supportive foundation for all life;
- Provision of food and fuel;
- Provision of shelter and building materials;
- Regulation of water flows and water quality;

- Regulation and purification of atmospheric gases;
- Moderation of climate and weather;
- Control of pests and diseases; and
- Maintenance of genetic resources.

The establishment of infrastructure as well as certain supportive activities have the potential to result in the loss of vegetation, habitat and related ecosystem functionality through physical disturbance and/or contamination of soil and/or water resources. As a baseline, this section provides an outline of the type of vegetation occurring on site and the status of the vegetation, highlights the occurrence of sensitive ecological environments including sensitive/ endangered species (if present) that require protection and/or additional mitigation should they be disturbed. The presence and extent of animal life is directly linked to the natural vegetation. The establishment of project infrastructure as well as project related activities have the potential to result in a loss of habitat through the destruction/disturbance of vegetation thereby reducing the occurrence of fauna on site. At the current mine site, vegetation communities has been disturbed through the establishment of existing mine infrastructure. However, where rehabilitation has taken place, such as the mined out open pit areas, the vegetation communities (and associated ecological functioning, where possible) are being restored in line with the approved EMP report (Metago 2003). To understand the basis of these potential impacts, a baseline situational analysis is described below.

Data collection

Information on the existing mine site was extracted from the approved EMP reports for the current mine infrastructure (approved July 2003, December 2009 and May 2010).

For Project Fairway, a project-specific biodiversity study was undertaken by Scientific Aquatic Services (2012) (Appendix G).

Prior to the field assessment, data collection was done through desktop assessments of maps, aerial photographs and digital satellite images, available published reports, plant and animal lists and maps. An initial visual on-site assessment of the subject property was made in order to confirm the assumptions made during consultation of the maps. Literature review with respect to habitats, vegetation types and species distribution was conducted. The timing of the fieldwork was aimed at coinciding with the flowering times of most plants expected to occur in the study area. Field investigations covered day- and night-time activities. Caught faunal specimens were identified through reference to literature and input from expert specialists. The ecological state of each habitat unit was calculated. Field investigations for the project were undertaken in October 2011 (flora, fauna), November 2011 (flora, invertebrate), late November (invertebrate, specifically cicada), December 2011 (invertebrate, to inspect traps) and January 2012 (flora, fauna, invertebrate). Further detail on the methodologies used is provided in the specialist report (Appendix G).

The wetland delineation was undertaken in accordance to the method presented in the final draft of "*A practical field procedure for identification and delineation of wetlands and riparian areas*" published by the Department of Water Affairs in February 2005.

Results – Regional Database Information

Mpumalanga Biobase

The Mpumalanga Biobase provides an indication of the importance the subject property has with respect to fauna. With reference to the Biobase, the subject property is considered most significant with regards to bird and reptile habitat. Little or no importance is indicated for invertebrates, reptiles, amphibians and mammals. From the Biobase it is indicated that invertebrate habitat sensitivity is low. However, this is possibly as a result of dated/inaccurate data, as various Red Data Listed invertebrate species are known to occur on the property.

The entire subject property is considered moderately important with regards to biodiversity conservation and vegetation communities. The subject property also falls on the boundary of two centres of endemism, namely the Sekhukhuneland and Lydenburg centres of endemism. Thus the area can be considered as sensitive and highly significant in terms of conservation, and great care and planning must be implemented prior to and during any destructive activities such as mining.

Mpumalanga Biodiversity Conservation Plan

The Mpumalanga Biodiversity Conservation Plan (MBCP) categorises the terrestrial biodiversity of the province for each Quarter-Degree Square (QDS). The subject property falls within the QDS 2530AA. The majority of the study area is classified as "Highly Significant". One area is classified as "Irreplaceable", although it seems to fall outside of the project area. Furthermore, some areas are classified as "No Natural Habitat Remaining", such as the Kiwi orchard areas. During the detailed field assessment, the "Highly Significant" areas (which included the wetland and ridge areas) were investigated to determine the current ecological integrity of these areas.

National Biodiversity GIS (BGIS) Database

Aspects pertaining to the subject property, as indicated by the National Biodiversity GIS (BGIS) database include the following:

- Two vegetation types occur within the subject property namely Sekhukhune Mountain Bushveld (considered least concern despite high levels of endemism) and Sekhukhune Montane Grassland (Vulnerable);
- The study area is situated in the headwaters of the Dwars River which is classified as Class B: Largely natural, forming part of the B41G Quaternary catchment.
- The majority if the study area is classified as Highly Significant

- The De Berg conservancy is located approximately 20km to the south of the property
- An ecological corridors run through and around the subject property mainly due to the Dwars River valley and the Groot Dwars River.

Freshwater Ecosystem Priority Areas (FEPA)

Aspects pertaining to the subject property, as indicated by the BGIS FEPA database include the following:

- The Groot Dwars River is considered to be a FEPA river system
- No other important wetland areas are indicated by the FEPA although a wide variety of pristine wetland areas are present on the study area.

Results - Vegetation

Biome and bioregion

Biomes are defined on combinations of dominant life forms and climatic features. The project area occurs within the Savanna biome. The Savanna biome is regarded as the spatially largest biome in South Africa comprising some 32.5% of the country.

Bioregions as spatial terrestrial units, which have similar biotic, physical features and processes at regional scale. In terms of this classification of bioregions the project area occurs within the Central Bushveld bioregion with the grassland to the east belonging to the Mesic Highveld Grassland bioregion. The central Bushveld bioregion has the highest number of vegetation types and covers most of the high-lying plateau west of the main escarpment from the Magaliesberg in the south to the Soutpansberg in the north.

Sekhukhune Centre of Endemism

Everest mine is located within the Sekhukhuneland centre of endemism (SKC), and is also in close proximity to the Lydenburg centre of endemism (LC) as well as the Wolkberg centre of endemism (WC). Van Wyk & Smith, 2001 (as cited in SAS, 2012) suggested that due to the strong floristic connections between the SKC and WC (species adapted to the ultramafic substrates) and the sharing of species between these two areas, they may in future be considered as one centre of endemism with various sub-centres. The SKC and WC flora is best described as being of Zambezian extraction with Afromontane elements especially at higher altitude and shows floristic links to the Drakensberg, Pondoland, Waterberg and Limpopo valley. In excess of 2 200 species are believed to be present in the SKC with two endemic/near endemic genera and more than 100 endemic/near endemic species (4.5%). The Burgersfort area is believed to have the greatest concentration of Aloe species in the world. Conservation in the form of official nature reserves is poor (only one reserve, Potlake Nature Reserve). Extensive mining throughout the area and poor agricultural practices (overgrazing) have led to further degradation of this unique floristic region. The WC is believed to have in excess of 2 500 species recorded of which more than 130 are endemic/near endemics (5.2%).

Vegetation types

Determining the vegetation type an area provides an indication of the floral composition that would be found if that area was in a pristine condition. The existing mine, as well as the proposed Project Fairway project area falls within two vegetation types namely Sekhukhune Mountain Bushveld (western portion situated within the Groot Dwars valley) and Sekhukhune Montane Grassland (eastern portion situated on the upper slopes of the Groot Dwars valley and the terrace).

Habitat types

The original EIA and EMP report (Metago, 2003) identified three habitats within the mine footprint area, namely Plains Grassland (including Wetland), Ridge Grassland and Bushveld. Plains Grassland was the main habitat type in which the mine surface infrastructure is located, however much of this habitat type had been disturbed by previous disturbances prior to the establishment of the mine.

The habitat assessment was performed with special focus on areas earmarked for the proposed project activities as well as areas considered as being of higher ecological importance and sensitivity. Three habitat units were identified during the assessment namely wetlands and drainage areas, ridges (comprised of Sekhukhune Mountain Bushveld and Sekhukhune Montane Grassland) and transformed areas (surrounding the Kiwi Farms). A summary of the key aspects of the vegetation communities is provided below with further detail included in the specialist report.

Habitat Unit 1: Wetland Areas

Several types of wetlands are present on the subject property which were delineated and are discussed in Section 1.1.7. The wetland system can be described as an interconnected system of perennial and non-perennial drainage systems, perched sheetrock wetlands and valley bottom wetlands, which are all connected to the larger Groot Dwars River. Most of the wetland areas and riparian systems are unmodified and in a natural condition, aside from the wetland areas situated in the vicinity of the proposed TSF. The wetlands provide habitat for a variety of protected and RDL floral species such as *Eulophia ovalis*, *Catha transvaalensis* and *Merwilla plumbea.* Therefore, although some areas of the wetland system are more transformed than others, the wetland habitat unit as a whole is considered to be of high conservational importance, especially when the highly sensitive nature of the Groot Dwars River system and the high number of endemic species is taken into consideration.

Habitat Unit 2: Ridges

The ridge areas accounted for the largest part of the study area and were encountered on the steep hillsides of the Groot Dwars River valley, and were associated with the Sekhukhune Mountain Bushveld and Sekhukhune Montane Grassland vegetation types. Habitat characteristics typical of this unit are rocky hillsides, rocky outcrops and woody thickets which consisted mainly of *Catha transvaalensis, Hippobromus pauciflorus, Rhoicissus sekhukhuniensis, Ziziphus mucronata, Acacia caffra, Peltophorum africanum* and *Olea capensis* subsp. *enervis.* These areas are of particular importance for both faunal and floral biodiversity conservation as plant endemism has been found to be greatest on surface rock comprised of norite, pyroxenite and anorthosite. As a result of the unique geology and aspect variations, the ridges are particularly floristically diverse with a wide variety of woody trees (*Kirkia wilmsii, Ozoroa reticulata, Catha transvaalensis, Combretum molle, Protea caffra*), shrubs, herbs (*Commelina africana, Ledebouria cooperi, Xerophyta retinervis*) and succulent taxa (*Aloe castanea, Cotyledon orbiculata*). These areas also support significant populations of Sekhukhune endemic species (such as *Catha transvaalensis*) due to the unique topography. These unique geological and topographical features in turn provide for specialist niche habitats for protected species such as *Resnova megaphylla* and *Asclepias sp.* Habitat integrity, floral community structure and ecological service provision was found to be intact. As a result, the ridge areas are considered to be highly sensitive and great care must be taken to minimise activity footprints, vegetation clearing, pollution and edge effects from mining activities.

Habitat Unit 3: Transformed Areas

All areas associated with past or present kiwi plantations and related activities are considered to fall within the transformed habitat unit. The habitat integrity and floral community structure of these areas have been severely impacted and alien floral invasion is characteristic of these areas. Alien floral species were well represented, with *Bidens pilosa, Tagetes minuta, Actinidia deliciosa, Eucalyptus camaldulensis, Solanum sysimbrifolium, Datura stramonium, D. ferox* and *Pinus patula* especially prevalent. Grassland areas to the west of the kiwi orchards have also been transformed, with alien species such as *Pennisetum clandestinum* encroaching upon these grasslands. Some evidence of cattle grazing was also encountered, although no evidence of severe overgrazing was recorded. Ecological functioning, although not completely absent, was found to be low in this unit. Although floral community structure and habitat characteristics have been altered, some protected species occur in the adjacent wetland areas, including *Eulophia ovalis, Eucomis autumnalis* and various Gladiolus species. Therefore, should the tailings dam be developed on these areas, care must be taken to minimise impacts and edge effects on the wetland areas.

Floral Community Assessment

Floral communities can provide information regarding the ecological status of specific areas within a study area. If the species composition is quantitatively determined and characteristics of all components of the floral community are taken into consideration, it is possible to determine the Present Ecological State of the portion of land represented by the assessment point.

Grass species are good indicators of veld conditions. Therefore a Floral Community assessment was undertaken by identifying the dominant grass species identified in a transect within an area moderately representative of vegetation in pristine condition. A detailed description of the grass species which were recorded within each transect is provided in the biodiversity assessment report (Appendix A). A summary of the conclusion of the Floral Community Assessment for each transect is provided below:

<u>Transect 1 – Buttonshope South box cut</u>

The dominant grass species are all indicators of good veld and primary grassland conditions. Although many of the grass species are also indicators of poor soil conditions, their occurrence is a function of the rocky and gravelly nature of the soil. Furthermore, the grass layer is representative of Sekhukhune Mountain Bushveld.

<u>Transect 2 – Buttonshope North box cut</u>

As with the Buttonshope South box cut transect, the dominant grass species are all indicators of good veld and primary grassland conditions. Although many of the grass species are also indicators of poor soil conditions, their occurrence is a function of the rocky and gravelly nature of the soil. Furthermore, the grass layer is representative of Sekhukhune Mountain Bushveld.

<u>Transect 3 –Waterfall box cut</u>

Similar grass species and abundances were present in this area, and the dominant grass species are all indicators of good veld and primary grassland conditions. Although many of the grass species are also indicators of poor soil conditions, their occurrence is a function of the rocky and gravelly nature of the soil. Furthermore, the grass layer is representative of Sekhukhune Mountain Bushveld.

<u>Transect 4 – Grassland area adjacent to proposed Tailings Storage Facility</u>

The majority of the identified dominant grass species are associated with livestock trampling and grazed grasslands. This is to be expected as livestock grazing is practiced in this area. Edge effects from the adjacent kiwi farming activities are also evident in the form of *Pennisetum clandestinum* invasion. Although some indicators of Sekhukhune Montane Grassland are present, the grassland can be described as a secondary grassland.

<u>Transect 5 – Wetland areas associated with proposed Tailings Storage Facility</u>

Most of the identified species are indicators of wetland conditions, which is to be expected as the transect was performed in a wetland area. However, high abundances of species indicative of disturbance mean that some transformation has taken place. The grassy layer of the wetland contains some characteristic species of the Sekhukhune Montane Grassland, it can most accurately be described as a secondary grassland in a transformed wetland.

From the above, it is evident that the ridge grasslands can be considered to be in good condition and are representative of Sekhukhune Mountain Bushveld. Therefore, these areas provide intact and functional habitat for a variety of floral species, with specific mention of RDL and/or Protected floral species. The grass layer in the area adjacent to the proposed tailings facility has been transformed by edge effects from agricultural activities and grazing of livestock. It was determined to be a secondary grassland with reduced ecological value.

Vegetation Index Score (VIS)

The subject property was divided into three dominant habitat types and the VIS was applied for each of these. The majority of the wetland unit has seen very limited vegetation transformation and habitat integrity is intact, and therefore calculated a score of 23, which falls within Class A (Unmodified/Natural). A score of 23 was also calculated for the ridge areas, which also falls within Class A (Unmodified/Natural). The transformed areas obtained a score of 9, which falls within Class D (Largely modified), as impacts from kiwi farming and cattle grazing are present, leading to habitat transformation.

The wetland and ridge units have seen little to no transformation and habitat integrity is intact. Thus, these areas provide intact habitat for a variety of floral species, with special mention of RDL and/or Protected flora.

Exotic and Invader Species

The grassland areas surrounding the proposed TSF and existing kiwi farms have been impacted the most within the Project Fairway project area as a result of overgrazing, trampling, incorrect fire management. The remainder of the Project Fairway project area has suffered very little encroachment by exotic vegetation. The Groot Dwars River Valley areas are mostly free from exotic species, with the exception of areas disturbed by valley service road construction. The areas transformed by Kiwi cultivation, in turn, are severely affected by alien floral invasion. This has led to adjacent areas also being invaded by exotics.

Medicinal plants

Medicinal plant species are not necessarily indigenous species, with many of them being regarded as alien invasive weeds. Medicinal plants identified within the current mine site during pervious studies include *Alepidea cf. peduncularis, Curtisia dentate, Eucomis autumnalis,* and *Hypoxis hemerocallidea*.

For Project Fairway, the majority of the medicinal plant species are located throughout the Project Fairway project area and are not restricted to specific habitats within the subject property. It should be noted that the species diversity observed was low due to the majority of the surveyed areas being wetland habitat as well as vegetation transformation due to grazing of cattle, crop production and the unusually dry conditions at the time of assessment. A table of the identified medicinal plant species is provided in the biodiversity assessment report (Appendix G). The identified species are all regarded as common and widespread species, with the exception of *Catha edulis, Catha transvaalensis* and *Curtisia dentate*, which were all encountered throughout the ridge areas in the Groot Dwars River Valley.

Red Data Listed (RDL) Floral Assessment

Prior to the establishment of mining activities, limited rare and/or endangered plant species were identified to potentially occur within the initial mining footprint. None were actually seen during the site surveys undertaken as part of the original EIA and EMP. The only protected species were found within the footprint of the current tailings dam and plant area.

For the proposed Project Fairway, an assessment considering the presence of any RDL plant species, as well as suitable habitat to support any such species, was undertaken. The complete PRECIS (Pretoria Computer Information Systems) red data plant list for the Quarter Degree Cell 2530AA was enquired from SANBI. The POC of each of the species listed was calculated with reference to habitat suitability found during the assessment of each of the proposed sites. After considering habitat availability and distribution aspects of each species, it is clear that most species have a high possibility of occurring on the study area. In addition, four of the species have been positively identified in the proposed Project Fairway project area. The majority of these species are likely to occur in the Groot Dwars River Valley. As such, the project area, especially the areas in the Groot Dwars River Valley, are highly important in terms of RDL floral species conservation.

TABLE1-8: PROBABILITY OF OCCURRENCE OF RDL FLORAL SPECIES OF CONCERN

Species	Probability of Occurrence	Motivation
Zantedeschia pentlandii	100%	Encountered during the field assessment.
Aloe cooperi Baker subsp. cooperi	100%	Encountered during the field assessment.
Aloe reitzii Reynolds var. reitzii	100%	Encountered during the field assessment.
Lydenburgia cassinoides	100%	Encountered during the field assessment.
Eucomis vandermerwei	93%	Suitable habitat available, known to occur on adjacent farms.
Habenaria barbertoni	93%	Recorded on adjacent farm, excellent habitat suitability.
Jamesbrittenia macrantha	93%	Ideal habitat conditions and within distribution range.

Crassula setulosa Harv. var. deminuta (Diels)	87%	Suitable habitat present, cryptic species and fairly difficult to detect, known to occur in adjacent areas.
Khadia alticola	87%	Suitable habitat available, within distribution range.
Disa zuluensis	80%	Suitable habitat available, within distribution range
Brachystelma minor	73%	Suitable habitat available, within distribution range, little known about ecology.
Brachystelma stellatum	73%	Suitable habitat available, within distribution range, little known about ecology.
Cryptocarya transvaalensis	73%	Occurs in afro-montane forests, limited habitat available.
Disa alticola	73%	Possibility of occurring, altitude not ideal.
Helichrysum aureum (Houtt.)	72%	Suitable habitat available, within distribution range, little known about its ecology in the region
Khadia beswickii	67%	Uncertainty about distribution, seems to be mainly confined to Gauteng
Graderia linearifolia	67%	Within distribution range, altitude too low.
Protea parvula	67%	Altitude and vegetation type not ideal

In addition, three RDL and one possible RDL floral species were encountered during the field assessment which are not listed under the regional RDL list. One such species, *Merwilla plumbea* (= *Scilla nervosa*) was encountered in the vicinity of the sheetrock wetlands and non-perennial drainage lines within the Groot Dwars River valley. Thus this species and its habitat will be impacted if project infrastructure encroaches upon these areas. The RDL tree species, *Curtisia dentate* and *Ilex mitis* were encountered in thickets associated with drainage lines and riparian areas in the Groot Dwars River valley. Once again, encroachment of mining related infrastructure will impact this species and its habitat. Furthermore, one specimen of an unidentified species of *Asclepias* was encountered on the ridge area close to the proposed Buttonshope South box cut, but due to its immature flowers it was not possible to positively identify the species. Another unidentified species of *Asclepias* was encountered in a study on the adjacent Hoogland project, which was determined to have a possible RDL rating of Critically Endangered (Ecorex, 2010). There is a strong probability that these two specimens may be the same species.

Thus, many unidentified species may be present but due to their cryptic nature may not have been observed. Furthermore, many RDL species may not be listed in regional RDL lists, such as *Merwilla plumbea.*

Protected Floral Species

Some species encountered during the assessment are protected under the Mpumalanga Nature Conservation Act of 1998 (Act 10 of 1998) (MNCA) and also under the list of Protected Tree Species under the National Forests Act of 1998 (Act 84 of 1998) (NFA). These species are listed in the table below:

TABLE1-9: IDENTIFIED PROTECTED SPECIES

Species	Act	Habitat Unit
Zantedeschia pentlandii	MNCA	Ridges, Groot Dwars River Valley
Aloe cooperi Baker subsp. cooperi	MNCA	Ridges, Groot Dwars River Valley
Aloe arborescens	MNCA	Ridges, Groot Dwars River Valley
Aloe greatheadii var. davyana	MNCA	Ridges, Groot Dwars River Valley
Aloe castanea	MNCA	Ridges, Groot Dwars River Valley
Aloe pretoriensis	MNCA	Ridges, Groot Dwars River Valley
Aloe minima	MNCA	Ridges, Groot Dwars River Valley
Lydenburgia cassinoides	NFA	Ridges and thicket, Groot Dwars River Valley
Catha edulis	NFA	Ridges and thickets, Groot Dwars River Valley
Olea capensis subsp. inervis	MNCA	Ridges and thickets, Groot Dwars River Valley
Aloe reitzii	MNCA	Ridges, Groot Dwars River Valley
Curtisia dentata	NFA	Riparian thicket, Groot Dwars River Valley
Scadoxus puniceus	MNCA	Ridges, Groot Dwars River Valley
Scadoxus multiflorus	MNCA	Ridges, Groot Dwars River Valley
Agapanthus inapertus	MNCA	Ridges, Groot Dwars River Valley
Eulophia ovalis	MNCA	Riparian areas and drainage lines, Groot Dwars River Valley, Wetlands in vicinity of proposed tailings dam
Gladiolus crassifolius	MNCA	Wetland areas associated with proposed tailings dam
Gladiolus sp.	MNCA	Ridges, Groot Dwars River Valley
Gladiolus ecklonii	MNCA	Wetland areas associated with proposed tailings dam
Gladoilus papilio	MNCA	Riparian areas and drainage lines, Groot Dwars River Valley, Wetlands in vicinity of proposed tailings dam
Protea caffra	MNCA	Ridges in Groot Dwars River Valley

In order to relocate, remove, destroy or transport these species, permits have to be obtained under the MNCA (1998) or the NFA (1998), whichever is applicable to the species. Furthermore, many of these species are endemic to the Groot Dwars River Valley or Mpumalanga, and great care must be exercised to limit the disturbance of these plants and their associated habitat.

Results - Animal Life

Terrestrial fauna present prior to mining activities have been listed in the original EIA and EMP report (Metago, 2003). The only red data and/or threatened species identified as potentially occurring on site prior to the current mining operations included bird and mammal species. It is expected that these animals will have, where possible, moved from the mine site during the initial mine development.

<u>Mammals</u>

The following mammal species were confirmed to occur within the Project Fairway project area through field sightings: Burchell's Zebra (*Equus quagga burchellii*), Grey Rhebok (*Pelea capreolus*) and Scrub Hare (*Lepus saxatilis*) were sighted at the bottom of the Dwars valley area and Baboons (*Papio ursinus*) were sighted along the proposed Valley Access road alignment. No mammal species were observed near the proposed TSF area.

Mammal species which were positively identified by means of spoor sightings include Leopard (*Panthera pardus*) spoor was encountered on the current Valley decline service road. Local neighbouring farmers have confirmed sightings of Leopard (*Panthera pardus*), Serval (*Leptailurus serval*), Honey Badger (*Mellivora capensis*), Brown Hyaena (*Hyaena brunnea*), Clawless Otter (*Aonyx capensis*), Common Duiker (*Sylvicapra grimmia*), Steenbok (*Raphicerus campestris*) and Aardvark (*Orycteropus afer*) over the past few years.

Dung droppings of probable small omnivorous mammals, most likely from Yellow Mongoose (*Cynictis penicillata*), Honey Badger (*Mellivora capensis*), White Tailed Mongoose (*Ichneumia albicauda*) and Rock Hyrax (*Procavia capensis*) were spotted down in the valley area and along the newly proposed haul road. No mammal droppings were found in the proposed TSF area. Dung droppings of probable larger mammal species, most likely Common Duiker (*Sylvicapra grimmia*), Steenbok (*Raphicerus campestris*) and Klipspringer (*Oreotragus oreotragus*) were recently found down in the Dwars valley area and along the newly proposed haul road.

Other important signs of mammal activity include mole rat mounds with several possible species occurring in this region but no positive identification of the genus and species was possible. However, the most likely species considered is the Robust Golden Mole (*Amblysomus robustus*), which is endemic to the Steenkampsberg Mountains and has a conservation status of Vulnerable (Cohen & Camacho, 2002; Mpumalanga SoER, 2003 and IUCN RDL, as cited in SAS, 2012).

Only one small mammal species was successfully trapped during the investigation, namely the Spiny Mouse (*Acomys subspinosus*). In addition, the presence of Verreaux's Eagle (*Aquila verreauxii*) indicates that a significant small mammal population is likely to be present on the subject property.

Other signs indicate the presence of Porcupine (*Hystrix africaeaustralis*) due to identified burrowing activity at the bottom of the Groot Dwars River valley.

In addition to the above, there is a high possibility for the following mammal to also occur within the valley: Black-backed Jackal (*Canis mesomelas*), Caracal (*Caracal caracal*) and Geoffroy’s Horseshoe Bat (*Rhinolophus clivosus*).

Avifauna

Table 1-10 below lists all the bird species identified within the project area during the assessment. The complete list of bird species expected for the QDS 2530AA is included in the biodiversity assessment report (Appendix G).

TABLE 1-10: IDENTIFIED AVIFAUNA

Common Name	**Scientific Name**
Helmeted Guineafowl	*Numida meleagris*
African Black Eagle or Verreaux's Eagle	*Aquila verreauxii*
Cape Turtle Dove	*Streptopelia capicola*
Laughing dove	*Stigmatopelia senegalensis*
Red Chested Cuckoo	*Cuculus solitarius*
Green (Red Billed) Wood Hoopoe	*Phoeniculus purpureus*
Brownhooded Kingfisher	*Halcyon albiventris*
Blacksmith Plover	*Vanellus armatus*
Common Fiscal Shrike	*Lanius collaris*
African Hoopoe	*Upupa epops*
White Browed Scrub Robin	*Cercotrichas leucophrys*
Fork-tailed Drongo	*Dicrurus adsimilis*
Freckled Nightjar	*Caprimulgus tristigma*
African Scops Owl	*Otus senegalensis*
Black-collared Barbet	*Lybius torquatus*
Red-chested Swallow	*Hirundo lucida*
Red Winged Starling	*Onychognathus morio*
Violet-backed Starling	*Cinnyricinclus leucogaster*
Steppe Buzzard	*Buteo vulpinus*
Southern Black Flycatcher	*Melaenornis pammelaina*
Barn Swallow	*Hirundo rustica*
Eurasian Golden Oriole	*Oriolus oriolus*
Cape Rock Thrush	*Monticola rupestris*
Red Collared widowbird	*Euplectes ardens*
Speckled Mousebird	*Colius striatus*
Buff Streaked Chat	*Campioloides bifasciata*
Common European Swift	*Apus apus*
Dederick Cuckoo	*Chrysococcyx caprius*
Black Crowned	*Tchagra Tchagra senegalus*
African Paradise Flycatcher	*Terpsiphone viridis*
European Bee Eater	*Merops apiaster*

Common Name	**Scientific Name**
Amethys Sunbird	*Nectarinia amethystina*
Southern Masked Weaver	*Ploceus velatus*

The Project Fairway project area consists of predominantly rocky hillside woodland habitat, therefore a lower number of grassland bird species was recorded. No RDL birds were identified during the site survey. However, the likelihood that some migratory RDL bird species flying onto the study area to forage or use as a corridor passageway is high, especially in and near the wetland and riparian area along the Groot Dwars River valley. Furthermore, from local knowledge and previous studies, indicate that three threatened species have been recorded on adjacent properties and have a high likelihood of occurring in the project area, these three birds are the African Crowned Eagle (*Stephanoaetus coronatus*), the Secretarybird (*Sagittarius serpentarius*) and the Lanner Falcon (*Falco cherrug*). Other threatened bird species which have a low or moderate likelihood of occurrence are the Wattled Crane (*Bugeranus carunculatus*) and Yellow Breasted Pipit (*Anthus chloris*) which have a low likelihood due to incorrect habitat and altitude. Blue Crane (*Anthropides paradiseus*), Grey Crowned Crane (*Balearica regulorum*) and African Grass Owl (*Tyto capensis*) all have a moderate likelihood due being irregular visitors. These birds are more than likely to occur near the proposed TSF area.

Reptiles

Four reptile species were identified during the assessment and were all located in the Groot Dwars River valley and along the proposed Valley Access road. One reptile RDL species were encountered during the site visit, the Sekhukhune or Transvaal Flat Lizard (*Platysaurus orientalis orientalis*) which is considered Near Threatened within Mpumalanga. Furthermore, sightings of the Southern African Python (*Python natalensis*), which has a status of Vulnerable have also been made on neighbouring properties and they therefore have a high probability of occurring within the study area. The other two species identified were the Variable Skink (*Trachylepsis varia*) and the Yellow Throated Plated Lizard (*Gerrhosaurus flavigularis)*.

Amphibians

Three amphibian species encountered during the assessment, namely the Common River Frog (*Rana angolensis*), Common Caco (*Cacosternum boettgeri*), African common toad (*Amietophrynus gutturalis*). No Red Data Listed amphibian species were encountered. All amphibian species were observed down in the Groot Dwars River valley area only.

The Giant Bullfrog (*Pyxicephalus adspersus*), a near threatened species, is favourably located near riparian and wetland zones where bullfrog habitat is optimal. The habitat along this valley area does not suit the favourable habitat to accommodate this threatened species. The likelihood of this species occurring in the Groot Dwars River valley is thus insignificant. There is greater chance of occurrence at the proposed TSF nearer the more riparian wetland regions.

Invertebrates

A summary of the results of the invertebrate specialist investigation is provided below. Refer to Appendix G for a detailed description of the results.

True bugs (Heteroptera)

Two hundred species, belonging to 29 families were collected in the study area. The large number of species collected is indicative of a moderately high to high biodiversity. Some species (often pest species) that are usually abundant at other localities were found to be absent. This is viewed as an indication of a pristine and unpolluted environment. At least three undescribed species were collected namely a *Humpatonannus*? sp.(*Schizopteridae*), a *Padasastra* sp. (*Reduviidae*) and a *Cametanthus* sp. (*Berytidae*). The latter two also represent genera not previously recorded from southern Africa - *Cametanthus* is known from a single species in Madagascar and *Padasastra* contains two species from West Africa. Accordingly, both must be considered as rare species as they were not previously collected in the northern provinces of South Africa. The study area is possibly the core area of their distribution. Another significant find was a population of *Aneurillus foliaceus* that was until now only known from its type locality in Swaziland.

Baboon, trapdoor and other spiders (Araneae)

From the desktop assessment, several species of baboon spiders could potentially occur on the site, however it is expected that only 2 or 3 species actually occur on the site. Due to the limited data available, it is possible that other species and even undescribed species may be present in the area. Trapdoor spiders are not protected but are regarded of conservation concern because they are long-lived, have relatively low reproduction rates and several species have limited distribution areas and are prone to demise by habitat destruction.

TABLE1-11: BABOON AND TRAPDOOR SPIDER SPECIES THAT POTENTIALLY OCCUR WITHIN THE PROJECT AREA

Species	Red Data	Protected by Province	Protected by NEMBA	Remarks
Baboon Spiders				
Brachionopus tristis	No	No	No	-
Ceratogyrus darling	No	Yes	Yes	-
Harpactira gigas	No	Yes	Yes	-
Harpactirella species	No	No	No	No species yet reported from the area.
Idiothele nigrofulva	No	Possible*	Possible*	Formerly placed in Pterinochilus.
Trapdoor Spiders				
Ancylotrypa barbetoni	No	No	No	-
Ctenolophus fenoulheti	No	No	No	-
Ctenolophus oomi	No	No	No	-

Homostola pardalina	No	No	No	-
Homostola zebrine	No	No	No	-
Idiops gerhardti	No	No	No	-
Idiops nigropilosus	No	No	No	-
Idiops vandami	No	No	No	-
Moggridgea paucispina	No	No	No	-
Segregara sylvestris	No	No	No	-
Segregara transvaalensis	No	No	No	-

* Formerly placed in *Pterinochilus* that is protected by NEMBA and Mpumalanga Nature Conservation Act - although Idiothele is not protected, the former association of the species with *Pterinochilus* probably protects it by implication

Scorpions

Between 4 and 8 species of scorpions are expected to occur at the site. During the previous studies undertaken for the existing valley decline, six scorpion species were recorded, three of which were protected or of conservation concern namely *Hadogenes polytrichobothrius, Opisthacanthus validus* and *Opistophthalmus glabrifrons*. The first two species were also collected during the field survey, within the Grot Dwars valley. The latter two species are widespread and only protected because of their potential exploitation by the pet trade. *Hadogenes polytrichobothrius* has a limited distribution and vulnerable to habitat destruction due to its specialised habitat.

Opistophthalmus glabrifrons was found to be very common in the study area and a very large population is present with many burrows scattered across the entire area. Although it is protected by NEM:BA it is a widespread species and not of particular conservation concern.

The rock scorpion *Hadogenes polytrichobothrius* was also common in the area surveyed and occurred wherever suitable rocky outcrops exist. This species was described in 2006 and has a limited distribution area and is therefore of conservation concern. It is unlikely that the mining activities will have a significant negative effect on the species as numerous suitable rocky outcrops are scattered over the entire valley. The scorpion is very common in the valley and specimens seem to be present at every rocky outcrop.

Butterflies (Rhopalocera)

Of the 9 Red Data listed species from the Mpumalanga Province, only *Dingana fraterna, Aloeides rossouwi* and *Lepidochrysops rossouwi* are considered likely to occur in the area. During the specialist investigation, 35 butterfly species were observed and identified in the study area. None of the above-mentioned RDL species were found at the site.

Leafhoppers (family Cicadellidae of the order Hemiptera)

One hundred and eight species of Heteroptera were collected during the invertebrate specialist assessment. The significant higher number of species collected in present study does not necessarily indicate a higher diversity of leafhoppers in the survey area, but is more likely the result of using more collecting methods. Besides sweep-netting, leafhoppers were also collected by fogging, at the light trap, and by D-vac. About 50 of the recorded species are grass feeders and they will be those most likely to be collected by sweep-netting, the method most suitable to be used as standard method to collect leafhoppers for monitoring purposes. Most of the collected species are widespread Savanna species, but a few of the species might be of conservation interest, for example *Elginus levilobus* which is known from only a few locations. A few possibly undescribed species were also recorded at the site. None of the South African leafhoppers have been red listed.

<u>Ants (family Formicidae of the order Hymenoptera)</u>

Sekhukhuneland is a hotspot of ant diversity and endemism. A new *Camponotus* species was discovered in 2007 on the farm Vygenhoek, about 12 km north of the present site, which is probably a Sekhukhuneland endemic. For the proposed Project Fairway, seventy-seven species of ants belonging to 24 genera were collected in the survey area. Most of the collected species are still in the process of being identified to species level. The *Camponotus* species mentioned above was found to be present at the site. Furthermore, six specimens of a *Lepisiota* species were found in the survey area. Up to now, this species has only been known from two specimens collected last year at Two Rivers Platinum.

72 ant species at the valley extension of the Everest Mine whereas 85 species were recorded at the proposed Hoogland project site, of which 5 species are undescribed. At both localities the ant diversity and abundance suggested a mainly undisturbed ant community. In both the above studies it is concluded that ants are highly suitable to be used for monitoring on-going impacts of the mining activities as well as rehabilitation. At present there are only two red listed ant species in South Africa. However, the *Camponotus* species mentioned above is in the process of being described and assessed for ICUN Red listed status and it is expected that it will be classified as Vulnerable or Near Threatened.

<u>Ground Beetles (family Carabidae of the order Coleoptera)</u>

The following protected genera/species that could potentially occur at the site were identified during the desktop assessment:

- *Dromica*: All *Dromica* species are protected by NEM:BA. The genus comprises about 150 species that occur in sub-Saharan Africa. All species are fast running, ground-living and flightless. Several *Dromica* species potentially occur at the site
- *Manticora* (Monster Tiger Beetles): All species of *Manticora* are protected by NEM:BA. The majority of the species belonging to the genus occur mainly in the drier parts of southern Africa.
- *Megacephala regalis*: The tiger beetle *M. regalis* is protected by NEM:BA. It is known that it is a widespread species that occurs over the largest part of Africa

About 30 species of ground beetles were collected during the field assessment. They are all winged and probably not of conservation concern. Four tiger beetle species were recorded during the field assessment and are still in the process of being identified. However, two of the collected *Dromica* species are protected in terms of NEM:BA and may be of conservation concern.

Dragon- and damselflies (Odonata)

The dragon- and damselflies collected are still in the process of being identified. One of the species collected is the Unicorn Cruiser, *Phyllomacromia monoceros*, a species that has only twice been reported from South Africa, once in 1911 from Barberton and recently from the Soutpansberg. It is included in the Red Data list of South African Dragonflies as “Data Deficient”. Although it is widespread in the rest of Africa, it may be vulnerable in South Africa. Only a single female specimen was observed and collected on 18 November 2011. No further specimens were seen or recorded during any of the site surveys. The river is the most important feature in the dragonfly's biology - their early stages (najades) live in the water. The river should thus be kept pristine.

Pycna sylvia (family Cicadidae, order Hemiptera)

Pycna sylvia is a rare species of cicada that occurs throughout the Groot Dwars River valley, as well as in the Small Dwars River valley and possibly at some other sites outside the area. The Groot Dwars River valley, however, seems to be its core distribution area. Except for its distribution, very little is known about the biology and reproduction of the Cicada. The mine noises have been shown not to interfere with the call of the adults. The impact of the vibrations created by vehicles or machinery on the nymphs while they are underground is unknown and should be studied further.

Large numbers of the *Pycna sylvia* were present within the Project Fairway project area. Many exuviae (shed nymphal skins) were observed in an area east of the river and several nymphs (of all in instars) were uncovered when digging beneath a *Rhus* species. This is the first place where exuviae were found in such large numbers and it offers the opportunity to study its biology which may give a much better idea of the vulnerability of the cicada and measures for its conservation. The area of concern is probably an important breeding ground for the cicada and it should be studied in more detail.

Faunal Red Data Species Assessment

Four Red Data List (RDL) faunal species were positively identified during the field surveys, namely the Leopard (*Panther pardus*), Sekhukhune or Transvaal Flat Lizard (*Platysaurus orientalis orientalis*), the Flat Rock Scorpion (*Hadogenes gunningi*) and the Unicorn Cruiser dragonfly (*Phyllomacromia monoceros*).

The biodiversity assessment report provides an indication of the other 18 RDL faunal species that were found to have a 60% or greater Probability of Occurrence (POC) of being found within the proposed Project Fairway project area (Appendix G).

Several other invertebrate species that are protected by NEM:BA and/or the Mpumalanga Province have been recorded. They are the baboon spider *Harpactira hamiltoni*, the scorpions *Hadogenes politrichobothrius* and *Opistophthalmus glabrifrons*, and two species of tiger beetles belonging to the genus *Dromica*. The rare cicada *Pycna sylvia* is common in the area and an possibly important breeding ground is present in the area.

Several undescribed invertebrate taxa were found in the study area and two of the *Heteroptera*, a *Padasastra* species (Reduviidae) and a *Cametanthus* sp. (Berytidae) are of particular importance as it is the first time that these genera are recorded in southern Africa.

Results - Wetlands

Wetland habitat is defined in the NWA as including the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent areas.

Following the completion of the wetland delineation, several different wetland systems were identified on the subject property. The wetland features are summarized below:

- The Groot Dwars River riverine system and associated floodplain;
- Non-perennial and perennial drainage lines in the Groot Dwars River valley; and
- The Valley bottom wetland complex in the vicinity of the proposed TSF ("TSF complex wetland system").

The system associated with the Groot Dwars River can be described as a riverine, upper perennial aquatic bed system. Some of the larger tributaries of this river system in the vicinity of the proposed Project Fairway activities in the valley can also be described as perennial systems with an aquatic bed. The Groot Dwars River and associated perennial tributaries are typical headwater systems with aquatic beds consisting of rocky substrate, gravel and sand.

Several of the tributaries of the Groot Dwars River are non-perennial drainage lines which are best described as non-perennial rivers. These systems are typical of the upper drainage areas of larger drainage systems consisting of either rocky substrates or sandy alluvial deposits.

The "TSF complex wetland system" can be described as a network of palustrine, valley bottom emergent wetlands with associated seepage zones. It should be noted that some areas of the wetland feature can be also be considered non-vegetated, due to impoundments within the wetland system occurring in the vicinity of the proposed TSF.

Wetland Function Assessment

With respect to wetland functioning, it is evident that the Groot Dwars River system generally has an intermediate level of ecological function and service provision. The system is the most important in terms of biodiversity maintenance due to the largely unique ecological conditions in the Groot Dwars River valley and the presence of several protected, endemic and endangered taxa, with special mention of flora. In addition sediment trapping and erosion control in the system are regarded as important functions. The system plays a limited role in supporting socio-cultural aspects although the system can provide some function in terms of tourism, education and research. With limited impacts on the system the system is of limited importance in nutrient cycling and toxicant assimilation.

The smaller perennial and non-perennial tributaries have largely similar functions to the Groot Dwars River. The systems are particularly important in terms of erosion control and biodiversity maintenance with several species of plants only occurring within the riparian thickets along these systems. These systems are of limited importance from a socio-cultural point of view.

The wetland complex in the vicinity of the proposed TSF is of increased importance in nutrient cycling and toxicant assimilation due to the effects of upstream mining activities and surrounding agricultural activities which make compounds such as nitrates, phosphates and other toxicants available in the system. Due to the physical nature of this system it is more important than the systems in the Groot Dwars River valley for carbon storage. With disturbances of soil occurring in the catchment the system is also important in terms of sediment trapping and erosion control. The wetland system associated with the TSF complex is also of limited importance in terms of socio-cultural functioning since the resources provided by the system are largely replaceable. The importance in terms of biodiversity maintenance is limited in relation to the Groot Dwars river with less sensitive habitats and fewer endemic, protected and endangered species occurring within the system. The wetland complex plays a vital role in cleansing the water in the system and controlling sediment prior to joining the Groot Dwars River which is of very high importance in terms of biodiversity maintenance and which has the potential to see significant cumulative impact from mining activities within the catchment.

Present Ecological State

The Present Ecological State (PES) of the Groot Dwars river wetland system falls within Class A – Natural/unmodified state. The remote location of the system and the fact that no activities occur higher up in the catchment has meant that the system has only been affected to a limited degree by prospecting access paths. The only impacts observed are small impacts from sediment load modification, water quality modification, indigenous vegetation removal, invasive plant encroachment and possible overutilisation of biota. The above-mentioned is also applicable to the non-perennial and perennial drainage lines in the Groot Dwars River valley, indicating the systems to be natural.

The PES for the wetland complex in the vicinity of the proposed TSF falls within Class B – largely natural. The most significant impacts observed are sediment load modifications and indigenous vegetation removal. Some impacts from impoundments on the system have caused flow modifications and inundation. Water quality modifications as well as alien flora and fauna are deemed likely to affect the system to some degree. With the system still falling in a Class B category it indicates that measures to limit the impact on this system should be put in place wherever possible. In addition measures to ensure the protection of the natural Groot Dwars River system downstream should be ensured.

The results obtained from the wetland assessment indicate relatively moderate transformation on all levels of ecology and functionality of the wetlands. Therefore, the Ecological Management Class deemed appropriate to enhance and maintain currently ecology as well as functionality is “Class B - Largely Natural” for the wetland complex associated with the proposed TSF and “Class A - Unmodified/Natural” for the wetland systems with the Groot Dwars River.

Aquatic Ecology

The study area falls within the Eastern Bankenveld ecoregion, which can be considered to contain high aquatic biodiversity and a fairly sensitive aquatic community. The study area falls within the B41G quaternary catchment.

The Department of Water Affairs and Forestry’s Desktop Ecological Classification considers quaternary catchment B41G to be of High Ecological Importance and Sensitivity (Class B: Small risk allowed). The high status is attributed to the presence of rare and endangered aquatic species, high diversity of aquatic habitats, and its importance as a refuge area, migration corridor and conservation area. The assessment was based on conditions at the lower border of the quaternary. The specialist study undertaken for the proposed Project Fairway was undertaken at a much finer spatial resolution than the Desktop Assessment. A summary of the findings is provided below with further detail provided in the specialist report (Appendix G):

- Water quality of the Groot Dwars River and Kafferskraalspruit is very good and the system has a relatively low level of dissolved salts and a slightly alkaline pH. The dissolved oxygen concentrations in the water are relatively high and suitable for supporting a diverse and sensitive aquatic macro-invertebrate community. It is notable that the electrical conductivity in the Groot Dwars River is increasing over time with special mention of the period from November 2009 until January 2012 and as such, increasing impact on the aquatic ecosystem can be expected. This observation correlates with the findings in the SASS data.

- Electrical conductivity (EC) of the Kafferskraalspruit has also increased over time in the lower areas of the system (biomonitoring point E2). It is also notable that the EC values at the RC1 and RC2 points are largely stable over time and no increases in dissolved salts have occurred at this point in the system. When the EC of the E2 site is compared to the RC1 and RC2 points it is evident that salts are added to the system between these points. This has always been the case, since the inception of the biomonitoring program however the degree of difference between the RC1 and RC2 points and the E2 point is increasing over time.
- Habitat conditions on the Groot Dwars River are highly suitable for supporting a diverse and sensitive aquatic macro-invertebrate community. Similarly habitat conditions are well suited for fish species adapted to living in small shallow tributaries with good flow over a rocky substrate, which is free of sediment deposition. In general the aquatic macro-invertebrate community in this system can be regarded as being largely natural with few modifications to the aquatic community having taken place. The fish community shows limited species diversity and abundance. The low fish species diversity and abundance may be due to natural distribution patterns, but downstream impacts from weirs and the introduction of predatory alien fish species (*Micropterus salmoides*) is deemed likely to impact on the fish community to some degree.
- The findings in the SASS5 data indicate largely stable aquatic macro-invertebrate community conditions within the Kafferskraalspruit. The ASPT has showed a slight improving trend over time indicating that no impact on the aquatic community is currently occurring. Habitat conditions on the Kafferskraalspruit are highly suitable for supporting a diverse and sensitive aquatic macro-invertebrate community although the presence of naturally occurring bedrock sections will limit the community to some degree with special mention of the E2 site. Similarly habitat conditions are well suited for fish species adapted to living in small shallow tributaries with good flow over a rocky substrate which is free of sediment deposition. Downstream migratory barriers however prevent a diverse fish community form colonizing this area of the system.
- In general the aquatic macro-invertebrate community in this system can be regarded as being largely natural with few modifications to the aquatic community having taken place. The fish community shows limited species diversity and abundance and only one fish species (*Tilapia sparrmanii*) is regularly observed in the system while within the TKO dam both *Cyprinus carpio* and *Clarias gariepinus* have been observed. The low fish species diversity and abundance may be due to natural distribution patterns with fish largely only present due to be introduced to the system by the farming community.
- With respect to the toxicological analyses, it was observed that historically, the process water associated to the Everest plant posed a severe acute hazard to the receiving environment. From the historic data, it is evident that toxicity levels decreased in times when mining activity was reduced (following the subsidence event in 2008) and then increased again as activity increased. The data therefore clearly indicates that the mining and minerals beneficiation process has an impact on water quality in the closed water system and any spill or seepage of this water to the receiving environment would have an impact on the aquatic ecology of the receiving environment

with degree of impact determined by the volumes of water reaching the receiving environment and the extent of dilution which takes place. Based on the historical observations as well as those of existing conditions the findings can be extrapolated to the proposed Project fairway activities as well as the new proposed TSF that any spill or seepage of this water to the receiving environment would have an impact on the aquatic ecology of the receiving environment with degree of impact determined by the volumes of water reaching the receiving environment and the extent of dilution which takes place.

- The results of the laboratory analyses of the sediments from the various sampling points around the existing mining infrastructure were considered. With the proposed mining activities being expected to be relatively similar to the mining activities at the existing operations similar impacts on sediments within watercourses can be expected. Between areas upstream and downstream of the mining areas there are often significant increases in the concentrations of various metal salts when the downstream sites are compared to the upstream sites. Despite these differences between the upstream and the downstream sites, the absolute value of change of each of the parameters measured is low and none of the parameters exceed the international standards available for heavy metal concentrations in sediment samples. No impact on the aquatic community from impacts on sediment chemistry is therefore deemed likely to occur.

Conclusion

The natural vegetation within the areas associated with the current Everest mine operations have been significantly degraded through their destruction by the placement of surface infrastructure. The Groot Dwars River valley is considered to be highly sensitive with respect to flora and fauna (with particular reference to invertebrates). In addition, several wetland systems associated with perennial and non-perennial tributaries were identified within the project area. The assessment of the aquatic ecology showed that the water quality within the riverine systems was very good, however there was evidence of impacts from current mining activities on these systems. Proper management of biodiversity resources during the life of the operations will assist in the effective rehabilitation of disturbed areas and the restoration of land capability post-project.

1.1.7 SURFACE WATER

This section should be read with reference to Figure 1-3 (Section 1.4).

Introduction and link to impact

Surface water resources include drainage lines, paths of preferential flow of stormwater runoff as well as the channelling and/or collection of water on the surface such as irrigation canals and dams. Mine related activities have the potential to alter the drainage of surface water through the placement of both temporary (such as processing infrastructure and support facilities) and permanent infrastructure (such as the tailings storage facility) and/or result in the contamination of the surface water resources through seepage and/or spillage of process materials, non-mineralised and mineralised wastes. To understand the basis of these potential impacts, a baseline situational analysis is described below.

Data collection

Information on the existing mine site was extracted from the approved EMP reports for the current mine infrastructure (approved July 2003, December 2009 and May 2010).

For Project Fairway, project-specific baseline hydrology studies were undertaken by SLR Consulting (2012) and DRA (2012) (Appendix H). SLR was responsible for defining the surface water characteristics while DRA was responsible for flood line determination.

Data used in determining the surface water characteristics include climatic data (see Section 1.1.2) and topographical data (see Section 1.1.3). The sources for rainfall and evaporation data have been outlined in Section 1.1.2 above. The mean annual runoff (MAR) for the catchments associated with the project was estimated using rainfall-runoff response parameters from WR2005. The rainfall-runoff response of the catchment was assumed to be the same as the regional rainfall-runoff response as determined for the quaternary catchment in which the project site falls (B41G).

The flood line calculations made use of updated survey information provided by the client. Use was made of the 1:50 000 topographical maps to identify the catchment of the Groot Dwars River. The whole catchment was then subdivided into ten sub-catchments with eight nodes and several sub nodes to cater for incoming streams. These sub-catchments were defined on a 5 metre contour plan provided by the client. The Utility Programs for Drainage suite of flood calculation was adopted and the following methods used: Alternative Rational Method, Unit Hydrograph, Standard Design Flood, and Empirical Methods (RMF). Using the survey information, cross sections of the river were taken at strategic points to setup the model. The HecRas program was used to analyse this model and the water levels obtained were plotted to define the 1:100 year flood line.

All fieldwork for the water quality hydrocensus was conducted based on the protocols and specifications, and code of practice contained in the SABS ISO 5667:1-15. These international standards address all aspects from the program design, sampling methods as well as sample preservation and many other aspects. The collected water samples were then analysed for physico-chemical properties, major anions, major cations and metals in a laboratory.

Field investigations were undertaken to delineate any wetland systems within the proposed project areas and to determine the Present Ecological State (PES) of these systems. The delineation was conducted in accordance to DWA field procedure. The PES of the wetlands was determined using the DWA scoring system. For further detail relating to this methodology refer to Appendix G.

Results

Surface Drainage

The mine and project site fall within quaternary catchment B41G, which is situated in the Olifants River Water Management Area. The Groot Dwars River is a major tributary of the Klein Dwars River. After its confluence with the Klein Dwars River, the river feeds into the Steelpoort River approximately 2km downstream of the De Hoop dam. The Steelpoort River ultimately flows into the Olifants River Basin.

The terrace where current mine infrastructure is located is drained by two perennial streams, referred to as the East and West streams in the original EIA and EMP report. On the terrace there are currently two dams, namely the TKO dams located on the East stream downstream of the mine's current infrastructure. Both the West and East streams feed into the second TKO dam from where the East stream flows in a northerly direction before flowing steeply towards the Groot Dwars River. The East stream feeds into the Groot Dwars River upstream of Der Brochen Dam. The existing TSF is bound to the west by the West Stream. The proposed TSF is bounded to the east by the West Stream. The confluence of the West Stream and the East stream is approximately 0.5 km north of the proposed TSF.

In the valley area, there are several ephemeral tributaries draining the side of the valley towards the Groot Dwars River. The existing service road leading to the valley box cut from the terrace crosses a number of these tributaries. Similarly the proposed Valley access road will cross these tributaries as well and lead into the valley to the position of the proposed Waterfall box cut. An access road from the proposed Waterfall box cut will traverse a tributary, as well as the Groot Dwars River itself, to the proposed Buttonshope South box cut. The access road from the Buttonshope South box cut to the Buttonshope North box cut will also traverse non-perennial tributaries on the western slope of the Groot Dwars valley.

Return Period Rainfall Depths

Using the Smithers and Schulze method, based on data taken from the six nearest rain stations which have similar mean annual precipitation and altitudes, the depth-duration-frequency (DDF) rainfall estimates were calculated (refer to Appendix H for more information on the methodology used). The calculated DDF rainfall estimates are provided in Table 1-12 for various durations. These estimates are used to inform the conceptual design of the proposed stormwater management measures.

TABLE 1-12: DEPTH DURATION FREQUENCY ESTIMATES FOR SITE

Duration (hours)	Rainfall Depth (mm)						
	1:2yr	1:5yr	1:10yr	1:20yr	1:50yr	1:100yr	1:200yr
0.08	8.4	11.1	13.1	15	17.7	19.8	22.1
0.167	12.2	16.2	19.1	21.9	25.8	28.9	32.2
0.25	15.3	20.3	23.8	27.3	32.2	36.1	40.2

Duration (hours)	Rainfall Depth (mm)						
	1:2yr	1:5yr	1:10yr	1:20yr	1:50yr	1:100yr	1:200yr
0.5	19.4	25.7	30.2	34.7	40.9	45.9	51
0.75	22.3	29.6	34.7	39.9	47.1	52.7	58.7
1	24.6	32.7	38.3	44.1	52	58.2	64.8
1.5	28.3	37.5	44.1	50.7	59.8	67	74.5
2	31.3	41.5	48.7	56	66	73.9	82.2
4	36.6	48.6	57	65.6	77.3	86.6	96.3
6	40.2	53.3	62.5	71.9	84.8	95	105.6
8	42.9	56.9	66.8	76.8	90.5	101.4	112.8
10	45.1	59.8	70.3	80.8	95.2	106.7	118.7
12	47	62.4	73.2	84.2	99.3	111.2	123.7
16	50.2	66.6	78.2	89.9	106	118.8	132.1
20	52.8	70.1	82.3	94.6	111.5	125	139
24	55.1	73	85.8	98.6	116.3	130.3	144.9

Surface water monitoring and water quality

Pre-mining baseline surface water quality in the East Stream, West Stream and Groot Dwars River was included in the original EIA and EMP report (Metago, 2003). Surface water quality samples were taken in August 2002, which corresponded to dry river flow conditions and thus dilution factors were at a minimum. The results of the chemical analysis were compared to DWAF's South African Water Quality Guidelines (SAWQG) for aquatic ecosystems, domestic use and irrigation or livestock watering as well as the receiving water quality objectives (RWQO) for the Dwars River - Steelpoort River Catchments (B41H and B41J). In summary, elevated concentrations of aluminium, iron and manganese were recorded. The elevated iron concentrations would result in some aesthetic effects (colour, taste, staining). In terms of human health, the recorded concentrations varied from no effects (aluminium and manganese) to slight health effects in young children and sensitive individuals (iron). Turbidity levels indicated that there is suspended matter in the water with downstream turbidity values generally higher than those upstream indicating an increase in suspended matter.

The EIA and EMP amendment (Metago, 2010) for the valley decline included water quality data for the Groot Dwars River measured as part of the mine's routine monitoring programme. When compared to the South African National Standards for Drinking water (SANS, 2005), the overall water quality in the Groot Dwars River falls within Class 0 (ideal water quality suitable for lifetime use).

From the results of the Project Fairway surface water quality hydrocensus, the surface water quality can be described as neutral (pH levels were between 6.41 and 8.26) and non-saline or low salinity (TDS levels between 6 mg/l and 128 mg/l). Salt, nutrient and heavy metal concentrations are very low. However aluminium, iron and manganese levels were detected above the DWAF South African Water Quality Guidelines for Domestic Use – Target Water Quality Guideline Ranges (Class 0 – ideal water quality suitable for lifetime use) values in a number of localities, but these concentrations were also comparatively low with no associated health effects if consumption. The water quality of the surface water features sampled can be described as pristine and are fit for domestic use based on the quality of the chemical variables analysed.

Floodlines

Floodlines for the East Stream and West Stream (1:50, 1:100 and 100 m offset) were calculated as part of the approved EIA and EMP report (Metago, 2003) (Figure 1-3).

For Project Fairway, floodline modelling was undertaken for the portion of the Groot Dwars River in the vicinity of the proposed Waterfall, Buttonshope South and Buttonshope North box cuts. For the non-perennial tributaries, the 100 m offset from the centre of the drainage line (as set out in Government Notice No. R.704 of 4 June 1999) is expected to be greater than the 1:100 year floodline and therefore this buffer has been used for planning purposes.

Disturbance to Water Courses

The existing tailings storage facility covered a poorly defined drainage line that flowed into the West Stream. The former open pit mining operations also temporarily disturbed a small drainage line that flows into the West Stream.

No formal watercourse/drainage line diversions are proposed as part of Project Fairway operations. However, stormwater management infrastructure will be designed and implemented to divert clean runoff water around the dirty infrastructure areas. These diversions will be designed and operated in accordance with the requirements of Government Notice No. R.704 of 4 June 1999.

Surface water use

Most people living on the terrace obtain water from springs, streams and boreholes. Surface water is also used by the aquatic ecosystems present along the streams. The Der Brochen Dam is located downstream of the mine on the Groot Dwars River, over 10 km north of the mine. From previous investigations, it is believed that about 97% of the water in the dam is allocated to various mining houses. The remaining allocation is used by a farmer and Didingwe Lodge downstream of the mine for irrigation and livestock watering.

Wetlands

The original EIA and EMP report identified riparian wetland features associated with the East and West Streams and their tributaries. During the former open pit mining operations, a small riparian wetland area associated with the tributary of the West Stream was mined through. However, following the rehabilitation of the open pit areas, this drainage line had been re-established. The EIA and EMP amendment (Metago, 2010) for the existing valley decline also noted that the decline area and the service road will impact on midslope seepage areas (some temporary). The temporary seepage areas were deemed to offer limited wetland function while the more significant midslope seepage wetlands were found to be in good ecological state.

For the proposed Project Fairway, a wetland delineation assessment was undertaken as part of the Biodiversity Assessment. The Wetland delineation did identify wetlands within the project area. The identified wetland features include riparian wetlands associated with the Groot Dwars River riverine system and associated floodplain, riparian wetlands associated with the non-perennial and perennial drainage lines in the Groot Dwars River valley; and the Valley bottom wetland complex in the vicinity of the proposed TSF. More detail on the identified wetlands is provided in Section 1.1.6.

Baseline Conclusion

Surface water features on the site include a perennial river (Groot Dwars River) ephemeral tributaries and wetlands (both midslope and valley-bottom wetlands). These surface water resources are generally in excellent condition and special care is needed to ensure that these conditions are not significantly altered through a decrease in water quality and/or quantity. Project-related activities are also located either on or in close proximity of the proposed 100 m buffer of tributaries. The project design should therefore include provision for appropriately designed measures for controlling flood waters, dirty water runoff and erosion control.

1.1.8 GROUNDWATER

This section should be read with reference to Figure 1-1 (geology), Figure 1-2 (geological structures), Figure 1-9 (boreholes and springs) and Figure 1-10 (flows and levels) (Section 1.4).

Introduction and link to impact

Groundwater is a valuable resource to both humans and the natural environment and is defined as water which is located beneath the ground surface in soil/rock pore spaces and in the fractures of lithological formations. Activities such as the handling and storage of hazardous materials and handling and storage of mineralised and non-mineralised wastes have the potential to result in the loss of groundwater resources, both to the environment and third party users, through pollution. In addition, where mining requires dewatering in order to provide a safe working environment, there is the potential for a dewatering cone to develop and this can result in a loss of water supply to surrounding users, including the ecosystem. To understand the basis of existing impacts and potential impacts associated with Project Fairway, a baseline analysis is described below.

Data collection

Information on the existing mine site was extracted from the approved EMP reports for the current mine infrastructure (approved July 2003, December 2009 and May 2010).

For Project Fairway, a project-specific groundwater study was undertaken by Future Flow GPMS (2011) (Appendix H). The study included (further detail on the methodologies used is provided in the specialist report):

- Review of previous studies undertaken within the project area and maps.
- A ground geophysical survey around the proposed new TSF area to identify geological features such as dykes and weathering zones that could act as preferential groundwater flow and contaminant migration pathways.
- A ground geophysical survey in the Groot Dwars River valley to locate geological features that could form a hydraulic connection between surface water in the valley, and the decline and underground mine areas.
- A hydrocensus investigation was undertaken within the broader project area (approximately 5km radius). The purpose of the hydrocensus was to identify groundwater use, water use volume, borehole depth, depth to groundwater level (if accessible) and sample water for analysis. The hydrocensus included newly installed boreholes, exploration boreholes, water supply boreholes and fountains/springs both at the mine and near the project site. Approximately 17 boreholes and 38 springs were identified and visited. Water samples were taken from five hydrocensus points (three boreholes and two springs), four newly installed TSF boreholes and one sample from the toe drain of the existing TSF to characterise the expected seepage quality from the TSF.
- Four new monitoring boreholes were drilled around the TSF site to a depth of 35 m (until competent rock was reached) and these boreholes were pump tested to characterise the aquifer conditions on the site.
- Packer testing was performed on two existing exploration boreholes in the Groot Dwars River valley to determine aquifer hydraulic conductivity where the decline will undermine the river. The tests were done at different depths using double packers.

Results

<u>Groundwater Zone (Aquifers)</u>

The original EIA and EMP report (Metago, 2003) identified that the hydrogeology of the mining area and that of the existing tailings dam and plant site differed slightly. In the mining area, two aquifers were identified. These aquifers are associated with a) the upper weathered material, and b) the underlying competent and fractured rock material. These aquifers also occur the Project Fairway underground mine area as well as at the proposed tailings dam site, both located adjacent to the existing mine. At the existing tailings dam and plant, the 2003 EIA and EMP report identified one main aquifer type, namely contact aquifers between post and sin Bushveld Igneous Complex rock and pre-Bushveld Igneous Complex rocks (both sediments and intrusive rocks) (Metago, 2003). These aquifers are discussed further below.

Upper Weathered Material Aquifer

The formation of the Upper Weathered Material aquifer is as a result of the infiltration of rainfall into the weathered material. The material underlying the upper weathered material has a lower permeability and therefore groundwater collects above the lower permeability contact forming the aquifer. This groundwater migrates down gradient along the contact to lower lying areas. In places where the contact is near surface the groundwater can daylight on surface as one of the many springs that occur in the area, or seep as baseflow into the surface water bodies.

This aquifer is expected to be seasonably variable with increased groundwater levels and groundwater availability during the rainy season when there is active recharge from rainfall. During the dry season groundwater levels and yields are expected to decline. However, from the hydrocensus results which show a large number of springs being used by surrounding landowners for domestic and stock watering purposes, it is apparent that this aquifer yields a sustained water supply year-round.

The depth of weathering in the existing underground mine and proposed Fairway mining area is expected to be around 20 m deep in high lying, relatively flat areas. Weathering depths of between 35 m and 45 m have been recorded in the Fairway mining area. Areas affected by fault zones could show deeper weathering. Against the valley slopes the thickness of the weathered material is less due to the effect of increased surface runoff against the steeper slopes. At the proposed TSF area, the depth of weathering ranges between 2 m and 14 mbgl.

Lower Fractured Rock Aquifer

Groundwater flows in the lower aquifer are associated with the secondary fracturing in the competent rock and as such will be along discrete pathways associated with the fractures. From the review of previous studies, it has been concluded that faults having a north-northeast to south-southwest strike direction are the main water bearing structures in the area. These include the St George's fault (along the Groot Dwars River), a graben structure in the Fairway mining area, geological structures that underlie the proposed TSF site, and the shear zone present at the existing Everest underground mine (see Section 1.1.1 for further detail).

The majority of groundwater flows in this aquifer is expected to be along the upper 40 to 50 m. Previous experience shows that groundwater flows along fractures and faults at depths below around 80 m below surface decrease markedly due to the weight of the overlying rock material closing the fractures and lowering the yields. This appears to be supported by verbal evidence from mine personnel that although there are a large number of northeast – southwest trending faults and fractures in the area, they are closed at depth, Localised differences could occur especially in areas affected by prominent faults and fractures. In such areas significant groundwater flows could occur to much greater depths.

Yields from this aquifer are normally much more consistent than the seasonably variable upper aquifer and this is the aquifer that is targeted by boreholes of the surrounding water users.

Contact aquifer at the existing tailings dam and plant sites

The fractured rock aquifer includes the contact aquifer which was identified in the original EIA and EMP report. Groundwater yields in this aquifer are in the order of 6000 to 18000 litres per hour (Metago, 2003). Most water was yielded close to the contact with pre-Bushveld rocks and is most likely influenced by the nearby dolerite intrusion. These aquifers are highly heterogenic and difficult to delineate due to the irregular nature of the Marginal Zone and Critical Zone contact. Groundwater was also intersected in weathered norite. The average weathering in the area is in the order of 10 to 12 m.

Aquifer classification

In the original EMP report (Metago, 2003), aquifers at the mine were described as low to moderate yielding (0.1 l/s to 5 l/s) with good potable quality water. Due to the abundance of surface water, the aquifers were not classed as sole sources of water. Based on the aquifer characteristics described by the current study and following the Parsons Classification system of 1995, the aquifers are classified as a minor aquifer, but of high importance to the local land owners as they depend on the aquifers for domestic and stock water purposes.

Groundwater levels and flows

Based on pre-mining data, the depth to groundwater level at the mine varied between near surface to 100 m below ground level (mbgl) (Metago 2003). The large variation in depth to groundwater level was attributed to the heterogenic nature of the hydrogeological environment of the area. The mean depth of groundwater levels was 8 mbgl. During a study done by GCS in 2007, it was identified that on average groundwater levels were approximately 2 m below the original 2002 data. This is expected to be due to dewatering activities at the mine.

