ENVIRONMENTAL MANAGEMENT PROGRAMME AMENDMENT

FOR

COPPER SUNSET TRADING

FS 30/5/1/2/2/164 MR

COPPER SUNSET TRADING (PTY) LTD

BANKFONTEIN 9

OCTOBER 2010

Environmental Solutions Provider

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EXECUTIVE SUMMARY

Digby Wells Environmental (Digby Wells) has been appointed by Copper Sunset Trading 324 (Pty) Ltd (Copper Sunset) as independent environmental consultants to undertake the social and environmental studies relating to an amendment to their existing mining right application for general sand.

Copper Sunset, formerly known as Vaal Sand, has an approved Environmental Management Programme (EMP) and a mining right with the number FS 30/5/1/2/2/164 MR for their operation on the farm Bankfontein 9 near the town of Vereeniging. Bankfontein is located in the Free State Province approximately 10 km from the border with Gauteng. The deposit lies adjacent to the Lethabo Power Station and was previously undermined by Anglo Coal.

The amendment has been compiled for the construction of additional infrastructure on the farm Bankfontein 9. The additional infrastructure is namely, a washing plant, a return water dam (RWD), a settling dam, and brick building which will be used for the housing of electrical components, as well as a borehole which will be used to provide water for the operation of washing plant.

The introduction of this additional infrastructure will allow Copper Sunset to provide an additional product in the form of industrial sand. This will in turn allow for the inclusion of additional industrial clients.

In order to comply with the requirements of the Minerals and Petroleum Resources Development Act, 2002 (Act 28 of 2002) ("the MPRDA"), a section 102 in accordance with the MPRDA needs to be compiled and submitted to the Regional Manager of the Department of Mineral Resources (DMR), Free State.

Copper Sunset will also be applying for a water use licence, in line with the National Water Act, Act 36 of 1998 (NWA). Whereby the following section 21 activities will be applied for, and are related to the introduction of the washing plant and the associated infrastructure;

- (a); Abstraction of water;
- (b); Storing water; and
- (g); Disposing of waste in a manner which may detrimentally impact on a water resource.

Project Description

The Bankfontein 9 farm is located 11 km south of Vereeniging and 13 km north east of Sasolburg and falls within the Fezile Dabi District Municipality and the Metsimaholo Local Municipality of the Free State Province.

The sand deposit extends over an area of approximately 600 ha. Exploitable sand lies between 0.35m and 0.5m below the surface. The total deposit is thus of the order of 5 million bulk cubic meters (BCMs). The economic life of the mine is approximately 12-15 years.

The current mining operation involves strip mining in 30 m wide strips with a length of 900 m. The product is stockpiled temporarily before the purchasers trucks get loaded with the sand from the stockpile. As each strip is excavated, the overburden is placed in the excavation previously mined. Concurrent rehabilitation is currently being carried out.

In order for Copper Sunset to expand their clientele, additional infrastructure is required. The additional infrastructure, namely a washing plant, return water dam and settling dam, will rinse out 4% of fines, providing industrial clients with the required industrial grade sand. This process will allow for an increase of 15% in sales.

Environmental Impact Assessment Methodology and Findings

The Environmental Impact Assessment (EIA) uses a rigorous, numerical environmental significance rating process to determine the significance, frequency and severity of an impact. The impact rating process is designed to provide a numerical rating of the various environmental impacts identified by use of the “Input-Output” model. The process is based on the accepted impact assessment methodology that uses the probability of an

event occurring and the severity of the impact, should an event occur, as factors to determine the significance of a particular environmental risk.

It has to be stressed that the purpose of the EIA process is not to provide an incontrovertible rating of the significance of various aspects, but rather to provide a structured, traceable and defendable methodology of rating the relative significance of impacts in a specific context. The methodology employed for this environmental impact assessment is divided into two distinct phases, namely, impact identification and impact assessment. The values assigned to these factors (weighting) are discussed as part of the EIA.

The following table provides a summary of the anticipated significant environmental impacts associated with the washing plant and the associated infrastructure at Copper Sunset:

SIGNIFICANT ENVIRONMENTAL IMPACTS	
SOILS AND LAND CAPABILITY	• Potential soil contamination could occur due to spillage of fuel or lubricants from vehicles (e.g. front loaders, transport trucks, etc.).
AIR QUALITY	• Dust emissions are expected to increase due to: - Increase of dust particles by the movement and operation of vehicles during construction; - Tipping of sand product into trucks and onto stockpiles; - Vehicle movement increasing the dust on haul roads;
NOISE	• Noise levels will increase slightly due to the operating of the washing plant.
NATURAL VEGETATION	• Natural vegetation will be destroyed and removed during site clearance (dams), however, alien species have been noted in the area and these plants will be eliminated.
SURFACE WATER	• Potential surface water contamination could occur through the potential spills of contaminants by vehicles.
GROUNDWATER	• Potential contamination of groundwater could occur due to spillage of fuels, inadequate handling of wastes and leakages

SIGNIFICANT ENVIRONMENTAL IMPACTS	
	in slurry ponds; and • The abstraction of groundwater for the use at the washing plant could decrease the availability of groundwater in the area.
SOCIO-ECONOMIC	• Generation of nuisance dust may impact on surrounding land users; and • Increase in traffic for surrounding land users.
TRAFFIC	• Increased traffic and associated safety risks on roads used to transport sand to the product purchaser.

Public Participation Process

The Public Participation Process (PPP) for Copper Sunset attempted to ensure that all Interested and Affected Parties (IAPs) were adequately involved in the project. IAPs were afforded the opportunity to participate in and contribute to the EIA/EMP studies. Stakeholders were presented with detailed and up-to-date information regarding the Copper Sunset amended mining right application to ensure that all feedback was relevant and well-informed.

Management and Monitoring

The management plan should be used to address impacts that were identified during the impact assessment. Monitoring is required in order to check compliance with agreed upon standards or objectives and targets. During pre-construction, construction, decommissioning and closure monitoring would be used to check compliance with regulations while post closure monitoring is to ensure aftercare and maintenance of post closure objectives.

Financial Provision

According to the DMR guidelines Copper Sunset has to provide **R 185,560.98** for rehabilitation and closure of the washing plant, settling dam and return water dam**.**

Conclusion

The current operation and Copper Sunset is operating successfully, however, the inclusion of the washing plant and associated infrastructure will contribute to broadening the client base and product for the operation. The new infrastructure is proposed to be constructed within the authorised mining area, and is expected to have limited impact on the receiving environment.