From the project-specific hydrocensus, the depth to groundwater level ranged between surface (i.e. springs) and 20 metres below ground level (mbgl). The reason for the difference in the range of depths from the 2002 data is that many of the boreholes in the Everest mining area were covered/destroyed by the placement of mine infrastructure and/or mining activities. The depth to groundwater levels in the boreholes alone was between 1.49 and 19.85 mbgl, with an average depth of 10.87 mbgl (FutureFlow GPMS, 2012). This average depth correlates with the 2007 finding above. Given the depth of the weathered material aquifer, as outlined above, it is considered that the groundwater level at the mine lies within the weathered material aquifer.

Groundwater monitoring data from the existing TSF area shows depths to groundwater levels in line with regional trends however some of the boreholes have shown a rise in water levels over time. The increasing groundwater levels could be indicative of seepage from the existing TSF. Groundwater levels measured at the proposed TSF site show depths to groundwater level of between 1.4 and 14 mbgl. The shallow groundwater levels are indicative of a strong connection to the shallow groundwater levels in the wetland area and stream.

Generally, the groundwater levels in the area mimics the topography. Groundwater flow gradients are slightly lower than topography and range between 1:5 on the valley slopes and 1:20 in the high lying plateaus and low lying river valleys. The groundwater flows are directed from the high lying areas towards the valleys.

Groundwater monitoring and quality

Pre-mining baseline groundwater quality in the vicinity of the mine was determined for the mine's approved EMP report (June 2003). Water samples were sourced from ten boreholes and were taken so as to represent a composite sample of different aquifers present on site.

The results of the chemical analysis are provided in TABLE 1-13. The results were compared to DWAF's South African Water Quality Guidelines (SAWQG) for domestic use, SABS drinking water standards and the receiving water quality objectives (RWQO) for the Dwars River - Steelpoort River Catchments (B41H and B41J). A summary of the findings provided below.

- In general, the quality of groundwater is good and is generally suitable for domestic use including human consumption.
- Slightly elevated concentrations of calcium, sodium and heavy metals such as iron and vanadium were recorded in some boreholes. The elevated baseline concentrations were attributed to natural variations in geology and hydrogeology.
- Groundwater in the area is bicarbonate-calcium and bicarbonate-calcium and magnesium dominant.

TABLE 1-13: PRE-MINING GROUNDWATER QUALITY RESULTS

Sample No	**EMS 1**	**ESM 2**	**ESM 3**	**ESM 4**	**ESM 5**	**ESM 6**	**GCS 3**	**GCS 3**	**GCS 3**	**GCS 4**	**GCS 4**	**GCS 4**	**BH5575**	**ES1**
Sampling Date	Aug-02	Aug-02	Aug-02	Aug-02	Aug-02	Aug-02	Jun-02	Jul-02	Aug-02	Jun-02	Jul-02	Aug-02	Feb-01	Feb-01
Total Dissolved Solids	114	132	108	100	58	122	114	114	86	118	118	106	116	94
pH-Value at 25 ° C	7.72	7.58	7.61	7.66	7.61	7.48	7.62	7.62	7.56	7.56	7.56	7.54	7.34	7.91
Conductivity at 25° C	20	23.4	19.55	18.2	11.15	23	15.67	15.67	17.57	16.54	16.54	16.68	18.1	15.8
Sodium as Na	3.82	4.84	10.8	3.15	3.14	16.7	2.84	2.84	2.94	3.67	3.67	3	3.9	3.6
Potassium as K	0.54	0.68	0.88	0.72	0.64	1.68	0.18	0.18	0.52	1.21	1.21	0.36	4.2	0.3
Calcium as Ca	17.2	16.7	9.04	10.3	6.24	9.17	12.01	12.01	18.3	11.3	11.3	16.8	35.2	18.4
Magnesium as Mg	9.47	14.6	10.7	10.4	5.9	5.99	6.06	6.06	7.38	7.02	7.02	6.88	0.5	7.8
Total Alkalinity as $CaCO_3$	88	110	82	74	42	58	62	62	80	66	66	60	74	80
Chlorides as Cl	5	6	4	3	4	26	2	2	3	2	2	3	3	2
Sulphate as SO_4	5.3	5.9	4.7	2	4.7	3.3	2	2	6	2.7	2.7	4	9	1.8
Fluoride as F	0.03	0.27	<0.01	<0.01	<0.01	0.42	<0.01	<0.01	0.07	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate NO_3 + Nitrite NO_2 as N	0.42	0.44	0.39	1.2	0.29	<0.01	0.2	0.2	0.28	0.34	0.34	4.2	2.44	0.33
Total Hardness as $CaC0_3$	82	102	67	69	40	48	55	55	76	57	57	70	88	46
Iron as Fe	<0.01	<0.01	**0.15**	<0.01	**0.37**	**0.37**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.5**	**0.02**
Manganese as Mn	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.09**	0.01
Aluminium as Al	<0.01	<0.01	<0.01	<0.01	<0.01	0.63	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**1.4**	0.1
Total Chromium as Cr	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.01	-	-	0.02	–	–
Vanadium as V	**0.13**	<0.01	**0.17**	<0.01	**0.12**	0.06	-	-	0.08	-	-	0.02	–	–

Text – exceeds DWAF Water Quality Reserve

Text – exceeds SAWQG target values for Domestic Use

For the current study, 10 points were sampled from a variety of sources (private boreholes, springs, newly drilled boreholes and existing TSF toe drain effluent. The results from the chemical analyses are summarised in Table 1-14 and Table 1-15. The results were compared to the SABS 241 water quality guidelines for domestic use and DWA South African Water Quality Guideline for Aquatic Ecosystems (1996). In terms of the SABS 214 guideline, Class 0 values represent the ideal range whilst Class II represents the maximum allowable levels. All elements that were found to exceed the guidelines are highlighted in the table and are from samples within the mining right boundary, except for two spring samples showing elevated iron because of natural geological occurrences. A summary of the findings is provided below.

- From the results of the water quality samples, it can be seen that the regional background groundwater quality in general is relatively good with almost all samples having elements within Class 0 except for the existing TSF leach sample that indicates iron and manganese concentrations within Class II and exceeding Class II respectively.
- Sampling points EVH11 and Spring 26 have a somewhat elevated iron concentration (0.1 and 0.05 mg/L respectively) which exceed the Class 0 guideline value of 0.01 mg/L.
- The major effects of the presence of iron in domestic water are aesthetic, but in some cases distribution systems may also be affected. Health effects may occur but only at extremely high concentrations.
- Manganese concentrations of around 0.1 to 0.15 mg/L are considered to be the threshold for significant staining and taste problems. Up to 1 mg/L there will be increasing staining and taste problems, however, no health effects are expected.
- The water type can be characterised into two general groupings, mainly a bicarbonate magnesium or calcium magnesium type water and calcium bicarbonate type water, with one sample (EVH1) classed as a third group, sulphate and/or sodium type water, due to higher sulphate values. The water also can be categorised as freshly recharged from precipitation; only the TSF sample indicates influence from mining activities directly.
- When compared to the DWA South African Water Quality Guideline for Aquatic Ecosystems (1996), the elements that exceed the Target Water Quality Range (TWQR) include aluminium, copper, manganese, selenium, and zinc. Comparison to groundwater qualities measured during pre-development studies at Everest show that aluminium, copper, and manganese are naturally elevated in the study area. Data from the original Everest EMP show that aluminium and copper concentrations naturally exceed the aquatic standards.

TABLE 1-14: GROUNDWATER CHEMICAL ANALYSIS RESULTS (DOMESTIC USE COMPARISON)

Element	Units	SABS 241 guideline		TSFmon01	TSFmon02	TSFmon03	TSFmon04	TSF34E	EVH 1	EVH 5	EVH 11	Spring 25	Spring 26
		Class 0	Class II										
pH		6-9	<4 and >9	6.42	6.48			5.48	6.6	6.8	6.6	6.7	6.8
TDS	mg/l	<450	>1000-2400	192	99			79	62	187	56	104	63
EC	mS/m	<70	>150-370	31.02	16.82			18.24	11	26	4.2	8.6	6.1
Sulphate	mg/l	<200	>400 -600	4.100	3.830	<0.132	11.39	9.75	133	5	5	3	2
Chloride	mg/l	<100	>200 – 600	1.408	1.408	2.3	8	10.5	8	18	10	5	2.7
Nitrate	mg/l	<6	>10 – 20	0.865	0.787	0.862	1.84	0.571	0.6	0.9	<0.5	<0.5	<0.5
Ammonium	mg/l	NS	NS	0.027	0.020	<0.015	<0.015	1.139	0.2	0.6	0.2	0.2	0.1
Total Alkalinity	mg/l	NS	NS	194.900	95.800	83.2	62.2	54.7	49	117	24	71	30
Calcium	mg/l	<80	>150-300	34.334	20.987	15.73	22.826	7.758	17	24	6	15	5.9
Magnesium	mg/l	<30	>70-100	27.938	10.701	11.28	5.668	6.479	8	17	1.8	4.6	3.6
Sodium	mg/l	<100	>200-400	6.100	4.320	0	0	<0.023	46	8.5	4.4	4.7	3.5
Potassium	mg/l	<25	>50-100	0.366	0.525	3.33	7.62	9.82	1.30	0.98	1.45	1.19	0.10
Iron	mg/l	<0.01	>0.2-2	0.006	0.006	<0.006	<0.006	1.202	<0.1	<0.1	0.1	<0.1	0.05
Aluminium	mg/l	<0.15	>0.3-0.5	0.006	0.023	<0.001	<0.001	<0.006	0.0086782	0.0082637	0.0042918	0.0206116	0.066849
Arsenic	mg/l	<0.01	>0.05-0.2	N/A	N/A	0	0	<0.023	0.000431	0.000854	0.000378	0.000362	0.000371
Barium	mg/l	NS	NS	N/A	N/A	0.002	0.009	0.07	4.42E<02	3.09E-02	8.00E-03	3.24E-02	1.22E-02
Beryllium	mg/l	NS	NS	N/A	N/A	<0.001	<0.001	<0.001	5.67E-05	3.86E-05	1.87E-05	5.71E-05	8.20E-06
Bismuth	mg/l	NS	NS	N/A	N/A	<0.01	<0.01	<0.01	<1.00E-06	2.40E-06	5.90E-06	3.00E-06	<1.00E-06
Cadmium	mg/l	<0.003	>0.005 – 0.01	0.001	0.001	<0.001	<0.001	<0.001	1.74E-05	4.26E-05	<1.00E-06	2.19E-05	3.02E-05
Chromium	mg/l	<0.05	>0.1-0.5	0.002	0.002	<0.002	<0.002	<0.002	0.0045609	0.0157781	0.0000928	0.0031208	0.0002617
Cobalt	mg/l	<0.25	>0.5-1	0.002	0.002	<0.002	<0.002	0.06	0.0000783	0.0001062	0.0000783	0.0000524	0.000053
Copper	mg/l	<0.5	>1-2	0.001	0.001	<0.001	<0.001	<0.001	0.0018807	0.0025456	0.0012302	0.0012638	0.0007539
Lead	mg/l	<0.01	>0.05-0.1	0.001	0.001	<0.001	0.004	<0.001	0.0002345	0.0001349	0.000205	0.0001983	0.0003186
Lithium	mg/l	NS	NS	N/A	N/A	<0.001	0.021	<0.001	0.0016394	0.0015927	0.0008062	0.0012742	0.000441

Element	**Units**	**SABS 241 guideline**		**TSFmon01**	**TSFmon02**	**TSFmon03**	**TSFmon04**	**TSF34E**	**EVH 1**	**EVH 5**	**EVH 11**	**Spring 25**	**Spring 26**
		Class 0	Class II										
Manganese	mg/l	<0.05	>0.1-1	0.001	0.001	<0.001	<0.001	3.624	<0.1	<0.1	<0.1	<0.1	<0.1
Molybdenum	mg/l	NS	NS	N/A	N/A	0.007	0.01	0.008	0.000108	0.000227	0.000144	0.0000327	0.0000587
Nickel	mg/l	<0.05	>0.15-0.3	0.003	0.003	<0.003	<0.003	<0.003	0.0005077	0.0014861	0.0006361	0.0009516	0.0004288
Rubidium	mg/l	NS	NS	N/A	N/A	0.008	0.05	0.033	0.002018	0.0009973	0.0012925	0.0024963	0.0002054
Selenium	mg/l	<0.01	>0.02-0.05	N/A	N/A	0	0	<0.023	0.0031778	0.0029888	0.0024944	0.0013639	0.0029484
Tellurium	mg/l	NS	NS	N/A	N/A	<0.023	<0.023	<0.023	<1.00E-06	0.000024	<1.00E-06	0.0000522	0.0000484
Thallium	mg/l	NS	NS	N/A	N/A	<0.087	<0.087	<0.087	0.0000622	0.0000717	0.0000539	0.0000696	0.0000534
Vanadium	mg/l	<0.1	>0.2-0.5	N/A	N/A	<0.003	0.003	<0.003	0.0020476	0.0049699	0.0001634	0.0020985	0.0009882
Zinc	mg/l	<3	>5-10	0.004	0.004	<0.004	<0.004	<0.004	0.0713323	1.5775356	0.4016075	0.1693315	0.070837

Legend:	
Class 0	
Class I	
Class II	
Exceeding Maximum	

TABLE 1-15: GROUNDWATER CHEMICAL ANALYSIS RESULTS (AQUATIC ECOSYSTEMS COMPARISON)

Element	Units	DWAF Aquatic ecosystem guideline			TSFMon01	TSFMon02	TSFMon03	TSFMon04	TSF34E	EVH 1	EVH 5	EVH 11	Spring 25	Spring 26
		Target	Chronic Effect Value (CEV)	Acute Effect Value (AEV)										
pH		Not vary by > 0.5 pH units of 5%			6.42	6.48	N/A	N/A	5.48	6.6	6.8	6.6	6.7	6.8
TDS	mg/l	Should not vary by > 15 % of baseline and no change in seasonal amplitude			192	99	N/A	N/A	79	62	187	56	104	63
EC	mS/m	Should not vary by > 15 % of baseline and no change in seasonal amplitude			31.02	16.82	N/A	N/A	18.24	11	26	4.2	8.6	6.1
Sulphate	mg/l	NS	NS	NS	4.100	3.830	<0.132	11.39	9.75	133	5	5	3	2
Chloride	mg/l	NS	NS	NS	1.408	1.408	2.3	8	10.5	8	18	10	5	2.7
Nitrate	mg/l	NS	NS	NS	0.865	0.787	0.862	1.84	0.571	0.6	0.9	<0.5	<0.5	<0.5
Ammonium	mg/l	NS	NS	NS	0.027	0.020	<0.015	<0.015	1.139	0.2	0.6	0.2	0.2	0.1
Total Alkalinity	mg/l	NS	NS	NS	194.900	95.800	83.2	62.2	54.7	49	117	24	71	30
Calcium	mg/l	NS	NS	NS	34.334	20.987	15.73	22.826	7.758	17	24	6	15	5.9
Magnesium	mg/l	NS	NS	NS	27.938	10.701	11.28	5.668	6.479	8	17	1.8	4.6	3.6
Sodium	mg/l	NS	NS	NS	6.100	4.320	0	0	<0.023	46	8.5	4.4	4.7	3.5
Potassium	mg/l	NS	NS	NS	0.366	0.525	3.33	7.62	9.82	1.30	0.98	1.45	1.19	0.10
Iron	mg/l	Should not vary by more than 10 % of background values			0.006	0.006	<0.006	<0.006	1.202	<0.1	<0.1	0.1	<0.1	0.05
Hardness ($CaCO_3$)	mg/l	NS	NS	NS	200.3808	96.3416	85.573	80.3038	45.9589	75.3	129.7	22.38	56.36	29.51
Aluminium (pH < 6.5)	mg/l	0.005	0.01	0.1	0.006	0.023	<0.001	<0.001	<0.006					
Aluminium (pH > 6.5)	mg/l	0.01	0.02	0.15						0.0086782	0.0082637	0.0042918	0.0206116	0.066849
Arsenic	mg/l	0.01	0.02	0.13	N/A	N/A	0	0	<0.023	0.000431	0.000854	0.000378	0.000362	0.000371
Barium	mg/l	NS	NS	NS	N/A	N/A	0.002	0.009	0.07	4.42E<02	3.09E-02	8.00E-03	3.24E-02	1.22E-02
Beryllium	mg/l	NS	NS	NS	N/A	N/A	<0.001	<0.001	<0.001	5.67E-05	3.86E-05	1.87E-05	5.71E-05	8.20E-06
Bismuth	mg/l	NS	NS	NS	N/A	N/A	<0.01	<0.01	<0.01	<1.00E-06	2.40E-06	5.90E-06	3.00E-06	<1.00E-06

Element	Units	DWAF Aquatic ecosystem guideline			TSFMon01	TSFMon02	TSFMon03	TSFMon04	TSF34E	EVH 1	EVH 5	EVH 11	Spring 25	Spring 26
		Target	Chronic Effect Value (CEV)	Acute Effect Value (AEV)										
Cadmium (Hardness <60)	mg/l	0.00015	0.0003	0.003	-	-	-	-	<0.001	-	-	<1.00E-06	2.19E-05	3.02E-05
Cadmium (Hardness 60-119)	mg/l	0.00025	0.0005	0.006	-	0.001	<0.001	<0.001	-	1.74E-05	-	-	-	-
Cadmium (Hardness <120-180)	mg/l	0.00035	0.0007	0.010	-	-	-	-	-	-	4.26E-05	-	-	-
Cadmium (Hardness <180)	mg/l	0.00040	0.0008	0.013	0.001	-	-	-	-	-	-	-	-	-
Chromium (III)	mg/l	0.012	0.024	0.340	0.002	0.002	<0.002	<0.002	<0.002	0.0045609	0.0157781	0.0000928	0.0031208	0.0002617
Cobalt	mg/l	NS	NS	NS	0.002	0.002	<0.002	<0.002	0.06	0.0000783	0.0001062	0.0000783	0.0000524	0.000053
Copper (Hardness <60)	mg/l	0.0003	0.00053	0.0016	-	-	-	-	<0.001	-	-	0.0012302	0.0012638	0.0007539
Copper (Hardness 60-119)	mg/l	0.0008	0.0015	0.0046	-	0.001	<0.001	<0.001		0.0018807	-	-	-	-
Copper (Hardness 120-180)	mg/l	0.0012	0.0024	0.0075	-	-	-	-	-	-	0.0025456	-	-	-
Copper (Hardness >180)	mg/l	0.0014	0.0028	0.012	0.001	-	-	-	-	-	-	-	-	-
Lead (Hardness <60)	mg/l	0.0002	0.0005	0.004	-	-	-	-	<0.001	-	-	0.000205	0.0001983	0.0003186
Lead (Hardness 60-119)	mg/l	0.0005	0.001	0.007	-	0.001	<0.001	0.004	-	0.0002345	-	-	-	-
Lead (Hardness 120-180)	mg/l	0.001	0.002	0.013	-	-	-	-	-	-	0.0001349	-	-	-
Lead (Hardness >180)	mg/l	0.0012	0.0024	0.016	0.001	-	-	-	-	-	-	-	-	-

Element	Units	DWAF Aquatic ecosystem guideline			TSFMon01	TSFMon02	TSFMon03	TSFMon04	TSF34E	EVH 1	EVH 5	EVH 11	Spring 25	Spring 26
		Target	Chronic Effect Value (CEV)	Acute Effect Value (AEV)										
Lithium	mg/l	NS	NS	NS	N/A	N/A	<0.001	0.021	<0.001	0.0016394	0.0015927	0.0008062	0.0012742	0.000441
Manganese	mg/l	0.18	0.37	1.3	0.001	0.001	<0.001	<0.001	3.624	<0.1	<0.1	<0.1	<0.1	<0.1
Molybdenum	mg/l	NS	NS	NS	N/A	N/A	0.007	0.01	0.008	0.000108	0.000227	0.000144	0.0000327	0.0000587
Nickel	mg/l	NS	NS	NS	0.003	0.003	<0.003	<0.003	<0.003	0.0005077	0.0014861	0.0006361	0.0009516	0.0004288
Rubidium	mg/l	NS	NS	NS	N/A	N/A	0.008	0.05	0.033	0.002018	0.0009973	0.0012925	0.0024963	0.0002054
Selenium	mg/l	0.002	0.005	0.03	N/A	N/A	0	0	<0.023	0.0031778	0.0029888	0.0024944	0.0013639	0.0029484
Tellurium	mg/l	NS	NS	NS	N/A	N/A	<0.023	<0.023	<0.023	<1.00E-06	0.000024	<1.00E-06	0.0000522	0.0000484
Thallium	mg/l	NS	NS	NS	N/A	N/A	<0.087	<0.087	<0.087	0.0000622	0.0000717	0.0000539	0.0000696	0.0000534
Vanadium	mg/l	NS	NS	NS	N/A	N/A	<0.003	0.003	<0.003	0.0020476	0.0049699	0.0001634	0.0020985	0.0009882
Zinc	mg/l	0.002	0.0036	0.036	0.004	0.004	<0.004	<0.004	<0.004	0.0713323	1.5775356	0.4016075	0.1693315	0.070837

Legend:	
Within target	
Exceed target	(yellow)
Exceed CEV	(orange)
Exceed AEV	(red)

Groundwater use

Based on the 2002 hydrocensus data, of the four identified private boreholes only two (ES1 and ES4) were used for water supply, for domestic purposes. Only one of these two boreholes (ES1) was close to the mine however this borehole no longer exists due to the previous open pit mining operations. At that stage, springs and streams were identified as the preferred sources of water in the area with water being sourced for domestic use and livestock watering. The springs identified during the 2002 hydrocensus are on ridges above the mine site at the foot of the Steenkampsberge (Figure 1-9).

From the current study it was identified that groundwater forms the sole source of water supply to the landowners surrounding Everest mine, in the form of boreholes (limited) and damming of springs (mostly). This water is used for domestic and stock water use. Of the boreholes and springs identified during the current hydrocensus, 24 are used by local landowners. A total of 4 groundwater abstraction points (Spring 20, Spring 21, Spring 22, and borehole EVH11) fall within 2 km from the edge of the Everest underground area. Springs 20 and 21 are used for domestic use while Spring 22 is currently not used. Borehole EVH11 collapsed and is not in use. Groundwater abstraction points Spring 36, Spring 37, EVH15 are located within 2 km from the edge of the proposed Fairway underground workings. The two springs are used for livestock watering and borehole EVH15 is used during the dry season for water supply. Using an average of 1000L/day from each abstraction point, it is estimated that approximately 8 760 m^3/annum (24m^3/day) is abstracted and used by surrounding water users. This equates to less than 1% of the average annual recharge of groundwater in the local sub-catchments. Dewatering requirements for the proposed Fairway underground area range up to approximately 730 000 m^3/annum, this equates to 2.5 % of the 28.754 Mm^3 annual recharge to the local sub-catchments.

At the TKO farm, boreholes are used for the farming operations. In addition, there is a borehole located in the relocated community along the Boschfontein Road. This borehole is used by community members for domestic purposes.

Water from the boreholes on the mine site is primarily used for domestic purposes.

From an ecological perspective, recent modelling indicates that groundwater does interact with the baseflow of surface water resources, particularly with respect to the Groot Dwars River.

Baseline conclusion

The nature of the Everest infrastructure and activities are such that they present real potential for pollution of groundwater resources that may be used by third parties for domestic, and/or agricultural uses and the natural environment. Furthermore dewatering requirements for the current and proposed underground mine workings may result in a reduction of groundwater availability for these third parties (including fauna and flora). Therefore mine operations and the proposed Project Fairway must be implemented/ managed in a way that pollution and reduction of groundwater resources is prevented.

1.1.9 AIR QUALITY

This section should be read with reference to Figure 1-11 (land uses) (Section 1.4).

Introduction and link to impact

Existing sources of emissions in the region and the characterisation of existing ambient pollution concentrations is fundamental to the assessment of cumulative air impacts. A change in ambient air quality can result in a range of impacts which in turn may cause a disturbance and/or health impacts to nearby receptors. Receptor sites include the neighbouring residents and communities and natural environments that have been described in Section 1.3.1. To understand the basis of existing impacts and potential impacts associated with Project Fairway, a baseline analysis is described below.

Data collection

Information on the existing mine site was extracted from the approved EMP reports for the current mine infrastructure (approved July 2003, December 2009 and May 2010).

For Project Fairway, a project-specific air quality study was undertaken by Airshed Planning Professionals (Airshed, 2011) (Appendix K). No on-site weather station (with wind data) exists, so meteorological data for the period 2010 (specific to the mine site) was extracted from the calculated MM5 data for the site (see Section 1.1.2 for a description of the climatic data). No ambient PM_{10} monitoring is available for the project site. Dust fallout is however measured at the mine. Given this the air study focused first on identifying sources and pollution types in the region and at the project site that may be important from a cumulative impacts perspective and provided an overview of available monitoring data from the mine. Further detail on the methodologies used is included in the specialist report (Appendix K).

Results

<u>Wind data and atmospheric stability indices</u>

Meteorological characteristics of a site govern the dispersion, transformation and eventual removal of pollutants from the atmosphere. Relevant wind data is included in Section 1.1.2.

<u>Regional air quality</u>

The sources of SO_2 and NOx that occur in the region include industrial emissions, blasting operations at mines, veld burning, vehicle exhaust emissions and household fuel burning. Various local and far-a-field sources are expected to contribute to the suspended fine particulate concentrations in the region. Long-range transport of particulates, emitted from remote tall stacks and from large-scale biomass burning in countries to the north of South Africa, has been found to contribute significantly to background fine particulate concentrations over the interior.

The identified industrial sources within the Mpumalanga region include the following:

- Emissions from coal combustion by power generation, metallurgical and petrochemical industries represents the greatest contribution to total emissions from the industrial / institutional / commercial fuel use sector within the Mpumalanga region.
- The metallurgical group is estimated to be responsible for at least ~50% of the particulate emissions from this sector. This group includes iron and steel, ferrochrome, ferro-alloy and stainless steel manufacturers (includes Highveld Steel & Vanadium), Ferrometals, Columbus Stainless, Transalloys, Middelburg Ferrochrome).
- Petrochemical and chemical industries are primarily situated in Secunda (viz. Sasol Chemical Industries). The use of coal for power generation and the coal gasification process represent significant sources of sulphur dioxide emissions. (Particulate emissions are controlled through the implementation of stack gas cleaning equipment.)
- Other industrial sources include: brick manufacturers which use coal (e.g. Witbank Brickworks, Quality Bricks, Corobrik, Hoeveld Stene, Middelwit Stene) and woodburning and wood drying by various sawmills (Bruply, Busby, M&N Sawmills) and other heavy industries (use coal and to a lesser extent HFO for steam generation). The contribution of fuel combustion (primarily coal) by institutions such as schools and hospitals to total emissions is relatively due to the extent of emissions from other groups.

<u>Local air quality</u>

Local sources include wind erosion from exposed areas, fugitive dust from agricultural and mining operations, vehicle entrainment from roadways and veld burning. There are no major industrial activities within the immediate vicinity of the mine and proposed Project Fairway.

<u>Potential receptor sites</u>

Receptors, potentially sensitive to air quality and dustfall impacts, identified in the vicinity of the mine site include:

- several dwellings immediately east and north east of the current Everest mining activities,
- the Kiwi Primary School and Everest Early Childhood Development Centre east of the mine,
- the Nel and Groenewald homesteads south of the existing Everest mine,
- the natural environment, and
- private farms and individual homesteads, approximately 8 km to the west of the current mine.

Dust fallout

The existing Everest Platinum Mine has a dust fallout network which provides an indication of the contribution in fugitive dust levels from the mining operations. Dust fallout is measured on a daily basis and sampled every two weeks. The dust fallout network comprises three directional dust buckets, namely the North quarry unit (monitored since June 2009), South quarry unit (monitored since April 2006) and Central unit (monitored since April 2006) (Figure 21-1).

Data provided by the mine for the period 18 April 2006 to 4 August 2011 was analysed and interpreted by Airshed as part of the project's air quality study. The dust fallout monitored results were compared to the recommended South African National Standard (SANS) residential limit of 600 mg/m^2/day and industrial limit of 1 200 mg/m^2/day. Exceedances of both the residential and industrial limits have occurred at the mine. These exceedances can be attributed to seasonal changes in wind conditions, increased activities at the mine during certain periods (such as backfilling of the former open pits and construction activities) and when the mine was under care and maintenance in late 2008, early 2009 when the tailings facility dried out from a lack of continuous depositing.

Baseline conclusion

The current mine site and proposed activities are located in a region where existing ambient air concentrations are influenced by nearby existing mining operations (downstream of Everest in the valley), agricultural activities as well as vehicle entrainment on unpaved road surfaces. Dust fallout concentrations within the existing Everest mine are generally kept within the SANS dust fallout guideline limits. These guideline limits have however been exceeded during certain periods. Data collected from the Everest dust fallout monitoring network, indicates that the SANS 'alert' dust fallout band of 2400 mg/m2/day has been exceeded in August 2006 and from 24 July 2007 to 7 August 2007. The SANS industrial target of 1200 mg/m^2/day was exceeded on three occasions between 18 April 2006 to 3 January 2010. The SANS residential limit of 600 mg/m^2/day has been exceeded on six occasions between June 2008 and January 2010. Management measures for current mining activities need to be complied with at all times to prevent any exceedances. The cumulative impact needs to be taken into consideration for any future mining activities to minimise disturbances and health implications.

1.1.10 NOISE

This section should be read with reference to Figure 1-11 (land uses) (Section 1.4).

Introduction and link to impact

Certain noise generating activities associated with the current Everest mining operations and proposed Project Fairway activities can cause an increase in ambient noise levels in and around the project area. This may cause a disturbance to nearby receptors. To understand the basis of these potential impacts, a baseline situational analysis is described below.

Data collection

Information on the existing mine site was extracted from the approved EMP reports for the current mine infrastructure (approved July 2003, December 2009 and May 2010).

For Project Fairway, a project-specific noise study was undertaken by Acusolv (Acusolv, 2012) (Appendix L). To quantify the current ambient noise levels, a physical measurement survey was undertaken at eight sampling points around the mine (Figure 1-11). In the nearest receptors to the mine, long duration recordings were made at two houses covering two daytime and two night-time periods. Where equipment safekeeping facilities for such long-duration unattended recordings were not available, ambient noise levels were probed and samples taken in which the level was averaged over sufficiently long time durations to obtain good estimates of the average ambient level. Meteorological conditions and the location of sampling points were taken into consideration when determining ambient noise levels. Methodologies used are detailed in the specialist report.

Results

A small number of the current mine components contribute to the audible noise footprint in the external environment. The noise footprint of the mine is convoluted by the mountainous topography. Depending on distance and topography between the mine and the receptor, the level and source of audible mining noise varies. The main source of noise from the existing mine operations are:

- ventilation equipment;
- crushing and screening plant located on the terrace;
- processing plant; and
- traffic on the tarred access road (Road D874 South) off the Provincial R577 and traffic on the R577.

Project Fairway is located in a district where in large areas the ambient noise still has a rural character. This rural character is degraded to some degree in zones along the main roads.

<u>Baseline noise measurements</u>

Baseline noise survey results are summarised in TABLE 1-16 below.

TABLE 1-16: NOISE MONITORING LOCATIONS AND RESULTS

Monitoring location		Ambient noise (Average level dBA) Day (L_d)	Night (L_n)	Description of sampling point
M1	Residence Nel 1,5 km South of Everest Plant	47	42	M1 serve as a representative sample of prevailing ambient noise conditions at the nearest houses immediately south of Everest Platinum Mine (Residences Nel and Groenewald). This is the area where existing Everest mining operations currently have its maximum noise impact on people living in the neighbourhood of the mine. At night, in addition to ever-present compressor (fan) noise, the plant and crushers (with variable intensity) are occasionally audible as well. Relative to a typical night-time level of 35 dBA in Rural Districts (SANS 10103), the mine elevates the ambient level by typically 7 dB, which amounts to a significant impact. Although the mine is at times audible during the day, the daytime level of 47 dBA is still in line with typical daytime levels (45 dBA) expected in Rural Districts and is caused primarily by farming and domestic work activities, birds and insects. It should be noted that as a result of farming activities, daytime ambient noise levels on farmyards are often much higher than 45 dBA.
M2	Residence Roux 2,5 km East of Everest	57	57	As a result of continuous on-site fan, motor and pump noise (nursery tunnels and Koi ponds) ambient noise at the Roux residence was found to be practically constant at 57 dBA throughout the day and night. This self-noise completely masks any mining noise which might have otherwise been audible at this location.
M3	Near houses 3,5 km N-E of Everest	45	37	The ambient noise level in the area does not deviate much from rural. Notwithstanding, the whining sound of the compressor station is clearly audible above the background ambient level (domestic activity, birds and insects). Although not causing a significant noise disturbance impact in terms of quantifiable elevation in ambient level, this noise by virtue of its pure-tone character does constitute a noise nuisance.
M4	Countryside 5 km N-E of Everest	38	34	Ambient noise in this area is determined primarily by birds, insects, occasional traffic on local roads and low intensity community activity. No noise from Everest Mine or any other mining or industrial activity was discernible.
M5	Near houses 7 km NN-E of Everest	39	36	As in the case of M4, ambient noise in this area is determined primarily by birds, insects, occasional traffic on local roads and low intensity community activity. Too far away from Everest Mine and shielded by the topography, no mining-related noise could be detected.
M6	Near main road 4 km S-E of Everest	47	39	Although relatively close to Everest Mine, this area is topographically shielded from direct Everest plant and compressor noise. But the mine does contribute to a rise in ambient level by virtue of product transport trucks and other traffic travelling on the Everest access road. With the level falling off with distance, road noise is expected (calculated) to fall off to rural levels beyond

Monitoring location		Ambient noise (Average level dBA) Day (L_d)	Night (L_n)	Description of sampling point
				500 m distance from the road. Although not detected in the samples taken during the course of the current survey, it can be expected that existing plant-related noise, the compressors in particular, will under certain atmospheric conditions be audible in this area.
M7	Near main road crossing 5 km S-E of Everest	51	41	Like location M6, noise at monitoring location M7 is also shielded from direct Everest plant and compressor noise by the topography. Ambient noise is elevated by general traffic and by truck noise on the main roads. With the level falling with distance, road noise is bound to fall off to rural levels beyond 500 m distance from the nearest main road.
M8	Fairway internal project area near proposed shafts	43	-	Ambient levels at this location are of no relevance to the mine’s existing or future impact on the external environment. A daytime sample taken during a period when (due to a striking action) the mine was not operating and was intended for purposes of information only. With no machine noise audible at this location, the daytime level was caused by natural sounds only, i.e. birds, insects and wind.
-	West of Project Fairway (Sheeprun)	45	35	Although no site-specific measurement was taken in this area, it is assumed that the current noise character corresponds to Rural District. This assumption is based on observations made in the initial scoping survey and is confirmed by the findings of the Hoogland noise study [5].
-	Kiwi Primary School	50		No site-specific measurement was taken in this area. Compared to residential locations where maximum impact occurs at night, offices, community centres and educational facilities operating during daytime are much less sensitive to noise. The current noise climate at the Kiwi Primary School and educational facilities to the north of the Everest Platinum Mine is still well within this guideline.

SANS 10103 Guidelines		Day (L_d)	Night (L_n)
Typical levels	Rural Districts	45	35
	Suburban little traffic	50	40
	Urban	55	45
	Urban - With some workshops, business premises & main roads	60	50
	Central business districts	65	55
	Industrial districts	70	60

Notes: L_d – day level L_n – night level

Baseline conclusion

The mine and project study area is located in a district where in large areas the ambient noise still has a rural character. Apart from zones along the main roads, one area where this rural character has to some degree been degraded, is the immediate surroundings of the mine. The ambient noise levels adopted for the project, based on the specialist recommendations, are summarised below:

Area	Existing ambient noise level LAeq (dBA)	
	Day (L_d)	Night (L_n)
Receptors within 2,5 km distance from the Everest Plant	50	40
Receptors in the remainder of the study area	45	35
Sheeprun and potential wilderness areas outside surveyed area	45	35

1.1.11 VISUAL LANDSCAPE

This section should be read with reference to Figure 1-11 (land uses) (Section 1.3.1).

Introduction and link to impact

Mining infrastructure has the potential to alter the landscape character of the site and surrounding area through the establishment of both temporary (such as processing infrastructure and support facilities) and permanent infrastructure (such as the tailings storage facilities). To understand the basis of existing impacts and potential impacts associated with Project Fairway, a baseline analysis is described below.

Data collection

Information on the existing mine site was extracted from the approved EMP reports for the current mine infrastructure (approved July 2003, December 2009 and May 2010).

For Project Fairway, a project-specific visual study was undertaken by Newton Landscape Architects CC (NLA, 2011) (Appendix M). Data collection was sourced from on-site observations, the review of relevant maps and a field survey undertaken by the visual specialist. This data was then evaluated qualitatively to provide a description of the visual resource. A series of panorama photographs of the landscape, as seen from nearby sensitive viewing points, were taken at various points within a 10 km radius of the project area. Further detail on the methodologies used is provided in the specialist report.

Results

In describing the visual landscape a number of factors are considered, including landscape character, sense of place, scenic quality, and sensitive views. The main findings of the specialist study are summarised below, with further detail provided in the specialist report.

- Landscape character and quality

  The mountains that run north south and define the valley associated with the Groot Dwars River dominate the general character of the area. The valley is deep and narrow and runs directly north from the base of Die Berg. The terrace, flatter in profile, is less spectacular in visual appeal when compared to the Groot Dwars River valley. The visual quality of the Groot Dwars River valley is considered to be very high while the quality of the terrace is considered to be moderate. The lower rating for the terrace is a consequence of the intrusion of man-made elements (geometric forms of windbreaks associated with the orchards and the groves of wattle trees) and the flatter nature of the topography. Project Fairway is located mostly in the Groot Dwars River valley with some project components located on the terrace, adjacent to existing mine infrastructure.

  The valley terrace topography rolls gently to the north and west, with small drainage lines flowing generally to the north. The area in the immediate vicinity of the existing Everest mine is used for farming and residential use. Kiwi orchards, planted in geometric patterns behind Casuarina and Pine windbreaks, lie to the north of the existing mine. North of these, the landscape tends to open up into expanses of grassland used mostly for grazing. The spatial quality of these areas is occasionally interrupted by groves of black wattle, which has also begun to 'creep' up the lower slopes of the Steenkampsberg mountains.

  To the north-east of the existing Everest mining area are the houses, education facilities and other facilities that support the work force associated with the Kiwi orchards. Only the Boschfontein road, running along the base of the Steenkampsberg mountains, connects the various farms to the R577 provincial road, east of the proposed mining area.

- Sensitivity of Visual Resource

  It follows that the highest value visual resource described above is also the most sensitive to changes. In contrast, areas which are not considered to have a high scenic value are the least sensitive to change. For the project area, the sensitivity of the visual resources is as follows:

  - High – these include the mountains and koppies, valleys, water bodies, farm dams and streams as well as the grassland vegetation (on- and off-site)
  - Moderate – these include residences / farmsteads with associated outbuildings and agricultural activities (off-site)
  - Low – these include roads, power and telecommunication infrastructure as well as the existing mining activities (on- and off-site).

- Sense of place

  Central to the concept of sense of place is that the landscape requires uniqueness and distinctiveness, the extent to which a person can recognise or recall a place as being distinct from other places – as having a vivid and unique character of its own. The general atmosphere of the pre-mining environment was one of quiet rural 'out of the way' farmland set in a beautiful natural valley. Although the landscape has been impacted by the existing mining operation, the sense of place of the study area is informed by the landscape character, as it is the existing land uses (a combination of natural valleys and the surrounding mountains) that define a sense of place. The visitor has the distinct feeling of being in a natural, elevated 'bowl' that opens to the north and which is contained by dramatic topography on three sides. From higher vantage points, especially south of the proposed site, the rural/nature and rugged character of the scene is evident. These factors combine to evoke a strong response in the visitor, creating the perception that the place has a rather unique quality and character. However, there is a sense that the beauty and 'wildness' of the area is being lost to development.

The scenic quality of the landscape within the project area is rated as high within the context of the sub-region but the areas surrounding the mine are considered to be low. The once spectacular and 'wild', rural landscape is being compromised by the presence of 'foreign', seemingly 'out of place' activities associated with the existing mining operations, prospecting sites, Eskom power lines, communications towers and the encroachment of alien vegetation. For this reason and when taken together, the study area's aesthetic value is reduced to moderate.

- Views and visibility

The visual context of the current Everest mine and the proposed Project Fairway is characterised by the mountainous topography of the Steenkampsberg Mountains. Views of the mine and Project Fairway area would mainly be from adjacent properties, all mostly contained within the Groot Dwars River valley area. The mine is screened from public vantage points, such as the R577 provincial road, by the Steenkampsberge.

Views from the Boschfontein road, east of the existing mining activities, would be classified as 'public' and would include views of the existing mining activities. Views from the access road to Vygenhoek as well as farmsteads located on Vygenhoek, also include views of the existing mining activities, although far in the background. Views from the farmsteads located on the farms Vygenhoek 10 JT, De Kafferskraal, Skuinsplaas 56 JT, Oshoek 69 JT, De Berg 71 JT, Triangle 62 JT, Wanhoop 78 JT, Kliprivier 73 JT, Sheeprun 50 JT as well as Sheeprun 179 JT, would be classified as 'private' and would thus be regarded as sensitive views.

Baseline conclusion

When considering landscape character, scenic quality, visual resource, sense of place and visual receptors the baseline includes three distinct areas of distinct visual value. The Steenkampsberg Mountains and Groot Dwars Valley have a high visual value. The terrace on which the current mine infrastructure is located has a moderate to low visual value. Current mining activities have already impacted on the available visual resources. Changing this visual resource further is unavoidable with the development of the project. However, the manner in which construction, operation and rehabilitation of the site takes place can remedy the intrusion through proper visual resource management.

1.2 ENVIRONMENTAL ASPECTS WHICH MAY REQUIRE PROTECTION OR REMEDIATION

Environmental aspects both on the site applied for and in the surrounding area which may require protection or remediation are listed below. The list is based on the concise descriptions provided in Sections 1.1 and 1.3.

- Drainage patterns on site after closure
- Stripped and stockpiled soils
- In-situ soils and land capabilities (not disturbed by infrastructure)
- Biodiversity (not disturbed by infrastructure)
- Alteration of surface drainage lines
- Groundwater resources
- Ambient air quality
- Noise environment
- Visual aspects
- Surrounding land uses, socio-economic conditions and economic activity
- Heritage (and cultural) resources (not disturbed by project infrastructure)

1.3 LAND USES, CULTURAL AND HERITAGE ASPECTS AND INFRASTRUCTURE

1.3.1 LAND USE

Introduction and link to impact

Mining activities have the potential to affect land uses both within the surface use area and in the surrounding areas. This can be caused by physical land transformation and through direct or secondary impacts. The key related impacts are: loss of soil, loss of biodiversity, pollution of water, dewatering, air pollution, noise pollution, visual impacts, loss of heritage resources, and the influx of job seekers with related social ills. To understand the basis of existing impacts and potential impacts associated with Project Fairway, a baseline analysis is described below.

Data collection

Information on the existing mine site was extracted from the approved EMP reports for the current mine infrastructure (approved July 2003, December 2009 and May 2010).

Surface right information was provided by AQPSA and confirmed by Metago SLR through a deed search conducted in August 2011.

For Project Fairway, a project-specific land use study was undertaken by Terra Africa Consult and Scientific Aquatic Services CC (2012) (Appendix N). The collection of data was done through questionnaires, site observations and interviews and through consulting related topographical maps and satellite images. The study followed a tiered approach with more focus placed on farm units closer to the site than areas further from the site. Further detail on the methodologies used is included in the land use specialist report (Appendix F).

Results - Mineral rights

AQPSA operates under a converted mining right (Original Mining License No.: ML14/18/2/5071) for portions of the farms Sterkfontein 52-JT, Sterkfontein 749-JT and De Kafferskraal 53-JT. AQPSA is in the process of finalising an agreement with Northam Platinum Limited to purchase the mineral rights of the southern portion of the Booysendal project area. The finalisation of the agreement is subject to the amendment of the Everest converted mining right to include Project Fairway by means of a Section 102 Application to the Department of Mineral Resources (DMR).

Results - Land ownership

The existing Everest mine is located on portions of the farms Sterkfontein 52-JT, Sterkfontein 749-JT, and De Kafferskraal 53-JT. Most of the land on which the existing mine infrastructure is located is owned by AQPSA or in the name of companies owned by AQPSA. Some of the portions are owned by other land owners. The surface right owners and corresponding property descriptions of the land in and adjacent to the project area are listed in Table 1-17 and Table 1-18, respectively.

TABLE 1-17: LAND OWNERSHIP OF PROPERTIES ON WHICH CURRENT MINE INFRASTRUCTURE IS LOCATED

Farm name	Portion	Registered Landowner
Sterkfontein 52-JT	4	Bakoni Ba Phetla Communal Property Association
	5	Aquarius Platinum (South Africa) (Pty) Ltd
	6	
Buttonshope 51-JT	Remaining Extent	Micawber 278 (Pty) Ltd
	1	
Sterkfontein 749-JT	0	Bakoni Ba Phetla Communal Property Association
De Kafferskraal 53-JT	Remaining Extent	South African Kiwi Fruit Industry (Pty) Ltd
	3	
	4	TKO Prop (Pty) Ltd
	8	Aquarius Platinum (South Africa) (Pty) Ltd
	15	Bakoni Ba Phetla Communal Property Association

TABLE 1-18: LANDOWNERS ADJACENT TO THE PROJECT FAIRWAY PROJECT AREA

Farm name	Portion	Registered Landowner
Booysendal 43-JT	Remaining Extent	Micawber 278 Pty Ltd
Sterkfontein 52-JT	Remaining Extent	Bakoni Ba Phetla Communal Property Association
	Portion 1	Aquarius Platinum (South Africa) (Pty) Ltd

Farm name	**Portion**	**Registered Landowner**
	Portion 3	Francois Breytenbach
Sheeprun 179-JT	Farm	Daisy Street Inv No 148 (Pty) Ltd
Sheeprun 50-JT	Portion 1	Nicholson Farms & Inv (Pty) Ltd
	Portion 2	Maria Catharina Smuts
Kliprivier 73-JT	Remaining Extent of Portion 15	Patrick John Price
	Portion 14	Jonathan Fitzcharles Hayden-Smith
	Portion 21	
	Portion 31	
	Portion 32	
	Portion 33	
	Portion 51	
	Portion 17 of Portion 2	Louise Geldenhuys
Kliprivier 73-JT	Portion 18 of Portion 2	Maria Catharina Smuts
	Portion 47	Aquidus Ondernemings CC
	Portion 48	Jacob Phillipus Grobler
Draaikraal 48-JT	Remaining Extent	Salpeterkrans Boerdery CC
	Portion 4	Kliprivier Communal Prop Association
	Portion 6	Christiaan Frederik Davel
	Portion 17 of Portion 7	
	Portion 16 of Portion 5	Maria Magdelena Grobler
	Portion 16	
	Portion 27	
Draaikraal 48-JT	Portion 26	Mathys Johannes Jacobus Boshoff
	Portion 28	
	Portion 34	Nicholson Farms & Inv (Pty) Ltd
Uysedoorns 47-JT	Remaining Extent	Theuns Moolman
Pietersburg 44-JT	Remaining Extent	Windfall 38 Prop (Pty) Ltd
	Portion 1	
	Portion 2	

<u>Community land ownership</u>

There has been a successful land claim by the Phetla community on the farms De Kafferskraal 53-JT (excluding Portions 27 and 18 of the farm), Sterkfontein 749-JT and Sterkfontein 52-JT (excluding Portion 5 of the farm). AQPSA has negotiated a surface lease agreement with the land claimants (Bakoni Ba Phetla Communal Property Association) for the use of their land.

The Department of Rural Development and Land Reform has advised that no land claims have been lodged on the farms Buttonshope 51-JT, Kliprivier 73-JT, Sheeprun 50-JT and Sheeprun 179-JT. However, a land claim has been lodged over the farm Draaikraal 48-JT. The land claim has been lodged on behalf of the Mahlangu Family, Bakoni Ba Maga Makua and the Ba Ga Makua community.

Results - Land use

Land uses on and surrounding the mine and project area comprise wilderness/conservation, mining and agricultural (commercial and subsistence). More detail is provided below.

Land uses in the area can be divided into five main categories, agriculture, tourism, protected areas, mining and mixed land use which is a combination of tourism activities and agriculture. Agricultural land use is made up of grazing and crop production while tourism consists of trout dams and accommodation facilities.

The surrounding properties are located in a mountainous area where land use options are restricted to whatever the topography of a specific farm allows. Arable agriculture in the area surrounding the Project Fairway project area may not be the most viable and practical option due to the availability of only small patches of arable land. Therefore, the most general land use in the area is cattle farming.

It was observed that, generally, farms have been subdivided into several smaller farm portions and that a single person/entity generally owns several of farm portions. For the purposes of the land use study, in instances where several portions of land are owned by the same owner, these are referred to as “land use units”.

<u>Agriculture</u>

Grazing

Vegetation within the broader study area is classified as sour veld. The grazing capacity of the veld ranges between 4 and 6 hectares per Large Animal Unit depending on the veld management skills of the land user. The majority of the land users surveyed indicated that grazing by cattle and game species a land use presently undertaken on their properties. The following land use units are solely used for the purpose of grazing:

- Portions 0 and 1 of Buttonshope 51-JT
- Portion 15 of Kliprivier 73-JT
- Portion 9 of Schaapkraal 42-JT
- Portions 0, 1, 4, 5 and 6 of Sterkfontein 52-JT

A variety of domestic browsers and grazers (cattle, sheep and goat breeds) as well as game species (such as eland, impala, kudu, mountain reedbuck and blesbuck) were identified as grazing on the surveyed land use units.

Watering facilities for the livestock have been erected in some of the cattle camps although most water is sourced from natural wetlands, dams or springs. There are also a number of farmers that source water from boreholes where the provision of electricity is possible as this seems to be the most reliable resource all year round.

On Portions 2, 23 and 45 of the Farm Kliprivier 73 JT, the landowner is currently farming and breeding with an Alpaca stud that is very well adapted in the mountain enclosure specifically because of its preference for high altitudes.

The remainder of the identified land use units have grazing land use in combination with another land use like tourism or agriculture.

Crop Farming

Small portions of land are currently used for irrigated as well as dryland crop farming. In the broader study area, crop cultivation is mostly only possible where the slope permits cultivation and were deep soils are found. Irrigated crops cultivated within the area include Lucerne as well as small areas with orchards while dryland crops are maize, forage crops and small areas of groundnuts. The most important factor for successful crop farming is availability of groundwater for irrigation and the correct soil depth and type.

Most fruit cultivated in the area fall within the deciduous fruit category, of which peaches are the most prominent in the area. This is because of the well-suited environment with the correct chilling units and the high rainfall. The lucrative local market for peaches also contributes to the growth of the market. Unique to the area is the kiwifruit farm. Kiwifruit is well adapted to the mountain enclosure around Everest specifically because of its preference for high altitudes and cold temperatures. Although large areas of the orchard still remains on Portions 3, 4, 7, 18 and 19 of De Kafferskraal 53 JT, it is not actively harvested and marketed. Peaches for the dried fruit market are produced on the farm Sheeprun 179 JT.

<u>Tourism</u>

Twelve land use units in the survey indicated that there are trout dams established on the farms. The Steenkampsberg is on the north western side of the Mpumalanga Trout Triangle, this area is distinctively known for its trout fishing and tourism business. The following land portions almost exclusively have trout dams as the dominant land use:

- Portion 4 of Oshoek 69-JT
- Portions 1 and 4 of Kliprivier 73-JT
- Portion 2 of Sheeprun 50-JT

Trout farming is a highly specialised diversification, which requires a particular environment. The broader study area has various contributing factors that ensure the correct environmental and the mountainous landscape makes it easy to construct dams in addition to the cool temperatures in the area. Trout are best suited to water temperatures between 13°C and 19°C. The area is well suited to accommodate low temperatures because of the high altitude and the protection created by the gullies in low-lying areas. The stocking of trout comes at a high price especially the infrastructure used to accommodate trout which include dams, rivers, bridges, logs and undercuts. The area's natural gullies and dykes assist in the construction of dams as well as the collection of water to fill these dams and ensure an oxygen rich environment.

Other tourism ventures operated by the local landowners are to provide accommodation such as lodges, eco camps and 4X4 routes. These accommodation facilities range from luxurious to basic facilities. Guest lodges are situated on the Portion 27 of the farm Kliprivier 73-JT, Sheeprun 179-JT and Der Brochen. There is also accommodation for 14 people available in the land use unit consisting of Portions 13,14,21,29,31,32,33 and 50 of Kliprivier 73-JT.

Mixed land use

Mixed land use is used to classify land units in that consist of a combination of traditional agricultural enterprises such as grazing and crop production in combination with other land uses such as tourism (trout fishing, accommodation) or game farming. Due to mountainous topography together with the lack of large areas for crop production, such a combination of land uses are often the most financially viable option.

It is also important to note that spring water is bottled on the farm Sheeprun 179-JT, therefore water quality is crucial to maintain this land use.

Protected Areas and Nature Reserves

Large portions of land in the area have been identified to form part of the Mpumalanga Biodiversity Stewardship Programme by the Mpumalanga Tourism and Parks Agency (MTPA). These farms and farm portions are owned by private landowners and as per the documentation received, the contractual requirements to form part of this programme will be completed shortly. The farms identified to be protected areas according to MTPA are:

- Portion 34 of Draaikraal 48-JT
- Portions 13, 14, 21, 31, 32, 33 of Kliprivier 73-JT
- Portion 2 of Sheeprun 50-JT

Taking the above into account these areas will in future be classified as Protected Environment and Nature reserve as contemplated in Section 28 and Section 23 of the National Environmental Management: Protected Areas Act (NEM:PAA) (Act 57 of 2003).

To the south of Everest, on the farms Triangle 72-JT and De Berg 71-JT, is Davel Private Nature Reserve, a protected private nature reserve. From the information available, this reserve is used mainly for private use and small scale tourism.

<u>Mining</u>

Apart from the current Everest mining activities located on the terrace and the existing valley decline, some prospecting activities have taken place in the Groot Dwars River valley resulting in the presence of dirt tracks. Further north of Everest are Anglo Platinum's Der Brochen mine and Northam Platinum's Booysendal Mine are in development.

Baseline conclusion

There are a number of land uses in the surrounding area which may be influenced by mining activities. Land uses on and adjacent to the project area mainly comprise of agricultural (grazing and crop farming, tourism related activities and mixed land uses (typically a combination of grazing and tourism related activities). Some of the adjacent farm portions may in the future form part of the Mpumalanga Biodiversity Stewardship Programme and therefore have protected status in the future. There is the potential for these land uses to be impacted by the project to varying degrees. As some of these land uses contribute to the economy of the region together with mineral-related activities, care should be taken when planning the project to limit impacts on these land uses.

1.3.2 CULTURAL ASPECTS

Cultural aspects of the project area are discussed below as part of the heritage discussion.

1.3.3 HERITAGE, CULTURAL AND PALEONTOLOGICAL RESOURCES

This section should be read with reference to Figure 1-12 (Section 1.4).

Introduction and link to impact

Mining operations have the potential to impact heritage, cultural and paleontological resources through the placement of infrastructure and through the related construction and operational activities. To understand the basis of existing impacts and potential impacts associated with Project Fairway, a baseline analysis is described below.

Data collection

Information on the existing mine site was extracted from the approved EMP reports for the current mine infrastructure (approved July 2003, December 2009 and May 2010).

For Project Fairway, a project-specific heritage and cultural study was undertaken by Dr Julius Pistorius (Pistorius, 2011) (Appendix O). Data collection comprised three key activities:

- Literature review to ascertain the pre-historical and historical context;
- Interrogation of the heritage databases such as database at the Mpumalanga Provincial Heritage Resources Agency in Barberton and the Archaeological Data Recording Centre at the National Flagship Institute (Museum Africa) in Pretoria; and
- Field surveys.

No project-specific palaeontological study was undertaken. Data was sourced from a study completed in 2011 for the Everest Hoogland project site, located approximately 2km south of the existing mining operations and Project Fairway project areas.

Results – Heritage and cultural resources

Everest and the proposed project area falls within a geographical area which includes parts of Sekhukhuneland and incorporates the Steelpoort Valley as well as the Lydenburg and Roossenekal areas. These are important historical locations that are marked by remains dating from the pre-historical into the historical (colonial) period. A detailed overview of the cultural and historical context of the broader region is provided in the specialist report (Appendix O).

Two declared heritage sites are located within the greater region (located approximately 20km from Everest), namely the Mapochs Caves and the Groot Dwars River geological occurrence which represents unique chromite bands in anorthosite. The Groot Dwars River geological site is situated to the north of the project area while Erholweni (Mapochs Caves) is located to the west of the Groot Dwars River Valley.

Furthermore, heritage resources have previously been identified within and near Everest, as part of previous heritage studies. These resources ranged in significance from low (such as stone artefacts, stone kraals, stone walled homesteads) to high (stone walls of a church and/or school, grave sites, cemetery, historic house). Resources of social and cultural importance were also previously identified including a rock gong. Where required, these sites were mitigated in line with the approved EIA and EMP report (Metago, 2003).

For Project Fairway, the study identified the following resources near to infrastructure sites: historical hamlet and a graveyard (see Table 1-19, Figure 1-12).

TABLE 1-19: HERITAGE RESOURCES IDENTIFIED IN THE PROJECT AREA

Site	Will site be disturbed by project?	Comments	Level of significance
Hamlet			
H01	Not directly affected by surface infrastructure	The remains of this hamlet comprises of limited stone walls which probably served as enclosures for small stock such as goat or as protective walls in which dwellings of some kind were constructed.	Medium/High
H02	Not directly affected by surface infrastructure	The remains of this hamlet comprises of two enclosures, a foundation for dwelling and limited stone walls similar to Hamlet H01.	Medium/High
H02	Not directly affected by surface infrastructure	This hamlet holds the remains of a large dwelling which was constructed with rubble and clay walls. A number of lower and upper grinding stones also occur at each hamlet.	Medium/High
Graveyard			
GY01	Not directly affected by surface infrastructure	The informal graveyard holds three graves one of which is fitted with a cement slab and headstone but with no inscriptions. The other two graves are demarcated with stones.	High

Results – Palaeontological resources

Previous palaeontological survey noted that the underlying geology comprises of Precambrian rocks; mostly rocks of the Rustenburg layered Suite Bushveld Igneous Complex (Section 1.1.1). In places, these rocks are overlain by Quaternary alluvium deposits. All the rocks in the targeted area are Precambrian in age and as palaeontological resources are not associated with this underlying geology it is unlikely that fossils will be affected by the proposed project.

Baseline conclusion

Heritage and cultural resources have been identified within the project area. These sites are important to the history and culture of South Africa and are protected by national legislation. Any disturbance of these sites requires the necessary permits and further assessment work prior to disturbance. In terms of paleontological resources, there is a limited to no potential for these resources to occur on site.

1.3.4 SOCIO-ECONOMIC

This section should be read with reference to Figure 1-11 (land uses) (Section 1.4).

Introduction and link to impact

Mines have the potential to result in both positive and negative socio-economic impacts. The positive impacts are usually economic in nature with mines contributing directly towards employment, procurement, skills development and taxes on a local, regional and national scale. In addition, mines indirectly contribute to economic growth in the local and regional economies because the increase in the number of income earning people has a multiplying effect on the trade of other goods and services in other sectors.

The negative impacts can be both social and economic in nature. In this regard, mines can cause:

- Influx of people seeking job opportunities which can lead to increased pressure on basic infrastructure and services (housing, health, sanitation and education), informal settlement development, increased crime, introduction of diseases and disruption to the existing social structures within established communities;
- A change to not only pre-existing land uses, but also the associated social structure and meaning associated with these land uses and way of life. This is particularly relevant in the closure phase when the economic support provided by mines ends, the natural resources that were available to the pre-mining society are reduced, and the social structure that has been transformed to deal with the threats and opportunities associated with mining, finds it difficult to readapt; and
- Relocation of all or parts of communities where the impacts associated with mines are deemed to be highly significant. While the intention of these relocation exercises is often to mitigate environmental impacts, the relocation can itself present a separate range of social, economic and environmental impacts.

To understand the basis of existing impacts and potential impacts associated with Project Fairway, a baseline analysis is described below.

Data collection

Information on the existing mine site was extracted from the approved EMP reports for the current mine infrastructure (approved July 2003, December 2009 and May 2010).

For Project Fairway, a project-specific socio-economic baseline study (Eva Solutions, 2012) and a project-specific economic assessment (Strategy4Good, 2012) were undertaken (Appendix P and Appendix Q, respectively).

Data was collected through the review of available databases and field observations. The assessor paid several visits to the affected environment, and particularly to the communities and environs of the mine as well as residential areas of Lydenburg. These visits, amongst others, served to qualitatively familiarise the assessor with:

- The nature of socio-economic activities in the affected environment;
- The extent and quality of infrastructure and facilities in the affected environment;
- Current development initiatives in the affected environment.

A scan of existing literature and documentary data sources was executed simultaneously with the data gathering process, to compile a socio-economic profile of the primary affected environment.

Several sources were consulted, such as Census 2001 (Statistics South Africa), the Community Survey 2007 (Statistics South Africa) and the Integrated Development Plan Review (IDP) for the local municipality. Personal interviews with key informants further served to enhance an understanding of the socio-economic dynamics in the affected environment.

Results

Everest Platinum Mine is located in the Thaba Chweu Local Municipality (TCLM) within the Ehlanzeni District Municipality (EDM) in Mpumalanga Province. Project Fairway is mainly located in the Thaba Chweu Local Municipality. No surface infrastructure is planned on this portion as part of the current project scope.

Provincial Level

Population

The Mpumalanga Province has a population of approximately 3.6 million people, with an average population density of 47.14 people per km^2, which is slightly higher than that of South Africa as a whole at 40.94 people per km^2.

The 2010 Quantec EasyData figures indicate that the Mpumalanga Province has a population of approximately 3.6 million people, with an average population density of 47.14 people per km^2, which is slightly higher than that of South Africa as a whole (at 40.94 people per km^2). The population growth rate over the past decade (2001 to 2010) for Mpumalanga is estimated at 0.8 %. It is expected that population growth will generally focus on the larger towns and cities, which provide economic opportunities such as Witbank, Middelburg and Nelspruit, as well as within rural areas of the province. The Ehlanzeni District has a total of 1 526 237 people and the Thaba Chweu Municipality has a total population of 85 488.

Economic activity

Provincially it was estimated that, in 2010, the most dominant sector contributing to the Mpumalanga Province's economy was the "wholesale and retail trade, catering and accommodation" industry. This was demonstrated by 25% of the economically active population being employed in this industry. Mining employs 9% of the people in the Mpumalanga Province.

The main sources of employment in the region of the mine are identified below. The table below shows that wholesale and retail trade, catering and accommodation are important sources of employment in the region. Mining employs 9 % of the people in the Mpumalanga Province and has increased from 0.52 % (in 1996) to 13% (in 2010) in the Thaba Chweu Municipality.

Economic Activity Group	Mpumalanga Province	Ehlanzeni District Council	Thaba Chweu Local Municipality
Agriculture, forestry and fishing	8%	8%	8%
Mining and quarrying	9%	3%	13%
Manufacturing	7%	7%	15%
Electricity, gas and water	1%	1%	1%
Construction	6%	5%	4%
Wholesale and retail trade, catering and accommodation	25%	24%	22%
Transport, storage and communication	4%	4%	5%
Finance, insurance, real estate and business services	11%	13%	9%
Community, social and personal services	14%	16%	10%
General government	15%	19%	14%
Total	**100%**	**100%**	**100%**

Source: Quantec Easy Data, 2010 statistics

In the vicinity of the mine, people depend on employment on the farms, either seasonally or full time and at the Everest mine.

Unemployment

The unemployment rate for Mpumalanga at the end of the second quarter of 2009 was 26.5%. This was 2.2% higher than the unemployment rate of 24.7% registered for the first quarter of 2009.

The employment situation in the Mpumalanga Province as well as the District is shown below. About 36% of the working-age population (defined as those between the ages of 15 and 65 years according to Statistics South Africa) in the Mpumalanga Province are employed. The percentage of employed people in the Thaba Chweu Municipality is higher at about 45 %.

	Mpumalanga Province	Ehlanzeni District Council	Thaba Chweu Municipality
Employed	36.32%	33.91%	45.07%
Unemployed	13.53%	12.70%	11.50%
Economically inactive	50.16%	53.38%	43.42%
Total working-age population	100%	100%	100%

Source: Quantec Easy Data, 2009 statistics

Education

In the 2008 matriculation exams, 63% of pupils passed, while 20% passed well enough to study for a bachelor's degree at university. The proportion of people in South Africa 20 years or older in 2007 with no schooling was 9.2%. 69% had a Grade 8 (Standard 6), 33% had a matric and 3.8% had higher education. In 2009, 1 255 000 people (out of 4 184 000) who had completed secondary school were unemployed. In 2009, there were three Further Education and Training (FET) colleges in

Mpumalanga with 20 campuses. This is below average when comparing it to other provinces in South Africa. There is no university in Mpumalanga Province.

Basic Services

The majority of the Mpumalanga population's households have access to piped water, with only 9% using alternate water sources (for example, boreholes, water vendors, wells, tankers, dams, rivers, streams). In the Limpopo province approximately 83.6% of households have access to piped water. The people of the Mpumalanga Province obtain water from different sources as outlined below.

Water Supply Source	**Mpumalanga Province**	**Ehlanzeni District Council**	**Thaba Chweu Local Municipality**
Piped water inside dwelling	26%	18%	33%
Piped water inside yard	35%	29%	35%
Piped water on community stand: distance greater than 200m from dwelling	14%	20%	8%
Piped water on community stand: distance less than 200m from dwelling	16%	23%	17%
Borehole/rain-water tank/well	3%	2%	3%
Dam/river/stream/spring	3%	5%	4%
Water-carrier/tanker/Water vendor	1%	1%	0%
Other/Unspecified/Dummy	2%	2%	0%
Total	**100%**	**100%**	**100%**

Source: Quantec Easy Data, 2010 statistics

Most households in the Thaba Chweu Municipality are able to derive water either from their dwellings or from piped water on the community stand within 200 metres from their dwellings. Both locally and throughout the province, some people still use water from streams.

Most households in the vicinity of the mine obtain water from a yard tap or a communal tap. Some obtain water from stream.

In terms of sanitation, approximately 47% of households utilise pit latrines, while in Limpopo the 64.5% of households utilise pit latrines.

Over 80 % of households in the province utilise electricity as a source of lighting as outlined below. Most of electricity users are in urban areas. The use of paraffin and candles is common amongst rural households.

Energy Source Used for Lighting	**Mpumalanga Province**	**Ehlanzeni District Council**	**Thaba Chweu Local Municipality**
Electricity	83%	85%	81%
Candles	14%	12%	13%
Gas	0%	0%	0%
Paraffin	2%	2%	5%

Solar/other/unspecified	1%	1%	0%
Total	**100%**	**100%**	**100%**

Source: Quantec Easy Data, 2010 statistics

Local level – Thaba Chweu Local Municipality

Population

The population of the Thaba Chweu Local Municipality (TCLM) was estimated to be 87 545 persons from the 2007 Community Survey.

Economic activity

It was estimated that in 2010, 13% of the TCLM's economically active population was employed in the mining sector. The "wholesale and retail trade, catering and accommodation" sector was the largest major economic activity in both municipalities, at over 20%.

Unemployment

Within the TCLM in 2007, 8082 persons were unemployed.

Basic Services

As far as access to piped water is concerned, 68% of households in TCLM are able to derive water either from their dwellings or from piped water on the community stand within 200 metres from their dwellings.

50.3% of households within the TCLM have full service with respect to sanitation. The remainder of households have basic sanitation systems (pit latrines or septic tanks).

Electricity is used as a primary source of energy for lighting in 81% of the homes within the TCLM .

Local level – Ward 5 of the TCLM

TCLM is made up of twelve wards. Everest mine and the proposed Project Fairway are located within Ward 5 (Figure 0-2). Table 1-20 below sets out the socio-economic profile of Ward 5 of the TCLM. Draaikraal, the Kiwi Community and the local landowners all fall into this Ward.

TABLE 1-20: WARD 5 PROFILE

Types of dwelling:	
Mud	159
Shack	585
Brick	110
Number of People	
Adult (35-80)	322

Youth (16-34)	490
Children (0-14)	406
Disability	6
Number of employed	43
Number of unemployed	617
Number of domestic workers	55
Number of schools	
Primary	03, one needed in Draaikraal
Secondary	1
Types of Grant	
Number of Old Aged Grants	322
Number of support Grants	401
Number of foster Grants	29
Number of Disability Grants	6
Other indicators	
Number of SAPS	One needed in Draaikraal
Pension Point	None, one needed
Department of Home Affairs	Mobile
Department of Social Services	Mobile
Department of Agriculture	All
How many shops	4
How many churches	3
How many CPA	15 (in Ward 5)

Provision of services other than water and power in the Thaba Chweu Municipality and the vicinity of the mine are outlined below. Services such as police stations, high schools, post offices, hospitals and public transport are absent. The local people depend on the nearest town, Lydenburg for services and they depend on lifts to go to Lydenburg.

Socio-economic data	Thaba Chweu Municipality	Everest area
Transportation	Taxis, School busses for school children. The rail passenger network in Thaba Chweu predominantly serves the mining and forestry sectors, and to a lesser extent that of farming (Source: Thaba Chweu IDP 2010/2011)	Mashishing (Lydenburg) – Transportation of mine workers from the compound at Skhila to Everest Mine (Source: Thaba Chweu IDP 2010/2011)
High Schools	Four (two at Mashishing, one at Lydenburg, one at Setageng)	The nearest high school is at Setageng and it is not within walking distance.

Socio-economic data	Thaba Chweu Municipality	Everest area
Hospitals	Two (one at Lydenburg and one at Sabie)	No hospital in the area. Patients have to travel to town in a situation of no public transport.
Sports and recreation	One rugby field and it belongs to the rugby club. One stadium at Mashishing and one at a high school in Lydenburg	No sporting facilities in the area.
Shopping centres	Lydenburg and Sabie	No shops in the area.
Industry (like mines, textile, manufacturing, etc.)	Mainly farming	One mine and one proposed mine in the area. There are farms, including the Kiwi fruit farm, which employs many people in the area.
Police and emergency services	Two police stations (one at Mashishing, one at Sabie, and one at Lydenburg). Two fire stations (one at Sabie and one at Lydenburg). One police station at Marteenshoop	No police stations and emergency services in the area.
Banks: how many or where they are, including ATM's	There are banks and ATMs at Lydenburg and Sabie	No ATMs/ banks in the area.
Post office	Two, one at Lydenburg and another at Sabie	No post office in the area.
Communications (Radio stations)	No radio station in the area	There is a network for the Thobela (Pedi), Jakaranda (Eng/Afr), Ligwalagwala (Seswati), Munghana (Tsonga), Ikwekwezi (Ndebele) radio stations
Cellphone networks	MTN and Vodacom	Vodacom network available in the area. No public phones.
Waste disposal facilities	One landfill site for the Lydenburg magisterial district. Plan to establish waste disposal sites at Sabie and Lydenburg in 2011/2012 (Source: Thaba Chweu IDP 2010/2011)	No waste collection services.

Local level – Kiwi Community

North-east of Everest Platinum is the so-called “Kiwi community”. The Kiwi community comprises approximately 260 people who were relocated from the current mine area to an area adjacent to the Boschfontein Road. The homes of non-landowners include traditional circular mud huts with grass roofs, brick houses and wooden and/or zinc shacks. In addition to the residences there are two schools, namely the Kiwi Primary School (previously known as the TKO Primary School) and the Everest Platinum Early Childhood Development Centre.

As part of the current SLP commitments of the mine, various skills development programmes and initiatives have been implemented by Everest. The Kiwi Primary School was upgraded and Everest Early Childhood Development Centre was established, as part of the mines original SLP commitments. Due to the needs of the local community, Everest have committed to extending the project for another 5 years and proposed to develop a sports field, as well as constructing additional classrooms and an administration block, with a view to convert the school into a higher primary school.

Additional projects identified by Everest for the Kiwi community, in partnership with the local municipality, is the provision of electrical and water services to the community. From the information provided by AQPSA it was indicated that the Thaba Chweu Local Municipality are finalising the necessary applications with ESKOM before construction can commence.

Local level – Draaikraal Community

The Draaikraal community is situated 17 km outside of Roossenekal. In 2003 a number of the farms at Draaikraal were repossessed by the government and passed on to five Community Property Associations (CPA's). A large majority of the community at Draaikraal spend their time in urban areas seeking work, only returning at weekends or month-end. Approximately 90% or the residents are supported by social grants.

Also living in the area are a number of Phetla's. These people moved from the area around the mine to Draaikraal and have put in a claim for this land. A number of people in the community grow maize and exchange it at the co-operative for mielie meal. Community members also grow peach trees and, at the time of harvest, sell them on the side of the R577 road.

Individuals within the Draaikraal community also own cattle. The cattle get water from the local stream which is also the community's supply of drinking water. Water is transported from the stream by means of buckets. The community members buy wood for cooking and for warmth during the winter period. There are poles and cables that were erected in about 2008 to supply electricity but this has not been installed. There is no municipal rubbish collection. Members of the community dig holes in their yards, burn the rubbish and once full, dig another one.

There is also a water shortage during the winter as the local river/stream dries up. While there are 4 to 5 boreholes, there is no electricity to pump the water. The chief has allocated a small piece of land to each household in order to grow vegetables (spinach) and peach trees. They make compost from the cow dung in order to fertilise the soil.

Local level – The Ba Ga Makua community

The Makua community is located approximately 6 km west of the mine. While related to the Bakone BaPhetla, the Makua are widely dispersed and few reside in the area.

Local level – Private landowners

There are several private landowners owning farms surrounding the existing mine and proposed Project Fairway. Various land uses are undertaken on these properties (refer to Section 1.3.1).

Baseline conclusion

When considering socio-economic impacts the existing situation indicates that there is a measure of inward migration of people with the resultant pressure on basic infrastructure and services, informal settlement development, increased crime, introduction of diseases and disruption to the existing social structures within established communities, and pressure of deliver of basic services (health, education, sanitation, water and power supply).

1.4 MAPS SHOWING THE SPATIAL LOCALITY AND AERIAL EXTENT OF ENVIRONMENTAL FEATURES

This section includes a series of maps that show the spatial locality and aerial extent of all environmental, cultural/heritage, infrastructure and land use features identified on site and on the neighbouring properties and farms. These maps include:

- Geology map (Figure 1-1)
- Identified geological structures and features (Figure 1-2)
- Topography and hydrology map (Figure 1-3)
- Period day-time and night-time and seasonal wind roses (Figure 1-4)
- Land types identified at the mine and on the project site (Figure 1-5)
- Soil types identified at the mine and on the project site (Figure 1-6)
- Land capability of soils at the mine and on the project site (Figure 1-7)
- Vegetation types and key ecological aspects of the area (Figure 1-8)
- Boreholes (hydrocensus and drilled) in the area (Figure 1-9)
- Schematic representation of groundwater flows and levels (Figure 1-10)
- Land uses on and surrounding the mine (Figure 1-11)
- Heritage resources (Figure 1-12).

FIGURE 1-1: GEOLOGY

FIGURE 1-2: IDENTIFIED GEOLOGICAL STRUCTURES AND FEATURES

FIGURE 1-3: TOPOGRAPHY AND HYDROLOGY MAP

FIGURE 1-4: PERIOD, DAY-TIME AND NIGHT-TIME WIND ROSES

FIGURE 1-5: LAND TYPES

FIGURE 1-6: SOIL TYPES

FIGURE 1-7: LAND CAPABILITY

FIGURE 1-8: VEGETATION TYPES

FIGURE 1-9: BOREHOLES (HYDROCENSUS AND DRILLED) IN THE AREA

FIGURE 1-10: SCHEMATIC REPRESENTATION OF GROUNDWATER FLOWS AND LEVELS

FIGURE 1-11: LAND USES ON AND SURROUNDING THE MINE

FIGURE 1-12: HERITAGE RESOURCES

1.5 SUPPORTING DOCUMENTS

The following specialist studies are attached as appendices to this report:

- Soils and land capability study (Appendix F)
- Biodiversity Study (Appendix G);
- Hydrological Study (Appendix I);
- Water Quality Hydrocensus (Appendix I);
- Geohydrological Study (Appendix J);
- Air Quality Study (Appendix K);
- Noise Study (Appendix L);
- Visual Study (Appendix M);
- Land Use Study (Appendix N);
- Heritage and Cultural Study (Appendix O);
- Socio-Economic Baseline Report (Appendix P);
- Economic Study (Appendix Q);
- Financial Provision Calculation (Appendix R);
- Climatic Water Balance (Appendix S);
- Stormwater Management Plan (Appendix T); And
- Tailings Storage Facility Feasibility Study (Appendix U).

2 CURRENT AND PROPOSED MINING OPERATIONS

INTRODUCTION

This section provides an overview of the approved operations which are currently being undertaken at Everest and provides detail on the proposed Project Fairway operations.

The Everest operations comprise declines for accessing the underground mine, ventilation shafts, historical rehabilitated opencast mining areas, ore and product stockpiles, topsoil and overburden stockpiles, crushing and screening facilities, a platinum concentrator plant, a chrome recovery plant, tailings storage facility, water management facilities, contractor areas to support the mining and processing operations, a main access road and support services and facilities.

The main aim of Project Fairway is to access additional underground ore reserves situated to the west of the existing operations. The main project components will include four box cuts, a new tailings storage facility, a DMS plant and associated stockpiles, temporary soil stockpiles, water management facilities, support workshops and offices, an access road into the Valley and the extension of services from the mine to the project site. Further detail on the proposed infrastructure is provided in the sections below.

An indication of the estimated project timeline is provided in Table 2-1 below.

TABLE 2-1: ESTIMATED PROJECT TIMELINES

Aspect	Project activities
Proposed commencement of construction	Should the various required environmental authorisations be issued, the target date for commencing construction is mid-2012.
Duration of construction phase	3 years
Start operation	1st quarter 2016
Life of operation	This EIA and EMP report covers only the first 10 – 15 years of mining activities associated with the Buttonshope section of the underground mining area The total ore reserve, which covers the farms Buttonshope 51-JT, Sheeprun 50-JT, Sheeprun 179-JT, Draaikraal 48-JT and Kliprivier 73-JT, has 30 years estimated life of mine with the possibility of extending to 60 years depending on the results of exploration work.

2.1 MINERALS TO BE MINED

The target minerals to be mined as part of the proposed Project Fairway are the same as the current Everest mining operation, namely the Platinum Group Metals (PGMs). All minerals and metals found in mineralogical association with the PGMs are also mined out of necessity and include, but are not limited to, gold, silver, nickel, copper, cobalt, chrome, vanadium, and iron ore as well as non-metallic elements including sulphur, selenium and tellurium.

2.2 MINING METHOD

This section should be read with reference to the mine progression plan and overall site layout drawings (Figure 2-1 and Figure 2-2 in Section 2.4).

2.2.1 CURRENT UNDERGROUND MINING

The existing Everest mine utilises three declines to access the underground mine. These include the north decline, south decline and valley decline. The north decline comprises a three-decline system for men, materials and ore. The south decline comprises a single decline system for ore and materials. The valley decline comprises a single decline for men and materials only. The original decline, approved as part of the 2003 EIA and EMP, was sealed and rehabilitated in 2009. As this document is an EMP consolidation, this information is included for completeness. The conventional Everest underground mining method includes the activities listed below:

- Room-and-pillar stoping methods are used and a minimum stoping height of 1.6 m is maintained to allow the use of mechanised electro-hydraulic, low profile drilling jumbos and low profile load-haul-dump (LHD) units. The size of the pillars are a function of stope height and depth below surface, which depth ranges between 25 to 190 m. As the seam dip angle varies (from 6° to up to 16°) two different stoping methods are used;
- Wide-reef room-and-pillar stoping is used in all areas where the dip of the reef is less than 10° to 12°. This method is similar to that used at AQPSA's Kroondal Platinum Mine on the western limb of the Bushveld complex and in most chrome mines in South Africa. Blasted ore is mucked by load haul dump units (LHDs) and tipped into loading bins feeding conveyors.
- Steep room-and-pillar stoping is used where the dip of the reef exceeds 12º. The stoping is undertaken using hand-held rockdrill and leg, in combination with electric scraper and hoe for cleaning. Dip scrapers are used to scrape broken material to the flatter lying areas where it is picked up by the LHD and transferred to the nearest strike conveyor.
- As the faces are mined along strike blasted material is trammed from the face to tipping points. Once the tramming distance exceeds approximately 100 m, strike conveyors are extended to within 20 m of the face. As the faces are mined further along strike, the secondary strike conveyors are extended in 75 to 100 m increments as the stopes are developed.

2.2.2 PROPOSED UNDERGROUND MINING

The proposed Project Fairway entails the establishment of four additional box cuts to facilitate the underground mining of the Buttonshope mining block, located to the west of the existing mining area (refer to Figure 2-1 for the underground mine progression plan for the proposed project). The same underground mining methods currently utilised at the existing Everest Mine, as outlined above, will be used for Project Fairway. The order in which the proposed surface infrastructure will be established in relation to the proposed mining sequence is detailed below.

- Mine development from the current mine in a westerly direction towards Buttonshope will continue and the construction of the Waterfall and Buttonshope South Box cut will commence. The construction period for the proposed box cuts will be approximately 2 years.
- Once the construction of these box cuts is completed, the run of mine (ROM) from the Buttonshope South box cut will be trucked to the Waterfall box cut, where the material will be loaded onto an underground conveyor. The underground conveyor will then transport the ROM material to the existing EPM North decline from which it will be transported to the processing plant by means of the existing overland conveyor. It is estimated that this will occur over a four year period following the completion of construction of the box cuts (i.e. up to year 4 of the LOM).
- It is anticipated that the underground development between the Waterfall box cut and the Buttonshope South box cut will take approximately four years to complete (i.e. from year 4 of the LOM). At this point, the ROM material will be loaded onto the underground belt connecting the Buttonshope South Box cut and the Waterfall box cut and will be transported to the plant via the EPM North decline and existing overland conveyor as above.
- When the underground mining has progressed into Buttonshope to the point where additional ventilation is required, raise bore ventilation shafts, or alternatively, the Buttonshope North box cut, will be constructed. It is estimated that this will occur two years after the development between the Waterfall box cut and the Buttonshope South box cut has completed (i.e. construction is proposed to commence in year 6 of the LOM).
- At such a time when the mine increases production from 220 kilotonnes per month (ktpm) to 310 ktpm, the EPM South box cut will be constructed. Once this box cut is completed, the ROM material will be initially trucked to the ROM pad, where it will be loaded onto the existing surface conveyor and transported to the processing plant. Production permitting, a surface conveyor will be constructed from the EPM South box cut to the ROM pad at a later stage, where it will take material to the plant. It is estimated that this will occur two years after the development of the establishment of additional vent shafts or the Buttonshope North box cut is completed (i.e. construction of the EPM South box cut is proposed to commence in year 8 of the LOM).

2.3 LIST OF MAIN ACTIONS/ACTIVITIES/PROCESSES ON SITE

Key activities that currently take place at the mine during each phase (construction, operational, decommissioning, closure) are listed in Table 2-2 below. For the purposes of this report, in broad terms, construction is the phase in which surface infrastructure is established and the declines are developed, operation covers the production phase, decommissioning covers infrastructure removal and site rehabilitation, and the closure phase refers to the period of time when maintenance and aftercare of rehabilitated areas and facilities is required to ensure closure objectives are met.

This table reflects the proposed activity. Alternatives considered in the development of the proposed project plan are discussed in Appendix A. Design details for components of the project plan, where required, are either included in the specialist reports or in the project action plans (see Section 19).

TABLE 2-2: LIST OF PROJECT ACTIONS / ACTIVITIES / PROCESSES

Main activity/process	Typical sub-activities	Construction	Operation	Decommissioning	Closure
Exploration Exploration will take place to refine the extent of the ore reserves.	Drilling, trenching, collection of samples	On-going	On-going		
Site preparation	Selective bush clearing in line with biodiversity management plan	On-going			
	Removal of existing structures (if present)	As required			
	Establishing the construction contractor's area	At start of phase			
Earthworks Earthworks on site relate mainly to the moving of soil and rock.	Stripping and stockpiling of soil resources in line with the soil management programme (see Table 7-2)	On-going	As required		
	Bulk earthworks including digging foundation excavations, compaction, building of dam walls and berms, preparing TSF footprint	On-going			
	Establishing access road into the Groot Dwars valley	On-going	As required		
	Developing construction borrow pits	On-going			
	Establishing storm water controls (channels, berms) as per storm water management plan (see Appendix T)	At start of phase			
	Maintenance of existing exploration roads	On-going	For maintenance	For maintenance	
Civil works Civil works on site relate mainly to any steel and concrete work.	General building activities and erection of structures	On-going			
	Use of scaffolding and cranes	On-going		As required	
	Mixing of concrete and concrete work including culverts and plinths	On-going			
	Steel work (including grinding and welding)	On-going	As required	As required	
	Vehicle maintenance and wash bays	On-going	As required	As required	
	Storage and handling of: fuel, lubricants, cement, chemical additives in cements	On-going	As required	As required	
	Installing re-enforcement steel	On-going			

Main activity/process	Typical sub-activities	Construction	Operation	Decommissioning	Closure
Underground Mining	Construction of box cuts and associated declines.	On-going			
	Drilling and blasting	On-going	On-going		
	Loading and hauling		On-going		
	Dewatering, treatment and discharge from underground works		On-going	On-going	
DMS Plant and stockpile	Construction and utilisation of equipment required: - Single deck screen - DMS drum - New conveyors		On-going		
	DMS stockpiles and associated handling and transportation		On-going		
Tailings Management	Delivery and storage of tailings from existing plant via pipeline		On-going		
	Final disposal on TSF		On-going	Permanent	Permanent
	Construction and utilisation of site support services include: - Return water dam - Pumping station - Overland piping and river crossing - Pipe and cable crossing - Roads layout - 22kv overhead power line	On-going	On-going		
Power supply and use	Construction, operation and maintenance of electricity lines	On-going	On-going	On-going	
	Construction, operation and maintenance of substations and transformers	On-going	On-going	On-going	
	Supply and use of electricity at offices, workshops change houses and stores.	On-going	On-going	On-going	
	Temporary diesel powered generators	On-going	On-going	On-going	
	Existing power line diversions	At start of phase			

Main activity/process	Typical sub-activities	Construction	Operation	Decommissioning	Closure
Water supply and use	Construction, operation and maintenance of pipelines for water supply	On-going			
	Sourcing water from the existing Everest water circuit (includes domestic and process water)	On-going	On-going		
	Recycling and re-use via pipeline within the Everest circuit from the following sources: - Sewage treatment plants - Tailings return water system - Process water dams - Storm water control dams - Mine dewatering		On-going	Limited	
Stormwater management	Diversion of clean water using channels and berms	On-going	On-going	On-going	
	Separation of dirty water and clean water	On-going	On-going	On-going	
	Collection and storage of dirty water using pollution control dams for recycling and re-use	After rainfall events	After rainfall events	After rainfall events	
Process water management	Collection of dirty water		On-going	On-going	
	Storage of dirty water in dams for re-use (settling facilities)		On-going	On-going	
	Recycling of water back into process		On-going	On-going	
Transport systems	Construction, operation and maintenance of roads	On-going	On-going	On-going	
	Vehicle and equipment servicing and maintenance workshops and wash bays	On-going	On-going	On-going	
	Installation and use of parking, loading and off-loading areas for trucks, buses and other vehicles	On-going	On-going	On-going	
	Transportation of staff to and from site (using buses and private cars via surfaced and gravel roads)	On-going	On-going	On-going	
	Transport of input materials, supplies, services and waste removal (using trucks and vans via surfaced and gravel roads)	On-going	On-going	On-going	Limited

Main activity/process	Typical sub-activities	Construction	Operation	Decommissioning	Closure
	Transportation of borrow material, soil, waste rock and ROM via trucks	On-going	On-going	On-going	Limited
	Transport of PGM and Chrome products via trucks		On-going		
Non-mineralised waste management (general and industrial hazardous)	Handling, storage and disposal of general and hazardous waste on site: - General waste (domestic waste, garden waste, building rubble, recyclable waste, catering waste, waste wood and wood pallets, wood chips, ash, bulk bags, tyres, rubber and laboratory waste - Hazardous waste (chemical bulk bags, sewage sludge, sewage effluent, sump effluent, fluorescent tubes, light bulbs, grease, medical waste, oil, oil containing PCB or PCT, equipment containing oil which contains PCB or PCT, oil and grease containing waste, organic solvents, empty paint containers, explosive packaging, wet cell batteries, reagent bags, reagents, printer and toner cartridges, laboratory waste)	On-going	On-going	On-going	
	Separation of oil and water at wash bays	On-going	On-going	On-going	Limited
	Disposal and/or treatment of contaminated soils	On-going	On-going	On-going	
	Temporary storage of and hazardous waste within dedicated demarcated containers/areas	On-going	On-going	On-going	
	Sorting of general and hazardous waste for re-use and/or recycling purposes	On-going	On-going	On-going	
	Removal of waste by contractor for recycling, re-use and/or final disposal at permitted waste disposal facilities	On-going	On-going	On-going	

Main activity/process	Typical sub-activities	Construction	Operation	Decommissioning	Closure
	Treatment of sewage at proposed and existing sewage treatment facilities.		On-going		
Site support services	Offices	On-going	On-going	On-going	
	Parking area for vehicles and bus shelter and drop-off areas	On-going	On-going	On-going	On-going (but limited)
	Change house		On-going		
Storage and maintenance services/ facilities	Washing of machinery and vehicles (washbays) (at workshop)		On-going		
	Servicing machinery and vehicles (workshops)		On-going		
	Storage (stores, tanks) and handling of non-process materials (consumables)		On-going		
General site management	Appointment of contractors and establishment of contractor working camps and areas	On-going	On-going	On-going	On-going
	Site management (monitoring, inspections, maintenance, security, access control)	On-going	On-going	On-going	On-going
	Environmental awareness training and emergency response	On-going	On-going	On-going	On-going
	On-going rehabilitation of facilities/disturbed areas (where possible)	On-going	On-going	On-going	On-going
	Implementing and maintaining management plans	On-going	On-going	On-going	On-going
Demolition	Removing construction contractor's area (if not incorporated into plant footprint)	At end of phase		At end of phase	
	Dismantling and demolition of infrastructure and equipment. Possible blasting		For maintenance	On-going	
	Utilisation of site supporting services: - access control and security - contractors yard - canteens - workshops and wash bays - general stores		For maintenance	On-going	

Main activity/process	Typical sub-activities	Construction	Operation	Decommissioning	Closure
	- storage area for hazardous and non-hazardous waste - formal ablution facilities within contractor yard - diesel tanks and or diesel bowsers (re-fuelling equipment)				
Rehabilitation	Underground supports and potential sealing of declines	On-going	On-going	On-going	
	Removal of box cut infrastructure			On-going	
	Replacing soil resources	On-going	On-going	On-going	
	Slope stabilisation and erosion control	On-going	On-going	On-going	
	Landscaping	On-going	On-going	On-going	
	Re-vegetation of disturbed areas and where infrastructure was removed	On-going	On-going	On-going	
	Removal of alien invasive species from rehabilitated sites	On-going	On-going	On-going	
	Restoration of natural drainage patterns as far as practically possible	On-going	On-going	On-going	
	Rehabilitation of all mineralised waste facilities and other stockpiles (tailings, waste rock, chrome)	On-going	On-going	On-going	
	Rehabilitation of access roads	On-going	On-going	On-going	
Maintenance and aftercare	Initiation of aftercare and maintenance program			At end of phase	
	Maintenance and repair of post closure landforms, facilities, and rehabilitated areas				As required
	Establishment and maintenance of ecology and landscape functionality				As required

2.4 PLANS SHOWING LOCATION AND EXTENT OF OPERATIONS

Site layouts including an overall site layout showing both existing and proposed infrastructure as well as larger scale plans for each of the box cuts, as well as the proposed TSF are provided in the following figures:

- Current and proposed Underground Mining Progression Plan (Figure 2-1)
- Overall surface infrastructure layout (Figure 2-2)
- EPM South box cut surface infrastructure layout (Figure 2-3)
- Valley box cut surface infrastructure layout (Figure 2-4)
- Waterfall box cut surface infrastructure layout (Figure 2-5)
- Buttonshope South box cut surface infrastructure layout (Figure 2-6)
- Buttonshope North box cut surface infrastructure layout (Figure 2-7)
- Proposed tailings storage facility layout (Figure 2-8)

A list of the current and proposed surface infrastructure is provided in more detail below.

FIGURE 2-1: PROPOSED UNDERGROUND MINING PROGRESSION PLAN

FIGURE 2-2: OVERALL INFRASTRUCTURE LAYOUT

FIGURE 2-3: EPM SOUTH BOX CUT SURFACE INFRASTRUCTURE LAYOUT

FIGURE 2-4: VALLEY BOX CUT SURFACE INFRASTRUCTURE LAYOUT

FIGURE 2-5: WATERFALL BOX CUT INFRASTRUCTURE LAYOUT

FIGURE 2-6: BUTTONSHOPE SOUTH BOX CUT SURFACE INFRASTRUCTURE LAYOUT

FIGURE 2-7: BUTTONSHOPE NORTH BOX CUT SURFACE INFRASTRUCTURE LAYOUT

FIGURE 2-8: PROPOSED TAILINGS STORAGE FACILITY LAYOUT

2.5 LISTED ACTIVITIES IN TERMS OF NEMA EIA REGULATIONS

The relevant listed activities (in terms of the NEMA EIA Regulations) which are relevant to the proposed project are listed in the table below.

TABLE2-3: NEMA LISTED ACTIVITIES RELEVANT TO THE PROJECT

ACTIVITY NUMBER	LISTED ACTIVITY	DESCRIPTION OF ACTIVITY
Notice 544, 18 June 2010		
9	The construction of facilities or infrastructure exceeding 1 000 metres in length for the bulk transportation of water, sewage or storm water – (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more, excluding where: a. such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or b. where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.	Preliminary design information allows for the transportation of water, sewage and storm water in pipeline sizes with a diameter larger than 0.36 meters.
10	The construction of facilities or infrastructure for the transmission and distribution of electricity - (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.	Preliminary design information allows for the transmission of electricity with a capacity greater than 33 kilovolts.
11	The construction of: (i) canals; (ii) channels; (iii) bridges; (iv) dams; (v) weirs; (vi) bulk storm water outlet structures; (vii) marinas; (viii) jetties exceeding 50 square metres in size;	River crossings are proposed over the Groot Dwars River so as to provide access to Buttonshope farm from Everest.

ACTIVITY NUMBER	LISTED ACTIVITY	DESCRIPTION OF ACTIVITY
	(ix) slipways exceeding 50 square metres in size; or (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more; where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	
12	The construction of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 cubic metres or more, unless such storage falls within the ambit of activity 19 of Notice 545 of 2010.	The proposed project will require the construction of return water and stormwater control dams.
13	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres.	The proposed project will require the storage and handling of fuel with a combined capacity exceeding 80 cubic metres.
18	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from (i) a watercourse; (ii) the sea; (iii) the seashore; (iv) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater- but excluding where such infilling, depositing, dredging, excavation, removal or moving (i) is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or (ii) occurs behind the development setback line.	The construction of the proposed river crossings may require the excavation, removing and/or removal of soil in excess of $5m^3$ from a watercourse.
22	The construction of a road, outside urban areas, (i) with a reserve wider than 13,5 metres or, (ii) where no reserve exists where the road is wider than 8 metres, or (iii) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 545 of 2010.	Preliminary design information indicates that the access road into the valley will be wider than 8m, and will not be in a national road reserve.

ACTIVITY NUMBER	LISTED ACTIVITY	DESCRIPTION OF ACTIVITY
28	The expansion of existing facilities for any process or activity where such expansion will result in the need for a, an existing permit or license in terms of national or provincial legislation governing the release of emissions or pollution, excluding where the facility, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.	The proposed Project Fairway will require the submission of a Water Use Licence application.
Notice 545, 18 June 2010		
5	The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. 544 of 2010 or included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.	The proposed Project Fairway will require the submission of a Water Use Licence application.
15	Physical alternation of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes place for: (i) linear development activities; or (ii) agriculture or afforestation where activity 16 in this schedule will apply.	The total site area that will be transformed will exceed 20 hectares.
19	The construction of a dam, where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the high-water mark of the dam covers an area of 10 hectares or more.	The proposed project will require the construction of return water and stormwater control dams.
Notice 546, 18 June 2010		
4(a)(ii)(aa)	(a) In Eastern Cape, Free State, KwaZulu-Natal, Limpopo, Mpumalanga and Northern Cape provinces: ii. Outside urban areas, in: (aa) A protected area identified in terms of NEMPAA, excluding conservancies.	The project area is located in a National Protected Area Expansion Strategy Focus area and may require the construction of a road wider than 4 metres.
9	The construction of above ground cableways and funiculars: (a) In Eastern Cape, Free State, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape and Western Cape: ii. Areas outside urban areas;	The proposed project will require the construction of an overland chairlift at the proposed box cuts to transport mine workers from the change house to the box cuts.
10	The construction of facilities or infrastructure for the storage, or storage and handling of a	The proposed project will require the storage

ACTIVITY NUMBER	LISTED ACTIVITY	DESCRIPTION OF ACTIVITY
	dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres: (a) In Eastern Cape, Free State, KwaZulu-Natal, Limpopo, Mpumalanga and Northern Cape provinces: ii. Outside urban areas, in: (bb) National Protected Area Expansion Strategy Focus areas. (ii) Areas on the watercourse side of the development setback line or within 100 metres from the edge of a watercourse where no such setback line has been determined;	and handling of fuel with a combined capacity exceeding 30 cubic metres at the proposed box cuts.
13	The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for: (1) the undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), in which case the activity is regarded to be excluded from this list. (2) the undertaking of a linear activity falling below the thresholds mentioned in Listing Notice 1 in terms of GN No. 544 of 2010. (b) National Protected Area Expansion Strategy Focus areas.	The proposed project will require the removal of indigenous vegetation for the establishment of the proposed box cuts.
14	The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for: (1) purposes of agriculture or afforestation inside areas identified in spatial instruments adopted by the competent authority for agriculture or afforestation purposes; (2) the undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the activity is regarded to be excluded from this list; (3) the undertaking of a linear activity falling below the thresholds in Notice 544 of 2010. (a) In Eastern Cape, Free State, KwaZulu-Natal, Gauteng, Limpopo, Mpumalanga, Northern Cape, Northwest and Western Cape: i. All areas outside urban areas.	The proposed project will require the removal of indigenous vegetation for the establishment of the proposed box cuts.

ACTIVITY NUMBER	LISTED ACTIVITY	DESCRIPTION OF ACTIVITY
16(iv)(a)(bb)	The construction of: (i) jetties exceeding 10 square metres in size; (ii) slipways exceeding 10 square metres in size; (iii) buildings with a footprint exceeding 10 square metres in size; or (iv) infrastructure covering 10 square metres or more; where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line. (a) In Eastern Cape, Free State, KwaZulu-Natal, Limpopo, Mpumalanga and Northern Cape: (bb) National Protected Area Expansion Strategy Focus areas.	In order to facilitate access to the proposed box cuts, river crossings will be constructed over the Groot Dwars river.

In addition to the above, the following listed activities in terms of the National Environmental Management: Waste Act (NEM:WA) as per Government Notices No. R.718 of 3 July 2009 were identified:

TABLE2-4: NEM:WA LISTED ACTIVITIES RELEVANT TO THE PROJECT

ACTIVITY NUMBER	LISTED ACTIVITY	DESCRIPTION OF ACTIVITY
CATEGORY A		
1	The storage, including the temporary storage, of general waste at a facility that has the capacity to store in excess of $100m^3$ of general waste at any one time, excluding the storage of waste in lagoons.	Activities associated with the proposed project will result in the generation of general waste. General waste is stored temporarily at specific designated areas on-site and is collected for off-site disposal by accredited waste removal companies.

2	The storage including temporary storage of hazardous waste at a facility that has the capacity to store in excess of $35m^3$ of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons.	Activities associated with the proposed project will result in the generation of hazardous waste. Hazardous waste is stored temporarily at specific designated areas on-site and is collected for off-site disposal by accredited waste removal companies.
11	The treatment of effluent, wastewater or sewage with an annual throughput capacity of more than 2 000 cubic metres but less than 15 000 cubic metres.	The proposed project entails the construction of sewage treatment facilities at the proposed box cuts.
18	The construction of facilities for activities listed in Category A of this Schedule (not in isolation to associated activity).	The proposed project entails the construction of sewage treatment facilities at the proposed box cuts.
CATEGORY B		
7	The treatment of effluent, wastewater or sewage with an annual throughput capacity of greater than 15 $000m^3$.	The proposed project entails the construction of sewage treatment facilities at the proposed box cuts.
11	The construction of facilities for activities listed in Category B of this schedule (not in isolation to associated activity).	

2.6 INDICATION OF PHASES AND TIMEFRAMES ASSOCIATED WITH MAIN ACTIONS/ ACTIVITIES/ PROCESSES

An indication of the phases and estimated timeframes in relation to the main actions, activities or processes and infrastructure is provided in Table 2-2 above.

2.7 EXISTING AND PROPOSED SURFACE INFRASTRUCTURE

Current Surface Infrastructure

The existing surface infrastructure at Everest is predominantly confined to the terrace area above the valley (some infrastructure associated with the valley decline is located within the valley) and comprises:

- Previously mined out open pit areas, referred to as the north pit, south pit and central pit. The open pits have subsequently been rehabilitated;
- Decline system for accessing the underground mine with associated ventilation shafts (north decline, south decline and valley decline). The original mine portal has been closed and rehabilitated following a surface subsidence event above the decline in late 2008;
- During the establishment of the original decline small amounts of waste rock (hard overburden) were generated and used for the construction of the tailings dam. Currently, there are two waste rock stockpiles at the mine, one located on the terrace and the second in the valley. These stockpiles are temporary and will be used as building material for the mine where required;
- Primary crusher located at the ROM pad;
- Stockpiles at the mine comprise topsoil stockpiles, run-of-mine (ROM) stockpiles, emergency stockpiles at the crusher plant, and chrome concentrate stockpiles;
- There are two ore silos at the mine, one located near the primary crusher and the second near the plant;
- Transport infrastructure including a surfaced mine access road off the Roossenekal-Lydenburg road (R577), internal service road linking the EPM North and South declines to the plant, haul roads, conveyor and chairlift systems and pipelines (potable, process and sewage), as well as parking areas;
- There is a security fence around the perimeter of the mine as well as around components of the site. There is one security access control point located at the entrance to the mine;
- Two contractor’s areas (one for the underground mining contractor and one for the plant) – each area comprises one or all of the following facilities depending on their requirements: offices, workshops, stores, lay down areas, general and hazardous waste management facilities, change houses with ablutions (chemical toilets);
- Fuel storage and handling facilities at the mine include bulk diesel and bulk oil facilities. These storage and handling facilities are located on concrete surfaces within bunded areas;
- Explosives storage and handling facility; and

- The main AQPSA office complex located at the plant, near the entrance of the mine, with a helicopter landing pad.

Sections 2.7.1 - 2.7.8 provide additional information with respect to other surface infrastructure presently located at Everest.

Approved Infrastructure at Existing Valley Decline

Prior to the establishment of the existing Valley decline an EIA process was undertaken and the relevant approvals were received from the DMR in May 2010 and from the MDEDET in May 2010. As part of this approval process, the following surface infrastructure was approved:

- Additional substation and transformer bay;
- A sewage treatment facility designed to cater for 200 employees and have a treatment capacity of 60 m^3/month of sewage;
- A settling/thickener facility (with a capacity of 300 m^3) and associated dirty water reservoir (with a capacity of 100 m^3);
- Stormwater management infrastructure;
- A potable water storage tank (about 64 m^3);
- Fencing, security and access control;
- A bus off-loading and loading area and parking area for mine equipment and vehicles;
- Offices and change houses with ablution facilities;
- A control room;
- Stores and workshops;
- Fuel storage (approximately 100 m^3) and handling point;
- Explosives delivery and handling facility; and
- Compressors.

With respect to the proposed Project Fairway, changes to the surface infrastructure (from what was previously approved) are proposed. Refer to Table 2-5 and to Figure 2-4 for an indication of the surface infrastructure proposed at the existing Valley decline.

Proposed Surface Infrastructure

A summary of the required surface infrastructure at each of the proposed box cuts (and at the existing Valley box cut) is provided in Table 2-5below.

TABLE 2-5: PROPOSED SURFACE INFRASTRUCTURE AT EACH BOX CUT

Proposed Infrastructure	EPM South box cut	Valley decline	Waterfall box cut	Buttonshope South box cut	Buttonshope North box cut
Platforms and terracing	✓	✓	✓	✓	✓
ROM stockpile				✓	✓
ROM Stockpile feed conveyor				✓	✓
Settler dams	✓	✓		✓	
Conveyors (Conveyor transfer and emergency stockpile conveyor, overland conveyor)	✓				
Conveyor tip-bin arrangement, drive station, and/or transfer station			✓ (Conveyor tip-bin arrangement and conveyor drive station)	✓ (Conveyor transfer station)	✓ (Conveyor transfer station)
Emergency Stockpile	✓				
Silo	✓				
Stormwater dam	✓				
Stormwater pollution control dam	✓	✓	✓	✓	✓
Service road	✓				
MCC, transformer bays, and/or HT/substation	✓ (MCC and transformer bays)	✓ (Transformer bays)	✓ (MCC and HT/substation)	✓ (MCC and HT/substation)	✓ (MCC and HT/substation)
Topsoil stockpile	✓	✓			
Brake test ramp and arrestor		✓	✓	✓	✓
Compressor house		✓		✓	✓
Explosives off-loading bay		✓	✓	✓	✓

Proposed Infrastructure	**EPM South box cut**	**Valley decline**	**Waterfall box cut**	**Buttonshope South box cut**	**Buttonshope North box cut**
Refuelling bay		✓			
Gate house		✓			
Hazardous materials store		✓			
Offices, ablution facilities and/or workshops		✓ (Workshops)		✓ (Offices and ablution facilities)	✓ (Offices and ablution facilities)
Oil, lube and fuel depot		✓		✓	✓
Roads and/or parking area		✓ (Parking area)	✓ (Parking area)	✓	✓
Salvage yard		✓			
Store and/or store yard		✓ (Store and store-yard)	✓ (Satellite store)	✓ (Satellite store)	✓ (Satellite store)
Access control and fencing		✓	✓	✓	✓
Change house			✓		
Temporary generator and diesel storage			✓		
Sewerage Treatment plant		✓	✓	✓	✓
Bus-shelter and drop-off			✓	✓	✓
Personnel walkway and bridge over vehicle access			✓		
Service bay and oil trap			✓	✓	✓
Settling dam and/or service-water dams			✓ (Settling dam and service-water dams)	✓ (Settling dams)	✓ (Settling dams)
Potable and fire-fighting water storage		✓	✓	✓	✓
Cooling tower				✓	✓

2.7.1 EXISTING AND PROPOSED TRANSPORT SYSTEMS

Roads and access points

There are existing roads and access points at the mine. The main access road (Road D874 South) to Everest is located off the Roossenekal-Lydenburg road (R577). The existing mine access road is a 7 m wide surface road approximately 3.3 km long. The mine access road begins at the intersection of the Boschfontein Road and runs for approximately 1.5 km before providing access to the plant and offices. There is one security access control point located at the entrance of the mine located before the plan and office complex. The access road then continues to the existing EPM North box cut surface infrastructure complex where it terminates in the parking area.

From traffic counts undertaken for the current operations, the total current traffic travelling to and from Everest on the average workday is 203 light vehicles and

In addition to the various other internal access roads, there is a service road (approximately 4.2 km long) which has been extended from the terrace to provide access to the valley box cut. The remaining existing roads are a 3 m wide, 2,5 km long gravel service road from the process plant to the EPM North Boxcut surface infrastructure complex. Another gravel service road runs next to the Eastern and Western side of the existing tailings dam.

In terms of the proposed Project Fairway, a new access road to the valley is proposed. The current valley service road will be decommissioned and rehabilitated following the completion of the proposed valley access road. The proposed Valley access road will be a surfaced, two-lane single carriageway from the existing surface operations on the terrace to the proposed Waterfall box cut. The total length of the road is estimated to be 8 km. Traffic volumes on this road will predominantly comprise buses (30 buses daily) to transport mine staff to the change house located at the box cut access. Where the road crosses drainage lines, appropriately engineered crossings will be designed so that the stream flow is not impeded at the crossing and the crossing embankments are not susceptible to erosion.

The expected traffic composition and volumes during the construction phase and the operational phase is outlined in Table 2-7 and Table 2-7, respectively.

TABLE 2-6: EXPECTED TRAFFIC COMPOSITION AND VOLUMES DURING CONSTRUCTION PHASE

Construction Phase	Buttonshope South to Buttonshope North box cut		Waterfall decline to Buttonshope South box cut		Ventilation fan service road	
	Quantity per Day	Duration	Quantity per Day	Duration	Quantity per Day	Duration
Earthworks (Peak)						
Busses	4	9 Months	4	9 Months	0	1 Month
Haul Trucks	10	9 Months	10	9 Months	2	1 Month

Construction Phase	Buttonshope South to Buttonshope North box cut		Waterfall decline to Buttonshope South box cut		Ventilation fan service road	
	Quantity per Day	Duration	Quantity per Day	Duration	Quantity per Day	Duration
Diesel Deliveries	0.2	9 Months	0.2	9 Months	0	1 Month
Light Delivery Vehicles	1	9 Months	1	9 Months	1	1 Month
Cars/4X4's	3	9 Months	3	9 Months	1	1 Month
Civil Works (Peak)						
Busses	3	6 Months	3	6 Months	0	2 Months
Light Delivery Vehicles	4	6 Months	4	6 Months	1	2 Months
Cement Trucks	0.2	6 Months	0.2	6 Months	0.2	2 Months
Aggregate Trucks	0.2	6 Months	0.2	6 Months	0.2	2 Months
Reinforcement Trucks	1	6 Months	1	6 Months	0.5	2 Months
Cars/4X4's	4	6 Months	4	6 Months	1	2 Months
Mechanical Works (Peak)						
Busses	2	11 Months	2	11 Months	0	1 Month
Light Delivery Vehicles	2	11 Months	2	11 Months	1	1 Month
Heavy Delivery Vehicles	10	11 Months	10	11 Months	0.2	1 Month
Mining (Peak)						
Busses	10	11 Months	10	11 Months	0	2 Months

TABLE 2-7: EXPECTED STEADY STATE TRAFFIC COMPOSITION AND VOLUMES DURING OPERATION

Vehicle Type	Buttonshope South to Buttonshope North		Waterfall Decline to Buttonshope South		Ventilation fan service road	
	Quantity per Day	Duration	Quantity per Day	Duration	Quantity per Day	Duration
Haul Trucks	80	4 Years	166	4 Years	0	30 Years
Busses	2	4 Years	2	4 Years	0	30 Years
15 seater minibus	4	4 Years	4	4 Years	0	30 Years
Passenger Cars/4X4's/Light Delivery Vehicles	5	4 Years	5	4 Years	1	30 Years

Conveyors

At the mine, there is an existing underground conveyor system servicing the underground works. There is also an overland conveyor system feeding ore from the underground works to the crusher plant and from the crusher plant to the processing plant.

For Project Fairway it is proposed that once the underground development between the Waterfall box cut and the Buttonshope South box cut meets, an underground conveyor connecting the Buttonshope South Box cut and the Waterfall box cut and will be used to transport the ROM to the existing underground workings. From there, the existing network of conveyors will be used to transport the ROM. Production permitting, a surface conveyor will also be constructed from the EPM South box cut to the ROM pad where the ROM material will be transported to the plant by the existing overland conveyor.

Power Supply Infrastructure

Existing power supply infrastructure at Everest includes a 132 kV Eskom supply line from the Simplon substation, an on-site substation and internal 11 kV power lines.

As part of the proposed Project Fairway, an additional 132 kV overhead power line will be installed from the processing plant to the Buttonshope South box cut. The proposed overhead power line will utilise a 3-strand, mono-pole system. At the proposed TSF site, an additional 22 kV overhead power line (and telecommunications line) is proposed to follow an alignment on the eastern boundary of the proposed TSF to the current mining operations.

Pipelines

There is a network of pipelines distributing water (process and potable) throughout the mine, tailings from the processing plant to the tailings dam and return water from the return water dam back to the process circuit.

For Project Fairway, it is proposed that the existing underground network will be extended to service the proposed box cuts. A pipeline network will also be established on surface to facilitate the delivery of tailings from the processing plant to the proposed TSF and return water from the return water dam back to the process circuit.

2.7.2 DOMESTIC AND INDUSTRIAL WASTE DISPOSAL FACILITIES

Domestic and industrial hazardous waste produced by the mine is collected on site in demarcated areas. There is a central salvage yard for the sorting and temporary storage of waste prior to collection by a waste contractor (Waste Technologist). The final disposal of waste occurs off site at Holfontein (hazardous waste) and Lydenburg (domestic waste). No on-site landfill facility is located at Everest.

Any waste generated by Project Fairway will be dealt with in accordance to the mine's waste management procedure. The mine's waste management procedure is detailed in Table 7-1. A salvage yard for the recovery, re-use and/or recycling of materials forms part of the proposed surface infrastructure at the Valley box cut.

2.7.3 MINE RESIDUE WASTE DISPOSAL FACILITIES: WASTE ROCK

Waste material (overburden that cannot be used for construction purposes) will be produced from the development of the proposed TSF and associated return water dam. A topsoil and waste material stockpile is proposed to be located just south of the proposed TSF in the region of the rehabilitated north open pit. Waste rock produced during the mining operations will be crushed and used for construction purposes.

Spoil associated with the construction of the proposed Valley access road will be incorporated into the embankment construction where possible so as to minimise waste stockpiling.

2.7.4 MINE RESIDUE WASTE DISPOSAL FACILITIES: TAILINGS

Existing Tailings Storage Facility

The existing tailings dam has a design capacity of 16.46 x 106 m^3 (typically 3 million tons/annum over 11 years for a dry density of 1.85 t/m^3) and has an approximate footprint of 90 ha. Associated with the existing TSF is a return water dam and contractor area.

Proposed Tailings Storage Facility

SRK Consulting undertook the conceptual design for the proposed tailings dam. The design of the proposed TSF has taken into consideration the extensive rock outcropping located to the west of the proposed TSF site, as well as significant variations in the topography to the north of the site (localised ridgeline and adjacent low lying areas). Consequently the design of the proposed TSF has avoided these areas as far as possible (refer to Figure 2-8).

The targeted life of the tailings facility is 10 years with a total volume of tailings product to be accommodated of 15 Mm^3 for an assumed dry density of 1.75 t/m^3. The design of the proposed TSF comprises of two independent compartments which will be operated simultaneously. The proposed method of tailings disposal is spigotting as is the case of the current TSF. This method of disposal relies on the segregation of the tailings (through hydraulic sorting) along the tailings beach to produce a coarse outer wall of sufficient strength to enable self-building. Starter walls will be required to contain the initial product when the rates of rise are high and self-building is not possible from a stability and operational perspective. Once a suitable rate of rise (3 m/year) has been achieved, self- building using the upstream method of development can be employed.

TABLE 2-8: CONCEPTUAL DESIGN OF THE TSF

Features		Description
Method of development		Hillside development with conventional upstream construction; two compartment configuration with full perimeter conventional spigot disposal
Rate of rise		Maximum rate of rise of 3.0 m/year at starter wall crest; maximum rate of rise of 2.5 m/year (at closure).
Rate of deposition		Expected monthly production rate of 220 000 tons/month at placed dry density of 1.75 tons/m^3 results in volume placement rate of 125 714 m^3/month.
Dimensions and rate of	Total volume of tailings	15.1 Mm^3 (2.64 Mt/annum over 10 years @ dry density 1.75 t/m^3).

Features		**Description**
deposition	Top area	60 ha (dam footprint will be completely covered by tailings within 2 to 3 years after commissioning).
	Total area	120 ha (including starter wall and paddocks).
	Height	Maximum height of 37 m measured at lowest natural ground level (northern compartment).
Tailings delivery		355 mm (OD) diameter HDPE slurry delivery and spigot pipelines.
Walls	Starter wall/ containment structure	Each compartment will be equipped with a starter wall constructed to a crest elevation that corresponds to a maximum rate of rise of no more than 3.0 m/year. Walls will be constructed from locally sourced fine grained silts and clays with inner and outer slopes of 1v: 3h Maximum wall height of 7 m (southern cell) and 10 m high (northern cell).
	Toe wall	A 1 m high compacted toe wall will be constructed around the remaining perimeter of the compartments where the natural ground elevation is higher than the starter wall crest.
Drainage	Toe drain	5 m wide toe drains at the base of the starter walls (and extending to the full perimeter of each of the compartments) will discharge collected seepage into a 1 m deep solution trench. This solution trench will be installed to the perimeter of the TSF and will transfer collected seepage water to the return water dam. Toe drain outlets will be provided at 50 m intervals.
	Chimney drain	Additional drainage will be provided by a 15 m high internal, vertical collector drain. This drain will be positioned 60 m from the starter embankment centreline and will discharge collected seepage into the perimeter solution trench will outlets provided at 50 m intervals.
Decant System	Pipeline	675 mm precast concrete spigot-and-socket buried pipeline equipped with intermediate and final inlet / intake structures in each compartment
	Towers	7 precast concrete inlet towers (intermediate and final) founded on 40 MPa concrete bases to decant supernatant water to the pipeline. The final intake tower in the northern cell will be founded on a 5 m high concrete base.
	Dissipater, Silt Trap, and Return Water Dam	The supernatant water from the decant pipeline passes through a hydraulic dissipater and dual compartment silt trap before entering the return water dam (RWD). The RWD has a 250,000 m^3 storage capacity.
Stormwater diversion		Clean runoff from the areas up gradient of the tailings dam site will be diverted away from the site by suitably sized diversion structures
Access and access control		A wooden catwalk/access will be provided from the starter walls to the intermediate and final penstock inlets. A 5 m wide gravel road will be constructed around the perimeter of the TSF and RWD. A five-strand barbed wire perimeter fence with access gates will be installed along with appropriate signage
Seismicity		An Operating Base Earthquake (OBE) of 0.01 g has been adopted for the feasibility design. A Maximum Design Earthquake (MDE) of 0.02 g has been assumed.
Closure aspects	Rehabilitation during the life of the mine	The TSF will be constructed with flat overall side slopes (1:3) and berms (or step-ins) at 8 to 9 m height increments that will be engineered to allow collection and control of runoff from the slopes. Vegetation will be placed on the side slopes of the dam by means of hydroseeding, hand planting and irrigation. Crests of berms covered with a media to reduce dust and assist with vegetation establishment.

Features		**Description**
	Rehabilitation when the dam is no longer operational	The final penstock decants will be sealed. The dam surface will be reshaped and profiled to retain runoff (there will be no decanting of storm runoff). The surface will be vegetated. It is envisaged that only 60% of the dam surface will be accessed in the first year following closure while the remaining 40%, which encompasses the area of the two pools, will need some 2 to 5 years before limited access can be achieved. This falls into the aftercare period. Surface water run off drainage measures will be established to control erosion where necessary, for example along access roads.
	Aftercare	The monitoring vegetation establishment. Monitoring of the decreases in the phreatic surface and the quantity and quality of the seepage from the underdrains followed by underdrain outlet closure.
Method of development		Hillside development with conventional upstream construction; two compartment configuration with full perimeter conventional spigot disposal
Rate of rise		Maximum rate of rise of 3.0 m/year at starter wall crest; maximum rate of rise of 2.5 m/year (at closure).
Rate of deposition		Expected monthly production rate of 220 000 tons/month at placed dry density of 1.75 tons/m^3 results in volume placement rate of 125 714 m^3/month.
Dimensions and rate of deposition	Total volume of tailings	15.1 Mm^3 (2.64 Mt/annum over 10 years at a dry density 1.75 t/m^3).
	Top area	60 ha (dam footprint will be completely covered by tailings within 2 to 3 years after commissioning).
	Total area	120 ha (including starter wall and paddocks).
	Height	Maximum height of 37 m measured at lowest natural ground level (northern compartment).
Tailings delivery		355 mm (OD) diameter HDPE slurry delivery and spigot pipelines.
Walls	Starter wall/ containment structure	Each compartment will be equipped with a starter wall constructed to a crest elevation that corresponds to a maximum rate of rise of no more than 3.0 m/year. Walls will be constructed from locally sourced fine grained silts and clays with inner and outer slopes of 1 vertical : 3 horizontal. Maximum wall height of 7 m (southern cell) and 10 m high (northern cell).
	Toe wall	A 1 m high compacted toe wall will be constructed around the remaining perimeter of the compartments where the natural ground elevation is higher than the starter wall crest.
Drainage	Toe drain	5 m wide toe drains at the base of the starter walls (and extending to the full perimeter of each of the compartments) will discharge collected seepage into a 1 m deep solution trench. This solution trench will be installed to the perimeter of the TSF and will transfer collected seepage water to the return water dam. Toe drain outlets will be provided at 50 m intervals.
	Chimney drain	Additional drainage will be provided by a 15 m high internal, vertical collector drain. This drain will be positioned 60 m from the starter embankment centreline and will discharge collected seepage into the perimeter solution trench will outlets provided at 50 m intervals.
Decant System	Pipeline	675 mm precast concrete spigot-and-socket buried pipeline equipped with intermediate and final inlet / intake structures in each compartment
	Towers	7 precast concrete inlet towers (intermediate and final) founded on 40 MPa concrete bases to decant supernatant water to the pipeline. The final intake tower in the northern cell will be founded on a 5 m high concrete base.
	Dissipater, Silt Trap, and Return Water Dam	The supernatant water from the decant pipeline passes through a hydraulic dissipater and dual compartment silt trap before entering the return water dam (RWD). The RWD has a 250,000 m^3 storage capacity.
Stormwater diversion		Clean runoff from the areas up gradient of the tailings dam site will be diverted away from the site by suitably sized diversion structures

Features		Description
Access and access control		A wooden catwalk/access will be provided from the starter walls to the intermediate and final penstock inlets. A 5 m wide gravel road will be constructed around the perimeter of the TSF and RWD. A five-strand barbed wire perimeter fence with access gates will be installed along with appropriate signage
Seismicity		An Operating Base Earthquake (OBE) of 0.01 g has been adopted for the feasibility design. A Maximum Design Earthquake (MDE) of 0.02 g has been assumed.
Closure aspects	Rehabilitation during the life of the mine	The TSF will be constructed with flat overall side slopes (1:3) and berms (or step-ins) at 8 to 9 m height increments that will be engineered to allow collection and control of runoff from the slopes. Vegetation will be placed on the side slopes of the dam by means of hydroseeding, hand planting and irrigation. Crests of berms covered with a media to reduce dust and assist with vegetation establishment.
	Rehabilitation when the dam is no longer operational	The final penstock decants will be sealed. The dam surface will be reshaped and profiled to retain runoff (there will be no decanting of storm runoff). The surface will be vegetated. It is envisaged that only 60% of the dam surface will be accessed in the first year following closure while the remaining 40%, which encompasses the area of the two pools, will need some 2 to 5 years before limited access can be achieved. This falls into the aftercare period. Surface water run off drainage measures will be established to control erosion where necessary, for example along access roads.
	Aftercare	The monitoring vegetation establishment. Monitoring of the decreases in the phreatic surface and the quantity and quality of the seepage from the underdrains followed by underdrain outlet closure.

2.7.5 WATER POLLUTION MANAGEMENT FACILITIES

Water Management Infrastructure

The existing water management infrastructure at Everest includes clean and dirty stormwater controls, a plant storm water dam, a plant process water dam, a decline stormwater dam, decline settling facilities and potable and fire water storage tanks. Similar water management facilities are to be located at the proposed box cuts, as outlined in Table 2-5 below.

Sewage treatment

There are two sewage plants at the mine, one at the mining area and one at the concentrator plant. As part of the proposed Project Fairway, the existing sewage treatment plant at the mining area is to be upgraded to increase the capacity. The proposed upgrade is to ensure that the current facility has sufficient capacity to accommodate the effluent presently generated on-site and to ensure that the treated effluent meets the required standards prior to discharge.

In addition to the above, a sewage treatment facilities are proposed at the existing Valley decline, the Waterfall, Buttonshope South and Buttonshope North box cuts. These facilities are proposed to be standard containerised modular package sewer treatment plants. The proposed treatment method is to be the extended aeration activated sludge method which will treat the effluent to the DWAF recommended standard. The treated sewage effluent will be recycled into the process water circuit.

The anticipated volumes of the facilities are as follows:

- Valley decline - 5m^3/day;
- Waterfall box cut - 255m^3/day;
- Buttonshope South box cut - 10m^3/day; and
- Buttonshope North box cut - 10m^3/day.

Polluted water treatment facility

Due to dewatering of the underground mine works, there will be a need to discharge the excess water. Accordingly a storage facility and water treatment plant is planned as part of the required the surface infrastructure. Water from the mine workings will be pumped to the storage facility from which the water will be treated at the treatment plant and then discharged back into the West stream. The treatment plant is proposed to have a capacity of treating up to 3.5 ML of mine water per day.

Stormwater dams

Dirty runoff from the box cut areas will be diverted to a stormwater dam located downstream of the surface infrastructure. The proposed stormwater dams have been designed to have sufficient capacity to cater for the 1:50 year storm event. The dams will comply with the requirements of Government Notice No. R.704 of 4 June 1999.

Tailings return water dam

There is an existing return water dam associated with the existing TSF. An additional return water dam will be located down gradient of the proposed tailings dam. The return water dam (RWD) will hold water decanted off the tailings dam and water from the mine workings when necessary. The proposed storage capacity of the RWD is 250,000 m^3. The RWD will be HDPE lined and a groundwater separation / drainage layer will be installed and monitored. The maximum depth of excavation is 4.5 m and maximum external wall height 6 m, measured at lowest natural ground level, is proposed. The RWD has been sized to accommodate the 1:50 year storm event, in accordance with Government Notice No. R.704 of 4 June 1999. A spillway has been included in the RWD to control the release of storm events that exceed the design storm event.

2.7.6 POTABLE WATER SUPPLY

Potable water at Everest is sourced from four production boreholes. The water is pumped to storage tanks before being used. Potable water storage tanks will be established at the existing Valley decline, the proposed Waterfall, Buttonshope North and South box cuts. The proposed volumes of water to be stored are 20 m^3 at the Valley decline, Buttonshope North and South box cuts and 300 m^3 at the Waterfall box cut. Where additional water is required for domestic purposes, this will be sourced from the mine's existing water allocation.

2.7.7 PROCESS WATER SUPPLY

Presently process water at the mine is sourced from boreholes (through dewatering activities), groundwater inflows into the workings, storm water runoff from the mining and plant area and the TKO dam. The water is pumped to a process water dam before being used. No changes to the sources of process water are anticipated for Project Fairway.

2.7.8 MINERAL PROCESSING PLANT

There is one concentrator plant at the mine comprising PGM and chrome processing sections. The plant was designed to process 250 kilotonnes run-of-mine ore per month. For Project Fairway, the design capacity of the plant will be increased by adding a DMS plant and associated stockpiles, as well as upgrading of the mechanical equipment of the processing plant. The proposed changes will increase the production capacity to 280 ktpm. This is to accommodate the increase in the amount of ROM that will be generated by the proposed underground mining activities.

Typical equipment required for the DMS processing plant includes a single deck screen, a DMS drum and new conveyors. The approximate footprint of the DMS plant will be 20 m by 20 m. The DMS plant will only be in operation if more than 220kt run-of-mine ore per month is extracted from the mine. The discard will be located south of the existing process plant.

2.7.9 STORMWATER MANAGEMENT

Stormwater management infrastructure at the mine has been planned and will be designed to comply with the requirements of Government Notice No. R.704 of 4 June 1999. Dirty areas will be reduced to a minimum to reduce the quantity of dirty water that has to be collected and handled in the mine water circuit. Good housekeeping will be practised in dirty areas to reduce the pollution potential to a minimum. Stormwater management infrastructure will be established to prevent suspended solids and other pollutants from the construction sites entering watercourses. Refer to the Stormwater Management Plan prepared by Dowding, Reynard & Associates (Pty) Ltd (DRA) attached as Appendix T of the EIA and EMP report.

2.7.10 WATER BALANCE

The climatic water balance calculated by DRA for Project Fairway provides an indication of the volume of make-up water needed for the current and proposed operations (see Appendix R). The water balance model accounts for monthly inflows and outflows of water from:

- The concentrator plant;
- The existing and proposed tailings storage facilities (proposed to be operational by October 2017) and associated return water dams; and
- Mining water inflows from the underground mine workings.

For the purpose of the water balance it was assumed that clean water requirements for the plant are primarily serviced by tailings return water. Any additional clean water requirements are obtained from a top-up facility from the TKO dam and/or boreholes, in line with the existing water use licence conditions.

It is indicated in the water balance that for the period October 2012 – September 2026, the plant and mining operations will require make-up water from the TKO dam in order to meet water consumption requirements. For the period October 2012 – September 2019, the TKO top up volumes range from an approximate 20,000 – 40,000m^3 in the wet season, increasing to an approximate 65,000 - 90,000m^3 in the dry season. After October 2019 the TKO dam water consumption reduces each year until October 2026 when no top up water from the TKO dam is required. This is attributed to the fact that as of October 2019 mine water inflow volumes start to increase significantly.

The mine water inflows increase from approximately 30 000 m^3 per month in 2012/2013 to 40 000 m^3 in 2019 and eventually 75 000 m^3 in 2024.

In order to cater for possible future excess flows or spillages after 2026, a water treatment facility will be designed for the project. This treatment facility will treat contaminated water directly from the return water system so as to produce a water quality that is acceptable to be discharged into the environment if necessary.

3 POTENTIAL IMPACTS

3.1 LIST OF POTENTIAL IMPACTS ON ENVIRONMENTAL ASPECTS

This section provides a list of potential impacts on environmental aspects (excluding social and cultural aspects – see Section 6) separately in respect of each of the main project actions / activities and processes. The potential impacts are presented for each of the project phases in tabular format (Table 3-1).

TABLE 3-1: LIST OF POTENTIAL IMPACTS AS THEY RELATE TO PROJECT ACTIONS / ACTIVITIES / PROCESSES (EXCLUDING SOCIAL AND CULTURAL)

Main activity/process	Phase	Impacts (unmitigated)
Site preparation	Construction Operation Decommissioning	Physical destruction of biodiversity General disturbance of biodiversity Air pollution Noise pollution Visual impacts
Earthworks (For all surface infrastructure)	Construction Operation Decommissioning	Hazardous structures/excavations/ surface subsidence Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Pollution of surface water resources Alteration of natural drainage patters Contamination of groundwater Air pollution Noise pollution Blasting damage Visual impacts
Civil works Civil works on site relate mainly to any steel and concrete work.	Construction Operation Decommissioning	Loss and sterilization of mineral resources Hazardous structures/excavations/ surface subsidence Loss of soil resources and land capability through pollution Pollution of surface water resources Alteration of natural drainage patters Contamination of groundwater Air pollution Noise pollution Visual impacts
Exploration activities (drilling and reconnaissance survey)	Construction Operation Decommissioning	Hazardous structures/excavations/ surface subsidence Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Pollution of surface water resources Alteration of natural drainage patters Contamination of groundwater Air pollution Noise pollution

Main activity/process	Phase	Impacts (unmitigated)
		Visual impacts
Declines	Construction Operation Decommissioning	Loss and sterilization of mineral resources Hazardous structures/excavations/ surface subsidence Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Pollution of surface water resources Alteration of natural drainage patters Contamination of groundwater Dewatering Air pollution Noise pollution Blasting damage Visual impacts
Open pit mining (previous and potential future)	Construction Operation Decommissioning	Loss and sterilization of mineral resources Hazardous structures/excavations/ surface subsidence Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Pollution of surface water resources Alteration of natural drainage patters Contamination of groundwater Dewatering Air pollution Noise pollution Blasting damage Visual impacts
Concentrator operations	Construction Operation Decommissioning	Hazardous structures/excavations/ surface subsidence Loss of soil resources and land capability through pollution Physical destruction of biodiversity General disturbance of biodiversity Pollution of surface water resources Alteration of natural drainage patters Contamination of groundwater Air pollution Noise pollution Visual impacts
Chrome processing	Operation Construction Operation	Hazardous structures/excavations/ surface subsidence Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Pollution of surface water resources Alteration of natural drainage patters Contamination of groundwater Air pollution Noise pollution Visual impacts

Main activity/process	Phase	Impacts (unmitigated)
Tailings dams (proposed and current tailings dam)	Operation Operation Decommissioning Closure	Loss and sterilization of mineral resources Hazardous structures/excavations/ surface subsidence Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Pollution of surface water resources Alteration of natural drainage patters Contamination of groundwater Air pollution Visual impacts
Power and compressed air supply and use	Construction Operation Decommissioning	Hazardous structures/excavations/ surface subsidence Loss of soil resources and land capability through pollution Physical destruction of biodiversity General disturbance of biodiversity Pollution of surface water resources Alteration of natural drainage patters Contamination of groundwater Noise pollution Visual impacts
Water supply and use	Construction Operation Decommissioning	Hazardous structures/excavations/ surface subsidence Loss of soil resources and land capability through pollution Physical destruction of biodiversity General disturbance of biodiversity Pollution of surface water resources Alteration of natural drainage patters Contamination of groundwater Visual impacts
Transport systems	Construction Operation Decommissioning	Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Pollution of surface water resources Alteration of natural drainage patters Contamination of groundwater Air pollution Noise pollution Traffic impacts Visual impacts
Non-mineralised waste management (general and industrial hazardous)	Construction Operation Decommissioning Closure	Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Pollution of surface water resources Alteration of natural drainage patters Contamination of groundwater Air pollution Visual impacts

Main activity/process	Phase	Impacts (unmitigated)
General site management	Construction Operation Decommissioning Closure	Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Pollution of surface water resources Alteration of natural drainage patters Contamination of groundwater Visual impacts
Other support services and amenities	Construction Operation Decommissioning	Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Pollution of surface water resources Alteration of natural drainage patters Contamination of groundwater Air pollution Visual impacts
Demolition	Decommissioning	Hazardous structures/excavations/ surface subsidence Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of groundwater Pollution of surface water resources Alteration of natural drainage patters Air pollution Noise pollution Blasting damage Visual impacts
Rehabilitation	Construction Operation Decommissioning	Hazardous structures/excavations/ surface subsidence Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Pollution of surface water resources Alteration of natural drainage patters Contamination of groundwater Air pollution Noise pollution Visual impacts
Maintenance and aftercare	Closure	Loss and sterilization of mineral resources Hazardous structures/excavations/ surface subsidence Loss of soil resources and land capability through pollution Loss of soil and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Pollution of surface water resources Alteration of natural drainage patters Contamination of groundwater

Main activity/process	Phase	Impacts (unmitigated)
		Air pollution Visual impacts

3.2 LIST OF POTENTIAL CUMULATIVE IMPACTS

Potential cumulative environmental impacts include:

- Hazardous structures/excavations/ surface subsidence
- Loss of soil resources and land capability through pollution
- Loss of soil resources and land capability through physical disturbance
- Physical destruction of biodiversity
- General disturbance of biodiversity
- Contamination of groundwater
- Pollution of surface water resources
- Alteration of natural drainage patters
- Air pollution
- Noise pollution
- Blasting damage
- Visual impacts
- Imapcts on land uses

3.3 POTENTIAL FOR ACID MINE DRAINAGE OR GROUNDWATER CONTAMINATION

Information in this section was sourced from the groundwater study (Future Flow GPMS, 2011) and the approved EIA and EMP reports for the current mine infrastructure (approved July 2003, December 2009 and May 2010).