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LIST OF ABBREVIATIONS

BCM's	Bulk Cubic Metres
Copper Sunset	Copper Sunset Trading 324 (Pty) Ltd
Digby Wells	Digby Wells & Associates (Pty) Ltd
DWA	Department of Water Affairs
DEA	Department of Environmental Affairs
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
I&APs	Interested and Affected Parties
MPRDA	Mineral Petroleum Resources Development Act
NWA	National Water Act
PPP	Public Participation Process
RWD	Return Water Dam

1 INTRODUCTION

Copper Sunset Trading 324 (Pty) Ltd (Copper Sunset), formerly known as Vaal Sand, has an approved Environmental Management Programme (EMP) and a mining right with the number FS 30/5/1/2/2/164 MR for their operation on the farm Bankfontein 9 near the town of Vereeniging. Bankfontein is located in the Free State Province approximately 10 km south of the border with Gauteng. The deposit lies adjacent to the Lethabo Power Station and was previously undermined by Anglo Coal.

Vaal Sand previously operated at a site west of Bankfontein, however, Anglo Coal required Vaal Sand to move their operation as open cast coal mining was to commence on the property. Anglo Coal and Vaal Sands reached an agreement for the Vaal Sands operation to be relocated to the new site,with a similar sand reserve, resulting in the establishment of the operations on Bankfontein 9. Bankfontein 9 was previously undermined (underground mining) by Anglo Coal.

The current mining operation involves strip mining in 30 m wide strips with a length of 900 m. The product is stockpiled temporarily prior to the purchasers' trucks being loaded with the sand from the stockpile.

General Sand, which comprises 90% plaster sand and 10% building sand, is being mined at the Copper Sunset operation on Bankfontein9. Copper Sunset supply a number of construction industry clients from the Northern Free State and Gauteng area with sand.

Apart from the addition of the washing plant and its associated infrastructure, no changes to the mining method or future mine plan are expected. The construction and use of the washing plant will enable Copper Sunset to provide an additional product, a finer sand, which can be sold to industrial clients.

According to the Minerals and Petroleum Resources Development Act28 of 2002 (MPRDA), an amendment of an approved Environmental Management Programme is described in Section 102, and Copper Sunset are carrying out a Section 102 amendment

in order to include a washing plant, return water dam, settling dam as well as a brick building which is used to house electrical components.

Copper Sunset are applying for a water use licence, according to the National Water Act, Act 36 of 1998 (NWA) for the washing plant. The Section 21 activities which are being applied for are:

- (a); Abstraction of water;
- (b); Storing water; and
- (g); Disposing of waste in a manner which may detrimentally impact on a water resource.

Digby Wells and Associates (Pty) Ltd (Digby Wells) have been appointed by Copper Sunset as an independent environmental consultant, to carry out the Section 102 application to acquired authorisation as per the MPRDA for the amended EMP. Digby Wells is also compiling the Integrated Water Use License Application to obtain authorisation for the washing plant and the associated infrastructure from the Department of Water Affairs (DWA) in term of the NWA

1.1 Project Activities

The inclusion of the washing plant will result in the addition of activities taking place at the operation. The additional activities are described below (Table 1-1), and these activities are assessed in Section 8.

Table 1-1: List of activities expected to take place

Activity Number	Activity	Description
Construction Phase		
1	Removal of topsoil	Clearing of topsoil to make way for the construction of infrastructure

Activity Number	Activity	Description
2	Construction of infrastructure	Construction of Washing plant, Return Water Dam (RWD), settling dam and electrical building
3	Vehicular movement	Vehicular movement caused by the transportation of product to and from the washing plant area
Operational Phase		
4	Washing plant operations	Activities associated with the operation of the washing plant
5	Temporary stockpiling of rinsed product	The product is temporarily stockpiled alongside the washing plant until it is collected by the trucks
6	Abstraction of water from the borehole	When required, water is will be abstracted from the borehole on site
7	Storing and disposing of water	The use of the RWD and settling dam
Decommissioning Phase		
8	Decommissioning of infrastructure	The breaking down of all relevant infrastructure
9	Rehabilitation	Required rehabilitation once infrastructure is removed
Post-closure Phase		
10	Monitoring	Required monitoring for environmental impacts following the closure of the operation

2 LEGAL FRAMEWORK

The following sections briefly introduce the principle legislation of the proposed project for authorisation purposes so that mining activities can continue lawfully.

2.1 Mineral and Petroleum Resource Development Act, Act No.28 of 2002 (MPRDA)

Copper Sunset are in possession of an approved EMP as well as a mining right (FS 30/5/1/2/2/164 MR) since 2009, however, wish to amend the approved EMP to include a washing plant, a return water dam, a settling dam, a borehole and a building to house electrical components. According to Section 102 of the MPRDA, an EIA/EMP may not be amended without the written consent of the Minister. Section 102 requires the submission of variation application to the DMR. If the application is accepted an EMP Amendment can be submitted without consultation having to take place.

Copper Sunset needs environmental authorisation in order to commence with the new proposed activities, namely the washing plant and associated dams and infrastructure.

This EMP has been drafted to obtain the approval of the Minister under section 102 of the MPRDA for inclusion of additional infrastructure.

2.2 National Water Act, Act 36 of 1998 (NWA)

The following water uses have been identified on site, which require licensing according to Section 21 of the NWA:

- (a); Abstraction of water;
- (b); Storing water; and
- (g); Disposing of waste in a manner which may detrimentally impact on a water resource.

Copper Sunset is applying to the Department of Water Affairs (DWA) for the uses above. A technical document will be prepared in accordance with the DWA best practice guidelines, which will further describe the water uses for which Copper Sunset is applying, and their impacts on the surrounding environment.

2.3 Other Legislation

The amendment of the EMP study is not only subject to the terms and regulations of the MPRDA and NWA but must also comply with other applicable statutory requirements and guideline documents relevant to the project. The following includes a non-exhaustive list of legislation and guidelines that were considered during the scoping phase of the project:

National Legislation and associated Regulations:

- Atmospheric Pollution Prevention Act, Act No. 45 of 1965;
- Constitution of the Republic of South Africa Act, Act No. 108 of 1996;
- Environment Conservation Act, Act No.73 of 1989;
- Hazardous Substances Act, Act No. 15 of 1973;
- Mineral and Petroleum Resources Development Act, Act No. 28 of 2002;
- National Heritage Resources Act, Act No. 25 of 1999;
- National Environmental Management Act, Act No. Act No. 107 of 1998;
- National Environmental Management: Air Quality Act, Act No 39 of 2004;
- National Environment Management: Biodiversity Act, Act No. 10 of 2004;
- National Forest Act, Act No. 84 of 1998;
- National Water Act, Act No. 36 of 1998; and

- Promotion of Access to Information Act, Act No. 2 of 2000.