3.3.1 GEOCHEMICAL TEST WORK

As part of the mine's approved EMP (July 2003), acid-base accounting tests (ABA) were conducted on rock and tailings samples to determine the potential of exposed rock in the mine workings and the tailings dam to produce acid rock drainage. These tests were coupled with element enrichment tests to provide an indication of the main soluble chemical constituents that would be present in leachate from exposed rock in the mine workings and from the tailings dam.

The results of the ABA tests indicated that the exposed rock and the tailings dam are unlikely to produce acid mine drainage. The net acid generation of all the samples was zero or close to zero. The final pH of the samples, after full oxidation was also above 7, indicating that a neutral pH could be expected even in a total weathered and oxidised environment.

From the element enrichment tests, it was concluded that water from the tailings dam and the underground workings will have elevated salinity levels, with sulphate being the dominant ion. Water from the tailings could also contain elevated levels of nitrate.

From the geohydrological study (Appendix J) it is noted that no additional ABA or leach testing was done and use was made of previous investigations undertaken for the proposed Hoogland project. These investgations undertook ABA and leach testing on material from the Hoogland ore body and overlying rock material and a sample collected from the existing TSF material. This can be assumed to be representative of the material that will be stored on the proposed new TSF as it is from the same ore body and went through the same processes.

3.3.2 SUMMARY OF RESULTS

From the information contained in the Future Flow report, it is noted that the total sulphur content of the Hoogland ore and overlying rock material is low (< 0.25%) and the pH of the samples was found to be high (between 8.8 and 9.1). This indicates that the likelihood of acid generation is small.

In summary, the low sulphide content of all the samples tested, high NPR ratios and the rock classification shows that no AMD is expected. The major elements that were leached from the above samples were calcium, magnesium, sodium, silicon, iron, manganese. However, the heavy metals are expected to be retained in the system under normal natural pH and Eh conditions. The ore body to be mined does not contain significant amounts of sulphide minerals that would contribute towards acid rock drainage that would mobilize these elements. Given that the proposed Project Fairway ore body is the same as the one currently being mined at Everest, it is expected that the ore body will not contain significant amounts of sulphide minerals that would contribute towards AMD.

3.3.3 OVERVIEW OF ASSESSMENT AND EVALUATION OF IMPACT

Potential groundwater pollution impacts are discussed and assessed in Section 7.2.9. In the unmitigated scenario, while there is no material risk of acid mine drainage, until such time that the anticipated quality of seepage emanating from the proposed TSF is confirmed through additional laboratory test work and simulation modelling, it is assumed that there is potential for groundwater contamination associated with the proposed TSF. From the information made available, it is considered that there is no material risk of acid mine drainage. However, until such time that the anticipated quality of seepage emanating from the proposed TSF is confirmed through additional laboratory test work and simulation modelling, it is assumed that there is potential for groundwater contamination associated with the proposed TSF. Therefore surrounding surface water resources (namely the West Stream) may potentially be contaminated because of the identified link between ground and surface water and because of the predicted pollution plume concentrations in the unmitigated scenario. This is a high significance in the unmitigated scenario. With mitigation as outlined in the EMP which focuses on professionally engineered facilities with pollution control measures, good housekeeping, maintaining an up to date groundwater model, monitoring groundwater qualities on site and at third party boreholes, the significance if potential impacts reduces to medium (see Section 7.2.9 and Section 19).

4 ALTERNATIVE LAND USE OR DEVELOPMENT

Given that this report is also a consolidation report which describes an existing mine and associated infrastructure, there is no practical alternative land use or development for the mining area in question. This section therefore focuses on the alternative land use or development of project areas associated with Project Fairway.

4.1 DESCRIPTION OF ALTERNATIVE LAND USE OF THE AREA

Project Fairway infrastructure is mainly located in the Groot Dwars River valley, in areas currently used for wilderness (conservation) and livestock grazing. Some infrastructure is located on the terrace above the valley, to the east. In this regard, the proposed EPM South box cut is located mainly within an area already occupied and/or disturbed by the existing mining operations while the proposed TSF site is located adjacent to the existing mine, in an area that was used for kiwi cultivation. This section of the kiwi orchards however no longer yields fruit. Areas adjacent to project sites are used for wilderness, livestock grazing, existing mining infrastructure, and on-going kiwi cultivation. Further afield, land is used for wilderness, agricultural activities (cattle and game farming, livestock grazing and commercial fruit cultivation) and tourism (hunting and accommodation) related activities (see Section 1.3.1 for a detailed description of existing land uses in the area). As some of these land uses contribute to the economy of the region together with mineral-related activities, care should be taken when planning the project to limit impacts on these land uses.

As an alternative to the development of Project Fairway infrastructure in the valley, the current land uses would continue. For areas on the terrace to the east of the valley and to the west of the ridge overlooking the valley, it is possible that the landowners could consider venturing into larger scale agriculture and/or tourism operations. This could include increasing their cattle and game farming practises, developing tourism type activities such as hiking, mountain biking etc. establishing accommodation facilities and additional irrigated farming. This would tie in with land uses in the broader surrounding area. A key factor, as identified by the land use specialist, is the availability of water resources (see Section 1.3.1). No other land uses are considered feasible at this stage.

4.2 MAIN FEATURES AND INFRASTRUCTURE RELATED TO ALTERNATIVE LAND USE / DEVELOPMENT

Potential features and infrastructure that could be associated with the alternative land use/development are listed below and fall within the type of infrastructure found in the surrounding area (see Section 1.3.1).

Feature / infrastructure	Description
Agriculture	Introducing additional/new livestock to the farms Irrigation facilities for crops
Tourism	Building tourism related accommodation facilities (such as camp sites, self-catering units, lodges) of varying scales. Building farm work / service staff accommodation and facilities Construction of additional surface water dams for trout fishing activities
Roads	Gravel roads providing access around the farms for visitors and tourists
Water supply	Drilling and establishing additional boreholes for water supply Construction of additional surface water dams for water supply

4.3 PLAN SHOWING LOCATION AND EXTENT OF ALTERNATIVE LAND USE / DEVELOPMENT

A plan showing the location and extent of the alternative land use / development is not possible to present at this stage as this would depend on the individual landowners preferences and financial situation.

5 POTENTIAL IMPACTS OF ALTERNATIVE LAND USE OR DEVELOPMENT

Given that this report is also a consolidation report which describes an existing mine and associated infrastructure, there is no practical alternative land use or development for the mining area in question. This section therefore focuses on the alternative land use or development of project areas associated with Project Fairway.

5.1 LIST OF POTENTIAL IMPACTS

Potential impacts, expected to occur as a result of the alternative land use / development described in Section 4 above, are listed below:

<table>
<tr><th>Feature / infrastructure</th><th>Potential impacts</th></tr>
<tr><td>Grazing for livestock</td><td rowspan="2">Increased pressure on grazing resources
Loss of soils through incorrect management
Increased income and associated socio-economic benefits
Increased pressure on water resources</td></tr>
<tr><td>Grazing for game</td></tr>
<tr><td>Agriculture</td><td>Alteration of natural drainage patterns
Surface and/or groundwater pollution through the use of fertilisers
Dust generation from exposed areas
Increased income and associated socio-economic benefits
Physical destruction of biodiversity
General disturbance of biodiversity</td></tr>
<tr><td>Accommodation / facilities</td><td>Loss of natural vegetation
Loss of soils through incorrect management
Surface and/or groundwater pollution through unmanaged sanitation facilities
Increased income and associated socio-economic benefits</td></tr>
<tr><td>Roads</td><td>Dust generation
Accidents</td></tr>
<tr><td>Water supply</td><td>Increased pressure on water resources
Alteration of drainage patterns</td></tr>
</table>

5.2 LIST OF POTENTIAL CUMULATIVE IMPACTS

Potential cumulative impacts associated with the alternative land use, when compared to the existing land use on site and in the surrounding area, are expected to include:

- Increased pressure on water resources
- Increased pressure on veld resources for grazing purposes
- Loss of soils through incorrect management
- Surface and/or groundwater pollution through the use of fertilisers

6 POTENTIAL SOCIAL AND CULTURAL IMPACTS

6.1 LIST OF POTENTIAL IMPACTS ON SOCIO-ECONOMIC CONDITIONS OF THIRD PARTY LAND USE ACTIVITIES

Potential impacts on the socio-economic conditions of other parties land use activities both on site and in the surrounding area are discussed in detail in Section 1.3.4 and listed below.

- Loss of current land uses through impacts on the bio-physical environment
- Blasting hazards
- Project-related road use and traffic
- Economic impacts (positive and negative)
- Informal settlements, safety, security and services and associated social ills

6.2 CULTURAL ASPECTS AND POTENTIAL IMPACTS THEREON

Cultural aspects are discussed as part of heritage discussion below.

6.3 HERITAGE FEATURES AND POTENTIAL IMPACTS THEREON

6.3.1 HERITAGE (AND CULTURAL) FEATURES

A wide range of heritage and cultural resources have been identified within the Everest mine area. These include stone artefacts, stone kraals, stone walled homesteads and church and/or school, grave sites, cemetery and a historic house. It is possible that further heritage resources are uncovered during the development of any future activities.

Potential impacts on heritage (including cultural) features include the loss of these resources for future generations through physical destruction and/or disturbance (described further in Sections 7.2.15). These resources are protected by national legislation and require mitigation prior to any disturbance.

6.3.2 PALAEONTOLOGICAL FEATURES

Given the underlying geology of the Everest mine area, being Rustenburg layered Suite Bushveld Igneous Complex (see Section 1.3.3), there is no potential for paleontological resources to occur.

6.4 QUANTIFICATION OF IMPACT ON SOCIO-ECONOMIC CONDITIONS

Refer to Section 7.2.16 for the impact associated with the loss of land as well as AQPSA's contribution to the provincial and national economy.

7 ASSESSMENT AND EVALUATION OF POTENTIAL IMPACTS

7.1 LIST OF POTENTIAL IMPACTS

Potential environmental and socio-economic impacts were identified by Metago SLR and Everest. The impacts are discussed under issue headings in this section. All identified impacts are considered in a cumulative manner such that the current baseline conditions on site and in the surrounding area are discussed and assessed together.

List of impacts:

- Sterilization of a mineral resource (Section 7.2.1)
- Hazardous excavations/structures/surface subsidence (Section 7.2.2)
- Loss of soil resources and land capability through pollution (Section 7.2.3)
- Loss of soil resources and land capability through physical disturbance (Section 7.2.4)
- Physical disturbance of biodiversity (Section 7.2.5)
- General disturbance of biodiversity (Section 7.2.6)
- Pollution of surface water resources (Section 7.2.7)
- Alteration of drainage patterns (Section 7.2.8)
- Contamination of groundwater (Section 7.2.9)
- Dewatering (Section 7.2.10 and 7.2.11)
- Air pollution (Section 7.2.12)
- Noise pollution (Section 7.2.13)
- Visual impacts (Section 7.2.14)
- Impacts on heritage, cultural and paleontological resources (Section 7.2.15)
- Economic impact (Section 7.2.16)
- Inward migration impact (Section 7.2.17)
- Land use impacts (Section 7.2.18)
- Change in land values (Section 7.2.19)
- Blasting impacts (Section 7.2.20)
- Road disturbance and traffic safety (Section 7.2.21)

7.2 IMPACT RATING FOR EACH POTENTIAL IMPACT

The impact rating for each potential impact listed above (Section 7.1) is provided in the section below. The criteria used to rate each impact is outlined in Section 7.2.20. The potential impacts are rated with the assumption that no mitigation measures are applied and then again with mitigation. An indication of the phases in which the impact will occur is provided below and summarised in Section 7.4 together with the estimated timeframes for each rated impact.

GEOLOGY

7.2.1 ISSUE: LOSS AND STERILISATION OF MINERAL RESOURCES

Introduction

Mineral resources can be sterilized and/or lost through the placement of infrastructure and activities in close proximity to mineral resources, by preventing access to potential mining areas, and through the disposal of mineral resources onto waste facilities.

In the normal course of mining a certain degree of sterilisation is required to ensure safe underground workings. Typically mines sterilise resources by leaving support pillars underground and by leaving safe barriers between the base of open pits and the roof of underlying mining areas. This routine sterilisation is not discussed further because it is necessarily linked to safe mining conditions at Everest.

By the nature of mining projects the geology is exploited for the target minerals. UG2 ore, including chromite reefs and mineralised partings, are currently mined at Everest. The approved EMP report (July 2003) identifies that while the geology of the Everest ore body will be permanently changed by mining, the changes in geology will not have significant negative impacts on the health and welfare of people, the well-being of surrounding plant and animal communities and the condition of other natural resources. Mining of the main Everest resource will not sterilise other mineral resources in the region of this ore body. In addition, both the PGMs and chromitite are extracted from the ore during the processing operations before depositing the tailings material on the tailings dam. The underground mining activities associated with the proposed Project Fairway will be similar in nature to the current mining operations.

As for the approved EMP report (July 2003), no assessment of impacts with respect to the loss and sterilisation of mineral resources is given, as the changes described above will not result in notable negative environmental impacts. The mining of the resource will ensure the continuation of the mine and the resulting socio-economic benefits (Section 7.2.16).

In addition Everest will ensure that provision is made to extract all minerals possible prior to final disposal onto the mineralised waste facilities. Where a lack of technological processes has caused minerals to be disposed onto the mineralised waste facilities, the option of reprocessing the facilities will be considered and implemented where feasible and technological possible.

TOPOGRAPHY

7.2.2 ISSUE: HAZARDOUS STRUCTURES / EXCAVATIONS/SURFACE SUBSIDENCE

Introduction

Hazardous excavations and infrastructure include all structures into or off which third parties and animals can fall and be harmed. Included in this category are facilities that can fail (such as tailings storage facilities and water dams). Hazardous excavations and infrastructure occur in all mine phases from construction through operation to decommissioning and closure. In the construction and decommissioning phases these hazardous excavations and infrastructure are usually temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long term hazardous excavations and infrastructure and the closure phase will present final land forms that are considered hazardous if left unmitigated.

In terms of surface subsidence, the original approved EMP report (approved July 2003) assessed that surface subsidence above the mine workings would not occur due to the support provided underground. However, in late 2008, subsidence, although shallow (20 cm), occurred at the mine above the original decline. The subsidence was as a result of a combination of factors: the mine experienced a rainfall event of 220 mm in one day and the excessive percolation of water into the mine weakened a geological infill layer. The infill layer is evident in the support pillars in a small upper area of the mine and combined with an increased dead weight due to the rain, the pillar strength was exceeded and the area became unstable and subsided. Following this event, the mine has since designed a new mine pillar layout based on numerical modelling to ensure that surface subsidence above the underground workings does not re-occur. This issue is not discussed further below.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
Earthworks Civil works Rehabilitation	Earthworks Civil works Exploration -sumps Tailings storage facilities Declines and box cuts Processing facilities Water storage and supply infrastructure Transport infrastructure Power supply infrastructure Rehabilitation	Earthworks Civil works Demolition Rehabilitation	Maintenance and aftercare of final land forms and rehabilitated areas

Rating of impact

Severity / nature

Hazardous excavations and structures are present at the existing mining operations and without mitigation (already implemented by the mine) these would present a potential risk of injury and/or death to both animals (wildlife and livestock) and third parties. Similarly, the proposed Project Fairway will present similar types of hazardous excavations and structures. In the unmitigated scenario, the potential risk of injury and/or death to both animals and third parties constitutes a high severity impact. With mitigation, the severity reduces to medium to low.

Duration

In the context of this assessment, death or permanent injury to a third party person or animal is considered a long term, permanent impact, regardless of the phase or mitigation applied.

Spatial scale / extent

For the most part, the direct impacts will occur within the Everest mine site, but the indirect impacts (for example, loss of income due to the death of a family member, loss of a food resource, financial pressure created by an injury) will extend to the communities to which the people/animals belong.

Consequence

In the unmitigated scenario, the consequence of this potential impact is high. With mitigation, the consequence reduces to high-medium.

Probability

Current mitigation measures focus on infrastructure safety design and implementation as well as on limiting access to third parties and animals which reduces the probability of the impact occurring during the current mining operations. These mitigation measures will be carried over to Project Fairway. The professionally engineered design of the tailings storage facilities and water dams (and implementation thereof) limits the risk of possible failure of these facilities. In addition, there are limited third party receptors, apart from the natural environment, downstream of these facilities. The implementation of the recommended mitigation measures amounts to a low probability. In the unmitigated scenario, where the mitigation measures are not consistently implemented, the impact probability is expected to increase.

Significance

In the unmitigated scenario, the significance of this potential impact is considered high. In the mitigated scenario, the significance of this potential impact is medium to low because there will be a reduction in the probability that the impact occurs.

Unmitigated – summary of the rated impact per phase of the mine, including Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	M	H

Mitigated – summary of the rated impact per phase of the mine, including Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Mitigated	M-L	H	M	H-M	L	M-L

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Sections 19).

Objective

The objective of the mitigation measures is to prevent physical harm to third parties and animals from hazardous excavations and infrastructure.

Actions

All existing and proposed mineralise waste facilities and water dams will be designed, constructed, operated and closed in a manner to ensure stability related safety risks to third parties and animals are addressed. It will furthermore be monitored according to a schedule that is deemed relevant to the type of facility by a professional engineer.

AQPSA will survey its surface use area and update its surface use area map on a routine basis to ensure that the position and extent of all potential hazardous excavations, hazardous infrastructure and subsidence is known. It will furthermore ensure that appropriate management measures are taken to address the related safety risks to third parties and animals.

During construction and operation, the safety risks associated with identified hazardous excavations, subsidence and infrastructure will be addressed through on or more of the following:

- Fencing, berms, barriers and/or security personnel to prevent unauthorised access;
- Warning signs in English, Afrikaans and SePedi. Warning pictures can be used as an alternative.

Third parties will only have access to safety risk areas on site if accompanied by a mine representative or after completing the relevant safety induction appropriate to the area being visited.

During operation and decommissioning, adequate support will be provided in the underground workings to ensure that there is no subsidence. A professional rock engineer will design pillar dimensions for underground support and to ensure no subsidence. The mine will contact the DMR's Directorate of Mine

Surveyors to obtain specifications for the monitoring of subsidence above mine workings. The mine will then monitor subsidence according to these specifications. If subsidence is detected, the mine will immediately identify the cause and implement appropriate mitigation measures to prevent further subsidence. Where necessary, land disturbed by subsidence will be landscaped.

During construction, operation and decommissioning, any hazardous structure or excavations will be rehabilitated as soon as practically possible.

During decommissioning planning of any part of the mine, provision will be made to address long term safety risks in the decommissioning and rehabilitation phases.

At closure of any part of the mine, the hazardous infrastructure will either have been removed or decommissioned and rehabilitated in a manner that it does not presents a long term safety and/or stability risk.

At closure of any part of the mine the hazardous excavations and subsidence will have been dealt with as follows:

- All decline openings and ventilation shafts will have been sealed and rehabilitated;
- The potential for surface subsidence will have been addressed by providing underground support in mined out areas;
- Monitoring and maintenance will take place to observe whether the relevant long term safety objectives have been achieved and to identify the need for additional intervention where the objectives have not been met.

Where AQPSA has caused injury or death to third parties and/or animals, appropriate compensation will be provided.

Emergency situations

If people or animals fall off or into hazardous excavations or infrastructure causing injury, or if any mineralised waste or water facilities fail causing injury to people or animals, the Everest emergency response procedure will be initiated.

SOILS AND LAND CAPABILITY

Soils are a significant component of most ecosystems. As an ecological driver, soil is the medium in which most vegetation grows and a range of vertebrates and invertebrates exist. In the context of mining, soil is even more significant if one considers that mining is a temporary land use where-after rehabilitation (using soil) is the key to re-establishing post closure land capability that will support post closure land use objectives.

7.2.3 ISSUE: LOSS OF SOIL RESOURCES AND LAND CAPABILITY THROUGH POLLUTION

Introduction

There are a number of potential sources that could pollute soils and reduce land capability in all phases, particularly in the unmitigated scenario. In the construction and decommissioning phases these potential pollution sources are temporary in nature, usually existing for a few weeks to a few months. Although the sources are temporary in nature, the potential related pollution can have long term effects. The operational phase will present more long term potential sources while the closure phase will present final land forms that may have the potential to contaminate soils through long term seepage and/or run-off.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Rehabilitation	Earthworks Civil works Exploration Site management Transport systems Non-mineralised waste management Support services and amenities Tailings dam Water supply infrastructure Power supply infrastructure Rehabilitation	Demolition Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Tailings dam Water supply infrastructure Power supply infrastructure Rehabilitation	Maintenance and aftercare of final land forms and rehabilitated areas

Rating of impact

Severity / nature

If unmitigated, the contamination of soil resources during current operations can result in a loss of soil functionality as an ecological driver and may impact on the soils ability to sustain ecological systems post-mining. The use and handling of fuels, lubricants, other potential contaminants and poor waste management could result in a permanent loss of soil resources. Potential seepage and/or dirty runoff from residue waste stockpiles could alter the soil composition, negatively impacting on the chemistry of the soils and thereby impairing growth conditions. Although there is limited potential for acid rock drainage (see Section 3.3), high concentrations of suspended solids and dissolved salts within these seepage/runoff waters could negatively impact soil resources.

Project Fairway will contribute additional similar type pollution sources given that the project scope is similar to that of the existing operations. Potential seepage from the proposed TSF can also result in the contamination of soils. As with any mining operation, incidents of soil pollution (mostly related to hydrocarbons and fuels) have occurred at the mine but in most instances these have been remediated in line with the mine's incident and spillage management procedures. No significant soil pollution has been detected from seepage or spillage of tailings or dirty water systems from the existing operations. Without the implementation of mitigation measures (already in place for the current operations and proposed for the project) the contamination of soil resources would result in a high severity impact. In the mitigated scenario, the nature and number of pollution events should be significantly less which will reduce the potential severity to low.

Duration

In the unmitigated scenario, most pollution impacts and associated loss in functionality will remain long after closure. In the mitigated scenario most of these potential impacts should either be avoided or be remedied within the life of the mine. Important related issues are the reaction time of the clean-up team and the chosen remediation methods.

Spatial scale / extent

In the unmitigated scenario, spillages of chemical, fuels and/or oil (especially in the steep valley terrain) and seepage or spillage from the tailings and dirty water systems (pipelines and dams) could pollute soils beyond the site boundary. In the mitigated scenario, potential soil pollution will be restricted within the site boundary, for all project phases.

Consequence

In the unmitigated scenario, the consequence of this potential impact is high. In the mitigated scenario, the consequence reduces to low because the severity, duration and spatial scale of potential impacts is reduced.

Probability

Without any mitigation the probability of impacting on soils through pollution events is likely to be definite and frequent. With mitigation, including the current practises at Everest, the probability will be significantly reduced to low because emphasis will be placed on preventing pollution events and on quick and effective containment and remediation if a pollution event does occur.

Significance

The unmitigated significance for the mine, including Project Fairway is high for all phases. With the implementation of the mitigation measures recommended below, the significance is reduced to low.

Unmitigated – summary of the rated impact per phase of the mine and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	M	H

Mitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Mitigated	L	L	L	L	L	L

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 19).

Objective

The objective of the measures is to prevent pollution of soils.

Actions

In the construction, operation and decommissioning phases the mine will ensure that all hazardous chemicals (new and used), dirty water, mineralised wastes and non-mineralised wastes are transported, handled and stored in a manner that they do not pollute soils. This will be implemented through a procedure(s) covering the following:

- Pollution prevention through basic infrastructure design (adequate sanitary and non-mineralised waste management facilities, hazardous substance management, mineralised waste management, impermeable substrates, bunds, spillage control and containment, collection facilities, stormwater control, dirty water systems);
- Pollution prevention through maintenance of equipment and vehicles;
- Pollution prevention through education and training of workers (permanent and temporary);
- Pollution prevention through appropriate management of hazardous materials and wastes – cognisance will be taken of the principles outlined in Table 7-1;
- The required steps to enable fast reaction to contain and remediate pollution incidents. In this regard the remediation options include containment and in situ treatment or disposal of contaminated soils as hazardous waste. In-situ treatment is generally considered to be the preferred option because with successful in situ remediation the soil resource will be retained in the correct place. The in situ options include bioremediation at the point of pollution, or removal of soils for washing and/or bio remediation at a designated area after which the soils are returned; and
- Specifications for post rehabilitation audit criteria to ascertain whether the remediation of any polluted soils and re-establishment of soil functionality has been successful and if not, to recommend and implement further measures.

TABLE 7-1: NON-MINERALISED WASTE MANAGEMENT PRINCIPLES

Items to be considered		Intentions
General	**Specific**	
Classification and record keeping	General	The waste management procedure for the mine will cover the storage, handling and transportation of waste to and from the mine. The mine will ensure that the contractor's responsible are made aware of these procedures.
	Waste opportunity analysis	In line with DWAFs' strategy to eliminate waste streams in the longer term, the mine will assess each waste type to see whether there are alternative uses for the material. This will be done as a priority before the disposal option.
	Classification	Wastes will be broadly classified in terms of the DWAF Minimum Requirements for Waste Disposal (DWAF, 1998).
	Waste minimisation and recycling	Opportunities to minimise waste production will be identified and taken where possible. Where possible wastes will be recycled.
Waste disposal facilities	Collection points	Designated waste collection points will be established on site. Care will be taken to ensure that there will be sufficient collection points with adequate capacity and that these are serviced frequently.
	On site waste disposal facilities	At present there is no intention to develop waste disposal facilities on site. No waste disposal facility will be developed by the mine without the relevant permissions. These permissions include an environmental authorisation (from DALA) in terms of the National Environmental Management Act and a waste permit (from DEAT) in terms of the Environment Conservation Act.
	Offsite waste disposal facilities	Waste will be disposed of at appropriate permitted waste disposal facilities as outlined below. For general waste the closest permitted site is Lydenburg. For hazardous waste the closest permitted site is at Holfontein.
Waste transport	Contractor	An approved waste management subcontractor, working to local authority standards, will undertake the waste transport.
Disposal of different types of waste	Hazardous wastes	Disposal at a permitted hazardous waste disposal facility.
	Non-hazardous waste	Disposal at a permitted non-hazardous waste disposal facility.
	Any soil polluted by a spill	If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriately qualified specialist. If remediation of the soil in situ is not possible, the soils will be classified as a waste in terms of the Minimum Requirements and will be disposed of at an appropriate permitted waste facility. After removal of the contaminated soils, the affected areas will be landscaped and rehabilitated.
	Building rubble	Care will be taken to ensure that building rubble does not become polluted or mixed with any other waste. The building rubble will be used to backfill excavations.

Items to be considered		Intentions
General	Specific	
	Laydown areas	During decommissioning and closure, lay down areas for re-usable non-hazardous materials will be established. Mixing of re-usable materials with other wastes, especially hazardous wastes will be prevented.
	Scrap metal	Care will be taken to ensure that scrap metal does not become polluted or mixed with any other waste. The scrap metal will be collected in a designated area for scrap metal (scrap yard). It will be sold to scrap dealers.
	Oil and grease	Oil and grease will be collected in suitable containers at designated collection points. The collection points will be bunded and underlain by impervious materials to ensure that any spills are contained. Notices will be erected at each waste oil point giving instructions on the procedure for waste oil discharge and collection. An approved subcontractor will remove oil from site.
Banned practices	Long-term stockpiling of waste	Stockpiling of waste is a temporary measure. Waste stockpiling sites must have an impervious floor, be bunded and have a drainage system for collection and containment of water on the site.
	Burying of waste	No wastes other than mine residues will be placed on site.
	Burning of waste	Waste may only be burned in legally approved incinerators.

The designs of any permanent and potentially polluting structures (mineralised waste facilities) will take account of the requirements for long term soil pollution prevention, land function and confirmatory monitoring.

Emergency situations

Major spillage incidents will be handled in accordance with the Everest emergency response procedure.

7.2.4 ISSUE: LOSS OF SOIL RESOURCES AND LAND CAPABILITY THROUGH PHYSICAL DISTURBANCE

Introduction

There are a number of activities/infrastructure in all phases that have the potential to disturb soils and related land capability through removal, compaction and/or erosion. The total current mine footprint disturbance area is approximately 160 hectares. The area of disturbance for the proposed Project Fairway is approximately 360 ha. In the construction and decommissioning phases these activities could be temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long term activities and the closure phase will present final land forms that may be susceptible to erosion.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
Earthworks - for all surface infrastructure Site management Transport systems Support services and amenities Rehabilitation	Earthworks - for all surface infrastructure Exploration Site management Transport systems Non-mineralised waste management Support services and amenities Tailings dam Water supply infrastructure Power supply infrastructure Rehabilitation	Demolition Earthworks Site management Transport systems Non-mineralised waste management Support services and amenities Tailings dam Water supply infrastructure Power supply infrastructure Rehabilitation	Maintenance and aftercare of final land forms and rehabilitated areas

Rating of impact

<u>Severity / nature</u>

In the unmitigated scenario, physical soil disturbance can result in a loss of soil functionality as an ecological driver. In the case of erosion, the soils will be lost to the area of disturbance, and in the case of compaction the soils functionality will firstly be compromised through a lack of rooting ability and aeration, and secondly the compacted soils are likely to erode because with less inherent functionality there will be little chance for the establishment of vegetation and other matter that naturally protects the soils from erosion. The natural slope gradients at the mine add to the erosion potential. The topography associated with the proposed Project Fairway is generally considered to comprise of steep slopes due to its locality within the Groot Dwars valley, therefore the erosion potential of disturbed areas (i.e. the Valley Access road, the proposed box cuts and associated infrastructure and the proposed surface infrastructure at the existing valley decline) is considered to be high. Any soils that remain beneath the permanent landforms (e.g. existing and proposed TSF) will be compacted and a lost resource. The construction of the proposed TSF will result in the permanent loss of soil with arable land capability where crops could be cultivated. Furthermore, the proposed TSF will result in the loss of soils with hydromorphic properties that sustain wetland functioning. Considering the erosion potential of the project area and the loss of soils with arable and wetland land capability, the unmitigated severity of this impact is high. In the mitigated scenario, the soil is conserved, replaced and the functionality restored (with the exception of the proposed TSF area) which reduces the severity of the impact to medium.

<u>Duration</u>

In the unmitigated scenario the loss of soil and related functionality is long term and will continue after the life of the mine. In the mitigated scenario, the soil is conserved, replaced and the functionality restored which reduces the duration of the impact to medium. However the construction of the proposed TSF will result in the permanent loss of soil with arable and wetland land capability.

Spatial scale / extent

Physical disturbance of the soil will be restricted to the area of direct influence of the infrastructure/activities associated with the mine.

Consequence

In the unmitigated scenario, the consequence of this potential impact is high. In the mitigated scenario this reduces to medium because the severity and duration of the impacts are reduced (with the exception of the soils in the locality of the proposed TSF).

Probability

Without any mitigation the probability of losing soil and its functionality is definite. With mitigation, the probability is reduced because emphasis is placed on soil conservation and function re-establishment (excluding the proposed TSF area).

Significance

In the unmitigated scenario, the significance of this potential impact is high. In the mitigated scenario, the significance is reduced to medium because although soils can be conserved and replaced in most areas, this is not true for the soils beneath the proposed TSF.

Unmitigated – summary of the rated impact per phase of the mine, including Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	L	H	H	H

Mitigated – summary of the rated impact per phase of the mine, including Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Mitigated	M	M	L	M	M	M

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 19).

Objective

The objective of the measures is to minimise the loss of soil resources and related functionality through physical disturbance, erosion and compaction.

Actions

In the construction, operation and decommissioning phases a soil management plan, with the following key components, will be implemented:

- Limit the disturbance of soils to what is absolutely necessary for earthworks, on-going activities, infrastructure footprints and use of vehicles; and
- Where soils have to be disturbed the soil will be stripped, stored, maintained and replaced in accordance with the specifications of the soil management principles in Table 7-2.
- To control erosion in disturbed areas, the mine will:
    - Establish vegetation in disturbed areas as soon as is practical. Where disturbed areas cannot be re-vegetated during the life of the mine appropriate measures will be taken to control erosion. These may include: contours; berms; runoff diversion canals; energy dissipaters; and application of straw mulches or soil binders to exposed soils.
    - Implement the Department of Agriculture requirements in the design of effective erosion control measures on bare soils as follows:
        - Erosion control measures, such as contours, are required in all areas where slope gradients exceed 2% (1:50)
        - Engineered erosion control measures are required where slope gradients exceed 7% (1:15).
    - The mine will ensure that erosion controls are included in the designs of linear infrastructure and points of water discharge. Linear infrastructure will be inspected on a weekly basis to check that the associated water management infrastructure is effective in controlling erosion.
    - Energy dissipaters will be constructed at points where there are concentrated discharges of water to the environment (such as culverts and outflows of water from diversion berms or canals).
- Consideration should be given to incorporate stripped topsoil as part of the on-site nursery where relocated flora species are transplanted so as to maintain soil functionality.

TABLE 7-2: SOIL STOCKPILE MANAGEMENT PRINCIPLES

Steps	Considerations	Detail
Delineation of areas to be stripped		Stripping will only occur where soils are to be disturbed and when an end-use for the stripped soil has been identified.
Delineation of stockpiling areas	Location and footprint	Suitable stockpiling areas will be identified, preferably in close proximity to the source of the topsoil. The areas will be calculated on the basis of the expected soil volume.
	Storm water controls	Stockpiles will be established within the bounds of stormwater management infrastructure.
	Designation of the areas	Soil stockpiles will be clearly identified as such.
Stripping	Invasive vegetation	Invasive plants, such as wattle will be removed, before topsoil is stripped.
	Timing	Vegetation clearing and topsoil stripping will be avoided during the rainy season when chances of runoff and water erosion are highest.
	Topsoil	The top 200 to 500 mm of soil (‘topsoil’) will be stripped first and put aside, together with any vegetation cover present (only large bushes to be removed prior to stripping).

Steps	Considerations	Detail
Stockpiles	Topsoil/ subsoil	Topsoil will be stockpiled separately from any subsoils and rock.
	Erosion control	Rapid growth of vegetation on the stockpiles will be promoted (by means of watering to prevent erosion by water and wind.
	Waste	No waste material will be placed on the soil stockpiles.
	Prevention of compaction	To avoid compaction and consequent damage to the soils, equipment movement on the stockpiles will be limited and the height of the stockpiles will not exceed 5 m.
Rehabilitation of disturbed land: restoration of land capability	Replacement of topsoil at other sites	At least 200 mm will be placed on disturbed sites to facilitate rehabilitation of disturbed land. At least 500 mm will be placed on disturbed sites that are to be returned to arable land capability.
	Fertilisation	Samples of stripped soils will be analysed to determine the nutrient status. Fertilisers will be applied if/ as required.
	Erosion control	Erosion control measures will be implemented to ensure that the topsoil is not washed away and erosion gulleys do not develop in the arable land.

As part of closure planning, the designs of any permanent landforms (e.g. mineralised waste facilities) will take into consideration the requirements for land function, long term erosion prevention and confirmatory monitoring.

Emergency situations

None identified.

BIODIVERSITY (FLORA AND FAUNA)

In the broadest sense, biodiversity provides value for ecosystem functionality, aesthetic, spiritual, cultural, and recreational reasons. The known ecosystem related value is listed as follows:

- Soil formation and fertility maintenance;
- Primary production through photosynthesis, as the supportive foundation for all life;
- Provision of food and fuel;
- Provision of shelter and building materials;
- Regulation of water flows and water quality;
- Regulation and purification of atmospheric gases;
- Moderation of climate and weather;
- Control of pests and diseases; and
- Maintenance of genetic resources (key for medicines, crop and livestock breeding).

The proposed Project Fairway project area has both habitat and species richness. In this context species richness refers to both flora and fauna species. The assessment covers the following broad topics: physical destruction of biodiversity and related functions and general disturbances to biodiversity. Each of these topics is individually assessed below.

It must also be noted that the secondary impacts on biodiversity associated with soil erosion, soil compaction, and physical disturbance and pollution of soils have already been assessed in Sections 7.2.3 and 7.2.4 and will not be repeated below.

7.2.5 ISSUE: PHYSICAL DESTRUCTION OF BIODIVERSITY (TERRESTRIAL AND AQUATIC)

Introduction

There are a number of activities/infrastructure in all phases that have the potential to destroy biodiversity in the broadest sense. In this regard, the discussion relates to the physical destruction of specific biodiversity areas, of linkages between biodiversity areas and related species which are considered to be significant because of their status, and/or the role that they play in the ecosystem.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
Site preparation Earthworks for all surface infrastructure Site management Transport systems Support services and amenities Site management Rehabilitation	Site preparation Earthworks - for all surface infrastructure Exploration Site management Transport systems Non-mineralised waste management Support services and amenities Site management Tailings Storage Facility (existing and proposed) Water supply infrastructure Power supply infrastructure Rehabilitation	Site preparation Demolition Earthworks Site management Transport systems Non-mineralised waste management Support services and amenities Site management Tailings Storage Facility (existing and proposed) Water supply infrastructure Rehabilitation	Maintenance and aftercare of final land forms and rehabilitated areas

Rating of impact

<u>Severity / nature</u>

The terrace on which the current mine is located is considered to have a biodiversity ranging from highly disturbed (due to historic and current forestation and cultivation activities) to pristine (generally the steeper areas of the Steenkampsberge and Groot Dwars River valley). The majority of the existing mine infrastructure is located in the previously disturbed areas on the terrace. However, the development of the existing valley decline and associated service road did result in the destruction of sensitive habitats and associated fauna unable to move away from the area. Furthermore, the service road linking the valley decline to the mine operations on the terrace crosses a number of ephemeral tributaries, some associated with midslope seepage wetlands (in good ecological state) and some temporary seepage areas (with limited wetland function).

With respect to the proposed Project Fairway, the proposed location of infrastructure can be grouped into three general areas:

- The proposed Waterfall and Buttonshope South and North box cuts (and associated supporting infrastructure) within the Groot Dwars River valley;
- The proposed TSF, EPM South box cut, DMS plant and associated infrastructure located on the terrace; and
- The proposed surface infrastructure at the existing valley decline and the Valley Access road which links the current mine located on the terrace with the proposed box cuts in the Groot Dwars River valley.

The Groot Dwars River valley is considered to be a pristine and highly sensitive environment, therefore the development of the proposed Waterfall and Buttonshope South and North box cuts and the Valley Access road in this area is potentially significant from a biodiversity perspective. Sensitive communities (habitats, flora and fauna) identified within the proposed infrastructure localities include riparian and wetland habitat associated with the Groot Dwars River and perennial and non-perennial tributaries, a possibly important breeding ground for the rare cicada *Pycna Sylvia*, Red Data Listed flora (7 species confirmed to be present and a further 14 species with a high probability of occurring), vertebrates (3 species confirmed to be present and a further 14 species with a high probability of occurring), and invertebrates (1 species confirmed to be present and several un-described species), as well as several other fauna and flora species protected in terms of the NEM:BA and the Mpumalanga Nature Conservation Act of 1998 (Act 10 of 1998).

In the unmitigated scenario, the natural vegetation/habitat and associated fauna (representing highly diverse and undisturbed ecological systems within the Groot Dwars River valley) within the proposed project footprint will either be completed destroyed and/or severely deteriorated. The encroachment of mining activity footprints into the Groot Dwars River valley is therefore considered to have a high severity. With mitigation, rehabilitation of project infrastructure footprints will take place in the decommissioning and closure phases, where all surface infrastructure will be removed and rehabilitation of the infrastructure footprints will take place, which will reduce the severity. However, even with the implementation of rehabilitation, the diversity and conservation value of the re-established vegetation communities and associated ecosystems may never be restored.

The proposed Project Fairway infrastructure located on the terrace is predominately located within areas which have been disturbed by previous agricultural activities, as well as the current mining activities. The proposed DMS plant is to be located in the same area as the existing processing plant, therefore no impacts are associated with the physical destruction of biodiversity are anticipated. The proposed EPM South box cut is located in close proximity to the existing south decline and service road leading to the valley decline. The area where the proposed valley surface infrastructure is located was disturbed during the establishment of the valley decline. The proposed TSF will impact on an area which has already been disturbed by agricultural activities (presence of the Kiwifruit plantation). Even though the agricultural activities have already disturbed this area the TSF will exacerbate the situation which is likely to result in additional fragmentation of the wetland complex and loss of wetland functioning. The unmitigated severity for the physical destruction of biodiversity on the terrace and at the existing valley decline is considered to be medium. With mitigation, the severity of impacts reduces to low.

Duration

In the unmitigated scenario, the loss of biodiversity and related functionality is long term and will continue after the life of the mine. In the mitigated scenario the biodiversity and related functionality may be restored during the decommissioning and closure phases, however it not known whether this will be the case within the Groot Dwars River valley. The duration is therefore high unmitigated and medium to high in the mitigated scenario. For the activities on the terrace, the mitigated duration is expected to be medium.

Spatial scale / extent

Given that biodiversity processes are not confined to the project site and the potential for edge effects exist, the spatial scale of impacts will extend beyond the site boundary in the unmitigated scenario. With mitigation, the physical destruction of biodiversity will be restricted to the proposed project infrastructure footprints.

Consequence

In the unmitigated scenario, the consequence of this potential impact is high. With the implementation of mitigation the consequence will reduce to medium for activities within the Groot Dwars River valley, while the mitigated consequence of the activities proposed on the terrace is low.

Probability

Without mitigation the probability associated with the impacts is definite. With mitigation, the probability may be reduced because the emphasis will be placed on limiting the project infrastructure footprints, conserving linkage areas and restoring disturbed areas. In this regard, some uncertainty remains about the realistic chances of effectively achieving either the conservation or the restoration in the longer term of the more sensitive ecosystems within the Groot Dwars Valley.

Significance

In all project phases, the significance of the unmitigated scenario is high. With mitigation this reduces to medium for activities within the Groot Dwars River valley although there is uncertainty as to whether the pre-mining ecology and species diversity can be restored following rehabilitation. For the proposed activities on the terrace the significance reduces to low.

Unmitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases - Groot Dwars River valley						
Unmitigated	H	H	M	H	H	H
All phases - Terrace						
Unmitigated	M	H	M	H	H	H

Mitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases- Groot Dwars River valley						
Mitigated	M	H - M	L	M	M	M
All phases - Terrace						
Mitigated	L	M	L	L	L	L

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided in the section below and tabulated in the EMP (Section 19).

Objective

The objective of the mitigation measures is to prevent the unacceptable loss of biodiversity and related ecosystem functionality through physical destruction and disturbance.

Actions

Mine staff will be made aware the following plant habitats close to the mine site need to be protected from disturbance:

- the Ridge Grassland on the ridge above the ore body;
- the Protea Woodland to the south and south-east of the plant and existing tailings dam area;
- all the natural vegetation outside of the proposed Project Fairway infrastructure footprints within the Groot Dwars River valley;
- the wetland and riparian zones associated with all perennial and non-perennial tributaries, especially the Groot Dwars River, West Stream and East Stream.

An appropriately qualified vegetation specialist will be appointed to check these habitats mentioned above on a quarterly basis to see that they are not being disturbed by mining-related activities and there is no encroachment of invasive plants into these habitats. Vehicle movement off road in the habitats mentioned above will be prohibited.

An appropriately qualified zoologist will be appointed to clear all active burrows at the sites of mine infrastructure before construction and mining activities commence.

A herpetologist will be appointed to undertake search and rescue operations at the potentially affected rocky outcrops before the construction phase of mining commences.

The number of stream crossings will be minimised and culverts will be designed so that they do not alter flow in the stream. Stream crossings will be inspected for erosion and damaged areas will be repaired immediately.

The mine will implement a biodiversity action plan that will be refined and implemented in consultation with the biodiversity expertise and resources of an ecological specialist and the MTPA and comply with the requirements of the National Environmental Management: Biodiversity Act (Act 10 of 2004). This action plan will aim at preserving and restoring the natural ecology of the area. This action plan will be in place prior to the commencement of the project and it will include additional detail on the following management actions:

- To limit mine infrastructure, activities and related surface disturbances to those specifically identified and described in the approved original EMP and subsequent amendments, this EIA and EMP consolidation report with controlled access and zero tolerance of disturbances to vegetation communities outside of the project boundaries. This can be achieved by fencing footprint areas to contain all activities within designated areas. All activity must be, as far as possible, situated outside of the 100 m buffer zones around the wetland and riparian zones, unless encroachment of the 100 m or 1:100 year floodline has been authorised by the DWA and/or competent authority identified in terms of NEMA. Activities that are likely to disturb streams should start upstream and work downstream so that the recovery process can start immediately without further disturbance from upstream disturbance.
- To develop and implement a Biodiversity Offset Plan prior to the commencement of the proposed project. The mine commits to offsetting 10 hectares for every hectare disturbed for new approvals granted. The biodiversity offset should be undertaken as near to the mining operation as possible, within the within the Sekhukhuneland Centre of Plant Endemism (SCPE), in order to improve the effectiveness of the offset. This should preferably be done in conjunction with adjacent landowners/nearby mining operations to ensure that a substantial area is conserved. The option of declaring a Special Nature Reserve should be investigated. The area must be conserved in perpetuity and must be protected by appropriate legislation.

- Where the roads will cross drainage lines, the engineering design work of culverts and stormwater controls will be done in consultation with a qualified ecologist with water course related expertise to limit the destruction of habitat and species and to promote re-establishment thereof. Where possible, pebbles, rocks and biodiversity will be re-established and the crossing routes will be scanned for sensitive fauna and flora prior to construction.
- There will be planning on the removal of fauna and flora (plants and seeds) species prior to disturbance by mining activities and infrastructure. This will include planning on the collection, preservation, cultivation and re-use of these species in on-going restoration practices. Special attention will be paid to conservation-important species (flora and fauna) and also ensuring the regrowth of fauna-specific plants, especially conservation-important fauna. Links will also be made to the soil conservation procedure and actions.
- The mine will obtain permits from the relevant authorities for the removal or destruction of any protected plant species in accordance with the Mpumalanga Nature Conservation Act, the National Forests Act (Act 84 of 1998) and National Environmental Management: Biodiversity Act (Act 10 of 2004).
- A rescue and relocation handbook will be developed by a suitably qualified specialist to inform the identification and relocation of impotant flora species from the proposed Project Fairway infrastructure footpints. The handbook will be a living document which is updated as, and when necessary which, amongst other information, provides means for the identification of important flora species and details how the relocation process should be undertaken.
- The existing nursery will continue and be further developed wherein on-site tree and forb species are cultivated and utilised during rehabilitation processes. Where possible plants from the project sites will be relocated to the nursery. The nursery will be sited such that it provides a variety of habitats to support the potential relocated species. Where necessary this will be done in consultation with an appropriately qualified specialist. Consideration should be given to incorporate topsoil stockpiles as part of the nursery so as to maintain soil functionality.
- Implementation of an alien/invasive/weed management programme in collaboration with the Department of Agriculture, DWA and Working for Water to control the spread of these plants onto disturbed areas to control the spread of these plants onto and from disturbed areas through active eradication, establishment of natural species and through on-going monitoring and assessment. Invasive plants will be removed from land adjacent to mine infrastructure sites, up to 500 m from the mine infrastructure sites. This programme must comply with existing legislation, namely amendments to the regulations under the Conservation of Agricultural Resources Act (Act 43 of 1983) and Section 28 of NEMA. In this regard, the use of herbicides will be limited and will only be used under strict controls if alternative less intrusive eradication methods are not successful. Care will be taken to prevent the encroachment of alien plant species into rehabilitated areas.
- AQPSA will establish a biodiversity research centre in the region. The purpose of the research centre is to provide scientists with the facilities and opportunity to undertake studies on the biodiversity

located within the Groot Dwars River valley and the Sekhukhuneland Centre of Plant Endemism (SCPE). Potential fields of research can include studies regarding the propogation of endmic flora species for use in rehabilitation at the mine and understanding the life cycle of the *Pynca Sylvia* cicada.

- AQPSA must set up and undertake biodiversity monitoring (see programme in Section 21.1.4), this monitoring programme should include an invertebrate component. On-going aquatic biomonitoring of the surface water features upstream and downstream of the proposed TSF is deemed essential to monitoring impacts on the in stream ecology.
- The mine will aim at achieving the rehabilitation targets set out in Section 21.1.4.

Protection of wetlands:

- Prospecting roads will be routed to avoid unnecessary steep gradients.
- Stream crossings and mobilisation of sediments will be minimised by using drainage pipes, culverts or large cobbles.
- 100 m buffer zones of natural vegetation will be implemented either side of streams and riparian zones, where possible.
- Stormwater from the road and other stormwater will be diverted into natural vegetation buffer zones before discharging into streams.
- Bulldozing soils into streams or wetlands will be avoided.

AQPSA will consider rehabilitation of the riparian wetland along West Stream through removal of existing drainage furrows and berms in the seasonal and permanent zones of the wetland (Such furrows are present below the walls of the Ackerman and TKO Dams, they prevent an even distribution of sub-surface and surface water flow and can cause desiccation of the wetlands and loss of functionality and change in vegetal cover).

When upgrading the East Stream road crossing, AQPSA will consider rehabilitation of the stream to prevent further degradation. This would require upgrading the existing road crossings to allow free flow of floodwaters, and the construction of gabions and/or introduction of straw bales at key erosion points.

Rehabilitation of in-stream habitats should aim to recreate the same mix of habitats that was present prior to the development. Where possible, activities that are likely to disturb the streams should start upstream and work downstream, so that the recovery process can start immediately, without further disturbance from upstream disturbance.

If it is absolutely unavoidable that some encroachment into wetland areas occurs, measures to offset wetland impacts should take place by formally conserving other wetland resources in the upper Steelpoort River catchment.

Prior to decommissioning and closure of the mine, a detailed rehabilitation plan must be developed in conjunction with the closure plan prepared for the mine. The rehabilitation plan should include the following:

- Indigenous trees, grass and forb species as found within the project area will be utilised for rehabilitation. It is deemed essential that a suitably qualified ecologist make up part of the team tasked with the development of the closure plan.
- Generally, where vegetation is to be planted, a mixture of commercially available seeds that germinate reliably (high seed viability) will be used. The species to be used will be indigenous (no exotic plant species will be used) and will be selected on the basis of their ability to bind and cover soil (afford erosion protection) and their tolerance of prevailing environmental conditions. Species that can become invasive or a problem in the future cultivation of the rehabilitated land will be avoided. Species that will enhance the arable potential of soils will be used where possible.
- The designs of any permanent structures (mineralised waste facilities) will take into consideration the requirements for the establishment of long term species diversity, ecosystem functionality, aftercare and confirmatory monitoring.
- Areas should be reseeded with indigenous grasses as required. All rehabilitated areas should be rehabilitated to a point where natural processes will allow the pre-development ecological functioning and biodiversity of the area to be re-instated.
- Ensure all areas affected by construction and operational activities should be rehabilitated upon closure of the mine and that rehabilitated areas are rehabilitated to a point where natural processes will allow the pre-development ecological functioning and biodiversity of the area to be re-instated.
- A monitoring plan to determine the efficacy of the rehabilitation exercise must be implemented.

AQPSA will participate in a conservancy if a conservancy is established in the region and it overlaps with the project area.

Continued monitoring of the rehabilitated pit areas after mining operations have ceased until mine closure will be conducted. Repeat surveys will be carried out annually for at least the first three years post-rehabilitation, after which the frequency the may be reduced, initially to every second year and then every 3-5 years until rehabilitation targets have been reached.

Emergency situations

None identified.

7.2.6 ISSUE: GENERAL DISTURBANCE OF BIODIVERSITY

Introduction

There are a number of activities/infrastructure that have the potential to directly disturb vegetation, vertebrates and invertebrates in all mine phases, particularly in the unmitigated scenario. In the construction and decommissioning phases these activities are temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long term occurrences and the closure phase will present final land forms that may have pollution potential through long term seepage and/or run-off. It is in this context that impacts as a result of general disturbance of biodiversity are assessed below. Potential impacts on the baseflow of surface water features, particularly the Groot Dwars River, as a result of dewatering activities may negatively impact certain species (particularly aquatic species). Impacts on the baseflow of have been assessed in Section 7.2.11 and will not be repeated below.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
Site preparation Earthworks for all surface infrastructure Site management Transport systems Support services and amenities Site management Rehabilitation	Site preparation Earthworks - for all surface infrastructure Exploration Site management Transport systems Non-mineralised waste management Support services and amenities Site management Open pit mining (former) Declines (current and proposed) Processing Plant Tailings Storage Facility (existing and proposed) Water supply infrastructure Power supply infrastructure Rehabilitation	Site preparation Demolition Earthworks Site management Transport systems Non-mineralised waste management Support services and amenities Site management Waste rock dumps Tailings Storage Facility (existing and proposed) Water supply infrastructure Rehabilitation	Maintenance and aftercare of final land forms and rehabilitated areas

Rating of impact

<u>Severity / nature</u>

In the unmitigated scenario, biodiversity will be disturbed in the following ways:

- White light attracts large numbers of invertebrates which become easy prey for predators. This can upset the invertebrate population balances. Other impacts may include interference with normal foraging and mating behaviour;
- Power lines can lead to bird kills;
- People may kill various types of species for food, for sport, for fire wood, etc.;

- People may illegally collect and remove vegetation, vertebrate and invertebrate species;
- Excessive dust fallout from various dust sources may have adverse effects on the growth of some vegetation, and it may cause varying stress on the teeth of vertebrates that have to graze soiled vegetation;
- Noise and vibration pollution may scare off vertebrates and invertebrates. In some instances the animals may be deterred from passing close to noisy activities which can effectively block some of their migration paths. In other instances, vertebrates and invertebrates that rely on vibration and noise senses to locate, and hunt, prey may be forced to leave the vicinity of noisy, vibrating activities. Furthermore the impact of noise and vibrations on the breeding lifecycle of the rare cicada *Pycna sylvia* is unknown at this stage;
- The presence of vehicles in the area can cause road kills especially if drivers speed;
- The presence of mine water impoundments and pipelines may lead to drowning of fauna; and
- Pollution emissions and general litter may directly impact on the survival of individual plants, vertebrates and invertebrates.

In addition to the above, direct impacts on important fauna habitat may lead to secondary impacts on faunal species. With respect to the proposed Project Fairway, mining activity may result in the increased sedimentation or impaired water quality of perennial and non-perennial tributaries within the Groot Dwars River catchment and the Groot Dwars River itself. Given the sensitivity of the biodiversity in the Groot Dwars River valley, changes to the current water quality can lead to significant impacts on species reliant on these surface water features.

Furthermore, a portion of the road alignment leading from the Waterfall box cut to the Buttonshope South box cut is in close proximity to the identified important breeding ground for the cicada *Pycna Sylvia*. Previous investigations have shown that mine noises do not interfere with the call of the adults, however the impact of the vibrations on the nymphs while they are underground is unknown.

Taken together, the disturbances will have a high severity in the unmitigated scenario. In the mitigated scenario, many of these disturbances can be prevented or mitigated to acceptable levels. However, given the uncertainty of the potential impacts on the *Pynca Sylvia* nymphs, the mitigated severity is considered to be medium.

Duration

In the mitigated and unmitigated scenarios, the impacts are long term because where biodiversity is compromised, killed or removed from the area this impact is likely to exist beyond the life of mine.

Spatial scale / extent

Given that biodiversity processes are not confined to the proposed project site, the spatial scale of impacts will extend beyond the site boundary in the unmitigated scenario. Key related issues are the migration of species and linkages between biodiversity areas. This is a medium spatial scale. In the mitigated scenario, impacts on terrestrial biodiversity will be confined within the site boundary.

Consequence

In the unmitigated scenario, the consequence of this potential impact is high. In the mitigated scenario, the consequence is reduced to medium.

Probability

Without any mitigation the probability of negatively impacting on biodiversity through multiple disturbance events is high. With mitigation, the probability may be reduced to medium because most of the disturbances can be controlled through implementation and enforcement of practices, policies and procedures.

Significance

In unmitigated scenario, the significance of this potential impact is high. With mitigation, the significance reduces to low.

Unmitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H

Mitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Mitigated	M - L	H	L	M	M	M

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Sections 19).

Objective

The objective of the mitigation measures is to prevent the unacceptable loss of biodiversity and related ecosystem functionality through general disturbance.

Actions

Surface disturbance will be kept to a minimum. Activities will be concentrated in disturbed areas as far as is possible. Human and vehicular activity will be restricted to construction and operational sites.

The placement and construction of infrastructure must be done in such a way to ensure that migratory connectivity is maintained between undisturbed areas. In addition, ecological connectivity of the wetland features should be maintained with special mention of bridge crossings over drainage features.

No waste will be disposed of in or around the mine area, waste will be disposed of at an off-site waste disposal facility (Table 28).

In compliance with the Government Notice No. R.704 of 4 June 1999, AQPSA will ensure that its stormwater collection facilities and dirty-water holding facilities are designed for the 1:50 year storm event. This means that there will be no discharges of dirty water from the mine site unless there is an extreme storm event. Storm water management infrastructure will be installed before any construction and mining activities commence to ensure that sediments are not washed into any perennial and non-perennial tributaries from these sites.

Soil conservation measures should be undertaken in line with the soil management principles outlined in Table 7-2. All areas of disturbed and compacted soils need to be ripped, aerated and profiled once the disturbance has ceased to reduce runoff volumes and allow for plant establishment and growth. All stripped topsoil must be classified according to soil classification principles, stockpiles to be managed and stripped soils re-applied during rehabilitation. Care will be taken to ensure that topsoil stripped from areas where invasive plants are abundant is not placed elsewhere.

As much vegetation growth as possible should be retained in order to protect soils and to reduce the percentage of the surface area which is paved. In this regard special mention is made of the need to use indigenous vegetation species as the first choice during landscaping.

All informal fires on the property should be prohibited. Where a burning regime is implemented, it should be overseen by a qualified and experienced professional.

No trapping or hunting of fauna is to take place. Access control must be implemented to ensure that no illegal trapping or poaching takes place. No person will be allowed to collect firewood or any other plant resources from the surrounding vegetation. The Environmental Compliance Officer will visit sensitive areas adjacent to the impact footprint and check for evidence of any illegal harvesting on a regular basis. Transgressors should be prosecuted under the Mpumalanga Nature Conservation Act (Act 10 of 1998). Education for mine staff on the identification for any RDL faunal species that may be found within the study site must be provided. Special mention must be made for the Leopard (*Panthera pardus*) which is positively identified to habituate in the study area.

Ensure that all roads and construction areas are regularly sprayed with water in order to curb dust generation. Wherever possible, roads should be constructed a distance from open space and sensitive areas.

Mine design and planning should ensure that any cone of dewatering which may be caused by mining does not lead to a reduction of stream flow or dewatering of the Groot Dwars River.

A detailed programme for vegetation establishment on the tailings storage facility (proposed and existing) will be prepared as part of the detailed design of the TSF.

All powerline routes will be designed to avoid obvious fly-through routes for large birds. An ecologist with avifaunal expertise must be consulted to determine whether “bird flappers” should be installed along the length of the powerline route.

Control dust in line with the dust management plan.

Management of lighting:

- Externally visible lighting will be kept to an absolute minimum, and wherever possible long-wavelength light sources (i.e. yellow/orange) will be used.
- Internal lighting will as far as possible be shielded by blinds, curtains or by eliminating outward-facing windows in building designs, to prevent spillage of light into the surrounding natural environments.
- Where external lighting of structures is essential, light sources will be directed inward so as to light up the structure and result in this becoming a large diffuse light source, rather than having bright point sources directed outward into the natural environment.
- Lighting will be positioned so that it does not shine onto natural habitats.
- Long-wavelength light sources will be used (at least 550 nm, preferably longer than 575 nm), preferably low-pressure sodium vapour, or yellow LEDs, as these result in very low disturbance of insect populations. Less preferable, but still better than mercury vapour or halogen lamps, would be high pressure sodium vapour or warm white LEDs. Another alternative would be the use of ultraviolet (UV) filters which can reduce insect attraction to high pressure mercury vapour lamps to below that of high pressure sodium vapour lamps. Fluorescent lights, including compact versions, will not be used outdoors, as a significant amount of UV light is emitted by these, and this is highly attractive to insects.

Management of blasting:

- Blast hazards are to be controlled in line with the blast management plan.
- Low-noise output machinery will be used wherever such options are available.
- Adequate berms will be constructed around the open pits and other areas where machinery is operational to limit sound levels in the surrounding environment.
- Blasting will be limited to the minimum possible number of occurrences per day.

Management of invasive plant species:

- Institute strict control over materials brought onto site, which will be inspected for potential invasive species and / or steps taken to eradicate these before transport to the site. Two possible approaches would be a visual inspection of all materials, particularly those that have been stockpiled in high-risk locations, for presence of invasive species and apply topical control (e.g. direct spraying with low residual insecticides) when necessary; or routine fumigation or spraying of all materials with appropriate low-residue insecticides prior to transport to or in a quarantine area on site.
- Disturbed areas will be rehabilitate as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish.
- A monitoring programme will be implemented to detect alien invasive species.
- An eradication / control programme will be implemented for early intervention of invasive species, so that their spread to surrounding natural ecosystems can be prevented.
- Monitoring programmes and control measures will be developed with reference to inter alia information provided by the IUCN SSC Invasive Species Specialist Group (http://www.issg.org/).

Emergency situations

Major spillage incidents will be handled in accordance with the Everest emergency response procedure.

SURFACE WATER

7.2.7 ISSUE: POLLUTION OF SURFACE WATER RESOURCES

Introduction

There are a number of pollution sources in all project phases that have the potential to pollute surface water, particularly in the unmitigated scenario. In the construction and decommissioning phases these potential pollution sources are temporary in nature, usually existing for a few weeks to a few months. Although these sources may be temporary, the potential pollution may be long term. The operational phase will present more long term potential sources and the closure phase will present final land forms that may have the potential to contaminate surface water through long term seepage and/or run-off.

In relation to the existing mine and Project Fairway, the nearest surface water resources are perennial streams (the East and West stream), rivers (Groot Dwars River), non-perennial tributaries (of the Groot Dwars River), riparian wetland features (associated with the East Stream, the Valley bottom wetland complex associated with the West Stream, Groot Dwars River and non-perennial and perennial drainage lines in the Groot Dwars River valley) and two agricultural dams (TKO dams). In the valley, the Groot Dwars River flows in a northerly direction through a steep sided valley. In the vicinity of the mine, there is reliance on these surface water resources by humans (and livestock) and ecological resources.

In the construction and decommissioning phases these potential pollution sources are temporary in nature, usually existing for a few weeks to a few months. Although these sources may be temporary, the impact of potential pollution may be long term. The operational phase will present more long term potential sources such as the TSF and the closure phase will present the underground void that may have the potential to contaminate surface water through long term decant. Biodiversity related impacts are discussed in Section 7.2.6. Soil related impacts are discussed in Section 7.2.3. This section therefore focuses on the potential for human health and livestock related impacts as a result of the pollution of surface water.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Rehabilitation	Earthworks Civil works Exploration Site management Transport systems Non-mineralised waste management Support services and amenities Open pit mining (former) Declines (existing and proposed) Tailings Storage Facility (existing and proposed) Water supply infrastructure Power supply infrastructure Rehabilitation	Demolition Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Waste rock dumps Tailings Storage Facility Water supply infrastructure Power supply infrastructure Rehabilitation	Maintenance and aftercare of final land forms and rehabilitated areas

Rating of impact

<u>Severity / nature</u>

There are a number of potential pollution sources associated with the operation of the current mine. According to the mine's approved EMP (July 2003), the most significant release of polluted water to the environment could be seepage from the tailings dam which could impact on the West Stream.

For Project Fairway, in the unmitigated scenario, surface water may collect contaminants (hydrocarbons, salts, and metals) from numerous sources. Potential construction and decommissioning phase pollution sources include sedimentation from erosion and spillage from portable toilets, spillages of construction fuel, lubricants, cement or leaks from vehicles and equipment.

During the unmitigated operational phase, there is also potential for spillages while handling fuels, lubricants and chemicals. Leaks from the tailings slurry pipelines and associated infrastructure, the sewage treatment plants, vehicles and other equipment also pose a risk. Contaminated discharges from the dirty water systems including: the return water dams, dirty water pipelines and toe paddocks of the existing and proposed TSF may also occur.

In addition to the above, the groundwater study, undertaken by FutureFlow, noted that that seepage from both the current and the proposed TSF footprint areas can reach the West Stream in the long term. It is indicated that seepage qualities are expected to be similar to the water quality from the toe drain of the current TSF. Chemical analysis of this water indicated elevated iron and manganese concentrations (FutureFlow GPMS, 2012). High manganese concentrations were also observed in the water samples analysed in the water quality hydrocensus and these elevated concentrations are considered likely to be as a result of the local geology. On-going monitoring undertaken by the mine reflects that calcium, total dissolved solids, magnesium and sulphate show an increasing trend in concentration over the past year within the catchment of the West Stream, however the concentrations are still within the Water Use Licence requirements for surface waters (SAS, 2011).