Guideline Documents include:

- DEAT Air Quality Guidelines;
- SANS 10103:2004 The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and to Speech Communication;
- SANS 10286: Mine Residue Disposal, 1998 1st Edition;
- SANS 1929:2005 Edition 1.1 – Ambient Air Quality Limits for Common Pollutants;
- DWAF: Best Practice Guideline G1: Storm Water Management;
- DWAF: Best Practice Guideline G2: Water and Salt Balances; August 2006;
- DWAF: Best Practice Guideline A4: Pollution Control Dams (PCD's);
- DWAF: Best Practice Guideline GH: Water Reuse and Reclamation, June 2006;
- DWAF: Minimum Requirements Guideline for the Handling, Classification and Disposal of Hazardous Waste, 1998;
- DWAF: Minimum Requirements Guideline for Waste Disposal by Landfill, 1998;
- DWAF: Minimum Requirements Guideline for the Water Monitoring at Waste Management Facilities;
- SA Water Quality Guidelines – Aquatic Ecosystems, 1996; and
- SA Water Quality Guidelines – Domestic Water Use, 1996.

3 METHODOLOGY

This Environmental Impact Assessment/Environmental Management Programme (EIA/EMP) gives a full impact assessment, recommends mitigation measures and rates the current and future impacts according to their significance.

This EMP has been drafted to obtain the approval Minister under section 102 of the MPRDA for inclusion of additional infrastructure.

3.1 Environmental Impact Assessment

The EIA uses a rigorous, numerical environmental significance rating process. Both processes are based on the accepted impact assessment methodology that uses the probability of an event occurring and the severity of the impact, should an event occur, as factors to determine the significance of a particular environmental risk.

In order to determine the severity of any potential environmental impact, the criteria that are taken into consideration are the spatial extent of the impact, the duration of the impact and the severity of the impact. The probability of an impact occurring is determined by the frequency at which the activity takes place and by how often the type of impact in question has taken place or takes place in similar circumstances. The values assigned to these factors (weighting) are discussed as part of the EIA (Section 8).

In order to clarify the purpose and limitations of the impact assessment methodology, it is necessary to address the issue of subjectivity in the assessment of the significance of environmental impacts. Even though Digby Wells, and the majority of Environmental Assessment Practitioners (EAPs), propose a numerical methodology for impact assessment, one has to accept that the process of environmental significance determination is inherently subjective. The weight assigned to each factor of a potential impact, and also the design of the rating process itself, is based on the values and perception of risk of members of the assessment team, as well as that of the Interested and Affected Parties (IAPs) and authorities who provide input into the process. Whereas the determination of the spatial scale and the duration of impacts are to some extent

amenable to scientific enquiry, the severity value assigned to impacts is highly dependent on the perceptions and values of all involved. It is for this reason that it is crucial that all EIAs make reference to the environmental and socio-economic context of the proposed activity in order to reach an acceptable rating of the significance of impacts. Similarly, the perception of the probability of an impact occurring is dependent on perceptions, aversion to risk and availability of information.

It has to be stressed that the purpose of the EIA process is not to provide an incontrovertible rating of the significance of various aspects, but rather to provide a structured, traceable and defendable methodology of rating the relative significance of impacts in a specific context.

The EIA assesses environmental and social impacts according to different stages of the proposed project, namely: the construction, operational, decommissioning and post closure phases. Impact and benefit significance are assessed before and after the application of any mitigation measures and refer to effects on both the ecological and social environment.

Lastly, the cumulative impacts of the proposed operation on the environment, with reference to similar operations and activities in the area are discussed.

3.2 Environmental Management Programme

This document aims to address all environmental impacts likely to occur during the execution of the project and to give a description of the general environment.

As the EIA indicates the relative significance of the various environmental impacts associated with mining activities, serves to focus the allocation of resources on environmental aspects and specific impacts requiring mitigation. The aim of the mitigation measures is to minimise the negative impacts and enhance the positive aspects of the project, as well as to inform, involve and improve the local communities in the process. In terms of Section 39 (1) of the MPRDA, an EMP must describe the manner in which the applicant intends to:

- Modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
- Contain or remedy the cause of pollution or degradation and migration of pollutants; and
- Comply with any prescribed waste standard or management standards or practices.

The EMP section is divided into setting objectives and planning of management measures. The monitoring and performance assessment section of the EMP details the annual monitoring and audits that will be implemented to ensure the effectiveness of mitigation measures.

4 PROJECT DESCRIPTION

4.1 Project Introduction

Copper Sunset, formerly known as Vaal Sand, has an approved Environmental Management Programme (EMP) and a mining right with the number FS 30/5/1/2/2/164 MR for their operation on the farm Bankfontein 9 near the town of Vereeniging

Copper Sunset mine general sand from the farm Bankfontein 9, and the deposit extends over approximately 600 ha and contains around 5 million Bulk Cubic Meters (BCMs). The current mining operation involves strip mining in 30 m wide strips with a length of 900 m. The product is stockpiled temporarily before the purchasers trucks get loaded with the sand from the stockpile.

General Sand, which comprises 90% plaster sand and 10% building sand, is being mined at the Copper Sunset operation on Bankfontein, and Copper Sunset have established that if the sand is rinsed with the use of a washing plant an additional product, in the form of industrial sand, can be produced and sold to the appropriate client base.

It was established that the introduction of the washing plant and associated infrastructure, will result in the need to amend the current EMP, resulting in a Section 102 amendment, according to the MPRDA, for which this document has been compiled to facilitate. The changes to the previously submitted and authorised EMP lie with the addition of a washing plant for the rinsing of sand. No changes to the mining method or future mine plan are expected. The associated infrastructure entails the construction and use of a RWD, a settling dam, a borehole and an electrical component housing building.

Copper Sunset is also in the process of applying for a water use licence for the washing plant and associated activities. The section 21 activities which will be applied for are;

- (a); Abstraction of water;
- (b); Storing water; and

- (g); Disposing of waste in a manner which may detrimentally impact on a water resource.

4.2 Project Applicant

The Table 4-1 gives the contact details and applicable information for Copper Sunset.

Table 4-1: Applicant details

Name of Applicant	Copper Sunset Trading 324 (Pty) Ltd.
Person Responsible	Gerd Kappler / Rudi Wolter
Postal Address	P.O. Box 413712, Craighall, 2024
Telephone No.	011 787 9274
Fax No.	011 326 4647

4.3 Expertise of the Environmental Impact Assessment Practitioner

Digby Wells has been appointed as independent environmental consultants to investigate the environmental aspects of the proposed mining operation. Digby Wells has extensive experience within the mining sector, providing environmental solutions. The following specialists were involved in the completion of the investigations:

- Grant Beringer - Project Sponsor;
- Irene Bopp – Project Management
- Thomas Wilson- EIA document compilation;
- Jennifer Molwantana - Hydrology and IWULA compilation;
- Helen Knight - Public Participation; and
- Stephanie Crone - Geographic Information Systems.

The curriculum vitae for these environmentalists are attached as Appendix 1.

4.4 Motivation

Copper Sunset is currently mining at the farm Bankfontein. The operation mining right were approved in May 2009. The operation is currently producing 500 000m³ of sand per annum, which is being supplied to the building industry around South Africa. The sand, which is being extracted, has the potential to be purchased by industrial clients. In order to attract industrial clients Copper Sunset needs to provide a more refined sand product. This product can be achieved by the washing of the sand, using a washing plant. The washing plant can remove approximately 4% of fines from the mined sand, resulting in the desired industrial sand.

The addition of industrial sand as a product at Copper Sunset will result in an increase in sales of 15%. The current operation supplies approximately 195 trucks, daily, which purchase the unrefined sand daily. It is estimated that an additional 30 trucks loads will be sold daily if the additional product is produced. This will result in 85% of the product being sold as plaster sand, and the remaining 15% as bulding sand. The addition of the industrial sand will allow for the expansion of the Copper Sunset operation as well as the financial stability within the company to ensure employment security and potential job opportunities as the operation expands.

4.5 Regional setting

The Bankfontein 9 farm is located 11 km south of Vereeniging and 13 km north east of Sasolburg and falls within the Fezile Dabi District Municipality and the Metsimaholo Local Municipality of the Free State Province (Plan 1, Appendix 2). The site is situated adjacent to the Lethabo Power Station and the Vaal River is approximately 4 km from the site. The proposed washing plant is to be situated at S 26° 45’10.0” E 027° 56’ 41.8”.

4.6 Land Ownership

The Bankfontein 9 Farm is owned by Copper Sunset Trading. The relevant portions included in this EIA/EMP amendment are portions 7, 11, 12, 17, 18, 22, 23 and the remaining extent (Plan 2). Table 4-2 shows the surrounding farms and the farm owners.

Table 4-2: Surrounding land owners to the farm Bankfontein 9

Farm name	Ptn Number	Name of Landowner/ Occupant
Bankfontein 9 Heilbron RD	RE	Copper Sunset Trading
Bankfontein 9 Heilbron RD	7, 11, 12, 18, 23	Home Start Real Estates CC
Bankfontein 9 Heilbron RD	17	Rosherville Properties Pty Ltd
Lethabo Power Station 1814 Heilbron RD	RE	Eskom Holdings
Maccaw Vlei 121 Heolbron RD	RE	Anglo Operations Ltd
Modderfontein 1279 Heilbron RD	RE	Jacob van Niekerk
Rietfontein 152 Heilbron RD	RE	Anglo Operations
Zandfontein 259 Heilbron RD	RE, 5	Anglo Operations
Zandfontein 259 Heilbron RD	3, 8, 14	Home Start Real Estates CC
Zandfontein 259 Heilbron RD	13	Rosherville Properties Pty Ltd

4.7 Mineral resources

The deposit extends over an area of approximately 600 ha, with an estimated thickness of between 2.0 m and 2.5 m. Exploitable sand lies between 0.35 m and 0.5 m below the surface. The total deposit is thus of the order of 5 million BCMs; assuming a yield of 85% and average monthly sales of 30 000 BCMs, the economic life of the mine is approximately 15-20 years. The mine plan for the site is shown schematically in Plan 3.

The deposit lies adjacent to the Lethabo Power Station and was previously undermined by Anglo Coal.

General Sand, which comprises 90% plaster sand and 10% building sand, is currently being mined at Bankfontein. Copper Sunset supply a number of clients in the construction industry.

4.8 Mining methods

Currently the top soil layer, of up to 350 mm thick, is being removed with a bulldozer and stored separately in a stockpile which acts as a berm. The mining method used is strip mining and dozers and trucks are used to mine the sand. The sand is removed in strips of 30 m wide, 900 m long and 3.0 m deep. As each strip is excavated, the overburden is placed in the excavation previously mined.

It is then proposed that the raw sand be screened in the washing plant to remove impurities. Discard from the screening process will be disposed of in the mined areas. The discard only consists of plant roots and other larger particles that exist in the soil before it is mined. The operation requires approximately 24 skilled or multi-skilled employees.

The washing will allow for the elimination of approximately 4% of fines, making the product viable for purchase in the industrial industry. The sand requiring rinsing will be transported to the washing plant, where it will be stockpiled, and then fed through the washing plant for rinsing. The resulting rinsed sand will then be stockpiled adjacent to the washing plant and collected by the clients. The plant will be constructed on a concrete floor which was already in place when the operation started. Water for the rinsing process will be abstracted from a borehole on the property. The abstracted water will be stored in a return water dam for use only by the washing plant, and following the rinsing of the sand, the used water will be piped to a settling pond adjacent to the wash plant, where the sediment will settle out and the water will be returned to the return water dam for re-use. Approximately 90% of the water will be recovered during the process. Water will only be

abstracted from the borehole if the water stored in the return water dam is not adequate for the rinsing process. The project process is shown schematically on Plan 4.

The proposed site plan is shown in Plan 5.

4.9 Mine products

General Sand which Copper Sunset is currently mining, which comprises 90% plaster sand and 10% building sand, is being mined at Bankfontein. Copper Sunset supplies a number of clients who use the sand in the construction industry

The product produced from the washing plant will be industrial sand which will be as a result of the rinsing process of the washing plant. The rinsing process will aid in removing 4% of the fines in the sand.

It is expected that the particle size from the rinsing process will not change in comparison to the unrinsed sand however, a decrease of oxides is expected and this will result in the removal of sand particles These oxides commonly characterise clay particles in the soil, therefore this may be lost during the washing process. Minimal differences in aluminium and iron oxides are expected.

4.10 Employment figures

The operation employs 24 skilled and multi-skilled personnel.

4.11 Project Process

Copper Sunset can provide their clients with building sand and a washing plant is proposed to accommodate demand for industrial sand. Sand extracted from the pit is to be transported via truck to the hopper at the washing plant.

The sand will then be fed via a 25 m conveyor into the splitter screen where unwanted materials, grass roots and other impurities, are removed by screening. From the screen the sand will be fed into the cyclone where the sand is rinsed, using high pressure water, forcing the particles through a 2 mm screen into a conical tank. The sand pump will then

transfer the sand and water to a cyclone system. With the use of centrifugal forces any oversize material will be disposed off, followed by the sand and water passing through a final screen which acts as a dewatering screen. The screen deck will be sized at 0.5mm, resulting in the water and sand particle with a size of 0.5mm or smaller, being transported to the settling dam. The resulting sand is stockpiled temporarily, until it is loaded onto the truck of the purchasing client (Plan 4).