In the closure phase, groundwater filling up the mining void could become polluted and decant from the declines into the surface water resources in the valley. This decant may contain elevated concentrations of calcium, magnesium, sodium, silicon, iron and manganese. Due to the fact that the Waterfall box cut has the lowest elevation, decant from this area can be expected first. The polluted decant water has the potential to enter surface water features in the unmitigated scenario.

At elevated concentrations these contaminants can exceed the relevant limits imposed by DWA (these limits may be subject to periodic revision in consultation with DWA) and can be harmful to humans and livestock if ingested directly and possibly even indirectly through contaminated vegetation, vertebrates and invertebrates. The related unmitigated severity is high.

In the mitigated scenario, most surface water run-off should be relatively clean as Everest has implemented a system where most of the dirty areas are isolated from clean run-off. Furthermore, the overall objective is to ensure that dirty water is contained and reused rather than discharged into the environment. Measures already implemented by the mine will be carried over to Project Fairway and the design team will ensure these measures meet the required standards for pollution prevention and control.

To combat seepage from the proposed TSF the installation of a cut-off trench down-gradient of the proposed TSF is proposed. The aim of the cut-off trench is to intercept shallow seepage through the weathered aquifer underlying the proposed TSF.

During closure, the sealing of the all the box cuts will prevent decant being discharged from these areas. However given the location of the box cuts on the slope of the Groot Dwars River valley, and fact that the valley formed due to the presence of a major regional geological structure that caused fracturing, it is possible that uncontrolled decant could occur along the side of the slope if the box cuts are sealed. Therefore it is recommended that controlled discharge of decant from the Waterfall box cut take place. Depending on the quality of the decant water, this water may need to be treated to the relevant standard prior to discharge.

In the mitigated scenario, the severity is therefore reduced to low for all phases.

Duration

In the unmitigated scenario, the potential health impacts are long term, occurring for periods longer than the life of mine. With mitigation most of the health impacts can be reversed or mitigated within the life of mine, however seepage from the current and proposed TSF, as well as day-lighting of decant may have long-term effects, even with the implementation of mitigation.

Spatial scale / extent

The spatial scale of the potential impacts is likely to extend beyond the mine site because contamination is mobile once it reaches flowing water courses. This will be more of an issue in the rainy season when flows in water courses increase. With mitigation, potential contamination can be contained within the site boundary.

Consequence

In the unmitigated scenario the consequence is high for all phases. In the mitigated scenario the consequence is low for the construction, operation and decommissioning phases and medium for the closure phase.

Probability

The probability of the impact occurring relies on a causal chain that comprises three main elements:

- Does contamination reach surface water resources?
- Will people and animals utilise this contaminated water?
- Is the contamination level harmful?

The first element is that contamination reaches the surface water resources adjacent to the proposed project areas. Even with mitigation, there is evidence of increased concentrations of calcium, total dissolved solids, magnesium and sulphate within the catchment of the West Stream. The second element is that as third parties and/or livestock use obtain water from springs and streams on the terrace, they may consume the contaminated water. The third element is that it is likely that only some contaminants will be at a level which is harmful to humans and livestock. This is influenced both by the quality of any discharged water and by the diluting effect of any rainwater particularly in the rainy season. Chemical analysis of samples from the toe drain of the existing TSF indicated elevated iron and manganese concentrations that fall within or exceed the Class II guidelines for domestic use. As a combination, the unmitigated probability is medium and the mitigated probability is low.

Significance

In the unmitigated scenario, the significance of this potential impact is high for all phases. In the mitigated scenario, the significance is reduced to low.

Unmitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	M	H

Mitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, Operational and Decommissioning phases						
Mitigated	L	L	L	L	L	L
Closure phase						
Mitigated	L	H	L	M	L	L

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 19).

Objective

The objective of the mitigation measures is to prevent pollution of surface water resources and related harm to surface water users.

Actions

The clean and dirty water systems for the proposed surface infrastructure will be designed, implemented and managed in accordance with the provisions of Government Notice No. R.704 of 4 June 1999 and the corresponding DWAF M6.1 Operational Guideline and the requirements of DWA as stipulated in the water licence. In this regard:

- Clean water will be diverted around operational areas;

- Minimising the footprint of dirty areas;
- All other dirty water will be contained in the dirty water run-off and/or process water system that comprises dirty water pipes, channels, berms and dams, and from which dirty water will be reused rather than discharged to the environment. These systems will be routinely inspected to detect possible breaches and implement preventative or corrective action. No dirty water runoff must be permitted to reach the wetland resources.

Storm water management infrastructure will be established before any construction activities commence to ensure sediments are not washed into perennial and non-perennial tributaries in the vicinity of project infrastructure and the Groot Dwars River. Any dirty water runoff containment facilities must remain outside the defined wetland areas and their buffers unless it is absolutely unavoidable with specific mention of the activities near to the Groot Dwars River.

There will be no discharges of dirty water from the project site unless there is an extreme storm event, with a recurrence interval exceeding 1:50 years.

The non-mineralised waste management procedures outlined in Table 7-1 will be implemented.

Environmental conditions will be included in construction contracts, thereby making contractors aware of the necessity to prevent accidental spillages by the implementation of good housekeeping practices.

The water balance for the mine will be refined on an on-going basis during the life of mine. The water balance will be used to check on an on-going basis that the capacity of the dirty water holding facilities is adequate, taking the operational distribution and use of water into account.

The mine will continue its surface water monitoring programme in the Groot Dwars River. Further detail is provided in Section 21.1.1. In addition to the current surface water monitoring programme, the following additional monitoring requirements are to be undertaken:

- Monitoring of the groundwater and surface water quality downstream of the new TSF should also take place throughout the life of the operation and for at least 10 years after closure of the TSF structure.
- Sediment chemistry upstream and downstream of the TKO dam will be undertaken throughout the life of the TSF until such time as seepage water from the facility no longer poses a hazard to the system. Should any concerning trends emerge, measures to prevent the development of a contaminated sediment sink should be employed.
- The aquatic biomonitoring program must be extended in order monitor the impacts from Project Fairway at points in the Groot Dwars River upstream and downstream of the footprint areas. Assessment point B0 should be used for future reference, in addition a point further upstream in the

valley should be initiated as a new reference point prior to construction activities being initiated. On-going biomonitoring should continue in the summer and winter of each year

- Whole Effluent Toxicity testing will be implemented at points upstream and downstream of the Groot Dwars ricer crossing in order to monitor the toxicological risk to the system. This testing should take place on 6 monthly intervals in conjunction with the biomonitoring assessment.
- Two additional biomonitoring points should be added to the biomonitoring program at points upstream and downstream of the proposed Project Fairway box cuts and associated infrastructure.
- Monitoring of surface water quality as well as wetland functionality and integrity should take place throughout the life of the mine. The wetland Present Ecological State and eco-services should be assessed annually to identify any emerging impacts on the wetland resources;

Should any contamination be detected the mine will immediately notify DWA. The mine, in consultation with DWA and an appropriately qualified person, identify the source of contamination, identify measures for the prevention of this contamination (in the short term and the long term) and then implement these measures.

The designs of any permanent and potentially polluting structures will take account of the requirements for long term surface water pollution prevention. Moreover, where these facilities are associated with groundwater plumes that have or will impact the quality of surface water resources, Everest will implement mitigation measures for as long as is needed to eliminate the risk and achieve the stated mitigation objectives. In this regard:

- The anticipated quality of seepage emanating from the proposed TSF during operations and post closure must be confirmed through laboratory test work and simulation modelling to refine the seepage and infiltration assessments.
- Additional groundwater investigations to measure seasonal groundwater variations across the proposed TSF site must be undertaken to allow for the refinement of the dewatering and foundation treatment plan. Further refinement of the groundwater modelling is proposed to incorporate these seasonal fluctuations as well as confirmed seepage quality characteristics.
- The footprint of the TSF is to be compacted where possible to reduce the vertical hydraulic conductivity to the underlying material and aquifers. The proposed drainage features can be expanded if so required to include a full herringbone underdrainage system.
- A cut-off trench will be installed along the southern, eastern, north-eastern, and northern borders of the proposed TSF. Seepage into the rehabilitated open pits will be dewatered via the existing dewatering boreholes. At least the base of the trench will be appropriately sealed.
- Additional monitoring boreholes will be installed down gradient of the cut-off trench. Scavenger wells should be installed in the event that the monitoring program indicates any contamination of the fractured rock aquifer in order to control contaminant migration away from the site.

- The RWD will be equipped with a HDPE liner to ensure that all impacted water is contained. In addition, a groundwater separation/ drainage layer will be provided to ensure the on-going separation of ground water and zero uplift on the liner.

Specific attention must be paid to preventing uncontrolled post-closure decant. Depending on the quality of the decant water, the appropriate pumping, collection, and treatment facilities will be designed and implemented according to agreed specifications with the relevant stakeholders and government departments so as to ensure that the controlled discharge of treated decant water meets the relevant standards imposed by these stakeholders.

The toe of the RWD should have a sump constructed in order to allow seepage water to be pumped back into the process water system throughout the life of mine and beyond closure until such time as the seepage water emanating from the TSF complex does not pose a risk to the downstream aquatic ecology. This needs to be verified 6 monthly beyond closure by means of toxicological testing by a suitably qualified aquatic ecologist.

All mine residue deposits and water return dams are maintained and regularly inspected for seepage.

All hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage.

All vehicles should be inspected for leaks. Re-fuelling of vehicles must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil.

7.2.8 ISSUE: ALTERATION OF NATURAL DRAINAGE PATTERNS

Introduction

There are a number of activities/infrastructure, in all project phases, which will alter drainage patterns either by reducing the volume of run-off into the downstream catchments or through their proximity to wetlands and flood lines associated with watercourses. The construction of the proposed TSF will destroy a portion of an already disturbed wetland. In addition to this project specific catchment areas of infrastructure will reduce the volume of run-off into downstream catchments. During the decommissioning phase, these activities will continue until such time as project infrastructure can be removed and/or the project areas are rehabilitated. During the closure phase rehabilitation will allow for the restoration of drainage patterns in certain instances, while final landforms such as the TSF will remain. During the operational phase, the dewatering of the underground mine works will result in impacts on the baseflow of perennial rivers, particularly the Groot Dwars River. The potential impact on drainage patterns as a result of stream flow reduction from dewatering activities is discussed in Section 7.2.11 and will not be repeated below. Erosion-related issues as a result of altering drainage patterns are discussed in Section 7.2.3.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Rehabilitation	Earthworks Civil works Exploration Site management Transport systems Non-mineralised waste management Support services and amenities Open pit mining (former) Declines Tailings Storage Facilities (existing and proposed) Water supply infrastructure Power supply infrastructure Rehabilitation	Demolition Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Waste rock dumps Tailings Storage Facilities (existing and proposed) Slag dump Water supply infrastructure Power supply infrastructure Rehabilitation	Maintenance and aftercare of final land forms and rehabilitated areas

Rating of impact

Severity / nature

During the construction and operation of Everest, rainfall and surface water run-off has been collected in all areas that have been designed with water containment infrastructure. The collected run-off has therefore been lost to the catchment. The proposed Project Fairway will result in the containment of even more runoff which will be lost to the catchment and thus may result in the alteration of drainage patterns. The total MAR for the quarternary catchment B41G is 24 480 000 m3/year. If one assumes that all run-off water that is generated in the infrastructure areas is contained then the estimated loss of run-off to the surface use area is approximately 164 680 m^3/year and this equates to less than 1% of the total MAR. In the context of the affected quaternary catchment this is considered to be a medium severity because the reduction is measurable but will not result in a substantial deterioration in the water reserve and downstream water uses.

In terms of drainage lines, the proposed Project Fairway will affect several non-perennial tributaries located on the eastern slopes of the Groot Dwars River valley, through the creation of river crossings associated with the Valley Access Road. The existing service road to the valley decline has already had an impact on some of these tributaries. With respect to the proposed activities within the Groot Dwars River valley, the Valley Access road will also cross the Groot Dwars River and the access road from the Buttonshope South box cut to the Buttonshope North box cut will cross several non-perennial tributaries on the western slopes of the valley. Associated with the above-mentioned tributaries are wetland systems. The proposed surface infrastructure at the existing valley decline and the proposed Waterfall, Buttonshope South and North, and EPM South box cuts are not located within the 32 m buffer zone of the identified wetlands.

The wetland delineation assessment identified a valley bottom wetland complex within the proposed TSF footprint area. The wetland system is described as a network of palustrine, valley bottom emergent wetlands with associated seepage zones. This wetland system is associated with a tributary of the West Stream, as well as the West Stream itself and is located within and around the Kiwi orchard. It should be noted that some areas of the wetland feature can be also be considered non-vegetated, due to impoundments within the wetland system occurring in the vicinity of the proposed TSF footprint. The system has been impacted upon through sediment load modifications and the removal of indigenous vegetation, as well as flow modifications and inundation. Water quality modifications as well as alien flora and fauna are deemed likely to also affect the system to some degree. However, as the system is situated within an agricultural area and downstream of the existing mining operations, it plays a role in controlling sediment entering the Groot Dwars River. In the unmitigated scenario, impacts on perennial and non-perennial drainage systems and the associated wetland systems is considered to have a high severity.

In the mitigated scenario, clean stormwater control measures will be established to divert clean water around the project sites and to ensure that the clean water enters the drainage line it would naturally flow in to. Stormwater control measures will be professionally engineered to manage these issues. Where stream crossings are required, the culverts and/or crossings will be designed and constructed such that they do not alter or obstruct the flow of water in the tributaries. Although the physical destruction of a portion of the valley bottom wetland complex cannot be mitigated it is noted that the portion of wetland which will be lost has limited biodiversity value due to previous disturbances from the kiwi orchards developed in the area and the system is therefore of limited importance on a localised scale in terms of nutrient cycling and purification services. Therefore, in the mitigated scenario, the severity reduces to medium as most potential impacts can be mitigated and the part of the valley bottom wetland complex which is located within the proposed TSF footprint has been previously impacted upon by previous agricultural activities.

Duration

The alteration of drainage patterns will extend beyond closure albeit that the alternations can largely be reduced and/or eliminated at closure. However, the destruction of the portion of the valley bottom wetland complex is permanent. Therefore the duration is considered to be long-term in both the unmitigated and mitigated scenarios.

Spatial scale / extent

The physical alteration of drainage patterns and flow reduction impacts will occur within the project area, however the impacts on flow could extend further downstream.

Consequence

In all phases prior to closure the consequence is high for the unmitigated and mitigated scenario.

Probability

The alteration of drainage patterns is definite, but the magnitude of the reduced flows is unlikely to result in substantial deterioration and related flow impacts so the impact probability is medium until closure when it is expected to reduce further.

Significance

The significance is high in all phases prior to closure, without mitigation. At closure the significance is considered to be medium. With mitigation the significance is medium for all phases.

Unmitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, Operational and Decommissioning phases						
Unmitigated	H	H	M	H	M	H
Closure phase						
Unmitigated	M	H	M	H	L	M

Mitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Mitigated	M	H	M	H	L	M

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 19).

Objective

The objective of the mitigation measures is to prevent unacceptable alteration of drainage patterns and related reduction of downstream surface water flow.

Actions

Storm water controls will be designed in accordance with the requirements of Government Notice No. R.704 of 4 June 1999, the corresponding DWAF M6.1 Operational Guideline, the requirements of DWA as stipulated in the water licence, and will be done by an appropriately qualified engineer.

Any dirty water runoff containment facilities must remain outside the defined wetland areas and their buffers as a measure to minimise the footprint areas of mining within sensitive wetland areas.

Stream crossings will be designed so that they do not alter the flow. Stream crossings will be inspected regularly for erosion and any culvert blockages. Blockages will be cleared and damaged areas will be repaired immediately. In these designs, considerations will be given to the biodiversity and rehabilitation requirements. In this regard the following key points must be adhered to:

- Support pillars should not be placed in the active channel of the stream;
- Support pillars must be designed in such a way as to minimise the creation of turbulent flow;
- Bridge structures must not lead to upstream ponding and sedimentation;
- Bridge structures must not lead to downstream erosion and incision; and
- Bridge structures must ensure that the systems (with Special mention of the Groot Dwars River) remain free flowing and that no impediments to fish migration occur.

Aside from the disturbed wetland in the TSF footprint, all wetland boundaries and associated buffer zones must be demarcated and declared no-go areas. Any activities causing erosion and incision of any of the wetland features must be identified and the impacts must be mitigated immediately.

All areas affected by construction should be rehabilitated upon cessation of the disturbing activities. Disturbed drainage areas should have the banks reprofiled to a maximum gradient of 1:3 to ensure bank stability. Where necessary, banks and drainage features should be reinforced with gabions, reno mattresses and geotextiles.

During the construction and operational phases, erosion berms should be installed to prevent gully formation and siltation of the wetland resources. The following points should serve to guide the placement of erosion berms:

- Where the track has slope of less than 2%, berms every 50m should be installed.
- Where the track slopes between 2% and 10%, berms every 25m should be installed.
- Where the track slopes between 10%-15%, berms every 20m should be installed.
- Where the track has slope greater than 15%, berms every 10m should be installed.

The Stormwater Management Plan will be implemented for the proposed Project Fairway (refer to Appendix H).

Emergency situations

Any significant breach of the stormwater management infrastructure is considered an emergency situation. In such instances the emergency procedure included in Section 20 will be followed.

GROUNDWATER

7.2.9 ISSUE: CONTAMINATION OF GROUNDWATER

Introduction

There are a number of sources in all mine phases that have the potential to pollute groundwater. In the construction and decommissioning phases some of these potential pollution sources are temporary and diffuse in nature, usually existing for a few weeks to a few months. Even though the sources are temporary in nature, related potential pollution can be long term. The operational phase will present more long term potential sources and the closure phase will present final land forms that may have the potential to pollute water resources through long term seepage and/or run-off. Private landowners, the TKO farm and the local Kiwi community rely on groundwater (from boreholes and/or springs) for domestic and agricultural use and on streams for livestock watering. Any significant changes to groundwater quality could lead to significant impacts on these groundwater users, if their water supply is affected. Surface water related pollution impacts (as a result of the close connection between the groundwater and surface water systems) are discussed in Section 7.2.7. Contamination of groundwater could also impact on biodiversity (and the associated land uses), these impacts are discussed in Section 7.2.6. This assessment therefore focuses on the potential for human- and livestock-related impacts.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Rehabilitation	Earthworks Civil works Exploration Site management Transport systems Non-mineralised waste management Support services and amenities Tailings dams and waste rock management Water supply infrastructure Power supply infrastructure Rehabilitation	Demolition Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Tailings dams Water supply infrastructure Power supply infrastructure Rehabilitation	Maintenance and aftercare of final land forms and rehabilitated areas

Rating of impact

Severity / nature

Two types of pollution sources occur at the mine and are broadly considered below. The one type is diffuse pollution which includes ad hoc spills and discharges of polluting substances. The other type is point source pollution which includes more long term pollution associated with longer term sources such as mineralised and non-mineralised waste facilities. These could present a number of pollution parameters that can have animal and human health impacts depending on how they are transported from the pollution source and at what concentrations they might occur in areas where animals and people have access to groundwater.

The mine's approved EMP identified seepage from the existing tailings dam to be the primary source of potential groundwater contamination. For the approved EMP (July 2003), the groundwater impact study focused on the mitigated impact. The measures for the management of the impact were incorporated into the tailings dam design and are monitored by a professional engineer on an annual basis and through the groundwater monitoring programme. The severity of the mitigated impact was rated as medium for the operation of the mine and low post closure. Although there have been changes to surface infrastructure at the mine these have not altered the potential for groundwater pollution impacts.

During the construction phase, Project Fairway will add to the mine's potential for groundwater pollution mainly through diffuse pollution sources such as hydrocarbon and fuel spills. If these pollutants enter the groundwater system, in the unmitigated scenario, the severity of the contribution would be medium. With mitigation, the severity reduces to low.

During the operation, decommissioning and closure phases of Project Fairway, the most significant addition of potential pollution is associated with the proposed TSF. Geochemical results indicate that the total sulphur content of the rock material stored on the current TSF is low (< 0.25%) indicating that the likelihood of acid generation is small. The TSF Feasibility Study undertaken by SRK (refer to Appendix U) indicates that the seepage quality of the proposed TSF is assumed to not be net acid generating and will not leach elevated concentration of metals into the substrate. While there is no material risk of acid mine drainage, until such time that the anticipated quality of seepage emanating from the proposed TSF is confirmed through additional laboratory test work and simulation modelling, it is assumed that there is potential for groundwater contamination associated with the proposed TSF. This contamination therefore has potential to influence surrounding surface water resources (namely the West Stream) because of the link between ground and surface water within the proposed TSF footprint and because of the predicted pollution plume concentrations in the unmitigated scenario. There are no current groundwater users immediately downstream of the mine's operations, however given the importance of groundwater in the broader area for water supply, in this assessment a precautionary approach has been adopted such that if contaminated groundwater downstream of the mine site is consumed by animals and/or humans (albeit limited) this has potential health related impacts. This is a high severity in the unmitigated scenario.

In the mitigated scenario, pollution prevention measures will be included in the design of the proposed TSF (such as the installation of toe drains as well as vertical chimney drains) and dirty water systems and undertaking monitoring to detect early pollution. Moreover, the SRK TSF Feasibility Study indicates that once a fully consolidated tailings horizon has been deposited, the vertical infiltration of fluids will be significantly reduced and the majority contaminated fluids will be transported directly to the Return Water Dam by means of decant, chimney drains and underdrainage features. The severity is therefore reduced to medium.

Duration

In the unmitigated construction scenario, groundwater contamination and the potential related health impacts are long term in nature, occurring for periods longer than the life of mine. With mitigation the pollution and related impacts can be reversed through the implementation of preventative measures. In the mitigated operation, decommissioning and closure phases, the pollution and related impacts can be reduced during the life of mine which is a medium duration.

Spatial scale / extent

Unmitigated groundwater pollution impacts may extend beyond the boundary of the mine site, regardless of the project phase. This is particularly relevant to the potential pollution from the proposed TSF because modelling shows that the long term unmitigated groundwater pollution plume may influence the water quality in the West Stream. This is a medium spatial scale.

Mitigated groundwater pollution impacts, when including measures to prevent and/or intercept seepage, will be confined to the mine site and proposed project area. This is a localised spatial scale. The surface water element of this may extend further but this has been assessed in Section 7.2.7.

Consequence

The unmitigated consequence for all phases is high. With mitigation, this reduces to low for the construction phase of the project and medium for the operational, decommissioning and closure phases of the mine.

Probability

The probability of the impact occurring relies on a causal chain that comprises three elements: 1) does the contamination reach groundwater resources, 2) will people or animals use this contaminated water and 3) is the contamination level harmful. When considering these three aspects, based on the modelled groundwater results for the mine, groundwater could become contaminated however no third party boreholes or springs have been identified within the potential contamination plume. Third party groundwater users (identified during the project's hydrocensus) are mostly located upstream of the mine's activities. On-going groundwater monitoring at the mine has not identified any significant pollution arising from the mine's operations. Nonetheless, for this assessment a precautionary approach has been adopted to cater for model uncertainties and the fact that groundwater is an important resource to third party users, in the absence of municipal water. In this regard, even in the mitigated scenario, a medium probability is used.

<u>Significance</u>

The unmitigated significance for all phases is high and with mitigation this reduces to medium.

<u>Unmitigated – summary of the rated impact per phase of the current operations and Project Fairway</u>

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction phase						
Unmitigated	M	H	M	H	M	H
Operational, decommissioning and closure phase						
Unmitigated	H	H	M	H	M	H

<u>Mitigated – summary of the rated impact per phase of the current operations and Project Fairway</u>

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction phase						
Mitigated	L	M	L	L	M	M
Operational, decommissioning and closure phase						
Mitigated	M	M	L	M	M	M

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 19).

<u>Objective</u>

The objective of the mitigation measures is to prevent pollution of ground water resources and related harm to water users.

<u>Actions</u>

Everest will comply with both the National Water Act (NWA), (Act 36 of 1998) and Government Notice No. R.704 of 4 June 1999 or any future amendments thereto, and the terms and conditions of water authorisations/licenses.

In the design, construction, operation and decommissioning phases the mine will ensure that all hazardous chemicals (new and used), mineralised wastes and non-mineralised wastes are handled in a manner that they do not pollute groundwater. This will be implemented through a procedure(s) covering the following:

- Pollution prevention through basic infrastructure design (minimised disturbance footprints, incorporation of the tailings and return water design philosophy detailed in Section 2.7.4, seepage interception systems, appropriate lining of dirty water systems);
- Pollution prevention through maintenance of equipment;
- Pollution prevention through education and training of workers (permanent and temporary);
- Pollution prevention through appropriate management of hazardous chemicals, materials and non-mineralised waste; and
- The required steps to enable containment and remediation of pollution incidents.

The designs of any permanent and potentially polluting structures will take account of the requirements for long term surface water pollution prevention. Moreover, where these facilities are associated with groundwater plumes that have or will impact the quality of surface water resources, Everest will implement mitigation measures for as long as is needed to eliminate the risk and achieve the stated mitigation objectives. In this regard:

- The anticipated quality of seepage emanating from the proposed TSF during operations and post closure must be confirmed through laboratory test work and simulation modelling to refine the seepage and infiltration assessments.
- Additional groundwater investigations to measure seasonal groundwater variations across the proposed TSF site must be undertaken to allow for the refinement of the dewatering and foundation treatment plan. Further refinement of the groundwater modelling is proposed to incorporate these seasonal fluctuations as well as confirmed seepage quality characteristics.
- The footprint of the TSF is to be compacted where possible to reduce the vertical hydraulic conductivity to the underlying material and aquifers. The proposed drainage features can be expanded if so required to include a full herringbone underdrainage system.
- A cut-off trench will be installed along the southern, eastern, north-eastern, and northern borders of the proposed TSF. Seepage into the rehabilitated open pits will be dewatered via the existing dewatering boreholes. At least the base of the trench will be appropriately sealed.
- Additional monitoring boreholes will be installed down gradient of the cut-off trench. Scavenger wells should be installed in the event that the monitoring program indicates any contamination of the fractured rock aquifer in order to control contaminant migration away from the site.
- The RWD will be equipped with a HDPE liner to ensure that all impacted water is contained. In addition, a groundwater separation/ drainage layer will be provided to ensure the on-going separation of ground water and zero uplift on the liner.

Existing and proposed infrastructure that is or has the potential to cause groundwater contamination will be identified and included in a groundwater pollution management plan which will be implemented as part of the operational phase. This plan has the following principles:

- Determine potential pollution sources;
- Determine the extent of the existing or potential contamination plume;
- Design and implement intervention measures to prevent and/or eliminate the pollution plume;
- Monitor all existing and potential impact zones to track pollution and mitigation impacts;
- Where pollution negatively impacts third party water supply, an alternative equivalent supply will be provided by Everest.

Ensure that all activities impacting on geohydrological resources of the property are managed according to the relevant DWA licensing regulations and groundwater monitoring and management requirements.

Mine design and planning should ensure that any cone of dewatering which may be caused by mining does not lead to a reduction of stream flow or dewatering of the Groot Dwars River. In addition, ecological connectivity of the wetland features should be maintained with special mention of bridge crossings over drainage features.

The mine will implement the monitoring programme as detailed in Section 21. If monitoring indicates a mine-related decrease in groundwater quality at third party boreholes, appropriate measures will be taken to rectify the contamination situation, to provide the affected third parties with an alternative water supply, and/or to possibly purchase affected farms.

Emergency situations

Discharge incidents that may result in pollution of groundwater resources will be handled in accordance with the emergency response procedure (Section 20.2).

7.2.10 ISSUE: DEWATERING AFFECTING THIRD PARTY BOREHOLE USERS

Introduction

As no impact on third party boreholes users have been identified, no further assessment for this impact has been undertaken. Groundwater levels around the Everest underground mine areas are already drawn down due to the current underground mine workings in the area. In addition, there are dewatering boreholes installed in the rehabilitated opencast workings that maintain dewatered conditions in the rehabilitated area in order to minimise the risk of subsidence. The maximum drawdown in groundwater level around the existing underground mine area is expected to be around 25 to 30 m. The zone of influence of the dewatering cone is calculated by the groundwater specialist to extend up to 100 m from the underground workings.

For the proposed Project Fairway, the underground mine works are below the general groundwater level thus causing groundwater inflows into the mining areas. The pumping of groundwater that seeps into the mine will cause dewatering of the surrounding aquifers and an associated decrease in groundwater level within the zone of influence of the dewatering cones. The proposed underground mine works lie approximately 70 m below surface where it crosses under the Groot Dwars River. There are a number of prominent geological features underlying the river which show a relatively high hydraulic conductivity extending down the level of the proposed declines. Based on the above, it can be expected that water will flow from the river to the underlying excavations. Therefore it is anticipated that there will be little to no drawdown in the groundwater levels around the decline underlying the Groot Dwars River as the river itself will recharge the underlying aquifer.

With respect to the broader Project Fairway underground mining area (i.e. that extending under the farm Buttonshope), the zone of influence of the drawdown in groundwater level around the Fairway underground area is limited to approximately 100 m from the underground workings due to the very low assumed hydraulic conductivity of the material. These underground workings are located within the fractured rock aquifer and as such inflows will mostly occur along discrete pathways formed by faulting and fracturing. In order to follow a conservative approach it was assumed by the groundwater specialist that the major faults retain some water bearing capacity to depth. However, it is expected that it is likely that there will be an aquifer extinction depth below which fractures are closed due to the weight of the overlying rock material. Towards the west, where the mine area is very deep (up to 1 200 m below surface) there will be no notable impacts on the groundwater levels.

No third party groundwater users were identified within this zone of influence and therefore no impacts on third party borehole users are expected from the current or proposed Project Fairway dewatering activities.

7.2.11 ISSUE: DEWATERING AFFECTING BASEFLOW OF RIVERS

Introduction

There is one main activity that may potentially result in a reduction of groundwater levels affecting the baseflow of rivers. This is the dewatering of the underground mining works where groundwater is pumped to surface from the workings to ensure a safe working environment. This activity will commence in the construction phase through the development of declines and will cease in the decommissioning phase.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
N/A	Underground mining	Underground mine void	Underground mine void

Rating of impact

Severity / nature

The groundwater levels around the Everest underground mine areas are already drawn down due to the current underground mine workings in the area. In addition, there are dewatering boreholes installed in the rehabilitated opencast workings that maintain dewatered conditions in the rehabilitated area in order to minimise the risk of subsidence. The maximum drawdown in groundwater level around the underground mine area is expected to be around 25 to 30 m. The zone of influence of the dewatering cone is calculated by the groundwater specialist to extend up to 100 m from the underground workings. In terms of impacts on the base flow of rivers, the previous open pit and current underground mining on the terrace were predicted to affect the base flow of West Stream by up to 25% of groundwater flow towards the West Stream (Metago, 2003). This quantity of groundwater was noted to be 5% of the average flow over the affected reach of the river.

For the proposed Project Fairway, during the construction phase, although groundwater levels will be breached during excavations for the box cuts, the effect on the baseflow of the Groot Dwars River is expected to be small. In the construction phase, even in the unmitigated scenario, the impact has a low severity.

During operation, the proposed underground mine works lie below the general groundwater level. Where the mining crosses under the Groot Dwars River, the works lie approximately 70 m below surface. There are a number of prominent geological features underlying the river which show a relatively high hydraulic conductivity extending down the level of the proposed declines. Based on the above, it can be expected that there will be an increased vertical flux, with some water seeping from the river to the underlying excavations. The drawdown of groundwater levels caused by dewatering of the underground mine workings will impact upon flows of the Groot Dwars River through some seepage from the river into the mine workings and interception of groundwater which would otherwise contribute to the baseflow to the river.

In order to quantify the reduction in flows within the Groot Dwars River during the operational phase, as part of the Hydrological Assessment (Appendix G), the total flows from the river were estimated both upstream and downstream of the 3 km stretch of the Groot Dwars River which may be impacted by dewatering. Due to the fact that no flow data for the affected reach of the river is available, a conservative approach has been undertaken. Using this approach it was estimated that flows within the Groot Dwars River are likely to be reduced by between 8.5% and 5.3% along the 3 km stretch of the river which will be impacted by dewatering. The most significant reduction in flows will occur during the dry-season and towards the end of the operational phase. The proposed dewatering may also reduce the volume of water available to the downstream water users. Based on the estimated reduction in flows within the river, the annual flow into De Brochen Dam is likely to be reduced by 79 388 m^3/year which equates to 1.2% of the total yield. These calculations have been undertaken using the best available data available at the time of the study, however several assumptions have been made (refer to Section 11.9) and the assessment draws upon desk based estimates of baseline flows in the Groot-Dwars which have not be calibrated against actual flow measurements recorded in the river. Therefore, a precautionary approach is applied and the unmitigated severity is regarded as high as the reduction of flow is regarded as measurable and may result in a deterioration in the water reserve for downstream water uses, particularly with respect to the in-stream biodiversity and aquatic functionality of the Groot Dwars River. After closure, the severity (over time – approximately 75 years) will reduce to low.

In the mitigated scenario, the severity of dewatering impacts on drainage patterns is considered to be low during the construction phase. During the operational, decommissioning and closure phases mitigation in the form of controlled discharge upstream of the dewatering cone and compensation to affected users is expected to reduce the severity of the alteration of drainage patterns.

Duration

The duration of the impacts is linked to the duration of the dewatering and the recharge time thereafter. It is expected that dewatering activities will continue for the life of mine. The timeframes for groundwater levels to recover is predicted to be approximately 75 years. Therefore in the unmitigated scenario, for all project phases, the alteration of drainage patterns would extend beyond closure. In the mitigated scenario, these impacts can be avoided and remediated prior to closure.

Spatial scale / extent

Unmitigated the spatial scale could extend beyond the site boundary. With mitigation, the potential impacts are expected to be localised.

Consequence

In the unmitigated scenario, the consequence is medium for the construction phase and high for the operational, decommissioning and closure phases. With mitigation, the consequence remains low for the construction and closure phases and reduces to medium for the operation and decommissioning phases.

Probability

In the absence of flow measurements within the Groot Dwars River, a precautionary approach has been applied. In the construction phase, in both the unmitigated and mitigated scenario, the probability of decreased baseflow as a result of dewatering activities is unlikely. Without mitigation for the operational, decommissioning and closure phases, the impacts are definite. With mitigation, the impact probability of dewatering impacting on the baseflow of rivers is possible.

Significance

In both the unmitigated and mitigated scenarios, the significance of impacts from the construction phase is low. In the unmitigated scenario the significance is high for the operational, decommissioning and closure phases. In the mitigated scenario, the significance reduces to medium.

Unmitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction phase						
Unmitigated	L	H	M	M	L	L
Operational and Decommissioning phases						
Unmitigated	H	H	M	H	H	H
Closure phase						
Unmitigated	M	H	M	H	H	H

Mitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction phase						
Mitigated	L	M	L	L	L	L
Operation and decommissioning phases						
Mitigated	M	M	L	M	M	M
Closure phase						
Mitigated	L	M	L	L	M	M

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 19)

Objective

The objective of the mitigation measures is to prevent water losses to third party water users including ecosystems, as well as limit the reduction in baseflow of surface water features.

Actions

Dewatering will only take place to ensure the safe workings of the underground operations. Unnecessary dewatering will be avoided.

Dewatering will be undertaken in line with the water use licence conditions.

Within the underground mine works, individual seepage zones in the fractured rock should be sealed to limit the volume of water which inflows into the underground mine works area.

Water removed from underground will be re-used in the process to minimise the need for external water supply.

Exploration boreholes will be sealed to minimise groundwater inflow into mine workings and lowering of water levels.

In addition to the above, the mine will set up and maintain a transient groundwater flow model showing changes in water levels and water qualities as a result of its operations using water quality and water level data sourced from its monitoring programme. This model will be maintained on an annual basis. If the model predictions change to those assessed and discussed in this report, additional mitigation measures will be implemented in consultation the authorities and an appropriately qualified specialist.

Prior to the commencement of Project Fairway, Everest will conduct an in-stream flow study to quantify the relationship between in-stream flow, rainfall, surface runoff and inflow from groundwater for the Groot Dwars River. If this study indicates that losses from groundwater inflows are material on the basis of a revised independent assessment, a discharge programme will be designed and implemented to compensate for mine dewatering losses to the surface water system. This discharge programme will be designed and implemented with the following considerations:

- Discharge water quality;
- Discharge volumes and points;
- Erosion protection measures; and
- In-stream monitoring gauges and aquatic biodiversity monitoring programme.

Where Everest's dewatering causes a loss of water supply to third parties, an alternative equivalent water supply will be provided by Everest until such time as the dewatering impacts cease.

The mine will implement the monitoring programme as detailed in Section 21.

Emergency situations

None identified.

AIR QUALITY

7.2.12 ISSUE: AIR POLLUTION

Introduction

There are a number of existing and proposed activities/infrastructure in all phases that have the potential to pollute the air. In the construction and decommissioning phases these activities are temporary in nature. The operational phase will present more long term activities and the closure phase will present final land forms that may have the potential to pollute the air through long term wind erosion.

With projects of this nature (similar to the existing mine operations), the main emissions include: inhalable particulate matter less than 10 microns in size (PM10), larger total suspended particulates (TSP), and gas emissions (such as sulphur dioxide, oxides of nitrogen, carbon monoxide, from vehicle exhausts and blasting). The inhalable components of particulates can cause human health impacts at high concentrations, while the larger particulate component can cause animal and plant health impacts. In the case of animals, grazing on soiled vegetation over extended periods reduces teeth life which can reduce animal life expectancy. In the case of plants, soiling of vegetation can reduce growth and productivity and can lead to vegetation die-off. However, no national ambient air quality standards or guidelines are available for the protection of animals or vegetation. Air pollution related impacts on biodiversity have been discussed in Section 7.2.6 and therefore this section focuses on the potential for human health impacts.

The comparison of predicted pollutant concentrations to guidelines and standards facilitates a preliminary screening of potential impacts. The following set of health and nuisance evaluation criteria have been used (refer to Appendix K for further detail):

- South African National Ambient Air Quality Standards (NAAQS) – daily PM_{10} (75 microgram/m^3) and annual PM_{10} (40 microgram/m^3) for human and animal receptors (in the absence of South African or international standards for animal receptors)
- South African TSP (dust fallout) limits and standards for residential (600 mg/m^2/day)
- Comment is also made on predicted impacts with respect to the Draft NAAQS for $PM_{2.5}$ which have been gazetted for comment on 5 August 2011. The limitation of the current draft $PM_{2.5}$ standards is the absence of an allowable frequency of exceedances.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
Site preparation Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Rehabilitation	Site preparation Earthworks Civil works Exploration Site management Transport systems Non-mineralised waste management Support services and amenities Chrome processing Tailings dams Rehabilitation	Site preparation Demolition Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Waste rock dumps Tailings dams Rehabilitation	Maintenance and aftercare of final land forms and rehabilitated areas

Rating of impact

Severity / nature

The air specialist made use of a theoretical model to conservatively predict air quality impacts during the operational phase and qualitatively described impacts from the construction, decommissioning and closure phases. The modelling was undertaken for the current Everest operations, as well as the proposed Project Fairway.

The air quality assessment identified the sources of atmospheric emissions by identifying the inputs and outputs to the various processes of the current and proposed operations and secondly considering the disturbance to the environment by the current and proposed operations. The main source of concern was identified to be fugitive dust (restricted to particulate matter with diameter of less than 10 µm (PM_{10}), less than 2.5 µm ($PM_{2.5}$) and dust fallout (TSP)) emanating from the mining activities and sulphur dioxide (SO_2), oxides of nitrogen (NO_x) and carbon monoxide (CO) from vehicle exhaust emissions.

The predicted concentrations of the above-mentioned emissions were then compared to the new National Ambient Air Quality Standards (NAAQS) published in Government Gazette No. 32816 of 24 December 2009. These ambient air quality limits are intended to indicate safe exposure levels for the majority of the population, including the very young and the elderly, throughout an individual's lifetime, for specific averaging periods (instantaneous peak, 1-hour average, 24-hour average, 1-month average, and annual average).

For the current Everest mining operations, the predicted PM_{10} impacts at the identified sensitive receptors (see Section 1.1.9) are within the NAAQS limits. Furthermore, dustfall (TSP) at all identified sensitive receptors were within the draft National Dust Regulation limit of 600 mg/m²/day considered acceptable for residential areas.

As only draft $PM_{2.5}$ Regulations are available, the predicted $PM_{2.5}$ ground level concentrations at the identified sensitive receptors can only be compared to these levels and not assessed according to compliance. The predicted $PM_{2.5}$ impacts due to current operations fall within the proposed NAAQS.

For the construction phase of the proposed Project Fairway, the incremental PM_{10} concentrations and deposition rates will be of relatively short-term and of local impact. Activities which would result in atmospheric emissions include the construction and clearing of the new box cut areas, clearing of the proposed tailings dam area, grading of new roads, and changes to the existing Everest plant. Unmitigated construction activities provide the potential for impacts on local communities, primarily due to nuisance and aesthetic impacts associated with fugitive dust emissions. The extent of emissions will vary substantially from day to day and will be dependent on the level of activity, the specific operations being undertaken and the prevailing meteorological conditions. The unmitigated severity during the construction phase is considered to be moderate. With mitigation, the severity reduces to low.

For the operational phase, the main sources of particulate emissions due to unmitigated operations were windblown dust from the tailings facilities, crushing and screening activities and vehicle entrainment. The gaseous CO, NO_x and SO_2 emissions are due to vehicle exhaust emissions. The predicted PM_{10} impacts and CO, NO_x and SO_2 ground level concentrations due to Project Fairway operations at the identified sensitive receptors are within the proposed NAAQS. The total daily dustfall deposition is predicted to be within the SANS target and the draft National Dust Regulation limit of 600 mg/m²/day for residential areas. As the unmitigated impacts fall within the NAAQS limits, the severity for the operational phase is considered to be low. The mitigated scenario will remain low.

The predicted $PM_{2.5}$ impacts for the operational phase were found to exceed the draft NAAQS at the receptors located approximately 8 km west of the current operations. The limitation of the current draft $PM_{2.5}$ standards is the absence of an allowable frequency of exceedances. As these draft standards are subject to comment, they may change prior to their enactment and therefore cannot be meaningfully assessed.

For the decommissioning and closure phase, all operational activities would have ceased. The identified activities identified as potential sources of TSP and PM_{10} include topsoil stockpiles used for rehabilitation, movement of plant for infrastructure removal and vehicle entrainment on unpaved road surfaces. The potential for impacts during this phase will depend on the extent of demolition and rehabilitation efforts during closure. The unmitigated severity for the decommissioning and closure phases is considered to be medium, with mitigation the severity reduces to low.

Duration

The potential for concentrations exceeding the evaluation criteria is as least as long as the operation of the mine and the related potential health impacts could occur post closure. This amounts to a long term duration in the unmitigated scenario. With mitigation, the duration of impacts will be limited to the phase prior to closure.

Spatial scale / extent

The spatial scale of the potential impact is directly related to the spatial scale of the dispersion of any air pollution that has the potential to cause human health impacts. In both the unmitigated and mitigated scenario, the potential impacts will extend beyond the site boundary.

Consequence

The unmitigated consequence is high for the construction, decommissioning and closure phases. The consequence of the unmitigated operational phase is medium. With the implementation of mitigation, the consequence reduces to low for all phases.

Probability

Without mitigation, the probability of off-site pollution is high. Whether the predicted air pollution will result in human health impacts depends on the extent of the pollution plume, the concentration of the different pollution components, and the exposure of receptors to exceedances of the relevant evaluation criteria. The potential for health impacts in the unmitigated scenario is possible. This is reduced to unlikely in the mitigated scenario for all project phases.

Significance

The significance of this impact is high for the construction, decommissioning and closure phases in the unmitigated scenario. The unmitigated significance of the operational phase is medium. With mitigation, the significance is expected to reduce to low.

Unmitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, Decommissioning and Closure phases						
Unmitigated	M	H	M	H	M	H
Operational phase						
Unmitigated	L	H	M	M	M	M

Mitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Mitigated	L	M	M	L	L	L

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 19).

Objective

The objective of the mitigation measures is to prevent air pollution health impacts and to ensure that all operations at the mine and processing plant are within ambient air quality criteria.

Actions

Everest will implement a dynamic air quality management plan that covers:

- the identification of sources (emissions inventory);
- the implementation of source based controls;

- the use of source and receptor based performance indicators and monitoring strategies;
- the use of source and receptor based mitigation measures;
- the use of internal and external auditing; and
- review and plan adjustment as required.

In the construction, operational and decommissioning phases, the following specific mitigation measures will be implemented for the main emission sources: roads, crushing and screening, materials handling, processing plant, the existing and proposed TSF, vehicles and wind erosion. The recommended methods to achieve this are:

- Limit the disturbance of land to what is absolutely necessary and in accordance with the mine infrastructure layout.
- Where possible roads will be paved and spillages of material on these paved roads will be routinely cleaned. Alternatively, Everest will apply dust suppression on unpaved roads through chemical binding agents and/or water sprays combined with vehicle speed and volume controls. Control measures will aim to achieve a 75% dust control efficiency.
- Dust controls at the crushing and screening operation by water sprays and/or installing extraction hoods with filters or scrubbers. The nozzle pressure of water sprays at the crusher will be below 60psi to avoid stirring the dust cloud and reducing the capture efficiency of the ventilation system. Control measures will aim to achieve a 50% control efficiency.
- Dust controls at material handling points (loading and offloading) ;
- Conveyors will be partially covered by doghouse covers.
- Collection of spilled material and rehabilitation of areas where tailings spills occur along the pipe lines.
- Rehabilitation and re-vegetation of all decommissioned areas.
- Rehabilitation and re-vegetation of the side slopes of operational tailings dams. The control measures for the TSF will aim to achieve a 80% dust control efficiency on the side slopes and 50% wet beach area on the top surface area if feasible.
- If required, a water spraying system will be installed on the surface of the tailings dam covering the outer perimeter of the dam, spraying water when wind exceeds 4 m/s.
- Minimise dust emissions from operational tailings dams (e.g. by controlling deposition methodology).
- Maintenance of all vehicles to achieve optimal exhaust emissions.
- Dust control equipment will be maintained and inspected on a regular basis to ensure that the expected control efficiencies are attained.

As part of closure planning the designs of any permanent and potentially polluting structures (particularly the mineralized waste facilities) will, on the basis of impact modelling, incorporate measures to address long term pollution prevention and confirmatory monitoring.

Conduct dust monitoring as outlined in Section 21. The monitoring data will be analysed and interpreted and an annual air quality report will be produced.

If monitoring determines that unacceptable dust emissions is occurring, immediate steps will be taken to address the issue in consultation with a suitable air quality specialist.

Emergency situations

Upset conditions and related unmitigated emission incidents that are likely to result in an exceedance of one or more of the evaluation criteria are considered an emergency situation. These will be addressed in accordance with the Everest emergency response procedure.

NOISE

7.2.13 ISSUE: NOISE POLLUTION

Introduction

Two types of noise are distinguished: noise disturbance and noise nuisance. The former is noise that can be registered as a discernible reading on a sound level meter and the latter, although it may not register as a discernible reading on a sound level meter, may cause nuisance because of its tonal character (e.g. distant humming noises). The impacts of both noise types are assessed below.

Current activities at the mine have impacted on ambient noise levels of the surrounding area. Apart from influences from the existing mining operations, there are limited other activities (intermittent traffic and farming activities) surrounding the mine that contribute to natural ambient noise levels. There are a range of construction, operation and decommissioning activities associated with Project Fairway that have the potential to generate additional noise and cause related disturbance and nuisance. No impacts are associated with the closure phase.

Potential noise impacts on biodiversity have been addressed in Section 7.2.6 and so this section will focus on the potential human related noise impacts. The SANS guidelines (SANS 10103, 2008) stipulate that noise levels from a development that cause ambient background noise levels to increase in excess of 3 to 5 dBA will create a noise disturbance. In addition, SANS specifies that the guideline limits for rural areas are 45 dBA (day) and 35 dBA (night). These are the evaluation criteria for this assessment.

It should also be noted that noise pollution (disturbance and nuisance) will have different impacts on different receptors because some are very sensitive to noise and others are not. For example, workers do not expect a noise free work environment and so they will be less sensitive to environmental noise pollution at work. In contrast, surrounding residents are likely be sensitive to mining noises and so any change to ambient noise levels because of mine related noise may have a negative impact on them and their anticipated residential experience.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
			N/A
Exploration Site preparation Earthworks and civil works Process- and stormwater management Transport systems Non-mineralised waste management Storage and maintenance services/facilities Site/contract management	Earthworks Civil works Prospecting and survey Transport systems Ventilation shafts Compressor station Processing and DMS plant Rehabilitation	Demolition Earthworks Civil works Transport systems Rehabilitation	

Rating of impact

Severity / nature

The noise specialist the identified following components/activities associated with the current Everest mine operations which significantly contribute to the ambient level measured at closest receptors:

- Compressor array near ventilation fans;
- The crushing and screening plant located on the terrace;
- The processing plant;
- Traffic on the tarred access road (Road D874 South) off the Provincial R577 and traffic on the R577.

It was found by the noise specialist that the ambient noise level within 2.5 km of the current plant will have a day-time ambient noise level of 50 dBA and a night time level of 40 dBA, while receptors further than 2.5 km will experience a day-time ambient noise level of 45 dBA and a night time level of 35 dBA.

During the construction phase for the proposed Project Fairway most of the associated activities are not expected to be audible above the existing ambient noise at the nearest receptors. Should construction continue during the night, construction equipment may at times be audible at the receptors to the south of the mine. Occasional blasting will occur during construction and depending on atmospheric conditions, it will at times be clearly audible and occasionally cause a significant impact at the nearest receptors. Therefore the unmitigated severity during the construction phase is high and with mitigation the severity would reduce to moderate.

Noise in the decommissioning phase will be of a similar nature, but at a lower intensity and of shorter duration compared to noise in the construction phase. Decommissioning noise will be inaudible in noise-sensitive areas and the noise impact will be negligible, therefore the severity is considered to be low for the unmitigated and mitigated scenarios.

For the operational phase, noise contours were derived to predict the probable worst-case conditions (i.e. night-time and with winds potentially blowing from either the northerly or southerly sectors). The severity of a noise impact at any location depends on wind direction. Under worst-case conditions where the wind is blowing from a northerly direction at night, a significant noise impact relative to what is deemed to be an acceptable level is expected to occur at the nearest residences to the south of the min. However, since the existing night-time ambient level in this area is already elevated by the current Everest operation to 42 dBA, the new development will raise the actual level to 45 dBA, amounting to an incremental impact of 3 dB and a cumulative impact of 10 dB (based on pre-mining baseline conditions). The source responsible for the small increase in ambient level in this area is the vibrating screen in the proposed new DMS plant. In real terms, receptors in this area will experience the following:

- The increase in the ambient level will be barely noticeable because of the existing ambient noise levels. If a person listens carefully, the vibrating screen at the new DMS plant may at times be discernible.
- As is currently the case, the dominant source of audible noise will be the whining sound of the existing compressors. The new compressors and ventilation fans, to be located much further away and topographically screened off, will not be audible as an additional source of noise.

Additional noises from the remainder of noise sources, i.e. the proposed new ventilation fans, traffic on the valley road, shaft infrastructure, box-cut activities and the TSF pump are not expected to be audible in this area.

Noise associated with the proposed project will have a negligible impact on ambient noise levels at the nearest houses to the north and on levels in the remainder of the study area to the east, north and west of the mine.

Under probable worst-case conditions, the significant noise impact footprint extends approximately south of the Waterfall box cut, and the Project Fairway ventilation fan and compressor noise will be audible at the Triangle 72-JT and De Berg 71-JT farms. Furthermore, noise can at times spill over the valley to the west with a likelihood of a significant impact on the eastern side of the farm Sheeprun.

Given the above, the unmitigated severity of the proposed Project Fairway during the operational phase is high because, even though the proposed project will raise current ambient noise-levels slightly (3 dBA), the cumulative impact of the increased noise levels as a result of the current operations and the proposed project (10 dBA) is significantly above the SANS thresholds. The mitigated severity will also remain high given the already elevated noise levels at the identified receptors closest to the processing plant.

Duration

In both the unmitigated and mitigated scenarios the noise pollution impacts will occur until the closure phase of the mine. This is a medium duration. Whether noise impacts discussed above will have any secondary long term health effects, beyond the life of the project, is unknown. In this regard, it's possible for noise induced stress and related health issues to be felt beyond closure.

Spatial scale / extent

In both the unmitigated and mitigated scenarios the noise impacts will extend beyond the site boundary, regardless of the project phase. Depending on climatic conditions, nuisance type noise could occasionally be heard beyond this footprint as well as areas to the west of Project Fairway.

Consequence

The mitigated and unmitigated consequence is medium for the construction and operational phase, while for the decommissioning phase it is low.

Probability

The noise emissions from the mine are definite. The exceedance of the evaluation criteria as a result of mine noise emissions is definite and depends on the location of receptors relative to noise generating activities. Whether this results in a significant negative impact depends on the perspective and reaction of the receptors. Given that there have been noise complaints from surrounding landowners it would appear that the probability of the impact is high in both the unmitigated and mitigated scenarios. Limited management options are available to mitigate the existing noise generated by the plant.

Significance

The mitigated and unmitigated significance up to the point of closure is medium for all phases.

Unmitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction and Operational Phases						
Unmitigated	H	M	M	M	H	M
Decommissioning phase						
Unmitigated	L	M	M	L	H	M
Closure phase – no impacts expected						

Mitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction phase						
Mitigated	M	M	M	M	H	M
Operational phase						
Mitigated	H	M	M	M	H	M

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Decommissioning phase						
Mitigated	L	M	M	L	H	M
Closure phase – no impacts expected						

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 19).

Objective

The objective of the mitigation measures is to prevent unacceptable noise impacts.

Actions

All vehicles and equipment will be maintained to restrict noise emissions.

Construction and decommissioning activities will be restricted to within reasonable hours during the day and early evening.

Surface blasting will be scheduled to take place in the afternoon and under no circumstances during the morning hours of the day.

Noise sources will be equipped with silencers, acoustic covers (for stationery and fixed equipment), screens or sheds, noise suppression systems or mounted in acoustically designed enclosures, where appropriate.

Ventilation fans will be placed underground as far as practically possible. There will be no surface ventilation fans in the valley.

Once the design and layout of the proposed compressor station and the DMS plant has been completed, an acoustical engineer will be consulted to determine specific measures and material specifications to mitigate noise impacts for both the current and proposed activities and infrastructure.

All noise complaints will be documented, investigated and reasonable efforts made to address the area of concern. The mine will maintain an open line of communication with local residents to record complaints and identify how best to minimise the impact.

The mine will implement a noise monitoring programme as detailed in Section 21.

Emergency situations

None identified.

VISUAL

7.2.14 ISSUE: VISUAL IMPACTS

Introduction

Visual impacts may be caused by activities and infrastructure in all mine phases. These activities will be visible, to varying degrees from varying distances around the mine site. During construction, this will be influenced by the increase in activities and removal of vegetation on site. During operation this will be influenced by the presence of infrastructure and development of the TSF and during decommissioning and closure by the closure objectives and effectiveness of rehabilitation measures. The more significant visual impacts relate to the larger infrastructure components and the long term infrastructure (such as the proposed and existing TSF) that will remain post closure.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
Site preparation Earthworks Civil works Prospecting and survey Site management Transport systems Non-mineralised waste management Support services and amenities Rehabilitation	Site preparation Earthworks Civil works Exploration Site management Transport systems Non-mineralised waste management Support services and amenities Box cuts Processing plant DMS plant Chrome processing Tailings Storage Facility (proposed and existing) Water supply infrastructure Power supply infrastructure Rehabilitation	Site preparation Demolition Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Tailings Storage Facility (proposed and existing) Water supply infrastructure Power supply infrastructure Rehabilitation	Maintenance and aftercare of final land forms and rehabilitated areas

Rating of impact

Severity / nature

The severity of visual impacts is determined by assessing the change to the visual landscape as a result of mine related infrastructure and activities. The current mine infrastructure has already altered the visual landscape to a degree. The proposed Project Fairway will potentially add to the existing impact. Key issues are: visual intrusion, visibility and visual exposure, and viewer sensitivity. Each of these is discussed below.

In the unmitigated scenario, the visual intrusion of the proposed project when considered cumulatively with the existing mine infrastructure, will be moderate to high as even though it is partially compatible with the current land use patterns in the area, it will have a substantially negative effect on the visual quality of the landscape. Operational and security lighting in and around the proposed project area would be visible at night from within the Groot Dwars River valley. The proposed box cuts, valley access road and associated infrastructure is located sufficiently far away from the existing mine infrastructure that the cumulative visual impact is spread further out. The proposed TSF represents a major, permanent, change to views from sensitive viewing areas. Dust from vehicles on haul roads will also contribute to the existing visual disturbance.

Visual exposure is the extent to which infrastructure and activities will be visible. It follows that the closer the infrastructure and activities, the greater the visual exposure. In the unmitigated day scenario, visual exposure would be rated as high for views from farmsteads on portions of the farm De Kafferskraal. A moderate rating is assigned to views from viewpoints of the farms De Kafferskraal, Skuinsplaas 56-JT, Oshoek 69-JT, De Berg 71-JT, Triangle 62-JT, Sheeprun 50-JT, Sheeprun 179-JT, Schaapkraal 12-JT, and Triangle 54-JT. A moderate rating is also assigned to farmsteads & residences with views of the proposed Project Fairway on the farm Schaapkraal 12-JT. Views from viewpoints on the farms Skuinsplaas 56-JT, Oshoek 69-JT, De Berg 71-JT, Triangle 62-JT, Wanhoop 78-JT, Kliprivier 73-JT, Sheeprun 50-JT, Sheeprun 179-JT, Schaapkraal 12-JT and Vygenhoek 10-JT, as well as views from farmsteads / residences located on the farm Schaapkraal 12-JT are rated as having a low visual exposure.

Sensitivity of receptors relates to the way in which people will view the visual intrusion. In this regard, it is anticipated that receptors on adjacent properties and along vantage points to the south, south west and west of the site (where tourism-type activities do occur) will be highly sensitive, especially in the unmitigated scenario. Receptors are also expected to be sensitive to the light pollution at night. Even though this impact already occurs due to the current operations, surrounding areas are sensitive to this change.

Given the above, the unmitigated severity is high for the proposed TSF during the operational phase. The unmitigated severity of the proposed TSF during the construction, decommissioning and closure phases is medium. For the DMS plant, proposed box cuts and associated infrastructure in the valley and the proposed surface infrastructure at the valley decline, the unmitigated severity is medium for all project phases.

With mitigation, the severity of the proposed TSF would reduce to medium for the phase and low for the construction, decommissioning and closure phase. The mitigated severity for the proposed box cuts and associated infrastructure remains medium during the construction and operational phases but decreases to low during the decommissioning and closure phases.

Duration

In the unmitigated scenario the duration is high because the impacts will continue post closure. In the mitigated scenario the impacts are unlikely to extend post closure because only rehabilitated landforms will remain, and the duration reduces to medium.

Spatial scale / extent

The 'zone of potential influence' for the proposed project was set at 10.0 km by the visual specialist. Following the viewshed analysis, it was determined that the proposed project infrastructure would potentially be visible from less than half the zone of potential influence (i.e. approximately 5km) resulting in a moderate visibility.

Consequence

The unmitigated consequence is high for the operational phase and medium for the construction, decommissioning and closure phases. With mitigation this remains medium for the construction phase and high for the operational phase and reduces to low for the decommissioning and closure phases.

Probability

For all project phases, the probability of the visual impact occurring is definite in the unmitigated and mitigated scenarios.

Significance

The unmitigated and mitigated significance is high for the operational phase and medium for the construction, decommissioning and closure phases.

Unmitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction , Decommissioning and Closure phases						
Unmitigated	M	M	M	M	H	M
Operational phase						
Unmitigated	H	H	M	H	H	H

Mitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction phase						
Mitigated	M	M	M	M	H	M
Operational phase						
Mitigated	M	H	M	H	H	M (valley infrastructure) - H (mainly attributed to TSF)

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Decommissioning and Closure phases						
Mitigated	L	M	M	L	H	M

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 19)

Objective

The objective of the mitigation measures is to limit negative visual impacts.

Actions

In the construction and operation phases the following visual mitigation techniques will be implemented:

- Limit the clearing of vegetation and removal of topsoil. Ensure, wherever possible, all existing natural vegetation is retained and incorporated into the site to act as dust collectors and for rehabilitation.
- The Casuarinas windbreaks are maintained in a healthy growing condition as far as is possible.
- A combination of tall indigenous trees and shrubs are planted along the periphery and within the plant site to partially absorb views of the plant.
- Internal mine roads should follow the natural contours of the land to avoid extensive cut or fill areas.
- Limit the emission of visual air emission plumes (dust and fugitive emissions) in line with the dust management measures (Section 7.2.12).
- Light fixtures that provide precisely directed illumination and are covered on top will be utilised.
- Security lighting will only be used at the periphery of the site that is activated by movement and not constantly kept on.
- On-going vegetation establishment on rehabilitated areas and the TSF side slopes.
- Buildings and structures are painted with colours that reflect and complement the natural tan and dark greens of surrounding landscape. Pure whites and pure black colours are avoided.
- External surfaces of buildings and structures are articulated or textured to create interplay of light and shade and to reduce the potential glare, shiny or bare metal will be avoided.

In the decommissioning phase Everest will implement its closure plan which involves the removal of infrastructure, and the rehabilitation and re-vegetation of cleared areas and any final landforms that will remain post closure. These final landforms should be rehabilitated in a manner that limits the long term visual impact.

At closure, final landforms will be managed through an aftercare and maintenance programme to limit the long term post closure visual impacts.

Emergency situations

None identified.

HERITAGE, PALAEONTOLOGICAL AND CULTURAL RESOURCES

7.2.15 ISSUE: DESTRUCTION OF HERITAGE, PALAEONTOLOGICAL AND CULTURAL RESOURCES

Introduction

There are a number of activities/infrastructure in all phases prior to closure that have the potential to damage heritage and cultural resources, either directly or indirectly, and result in the loss of the resource for future generations. Heritage and cultural resources include sites of archaeological, cultural or historical importance. Heritage resources have been previously identified to occur within the Everest mine site. Furthermore, additional heritage resources were identified to occur within the Project Fairway project area.

Given the geology (the Rustenburg layered Suite Bushveld Igneous Complex) of the project area, there is no potential for paleontological resources to occur so no related impacts are considered further.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
Earthworks - for all surface infrastructure Site management Transport systems Support services and amenities Rehabilitation	Earthworks - for all surface infrastructure Exploration Site management Transport systems Non-mineralised waste management Support services and amenities Open pit mining (previous and potential future) Tailings Storage Facility (existing and proposed) Decline establishment Water supply infrastructure Power supply infrastructure Rehabilitation	Demolition Earthworks Site management Transport systems Non-mineralised waste management Support services and amenities Tailings dam Water supply infrastructure Power supply infrastructure Rehabilitation	N/A

Rating of impact

Severity / nature

Activities associated with the existing Everest mine site have disturbed heritage resources in the past with varying degrees of significance, including graves. These sites however were mitigated, where relevant, in line with the approved EIA and EMP report (Metago, 2003). Within the Project Fairway project area, three heritage and cultural resources have been identified (see Section 1.3.3 and Figure

1-12 for more detail), however the proposed surface infrastructure is positioned away from these heritage resources. It is possible that heritage resources not identified by the specialist during the project survey occur in areas of thick vegetation and below surface. In this regard, the severity is rated as medium as the potential for uncovering new heritage resources does exist.

Duration

If heritage and cultural resources are removed, damaged or destroyed the impact duration is long term. In the mitigated scenario, the duration of the impact will be less than that of the project life.

Spatial scale / extent

Although the actual loss of the resource will be within the site boundary, the unmitigated impact will be felt beyond the site boundary. With mitigation, the impact spatial extent is confined to the project area.

Consequence

The unmitigated consequence is high, while the consequence reduces to low with the implementation of mitigation.

Probability

As the establishment of the existing Everest operations has required the disturbance of heritage resources in the past and heritage resources were found in the vicinity of proposed project infrastructure, the probability is considered to be possible for the unmitigated scenario. With the implementation of the required management measures the disturbed heritage resources will not be lost to future generations and therefor the rating reduces to low.

Significance

The unmitigated significance for Project Fairway is high for all phases prior to closure. With the implementation of the mitigation measures recommended below, the significance is considered to be low.

Unmitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases prior to closure						
Unmitigated	M	H	M	H	M	H

Mitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases prior to closure						
Mitigated	L	L	L	L	L	L

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 19).

Objective

The objective of the mitigation measures is to prevent the loss of heritage and cultural resources.

Actions

Project infrastructure, activities and related disturbance will be limited to those specifically identified and described in this EIA and EMP report.

Where future plans require a change in mine footprint, a project specific heritage study will be done to identify any project specific heritage and cultural resources that may be affected and to detail the mitigation plan where required.

If removal or damage to resources is unavoidable, the necessary authorisations will be obtained from SAHRA prior to the removal or damage occurring.

In the event that any graves are discovered during the construction, operational or decommissioning phases, prior to damaging or destroying any identified graves, permission for the exhumation and relocation of graves must be obtained from the relevant descendants (if known) and the relevant local and provincial authorities.

All workers (temporary and permanent) will be educated about the heritage and cultural sites that may be encountered in their area of work and about the need to conserve these.

All heritage sites not impacted on by the actual development of infrastructure will be marked on the site layout plan.

All sites preserved in situ will be regularly inspected for signs of encroachment and/or damage.

Emergency situations

If there are any chance finds of heritage and/or cultural sites, Everest will follow its emergency response procedure.

SOCIO-ECONOMIC

In the broadest sense, all activities associated with the mine will have socio-economic impacts in all mine phases. Some of these are considered to be positive impacts and others are considered to be negative impacts.

7.2.16 ISSUE: ECONOMIC IMPACT

Introduction

The existing mine and proposed Project Fairway has the potential to impact on the economy both positively through potential growth in the mining sector and investment in social programmes and negatively through the potential loss of existing economic activities. This section focuses on the potential positive and negative economic impacts associated with the project and assesses these collectively.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
Site preparation Earthworks Civil works General site management Transport systems Non-mineralised waste management Rehabilitation	General site management Transport systems Non-mineralised waste management Open pit mining Tailings dams Re-processing of the old tailings dam Water supply infrastructure Power supply infrastructure Rehabilitation	Demolition General site management Transport systems Non-mineralised waste management Tailings dams Re-processing of the old tailings dam Power supply infrastructure Rehabilitation	Maintenance and aftercare of final land forms and rehabilitated areas

Rating of impact

<u>Severity / nature</u>

The development of the mine was predicted to have a positive economic impact through:

- employment of a large number of people during both the construction and operational phases;
- generation of substantial offshore revenue;
- payment of large amounts of money in the form of the company payroll;
- payment of significant amounts of money to the government in the form of local, regional and national taxes and levies;
- economic multiplier effect linked to the support of service-sector jobs again, the procurement of large quantities of consumables annually and the outsourcing of service provision to local service providers;
- benefits from the implementation of the mine’s social investment programme and SLP commitments.