Water from the RWD will be used for this process. Excess water from the washing plant will be piped into the settling dam, where the settling process occurs, causing the separation of fine sand particles to settle at the bottom of the dam and separate from the water. The water which results from the settling dam will flow back into the return water dam to allow for the re-use of the water in the washing plant. A borehole has been installed nearby and should the water available in the RWD not be sufficient for the operation of the washing plant, water will be pumped from the borehole (Plan 4).

45 m^3 of sand is estimated to be washed per hour, which will require 110 000 litres of water per hour. Considering the volume of water available in the return dam (Table 4-3), water will be abstracted from a borehole which is situated 420 m from the washing plant. Water is only abstracted on demand basis. The operation is expected to recover 90 % (99 000 litres per hour) of the water used.

4.12 Waste Management

The only waste to be generated by the proposed activities will be from the material screened from the sand this waste will be disposed of in the mined out strips. Domestic waste is currently being transported and dumped at the Sasolburg Municipal dumping site. Permission to do so was granted by the municipality.

All used oil is currently stored in plastic drums and is collected by Nora Oil Recycling (Pty) Ltd on a monthly basis. All new and used oil is being stored in a concrete bunded area where no seepage into the groundwater can occur.

4.13 Water Use and Resources

Water for the proposed washing plant will be abstracted from a borehole situated on site (Plan 3). The water will be piped from the abstraction point through to the return water dam. This water will then be used for the proposed washing plant. Excess water from the plant will then be pumped into the settling dam.

The addition of the washing plant is estimated to require 110 000 litres of water per hour. Depending on the volume of water which available in the RWD, water may be abstracted from the borehole. Water will only be abstracted on a demand basis. The operation is expected to recover 90 % (99 000 litres per hour) of the water used, in order to limit abstraction from the borehole.

4.14 Servitudes and Infrastructure

Servitudes and infrastructure have remained the same as that which was stated in the approved EMP. This includes offices and associated infrastructure, like toilets and a weigh bridge. Copper Sunset has renovated buildings, which were already on site when Copper Sunset purchased the farm Bankfontein 9, to accommodate the operations. All infrastructure left from previous land uses are being cleared, or where clearing is not possible, being stripped down and closed up to ensure safety on site. The proposed washing plant will be constructed on a concrete floor (137 m x 32 m), currently present on site. Associated infrastructure to be built will be a brick building (3x3m) which will be used to house electrical cabling and other components to ensure safety as well as a RWD and settling dam.

The water storage infrastructure (RWD and settling dam), will have the following dimensions (Table 4-3):

Table 4-3: Water storage facilities and relevant dimensions

Structure:	Capacity:	Length:	Breath:	Height:
Settling Dam	25 600 m^3	200 m	80 m	1.6 m

Return Water Dam	28 800 m^3	80 m	80 m	4.5 m

The dams, borehole and washing plant will be interconnected with the use of plastic and /or steal pipes These pipes will run from the borehole to the return dam, as well as from the settling dam to the return dam and from the washing plant to the settling dam (Table 4-4). The pipe from the return water dam to the washing plant will be steal whereas the others will be plastic.

Table 4-4: Pipe dimensions and lengths

Pipe Origin:	**Pipe End:**	**Diameter:**	**Length:**
Borehole	Return Water Dam	6 inch	420 m
Return Water Dam	Washing Plant	6 inch	140 m
Washing Plant	Settling Dam	8 inch	30 m
Settling Dam	Return Water Dam	6 inch	50 m

5 DESCRIPTION OF AFFECTED ENVIRONMENT

5.1 Climate

5.1.1 Description of regional climate

This regional climate is characterised by cold, dry winters, lasting from April to September, and warm, wet, summers (Schulze, et al. 1997).

5.1.2 Mean annual and monthly precipitation

The Mean Annual Precipitation (MAP) for this area is approximately 608 mm with the highest concentrations occurring between October and March. The winter months (June – August) contribute very little (2.12%) to the annual rainfall for this area, with the summer months (December – February) contributing the greatest amount (Figure 5-1).

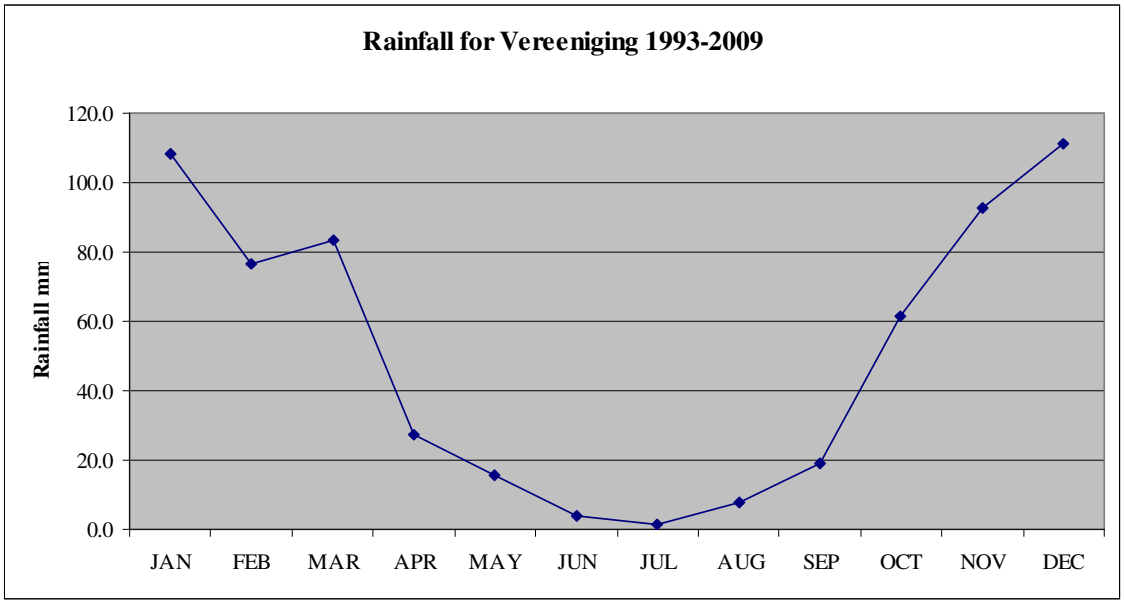

Figure 5-1: Mean monthly precipitation at the Vereeniging weather station (04387843) for the period between 1993 and 2009

5.1.3 Mean monthly maximum and minimum temperatures

Temperatures for this area are typical of the Northern Free State climatic zone, with warm summers and cool dry winters. Average temperatures vary from 28ºC in the summer to as low as 0ºC in the winter.