Changes that have taken place at the mine have aimed to ensure the viability of the mine. The approved EMP (July 2003) identified that positive impacts from the mine could be enhanced if financial resources generated through the project are harnessed to further development of alternative forms of income generation in the region and local area of the project. To date AQPSA has implemented various social investment projects through its programme and SLP, however the implementation of these projects was suspended when the mine went under care and maintenance. The mine is currently re-gaining its production output and with this, the associated positive benefits discussed above.

From an incremental perspective, the mine itself will potentially employ 1685 permanent and contractual workers, which equates to 562 on a time adjusted basis. Mining is predicted to have a multiplier effect, resulting in additional secondary jobs for every direct job at the mining operation. The multiplier effect is created through the need for support business and services and from the increased spending power of employees and contractors. It is also expected that there could be a negative economic impacts on the surrounding land uses (refer to Section 1.3). The related negative impact on farm related employment is not definite because the impacts on surround land may be mitigated particularly in the closure phase of the project. However, a conservative assumption has been made by the specialist to enable a relative comparison. In this assumed scenario, the loss of potential employment opportunities to farming if the land were to be used in accordance with current practices is about 102 jobs.

When comparing the predicted economic value added by the proposed mining operation (potentially R3.7 billion over the life of mine) against the potential agricultural potential value lost as a result of the proposed project (approximately R1 billion), it is significantly higher in value than the agricultural potential value lost.

It follows that without mitigation the economic contribution from the proposed project is high and the potential loss to agriculture is relatively low in comparison so the net impact severity is high positive. With mitigation, the surrounding land uses could still continue even with the operation of the neighbouring mine. This will limit the loss to agriculture and increase the net positive severity further.

<u>Duration</u>

The positive economic impacts described above will be limited to the life of the mine. After closure there may still be some positive impacts through maintenance and aftercare activities. The loss of agricultural land associated with the proposed TSF will extend beyond closure as this will remain in perpetuity.

<u>Spatial scale / extent</u>

In both the mitigated and unmitigated scenarios, the spatial scale of the impact is high because it will extend far beyond the proposed project areas on a regional and national scale.

Consequence

In both the unmitigated and mitigated scenarios the consequence is high and positive.

Probability

In the normal course of economic activity the net positive impacts will definitely occur. With mitigation, the potential negative impacts on farming and surrounding land uses are reduced. However this cannot be reduced for the proposed TSF as this agricultural land will be permanently lost.

Significance

In the unmitigated scenario, the significance of this potential impact is high positive. In the mitigated scenario, the significance is further increased.

Unmitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H+	M	H	H	H	H+

Mitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Mitigated	H+	M	H	H	H	H+

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 19).

Objective

To enhance the positive economic impacts and limit the negative economic impacts

Actions

The mine will establish and regularly update a skills database of people in the area and contractors will be encouraged to preferentially employ locals.

Non-core activities will be identified and prioritized for local service providers. Local service providers will be identified and requested to tender for the provision of the various services.

The mine will support the principle of Black Economic Empowerment (BEE) through procurement of the services of BEE contractors and suppliers. The mine will strive to identify and invite BEE companies to tender for the provision of services at the mine.

The mine will continue to implement the commitments in its social and labour plan in accordance with the employment, procurement and social investment principles of the Mining Charter. In this respect:

- Recruitment, selection and employment equity:

  The objective of sound recruitment, selection and equity policy is to ensure that the mine is staffed with competent, committed employees and that the benefits of internal appointments and local recruitment are realised. Everest will ensure that its recruitment process incorporates the following:
  - a policy of appointments from within should be applied where current employees with the necessary skills, competence and potential are available – formal succession and career planning should facilitate this process;
  - where internal appointments are not viable, recruitment must be aimed at employing members of local communities;
  - selection of employees should be based upon defined competency and skill requirements which should be available for scrutiny in the form of job specifications;
  - selection processes should be defensible and visibly fair – proper records of recruitment and selection practices should be kept; and
  - medical screening should be restricted to conditions relevant to the job as defined in the job specifications.
- Longer-term options for achieving sustainable productivity:
  - award bursaries to students who have shown commitment to their careers on condition that bursary holders can be retained within the company as far as possible;
  - provide learnership opportunities to ensure focused growth and development. Learnership programmes equip people with relevant skills identified in the industry and therefore contribute to the economic growth and development of the country; and
  - provide all staff with access to skills training, and for those staff identified as having potential, facilitate career progression as part of a career management process.
- Start closure planning as soon as practically possible.
- Incorporate economic considerations into closure planning

Emergency situations

None identified.

7.2.17 Issue: Inward Migration

Introduction

Mines tend to bring with them an expectation of employment in all project phases prior to closure. This expectation can lead to the influx of job seekers to an area which in turn increases pressure on existing communities, housing, basic service delivery and raises concerns around safety and security. This section focuses on the potential for the inward migration and associated social issues.

Rating of impact

Severity / nature

In the unmitigated scenario, the mine and project will attract job seekers to the area, which is likely to cause an increase of people moving through the surrounding areas and closest towns, pressure on the capacity of existing communities and possibly also the development of informal settlements. In general, both increased movement of poor people into an area and informal settlements are associated with poor standards of living which can promote disease, crime and a general threat to the safety and security of an area. Linked to this influx of people is the potential inability of receiving areas to supply basic services such as water, food, electricity, health, education and sanitation.

The severity of potential impacts is high in the unmitigated scenario. With mitigation, measures can be taken to prevent the establishment of informal settlements, to limit the pressure on infrastructure and services, and to promote the on-going safety and security of the existing community.

Duration

In the normal course, social impacts associated with each phase of the mine will occur for the life of the mine, but negative social issues associated with inward migration can continue beyond the closure of the mine, particularly in the unmitigated scenario.

Spatial scale / extent

In both the unmitigated and mitigated scenarios, the impacts of inward migration could extend beyond the project area and into surrounding communities.

Consequence

In the unmitigated scenario the consequence associated with inward migration is high. In the mitigated scenario, this reduces to medium.

Probability

In the unmitigated scenario the impact is considered to be definite. With mitigation, impacts associated with inward migration are considered to be less likely, but they are unlikely to be eliminated.

Significance

In the unmitigated scenario, the significance of this potential impact is high. With mitigation this may reduce to medium.

Unmitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H

Mitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Mitigated	M	M	M	M	M	M

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Sections 19).

Objective

The objective of the mitigation measures is to limit inward migration and related social impacts.

Actions

In terms of recruitment, procurement and training:

- Good communication with all job and procurement opportunity seekers will be maintained throughout the recruitment process. The process must be seen and understood to be fair and impartial by all involved. The personnel in charge of resolving recruitment and procurement concerns must be clearly identified and accessible to potential applicants;
- The precise number of new job opportunities (permanent and temporary) and procurement opportunities will be made public together with the required skills and qualifications. The duration of temporary work will be clearly indicated and the relevant employees/contractors provided with regular reminders and revisions throughout the temporary period;
- Recruitment and procurement, by Everest and its contractors, will be preferentially provided to people in the communities that are closest to Everest. In order to be in a position to achieve this Everest will maintain a skills register of people within the closest communities. Everest will also preferentially provide bursaries and training to people that reside in these closest communities;
- There will be no recruitment or procurement at the gates of the mine. All recruitment will take place off site, at designated locations in the closest communities. All procurement will be through existing, established procurement and tendering processes that will include mechanisms for empowering service providers from the closest communities; and
- Unsuccessful job seekers will be notified once the recruitment process is complete.

Everest acknowledges that it is responsible for ensuring that its employees and contractors are housed in formal serviced housing. This will be achieved by

- Allocating accommodation or an accommodation allowance to all employees that can demonstrate that they live in formal housing; and
- By maintaining an employee profile (for Everest and contractor employees) that can be used as a tool to identify socio-economic concerns and plan long term mitigation interventions.
- Everest will endeavour to work with local government and private stakeholders (such as but not limited to, property developers, estate agents, private land owners and financial institutions) to investigate the potential for and planning around the development of appropriate housing within the local area to assist the local workforce to meet its own housing requirements within the formal housing sector and facilitate long term investment in the local economy through the monthly income from the mine. This amounts to long term solutions to housing, facilitated through public-private partnerships, and will facilitate long term, sustainable development and assist in preventing the establishment of unsustainable, informal settlements which is problematic for the company and local government at the end of the life of the mine.
- Everest management will not be associated with employees residing in illegal informal settlements. Squatting on Everest land will not be permitted at any time and measures to facilitate the prevention of squatting on land in the vicinity of its operations will be implemented. Contractors will be required to keep a record of employee's physical addresses.
- Where hostel accommodation is provided, it will be of an acceptable standard. This includes hygienic ablution facilities, proper washing facilities with hot and cold running water, hygienic feeding facilities, suitable security of access, and avoidance of overcrowding. Single-sex hostel accommodation is not an acceptable solution to the housing needs of Everest's workforce, and whilst it may be utilized to meet short-term needs during construction periods where there is a lack of alternative accommodation, it will not be permitted as a long-term housing strategy.

Everest will work with its neighbours, local authorities and law enforcement officials to monitor and prevent the development of informal settlements near the mine and to assist where possible with crime prevention within the surface use area.

Everest will implement a health policy on HIV/ADS and tuberculosis. This policy will promote education, awareness and disease management both in the workplace and in the home so that the initiatives of the workplace have a positive impact on the communities from which employees are recruited. Partnerships will be formed with local and provincial authorities to maximise the off-site benefits of the policy.

Everest will work closely with the local and regional authorities, the Bakone Ba Phetla Communal Property Association and the Bakoni Ba Maga Makua and other mines/industry in the area to be part of the problem solving process that needs to address social service constraints and social problems relating to education, health, water supply, solid waste management, sanitation and housing.

Everest will continue to implement the stakeholder forum to facilitate stakeholder communication, information sharing and grievance mechanism to enable all stakeholders to engage with Everest on both socio-economic and environmental issues.

Everest will start closure planning as soon as practically possible and will incorporate social considerations into closure planning.

Emergency situations

The establishment of any informal settlements is considered to be an emergency situation that will be handled in accordance with the Everest emergency response procedure.

LAND USE

7.2.18 ISSUE: LAND USE IMPACTS

Information in this section was sourced from the Land Use Study (Appendix N), on-site observations and the project team.

Introduction

The range of environmental impacts that could occur as a result of the project which are taken into account when considering impacts on surrounding land use. These include: groundwater, air quality, noise and visual. With this in mind, the main activities that could have an impact on existing land uses is the dewatering of the underground mine works, establishment of the proposed TSF and the associated potential ground water contamination impacts, construction and operation of noise-generating infrastructure and the establishment of the site infrastructure resulting in visual impacts. These activities will commence in the construction phase and continue for the planned life of the project (10 – 15 years). At closure, the site will be rehabilitated and the final landforms will remain. Although it is unlikely that the current state of the site will be re-instated, the rehabilitation measures will minimise the potential for significant post-closure impacts. This section focuses on the potential loss and/or change of the land uses. Socio-economic related issues are discussed in Sections 7.2.16 and 7.2.18.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
Site preparation Earthworks Civil works General site management Transport systems Non-mineralised waste management	Exploration Site management Transport systems Non-mineralised waste management Support services and amenities	Site preparation Demolition Earthworks Civil works Site management Transport systems Non-mineralised waste	Maintenance and aftercare of final land forms and rehabilitated areas

Construction	Operation	Decommissioning	Closure
Rehabilitation	Processing plant Tailings Storage Facilities Water supply infrastructure Power supply infrastructure Rehabilitation	management Support services and amenities Tailings Storage Facilities Water supply infrastructure Power supply infrastructure Rehabilitation	

Rating of impact

Severity / nature

Other than mining, the various existing and proposed land uses within the broader study area include: agriculture (grazing and crop production), tourism (trout dams and accommodation facilities), protected areas (existing and proposed), current mining activities and mixed land use (which is a combination of tourism activities and agriculture).

These land uses may be affected by one or more of the following impacts:

- influence of the groundwater dewatering cone;
- potential groundwater contamination;
- noise pollution;
- air pollution; and
- visual.

When considered cumulatively, the severity of the potential impact on land uses is high in the unmitigated scenario. With mitigation that is focussed on prevention and/or controls for each impact type, the severity reduces to medium.

Duration

In the unmitigated scenario the impact on land use will extend beyond mine closure. With mitigation the majority of the land use impacts are expected to be limited to the life of mine.

Spatial scale / extent

The spatial scale is will extend beyond the boundaries of the Project Fairway project area.

Consequence

The unmitigated consequence is high. The mitigated consequence is medium.

Probability

In the unmitigated scenario, where impacts are uncontrolled, the probability that land uses will be impacted by mining is definite. With mitigation, the probability reduces to medium prior to closure and low post closure.

Significance

The unmitigated significance is high. With mitigation this reduces to medium prior to closure and to low post closure.

Unmitigated – summary of the rated land use impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H

Mitigated – summary of the rated land use impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning phases						
Mitigated	M	M	M	M	M	M
Closure						
Mitigated	M	M	M	M	L	L

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 19).

Objective

The objective of the mitigation measures is to prevent unacceptable negative impacts on surrounding land uses.

Actions

Everest will purchase/lease farms within application boundary.

Everest will implement the EMP commitments with a view not only to prevent and/or mitigate the various environmental and social impacts, but also to prevent negative impacts on surrounding land uses.

If a situation arises where any surrounding land use is negatively affected by the mine, Everest will immediately take steps to address the cause of the impacts. If the land use impact cannot be addressed, Everest will provide compensation for mine-related loss of land use.

Closure planning will incorporate measures to achieve the future land use plans for the land within the application boundary.

7.2.19 ISSUE: CHANGE IN LAND VALUES

Introduction

The mine development as a whole has the potential to impact on land values and associated economic activity. The proposed Project Fairway could add to this impact. The impact on land values could be affected both positively and negatively. Positive impacts are observed where mining companies require land adjacent to mining operations and as such land owners often sell land at a premium. Negative impacts are observed when the productivity of land surrounding mines or the quality of life of landowners/users is compromised by unacceptable negative environmental and social impacts. It is assumed that there is less concern about the scenario where land is purchased at a premium. Land use related losses are discussed in Section 7.2.18. This section focuses on the possibility of land devaluation from unacceptable negative environmental and social impacts.

Rating of impact

Severity / nature

In the unmitigated scenario, some land surrounding the mine and project site will experience unacceptable impacts which are likely to cause a loss in land values and/or economic activity. The severity of potential impacts is expected to be high for farms neighbouring the mine and project site, with the severity reducing the further away the farm unit is from the site. With mitigation which focuses on effective implementation of mitigation measures included in the EIA and EMP report, communication with stakeholders, rehabilitation of disturbed areas (as soon as possible) and compensation (if mine-related loss of land use and/or economic activity occurs after mitigation), the severity reduces to medium-low in the mitigated scenario.

Duration

In the unmitigated scenario, farm values and economic activity could be affected post-closure. With mitigation, the loss in land values to landowners would be avoided (through compensation) or reversed post-closure.

Spatial scale

In both the unmitigated and mitigated scenarios, any property value impacts or loss of economic activity will be experienced beyond the site boundary.

Consequence

A high consequence is expected in the unmitigated scenario. This reduces to medium-low in the mitigated scenario.

Probability

In the unmitigated scenario, it is possible that there will be a decline in property values and economic value of the property. With mitigation, potential impacts would be prevented and/or minimised.

Significance

In the unmitigated scenario, the significance of potential impacts is high. With mitigation this reduces to medium-low depending on the effectiveness of implemented management measures and whether all parties concerned can reach an agreement.

Tabulated summary of the rated cumulative impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	M	H
Mitigated	M-L	M-L	M	M-L	M-L	M-L

Description of existing and proposed Everest management measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 19).

Objective

To prevent and limit the potential decline in property values surrounding the mine.

Actions

Everest will implement the EMP commitments with a view not only to prevent and/or mitigate the various environmental and social impacts, but also to ensure that the identified impacts are contained on the project site and/or do not compromise the productivity of surrounding land.

Prior to project construction, an independent valuator acceptable to all stakeholders will be appointed to carry out a base case valuation of farmland surrounding the project site, the cost of which will be for the account of Everest. This valuation will provide a basis for future discussions if it is established that mine related impacts have caused a decrease in productivity from the affected farmland and as a direct result thereof , a decrease in land value, in which event, Everest will compensate the relevant land owners accordingly.

Emergency situations

None identified.

7.2.20 ISSUE: BLASTING DAMAGE

Introduction

Blast related impacts are an issue during the construction, operational and possibly also the decommissioning phases. Issues relating to blasting dust and blasting noise have been assessed as part of Section 7.2.12 and Section 7.2.13. The impacts assessed in this section related to infrastructure damage and/or harm to third parties and livestock.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
			N/A
Earthworks	Underground mining	Demolition	

Rating of impact

Severity / nature

Blasting was previously undertaken at the mine as part of the historic open pit mining operations. These areas have subsequently been completed and rehabilitated and therefore no surface blasting currently takes place at the mine. Current blasting activities at the mine are associated with the underground mining.

Blast hazards include ground vibration, airblast, fly rock. Injury to third parties and livestock may be caused by fly rock. Damage to third party infrastructure may be caused by:

- Fly rock,
- Ground vibration, and/or
- Air blast.

For the proposed Project Fairway, surface blasting will be required during the construction phase for the establishment of the proposed box cuts and the establishment of the proposed Valley access road. Once the box cuts are established and underground mining commences, all blasting activities will be undertaken underground. During the decommissioning phase, blasting may be potentially required to aid the removal of infrastructure. In this instance surface blasting may also be required. No blasting will be required for the closure phase.

During the construction and decommissioning phases, if any damage or injury to third parties occurs, it is considered to be a high severity in the unmitigated scenario which may be reduced to low in the mitigated scenario because the potential for blast related incidents is expected to decrease. During the operational phase, as the blasting will occur underground, the risk of impacts from fly rock and air blast are reduced. Therefore the unmitigated severity during the operational phase is medium, which can be reduced to low with the implementation of mitigation.

Duration

While damage to infrastructure can be repaired in the short term, injury or death is considered to be long term in nature. Therefore the unmitigated and mitigated impact duration is high.

Spatial scale / extent

In both the unmitigated and mitigated scenarios, potential impacts will be felt outside of the mine boundary but for the most part will still be localised. Injury and/or or death to people will, however, be felt by families and communities beyond the site boundary.

Consequence

The unmitigated consequence is high the mitigated consequence is medium for all phases (except closure).

Probability

Operational experience indicates that with mitigation it is unlikely that blasting activities will cause injury to people, livestock or damage to structures. This does not mean that blasts will go unnoticed in surrounding communities because the human response to vibrations and air blast will occur at thresholds that are much lower than the damage thresholds for structures. During the operational phase, as the blasting activities will be undertaken underground, the probability of impacts on third parties is unlikely even without mitigation. During the construction and decommissioning phases, without mitigation such impacts could occur.

Significance

The unmitigated significance is high for the construction and decommissioning phases, while for the operational phase it is medium. The mitigated significance is low for all phases.

Unmitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction and Decommissioning phases						
Unmitigated	H	H	M	H	M	H
Operational phase						
Unmitigated	M	H	M	H	L	M

Mitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases prior to closure						
Mitigated	L	H	M	M	L	L

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 19).

Objective

The objective of the mitigation measures is to prevent blast related damage to structures and/or injury to people and livestock.

Actions

Everest will implement a blast management plan which has the following key principles:

- Pre-mining crack surveys of structures within the potential impact zone;
- Design of blasts to prevent injury to people and livestock and to prevent damage to structures. As a minimum the blast design will achieve:
    - A fly rock impact zone limit of less than 500 m;
    - A peak particle velocity limit of less than 12.5 mm/s at third party structures that are built according to building industry standards and of 3 mm/s at third party structures that are not built according to building industry standards; and
    - An air blast limit of less than 125 dB at third party structures.
- Communication of the planned blast programme to interested and affected parties;
- Pre-blast warning and evacuation to clear people, moveable property and livestock from the potential fly rock impact zone;
- Blast monitoring to verify the effectiveness of the blast design and blast execution;
- Audit and review to adjust the blast design where necessary to achieve the stated objectives;
- Formal documented investigation and response for all third party blast related complaints; and
- Remediation of impacts caused by blasting.

As a general rule no blasting will take place within 500 m of third party structures. Where Everest would like to blast in areas within this 500 m distance, a project specific risk assessment will be completed and project specific mitigation measures will be implemented, subject to approval by the relevant authority(ies).

Emergency situations

If a person or animal is injured by blasting activities this must be handled in accordance with the Everest emergency response procedure.

7.2.21 ISSUE: TRAFFIC IMPACTS

Introduction

Increased traffic on existing public road networks as a result of the mine's operations can result in an inconvenience to current road users, greater accidents (for people and animals) and/or increased road damage. This in turn can put pressure on the relevant roads authority to increase the maintenance programmes and/or upgrade the roads. This section focuses on road capacity and safety related impacts. Safety related impacts have the potential to occur during the construction, operation and decommissioning phases with negligible road use taking place during the closure phase. The impacts are therefore assessed for the first three phases only.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure
			N/A
Transport systems	Transport systems	Transport systems	

Rating of impact

<u>Severity / nature</u>

The mine's approved EMP (July 2003) identified that the mine will contribute to the traffic in the project area, but that much of the existing traffic in area will be reduced because the Ackerman Sawmill and several families would relocate from the area to make way for mining. As part of the mine development, AQPSA upgraded the district road that provides access to the mine from the provincial R577 road to a tarred road. The roads within the mine boundaries are closed for public use. In the unmitigated scenario, the severity of impacts was rated as medium. This reduced to low with mitigation.

As the proposed Project Fairway will entail an increase in the production rate of the processing plant, an increase in heavy vehicle traffic volumes to those currently experienced on public roads to and from the mine. From the traffic counts conducted for the current operations, the number of heavy vehicles (including busses) travelling on the Road D874 South to and from the mine averages 35 heavy vehicles during the workday. The predicted daily heavy vehicle traffic volumes during the operation of Project Fairway are approximately 48 heavy vehicles per a workday, therefore the proposed Project Fairway will result in an increase of an additional 13 heavy vehicles per a workday. This increase may change the level of service of the existing public road infrastructure surrounding the mine.

The additional traffic generated by the proposed project is not expected to result in additional safety risks because these roads are already used for mine and public traffic and the additional volumes are not expected to change the nature of the road use and traffic.

In the unmitigated scenario if any injury or death of third parties occurs as a result of an accident, the severity is high. In the mitigated scenario the severity reduces to medium because the frequency of potential accidents is expected to reduce.

Duration

Any serious injury or death is a long term impact in both the unmitigated and mitigated scenarios.

Spatial scale / extent

Possible accident sites could be located within or outside the proposed project areas and the indirect impacts associated with any injuries or fatalities will extend to the communities to which the injured people/animals belong. This is a medium spatial scale.

Consequence

The consequence is high in both unmitigated and mitigated scenarios.

Probability

In the unmitigated scenario the probability of traffic accidents is medium as these do not occur on a continuous basis. With mitigation this reduces to low.

Significance

The unmitigated significance is high. With mitigation this reduces to medium.

Unmitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases prior to closure						
Unmitigated	H	H	M	H	M	H

Mitigated – summary of the rated impact per phase of the current operations and Project Fairway

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases prior to closure						
Mitigated	M	H	M	H	L	M

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 19).

Objective

The objective of the mitigation measures is to prevent transport related accidents and/or injury to people and livestock.

Actions

AQPSA has upgraded the district road that provides access to the mine from the provincial R577 road to an all-weather gravel road.

The mine roads constructed between the plant and the decline and the haul road to the rehabilitated open pit are all-weather gravel roads. These roads are closed for public use.

Trucks carrying concentrates from the mine are not overloaded – there is no spillage from the trucks that could damage roads and be hazardous to other road users.

The mine records and responds, appropriately and without delay, to any complaints about usage of roads by mine vehicles.

Emergency situations

Any road accident involving or caused by project related traffic is handled in accordance with the emergency response procedure as referenced in Section 20.2

7.3 DEFINITION OF CRITERIA USED

Both the criteria used to assess the impacts and the method of determining the significance of the impacts is outlined in Table 7-3. This method complies with the method provided in the EIA guideline document. Part A provides the approach for determining impact consequence (combining severity / nature, spatial scale and duration) and impact significance (the overall rating of the impact). Impact consequence and significance are determined from Part B and C. The interpretation of the impact significance is given in Part D. Unmitigated scenario is considered for each impact.

TABLE 7-3: CRITERIA FOR ASSESSING IMPACTS

PART A: DEFINITION AND CRITERIA		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of severity / nature, spatial extent and duration**
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action. Irreplaceable loss of resources.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints. Noticeable loss of resources.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints. Limited loss of resources.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE/ EXTENT of impacts	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national

PART B: DETERMINING CONSEQUENCE

SEVERITY / NATURE = L

DURATION	Long term	**H**	**Medium**	**Medium**	**Medium**
	Medium term	**M**	**Low**	**Low**	**Medium**
	Short term	**L**	**Low**	**Low**	**Medium**

SEVERITY / NATURE = M					
DURATION	Long term	**H**	**Medium**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**High**
	Short term	**L**	**Low**	**Medium**	**Medium**
SEVERITY / NATURE = H					
DURATION	Long term	**H**	**High**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**High**
	Short term	**L**	**Medium**	**Medium**	**High**
			L	**M**	**H**
			SPATIAL SCALE / EXTENT		

PART C: DETERMINING SIGNIFICANCE					
PROBABILITY (of exposure to impacts)	Definite/ Continuous	**H**	**Medium**	**Medium**	**High**
	Possible/ frequent	**M**	**Medium**	**Medium**	**High**
	Unlikely/ seldom	**L**	**Low**	**Low**	**Medium**
			L	**M**	**H**
			CONSEQUENCE		

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
High	It would influence the decision regardless of any possible mitigation.
Medium	It should have an influence on the decision unless it is mitigated.
Low	It will not have an influence on the decision.

***H = high, M= medium and L= low and + denotes a positive impact.**

7.4 PHASES AND TIMEFRAMES OF POTENTIAL IMPACTS

An indication of the phases in which impacts could occur is included in Section 7.2. This section also provides an indication of the duration of potential impacts. Potential impacts associated with the project have the potential to occur in almost all project phases and on a continuous basis if unmitigated. With the implementation of the mitigation as presented in Section 19, the monitoring programmes as presented in Section 21 and the emergency response procedures as presented in Section 20 the timeframe of potential impacts will be reduced significantly.

8 COMPARATIVE LAND USE ASSESSMENT

8.1 ALTERNATIVE LAND USE THAT COULD BE IMPACTED UPON

The mine site is currently used for livestock grazing and wilderness. The footprint of the proposed TSF area is located within a portion of the existing Kiwifruit plantation. Immediately surrounding land uses are similar to this with the addition of tourism-type activities take place (see Section 1.3.1 for a detailed description of existing land uses in the area. As an alternative to the development of the Project Fairway, these current land uses would continue. Given the location of the project within an area with conservation value, no other alternative land use is envisaged.

The proposed project will temporarily prevent the current land uses on site from continuing, for the life of the project. At closure, it is expected that with mitigation, the area could be used for grazing, with the exception of the proposed TSF footprint which will remain in perpetuity.

8.2 COMPARATIVE LAND USE ASSESSMENT

A comparative assessment was undertaken by the economic specialist, based on information provided by specialist consultants. Results from the study informed the impact assessments described in Sections 7.2.16 and 7.2.18. A full copy of the specialist report is included in Appendix Q. The specialist finding are summarised below.

The issue of the better economic use of alternative land is inextricably linked to the question of what is sustainable development. It is the specialist's view that the relevant question is: what is the best sustainable development option for South Africa between Agriculture and Mining for the Project Fairway study area? The specialist's conclusion is that the best alternative land-use is AQPSA's mining development proposal for Project Fairway. The main reasons are:

- In South Africa, employment is the single biggest enhancer or detractor of social stability. It is also the one factor that makes all the difference in a person's material and psychological well-being. Closely linked to employment is income generation. Every generation, as a general principle in economic development, must be afforded the opportunity to advance itself responsibly without compromising the future of the next generation. The applicant's mining development, both from an income generation and employment retention perspective (note this is based on saving jobs at Everest), far outstrips that of the Agricultural GGP from the impacted farms. The related negative impact on farm related employment is not definite, but a conservative assumption has been made by the specialist to enable a relative comparison.

- It is important to state that the economic viability of the Everest Mine is at stake should the proposed Hoogland project not take place and for this reason the short span of the life of mine could be accommodated.
- Thus at stake is the creation/retention of approximately 1 685 jobs compared to a maximum of 102 jobs that could be lost in the surrounding farm areas. The Time-Adjusted Employment created/retained (10/30 years to adjust for life of mine) for Project Fairway is 562 and this is more than the potential 102 jobs lost.
- Furthermore, the development takes place on the border of a municipality that is situated in one of the presidential development nodes so identified due to its abject poverty and need for development. Therefore, the industry that creates the most jobs must be seen as the better alternative for land-use. The municipality has a participation rate (employed/working age adults) of just over 30%, thus 3/10 working age adults have formal jobs.
- The impact of mine closure on the local economies will be significantly high – just over 2% for GGP decline and just under 6% decrease in formal jobs. Thus, this is another major reason to recommend the Fairway development. However, the discontinuation of the Everest operation would not cause an economic catastrophe for the region.

9 LIST OF SIGNIFICANT IMPACTS

A list of significant impacts, when considered without mitigation, as identified in the assessment conducted in Section 7 is provided below.

- Hazardous excavations/structures/surface subsidence (High)
- Loss of soil resources and land capability through pollution (High)
- Loss of soil resources and land capability through physical disturbance (High)
- Physical destruction of biodiversity (High)
- General disturbance of biodiversity (High)
- Pollution of surface water resources (High)
- Alteration of natural drainage patterns (High)
- Contamination of groundwater (High)
- Dewatering affecting baseflow of rivers (High)
- Air pollution (High)
- Noise pollution (Medium)
- Visual impacts (Medium - High)
- Destruction of heritage, cultural and paleontological resources (High)
- Economic impact (positive and negative) (High Positive)
- Inward migration impact (High)
- Land use impacts (High)
- Change in land values (High)
- Blasting damage (High)
- Traffic impacts (High)

10 STAKEHOLDER ENGAGEMENT PROCESS

This section provides a description of the engagement process with interested and affected persons (IAPs) followed during the course of the environmental assessment process. It outlines how IAPs were identified, confirms the details of the engagement process (with supporting documentation included as appendices), and how issues raised have been addressed.

10.1 IDENTIFICATION OF INTERESTED AND AFFECTED PARTIES

The stakeholder engagement process commenced with a stakeholder analysis that was aimed at identifying parties to be involved during the environmental assessment process and associated communication structures. This was done through review of the mine's existing IAP database, a deeds search of the relevant properties within the project site and immediately adjacent portions of land, social scans including site visits in the surrounding area, networking and direct consultation with IAPs. The database is being updated on an on-going basis throughout the environmental process. Key stakeholders identified for the project include:

Landowners and users

- Landowners as listed in Table 1-17 and Table 1-18 in Section 1.3.1;
- Land occupiers and community surrounding the project area;
- Downstream mines and industries;
- Non-government organisations and associations;
- Mine employees.

Regulatory authorities:

- Department of Mineral Resources (DMR);
- Department of Economic Development, Environment and Tourism (DEDET);
- Department of Agriculture, Forestry and Fisheries (DAFF);
- Department of Water Affairs (DWA);
- Department of Rural Development and Land Reform (DRDLR);
- Mpumalanga Tourism and Parks Agency (MTPA);
- South African Heritage Resources Agency (SAHRA);
- Traditional leadership of the communities as listed in Section 1.3.1.

Local authorities:

- Enhlanzeni District Municipality; and
- Thaba Chweu Local Municipality.

A full list of landowner names, local communities, other IAPs and non-government organisations consulted is provided in the IAPs and regulatory authorities' database included in Appendix C. The database is updated on an on-going basis throughout the environmental process.

10.2 DETAILS OF ENGAGEMENT PROCESS

Stakeholder engagement is an integral component of any development process. The goal of stakeholder engagement is to facilitate and improve communication between stakeholders (including the applicant) in the interest of facilitating better decision-making and more sustainable development (DEAT, 2002). In accordance with the requirement of Regulation 54 of the 2010 EIA Regulations, a stakeholder engagement programme has been developed to set out a coordinated process through which IAPs are informed of the proposed development and environmental assessment process and provided with an opportunity to provide input into the project plan and proposed mitigation measures. By consulting with authorities and IAPs, the range of environmental issues to be considered in the EIA has been given specific context and focus. Included below is an outline of the process followed, and the people engaged for Project Fairway.

10.2.1 STEPS IN THE PUBLIC PARTICIPATION PROCESS

Steps in the consultation process that have been conducted to date are set out in Table 10-1 below.

TABLE 10-1: CONSULTATION PROCESS WITH IAPS AND AUTHORITIES

Task	Description	Date
Notification - regulatory authorities and IAPs		
Registered letters sent to immediate landowners	Registered post was sent to the immediate landowners to inform them of the mine's intention to extend its mining operations and to inform them of the focussed stakeholder meeting.	15 August 2011
Application to DEDET	Formal application was submitted by Metago SLR to DEDET on 16 August 2011. A copy of the relevant parts of the application and the responses are attached in Appendix B.	16 August 2011
Application to DMR	Formal application was submitted by AQPSA to DMR on 19 October 2011.	19 October 2011
Information-sharing with immediate landowners	Initial discussions were held with the Phetla community leaders and Northam Platinum. The purpose of these initial interactions was to inform them of the proposed project, to introduce Metago SLR, provide conceptual information regarding the project and to obtain initial comments. The meeting minutes are presented in Appendix D.	30 August 2011 and 1 September 2011
Social scan	A social scan of the Fairway project sites was conducted by Metago SLR. The purpose of the social scan was: • to identify relevant municipal ward councillors, landowners, land occupiers, and other interested and affected parties; • to obtain updated contact details for IAPs; • to identify appropriate communication structures; and • inform IAPs of the project, upcoming public consultation	5 - 9 September 2011

Task	Description	Date
	process and associated scoping and EIA/EMP processes. As part of the social scan, direct consultation with landowners took place through informal discussions, focussed meetings and/or telephonic discussions. Issues raised during the social scan have been included in the issues table. One output of the social scan is an updated IAP database (Appendix C). The IAP database is updated throughout the EIA process as required.	
Distribution of background information document (BID)	BIDs were distributed to IAPs by email and/or post using the mine's IAP database and contact details obtained during the social scan and at the public scoping meetings as well as by fax and/or e-mail to authorities on the project's public involvement database. A copy of the BID (in English and SePedi) is attached in Appendix D. The purpose of the BID was to formally inform IAPs and authorities about the project, the environmental assessment process, possible environmental impacts and means of inputting into the environmental assessment process. Attached to the BID was a registration and response form, which provided IAPs with an opportunity to submit their names, contact details and comments on the project to Metago SLR.	5- 9 September 2011
Site notices	Laminated A2 site notices in English and SePedi were placed at key conspicuous positions in and around the project site as per the MPRDA and NEMA requirements. A copy of the site notice (in English and SePedi) as well as proof of placement is attached in Appendix D.	5 September 2011
Newspaper advertisements	Block advertisements were placed in the Daily Sun and the Steelburger as per MPRDA and NEMA requirements. Copies of the newspaper advertisements are attached in Appendix D.	9 September 2011
Scoping stage meetings and comments received		
Public scoping meetings	Public scoping meetings were held on 30 September 2011 and 1 October 2011 at the Steenkampsberge Boerevereenging Saal (in English and Afrikaans) and Kiwi Primary School (in SePedi and English) respectively. The purpose of the meetings was to provide IAPs with an outline of the project and environmental assessment process, obtain input on the baseline conditions of the area, identify potential issues to be investigated further, provide input into the terms of reference for specialist studies and agree on the way forward. Minutes of the meetings are included in Appendix D.	30 September 2011 and 1 October 2011
Written comments	Written comments were received by Metago SLR during the scoping process. Copies of the comments are included in Appendix D and a summary is included in the comments and response report in Appendix E.	September and October 2011

Task	Description	Date
Draft scoping report for review		
Authority review of draft scoping report	Copies of the scoping report were provided to the Limpopo DMR in hard copy and in electronic copy and at the same time hard copies of the report were distributed to the other authorities for review. Proof of distribution is contained in Appendix D. The following authorities were involved in the review process: DMR, DEDET, DAFF, DWA, DRDLR, MTPA, SAHRA Ehlanzeni District Municipality and Thaba Chweu Local Municipality. Apart from the DMR, regulatory authorities were given 40 days to review the scoping report and submit comments. The closing date for comments was 30 November 2011.	17 October 2011
Public review of scoping report	Copies of the scoping report were made available for public review at venues agreed to during the scoping process. These included Everest Platinum Mine Reception, the Phetla CPA, Kiwi Primary School, Steenkampsberge Boereverening, the Lydenburg Public Library, the De Berg Conservancy, the library at Metago SLR's offices in Pretoria and at Metago SLR's offices in Johannesburg. Scoping report summaries were made available in English and SePedi via post, email, and the Kiwi Primary School. A copy of the summary and proof of distribution are included in Appendix D. IAPs on the database were notified of the availability of the scoping report at public venues through distribution of the scoping report summaries, telephone calls, and e-mails. IAPs were given 40 days to review the scoping report and submit comments. The closing date for comments was 30 November 2011.	17 October 2011
Written comments	Written comments were received by Metago SLR during the review of the scoping report. Copies of the comments are included in Appendix D and a summary is included in the comments and response report in Appendix E.	17 October 2011 – 30 November 2011
Information-sharing meeting	Following a request from the Ba Ga Makua Community, a scoping meeting was held on 29 October 2011 at the Tonderdoos Secondary School on Draaikraal. The purpose of the meeting was to provide IAPs with an outline of the project and environmental assessment process, obtain input on the baseline conditions of the area, identify potential issues to be investigated further, provide input into the terms of reference for specialist studies and agree on the way forward. Minutes of the meeting are included in Appendix D.	29 October 2011
Final scoping report for review		
Authority review of final scoping report	The final scoping report including IAP comments was submitted to the DEDET and DEA for review.	15 December 2011
Public review of scoping report	Following the Ba Ga Makua Community meeting, a copy of the final scoping report and scoping report summaries (in SePedi and isiZulu) was forwarded to the Draaikraal community for review as agreed during the October 2011 meeting. Proof of distribution is included in Appendix D.	12 December 2011
	IAPs were notified via post, email and the Kiwi Primary School that the final scoping report was available for review. A follow up reminder was sent out via email in early January 2012. IAPs were given 21 days to review the final scoping report and submit any additional comments. The closing date for	15 December 2011

Task	Description	Date
	comments was 31 January 2012.	
Written comments	Written comments were received by Metago SLR during the review of the final scoping report. Copies of the comments are included in Appendix D and a summary is included in the comments and response report in Appendix E.	15 December 2011 – 31 January 2012

10.2.2 SPECIALIST TEAM

Upon input from IAPs on the potential impacts that may arise as a result of the proposed development, several specialists (see Table 0-4 for a complete list of all appointed specialist, their roles and responsibilities) were appointed to assess the potential impact of the proposed development. Where required, specialists consulted with stakeholders directly during their specialist studies. Details are provided in the specialist reports included as appendices.

10.2.3 REVIEW OF EIA AND EMP BY REGULATORY AUTHORITIES

The EIA and EMP report will be distributed to regulatory authorities for review as follows:

- Seven copies of the report will be forwarded to the Mpumalanga DMR in March 2012.
- At the same time copies of the report will be forwarded to the following regulatory and local authorities for review: DWA, SAHRA, DAFF, DRDLA, MPTA, Ehlanzeni District Municipality, Thaba Chweu Local Municipality. These authorities will be given 40 days to review the report and submit comments to Metago SLR.
- At the same time, a copy of the draft report will be forwarded to DEDET and DEA.
- Following public review of the final EIA and EMP report, five copies (two hard copies and three electronic) of the final EIA and EMP report (including IAP comments) will be forwarded by Metago SLR to DEDET and four copies to DEA in line with NEMA.

In addition, it is proposed to hold a regulatory authority meeting at some stage during the review process, if required. The purpose of the meeting will be to provide the authorities with a summary of the EIA and EMP report, undertake a site visit, and discuss any comment.

10.2.4 REVIEW OF THE EIA AND EMP BY IAPS

Copies of the draft EIA and EMP report will be made available for public review at the following places:

- Everest Platinum Mine (C/o The Receptionist);
- Phetla CPA (C/o Samuel Maredi – the CPA Chairman);
- Kiwi Primary School (C/o Peggy Ngutshane – School Principal);
- Steenkampsberge Boereverening (C/o Dawie Jacobs);
- Lydenburg Public Library;

- De Berg Conservancy (C/o Chris Davel);
- Ba Ga Makua Community (C/o William Segafa – Draaikraal representative);
- Library at SLR's offices in Johannesburg; and
- Library at SLR's offices in Pretoria.

Electronic copies of the report will be made available to IAPs on request (electronically on CD). A summary of the EIA and EMP report (in English, SePedi and Zulu) has been distributed to all IAPs registered on the project's public involvement database by post, e-mail, via the Kiwi Primary School and via the Ba Ga Makua community representative. IAPs have been notified of the availability of the report and/or summary for review as well as review periods via newsletter and sms (short text message). IAPs will be given 40 days to review the draft report and submit comments in writing to Metago SLR. For the Kiwi and Ba Ga Makua communities, members can drop off completed comments sheets at the respective representatives and Metago SLR will arrange for these to be collected.

All comments received from IAPs during the review period will be included in the final EIA and EMP report. IAPs will be notified of the availability of the final report for review via newsletter. IAPs will be given 21 days to review the final report and to submit to Metago SLR in writing any additional comments. For the Kiwi and Ba Ga Makua communities, members can drop off any additional comments sheets at the respective representatives and Metago SLR will arrange for these to be collected.

All comments received from IAPs during the review period will be forwarded to the DMR and included with the final report that is submitted to DEDET and DEA.

Once the DMR, DEDET and DEA have issued their respective records of decisions, the IAPs will be notified by e-mail, post, the Kiwi Primary School and Ba Ga Makua Community representative in accordance with the instructions from the DMR, DEDET and DEA respectively.

10.2.5 FEEDBACK MEETINGS

Three feedback meetings have been arranged, one at the Kiwi Primary School, one at the Steenkampsberge Boereverening and one at the Tonderdoos Secondary School on Draaikraal. The purpose of these is to provide IAPs with an opportunity to submit final comments of the EIA and EMP report. The details of the feedback meetings have been distributed to IAPs together with a summary of the EIA and EMP report.

10.3 MANNER IN WHICH ISSUES RAISED WERE ADDRESSED

Stakeholder meetings and public review of the scoping reports provided IAPs an opportunity to comment on the baseline environment and potential impacts of the project (including social and cultural impacts). All the issues and concerns raised have been captured into the comments and response report (Appendix E). The comments and response report provides responses to issues raised and identifies where the issues have been addressed in the EIA and EMP report.

11 ADEQUACY OF PREDICTIVE METHODS, UNDERLYING ASSUMPTIONS AND UNCERTAINTIES

Assumptions, uncertainties and limitations have been discussed throughout the EIA and EMP report the associated specialist studies. The more significant of these are included below.

11.1 ENVIRONMENTAL ASSESSMENT LIMIT

The assessment focused on third parties only and did not assess health and safety impacts on workers because the assumption was made that these aspects are separately regulated by health and safety legislation, policies and standards, and that Everest will adhere to these.

11.2 PREDICTIVE MODELS IN GENERAL

All predictive models are only as accurate as the input data provided to the modellers. If any of the input data is found to be inaccurate or is not applicable because of project design changes that occur over time, then the model predictions will be less accurate.

11.3 GEOLOGY

None.

11.4 CLIMATE

None.

11.5 TOPOGRAPHY

None.

11.6 LAND USE

All the impacts listed and discussed here were derived from the specialist studies and reports conducted by the respective specialists. Where necessary interpretation of the impacts on land use were made, however the impacts considered are largely those provided by the various specialists. It is assumed that each specialist gave a correct representation of the potential impacts that will result from the proposed projects. Should these impacts not be correct, it will influence on the conclusions of this report.

The scope of the Land Use assessment is neither a land valuation process nor an extensive game and cattle count survey. It is also not part of the public participation process. The focus of this report was to determine the current land use in the area and to determine how the proposed project will impact and possibly threaten the current land-use on farming units at varying distances from the proposed mining operation.

All the land users did not return the questionnaires or returned messages and phone calls and therefore it was not possible to determine whether some land users may have another unique enterprise on the farm that may be very dependent on the current environmental factors. Due to a lack of information from these farms, the impact of the proposed project is assumed to be no different than that of the farms for which information was made available.

The determination of possible cumulative impacts resulting from other proposed projects were assessed with the information available of other applications made (either for prospecting or mining). Should there be other applications in the area surrounding the project that the consultant becomes aware of the cumulative impact map will need to be re-assessed.

11.7 SOILS AND LAND CAPABILITY

None.

11.8 BIODIVERSITY

The following assumptions and limitations are applicable to the biodiversity assessment:

- The ecological assessment is confined to the subject property and does not include the neighbouring and adjacent properties, these were however considered as part of the desktop assessment.
- Due to late rain in the area, various site visits were necessary in order to accurately assess the study area in terms of floral diversity. However, due to temporal; variability, some species might have not have been detected. Therefore, site observations are compared with literature studies where necessary.
- Due to the nature and habits of most faunal taxa it is unlikely that all species would have been observed during a site assessment of limited duration. Therefore, site observations are compared with literature studies where necessary.
- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. A more accurate assessment would require that assessments take place in all seasons of the year. However, it is expected that most faunal and floral communities have been accurately assessed and considered.

- Sampling by its nature, means that not all individuals are assessed and identified. Therefore, some species and taxa on the subject property may have been missed during the assessment. Due to the nature and habits of fauna, varied stages of life cycles, adverse weather or seasonal and temporal fluctuations along with other external factors, it is unlikely that all faunal species will have been recorded during the site assessment. In addition the levels of anthropogenic activity in the study area and surrounding area may determine whether a particular species will be observed or not.
- The wetland delineation as presented in this report is regarded as a best estimate of the wetland boundary based on the site conditions present at the time of assessment.
- Wetlands and terrestrial areas form transitional areas where an ecotone is formed as vegetation species change from terrestrial species to facultative and obligate wetland species. Within this transition zone some variation of opinion on the wetland boundary may occur, however if the DWAF 2005 method is followed, all assessors should get largely similar results.

11.9 SURFACE WATER

The Hydrological Assessment was undertaken using the best available data available at the time of the study. The following assumptions have been made:

- Estimation of baseline flows within the Groot-Dwars River adjacent to the site assumes that the flows recorded at De Brochen Dam were measured accurately;
- Estimation of baseline flows within the Groot-Dwars River adjacent to the site assumes that the flow within a watercourse, or tributaries thereof, is directly proportional to the catchment area; and
- The modelled rate of required dewatering, rate of groundwater inflow to Groot-Dwars River and rate of leakage from the river into the mine workings are correct.

It should be acknowledged that the assessment of impacts is subject to the above assumption and draws upon desk based estimates of baseline flows in the Groot-Dwars which have not be calibrated against actual flow measurements recorded in the river. The accuracy of impacts could be improved by the following:

- Calibration of estimates of baseline flows during the dry-season months against actual recorded flows with the Groot-Dwars River; and
- Calibration of predicted dewatering volumes against actual recorded rates of dewatering.

11.10 GROUNDWATER

Assumptions and limitations for ground water assessment are summarised below:

- Aquifer characteristics at depth:

- A large portion of the proposed Fairway study area is located at more than 1 000 m below surface, yet at the deepest the mine extends 2 100 m below surface. Little information is available on the aquifer characteristics at those depths.
- Several major fault lines and dykes intersect the area that would have disturbed the host geology to a great depth during their formation and intrusion of the dyke material, thereby creating groundwater flow pathways. However, it would be expected that at that depth the vast majority of fractures are closed by the weight of the overlying rock mass. This however, does not rule out the possibility of individual high yielding fractures being intersected. A further point of concern is the limited information on the water yielding capacity of the hanging wall shear that is also mentioned in the GCS 2011 Hoogland study report.
- Groundwater inflows into the underground workings will largely be associated with individual water bearing fault lines and fractures. Therefore, the calculated inflow volumes are an average of the total inflows and do not take into consideration individual high yielding faults that are currently unknown and could occur at depth in the mine.

- ABA and leach testing:
  - ABA and leach testing was not done as part of this study and it relies on findings of previous studies performed by other consultants. While the general work of the previous consultants in general is very thorough and cannot be faulted, some of the original data on the ABA and leach testing is not available.

11.11 AIR

Assumptions and limitations for air quality assessment are summarised below:

- It was provided that the current operations at the Everest Mine consisted of underground mining activities and plant operations (including crushing activities and tailings facility). For the quantification of cumulative activities with the proposed Project Fairway operations, these existing mining activities (taking into consideration the expected life of the current tailings dam) were taken into account.
- Information required to calculate emissions from fugitive dust sources for the Proposed Project Fairway operations were provided by AQPSA personnel. The assumption was made that this information was accurate and correct.
- Routine emissions from mining operations were estimated and modelled. Atmospheric releases occurring as a result of accidents were not accounted for.
- On-site meteorological data was not available for the current assessment. Use was therefore made of calculated MM5 data for the area for the period 2010.
- The silt content and silt loading on the site road surfaces was unknown for the current assessment. Use was therefore made of typical levels as obtained from the United States Environmental Protection Agency (US-EPA).

- The impact assessment was limited to airborne particulates (including total suspended particulates (TSP), PM2.5 and PM10) and gaseous pollutants from vehicle exhausts (including carbon monoxide (CO), oxides of nitrogen (NOx) and sulphur dioxide (SO2)).
- Nitrogen monoxide (NO) is rapidly converted in the atmosphere into the much more poisonous nitrogen dioxide (NO2). The rate of this conversion process is determined by both the rate of the physical processes of dispersion and mixing of the plume and the chemical reaction rates. As a conservative measure, all NOx was assumed to be NO2.

11.12 HERITAGE AND CULTURAL RESOURCES

It is possible that some heritage and cultural resources were not detected during the field surveys. While some remains may simply be missed during surveys (observations), others may occur below the surface of the earth and may only be exposed once development (such as mining) commences. If any new heritage and cultural resources are exposed Everest's chance find procedure will be implemented.

11.13 NOISE

By defining the actual predevelopment ambient sound level as the reference, noise regulations applicable in Mpumalanga Province effectively apply what is known as noise emergence criteria. An alternative approach (as employed in the Gauteng Noise Regulations), is to use nominal table values recommended in SANS 10103. This is known as acceptable level criteria. Both methods have advantages and disadvantages.

Caution should be exercised in applying noise criteria, bearing in mind that no single principle or criterion will perfectly fit and be adequate or fair in all applications. The sensibility and fairness of any given criterion depend on the nature and origin of the existing ambient noise. In situations where existing ambient levels are on the high side, it is of crucial importance in the assessment of noise impact of a new development, to establish whether the existing ambient sound is primarily a result of interior or domestic activity (self-noise), or whether it is primarily caused by external sources of noise (intrusive noise).

Where the predevelopment ambient sound is dominated by noise emanating from external sources such as industrial plants, mining activity and road traffic on external main roads, special precaution needs to be exercised not to aggravate conditions. If the existing ambient level is already higher than what is regarded as typical or recommended, specific noise from a proposed new development should not be allowed to exceed the nominal value regarded as acceptable for the type of district under consideration. It would be more fitting in such instances, to apply acceptable level criteria; e.g. setting the daytime limit for specific noise from the development at the lower nominal limit.

Noise Regulations criteria should never be applied blindly without due consideration of the practical consequences. Finally, whatever guidelines are followed, it should always be investigated if there is a specific period (daytime or night-time) during a 24-hour cycle during which the noise impact will be at its worst. For constant 24-hour operations, this would normally occur at night-time.

11.14 VISUAL

A viewshed analysis is a two-dimensional spatial pattern created by an analysis that defines areas, which contain all possible observation sites from which an object would be visible. The basic assumption for preparing a viewshed analysis is that the observer eye height is 1,8 m above ground level. It should be noted that viewshed analyses are not absolute indicators of the level of significance (magnitude) of the impact in the view, but merely a statement of the fact of potential visibility.

11.15 SOCIO-ECONOMIC

The following assumptions were made for the Economic Assessment:

- It is assumed that the mining operation being evaluated is economically viable and the onus to this verification lies with the Regulator.
- Use was made of the project's mine works programme extensively to determine its economic benefits.
- The agricultural land in hectares lost is based on estimates by the land use specialist.
- The Economic Assessment memorandum does not express a view on the cost-benefits of integrated sustainable development (thus the balance between the environment, social and economics), but rather gives an indication of the better alternative for land-use.
- The study is limited in its scope as the specialist uses mainly "inferred economic data", thus it is limited to desktop research, site visits, telephonic interviews and interactions with other specialists and the lead environmental consulting firm.
- The study should not form a basis for land or any other compensation discussions as no specific (micro) land or income valuations have been made. The valuations are all based on macro-economic quantities and every specific piece of land would have to be evaluated in its own right. The reason for preferring macro-quantities is that the only reliable micro-economic data would be audited financial statements and tax returns from land-owners, which very few stakeholders are prepared to make available for a study of this nature and the macro-economic data is often a better comparison as the information is smoothed and it compares potential land yields as opposed to actuals (both for mining and agriculture).

12 DESCRIPTION AND ARRANGEMENT FOR MONITORING AND MANAGEMENT OF ENVIRONMENTAL IMPACTS

This section describes the arrangements for monitoring and management of environmental impacts. It identifies the impacts that require monitoring programmes and outlines the functional requirements, roles and responsibilities and timeframes for the monitoring programmes. Further detail on each monitoring programme is included in Section 19.

12.1 IMPACTS THAT REQUIRE MONITORING PROGRAMMES

Impacts that require monitoring include:

- Hazardous excavations and structures (failure of TSF and water dams)
- Physical destruction and general disturbance of biodiversity
- Dewatering impacts
- Contamination of groundwater
- Increase in air pollution
- Increase in disturbing noise levels
- Blasting hazards
- Noise levels

In addition to the above, the commitments as included in the EMP report will require monitoring to a) ensure that they are being implemented and b) that they are effective in mitigating potential impacts on the environment, socio-economic conditions of third parties and heritage/cultural aspects. This will be done through regular internal auditing by mine personnel.

12.2 FUNCTIONAL REQUIREMENTS OF MONITORING PROGRAMMES

The purpose of the monitoring programmes is to review the mine's impact on various aspects of the environment and to report on changes needed to the management programme.

As a general approach, the mine will ensure that the monitoring programmes comprise the following:

- A formal procedure
- Appropriately calibrated equipment
- Where samples require analysis they will be preserved according to laboratory specifications
- An accredited, independent, commercial laboratory will undertake sample analyses
- Parameters to be monitored will be identified in consultation with a specialist in the field and/or the relevant authority

- If necessary, following the initial monitoring results, certain parameters may be removed from the monitoring programme in consultation with a specialist and/or the relevant authority
- Monitoring data will be stored in a structured database
- Data will be interpreted and reports on trends in the data will be compiled by an appropriately qualified person on a quarterly basis
- Both the data and the reports will be kept on record for the life of mine.

12.3 ROLES AND RESPONSIBILITIES

The roles and responsibilities for the execution of the monitoring programmes are defined below.

- Group environmental manager:
  - Oversee the role of the site-specific environmental co-ordinator
- SHE Co-ordinator
  - ensure that the monitoring programmes are scoped and included in the annual mine budget
  - identify and appoint appropriately qualified specialists/engineers to undertake the programmes
  - appoint specialists in a timeously manner to ensure work can be carried out to acceptable standards

12.4 TIMEFRAMES FOR MONITORING AND REPORTING

The timeframes for monitoring and reporting thereof are detailed in the monitoring programme (see Section 21). A summary is provided below:

Programme	Monitoring: Timeframe and frequency	Reporting
Tailings dams, waste dumps and water dams	All project phases Daily and monthly by dam operators and quarterly by professional engineer	Monthly internally and quarterly by professional engineer
Biodiversity	All project phases Quarterly and annually	Annually by specialist
Groundwater and process water	All project phases Monthly (water levels), quarterly (water qualities), annually (update groundwater model and climatic water balance)	Quarterly and annually by specialists Annually to Department of Water Affairs (DWA)
Air	All project phases Quarterly (dust) and daily (PM10)	Quarterly and annually by specialist Annually to Department of Mineral Resources (DMR) and Department of Economic Development, Environment and Tourism (DEDET)
Noise	Periodically from the start of construction to the end of decommissioning Annually	Annually by specialist
Blasting	During operation of the mine Every blast	Monthly by specialist
Internal auditing	From start of construction to end of closure On-going Every two weeks during construction and decommissioning, and quarterly during operation and closure.	Monthly internally during construction and decommissioning Quarterly internally during operation and closure

Programme	Monitoring: Timeframe and frequency	Reporting
External auditing	From start of construction to end of closure Every two years	Every two years to DMR

13 TECHNICAL SUPPORTING INFORMATION

Technical and supporting information included as appendices to this report are listed below.

- Soils and Land Capability Study (Appendix F);
- Biodiversity Study (Appendix G);
- Hydrological Study (Appendix I);
- Water Quality Hydrocensus (Appendix I);
- Geohydrological Study (Appendix J);
- Air Quality Study (Appendix K);
- Noise Study (Appendix L);
- Visual Study (Appendix M);
- Land Use Study (Appendix N);
- Heritage and Cultural Study (Appendix O);
- Socio-Economic Baseline Report (Appendix P);
- Economic Study (Appendix Q);
- Financial Provision Calculation (Appendix R);
- Climatic Water Balance (Appendix S);
- Stormwater Management Plan (Appendix T); and
- Tailings Storage Facility Feasibility Study (Appendix U).

SECTION 2 – ENVIRONMENTAL MANAGEMENT PROGRAMME

14 ENVIRONMENTAL OBJECTIVES AND SPECIFIC GOALS FOR CLOSURE

14.1 ENVIRONMENTAL ASPECTS THAT DESCRIBE THE PRE-MINING ENVIRONMENT

Environmental aspects that describe the pre-mining environment (of the existing mine site and proposed Project Fairway project site) as informed by the baseline description (Section 1) are listed below. This list serves to guide the setting of environmental objectives for mine closure.

- Topographical features range between flatter terrace areas to steeper valleys.
- Soils that support agricultural potential (to varying degrees between arable and grazing) and hydromorphic soils.
- Biodiversity that ranges in sensitivity from very low to medium-high based on vegetation communities, vertebrate and invertebrate groups identified on site.
- Perennial and non-perennial drainage patterns.
- Moderate to good groundwater quality
- Stable water table providing groundwater as a water supply source and feeding streams in the upper reaches.
- Quiet agricultural environment.
- Open valley wilderness.

14.2 MEASURES TO CONTROL OR REMEDY ANY CAUSES OF POLLUTION OR DEGRADATION

Measures required to contain or remedy any causes of pollution or degradation or migration of pollutants, both for closure of the mine and post-closure are listed below.

- Implement a waste management procedure for general and hazardous waste on site
- Ensure immediate clean-up of any spills as per the emergency response procedures
- Establish and maintain dirty stormwater control measures in line with regulatory requirements, until such time as potentially polluting areas are rehabilitated
- Contain pollutants at source by storing and handling potentially polluting substances on impermeable substrates, within bunded areas and with the capacity to contain spills
- Design, construct and operation of the existing and proposed tailings dam with decant and drainage systems and runoff control measures
- Design, construct and operate existing and future waste dumps with runoff control measures
- Rehabilitate the site in line with a detailed closure plan to be developed at least five years prior to decommissioning

Further detail on the proposed action plans and mitigation measures is included in Section 19.

15 ENVIRONMENTAL OBJECTIVES AND SPECIFIC GOALS FOR MANAGEMENT OF IDENTIFIED ENVIRONMENTAL IMPACTS

The environmental objectives and specific goals for the management of identified environmental impacts are detailed in this section.

15.1 IMPACTS THAT REQUIRE MONITORING PROGRAMMES

Impacts that require monitoring include:

- Physical destruction and general disturbance of biodiversity
- Dewatering impacts on third party users
- Contamination of groundwater
- Increase in air pollution
- Increase in disturbing noise levels
- Blasting hazards

15.2 ACTIVITIES AND INFRASTRUCTURE

The source activities of potential impacts which require management are detailed in Section 2.3 and listed below.

- Earthworks
- Civil works
- Exploration
- Rehabilitation
- Water supply infrastructure
- Declines
- Concentrator
- Chrome processing
- Power supply infrastructure
- Demolition
- Maintenance and aftercare
- Site preparation
- Transportation system
- Support services and amenities
- Site management
- Non-mineralised waste management

15.3 MANAGEMENT ACTIVITIES

Management activities which will be conducted to control the project actions, activities or processes which have the potential to pollute or result in environmental degradation are detailed in Section 19.

15.4 ROLES AND RESPONSIBILITIES

The key personnel to ensure compliance to this EMP report will be a Group Environmental Manager and Site Safety, Health, Environment (SHE) Co-ordinator and Human Resources Manager. As a minimum, these roles as they relate to the implementation of monitoring programmes and management activities will include:

- Group environmental manager:
  - Oversee the role of the site-specific environmental co-ordinator
- SHE Co-ordinator (will report as a minimum to the Group Environmental Manager and Mine Manager)
  - ensure that the monitoring programmes are scoped and included in the annual mine budget
  - identify and appoint appropriately qualified specialists/engineers to undertake the programmes
  - appoint specialists in a timeously manner to ensure work can be carried out to acceptable standards
- Human Resources Manager:
  - manage labour-related aspects for the mine
  - liaise with the relevant structures in terms of the commitments in the SLP
  - ensure that commitments in the SLP are developed and implemented in a timeously fashion
  - establish and maintain good working relations with surrounding communities and landowners

16 ENVIRONMENTAL OBJECTIVES AND SPECIFIC GOALS FOR SOCIO-ECONOMIC CONDITIONS

16.1 ASPECTS OF THE SOCIO-ECONOMIC CONDITIONS

The socio-economic conditions in the vicinity of the mine are described in Section 1.3.4.

16.2 OBJECTIVES AND GOALS

Specific environmental objectives and goals to control, remedy or stop potential impacts emanating from the mine which may impact on communities and IAPs identified in the social and labour plan are described below. The information is presented in tabular format (Table 16-1).

TABLE 16-1: ENVIRONMENTAL OBJECTIVES AND GOALS – SOCIO-ECONOMIC CONDITIONS

Aspect	**Environmental objective**	**Goals**
Land uses	To prevent unacceptable impacts on surrounding land uses and their economic activity	To co-exist with existing land uses To negatively impact existing land uses as little as possible
Blasting	To minimise the potential for third party damage and/or loss	To protect third party property from mine-related activities, where possible Where damage is unavoidable, to work together with the third parties to achieve a favourable outcome To ensure public safety
Traffic	To reduce the potential for safety and vehicle related impacts on road users	To ensure the mine's use of public roads is done in a responsible manner
Socio-economic	To enhance the positive economic impacts and limit the negative economic impacts	To work together with existing structures and organisations
Informal settlements	To limit the impacts associated with inward migration	To establish and maintain a good working relationship with surrounding communities and land owners

17 ENVIRONMENTAL OBJECTIVES AND SPECIFIC GOALS FOR HISTORICAL AND CULTURAL ASPECTS

Environmental objectives and goals in respect of historical and cultural aspects are listed in the table below (Table 17-1).

TABLE 17-1: ENVIRONMENTAL OBJECTIVES AND GOALS – HISTORICAL AND CULTURAL ASPECTS

Aspect	Environmental objective	Goals
Heritage and cultural	To prevent unacceptable loss of heritage resources and related information	To protect heritage resources where possible If disturbance is unavoidable, then mitigate impact in consultation with a specialist and the SAHRA and in line with regulatory requirements

18 APPROPRIATE TECHNICAL AND MANAGEMENT OPTIONS CHOSEN FOR EACH IMPACTS

18.1 PROJECT ACTIONS, ACTIVITIES AND PROCESSES

All activities associated with the project have the potential to cause pollution or environmental degradation. These are described in Section 2 of this EIA and EMP report.

18.2 TECHNICAL AND MANAGEMENT OPTIONS

Appropriate technical and management options chosen to modify, remedy, control or stop any action, activity or process associated with the project which will cause significant impacts on the environment, socio-economic conditions and historical and cultural aspects are listed in the table below (Table 18-1) and described in detail in Section 7. In addition to these, the mine will implement an environmental management system to assist in the implementing and monitoring of commitments included in this EIA and EMP report.

TABLE 18-1: TECHNICAL AND MANAGEMENT OPTIONS

Potential impact	Technical and management options
Mineral sterilisation	Mine workings well be developed and designed taking cognisance of potential ore reserves Extraction of all possible minerals prior to final disposal
Hazardous structures	Construction of berms, fencing, barriers and access control Warning signs Sealing and backfilling declines Implement monitoring programme Implement an emergency response
Loss of soil resources and land capability through pollution	Implement hazardous waste, dirty water and mineralised and non-mineralised waste management procedures Permanent infrastructure designs to take long term soil prevention, land function and confirmatory monitoring into account
Loss of soil and land capability through physical disturbance	Implementation of a soil management plan Limiting disturbance of soil to what is necessary Stripping, storing, maintenance and replacement of topsoil in accordance to soil management procedures
Physical destruction of biodiversity	Implementation of the biodiversity management plan Restrict project footprint Limit disturbance on sensitive biodiversity Implement biodiversity offset Implementation of monitoring programmes Rehabilitate disturbed areas
General disturbance of biodiversity	Prevention of the killing of animal species Implementation of dust control measures Pollution prevention measures Prevention of the disturbance of ecosystems

Potential impact	Technical and management options
Pollution of surface water resources	Appropriate design of polluting facilities and pollution prevention facilities (and by qualified person) Implement and maintain storm water controls that meet regulatory requirements Implement site-specific soil management plan Implement a monitoring programme (water use, process water quality, rainfall-related discharge quality) Implement emergency response Implementation and maintenance of licence requirements
Alteration of natural drainage lines	Implement and maintain storm water controls that meet regulatory requirements
Contamination of groundwater	Appropriate design of pollution facilities Correct handling of hazardous wastes, mineralised and non-mineralised wastes Compensation for loss Implement and maintain terms and conditions of regulatory requirements Implementation of a monitoring programme Implement emergency response Implementation and maintenance of licence requirements
Dewatering	Compensation for loss Implementation of monitoring programme
Air pollution	Implementation an air quality monitoring programme Control dust plumes Implementation of an air complaints procedure Maintenance of abatement equipment Implement an emergency response Implementation and maintenance of licence requirements
Noise pollution	Maintenance of vehicles and equipment Implementation of noise monitoring programme Implementation of a noise complaints procedure Educate workers Equip machinery with silencers Construction of noise attenuation measures
Blasting damage	Implementation of a blast management plan Pre-mining crack survey Communication of planned blasting times with stakeholders Pre-blast warning Monitoring blasts Audit and review to adjust blast design were necessary Investigate blast related complaints Rectify damage to third party structures Implementation of a blasting complaints procedure Implement emergency response
Traffic increase	Implementation of a traffic safety programme Education and awareness training of workers Use of pedestrian crossing by pedestrians and school children Placement of signage to create awareness Maintenance of the transport systems Implementation of a traffic complaints procedure Implement emergency response

Potential impact	**Technical and management options**
Visual impacts	Limit the clearing of vegetation Limit the emission of visual air plumes Use of screening berms Concurrent rehabilitation Painting infrastructure to compliment the surrounding environment Implementation of a closure plan Management through care and aftercare
Heritage and cultural	Limit project infrastructure, activities and related disturbances to demarcated areas as per the EIA and EMP report Project specific heritage studies will be conducted to identify any resources should the project footprint change Education of workers Exhumation and relocation of graves where required Implement emergency response
Economic impact	Hire people from closest communities To extend the formal bursary and skills development to closest communities Implement a procurement mentorship programme Local procurement of goods and services Compensation for loss of land use Closure planning makes consideration for skills, economic consideration and the needs of future farming
Inward migration	Good communication in terms of recruitment, procurement and training Number of temporary and permanent new job opportunities and procurement will be made public Employment and procurement opportunities provided to closest communities No recruitment at the mine gate Notify unsuccessful job seekers Accommodation allocation to employees and contractors Maintaining an environmental profile Monitor and prevent the development of informal settlements through the interaction with neighbours, local authorities and law enforcement officials Implement a health policy on HIV/AIDs and tuberculosis to promote awareness and training Addressing social service constraints and social problems relating to education, health, water supply, solid waste management, sanitation and housing Implement emergency response
Land use	Implementation of EMP commitments that focus on environmental and social impacts Take necessary steps to prevent negative impact on surrounding land Closure planning to incorporate measures to achieve future land use plans

19 ACTION PLAN TO ACHIEVE OBJECTIVES AND GOALS

Action plans to achieve the objectives and goals set out in Section 15 (bio-physical environment), Section 16 (socio-economic conditions) and Section 17 (historical and cultural) above, are listed in tabular format together with timeframes for each action. The action plans include the timeframes and frequency for implementing the mitigation measures as well identifies the responsible party.

TABLE 19-1: ACTION PLAN – HAZARDOUS STRUCTURES / EXCAVATIONS/SURFACE SUBSIDENCE

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction	Earthworks Civil works Rehabilitation	**H**	**M-L**	• Establish security control measures.	At start	Once off	Site Manager
				• Undertake regular patrols of mine perimeter.	On-going	Daily	Security Manager
				• Educate third parties on potential dangers.	On-going	Quarterly	SHE Coordinator
				• Design and construct all stockpiles and residue facilities in line with relevant management plans.	As required	As required	SHE Coordinator
				• In case of injury or death due to hazardous excavations, follow the emergency response procedure as referenced in Section 20.2.	As required	As required	SHE Coordinator
Operation	Earthworks Civil works Exploration -sumps Tailings storage facilities Declines and box cuts Processing facilities Water storage and supply infrastructure Transport infrastructure Power supply infrastructure Rehabilitation	**H**	**M-L**	• Maintain security control measures.	On-going	As required	SHE Coordinator
				• Undertake regular patrols of mine perimeter.	On-going	Daily	Security Manager
				• Backfilling of open pits has been in accordance with rehabilitation plan.	On-going	Constant Quarterly	SHE Coordinator
				• Barriers such as fencing, walls or berms will be used to prevent access by humans and animals to hazards. The barriers will have warning notices at appropriate intervals in English, Afrikaans and SePedi and using pictures where appropriate.	On-going As required	As required	SHE Coordinator
				• Backfill and landscape other excavations e.g. pipeline excavations etc.	As required	As required	SHE Coordinator
				• The decline portals will be sealed once the development of the declines is completed such that the tunnel entrances to the declines will be evident on surface.	As required	As required	SHE Coordinator
				• Operate all stockpiles and residue facilities in line with relevant management plans and COPs.	On-going	Daily	SHE Coordinator
				• Excess backfill will be placed in open pits when backfilling to prevent subsidence through consolidation of overburden during the life of the mine so that there will be no subsidence remaining at closure.	As required	As required	SHE Coordinator
				• Adequate support will be provided in the underground workings to ensure that there is no subsidence. A professional rock engineer will design pillar dimensions for underground support and to ensure no subsidence.	As required	As required	SHE Coordinator
				• The mine will contact the DMR's Directorate of Mine Surveyors to obtain specifications for the monitoring of subsidence above mine workings. The mine will then monitor subsidence according to these specifications.	As required	As required	SHE Coordinator
				• If subsidence is detected, the mine will immediately identify the cause and implement appropriate mitigation measures to prevent further subsidence. Where necessary, land disturbed by subsidence will be landscaped.	As required	As required	SHE Coordinator
				• Educate third parties on potential dangers.	On-going	Quarterly	SHE Coordinator

Phase of operation	Activities	Sig UM	Sig M	Technical and management options	Action plan: Timeframe	Frequency	Responsible parties
				• In case of injury or death due to hazardous excavations, follow emergency response procedure as referenced in Section 20.2.	As required	As required	SHE Coordinator
Decommission	Earthworks Civil works Demolition Rehabilitation	**H**	**M-L**	• Seal decline and vent shafts with an engineered seal in accordance with specifications provided by the DMR. • Rehabilitate the site in line with recommended rehabilitation plan. • Educate third parties on potential dangers. • In case of injury or death due to hazardous excavations, follow emergency response procedure as referenced in Section 20.2.	As required As required As required As required	As required As required Quarterly As required	SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator
Closure	Maintenance and aftercare of final land forms and rehabilitated areas	**H**	**M-L**	• Repair and maintain security measures at residue facilities	Timeframe to be agreed upon with authorities	As required	SHE Coordinator

TABLE 19-2: ACTION PLAN – LOSS OF SOIL RESOURCES AND LAND CAPABILITY THROUGH POLLUTION

<table>
<tr><th rowspan="2">Phase of operation</th><th rowspan="2">Activities</th><th colspan="2">Sig</th><th rowspan="2">Technical and management options</th><th colspan="3">Action plan</th></tr>
<tr><th>UM</th><th>M</th><th>Timeframe</th><th>Frequency</th><th>Responsible parties</th></tr>
<tr><td>Construction</td><td>Earthworks
Civil works
Site management
Transport systems
Non-mineralised waste management
Support services and amenities
Rehabilitation</td><td>H</td><td>L</td><td rowspan="3">• Prevent dirty water runoff and spillages from entering the environment (impermeable substrates, bunds, stormwater control, catchment paddocks).
• Where practical, rehabilitate in line with rehabilitation plan as soon as possible.
In the construction, operation and decommissioning phases the mine will ensure that all hazardous chemicals (new and used), dirty water, mineralised wastes and non-mineralised wastes are transported, handled and stored in a manner that they do not pollute soils. This will be implemented through a procedure(s) covering the following:
- Pollution prevention through basic infrastructure design (adequate sanitary and non-mineralised waste management facilities, hazardous substance management, mineralised waste management, impermeable substrates, bunds, spillage control and containment, collection facilities, stormwater control, dirty water systems);
- Pollution prevention through maintenance of equipment and vehicles;
- Pollution prevention through education and training of workers (permanent and temporary);
- Pollution prevention through appropriate management of hazardous materials and wastes – cognisance will be taken of the principles outlined in Table 7-1.
- The required steps to enable fast reaction to contain and remediate pollution incidents. In this regard the remediation options include containment and in situ treatment or disposal of contaminated soils as hazardous waste. In-situ treatment is generally considered to be the preferred option because with successful in situ remediation the soil resource will be retained in the correct place. The in situ options include bioremediation at the point of pollution, or removal of soils for washing and/or bio remediation at a designated area after which the soils are returned; and
- Specifications for post rehabilitation audit criteria to ascertain whether the remediation of any polluted soils and re-establishment of soil functionality has been successful and if not, to recommend and implement further measures.</td><td rowspan="3">On-going

On-going

On-going</td><td rowspan="3">As required

On-going

As required</td><td rowspan="3">SHE Coordinator

SHE Coordinator

SHE Coordinator</td></tr>
<tr><td>Operation</td><td>Earthworks
Civil works
Exploration
Site management
Transport systems
Non-mineralised waste management
Support services and amenities
Tailings dam
Water supply infrastructure
Power supply infrastructure
Rehabilitation</td><td>H</td><td>L</td></tr>
<tr><td>Decommission</td><td>Demolition
Earthworks
Civil works
Site management
Transport systems
Non-mineralised waste management
Support services and amenities
Tailings dam</td><td>H</td><td>L</td></tr>
</table>

	Water supply infrastructure Power supply infrastructure Rehabilitation			• If soils become contaminated, appropriate remedial measures will be identified in consultation with an appropriately qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site. After removal of the contaminated soils, the affected areas will be landscaped and rehabilitated.	As required	As required	SHE Coordinator
				• Handle major spillage incidents in accordance with emergency response procedure (see Section 20.2).	As required	As required	SHE Coordinator
Closure	Maintenance and aftercare of final land forms and rehabilitated areas	**H**	**L**	• The designs of any permanent and potentially polluting structures (mineralized waste facilities) will take account of the requirements for long term soil pollution prevention, land function and confirmatory monitoring.	As required	As required	
				• In case of major spillage incidents the emergency response procedure in Section 20 will be followed.	As required	As required	

TABLE 19-3: - LOSS OF SOIL RESOURCES AND LAND CAPABILITY THROUGH PHYSICAL DISTURBANCE

Phase of operation	**Activities**	**Sig**		**Technical and management options**	**Action plan**		
		UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction	Exploration Site preparation Earth- and civil works Process- and stormwater Transport systems Non-mineralised waste Site support services Storage and maintenance services / facilities Site/contract management	**H**	**M**	• Limit the project footprint and activities to that in the approved EMP and amendments and current EMP amendment.	On-going	On-going	SHE Coordinator
				• Strip, store and maintain soils in line with the soil conservation procedure (this includes measures for erosion control) (Table 7-2).	On-going	As required	SHE Coordinator
				• Where practical, rehabilitate in line with rehabilitation plan as soon as possible.	On-going	On-going	SHE Coordinator
				• The following was implemented at the open pits: - Strip the top 500 mm of soil and then strip subsoil to the weathered rock. The weathered and broken rock (broken by blasting) will then be removed from the pit. The soil, subsoil and broken rock will be stockpiled separately. - The topsoil, subsoil and broken rock will be returned to worked out pits in the following order: broken rock will be placed in the pits first, subsoil will be placed over the broken rock; and then topsoil will be placed over the landscaped subsoil. - Care will be taken to ensure that the mixing of topsoil is limited, subsoil and broken rock during the handling of these materials. - At least 500 mm of topsoil will be placed over 500 mm of subsoil when rehabilitating the pits. This will ensure that the depth of the soil is at least 1 m.	As required	As required	SHE Coordinator
Operation	Exploration Open pit mining Backfilling of open pits Underground mining Waste rock and tailings Mineral processing Process- and stormwater Transport systems Non-mineralised waste Site support services Storage and maintenance services / facilities Site/contract management	**H**	**M**				
				• Vegetation establishment in disturbed areas will be undertaken as soon as is practical.	On-going	On-going	SHE Coordinator

				• Where disturbed areas cannot be re-vegetated during the life of the mine appropriate measures will be taken to control erosion. These may include: contours; berms; runoff diversion canals; energy dissipaters; and application of straw mulches or soil binders to exposed soils. • The mine will implement the Department of Agriculture in the design of effective erosion control measures on bare soils as follows: - Erosion control measures, such as contours, are required in all areas where slope gradients exceed 2% (1:50) - Engineered erosion control measures are required where slope gradients exceed 7% (1:15). • The mine will ensure that erosion controls are included in the designs of linear infrastructure and points of water discharge. Linear infrastructure will be inspected on a weekly basis to check that the associated water management infrastructure is effective in controlling erosion. • Energy dissipaters will be constructed at points where there are concentrated discharges of water to the environment (such as culverts and outflows of water from diversion berms or canals). • If soils become contaminated, appropriate remedial measures will be identified in consultation with an appropriately qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site. After removal of the contaminated soils, the affected areas will be landscaped and rehabilitated.	As required As required On-going As required As required	As required As required On-going As required As required	SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator
Decommission	Process- and stormwater Demolition Seal declines and vent shafts Waste rock and tailings Rehabilitation	**H**	**M**	• Limit the project footprint and activities to that in the approved EMP and amendments and current EMP amendment. • Replace soils in line with soil conservation procedure (Table 7-2) • Rehabilitate disturbed areas in line with recommended rehabilitation plan.	On-going As required On-going	On-going As required As required	SHE Coordinator SHE Coordinator SHE Coordinator
Closure	Maintenance and aftercare Final land forms (residue facilities)	**H**	**M**	• Repair erosion gullies and maintain erosion control measures.	Timeframe to be agreed upon with authorities	As required	SHE Coordinator

TABLE 19-4: ACTION PLAN – PHYSICAL DESTRUCTION OF BIODIVERSITY

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction	Site preparation Earthworks for all surface infrastructure	**H**	**M**	• Mine staff will be made aware the following plant habitats close to the mine site need to be protected from disturbance: ○ the Ridge Grassland on the ridge above the ore body;	On-going	On-going	SHE Coordinator

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
	Site management Transport systems Support services and amenities Site management Rehabilitation			○ the Protea Woodland to the south and south-east of the plant and existing tailings dam area; ○ all the natural vegetation outside of the proposed Project Fairway infrastructure footprints within the Groot Dwars River valley; ○ the wetland and riparian zones associated with all perennial and non-perennial tributaries, especially the Groot Dwars River, West Stream and East Stream.	On-going	Quarterly	SHE Coordinator
Operation	Site preparation Earthworks - for all surface infrastructure Exploration Site management Transport systems Non-mineralised waste management Support services and amenities Site management Tailings Storage Facility (existing and proposed) Water supply infrastructure Power supply infrastructure Rehabilitation	H	M	• An appropriately qualified vegetation specialist will be appointed to check these habitats mentioned above on a quarterly basis to see that they are not being disturbed by mining-related activities and there is no encroachment of invasive plants into these habitats.	On-going	On-going	SHE Coordinator
				• An appropriately qualified zoologist will be appointed to clear all active burrows at the sites of mine infrastructure before construction and mining activities commence.	On-going	On-going	SHE Coordinator
				• A herpetologist will be appointed to undertake search and rescue operations at the potentially affected rocky outcrops before the construction phase of mining commences.	Pre-construction	On-going	SHE Coordinator
				• The number of stream crossings will be minimised and culverts will be designed so that they do not alter flow in the stream. Stream crossings will be inspected for erosion and damaged areas will be repaired immediately.	On-going	As required	SHE Coordinator
				• The mine will implement a biodiversity action plan that will be refined and implemented in consultation with the biodiversity expertise and resources of an ecological specialist and the MTPA and comply with the requirements of the National Environmental Management: Biodiversity Act (Act 10 of 2004). This action plan will aim at preserving and restoring the natural ecology of the area. This action plan will be in place prior to the commencement of the project and it will include additional detail on the following management actions: - To limit mine infrastructure, activities and related surface disturbances to those specifically identified and described in the approved original EMP and subsequent amendments, this EIA and EMP consolidation report with controlled access and zero tolerance of disturbances to vegetation communities outside of the project boundaries. This can be achieved by fencing footprint areas to contain all activities within designated areas. All activity must be, as far as possible, situated outside of the 100 m buffer zones around the wetland and riparian zones, unless encroachment of the 100 m or	On-going	On-going	SHE Coordinator

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
				1:100 year floodline has been authorised by the DWA and/or competent authority identified in terms of NEMA. Activities that are likely to disturb streams should start upstream and work downstream so that the recovery process can start immediately without further disturbance from upstream disturbance.			
				- To develop and implement a Biodiversity Offset Plan prior to the commencement of the proposed project. The mine commits to offsetting 10 hectares for every hectare disturbed for new approvals granted. The biodiversity offset should be undertaken as near to the mining operation as possible, within the within the Sekhukhuneland Centre of Plant Endemism (SCPE), in order to improve the effectiveness of the offset. This should preferably be done in conjunction with adjacent landowners/nearby mining operations to ensure that a substantial area is conserved. The option of declaring a Special Nature Reserve should be investigated. The area must be conserved in perpetuity and must be protected by appropriate legislation.	Pre-construction	As required	SHE Coordinator
				- Where the roads will cross drainage lines, the engineering design work of culverts and stormwater controls will be done in consultation with a qualified ecologist with water course related expertise to limit the destruction of habitat and species and to promote re-establishment thereof. Where possible, pebbles, rocks and biodiversity will be re-established and the crossing routes will be scanned for sensitive fauna and flora prior to construction.	Pre-construction	As required	SHE Coordinator
				- There will be planning on the removal of fauna and flora (plants and seeds) species prior to disturbance by mining activities and infrastructure. This will include planning on the collection, preservation, cultivation and re-use of these species in on-going restoration practices. Special attention will be paid to conservation-important species (flora and fauna) and also ensuring the regrowth of fauna-specific plants, especially conservation-important fauna. Links will also be made to the soil conservation procedure and actions.	Pre-construction and on-going	On-going	SHE Coordinator
				- The mine will obtain permits from the relevant authorities for the removal or destruction of any protected plant species in accordance with the Mpumalanga Nature Conservation Act, the National Forests Act (Act 84 of 1998) and National Environmental Management: Biodiversity Act (Act 10 of 2004).	On-going	On-going	SHE Coordinator

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
				- A rescue and relocation handbook will be developed by a suitably qualified specialist to inform the identification and relocation of important flora species from the proposed Project Fairway infrastructure footprints. The handbook will be a living document which is updated as, and when necessary which, amongst other information, provides means for the identification of important flora species and details how the relocation process should be undertaken.	As required	On-going	SHE Coordinator
				- The existing nursery will continue and be further developed wherein on-site tree and forb species are cultivated and utilised during rehabilitation processes. Where possible plants from the project sites will be relocated to the nursery. The nursery will be sited such that it provides a variety of habitats to support the potential relocated species. Where necessary this will be done in consultation with an appropriately qualified specialist. Consideration should be given to incorporate topsoil stockpiles as part of the nursery so as to maintain soil functionality.	Pre-construction and on-going	On-going	SHE Coordinator
				- Implementation of an alien/invasive/weed management programme in collaboration with the Department of Agriculture, DWA and Working for Water to control the spread of these plants onto disturbed areas to control the spread of these plants onto and from disturbed areas through active eradication, establishment of natural species and through on-going monitoring and assessment. Invasive plants will be removed from land adjacent to mine infrastructure sites, up to 500 m from the mine infrastructure sites. This programme must comply with existing legislation, namely amendments to the regulations under the Conservation of Agricultural Resources Act (Act 43 of 1983) and Section 28 of NEMA. In this regard, the use of herbicides will be limited and will only be used under strict controls if alternative less intrusive eradication methods are not successful. Care will be taken to prevent the encroachment of alien plant species into rehabilitated areas.	On-going	On-going	SHE Coordinator
				- AQPSA will establish a biodiversity research centre in the region. The purpose of the research centre is to provide scientists with the facilities and opportunity to undertake studies on the biodiversity located within the Groot Dwars River valley and the Sekhukhuneland Centre of Plant Endemism (SCPE). Potential fields of research can include studies regarding the propagation of endemic flora species for	On-going	On-going	SHE Coordinator

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
				use in rehabilitation at the mine and understanding the life cycle of the *Pynca Sylvia* cicada.			
				- AQPSA must set up and undertake biodiversity monitoring (see programme in Section 21.1.4), this monitoring programme should include an invertebrate component. On-going aquatic biomonitoring of the surface water features upstream and downstream of the proposed TSF is deemed essential to monitoring impacts on the in stream ecology.	On-going	On-going	SHE Coordinator
				- The mine will aim at achieving the rehabilitation targets set out in Section 21.1.4.	On-going	On-going	SHE Coordinator
				• AQPSA will participate in a conservancy if a conservancy is established in the region and it overlaps with the project area.	As required	As required	As required
Decommission	Site preparation Demolition Earthworks Site management Transport systems Non-mineralised waste management Support services and amenities Site management Tailings Storage Facility (existing and proposed) Water supply infrastructure Rehabilitation	H	M	• Limit the project footprint and activities to that in the approved original EMP and subsequent amendments, this EIA and EMP report and any future amendments which are approved.	On-going	On-going	SHE Coordinator
				• All land disturbed by mining, other than the residue facilities, will be rehabilitated to a stable physical state and its pre-mining potential. The residue facilities will be vegetated to prevent erosion and reduce their visual impact.	On-going	On-going	SHE Coordinator
				• Undertake biodiversity monitoring programme (see Section 21).	On-going	On-going	SHE Coordinator
				• Rocks and boulders form an integral part of the landscape and are vital habitat for numerous plants that do not occur away from such outcrops therefore careful attention will be paid to ensuring that the reconstructed landscape includes such rock formations. It may be necessary to stockpile suitable rocks separately from the main subsoil stockpiles as far as possible.	As required	As required	SHE Coordinator
				• Seeding of the reconstructed landscape must be carried out using a mix of locally occurring plant species that are confirmed to occur adjacent to the valet access and haul road routes at the areas of impact. It is also strongly recommended that clumps of grass and herbaceous plants, representing as many of the species present as possible, be translocated to a nursery and later replanted into the reconstructed landscape.	As required	As required	As required
				• As far as is practical, implement concurrent rehabilitation in order to limit degradation of soil biota.	As required	As required	As required
Closure	Maintenance and aftercare of final land forms and rehabilitated areas	H	M	• Monitor vegetation establishment in line with rehabilitation plan. • Continued monitoring of the rehabilitated pit areas after mining operations have ceased until mine closure will be conducted. Repeat surveys will be carried out annually for at least the first three years post-rehabilitation, after which the frequency the may be reduced, initially to every second year and then every 3-5 years until rehabilitation targets have been reached.	Timeframe to be agreed upon with authorities	As required	SHE Coordinator

TABLE 19-5: ACTION PLAN – GENERAL DISTURBANCE OF BIODIVERSITY

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
Construction	Site preparation Earthworks for all surface infrastructure Site management Transport systems Support services and amenities Site management Rehabilitation	H	M	• Surface disturbance will be kept to a minimum. Activities will be concentrated in disturbed areas as far as is possible. Human and vehicular activity will be restricted to construction and operational sites.	Pre-construction and on-going	Once off and on-going	SHE Coordinator
				• The placement and construction of infrastructure must be done in such a way to ensure that migratory connectivity is maintained between undisturbed areas. In addition, ecological connectivity of the wetland features should be maintained with special mention of bridge crossings over drainage features.	Pre-construction and on-going	Once off and on-going	SHE Coordinator
				• No waste will be disposed of in or around the mine area, waste will be disposed of at an off-site waste disposal facility (Table 28).	On-going	On-going	SHE Coordinator
Operation	Site preparation Earthworks - for all surface infrastructure Exploration Site management Transport systems Non-mineralised waste management Support services and amenities Site management Open pit mining (former) Declines (current and proposed) Processing Plant Tailings Storage Facility (existing and proposed) Water supply infrastructure Power supply infrastructure Rehabilitation	H	M	• In compliance with the Government Notice No. R.704 of 4 June 1999, AQPSA will ensure that its stormwater collection facilities and dirty-water holding facilities are designed for the 1:50 year storm event. This means that there will be no discharges of dirty water from the mine site unless there is an extreme storm event. Storm water management infrastructure will be installed before any construction and mining activities commence to ensure that sediments are not washed into any perennial and non-perennial tributaries from these sites.	On-going	On-going	SHE Coordinator
				• Soil conservation measures should be undertaken in line with the soil management principles outlined in Table 7-2. All areas of disturbed and compacted soils need to be ripped, aerated and profiled once the disturbance has ceased to reduce runoff volumes and allow for plant establishment and growth. All stripped topsoil must be classified according to soil classification principles, stockpiles to be managed and stripped soils re-applied during rehabilitation. Care will be taken to ensure that topsoil stripped from areas where invasive plants are abundant is not placed elsewhere.	On-going	On-going	SHE Coordinator
				• AQPSA will consider rehabilitation of the riparian wetland along West Stream through removal of existing drainage furrows and berms in the seasonal and permanent zones of the wetland (Such furrows are present below the walls of the Ackerman and TKO Dams, they prevent an even distribution of sub-surface and surface water flow and can cause desiccation of the wetlands and loss of functionality and change in vegetal cover).	As required	As required	SHE Coordinator

				• When upgrading the East Stream road crossing, AQPSA will consider rehabilitation of the stream to prevent further degradation. This would require upgrading the existing road crossings to allow free flow of floodwaters, and the construction of gabions and/or introduction of straw bales at key erosion points.	As required	As required	SHE Coordinator
				• Rehabilitation of in-stream habitats should aim to recreate the same mix of habitats that was present prior to the development. Where possible, activities that are likely to disturb the streams should start upstream and work downstream, so that the recovery process can start immediately, without further disturbance from upstream disturbance.	As required	On-going	SHE Coordinator
				• As much vegetation growth as possible should be retained in order to protect soils and to reduce the percentage of the surface area which is paved. In this regard special mention is made of the need to use indigenous vegetation species as the first choice during landscaping.	On-going	On-going	SHE Coordinator
				• All informal fires on the property should be prohibited. Where a burning regime is implemented, it should be overseen by a qualified and experienced professional.	On-going	On-going	SHE Coordinator
				• No trapping or hunting of fauna is to take place. Access control must be implemented to ensure that no illegal trapping or poaching takes place. The Environmental Compliance Officer will visit sensitive areas adjacent to the impact footprint and check for evidence of any illegal harvesting on a regular basis. Transgressors should be prosecuted under the Mpumalanga Nature Conservation Act (Act 10 of 1998). Education for mine staff on the identification for any RDL faunal species that may be found within the study site must be provided. Special mention must be made for the Leopard (*Panthera pardus*) which is positively identified to habituate in the study area.	On-going	On-going	SHE Coordinator
				• Ensure that all roads and construction areas are regularly sprayed with water in order to curb dust generation. Wherever possible, roads should be constructed a distance from open space and sensitive areas.	On-going	On-going	SHE Coordinator
				• Mine design and planning should ensure that any cone of dewatering which may be caused by mining does not lead to a reduction of stream flow or dewatering of the Groot Dwars River.	On-going	On-going	SHE Coordinator
				• A detailed programme for vegetation establishment on the tailings storage facility (proposed and existing) will be prepared as part of the detailed design of the TSF.	On-going	On-going	SHE Coordinator
				• All powerline routes will be designed to avoid obvious fly-through routes for large birds. An ecologist with avifaunal expertise must be consulted to determine whether “bird flappers” should be installed along the length of the powerline route.	As required	On-going	SHE Coordinator

				• Control dust in line with the dust management plan (Section 21.1.2).	On-going	On-going	SHE Coordinator
				• Management of lighting: - Externally visible lighting will be kept to an absolute minimum, and wherever possible long-wavelength light sources (i.e. yellow/orange) will be used. - Internal lighting will as far as possible be shielded by blinds, curtains or by eliminating outward-facing windows in building designs, to prevent spillage of light into the surrounding natural environments. - Where external lighting of structures is essential, light sources will be directed inward so as to light up the structure and result in this becoming a large diffuse light source, rather than having bright point sources directed outward into the natural environment. - Lighting will be positioned so that it does not shine onto natural habitats. - Long-wavelength light sources will be used (at least 550 nm, preferably longer than 575 nm), preferably low-pressure sodium vapour, or yellow LEDs, as these result in very low disturbance of insect populations. Less preferable, but still better than mercury vapour or halogen lamps, would be high pressure sodium vapour or warm white LEDs. Another alternative would be the use of ultraviolet (UV) filters which can reduce insect attraction to high pressure mercury vapour lamps to below that of high pressure sodium vapour lamps. Fluorescent lights, including compact versions, will not be used outdoors, as a significant amount of UV light is emitted by these, and this is highly attractive to insects.	On-going	On-going	SHE Coordinator
				• Management of blasting: - Blast hazards are to be controlled in line with the blast management plan. - Low-noise output machinery will be used wherever such options are available. - Adequate berms will be constructed around the open pits and other areas where machinery is operational to limit sound levels in the surrounding environment. - Blasting will be limited to the minimum possible number of occurrences per day.	On-going	On-going	SHE Coordinator

				• Management of invasive plant species: - Institute strict control over materials brought onto site, which will be inspected for potential invasive species and / or steps taken to eradicate these before transport to the site. Two possible approaches would be a visual inspection of all materials, particularly those that have been stockpiled in high-risk locations, for presence of invasive species and apply topical control (e.g. direct spraying with low residual insecticides) when necessary; or routine fumigation or spraying of all materials with appropriate low-residue insecticides prior to transport to or in a quarantine area on site. - Disturbed areas will be rehabilitate as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish. - A monitoring programme will be implemented to detect alien invasive species. - An eradication / control programme will be implemented for early intervention of invasive species, so that their spread to surrounding natural ecosystems can be prevented. - Monitoring programmes and control measures will be developed with reference to inter alia information provided by the IUCN SSC Invasive Species Specialist Group (http://www.issg.org/).	On-going	On-going	SHE Coordinator
				• Protection of wetlands: - Prospecting roads will be routed to avoid unnecessary steep gradients. - Stream crossings and mobilisation of sediments will be minimised by using drainage pipes, culverts or large cobbles. - 100 m buffer zones of natural vegetation will be implemented either side of streams and riparian zones, where possible. - Stormwater from the road and other stormwater will be diverted into natural vegetation buffer zones before discharging into streams. - Bulldozing soils into streams or wetlands will be avoided.	On-going	On-going	SHE Coordinator

Decommission	Site preparation Demolition Earthworks Site management Transport systems Non-mineralised waste management Support services and amenities Site management Waste rock dumps Tailings Storage Facility (existing and proposed) Water supply infrastructure Rehabilitation	**H**	**M**	• Prior to decommissioning and closure of the mine, a detailed rehabilitation plan must be developed in conjunction with the closure plan prepared for the mine. The rehabilitation plan should include the following: - Indigenous trees, grass and forb species as found within the project area will be utilised for rehabilitation. It is deemed essential that a suitably qualified ecologist make up part of the team tasked with the development of the closure plan. - Generally, where vegetation is to be planted, a mixture of commercially available seeds that germinate reliably (high seed viability) will be used. The species to be used will be indigenous (no exotic plant species will be used) and will be selected on the basis of their ability to bind and cover soil (afford erosion protection) and their tolerance of prevailing environmental conditions. Species that can become invasive or a problem in the future cultivation of the rehabilitated land will be avoided. Species that will enhance the arable potential of soils will be used where possible. - The designs of any permanent structures (mineralised waste facilities) will take into consideration the requirements for the establishment of long term species diversity, ecosystem functionality, aftercare and confirmatory monitoring. - Areas should be reseeded with indigenous grasses as required. All rehabilitated areas should be rehabilitated to a point where natural processes will allow the pre-development ecological functioning and biodiversity of the area to be re-instated. - Ensure all areas affected by construction and operational activities should be rehabilitated upon closure of the mine and that rehabilitated areas are rehabilitated to a point where natural processes will allow the pre-development ecological functioning and biodiversity of the area to be re-instated. - A monitoring plan to determine the efficacy of the rehabilitation exercise must be implemented	As required	On-going	SHE Coordinator
Closure	Maintenance and aftercare of final land forms and rehabilitated areas	**H**	**M**				

TABLE 19-6: ACTION PLAN – POLLUTION OF SURFACE WATER RESOURCES

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
Construction	Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Rehabilitation	H	L	• The clean and dirty water systems for the proposed surface infrastructure will be designed, implemented and managed in accordance with the provisions of Government Notice No. R.704 of 4 June 1999 and the corresponding DWAF M6.1 Operational Guideline and the requirements of DWA as stipulated in the water licence. In this regard:	Design	Once off	SHE Coordinator
				• Clean water will be diverted around operational areas;	On-going	On-going	SHE Coordinator
				• Minimising the footprint of dirty areas;			
				• All other dirty water will be contained in the dirty water run-off and/or process water system that comprises dirty water pipes, channels, berms and dams, and from which dirty water will be reused rather than discharged to the environment. These systems will be routinely inspected to detect possible breaches and implement preventative or corrective action. No dirty water runoff must be permitted to reach the wetland resources.	On-going	On-going	SHE Coordinator
Operation	Earthworks Civil works Exploration Site management Transport systems Non-mineralised waste management Support services and amenities Open pit mining (former) Declines (existing and proposed) Tailings Storage Facility (existing and proposed) Water supply infrastructure Power supply infrastructure Rehabilitation	H	L	• Storm water management infrastructure will be established before any construction activities commence to ensure sediments are not washed into perennial and non-perennial tributaries in the vicinity of project infrastructure and the Groot Dwars River. Any dirty water runoff containment facilities must remain outside the defined wetland areas and their buffers unless it is absolutely unavoidable with specific mention of the activities near to the Groot Dwars River.	Construction	Once-off	SHE Coordinator
				• There will be no discharges of dirty water from the project site unless there is an extreme storm event, with a recurrence interval exceeding 1:50 years.	On-going	On-going	SHE Coordinator
				• The non-mineralised waste management procedures outlined in Table 7-1 will be implemented.	On-going	Once-off	SHE Coordinator
				• Environmental conditions will be included in construction contracts, thereby making contractors aware of the necessity to prevent accidental spillages by the implementation of good housekeeping practices.	Construction	Once-off	SHE Coordinator
				• The water balance for the mine will be refined on an on-going basis during the life of mine. The water balance will be used to check on an on-going basis that the capacity of the dirty water holding facilities is adequate, taking the operational distribution and use of water into account.	On-going	On-going	SHE Coordinator
				• The mine will continue its surface water monitoring programme in the Groot Dwars River. Further detail is provided in Section 21.1.1. In addition to the current surface water monitoring	Pre-construction and on-going for	Once-off then on-going	SHE Coordinator

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
				programme, the following additional monitoring requirements are to be undertaken: • Monitoring of the groundwater and surface water quality downstream of the new TSF should also take place throughout the life of the operation and for at least 10 years after closure of the TSF structure. • Sediment chemistry upstream and downstream of the TKO dam will be undertaken throughout the life of the TSF until such time as seepage water from the facility no longer poses a hazard to the system. Should any concerning trends emerge, measures to prevent the development of a contaminated sediment sink should be employed. • The aquatic biomonitoring program must be extended in order monitor the impacts from Project Fairway at points in the Groot Dwars River upstream and downstream of the footprint areas. Assessment point B0 should be used for future reference, in addition a point further upstream in the valley should be initiated as a new reference point prior to construction activities being initiated. On-going biomonitoring should continue in the summer and winter of each year • Whole Effluent Toxicity testing will be implemented at points upstream and downstream of the Groot Dwars ricer crossing in order to monitor the toxicological risk to the system. This testing should take place on 6 monthly intervals in conjunction with the biomonitoring assessment. • Two additional biomonitoring points should be added to the biomonitoring program at points upstream and downstream of the proposed Project Fairway box cuts and associated infrastructure. • Monitoring of surface water quality as well as wetland functionality and integrity should take place throughout the life of the mine. The wetland Present Ecological State and eco-services should be assessed annually to identify any emerging impacts on the wetland resources;	additional work		
				• Should any contamination be detected the mine will immediately notify DWA. The mine, in consultation with DWA and an appropriately qualified person, identify the source of contamination, identify measures for the prevention of this contamination (in the short term and the long term) and then implement these measures.	On-going	As required	SHE Coordinator
				• The designs of any permanent and potentially polluting structures will take account of the requirements for long term	Pre-construction	On-going	SHE Coordinator

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
				surface water pollution prevention. Moreover, where these facilities are associated with groundwater plumes that have or will impact the quality of surface water resources, Everest will implement mitigation measures for as long as is needed to eliminate the risk and achieve the stated mitigation objectives. In this regard:			
				- The anticipated quality of seepage emanating from the proposed TSF during operations and post closure must be confirmed through laboratory test work and simulation modelling to refine the seepage and infiltration assessments.	Pre-construction	Once-off	SHE Coordinator
				- Additional groundwater investigations to measure seasonal groundwater variations across the proposed TSF site must be undertaken to allow for the refinement of the dewatering and foundation treatment plan. Further refinement of the groundwater modelling is proposed to incorporate these seasonal fluctuations as well as confirmed seepage quality characteristics.	As required	On-going	SHE Coordinator
				- The footprint of the TSF is to be compacted where possible to reduce the vertical hydraulic conductivity to the underlying material and aquifers. The proposed drainage features can be expanded if so required to include a full herringbone underdrainage system.	Pre-construction	As required	SHE Coordinator
				- A cut-off trench will be installed along the southern, eastern, north-eastern, and northern borders of the proposed TSF. Seepage into the rehabilitated open pits will be dewatered via the existing dewatering boreholes. At least the base of the trench will be appropriately sealed.	Construction	As required	SHE Coordinator
				- Additional monitoring boreholes will be installed down gradient of the cut-off trench. Scavenger wells should be installed in the event that the monitoring program indicates any contamination of the fractured rock aquifer in order to control contaminant migration away from the site.	Construction	Once-off	SHE Coordinator
				- The RWD will be equipped with a HDPE liner to ensure that all impacted water is contained. In addition, a groundwater separation/ drainage layer will be provided to ensure the on-going separation of ground water and zero uplift on the liner.	Construction	Once-off	SHE Coordinator
				• All mine residue deposits and water return dams are maintained and regularly inspected for seepage.	On-going	On-going	SHE Coordinator
				• All hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage.	On-going	On-going	SHE Coordinator
				• All vehicles should be inspected for leaks. Re-fuelling of vehicles	On-going	On-going	SHE Coordinator

Phase of operation	Activities	Sig UM	Sig M	Technical and management options	Action plan: Timeframe	Frequency	Responsible parties
				must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil. • Handle major spillage incidents in line with emergency response procedure (see Section 20.2).	As required	As required	SHE Coordinator
Decommission	Demolition Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Waste rock dumps Tailings Storage Facility Water supply infrastructure Power supply infrastructure Rehabilitation	H	L	• Prevent dirty water runoff and spillages from entering the environment (bunds, stormwater control, catchment paddocks) until such time as infrastructure is removed • Prevent erosion runoff as per soil management plan • Continue monitoring surface water in accordance with section 21. • Handle major spillage incidents in line with emergency response procedure (see Section 20.2).	On-going On-going On-going As required	On-going On-going On-going As Required	SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator
Closure	Maintenance and aftercare of final land forms and rehabilitated areas	H	L	• The toe of the RWD should have a sump constructed in order to allow seepage water to be pumped back into the process water system throughout the life of mine and beyond closure until such time as the seepage water emanating from the TSF complex does not pose a risk to the downstream aquatic ecology. This needs to be verified 6 monthly beyond closure by means of toxicological testing by a suitably qualified aquatic ecologist. • Specific attention must be paid to preventing uncontrolled post-closure decant. Depending on the quality of the decant water, the appropriate pumping, collection, and treatment facilities will be designed and implemented according to agreed specifications with the relevant stakeholders and government departments so as to ensure that the controlled discharge of treated decant water meets the relevant standards imposed by these stakeholders. • Handle major spillage incidents in line with emergency response procedure (see Section 20.2).	As required Timeframes to be agreed upon with authorities As required	As required On-going As required	SHE Coordinator SHE Coordinator SHE Coordinator

TABLE19-7: ACTION PLAN – ALTERATION OF NATURAL DRAINAGE PATTERNS

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
Construction	Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Rehabilitation	H	M	• AQPSA will comply with the conditions of its water use licence	On-going	On-going	SHE Coordinator
				• Storm water controls will be designed in accordance with the requirements of Government Notice No. R.704 of 4 June 1999, the corresponding DWAF M6.1 Operational Guideline, the requirements of DWA as stipulated in the water licence, and will be done by an appropriately qualified engineer.	On-going	On-going	SHE Coordinator
				• Any dirty water runoff containment facilities must remain outside the defined wetland areas and their buffers as a measure to minimise the footprint areas of mining within sensitive wetland areas.	On-going	On-going	SHE Coordinator
Operation	Earthworks Civil works Exploration Site management Transport systems Non-mineralised waste management Support services and amenities Open pit mining (former) Declines Tailings Storage Facilities (existing and proposed) Water supply infrastructure Power supply infrastructure Rehabilitation	H	M	• Stream crossings will be designed so that they do not alter the flow. Stream crossings will be inspected regularly for erosion and any culvert blockages. Blockages will be cleared and damaged areas will be repaired immediately. In these designs, considerations will be given to the biodiversity and rehabilitation requirements. In this regard the following key points must be adhered to:	On-going	On-going	SHE Coordinator
				• Support pillars should not be placed in the active channel of the stream;	Construction	Once-off	SHE Coordinator
				• Support pillars must be designed in such a way as to minimise the creation of turbulent flow;	On-going	On-going	SHE Coordinator
				• Bridge structures must not lead to upstream ponding and sedimentation;	On-going	On-going	SHE Coordinator
				• Bridge structures must not lead to downstream erosion and incision; and	On-going	On-going	SHE Coordinator
				• Bridge structures must ensure that the systems (with Special mention of the Groot Dwars River) remain free flowing and that no impediments to fish migration occur.	On-going	On-going	SHE Coordinator
				• All wetland boundaries and associated buffer zones must be demarcated and declared no-go areas. Any activities causing erosion and incision of any of the wetland features must be identified and the impacts must be mitigated immediately.	Construction	As required	SHE Coordinator
Decommission	Demolition Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and	H	M	• All areas affected by construction should be rehabilitated upon cessation of the disturbing activities. Disturbed drainage areas should have the banks reprofiled to a maximum gradient of 1:3 to ensure bank stability. Where necessary, banks and drainage features should be reinforced with gabions, reno mattresses and geotextiles.	Construction	As required	SHE Coordinator
				• During the construction and operational phases, erosion berms should be installed to prevent gully formation and siltation of the	Construction	As required	SHE Coordinator

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
	amenities Waste rock dumps Tailings Storage Facilities (existing and proposed) Slag dump Water supply infrastructure Power supply infrastructure Rehabilitation			wetland resources. The following points should serve to guide the placement of erosion berms: - Where the track has slope of less than 2%, berms every 50m should be installed. - Where the track slopes between 2% and 10%, berms every 25m should be installed. - Where the track slopes between 10%-15%, berms every 20m should be installed. - Where the track has slope greater than 15%, berms every 10m should be installed.			
				• Subsidence above the workings will be monitored. If any subsidence that will cause alteration of drainage patterns is detected, this will be reported without delay to DMR and DWA. If necessary, appropriate remedial measures will be identified in consultation with these departments and implemented.	On-going	On-going	SHE Coordinator
				• The Stormwater Management Plan will be implemented for the proposed Project Fairway (refer to Appendix H).	On-going	On-going	SHE Coordinator
Closure	Maintenance and aftercare of final land forms and rehabilitated areas	M	M	• Maintain stormwater controls (through inspection and repair) until such time as facilities can be removed.	6 years	On-going	SHE Coordinator
				• Monitor re-instated drainage patterns to ensure natural flow patterns occur as far as possible.	On-going	As required	SHE Coordinator

TABLE19-8: ACTION PLAN – CONTAMINATION OF GROUNDWATER RESOURCES

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
Construction	Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Rehabilitation	H	M	• Everest will comply with both the National Water Act (NWA), (Act 36 of 1998) and Government Notice No. R.704 of 4 June 1999 or any future amendments thereto, and the terms and conditions of water authorisations/licenses.	On-going	On-going	SHE Coordinator
				• In the design, construction, operation and decommissioning phases the mine will ensure that all hazardous chemicals (new and used), mineralised wastes and non-mineralised wastes are handled in a manner that they do not pollute groundwater. This will be implemented through a procedure(s) covering the following:	On-going	On-going	SHE Coordinator

<table>
<tr><th rowspan="2">Phase of operation</th><th rowspan="2">Activities</th><th colspan="2">Sig</th><th rowspan="2">Technical and management options</th><th colspan="3">Action plan</th></tr>
<tr><th>UM</th><th>M</th><th>Timeframe</th><th>Frequency</th><th>Responsible parties</th></tr>
<tr><td rowspan="6">Operation</td><td rowspan="6">Earthworks
Civil works
Exploration
Site management
Transport systems
Non-mineralised waste management
Support services and amenities
Tailings dams and waste rock management
Water supply infrastructure
Power supply infrastructure
Rehabilitation</td><td rowspan="6">H</td><td rowspan="6">M</td><td>- Pollution prevention through basic infrastructure design (minimised disturbance footprints, incorporation of the tailings and return water design philosophy detailed in Section 2.7.4, seepage interception systems, appropriate lining of dirty water systems);</td><td>Pre-Construction</td><td>As required</td><td>SHE Coordinator</td></tr>
<tr><td>- Pollution prevention through maintenance of equipment;</td><td>On-going</td><td>On-going</td><td>SHE Coordinator</td></tr>
<tr><td>- Pollution prevention through education and training of workers (permanent and temporary);</td><td></td><td></td><td></td></tr>
<tr><td>- Pollution prevention through appropriate management of hazardous chemicals, materials and non-mineralised waste; and</td><td>On-going</td><td>On-going</td><td>SHE Coordinator</td></tr>
<tr><td>- The required steps to enable containment and remediation of pollution incidents.</td><td>On-going</td><td>As required</td><td>SHE Coordinator</td></tr>
<tr><td>• The designs of any permanent and potentially polluting structures will take account of the requirements for long term surface water pollution prevention. Moreover, where these facilities are associated with groundwater plumes that have or will impact the quality of surface water resources, Everest will implement mitigation measures for as long as is needed to eliminate the risk and achieve the stated mitigation objectives. In this regard:</td><td>Construction
On-going</td><td>Once-off
On-going</td><td>SHE Coordinator

SHE Coordinator</td></tr>
<tr><td rowspan="4">Decommission</td><td rowspan="4">Demolition
Earthworks
Civil works
Site management
Transport systems
Non-mineralised waste management
Support services and amenities
Tailings dams
Water supply infrastructure
Power supply infrastructure
Rehabilitation</td><td rowspan="4">H</td><td rowspan="4">M</td><td>- The anticipated quality of seepage emanating from the proposed TSF during operations and post closure must be confirmed through laboratory test work and simulation modelling to refine the seepage and infiltration assessments.</td><td>Pre-Construction</td><td>As required</td><td>SHE Coordinator</td></tr>
<tr><td>- Additional groundwater investigations to measure seasonal groundwater variations across the proposed TSF site must be undertaken to allow for the refinement of the dewatering and foundation treatment plan. Further refinement of the groundwater modelling is proposed to incorporate these seasonal fluctuations as well as confirmed seepage quality characteristics.</td><td>Pre-Construction</td><td>Once-off</td><td>SHE Coordinator</td></tr>
<tr><td>- The footprint of the TSF is to be compacted where possible to reduce the vertical hydraulic conductivity to the underlying material and aquifers. The proposed drainage features can be expanded if so required to include a full herringbone underdrainage system.</td><td>Construction</td><td>Once-off</td><td>SHE Coordinator</td></tr>
<tr><td>- A cut-off trench will be installed along the southern, eastern, north-eastern, and northern borders of the proposed TSF. Seepage into the rehabilitated open pits will be dewatered via the existing dewatering boreholes. At least the base of</td><td>Construction</td><td>Once-off</td><td>SHE Coordinator</td></tr>
</table>

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
				the trench will be appropriately sealed.			
				- Additional monitoring boreholes will be installed down gradient of the cut-off trench. Scavenger wells should be installed in the event that the monitoring program indicates any contamination of the fractured rock aquifer in order to control contaminant migration away from the site.	Construction	Once-off	SHE Coordinator
				- The RWD will be equipped with a HDPE liner to ensure that all impacted water is contained. In addition, a groundwater separation/ drainage layer will be provided to ensure the on-going separation of ground water and zero uplift on the liner.	Construction	Once-off	SHE Coordinator
				• Existing and proposed infrastructure that is or has the potential to cause groundwater contamination will be identified and included in a groundwater pollution management plan which will be implemented as part of the operational phase. This plan has the following principles: - Determine potential pollution sources; - Determine the extent of the existing or potential contamination plume; - Design and implement intervention measures to prevent and/or eliminate the pollution plume; - Monitor all existing and potential impact zones to track pollution and mitigation impacts; - Where pollution negatively impacts third party water supply, an alternative equivalent supply will be provided by Everest.	On-going	As required	SHE Coordinator
				• Ensure that all activities impacting on geohydrological resources of the property are managed according to the relevant DWA licensing regulations and groundwater monitoring and management requirements.	On-going	On-going	SHE Coordinator
				• Mine design and planning should ensure that any cone of dewatering which may be caused by mining does not lead to a reduction of stream flow or dewatering of the Groot Dwars River. In addition, ecological connectivity of the wetland features should be maintained with special mention of bridge crossings over drainage features.	On-going	On-going	SHE Coordinator
				• The mine will implement the monitoring programme as detailed in Section 21. If monitoring indicates a mine-related decrease in groundwater quality at third party boreholes, appropriate measures will be taken to rectify the contamination situation, to provide the affected third parties with an alternative water supply, and/or to possibly purchase affected farms.	On-going	On-going	SHE Coordinator
				• In the event of any significant pollution incident follow the	As required	As required	SHE Coordinator

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
				emergency response procedure (see Section 20.2).			
Closure	Maintenance and aftercare of final land forms and rehabilitated areas	**H**	**M**	• The open pit areas will be rehabilitated in such a way as to allow free runoff and limit infiltration. Stormwater control measures established at the start of the open pit operations will remain, for as long as required to provide sufficient time for the overburden to consolidate and prevent unnecessary infiltration of rehabilitated areas. • Newly drilled monitoring boreholes will be used to monitor rebound groundwater levels and intercept decant before it reaches the topography.	As required Timeframe to be agreed upon with authorities	As required Quarterly	SHE Coordinator SHE Coordinator

TABLE19-9: ACTION PLAN – DEWATERING IMPACTS

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
Operation	Underground mining	**H**	**M**	• Dewatering will only take place to ensure the safe workings of the underground operations. Unnecessary dewatering will be avoided. • Dewatering will be undertaken in line with the water use licence conditions. • Within the underground mine works, individual seepage zones in the fractured rock should be sealed to limit the volume of water which inflows into the underground mine works area. • Water removed from underground will be re-used in the process to minimise the need for external water supply. • Exploration boreholes will be sealed to minimise groundwater inflow into mine workings and lowering of water levels. • In addition to the above, the mine will set up and maintain a transient groundwater flow model showing changes in water levels and water qualities as a result of its operations using water quality and water level data sourced from its monitoring programme. This model will be maintained on an annual basis. If the model predictions change to those assessed and discussed in this report, additional mitigation measures will be implemented in consultation the authorities and an appropriately qualified specialist.	On-going On-going On-going On-going On-going Timeframe to be agreed upon with authorities	On-going On-going On-going On-going On-going On-going Quarterly	SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator
Decommission	Underground mine void	**H**	**M**				

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
Closure	Underground mine void	**H**	**M**	• Prior to the commencement of Project Fairway, Everest will conduct an in-stream flow study to quantify the relationship between in-stream flow, rainfall, surface runoff and inflow from groundwater for the Groot Dwars River. If this study indicates that losses from groundwater inflows are material on the basis of a revised independent assessment, a discharge programme will be designed and implemented to compensate for mine dewatering losses to the surface water system. This discharge programme will be designed and implemented with the following considerations: - Discharge water quality; - Discharge volumes and points; - Erosion protection measures; and - In-stream monitoring gauges and aquatic biodiversity monitoring programme.	Pre-Construction	On-going	SHE Coordinator
				• Where Everest's dewatering causes a loss of water supply to third parties, an alternative equivalent water supply will be provided by Everest until such time as the dewatering impacts cease.	As required	On-going	SHE Coordinator
				• The mine will implement the monitoring programme as detailed in Section 21.	On-going	On-going	SHE Coordinator

TABLE19-10: ACTION PLAN –AIR POLLUTION

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
Construction	Site preparation Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Rehabilitation	**H**	**L**	• Everest will implement a dynamic air quality management plan that covers: - the identification of sources (emissions inventory); - the implementation of source based controls; - the use of source and receptor based performance indicators and monitoring strategies; - the use of source and receptor based mitigation measures; - the use of internal and external auditing; and - review and plan adjustment as required.	On-going	On-going	SHE Coordinator
Operation	Site preparation Earthworks	**M**	**M**	• In the construction, operational and decommissioning phases, the following specific mitigation measures will be implemented for the main emission sources: roads, crushing and screening, materials handling, processing plant, the existing and proposed TSF, vehicles and wind erosion. The recommended methods to	On-going	On-going	SHE Coordinator

Phase of operation	Activities	Sig UM	Sig M	Technical and management options	Action plan: Timeframe	Action plan: Frequency	Action plan: Responsible parties
	Civil works Exploration Site management Transport systems Non-mineralised waste management Support services and amenities Chrome processing Tailings dams Rehabilitation			achieve this are: - Limit the disturbance of land to what is absolutely necessary and in accordance with the mine infrastructure layout.	On-going	On-going	SHE Coordinator
				- Where possible roads will be paved and spillages of material on these paved roads will be routinely cleaned. Alternatively, Everest will apply dust suppression on unpaved roads through chemical binding agents and/or water sprays combined with vehicle speed and volume controls. Control measures will aim to achieve a 75% dust control efficiency.	On-going	On-going	SHE Coordinator
				- Dust controls at the crushing and screening operation by water sprays and/or installing extraction hoods with filters or scrubbers. The nozzle pressure of water sprays at the crusher will be below 60psi to avoid stirring the dust cloud and reducing the capture efficiency of the ventilation system. Control measures will aim to achieve a 50% control efficiency.	On-going	On-going	SHE Coordinator
Decommission	Site preparation Demolition Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Waste rock dumps Tailings dams Rehabilitation	H	L	- Dust controls at material handling points (loading and offloading) ;	On-going	On-going	SHE Coordination
				- Conveyors will be partially covered by doghouse covers.	On-going	On-going	SHE Coordinator
				- Collection of spilled material and rehabilitation of areas where tailings spills occur along the pipe lines.	On-going	On-going	SHE Coordinator
				- Rehabilitation and re-vegetation of all decommissioned areas.	On-going	On-going	SHE Coordinator
				- Rehabilitation and re-vegetation of the side slopes of operational tailings dams. The control measures for the TSF will aim to achieve a 80% dust control efficiency on the side slopes and 50% wet beach area on the top surface area if feasible.	On-going	On-going	SHE Coordinator
				- If required, a water spraying system will be installed on the surface of the tailings dam covering the outer perimeter of the dam, spraying water when wind exceeds 4 m/s.	As required	On-going	SHE Coordinator
				- Minimise dust emissions from operational tailings dams (e.g. by controlling deposition methodology).	On-going	On-going	SHE Coordinator
				- Maintenance of all vehicles to achieve optimal exhaust emissions.	On-going	On-going	SHE Coordinator
				- Dust control equipment will be maintained and inspected on a regular basis to ensure that the expected control efficiencies are attained.	On-going	On-going	SHE Coordinator
				• Conduct dust monitoring as outlined in Section 21. The monitoring data will be analysed and interpreted and an annual air quality report will be produced.	On-going	On-going	SHE Coordinator

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
				• If monitoring determines that unacceptable dust emissions is occurring, immediate steps will be taken to address the issue in consultation with a suitable air quality specialist.	On-going	As required	SHE Coordinator
Closure	Maintenance and aftercare of final land forms and rehabilitated areas	H	L	• As part of closure planning the designs of any permanent and potentially polluting structures (particularly the mineralized waste facilities) will, on the basis of impact modelling, incorporate measures to address long term pollution prevention and confirmatory monitoring.	Timeframe to be agreed upon with authorities	On-going	SHE Coordinator

TABLE19-11: ACTION PLAN – INCREASE IN NOISE DISTURBANCE

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
Construction	Exploration Site preparation Earthworks and civil works Process- and stormwater management Transport systems Non-mineralised waste management Storage and maintenance services/facilities Site/contract management	M	M	• Noise attenuation measures (e.g. noise screens, acoustic barriers) were established between the open pit operations and sensitive noise receptors.	Construction	Once-off	SHE Coordinator
				• Noise sources will be equipped with silencers, acoustic covers (for stationery and fixed equipment), screens or sheds, noise suppression systems or mounted in acoustically designed enclosures, where appropriate.	Construction	Once-off	SHE Coordinator
				• Ventilation fans will be placed underground as far as practically possible. There will be no surface ventilation fans in the valley.	On-going	On-going	SHE Coordinator
				• No surface or near surface blasting may take place at night (between 18h00 and 06h00) or on the weekend between Fridays at 18h00 and Mondays at 06h00	On-going	On-going	SHE Coordinator
Operation	Earthworks Civil works Prospecting and survey Transport systems Ventilation shafts Compressor station Processing and DMS plant Rehabilitation	M	M	• A good maintenance management scheme is implemented to ensure that vehicles and plant and equipment are properly maintained thus reducing the occurrence of excessive emissions.	On-going	On-going	SHE Coordinator
				• A bus system for transporting mine staff to and from work was established to reduce vehicular traffic.	On-going	On-going	SHE Coordinator
				• The mine records and responds without delay to complaints about disturbing noise.	On-going	On-going	SHE Coordinator

Phase of operation	Activities	Sig UM	Sig M	Technical and management options	Action plan: Timeframe	Frequency	Responsible parties
				• Local residents will be notified of any potentially noisy field survey works or other works during the planning and design phase the proposed project and these activities will be undertaken at reasonable times of the day(not at night or on weekends).	On-going	On-going	SHE Coordinator
Decommission	Demolition Earthworks Civil works Transport systems Rehabilitation	**M**	**M**	• Consideration must be given to noise mitigation measures required during the construction phase which will be included in tender document specifications and relevant designs.	Construction	As required	SHE Coordinator
				• Construction site yards and other noisy fixed facilities will be located well away from noise sensitive areas.	Construction	Once-off	SHE Coordinator
				• Where possible, stationary noisy equipment (for example compressors, pumps, pneumatic breakers,) will be encapsulated in acoustic covers, screens or sheds. Portable acoustic shields will be used in the case where noisy equipment is not stationary (for example drills, angle grinders, chipping hammers, poker vibrators).	On-going	On-going	SHE Coordinator
				• Noisy construction activities will be restricted to reasonable hours during the day and early evening. Specifically, blasting will take place to a regular programme and will be restricted to the period between 08h00 and 16h00.	Construction	On-going	SHE Coordinator
				• In the event of unavoidable noisy construction activities in the vicinity of noise sensitive areas, the mine will liaise with local residents on how best to minimise the impact.	Construction	On-going	SHE Coordinator
				• Machines in intermittent use will be shut down in the intervening periods between work or throttled down to a minimum.	On-going	On-going	SHE Coordinator
				• Operations will aim to meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993).	On-going	On-going	SHE Coordinator
				• Staff working in areas where the 8-hour ambient noise levels exceed 75dBA will wear ear protection equipment.	On-going	On-going	SHE Coordinator
				• The source-based noise performance of less than 70dBA at the property boundary of the mine will be implemented as specified for industrial districts in SANS 10103. Where the noise level at any external site is presently at or exceeds the 70dBA maximum, the existing level shall not be increased by more than indicated as acceptable in SANS 10103.	On-going	On-going	SHE Coordinator
				• The latest technology incorporating maximum noise mitigation measures will be designed into the system. When ordering plant and machinery, manufacturers will be requested to provide	Design	Once-off	SHE Coordinator

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
				details of the sound power level (SPL). Where possible, those with the lowest SPL (most quiet) will be selected.			
				• The design process will consider, inter alia, the following aspects: - The position and orientation of buildings on the site. - The design of the buildings to minimise the transmission of noise from the inside to the outdoors. - The insulation of particularly noisy plant and equipment.	Design	Once-off	SHE Coordinator
				• The temporary dumps of spoil rock and overburden (berms) from operational open cast pit excavations will, where possible, be used as interim noise attenuation barriers.	On-going	On-going	SHE Coordinator
				• The National Noise Control Regulations and SANS 10103:2008 will be used as the main guidelines for addressing the potential noise impact.	On-going	On-going	SHE Coordinator
				• Once the design and layout of the proposed compressor station and the DMS plant has been completed, an acoustical engineer will be consulted to determine specific measures and material specifications to mitigate noise impacts for both the current and proposed activities and infrastructure.	Pre-construction	As required	SHE Coordinator
				• At the start of the project implementation, the noise footprint of each discrete element will be established by measurement in accordance with the relevant standards, namely SANS ISO 8297:1994 and SANS 10103. The character of the noise (qualitative aspect) will also be checked to ascertain whether there is any nuisance factor associated with the operations.	Construction	Once-off	SHE Coordinator

TABLE19-12: ACTION PLAN – VISUAL IMPACTS

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
Construction	Site preparation Earthworks Civil works Prospecting and survey Site management Transport systems Non-mineralised waste	H	M	• Land disturbance will be limited to what is absolutely necessary.	On-going	On-going	SHE Coordinator
				• As much existing vegetation (other than invasive plants) is retained wherever possible construction of any infrastructure to act as dust collectors and to break the monotony of vast expanses of exposed earth.	Construction	Once-off	SHE Coordinator
				• Good 'housekeeping' (keeping the site tidy and neat) is essential during site development.	On-going	On-going	SHE Coordinator

Phase of operation	Activities	Sig UM	Sig M	Technical and management options	Action plan: Timeframe	Action plan: Frequency	Action plan: Responsible parties
	management Support services and amenities Rehabilitation			• The outside slopes of the tailings dam are rehabilitated with grasses and/or groundcover vegetation. • Dust is suppressed in line with the air management plan. • Final shaping of remaining land forms will be implemented such that the final profile of the rehabilitated open pit mining areas and the sides and the top of the tailings dam are formed to emulate natural contours of the area.	On-going On-going Rehabilitation	On-going On-going Once-off	SHE Coordinator SHE Coordinator SHE Coordinator
Operation	Site preparation Earthworks Civil works Exploration Site management Transport systems Non-mineralised waste management Support services and amenities Box cuts Processing plant DMS plant Chrome processing Tailings Storage Facility (proposed and existing) Water supply infrastructure Power supply infrastructure Rehabilitation	**H**	**M**	• Harsh steep engineered slopes will be avoided during rehabilitation, instead the rehabilitated landscape will emulate natural contours of the area. • Natural vegetation is allowed to intrude onto the site. • A combination of tall indigenous trees and shrubs are planted along the periphery and within the plant site to partially absorb views of the plant. • The Casuarinas windbreaks are maintained in a healthy growing condition as far as is possible. • Buildings and structures are painted with colours that reflect and complement the natural tan and dark greens of surrounding landscape. Pure whites and pure black colours are avoided. • External surfaces of buildings and structures are articulated or textured to create interplay of light and shade and to reduce the potential glare, shiny or bare metal will be avoided. • Paved surfaces are paved with 'earthy' tones that complement the natural red/brown colours and textures of the soils in the area. • There is on-going rehabilitation of the open pit areas. • Light fixtures are installed that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the plant, and declines and vent shafts but which still illuminate the buildings/roads. High pole top flood and security lighting is avoided where possible. Peripheral security lighting will be movement activated and will not be kept on if practical.	Rehabilitation On-going Once-off On-going On-going On-going On-going On-going On-going	Once-off On-going Once-off On-going On-going On-going On-going On-going On-going	SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator
Decommission	Site preparation Demolition Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities Tailings Storage Facility	**H**	**M - L**	• Service roads must follow the natural contours of the land to avoid extensive cut or fill areas. • In the decommissioning phase Everest will implement its closure plan which involves the removal of infrastructure, and the rehabilitation and re-vegetation of cleared areas and any final landforms that will remain post closure. These final landforms should be rehabilitated in a manner that limits the long term visual impact.	Construction Decommissioning	Once-off Once-off	SHE Coordinator SHE Coordinator

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
	(proposed and existing) Water supply infrastructure Power supply infrastructure Rehabilitation						
Closure	Maintenance and aftercare of final land forms and rehabilitated areas	H	M - L	• At closure, final landforms will be managed through an aftercare and maintenance programme to limit the long term post closure visual impacts.	Timeframe to be agreed upon with authorities	As required	SHE Coordinator

TABLE19-13: ACTION PLAN – HERITAGE, PALEONTOLOGICAL AND CULTURAL RESOURCES

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
Construction	Earthworks - for all surface infrastructure Site management Transport systems Support services and amenities Rehabilitation	H	L	• Limit the project footprint and activities to that in the approved original EMP and subsequent amendments, this EIA and EMP report and any future amendments which are approved. • Where future plans require a change in mine footprint, a project specific heritage study will be done to identify any project specific heritage and cultural resources that may be affected and to detail the mitigation plan where required. • Disturbance of the archaeological and historical sites and graves are to be avoided where possible. • All identified archaeological sites are registered with the SAHRA. • Permits in terms of Section 35 of the National Heritage Resources Act were obtained for disturbance of archaeological sites for the establishment of initial mine infrastructure. • Permissions were obtained for the exhumation and relocation of graves for the initial mine establishment. • Graves within the Project Fairway project area will be preserved in situ where possible. These graves and graveyards will be demarcated with walls or fencing, and relatives wishing to visit the graves will be allowed access. • Where graves have to be moved for the proposed Project Fairway, the relevant permissions will be obtained. The exhumation of human remains and the relocation of	On-going As required On-going On-going Pre-construction Pre-construction Pre-construction Pre-construction	On-going As required On-going On-going Once-off Once-off Once-off Once-off	SHE Coordinator As required SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator
Operation	Earthworks - for all surface infrastructure Exploration Site management Transport systems Non-mineralised waste management Support services and amenities Open pit mining (previous and potential future) Tailings Storage Facility (existing and proposed) Decline establishment Water supply	H	L				

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
	infrastructure Power supply infrastructure Rehabilitation			graveyards are regulated by various laws, regulations and administrative procedures. This task will be undertaken by forensic archaeologists or by reputed undertakers who are acquainted with all the administrative procedures and relevant legislation. Permission will have to be obtained from the descendants of the deceased (if known), the National Department of Health, the Provincial Department of Health, the Premier of the Province and the local police.			
Decommission	Demolition Earthworks Site management Transport systems Non-mineralised waste management Support services and amenities Tailings dam Water supply infrastructure Power supply infrastructure Rehabilitation	H	L	• All heritage sites not impacted on by the actual development of infrastructure will be marked on the site layout plan. • All sites preserved in situ will be regularly inspected for signs of encroachment and/or damage. • All workers (temporary and permanent) will be educated about the heritage sites that may be encountered. • Any chance finds of heritage sites will follow the emergency procedure as referenced in Section 20.2	On-going On-going On-going As required	On-going On-going Induction and annually As required	SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator

TABLE19-14: ACTION PLAN – ECONOMIC IMPACTS (POSITIVE AND NEGATIVE)

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
Construction	Development of the mine	H+	H+	• The mine established and regularly updates a skills database of people in the area and contractors are encouraged to preferentially employ locals. • Non-core activities are identified and prioritized for local service providers. Local service providers are identified and requested to tender for the provision of the various services. • The mine supports the principle of Black Economic Empowerment (BEE) through procurement of the services of BEE contractors and suppliers. The mine strives to identify and invite BEE companies to tender for the provision of services at the mine. • The mine continues to implement the commitments in its social and labour plan in accordance with the employment, procurement and social investment principles of the Mining	Pre-construction and on-going On-going On-going On-going	Once-off and on-going On-going On-going On-going	HR Manager Procurement Manager Procurement Manager Mine Manager SLP Co-ordinator HR Manager
Operation	Presence and operation of the mine	H+	H+				
Decommission	Presence and rehabilitation/closure of the mine	H+	H+				

Phase of operation	Activities	Sig UM	Sig M	Technical and management options	Action plan: Timeframe	Frequency	Responsible parties
				Charter. In this respect: - **Recruitment, selection and employment equity:** The objective of sound recruitment, selection and equity policy is to ensure that the mine is staffed with competent, committed employees and that the benefits of internal appointments and local recruitment are realised. Everest will ensure that its recruitment process incorporates the following: (1) a policy of appointments from within should be applied where current employees with the necessary skills, competence and potential are available – formal succession and career planning should facilitate this process; (2) where internal appointments are not viable, recruitment must be aimed at employing members of local communities; (3) selection of employees should be based upon defined competency and skill requirements which should be available for scrutiny in the form of job specifications; (4) selection processes should be defensible and visibly fair – proper records of recruitment and selection practices should be kept; and (5) `medical screening should be restricted to conditions relevant to the job as defined in the job specifications. - **Longer-term options for achieving sustainable productivity:** (1) award bursaries to students who have shown commitment to their careers on condition that bursary holders can be retained within the company as far as possible; (2) provide learnership opportunities to ensure focused growth and development. Learnership programmes equip people with relevant skills identified in the industry and therefore contribute to the economic growth and development of the country; and (3) provide all staff with access to skills training, and for those staff identified as having potential, facilitate career progression as part of a career management process			Procurement Manager

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
				• Start closure planning as soon as practically possible. • Incorporate economic considerations into closure planning	At least 5 years prior to decommissioning	Once-off	Mine Manager SHE Coordinator
Closure	Maintenance and aftercare	**H+**	**H+**	• Monitor site in line with closure objectives and goals	Timeframe to be agreed upon with authorities	On-going	SHE Coordinator

TABLE19-15: ACTION PLAN – SOCIAL IMPACTS (POSITIVE AND NEGATIVE)

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
Construction	Development of the mine	H	M	• The mine established a social investment programme to enhance the socio-economic benefits and mitigate the negative socio-economic impacts of the development. The social investment programme aims to address the identified needs of surrounding communities. • Discussions were held with the South African Police Force regarding the policing of the area. • A forum was established whereby the mine and surrounding land users communicate on a regular basis to ensure that the mine is in a position to attend to any concerns of farmers promptly. • A joint strategy was developed with local authorities, the local police force and local farmers to deal with squatters. • The mine continues to implement the commitments in its Social and Labour Plan in accordance with the employment, procurement and social investment principles of the Mining Charter. In this respect: - **Housing:** a. Everest will endeavour to work with local government and private stakeholders (such as but not limited to, property developers, estate agents, private land owners and financial institutions) to investigate the potential for and planning around the development of appropriate housing within the local area to assist the local workforce to meet its own housing requirements within the formal housing sector and facilitate long term investment in the local economy through the monthly income from the mine. This amounts to long term solutions to housing, facilitated through public-private partnerships, and will facilitate long term,	Pre-construction and on-going Pre-construction and on-going Pre-construction and on-going Pre-construction and on-going On-going	Once-off then on-going Once-off then on-going Once-off then on-going Once-off then on-going On-going	SHE Coordinator SHE Coordinator SHE Coordinator SHE Coordinator Mine Manager SLP Co-ordinator HR Manager Procurement Manager
Operation	Presence and operation of the mine	H	M				
Decommission	Presence and rehabilitation/closure of the mine	H	M				

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
				sustainable development and assist in preventing the establishment of unsustainable, informal settlements which is problematic for the company and local government at the end of the life of the mine. b. Everest management will not be associated with employees residing in illegal informal settlements. Squatting on Everest land will not be permitted at any time and measures to facilitate the prevention of squatting on land in the vicinity of its operations will be implemented. Contractors will be required to keep a record of employee's physical addresses. c. Where hostel accommodation is provided, it will be of an acceptable standard. This includes hygienic ablution facilities, proper washing facilities with hot and cold running water, hygienic feeding facilities, suitable security of access, and avoidance of overcrowding. Single-sex hostel accommodation is not an acceptable solution to the housing needs of Everest's workforce, and whilst it may be utilized to meet short-term needs during construction periods where there is a lack of alternative accommodation, it will not be permitted as a long-term housing strategy. • Start closure planning as soon as practically possible. • Incorporate social considerations into closure planning. • The establishment of informal settlements in the area is considered an emergency situation. In such instances the emergency procedure included in Section 20 will be followed.	At least 5 years prior to decommissioning If required	Once-off If required	Mine Manager SHE Coordinator SHE Coordinator
Closure	Maintenance and aftercare	H	M	• Monitor site in line with closure objectives and goals.	Timeframe to be agreed upon with authorities	On-going	SHE Coordinator

TABLE 19-16: ACTION PLAN – LAND USE

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
Construction	Development of the mine	**H**	**M**	- Purchase/lease farms within application boundary	Pre-construction	Once off	SHE Coordinator
Operation	Presence and operation of the mine	**H**	**M**	- Effective implementation of all mitigation measures as outlined in this EMP report to reduce its overall impact on the environment and surrounding land-uses.	On-going	On-going	SHE Coordinator
Decommission	Presence and	**H**	**M**	- Should the impact on the pre-mining land use and/or pre-			

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
	rehabilitation of the mine			mining economic activity still prove unacceptable, the mine will compensate the relevant landowners accordingly.	As required	As required	SHE Coordinator
Closure	Final land forms (residue facilities)	H	L	• Monitor and maintain rehabilitated areas	Timeframe to be agreed upon with authorities	As required	SHE Coordinator

TABLE19-17: ACTION PLAN – BLASTING DAMAGE

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
Construction	Earthworks	H	L	• Blasts are designed using recognized formulae and by an expert in the field of blasting so that no damage is caused by blasting vibrations.	Pre-blast	Every blast	Mine Manager
				• All structures and services within 500 m of the blast are marked on a site plan.	Pre-blast	Every blast	Mine manager
				• Structures in the immediate vicinity of the blasts are checked in the presence of the owner and a record of the condition of the structures is taken.	Pre-blast	Every blast	Mine manager
				• Extra control of blast detonation and the projection of fly rock (mat or bags covers) are applied where blasting is undertaken in built up areas.	As required	As required	Mine manager
				• All regulatory authorities with service infrastructure and/or providing services in the area are consulted to determine what safety precautions have to be applied.	On-going	On-going	Mine manager SHE Coordinator
				• The mine must obtain the necessary approvals for blasting in terms of the Minerals Act and Explosives Act. The mine must comply with the conditions of these approvals.	On-going	On-going	Mine manager SHE Coordinator
				• The mine applies the blasting principle that the maximum peak particle velocity is less than 12.5 mm/s at third party structures that are built according to building industry	On-going	On-going	Mine manager SHE Coordinator

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
Operation	Underground mining	M	L	standards and of 3mm/s at third party structures that are not built according to building industry standards, at a distance of 500 m from a blast.	On-going	On-going	Mine manager
				• The mine will purchase properties with structures within 500 m of the workings. In addition airblast at third party structures is kept below the recommended threshold (125dB) and flyrock is contained within 500 m from the blast and for every blast, this zone is cleared of people and animals.	As required	As required	SHE Coordinator
				• The mine will undertake a thorough crack survey of the potentially affected structures. This will include a photographic record of the structures.	On-going	On-going	SHE Coordinator
				• The mine will inform the surrounding community of its blasting programme.	On-going	On-going	Mine manager SHE Coordinator
				• No surface or near surface blasting will take place at night (between 18h00 and 06h00) or on the weekend between Fridays at 18h00 and Mondays at 06h00.	On-going	On-going	Mine manager SHE Coordinator
				• The mine must respond immediately to any blast related complaints. These complaints and the follow up actions will be dated, documented and kept as records for the life of mine.	On-going	On-going	Mine manager SHE Coordinator
				• For each blast, the mine observes the following procedural safety steps: - The flyrock danger zone associated with each blast is delineated and people and animals are cleared from this zone before every blast - An audible warning is given at least three minutes before the blast is fired.	On-going	On-going	SHE Coordinator
				• Monitor blasts (see section 21).	If required	If required	Mine manager SHE Coordinator
Decommision	Demolition	H	L	• If monitoring data confirms that blast-related damage and/or nuisance has occurred the mine will, in consultation with the relevant third party, take steps to investigate and rectify any damage and to limit any further potential for damage and/or nuisance.			