Figure 5-2 illustrates the mean annual temperatures recorded between 1992 and 2009.

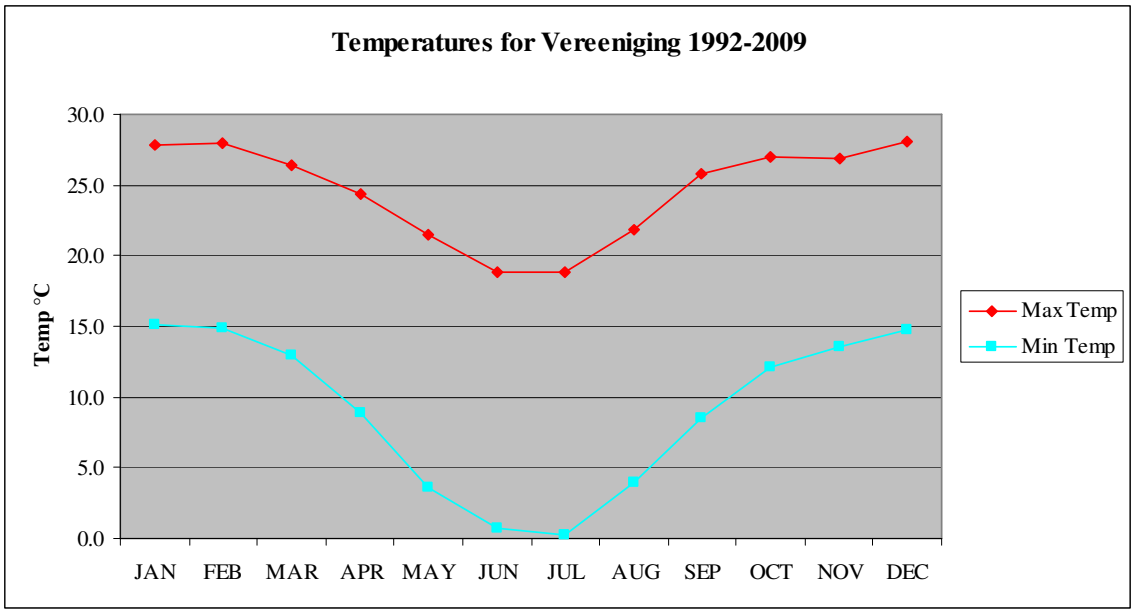

Figure 5-2: Monthly maximum and minimum temperatures for Vereeniging weather station (04387843) for the period between 1993 and 2009

5.1.4 Mean monthly wind direction and speed

Figure 5-3 represents the annual wind frequency distribution for the Vereeniging weather station taking into account all four seasonal fluctuations. The graph shows that the wind in the area is predominantly a north to north-north-westerly wind. The average annual wind speed is 2.51 m/s and the summer months generally experience higher wind speeds than that experienced in winter.

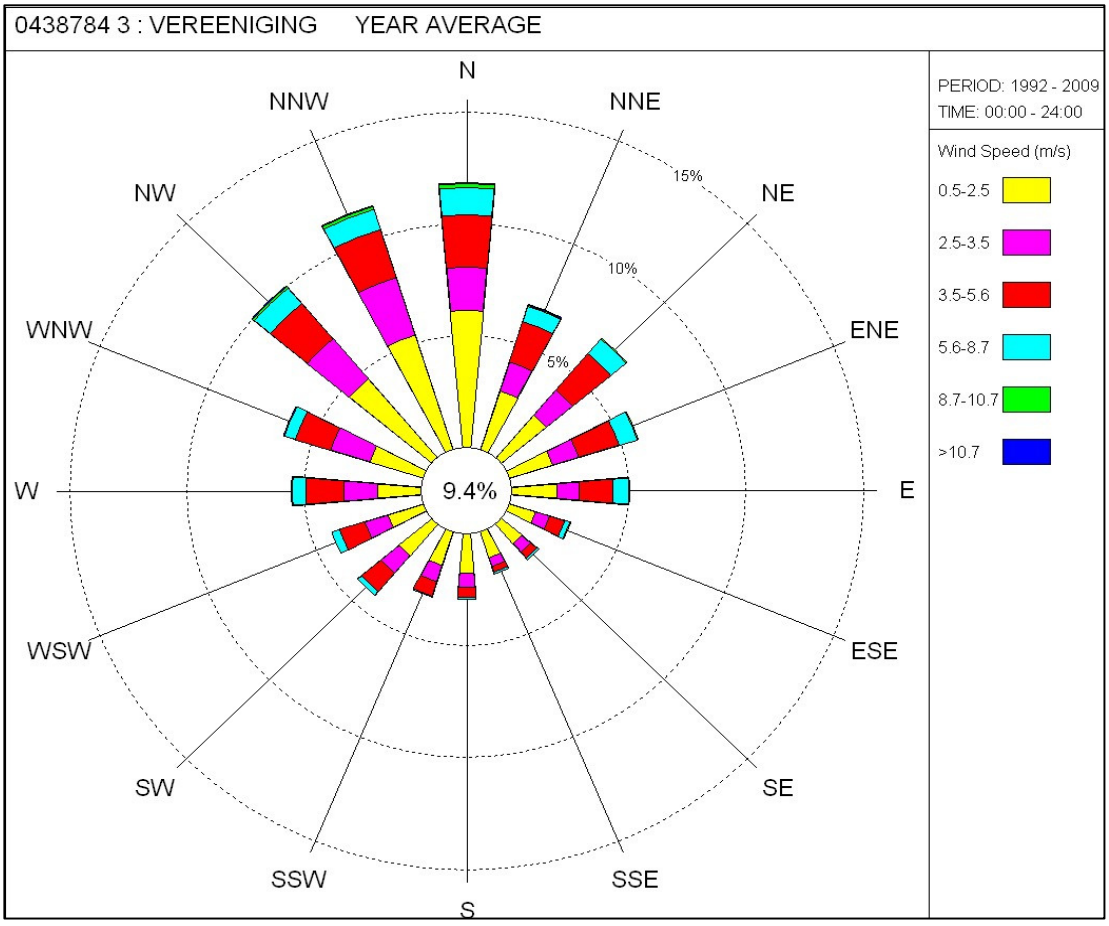

Figure 5-3: Wind rose depicting dominant wind direction

5.2 Topography

The site is located on a slight hill as the area is of higher elevation relative to the surrounding areas. The elevation on the site ranges from approximately 1500 m to 1460 m (above sea level - asl) deriving an elevation range of approximately 40 m over a distance of 3 km (average gradient ±1.3%). The relief of the site and surrounding areas can therefore be accepted as level. Please refer to Plan 6 in Appendix 2.