TABLE19-18: ACTION PLAN – TRAFFIC IMPACT

Phase of operation	Activities	Sig		Technical and management options	Action plan		
		UM	M		Timeframe	Frequency	Responsible parties
Construction	Transport systems Site/contract management			• AQPSA upgraded the district road that provides access to the mine from the provincial R577 road to an all-weather gravel road.	Pre-construction	Once-off	SHE Coordinator
Operation	Transport systems Site/contract management			• The mine roads constructed between the plant and the decline and the former open pit haul roads are all-weather gravel roads. These roads are closed for public use.	Pre-construction	Once-off	SHE Coordinator
Decommission	Transport systems Site/contract management			• Trucks carrying concentrates from the mine are not overloaded – there is no spillage from the trucks that could damage roads and be hazardous to other road users.	On-going	On-going	SHE Coordinator
				• The mine records and responds, appropriately and without delay, to any complaints about usage of roads by mine vehicles.	On-going	On-going	SHE Coordinator
				• Any road accident involving or caused by project related traffic is handled in accordance with the emergency response procedure as referenced in Section 20.2	As required	As required	SHE Coordinator

20 PROCEDURES FOR ENVIRONMENTAL EMERGENCIES AND REMEDIATION

20.1 ON-GOING MONITORING AND MANAGEMENT MEASURES

The on-going monitoring as described in Section 21 will be undertaken to provide early warning systems necessary to avoid environmental emergencies.

20.2 PROCEDURES IN CASE OF ENVIRONMENTAL EMERGENCIES

Emergency procedures apply to incidents that are unexpected and that may be sudden, and which lead to serious danger to the public and/or potentially serious pollution of, or detriment to the environment (immediate and delayed). Procedures to be followed in case of environmental emergencies are described in the table below (TABLE 20-1).

20.2.1 GENERAL EMERGENCY PROCEDURE

The general procedure that should be followed in the event of all emergency situations is as follows:

- Applicable operational managers must be notified of an incident upon discovery;
- Area to be cordoned off to prevent unauthorised access and tampering of evidence;
- If residue facilities/dams, stormwater diversions, etc., are partially or totally failing and this cannot be prevented, the emergency siren is to be sounded (nearest one available). After hours the Operations Engineer on shift must be notified;
- Take photographs and samples as necessary to assist in investigation;
- Report the incident to the responsible person of the Safety, Health, Environment and Quality (Environment) department (or equivalent);
- The Environment department must comply with Section 30 of the National Environmental Management Act (Act 107 of 1998) such that:
    - The Environment department must immediately notify the Director-General (DWA, DEA, DMR and Inspectorate of Mines as appropriate), the South African Police Services, the relevant fire prevention service, the Regional Manager of DMR, the provincial head of MDEDET, the head of the local municipality, the head of the regional DWA office and any persons whose health may be affected of:
    - The nature of the incident;
    - Any risks posed to public health, safety and property;
    - The toxicity of the substances or by-products released by the incident; and
    - Any steps taken to avoid or minimise the effects of the incident on public health and the environment.
    - The Environment department must as soon as is practical after the incident:

- Take all reasonable measures to contain and minimise the effects of the incident including its effects on the environment and any risks posed by the incident to the health, safety and property of persons;
- Undertake clean up procedures;
- Remedy the effects of the incident; and
- Assess immediate and long term effects of the incident (environment and public health).
- Within 14 days the Environment department must report to the Director-General DWA and DEA, the provincial head of DEDET, the regional manager of the DMR, the head of the local and district municipality, the head of the regional DWA office such information as is available to enable an initial evaluation of the incident, including:
- The nature of the incident;
- The substances involved and an estimation of the quantity released;
- The possible acute effects of the substances on the persons and the environment (including the data needed to assess these effects);
- Initial measures taken to minimise the impacts;
- Causes of the incident, whether direct or indirect, including equipment, technology, system or management failure; and
- Measures taken to avoid a recurrence of the incident.

20.2.2 IDENTIFICATION OF EMERGENCY SITUATIONS

The site wide emergency situations that have been identified together with specific emergency response procedures are outlined in TABLE 20-1.

20.3 TECHNICAL, MANAGEMENT AND FINANCIAL OPTIONS

Technical, management and financial options that will be put into place to deal with the remediation of impacts in cases of environmental emergencies are described below.

- The applicant will ensure a competent management team with the appropriate skills to manage a mine of this scale and nature is available.
- To prevent the occurrence of emergency situations, the mine will implement as a minimum the mine plan and mitigation measures as included in this EIA and EMP report.
- On an annual basis, the mine will undertake a risk assessment as part of its auditing procedures to identify and check potential risks associated with its operations. The findings of the risk assessment will be reported to mine management to be actioned.
- As part of its annual budget, the mine will allow a contingency for handling of any risks identified and/or emergency situations.

Where required, the mine will seek input from appropriately qualified people.

TABLE 20-1: EMERGENCY RESPONSE PROCEDURES

Item	Emergency Situation	Response in addition to general procedures
1	Spillage of chemicals, engineering substances and waste	Where there is a risk that contamination will contaminate the land (leading to a loss of resource), surface water and/or groundwater, Everest will: • Notify residents/users downstream of the pollution incident. • Identify and provide alternative resources should contamination impact adversely on the existing environment. • Cut off the source if the spill is originating from a pump, pipeline or valve (e.g. Tailings delivery pipeline, refuelling tanker) and the infrastructure 'made safe'. • Contain the spill (e.g. construct temporary earth bund around source such as road tanker). • Pump excess hazardous liquids on the surface to temporary containers (e.g. 210 litre drums, mobile tanker, etc.) for appropriate disposal. • Remove hazardous substances from damaged infrastructure to an appropriate storage area before it is removed/ repaired.
2	Discharge of dirty water to the environment	Apply the principals listed for Item 1 above. In addition: to stop spillage from the dirty water system the mine will: • Redirect excess water to other dirty water facilities where possible; • Pump dirty water to available containment in the clean water system, where there is no capacity in the dirty water system; and • Carry out an emergency discharge of clean water and redirect the spillage to the emptied facility. • Apply for emergency discharge as a last resort.
3	Pollution of surface water (including downstream wetlands)	Personnel discovering the incident must inform the Environment department of the location and contaminant source. Apply the principals listed for Item 1 above. Absorbent booms will be used to absorb surface plumes of hydrocarbon contaminants. Contamination entering the surface water drainage system should be redirected into the dirty water system. The Environment department will collect in-stream water samples downstream of the incident to assess the immediate risk posed by contamination. Where applicable, the Environment department will appoint an appropriate wetland specialist to assess the immediate risk to the downstream wetland and if necessary implement additional measures.
4	Groundwater contamination (including downstream ecosystems)	Use the groundwater monitoring boreholes as scavenger wells to pump out the polluted groundwater for re-use in the process water circuit (hence containing the contamination and preventing further migration). Investigate the source of contamination and implement control/mitigation measures. Where applicable, the Environment department will appoint an appropriate ecological specialist to assess the immediate risk to the downstream ecosystem and if necessary implement additional measures.

Item	Emergency Situation	Response in addition to general procedures
5	Burst water pipes (loss of resource and erosion)	Notify authority responsible for the pipeline (if not mine responsibility). Shut off the water flowing through the damaged area and repair the damage. Apply the principals listed for Item 1 above if spill is from the dirty/process water circuit.
6	Flooding from failure of surface water control infrastructure	Evacuate the area downstream of the failure. Using the emergency response team, rescue/recover and medically treat any injured personnel. Temporarily reinstate/repair stormwater diversions during the storm event (e.g. emergency supply of sandbags). Close the roads affected by localised flooding or where a stormwater surge has destroyed crossings/bridges.
7	Risk of drowning from falling into water dams	Attempt rescue of individuals from land by throwing lifeline/lifesaving ring. Get assistance of emergency response team whilst attempting rescue or to carry out rescue of animals. Ensure medical assistance is available to recovered individual.
8	Veld fire	Evacuate mine employees from areas at risk. Notify downwind residents and industries of the danger. Assist those in imminent danger/less able individuals to evacuate until danger has passed. Provide emergency fire fighting assistance with available trained mine personnel and equipment.
9	Overtopping or failure of the tailings dam	Sound the alarm to evacuate danger area. Pump water from top of dam and follow redirection of water as indicated in Item 2 above. Stop pumping tailings to the TSF. Recover casualties resulting from dam failure using the emergency response team. Make the remaining structure safe. Apply the principles of Item 1 above.
10	Falling into hazardous excavations	Personnel discovering the fallen individual or animal must mobilise the emergency response team to the location of the incident and provide a general appraisal of the situation (e.g. human or animal, conscious or unconscious, etc.). The injured party should be recovered by trained professionals such as the mine emergency response team. A doctor (or appropriate medical practitioner)/ambulance should be present at the scene to provide first aid and transport individual to hospital. A nearby vet should be consulted in the case of animal injury

Item	Emergency Situation	Response in addition to general procedures
11	Road traffic accidents (on site)	The individual discovering the accident (be it bystander or able casualty) must raise the alarm giving the location of the incident. Able personnel at the scene should shut down vehicles where it is safe to do so. Access to the area should be restricted and access roads cleared for the emergency response team. Vehicles must be made safe first by trained professionals (e.g. crushed or overturned vehicles). Casualties will be moved to safety by trained professionals and provided with medical assistance. Medical centres in the vicinity with appropriate medical capabilities will be notified if multiple seriously injured casualties are expected. A nearby vet should be consulted in the case of animal injury
12	Development of informal settlements	The mine will inform the local authorities (municipality and police) that people are illegally occupying the land and ensure that action is taken within 24hrs.
13	Injury from fly rock	The person discovering the incident will contact the mine emergency response personnel to recover the injured person or animal and provide medical assistance. Whilst awaiting arrival of the emergency response personnel, first aid should be administered to the injured person by a qualified first aider if it is safe to do so.
14	Uncovering of graves and sites	Personnel discovering the grave or site must inform the Environment department immediately. Prior to damaging or destroying any of the identified graves, permission for the exhumation and relocation of graves must be obtained from the relevant descendants (if known), the National Department of Health, the Provincial Department of Health, the Premier of the Province and the local Police. The exhumation process must comply with the requirements of the relevant Ordinance on Exhumations, and the Human Tissues Act, 65 of 1983.
15	Uncovering of fossils	Personnel discovering the fossil or potential site must inform the Environment department immediately. Should any fossils be uncovered during the development of the site, a palaeontologist or paleoanthropologist will be consulted to identify the possibility for research.

21 PLANNED MONITORING AND EMP PERFORMANCE ASSESSMENT

21.1 PLANNED MONITORING OF ENVIRONMENTAL ASPECTS

Environmental aspects requiring monitoring are listed below.

- Water resources – see Section 21.1.1 for details
- Air – see Section 21.1.2 for details
- Noise – see Section 21.1.3 for details
- Biodiversity – see Section 21.1.4 for details
- Biomonitoring – see Section 21.1.5 for details
- Blasting – see Section 21.1.6 for details
- Transport – see Section 21.1.7 for details
- Tailings dam, waste dumps and other water dams – see Section 21.1.1 for details

21.1.1 WATER RESOURCES

The mine has an existing groundwater and surface water monitoring programme in place. This monitoring programme was compiled with input from appropriately qualified specialists and updated to include the conditions of the mine's water use license. TABLE 21-1 and TABLE 21-2 below set out the monitoring points, programme and parameters to be monitored as part of the mine's groundwater and surface water programme (see Figure 21-1 for the position of monitoring points). Where required, third-party boreholes will be included in the mine's monitoring programme. The water quality parameters may be modified on the basis of input from an appropriate specialist and DWA. It is also possible that the programme will be modified as part of the water license amendment process. The frequency of monitoring may be amended depending on the results of the monitoring programme and with approval from DWA. Should any contamination be detected at the compliance monitoring points, the emergency response procedures detailed in Section 20 will be followed.

Surface water monitoring points will also include points important to the operation (on-site). These are:

- return water dam (existing and proposed);
- plant water; and
- sewage treatment plant (out).

Many of the existing boreholes in the areas where mining has occurred were destroyed through the mining activities and therefore limited monitoring data for groundwater qualities and depth is available. New boreholes have been drilled and were monitored during the latter half of 2007.

FIGURE 21-1: PROPOSED MONITORING NETWORK

TABLE 21-1: GROUND AND SURFACE WATER MONITORING POINTS

Note: Existing monitoring in normal font. Additional monitoring for Project Fairway written in bold.

Water type	BH / Sample	Location/Comment	Longitude	Latitude	Quality	Water level
Ground Water	ESM2/ESM10	Down-gradient of TSF	-85396	-2783492	A2 (monthly) + A3 (6 monthly)	Quarterly
	ESM3	Down-gradient of TSF	-85234	-2783953		Quarterly
	ESM5	Down-gradient of TSF return water dam	-85107	-2782752		Quarterly
	ESM6	Up-gradient of plant and TSF	-84265	-2784316		Quarterly
	ESM7	Down-gradient of tailings dam, next to the major N-S striking dyke	-85183	-2783153		Quarterly
	ESM8		-84114	-2783792		Quarterly
	ESM11	Monitoring of extent of cone of dewatering	-85922	-2781803	-	Quarterly
	ED20	Monitoring of extent of cone of dewatering	-87231	-2783483	-	Quarterly
	ED35	Monitoring of extent of cone of dewatering	-88757	-2783095	-	Quarterly
	ED49	North of eastern mining block	-86294	-2782213	A2 (monthly) + A3 (6 monthly)	Monthly
	ED48	South of eastern block	-86826	-2783933		Monthly
	ED45	South west of eastern block	-87374	-2784254		Monthly
	ED22	South west of eastern block and south east of western block	-87491	-2784010		Monthly
	ED38	Downstream (west)	-88191	-2782645		Monthly
	ED28	On or near to the western dyke system before Groot Dwars River	-88999	-2783673		Monthly
	ED30		-88961	-2783975		Monthly
	ED31		-89004	-2783383		Monthly
	ED33		-88731	-2783868		Monthly
	ED34		-88859	-2783246		Monthly
	ED35		-88755	-2783067		Monthly
	ED40	Downstream (south west)	-88058	-2782894	-	Monthly
	BH5581	In eastern mining block	-87653	-2783365	-	Monthly
	BH5611	In western mining block	-88351	-2783785	-	Monthly

Water type	BH / Sample	Location/Comment	Longitude	Latitude	Quality	Water level
	BH5612	In western mining block	-88028	-2783032	-	Monthly
	ED23	In western mining block	-87870	-2783284	-	Monthly
	ED40	Downstream (south west)	-88071	-2782887	-	Monthly
	Abstraction boreholes	As required	-	-	A2 (monthly) + A3 (6 monthly)	Volume daily
	ED27	**-**	-88998	-2783531	**-**	**Monthly**
	ED29	**-**	-88972	-2783833	**-**	**Monthly**
	TSFMon01	Newly drilled monitoring borehole at proposed TSF site	-84883	-2781642	**A2 (monthly) + A3 (6 monthly)**	**Monthly**
	TSFMon02	Newly drilled monitoring borehole at proposed TSF site	-84564	-2782043		**Monthly**
	TSFMon03	Newly drilled monitoring borehole at proposed TSF site	-85457	-2781356		**Monthly**
	TSFMon04	Newly drilled monitoring borehole at proposed TSF site	-85809	-2781449		**Monthly**
Surface Water	E1	In the East Stream, below the larger TKO dam (below the confluence of East and West Streams)	-85007	-2766349	A5 monthly	n/a
	E2	in the East Stream entering the TKO dam	-84615	-2781149	A5 monthly	
	E3	In the East Stream, upstream of the point where the access road to the mine crosses the stream	-83430	-2783049	A5 monthly	
	W1	In the West Stream entering the TKO dam	-84921	-2780258	A5 monthly	
	W2	In West Stream, upstream of the point where the access road to the mine crosses the stream	-85310	-2783861	A5 monthly	
	GD1	Downstream of mine	-88419	-2777867	A5 monthly	
	GD2	Downstream of mine before confluence with East Stream	-88480	-2778599	A5 monthly	
	GD3	Downstream of mine	-89005	-2782408	A5 monthly	
	GD4	Upstream of mine	-89042	-2785284	A5 monthly	
	GD9	Upstream of all proposed mining works.	-86240	-2786404	A5 monthly	
Mine infrastructure points	GD4	Tailings dam return water (seepage)	-89042	-2785284	A2 (monthly) + A3 (6 monthly)	Volume measured daily
	GD5	Sewage effluent water	-89061	-2784767	A4 (monthly)	

Water type	BH / Sample	Location/Comment	Longitude	Latitude	Quality	Water level
	3	Underground water disposed at return water dam			A1 (monthly	
	4	Underground water abstracted			-	

Note:

1) In addition to the above borehole monitoring, mine abstraction volumes will be monitored monthly. The quality of the abstracted water will be monitored quarterly.
2) Mine dewatering water and plant process water will also be monitored.
3) Water monitoring points will be surveyed and indicated on the detailed map of mine infrastructure.

In terms of the above monitoring requirements, parameter evaluation differs depending on the monitoring source. Five different sets of analysis are included in the issued license and can be found in TABLE 21-2. The water qualities will be compared to the DWAF Water Quality Reserve Standards, Steelpoort River (B41H, B41J), and also the SAWQG's for Domestic Use (DWAF 1996) as a secondary guideline. It is recommended that the SAWQG for Domestic Use be replaced by the DWAF Guidelines Domestic Water Supply (1999) or SANS 241:2006 standards for Drinking water specifications. It is also recommended that due to the pristine nature of the Groot Dwars River, that at least the samples from that river are compared to the SAWQG for Aquatic Ecosystems.

TABLE 21-2: MONITORING PARAMETERS FOR ANALYSIS AND REPORTING

A1	A2	A3	A4	A5
EC	pH	Cr_6	Faecal Coliforms	pH
TDS	EC	Cr	COD	EC
TSS	TDS	Cu	pH	TSS
NO_3	TSS	Cd	Ammonia (ionised and un-ionised) as N	Alkalinity as $CaCO_3$
SO_4	Cl	Fe	Nitrite/Nitrate as N	Ca
Cl	F	Mn	Chlorine as free Chlorine	Cl
Ca	NO_3	V	Suspended Solids	Mg
Mg	SO_4		EC	K
Na	Alkalinity as $CaCO_3$		Ortho-Phosphate as Phosphorus	Na
Cr_6	Hardness as $CaCO_3$		Flouride	NO_3
Fe	Ca			SO_4
Mn	Mg			COD
	Na			Fe
	K			Mn
	Fe			F
	NH_4			V
	Mn			Cr
	Al			

In terms of groundwater levels, the results will be compared to simulated water levels and the extent of the cone of depression will be analysed accordingly. Time series data will be applied for future model calibration purposes.

The flow of the Groot Dwars River will be monitored through a visual inspection and measuring stick methods. An underground mining management plan will be developed where specific management procedures in terms of dykes and river systems are stipulated.

The monitoring data will be documented, interpreted and reports on trends in the data will be submitted to DWA on an annual basis. The annual monitoring reports will also contain:

- biomonitoring results;
- results of monitoring sediments in the West Stream and Groot Dwars River; and
- updates to and the status of the mine water balance.

If monitoring indicates a mine-related decrease in groundwater supply to third parties or groundwater quality at third party boreholes, appropriate measures will be taken to prevent the decrease from occurring or rectify the contamination situation, to provide the affected third parties with an alternative water supply, and/or to possibly purchase affected farms.

Process water

Process water quality from dirty water dams is monitored on a quarterly basis. The parameters to be monitored are outlined in TABLE 21-2.

Rainfall related discharges are monitored as required according to the parameters in TABLE 21-2. If the quality of the monitored discharge is above acceptable levels, additional measures will be identified and implemented to prevent the future potential for surface water related pollution.

Water balance

The water balance will be updated on a monthly basis from recorded flow measurements and production figures. This is done by an appropriately qualified person. The water balance is used to check on an on-going basis that the capacity of the dirty water holding facilities is adequate.

21.1.2 AIR QUALITY

Currently monitoring of dust fallout is undertaken at the Everest Mine, consisting of three directional buckets. These buckets are currently placed as follows:

- South east of the tailings dam between the tailings dam and the processing plant (central unit);
- Adjacent to the run-of-mine stockpile (quarry unit); and
- Downwind of the Valley infrastructure.

As directional buckets are not the standard that the SANS limits are based on, it is recommended that the directional dust fallout buckets be replaced or operated in conjunction with single dust fallout buckets (according to the ASTM method). In addition it is recommended that 2 additional single dust buckets be put up should Project Fairway be approved:

- Bucket 1 – placed along the haul road from Buttonshope South box cut to Waterfall box cut to measure the impacts from the haul road. This bucket can be moved to materials handling points (i.e. at the mini conveyor) or sensitive receptors (i.e. Groenewald) once the first four years of Project

Fairway are completed in order to understand the impacts from these operations or at the closest sensitive receptor to the Project Fairway activities;

- Bucket 2 – placed to the northeast of the proposed tailings facility in line with the local Kiwi community further northeast, therefore useful in measuring the dustfall due to the windblown dust from the tailings that may impact on this area.

The monitoring programme will be implemented and managed in consultation with an appropriately qualified air quality specialist. The monitoring data will be analysed and interpreted and an annual air quality report will be produced. As with the current operations, the buckets will be monitored on a quarterly basis. The results will be compared to the DEAT dust fallout categories.

Source based performance to be implemented include:

- Dustfall immediately downwind of the tailings facility will be < 1200 mg/m²/day and dustfall at sensitive receptors will be <600 mg/m²/day.
- Dustfall at on-site roads and in the immediate vicinity will be less than 1200 mg/m^2/day and dustfall at sensitive receptors will be <600 mg/m²/day.
- Absence of visible dust plume at all tipping points and outside the crushers during crushing operations and dustfall in the immediate vicinity of various sources will be<1200 mg/m^2/day and dustfall at sensitive receptors will be <600 mg/m²/day.

It is recommended that a PM_{10} sampler be installed at the nearest sensitive receptor to the mine. The PM_{10} sampler can be either continuous or a manual operated device recording PM_{10} concentrations on a daily basis. Manual sampling can be done on a basis of 1 day out of every 6 days to ensure representative sampling of ambient PM_{10} concentrations in the region. In addition to the ambient PM_{10} concentrations, these samples (filter based) can be analyzed for metals and other compounds. A monitoring protocol will need to be established.

21.1.3 NOISE

An annual noise survey will be undertaken at the same locations. The purpose of these surveys is to verify the conceptual modeling undertaken for the EIA and to determine if implemented noise management measures are effective. The measurement points are shown on Figure 21-1. The A-weighted equivalent continuous noise level in a sequence of 10-minute intervals covering a period of preferably 24 hours will be undertaken or at least the night-time period from 22:00 to 06:00. Monitoring will be done by an appropriately qualified environmental noise specialist. The noise measurement points may be modified on the basis of input from an appropriate specialist. A report will be produced to document the measurement points, the methodology used, the measured results and recommendations, if required, to further minimise the mine's impact. Equipment, calibration and measurement procedures must comply with the requirements laid down in SANS 10103.

The source-based noise performance of less than 70dBA at the property boundary of the mine will be implemented as specified for industrial districts in SANS 10103. Where the noise level at any external site is presently at or exceeds the 70dBA maximum, the existing level shall not be increased by more than indicated as acceptable in SANS 10103.

21.1.4 BIODIVERSITY MONITORING PROGRAMME

Flora monitoring

Everest will monitor the following habitats on a quarterly basis to see that they are not being disturbed by mining-related activities and there is no encroachment of invasive plants into these habitats:

- the Bushveld in the Groot Dwars River valley to the west of the mine site;
- the Ridge Grassland on the ridge above the ore body;
- the riparian wetland along West Stream between the tailings dam site and mining area;
- the riparian wetland along East Stream where the mine access road crosses the stream; and
- the Protea Woodland to the south and south-east of the plant and tailings dam area.

Selecting suitable indicator groups

Detailed baseline studies of the indicator groups in the main vegetation types that will suffer direct impacts (*Acacia-Euclea* and *Acacia-Cussonia* Open Rocky Woodlands). For each vegetation type an area within the direct impact zone and a control area outside of this zone (preferably outside of the 500m buffer zone) should be selected and surveyed.

Monitoring program

Monitoring for the Valley includes:

- Regular monitoring (preferably annually), by repeat surveys of the control sites at the same time each year for life of the mine, to provide a measure of naturally occurring inter-annual variation so that this can be distinguished from mining-related impacts and rehabilitation progress. Frequency of monitoring is dependent on the expected duration of mining operations; for an operational life shorter than 5 years, annual monitoring would be recommended, while for longer operational periods (5-10 or 10-20 years) less frequent (every second or third year) might be adequate to provide an adequate baseline and indication of natural inter-annual variation.
- Continued monitoring of both the control sites and the rehabilitated areas after mining operations have ceased until mine closure; repeat surveys should be carried out annually for at least the first three years post-rehabilitation, after which the frequency may be reduced, initially to every second year and then every 3-5 years until rehabilitation targets have been reached.

Rehabilitation targets

Rehabilitation targets include:

- Ant and leafhopper biodiversity levels (total species number estimates) should return to at least 90% of baseline average, with diversity/evenness indices at least 90% of mean baseline values and at least 70% similarity of community species composition to baseline measure. Rank abundance plot slopes, which are expected to become significantly steeper in the early stages of rehabilitation, should have regained a similar pattern to that obtained from the baseline studies if rehabilitation is to be considered complete.
- All scorpion species recorded from the site (6 to date) should be re-established at densities of at least 80% of average baseline levels.
- *Pycna sylvia* populations should be re-established at no less than 80% of baseline average levels.

Modification of these targets may be necessary if high inter-annual variation in control site data is encountered; this should be done in consultation with MTPA and the specialist responsible for implementing the monitoring program.

Alien invasive species programme

During operation, decommissioning and closure Everest will implement an alien/invasive /weed management programme to control the spread of these plants onto and form disturbed areas. This will be achieved by active eradication and the establishment of natural species and through on-going monitoring and assessment. The use of herbicides will be limited and will only be used under strict controls if alternative less intrusive eradication methods are not successful.

Continued monitoring will be undertaken to ensure that the alien invasive species have been eradicated and are controlled for both controlled sites as well as rehabilitated areas. Repeat surveys should be carried out annually for at least the first three years post-rehabilitation.

21.1.5 BIOMONITORING

The mine's biomonitoring programme includes monitoring points upstream and downstream of the mine's operations in the East stream, West Stream and Groot Dwars River. The current biomonitoring points are included in TABLE 21-3 below. These points should correlate with the existing surface water monitoring points. If this is not possible, the surface water monitoring points should be moved to also cater for the biomonitoring requirements. An appropriately qualified specialist will undertake biomonitoring bi-annually – in the wet season and in the dry season, every year. This will include studies of habitat integrity. The ecological standard recommended for West Stream is Ecological Class B. Coupled with the biomonitoring, annual monitoring of sediments in the streambed of the West Stream, East Stream and Groot Dwars River will be undertaken by a qualified geomorphologist. Prior to construction, a baseline habitat integrity study including photographs of the river and baseline study of sediments was to be undertaken.

TABLE 21-3: LOCATION OF THE BIOMONITORING POINTS

Site	Latitude	Longitude	Description
E2	25° 07” 31.3 S	30° 09” 27.7 E	Located on Kafferskraalspruit downstream of a large farm dam
GD B1	25° 08” 15.3 S	30° 05” 29.6 E	Located downstream of all the Everest Platinum operations in the Groot Dwars river catchment in an extremely remote area
RC1	25° 09” 33.3 S	30° 10” 22.3 E	Located upstream of the mine haul road crossing over the western tributary of the East Stream
RC2	25° 09” 30.0 S	30° 10” 23.3 E	Located downstream of the mine haul road crossing over the western tributary of the East Stream

21.1.6 BLASTING

Prior to the construction phase, Everest will undertake a pre-blast baseline survey.

Monitoring of each surface blast will take place for the duration of blasting activities. Points for off-site vibration and airblast monitoring will be identified in consultation with surrounding landowners and a blast monitoring specialist. The monitoring results will be documented and maintained for record-keeping and auditing purposes.

21.1.7 TRANSPORT

Everest will monitor and evaluate its use of the relevant road intersections and road sections as part of its risk and safety management practices. This will be done annually during construction and decommissioning and every 5 years during operation. The scope and undertaking of the assessment will be done in consultation with an appropriately qualified traffic specialist. The monitoring results will be documented and maintained for record-keeping and auditing purposes.

21.1.1 TAILINGS DAM, WASTE DUMPS AND OTHER WATER DAMS

In addition to the abovementioned environmental monitoring programmes, the following issues will, as a minimum and where applicable, be monitored by the dam operators on a monthly basis and a professional engineer on a quarterly basis:

- the location and size of the supernatant pool, elevation and position of the phreatic surface, slope stability, adequacy of freeboard, presence of seepage, and functioning of drains, condition of pipelines and valves, incidence of layering
- pumping flow rates between, from and into the various dams and TSF

- vegetation cover and success rate of vegetation establishment in rehabilitated areas such as side slopes
- groundwater pollution aspects as detailed above
- dust generation
- erosion damage and general condition of facilities including catchment paddocks, drainage systems, sumps, silt traps.

In addition to the above, monitoring of all water dams will include:

- daily monitoring of water levels and operation of pumps and pump motor control systems.
- monthly monitoring to include:
    - Dipping of leak detectors to check integrity of liners (where relevant)
    - Physical inspection for damage to liner
    - Presence of seepage, erosion damage, wall movement, vegetation on outer slope, condition of riprap, condition of spillways
    - Condition of fences, access gates, signage, safety ropes, life rings
    - Capacity of silt trap, cleaning and removal of silt (when required).

The findings will be documented and maintained for record-keeping and auditing purposes.

21.2 AUDITING AND PERFORMANCE ASSESSMENTS

The environmental manager will conduct internal management audits against the commitments in the EMP. These audits will be conducted on an on-going basis until final closure. The audit findings will be documented for both record keeping purposes and for informing continual improvement. In addition, and in accordance with the Mineral and Petroleum Resources Development Regulations (Government Notice No, 527 of 23 April 2004), an independent professional will conduct an EMP performance assessment every 2 years. The site's compliance with the provisions of the EMP and the adequacy EMP report relative to the on-site activities will be assessed in the performance assessment.

21.3 FREQUENCY FOR REPORTING

As a minimum, the following documents will be submitted to the relevant authorities from the start of construction until mine closure:

- EMP performance assessment, submitted every two years to DMR
- Updated closure and rehabilitation cost estimate, submitted annually to the DMR
- water monitoring reports, submitted annually to DWA – these reports will not only present monitoring data but will also provide interpretations of trends in the data and reporting on compliance with water quality guidelines
- air monitoring reports, submitted annually to the DMR and DEDET
- traffic, submitted every two years to relevant roads authorities

- detailed plan for decommissioning/closure, submitted to DMR at least five years prior to decommissioning.

22 FINANCIAL PROVISION

The information in this section was sourced from the closure cost calculation study completed by SLR (Appendix R).

22.1 PLAN SHOWING LOCATION AND AERIAL EXTENT OF PROPOSED OPERATION

A plan showing the location and aerial extent of the proposed operation is provided as Figure 2-2 (Section 2.4). A plan showing the annual progression of the mining operation relative to the overall plan is included as Figure 2-1 (Section 2.4).

22.2 ANNUAL FORECASTED FINANCIAL PROVISION

22.2.1 MATCHING AND ACCRUAL

The annual forecasted financial provision for the first 10 years of operation together with the progressive total in Year 10 is provided in the table below (TABLE 22-1) and the principles of matching and accrual applied.

TABLE 22-1: FINANCIAL PROVISION – UP TO YEAR 10

Date	Year	Financial Liability (excl. VAT)	Percentage platinum reserves extracted and processed	Financial Liability based on Matching and Accrual Principle (excl. VAT)
Late 2012	1	R 24,663,474	0 %	R 0
Late 2013	2	R 25,480,507	0 %	R 0
Late 2014	3	R 26,261,706	0.47 %	R 124,238
Late 2015	4	R 27,128,907	2.73 %	R 741,499
Late 2016	5	R 36,040,625	7.21 %	R 2,599,064
Late 2017	6	R 36,843,324	13.60 %	R 5,011,044
Late 2018	7	R 37,660,358	21.59 %	R 8,130,037
Late 2019	8	R 38,463,057	30.56 %	R 11,753,657
Late 2020	9	R 39,280,090	40.32 %	R 15,836,579
Late 2021	10	R 40,111,457	50.26 %	R 20,161,711
Late 2027	15 (LOM)	R40,261,963	100 %	R40,261,963

22.3 CONFIRMATION OF AMOUNT TO BE PROVIDED

The amount of financial provision that will be provided should the right be granted is R 124,238 (covering the first year of operation).

22.4 METHOD OF PROVIDING FINANCIAL PROVISION

The financial provision will be provided in the form of a financial guarantee.

23 ENVIRONMENTAL AWARENESS PLAN

This section includes an environmental awareness plan for the mine. The plan describes how employees will be informed of environmental risks which may result from their work, the manner in which the risk must be dealt with in order to avoid pollution or degradation of the environment and the training required for general environmental awareness and the dealing of emergency situations and remediation measures for such emergencies.

All contractors that conduct work on behalf of Everest are bound by the content of the EMP and a contractual condition to this effect will be included in all such contracts entered into by the mine. If contractors are used, the responsibility for ensuring compliance with the EMP will remain with Everest.

The purpose of the environmental awareness plan is to ensure that all personnel (contractors, miners, machine operators, management, etc.) understand the general environmental requirements of the site. In addition, greater environmental awareness must be communicated to personnel involved in specific activities which can have a significant impact on the environment and ensure that they are competent to carry out their tasks on the basis of appropriate education, training and/or experience. The environmental awareness plan should enable Everest to achieve the objectives of the environmental policy.

23.1 ENVIRONMENTAL POLICY

At present Everest have developed a safety policy and are in the process of developing an environmental policy. Consideration will be given to combining these policies together to form an overall site wide safety, health and environmental (SHE) policy. Everest will display the environmental policy prominently at the mine entrance and key notice boards at the mine's business units. Everest's environmental policy is described below:

1. To minimise the impact of Everest's mining operations on the environment wherever possible by carrying out activities in an environmentally responsible manner;
2. Develop and maintain a positive environmental culture by demonstrating to employees good environmental management is everyone's responsibility, for example:
   - Holding all employees accountable for environmental performance by including it as a factor in job performance assessments;
   - Encourage communication of new ideas/suggestions by offering awards for positive contributions.
3. To comply with all applicable environmental legislation and the commitments contained in Everest's approved EIA/EMP report and amendments as a minimum requirement;
4. To ensure that all Everest's employees, contractors and sub-contractors:
   - Are aware of the impact of their activities on the environment;

- Are informed about the measures required to prevent, mitigate and manage environmental impacts; and
- Apply these principles whilst carrying out their work.

5. Investigate and report all environmental incidents and near misses to reduce the potential for recurrence.
6. To establish and maintain a good relationship with surrounding communities, industries and other interested and affected parties, with regard to Everest's activities;
7. To develop a localised environmental strategy to preserve and promote awareness of the pristine natural environment encountered in the area; and
8. To provide relevant and constructive consultation/public participation on the management of the potential environmental impacts posed by the mine in the future.

23.2 STEPS TO ACHIEVE THE ENVIRONMENTAL POLICY OBJECTIVES

Everest's environmental policy will be realised by setting specific, measurable and achievable objectives. It is proposed that new objectives are set throughout the life of mine, but initial objectives are as follows:

- Management of environmental responsibilities:
  - Everest will establish and appoint an Environmental Site Manager at senior mine management level, who will be provided with all necessary resources to carry out the management of all environmental aspects of the site as a primary function, for example:
    - Compliance with environmental legislation and EMP commitments;
    - Implementing and maintaining an environmental management system;
    - Developing environmental emergency response procedures and coordinating personnel during incidents;
    - Manage routine environmental monitoring and data interpretation;
    - Environmental trouble shooting and implementation of remediation strategies; and
    - Closure planning.
- Communication of environmental issues and information:
  - Meetings, consultations and progress reviews will be carried out, and specifically Everest will:
    - Set the discussion of environmental issues and feedback on environmental projects as an agenda item at all company board meetings;
    - Provide progress reports on the achievement of policy objectives and level of compliance with the approved EMP to the Department of Minerals Resources;
    - Ensure environmental issues are raised at monthly mine management executive committee meetings and all relevant mine wide meetings at all levels; and
    - Ensure environmental issues are discussed at all general liaison meetings with local communities and other interested and affected parties.

- Environmental awareness training:
  - Everest will provide environmental awareness training to individuals at a level of detail specific to the requirements of their job, but will generally comprise:
    - Basic awareness training at induction for all individuals to be on site generally less than five days.
    - General environmental awareness training will be given at advanced induction to all employees and contractors who will be on site longer than five days.
    - Specific environmental awareness training will be provided to personnel whose work activities can have a significant impact on the environment (e.g. workshops, waste handling and disposal, sanitation, etc.).
- Review and update the environmental topics already identified in the EMP which currently includes the following purpose
  - Geology (sterilisation of mineral resource);
  - Topography (hazardous excavations and surface subsidence);
  - Soil management (loss of soil resource);
  - Land capability (loss of land with agricultural and conservation/ecotourism potential);
  - Surface water management (alteration of surface drainage and pollution of surface water);
  - Groundwater management (reduction in groundwater levels/availability and groundwater contamination);
  - Management of air quality (dust generation);
  - Noise (specifically management of disturbing noise);
  - Visual aspects (reduction of negative visual impacts);
  - Surrounding land use (traffic management, blast management, land use loss);
  - Heritage resources (management of sites);
  - Socio-economic impacts (management of positive and negative impacts);
- All mine projects will be designed to minimise impact on the environment and to accomplish closure/rehabilitation objectives.
- Everest will maintain records of all environmental training, monitoring, incidents, corrective actions and reports.
- Contractors and employees will be contractually bound to participate in the achievement of environmental policy objectives and compliance with the EIA/EMP report.

23.3 TRAINING OBJECTIVES OF THE ENVIRONMENTAL AWARENESS PLAN

The environmental awareness plan ensures that training needs are identified and that appropriate training is provided. The environmental awareness plan should communicate:

- The importance of conformance with the environmental policy, procedures and other requirements of good environmental management

- The significant environmental impacts and risks of individuals work activities and explain the environmental benefits of improved performance
- Individuals roles and responsibilities in achieving the aims and objectives of the environmental policy
- The potential consequences of not complying with environmental procedures.

23.3.1 General Contents of the Environmental Awareness Plan

To achieve the objectives of the environmental awareness plan the general contents of the training plans are as follows:

- Module 1 – Basic training plan applicable to all personnel entering the site:
    - Short (15min) presentation to indicate the site layout and activities at specific business units together with their environmental aspects and potential impacts.
    - Individuals to sign off with site security on completion in order to gain access to the site.
- Module 2 – General training plan applicable to all personnel at the site for longer than 5 days:
    - General understanding of the environmental setting of the mine (e.g. pristine ecological environment, local communities and proximity to natural resources such as rivers);
    - Understanding the environmental impact of individuals activities on site (e.g. excessive production of waste, poor housekeeping, energy consumption, water use, noise, etc.);
    - Indicate potential site specific environmental aspects and their impacts;
    - Everest's environmental management strategy;
    - Identifying poor environmental management and stopping work which presents significant risks;
    - Reporting incidents;
    - Examples of poor environmental management and environmental incidents; and
    - Procedures for emergency response and cleaning up minor leaks and spills.
- Module 3 – Specific training plan:
    - Environmental setting of the workplace (e.g. proximity of watercourses, vulnerability of groundwater, sensitivity of surrounding environment, etc.);
    - Specific environmental aspects such as:
        - Spillage of hydrocarbons at workshops;
        - Spillage of explosive liquids in the open pits (former and potential future);
        - Poor waste management such as mixing hazardous and general wastes, inappropriate storage and stockpiling large amounts of waste;
        - Poor housekeeping practices;
        - Poor working practices (e.g. not carrying out oil changes in designated bunded areas);
        - Excessive noise generation and unnecessary use of hooters; and
        - Protection of heritage resources (including palaeontological resources).
    - Impact of environmental aspects, for example:
        - Hydrocarbon contamination resulting in loss of resource (soil, water) to downstream users;

    - Groundwater contamination also resulting in loss of resource due to potential adverse aesthetic, taste and health effects; and
    - Dust impacts on local communities (nuisance and health implications).
  - Everest's duty of care (specifically with respect to waste management); and
  - Purpose and function of Everest's environmental management system.

Individuals required to complete Module 3 (Specific training module) will need to complete Modules 1 and 2 first. On completion of the Module 3, individuals will be subject to a short test (written or verbal) to ensure the level of competence has been achieved. Individuals who fail the test will be allowed to re-sit the test after further training by the training department. In addition to the test, individuals involved in activities that pose a significant potential risk the environment will be assessed formally on their performance in the workplace. The actual contents of the training modules will be developed based on a training needs analysis.

Key personnel will be required to undergo formal, external environmental management training (e.g. how to operate the environmental management system, waste management and legal compliance).

In addition to the above Everest will:

- Conduct refresher training/presentations on environmental issues for mine employees (permanent and contractors) at regular intervals.
- Promote environmental awareness using relevant environmental topic posters displayed at strategic locations on the mine. These topics will be changed monthly, and will be reviewed annually by the Environmental Manager to ensure relevance.
- Participate and organise events which promote environmental awareness, some of which will be tied to national initiatives e.g. National Arbour Week, World Environment Day and National Water Week.

24 TECHNICAL SUPPORTING INFORMATION

The following specialist studies were commissioned specifically for this EIA and EMP report:

- Soils and Land Capability Study (Appendix F);
- Biodiversity Study (Appendix G);
- Hydrological Study (Appendix I);
- Water Quality Hydrocensus (Appendix I);
- Geohydrological Study (Appendix J);
- Air Quality Study (Appendix K);
- Noise Study (Appendix L);
- Visual Study (Appendix M);
- Land Use Study (Appendix N);
- Heritage and Cultural Study (Appendix O);
- Socio-Economic Baseline Report (Appendix P);
- Economic Study (Appendix Q);
- Financial Provision Calculation (Appendix R);
- Climatic Water Balance (Appendix S);
- Stormwater Management Plan (Appendix T); And
- Tailings Storage Facility Feasibility Study (Appendix U).

25 CAPACITY TO MANAGE AND REHABILITATE THE ENVIRONMENT

25.1 AMOUNT REQUIRED TO MANAGE AND REHABILITATE THE ENVIRONMENT

Estimated costs for implementing the technical and management options associated with the proposed Project Fairway as identified in Section 19 are included in the table below (Table 51). The costs are either once off costs or an annual cost and have been determined at 2011 rates. Please note that the costs included in the table are based on conceptual estimates only. These costs are in addition to those are spent by the mine for its current operations.

TABLE 25-1: ESTIMATED COSTS FOR IMPLEMENTING TECHNICAL AND MANAGEMENT OPTIONS ASSOCIATED WITH THE PROPOSED PROJECT FAIRWAY

Component	Detail	Estimated costs	
		Once off	Annual
Detailed design	Includes costs associated with the detailed design of facilities	Up to R80 million	-
Site services	Includes maintenance of facilities and services of general management activities at the project site	-	±R1 million
Site management	Includes activities that will be conducted by the mine personnel as part of their daily jobs	-	±R1.5 million
Construction cost	Includes facilities and activities that will be established and conducted during the development of the site, including support facilities, diversions, culverts, water storage facilities	± R57 million	-
Implement an EMS system	Includes implementing system, personnel training and on-going implementation	R200,000	Incl. above
Environmental aspects	The costs associated with the mitigation of environmental impacts are mainly catered for in the detailed design, construction, site services and site management costs outlined above	Incl. above	Incl. above
Rehabilitation costs	Rehabilitation of the site have been catered for as part of the closure cost calculation	Incl. below	Incl. below
Specialist input	It is expected that specialist input will be needed for some of the mitigation measures, for each of the monitoring programmes, for external auditing and updating of the closure cost calculation. It is assumed that existing specialist work at the mine will be extended to service the Project Fairway project site.	R750,000	R500,000
Compensation	If, despite the implementation of remedial steps, the land use impact cannot be addressed, Everest will compensate the relevant landowners accordingly.	To be determined	To be determined
	Total	±R137.1 million	±R3 million
Closure cost for life of mine	Based on closure cost calculation compiled by Metago SLR	± R40,261,963 (late 2027 based on current rates)	-

25.2 AMOUNT PROVIDED FOR

The amount as outlined in Table 51 above will be provided for in the mine budget.

26 UNDERTAKING SIGNED BY APPLICANT

COMMITMENT/UNDERTAKING BY APPLICANT

I, Abraham Johannes van Ghent

the undersigned and duly authorised thereto by

....

undertake to adhere to the requirements and to the conditions set out in the approved EMP with the exception of the exemption(s) and amendment(s) agreed to be relevant by the Regional Manager: ____________________ (include relevant province).

Signed at: ....

On: ....

Signature: ....

Designation: General Manager

REGIONAL MANAGER: ____________________ REGION

In terms of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) this document of .... is approved subject to the conditions as set out in the letter of approval.

Signed at: ....

On: ....

Signature: ....

Designation: ....

REGIONAL MANAGER: ________________

27 ENVIRONMENTAL IMPACT STATEMENT & CONCLUSION

This document presents the project plan as defined by AQPSA, presents findings of specialist studies, identifies and assesses potential impacts on the receiving environment in both the unmitigated and mitigated scenarios, including cumulative impacts, and identifies measures together with monitoring programmes to monitor and mitigate potential impacts.

A summary of the potential impacts (as per Section 7 of the EIA and EMP report), associated with the proposed project, in the unmitigated and mitigated scenarios for all project phases is included in the table below. The assessment of the proposed project presents the potential for significant impacts to occur on the bio-physical, cultural and socio-economic environments both on the site and in the surrounding area.

The economic impact assessment concluded that the development of Project Fairway is the preferred economic land use alternative and that the economic benefits of the project are significantly positive.

Provided that the EMP is implemented there is no environmental reason why the project should not proceed.

Name: Nicholas Arnott **Alex Pheiffer**
(Project Manager) **(Project Reviewer)**

Metago Environmental Engineers (Pty) Ltd

TABLE 27-1: TABULATED SUMMARY OF POTENTIAL CUMULATIVE IMPACTS

Section	Potential impact	Significance of the impact (the ratings are negative unless otherwise specified)							
		Construction		Operation		Decommissioning		Closure	
		Unmitigated	Mitigated	Unmitigated	Mitigated	Unmitigated	Mitigated	Unmitigated	Mitigated
Geology	Loss and Sterilisation of Mineral Resources	No impacts expected							
Topography	Hazardous Structures / Excavations / Surface Subsidence	High	Medium – Low	High	Medium – Low	High	Medium – Low	High	Medium – Low
Soils and land capabilities	Loss of soil resources and land capability through pollution	High	Low	High	Low	High	Low	High	Low
	Loss of soil resources and land capability through physical disturbance	High	Medium	High	Medium	High	Medium	High	Medium
Biodiversity	Physical destruction of biodiversity (terrestrial and aquatic) in the Groot Dwars River Valley	High	High - Medium	High	High - Medium	High	High - Medium	High	High - Medium
	Physical destruction of biodiversity (terrestrial and aquatic) on the Terrace	High	Low	High	Low	High	Low	High	Low
	General disturbance of biodiversity	High	Medium	High	Medium	High	Medium	High	Medium
Surface water	Pollution of surface water resources	High	Low	High	Low	High	Low	High	Low
	Alteration of natural drainage patterns	High	Medium	High	Medium	High	Medium	Medium	Medium
Groundwater	Contamination of groundwater	High	Medium	High	Medium	High	Medium	High	Medium
	Dewatering impacts affecting third party users	No impacts expected							

Section	**Potential impact**	**Significance of the impact (the ratings are negative unless otherwise specified)**							
		Construction		**Operation**		**Decommissioning**		**Closure**	
		Unmitigated	**Mitigated**	**Unmitigated**	**Mitigated**	**Unmitigated**	**Mitigated**	**Unmitigated**	**Mitigated**
	Dewatering impacts affecting base flow	Low	Low	High	Medium	High	Medium	High	Medium
Air quality	Increase in air pollution	High	Low	Medium	Low	High	Low	High	Low
Noise	Increase in disturbing noise levels	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Visual impacts	Negative landscape and visual impact	Medium	Medium	High	High	Medium	Medium	Medium	Medium
Heritage (and cultural)	Destruction of heritage, palaeontological and cultural resources	High	Low	High	Low	High	Low	High	Low
Socio-economic impacts	Economic impact (positive and negative)	High +	High +	High +	High +	High +	High +	High +	High +
	Inward Migration	High	Medium	High	Medium	High	Medium	High	Medium
Land use	Land use impacts	High	Medium	High	Medium	High	Medium	High	Low
	Change in land values	High	Medium - Low	High	Medium - Low	High	Medium - Low	High	Medium - Low
	Blasting damage	High	Low	Medium	Low	High	Low	No impacts expected	
	Project-related road use and traffic	High	Medium	High	Medium	High	Medium	No impacts expected	

28 REFERENCES

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RECORD OF REPORT DISTRIBUTION

Project Number:	E017-19
Title:	Proposed Extension of Mining Operations (Project Fairway) at Everest Platinum Mine
Report Number:	3
Proponent:	Aquarius Platinum (South Africa) (Pty) Ltd

Name	Entity	Copy No.	Date issued	Issuer
E. Dzivhani	Department of Mineral Resources	1 – 7	March 2012	N. Arnott
R. Luyt	Mpumalanga Department of Economic Development, Environment and Tourism	8	March 2012	N. Arnott
M Phaladi	Department of Environmental Affairs	9 – 11	March 2012	N. Arnott
M. Malapane	Department of Water Affairs – regional Office, Lydenburg	12	March 2012	N. Arnott
M. Lotter	Mpumalanga Parks and Tourism, Lydenburg	13	March 2012	N. Arnott
S. Nkosi	Mpumalanga Department of Rural Development and Land Reform	14	March 2012	N. Arnott
T. Ngwana	South African Heritage Resources Agency	15	March 2012	N. Arnott
F. Mashabela	Department of Agriculture, Forestry and Fisheries: Resource Conservation	16	March 2012	N. Arnott
H. Meintjies	Thaba Chweu Municipality – Head Office, Lydenburg Town Planning	17	March 2012	N. Arnott
H. Mbatha	Enhlanzeni District Municipality – Municipal Manager	18	March 2012	N. Arnott
S. Maredi	Phetla CPA – Chairperson	19	March 2012	N. Arnott
T. Jones	Northam Platinum	20	March 2012	N Arnott
Public review	Reception – Everest Platinum Mine	21	March 2012	N. Arnott
Public review	Principal, Kiwi Primary School C/o P Ngutshane	22	March 2012	N. Arnott
Public review	Chairman, Steenkampsberge Boerevereniging C/o D. Jacobs	23	March 2012	N. Arnott
Public review	De Berg Conservancy C/o Chris Davel	24	March 2012	N. Arnott
Public review	Ba Ga Makua Community – Draaikraal C/o William Segafa	25	March 2012	
Public review	Lydenburg Public Library	26	March 2012	N. Arnott
Public review	Metago SLR Library in Johannesburg	27	March 2012	N. Arnott
Public review	Metago SLR Library in Pretoria	28	March 2012	N. Arnott
A. van Ghent	Aquarius Platinum (South Africa) (Pty) Ltd	29	March 2012	N. Arnott
N. Hoek	Aquarius Platinum (South Africa) (Pty) Ltd	30	March 2012	N. Arnott
R. Luyt	Mpumalanga Department of Economic Development, Environment and Tourism	32-33	Following public review	N. Arnott
M Phaladi	Department of Environmental Affairs	34- 39		N. Arnott

APPENDIX A: PROJECT ALTERNATIVES CONSIDERED

Given that Everest is already in existence, there are no practical alternative land uses or developments for the land on which the mine and related infrastructure/activities are located. For the proposed Project Fairway, alternatives for various aspects of the project were considered. These are discussed below.

Alternative mining methods

Due to the depth of the ore body and the fact that it is an extension of the ore body currently being mine at Everest, the ore body will be mined using underground mining methods. No other alternative mining methods are considered feasible or possible.

Transport options

There is an existing access road (Road D874 South), off the Provincial R577, as well as the existing internal road network will be used for Project Fairway activities.

Access to the proposed box cuts within the Groot Dwars River valley will be by means of the proposed Valley Access road. The detailed design of the proposed Valley Access road was undertaken by SNA Civil and Structural Engineers (Pty) Ltd. Technical considerations for the proposed alignment of the road include:

- Nature of the road users (anticipated traffic volumes and size of vehicles which will use the road);
- Nature of the topography; and
- Position of, and distance from, starting point and end point.

Taking the above into consideration, the alignment of the proposed Valley Access road was selected.

Surface infrastructure layout options

<u>Box cuts</u>

Given the location of the ore body and the steep nature of the topography within the Groot Dwars River Valley and the proximity of perennial and non-perennial drainage lines, limited options exist for the placement of surface infrastructure. Surface infrastructure at each of the proposed box cuts has been placed as close to each other as possible to minimise the disturbance footprint. The proposed box cut positions have been selected as they represent the areas where the terrain is flat enough to avoid significant cut and fill excavations, while at the same time providing access to the ore body.

<u>Tailings Storage Facility</u>

During the initial prefeasibility studies for Everest, seven potential sites for the original TSF were identified. Following completion of the prefeasibility studies, six potential sites were carried through the to the feasibility study, which allowed for eight potential TSF options. The criteria which were used in the identification of the 8 options include (but are not limited to):

- Suitable topography for a TSF;
- Suitable sites away from major services (such as roads and powerlines);
- Suitable sites within 10 km from possible plant locations; and
- Suitable sites off the underground ore body.

The identification of the preferred TSF site for the proposed Project Fairway was based on the review of the potential sites identified in the above-mentioned site selection process. Additional criteria which were considered when selecting the preferred TSF site include:

- Landownership and current land use;
- Location outside of perennial streams and rivers;
- Location within a previously disturbed area (due to the kiwifruit plantations);
- No potential for the sterilisation of mineral resources below the proposed footprint; and
- Location and elevation in relation to the existing processing plant.

Services and processing operations

As far as possible, existing services, infrastructure and processes at the mine will be used. With respect to power supply, consideration was given to two alternatives:

- Extending the existing underground network to the proposed Project Fairway operations; and
- Construction overland powerlines from the existing plant to the proposed Project Fairway activities.

On evaluation of these two alternatives, the technical planning team indicated that the extension of the existing underground network to the Project Fairway underground mine void would not be feasible as the length of cable required would result in a loss of voltage. This loss would mean that the amount of power supplied would be insufficient for the power requirements of the Project Fairway mining activities.

Sewage sludge management options

The alternatives of off-site disposal or on-site use of the sludge have been considered. The criteria considered for these alternatives were waste minimisation, long term closure objectives, and environmental protection. Use of the treated sludge for on-site rehabilitation of disturbed areas is considered to be the best alternative if the sludge is declassified and its use licensed. Alternatively, off-site disposal will take place.

The "no-project" option

The assessment of this option requires a comparison between the alternative of proceeding with the project with that of not proceeding with the project. Proceeding with the project attracts potential economic benefits and potential negative environmental and social impacts. Not proceeding with the project leaves the status quo. In the unmitigated scenario, assuming no measures are implemented to control the mine's operations, the significance of potential impacts could be high. With the mitigation and monitoring as outlined in the EIA and EMP report, the significance of the impacts will reduce. A comparative assessment of the project development versus the alternative land use (which is the current land use) is given in Section 8 of the EIA and EMP report.

APPENDIX B: INFORMATION-SHARING WITH REGULATORY AUTHORITIES

- NEMA application submitted to MDEDET (16 August 2011)
- NEM:WA application submitted to DEA (16 August 2011)
- MDEDET acknowledged receipt of application (7 September 2011)
- DEA acknowledged receipt of application (17 August 2011)
- Thaba Chweu Municipality Local Municipality comments on Draft Scoping Report (22 November 2011)
- Ehlanzeni District Municipality comments on Final Scoping Report (15 December 2011)

APPENDIX C: STAKEHOLDER DATABASE

APPENDIX D: INFORMATION-SHARING WITH IAPS

- Proof of landowner notification (15 August 2011)
- Minutes of focussed stakeholder scoping meetings:
  - Phetla Community (30 August 2011)
  - Northam Platinum (1 September 2011)
- Background Information Document (in English and Sepedi) for information-sharing purposes
- Site notice (in English and Sepedi) and photos showing where site notices were displayed
- Newspaper advertisements placed in The Daily Sun (9 September 2011) and The Steelburger (9 September 2011)
- Minutes of public scoping meetings:
  - English Scoping Meeting at Steenkampsberge Farmers Hall (30 September 2011)
  - Sepedi Scoping Meeting at Kiwi School (1 October 2011)
- Written comments received from IAPs during the scoping process
- Scoping report summary and cover letter (in English and Sepedi)
- Proof of receipt forms for distribution of Draft Scoping Report for public review
- Minutes of information-sharing meeting with the Ba Ga Makua Community at Tonderdoos Secondary School (29 October 2011)
- Scoping report summary and cover letter to the Ba Ga Makua community (in isiZulu) (12 December 2012)
- Proof of receipt form for distribution of scoping report and summaries to Ba Ga Makua community
- Written comments received from IAPs during the review of the draft and final scoping report

APPENDIX E: COMMENT AND RESPONSE REPORT

APPENDIX F: SOILS AND LAND CAPABILITY STUDY

APPENDIX G: BIODIVERSITY STUDY

APPENDIX H: HYDROLOGICAL STUDY

APPENDIX I: WATER QUALITY HYDROCENSUS

APPENDIX J: GEOHYDROLOGICAL STUDY

APPENDIX K: AIR QUALITY STUDY

APPENDIX L: NOISE STUDY

APPENDIX M: VISUAL STUDY

APPENDIX N: LAND USE STUDY

APPENDIX O: HERITAGE AND CULTURAL STUDY

APPENDIX P: SOCIO-ECONOMIC BASELINE REPORT

APPENDIX Q: ECONOMIC STUDY

APPENDIX R: FINANCIAL PROVISION CALCULATION

APPENDIX S: CLIMATIC WATER BALANCE

APPENDIX T: STORMWATER MANAGEMENT PLAN

APPENDIX U: TAILINGS STORAGE FACILITY FEASIBILITY STUDY