5.3 Geology

The project area lies within the Vryheid Formation that forms part of the Ecca Group which is part of the Karoo Supergroup. The Vryheid Formation consists predominantly of thick beds of yellowish to white cross-bedded sandstone and grit alternating with beds of soft sandy shale. This unit also contains the coal seams that support the coal mining activities (Barnard, 2000). Dolerite sheets and dykes have intruded the sedimentary rocks extensively in the formation. Please refer to Plan 7 in Appendix 2.

5.4 Soils

A soil study was done by Envirosoil Consulting in 2007. Please refer to Plan 8 in Appendix 2 for a plan which indicates the soil types find on the entire mining area. Plan 8 also shows that the project area (the washing plant and associated infrastructure) is situated on a disturbed area, in terms of soil.

5.4.1 General Soil Description

The Land Type Map of the area (2626 West Rand, Land Type Survey Staff, 1984) describes the soils as part of a plinthic catena where upland duplex or margalitic soils are common. As the general terrain is very flat, the position of the soil in the catena only plays a small role in soil formation. The soils are derived from aeolian sand moved in over local colluvium derived from Ecca sandstone.

5.4.1.1 Upland soils

The gentle upper slopes tend to be occupied by Glencoe and Avalon form soils which consist of sandy topsoil over medium sandy subsoil. Both soft and hard plinthite is found where iron and manganese oxides have accumulated at 1 – 2 m depths, mainly at the upper end of the site.

5.4.1.2 Midslope soils

The lower mid-slope positions are occupied by the Clovelly and Longlands form soils where drainage is somewhat restricted. These soils are very sandy with low fertility.

5.4.2 Soils of the Area

The soil boundaries were established by augering the area on a grid of 200 x 200 m with a hand held soil auger to a depth of 1.2 m (or shallower if a limiting layer was encountered).

At each observation point the more important soil physical characteristics used to identify the soil i.e. depth, colour, texture and structure were noted.

Soils were classified according to the Taxonomic System for South Africa (Soil Classification Working Group, 1991)

On completion of the soil map of the area, six main soil units were identified , Cv (Clovelly), Gc (Glencoe), Lo (Longlands), Av(Avalon). The Soils Legend (Table 5-1) below describes these soil units in more detail.

Table 5-1: Soils Legend

Soil Unit	Dominant Soil Form and Family	Other Soils Forms	Average Depth (mm)	Land Capability	Summarized Description of Dominant Soil Form
Cv(sa)	Clovelly 2100	Glencoe, Avalon	1200+	Poor grazing	Deep, pale yellow with bleached layer 800 -1000mm, very sandy with no structure.
Gc	Glencoe 3100	Avalon, Wasbank	800 - 1000	Arable	Moderately deep, strong brown to yellowish brown, sandy with no structure, underlain by hard plinthite.
Lo	Longlands 1000	Clovelly, Avalon	1200+	Poor grazing	Deep, pale yellow with bleached layer 800 -1000mm, sandy with no structure; underlain by soft plinthite.
Av(sa)	Avalon	Clovelly,	800 -	Poor	Moderately deep, strong brown to

Soil Unit	Dominant Soil Form and Family	Other Soils Forms	Average Depth (mm)	Land Capability	Summarized Description of Dominant Soil Form
	3100	Longlands	1000	grazing	pale brown, very sandy with no structure, underlain by soft plinthite.

All the soil units had a high potential for soil erosion they had a very high sand fraction (80 – 90%), low silt (2-3%) and clay <5%. Due to the flat topography and high infiltration rate, however, erosion should not be a problem.

The areas and percentages covered by the soil units are found in Table 5-2 below.

Table 5-2: Areas and percentages covered by the soil units

Soil Unit	Area (ha)	Area (%)
Cv(sa)	200.1	10.7
Cv/Av	27.9	5.7
Gc	118.4	32.7
Gc/Av	26.4	4.6
Lo	69.1	11.4
Av(sa)	65.3	19.3
Av/Wa	35.1	4.3
Disturbed area	70.0	11.3
Total	**612.3**	**100.00**

The soils in the project area, where the proposed washing plant is to be constructed, is in the disturbed area soil unit described above.

5.4.3 Soil Analysis

Soil samples were taken of the upper soil layer (0 – 600 mm) of the dominant soil forms at three positions in the proposed sand mining area. The sampling points are shown on the detailed soil map (Plan 8).

The samples were analysed by the Institute of Soil Climate & Water (ISCW), using standard acceptable methods for pH, Cation Exchange Capacity (CEC), particle size distribution (7-Fraction) and Phosphate (P).

In general the soils in the Copper Sunset study area are highly leached and thus have a low base status. Soil pH values are between 5.5 and 6.9; and soils have a low fertility status (Table 5-3).

Topsoil Phosphate (P) values are low (2.1 –10.1 mg/kg), while Potassium (K) values vary from 20.7 mg/kg (low) to 54.4 mg/kg (fairly low).

Table 5-3: Soil Analysis

Analytical Data			
Sample No	**1**	**2**	**3**
Depth(mm)	0 – 600	0 - 600	0 - 600
Texture	Sa	Sa	Sa
Net extractable cations (me/100g soil)			
Na	0.067	0.061	0.053
K	0.068	0.139	0.053
Ca	1.162	1.415	0.490
Mg	0.281	0.401	0.137
S value	1.577	2.016	0.733
T value(CEC)	3.965	4.742	4.718
Other analyses			
Clay (%)	3.20	4.00	3.50
CEC clay	49.28	50.40	20.94
pH water	6.94	6.76	5.47
P (mg/kg)	4.55	2.08	10.06

Analytical Data			
K (mg/kg)	26.59	54.35	20.72

5.5 Pre-mining land capability and land use

The criteria of the Chamber of Mines of South Africa, Guidelines of Rehabilitation were applied in order to classify the soil units (as depicted in Plan 8) into three land capability classes; arable and, grazing land and "disturbed area" (wilderness). The area and percentage of each land capability class is given in Table 5-4 below.

Table 5-4: Area percentage of each land capability class

Land capability class	Area (ha)	Area (%)
Arable	144.8	23.6
Grazing	62.9	10.3
Grazing(poor)	334.5	54.6
Disturbed Area(wilderness)	70.0	11.4
Total	**612.3**	**100.0**

The project area is situated on 'disturbed area' land capability class.

5.6 Land use

The current land use at Bankfontein 9 is mining and the construction of the proposed infrastructure is there to compliment the current operation. The majority of the project area has not been used previously for agriculture, with only a small area in the north of showing signs that maize and cultivated pastures had occurred in the past. Please refer to Plan 9 in Appendix 2.

5.7 Surface water

There are no rivers or streams found on or near the proposed mining area. The closest river is the Vaal River, which is approximately 3 km from the site. The 1:50 year flood

line is situated on the 1434m asl contour line and the proposed area to mined is at an altitude 1460 m to 1500m asl. The operations are, therefore, well outside the 1:50 year floodline as determined by Randwater. Please refer to Plan 10 in Appendix 2.

5.7.1 Surface water quantity

5.7.1.1 Catchment boundaries

The mine is located in the Vaal River catchment (tertiary catchment C22F).

5.7.1.2 Drainage

As the site is on a slight hill, it can be expected that any surface water runoff will flow away from the site in the following directions:

- West: towards the Taaibosspruit, which flows into the Vaal River;
- North-west, north-east and east: towards the Vaal River.

5.7.2 Surface water quality

No water samples were taken due to the lack of water on the site. As there is no surface water present on the site and none in the vicinity, the establishment of baseline surface water quality is not applicable to the EIA/EMP.

5.7.3 Surface water use

There is no surface water on site.

5.7.4 Water authority

The water authority for this region is the Free State Department of Water Affairs and Forestry (DWAF), now known as the Department of Water Affairs (DWA) situated in Bloemfontein.

5.7.5 Wetlands

There are no wetlands present on the current and proposed site.

5.8 Groundwater

5.8.1 General description of groundwater

Two aquifer types occur in the Vryheid formation. The first is the upper weathered aquifer which consists of transported or in-situ weathered material and is generally between 5 and 12 m thick. Highly variable recharge occurs over the area but generally values are between 1 and 3 % of Mean Annual Precipitation (MAP) (Hodgson and Krantz, 1998).

The second is the lower fractured Karoo aquifer which includes the underlying Ecca sediments. Water movement is along secondary structures as the pores are generally too well cemented to allow the permeation of water. The later intrusions of dolerite dykes and sills are important in characterising the flow system active within this aquifer as the cooling joints act as conduits. Intrusions are associated with existing structural features and in this case the dykes/sills act as impermeable boundaries. This aquifer is generally recharged by interflow from the weathered aquifer (Hodgson and Krantz, 1998).

5.8.2 Depth of water table

The regional groundwater levels in the area vary from approximately 5 m below surface in the topographically lower lying areas to a maximum of approximately 22 m below natural ground level.

5.8.3 Presence of boreholes and springs and their estimated yields

Groundwater yield is classed as low, with 83% of boreholes on record producing less than 2 l/s in the Vryheid Formation. (Harvest Potential Map, Vegter, 1996)

5.8.4 Groundwater quality

According to the regional analysis (Barnard, 2000) the quality of groundwater is indicated by the average EC value of 57 mS/m and the mean pH of 7.5. There is, however, a significant variation in the concentration of sodium, chloride and sulphate which indicates contamination by the coal mining activities already present in the area.

Anglo Operations Limited has been monitoring the borehole (BH2) on site for a number of years. Water quality data collected during the period March 2002 to March 2007 have been analysed visually by using Hydrochemical Software.

The predominant constituent found in these samples was sulphate followed by sodium chloride. Water quality appears to be relatively constant over the five year period with only minor fluctuation in alkalinity at the end of the data set; this fluctuation is causing the water quality to develop higher sulphur levels. Alkalinity is defined as the capacity of water to neutralise acid, thus the decrease of the total alkalinity will lower the pH and the water samples will become more acidic and sulphur dominated.

A sample has been taken since Copper Sunset operates on Bankfontein 9. The sample was taken in September 2009 and was sent for analysis. The results can be seen in Table 5-5. The analysis indicates a relatively high TDS (total dissolved solids) count, as well as sodium, conductivity and fluoride. None of the constituents, however, reach beyond Class II of the Department of Water Affairs drinking water standards.

5.8.5 Groundwater use

Use of groundwater in the area is mostly for mining purposes. Copper Sunset will be utilising groundwater to compensate for the expected 25% loss of water, which is expected to take place during the use of the washing plant. If required, depending on rainfall which will also contribute to the shorfall, a maximum of 25 000 litres will be required from the borehole if the complete 25% of water is lost per hour.

Table 5-5: Groundwater Quality Data taken in September '09

Sample ID		Total Dissolved Solids	Nitrate NO_3 as N	Chlorides as Cl	Total Alkalinity as $CaCO_3$	Sulphate as SO_4	Calcium as Ca	Magnesium as Mg	Sodium as Na	Potassium as K	Iron as Fe	Manganese as Mn	Conductivity at 25° C in mS/m	pH-Value at 25° C	Aluminium as Al	Free and Saline Ammonia as N	Fluoride as F
Class 0	(Ideal)	<450	<6.0	<100	N/S	<200	<80	<30	<100	<25	<0.01	<0.05	<70	6.0-9.0	<0.15	N/S	<0.5
Class I	(Acceptable)	450-1000	6.0-10.0	100-200	N/S	200-400	80-150	30-70	100-200	25-50	0.01-0.2	0.05-1.0	70-150	5-6 or 9.0-9.5	0.15-0.3	N/S	0.5-1
Class II	(Max. Allowable)	1000-2400	>10-20	200-600	N/S	400-600	150-300	70-100	00-400	0-100	0.2-2	0.1-1	150-370	4-5 or 9.5-10	>0.3-0.58	N/S	1-1.5
Class III	(Exceeding)	>2400	>20	>600	N/S	>600	>300	>100	>400	>100	>2	>1	>370	4 or >10	>0.58	N/S	>1.5
VAA 01		1158	<0.1	31	793	149	19.7	14.9	391	2.77	0.02	>0.01	177	7.65	0.05	>0.2	1.17

5.9 Air quality

Dust samples were previously recorded for the approved EMP. The samples were sent to the mine's laboratory for analysis. The results were then placed into a series of graphs and tables that best represent the data collected.

Table 5-6and Figure 5-4 shows the total fallout dust recorded from each sampler over the 14 day sampling period. The results obtained during this period were well within the recommended levels for industrial activity as shown in

Table 5-6: Total dust fall recorded for each sampler

Station 1	**Mg**	**mg/m^2/day**
North	18	54
East	20	60
South	15	43
West	18	54
Total	**71**	**211**
Station 2	**Mg**	**mg/m^2/day**
North	20	59
East	26	77
South	30	89
West	24	69
Total	**100**	**294**

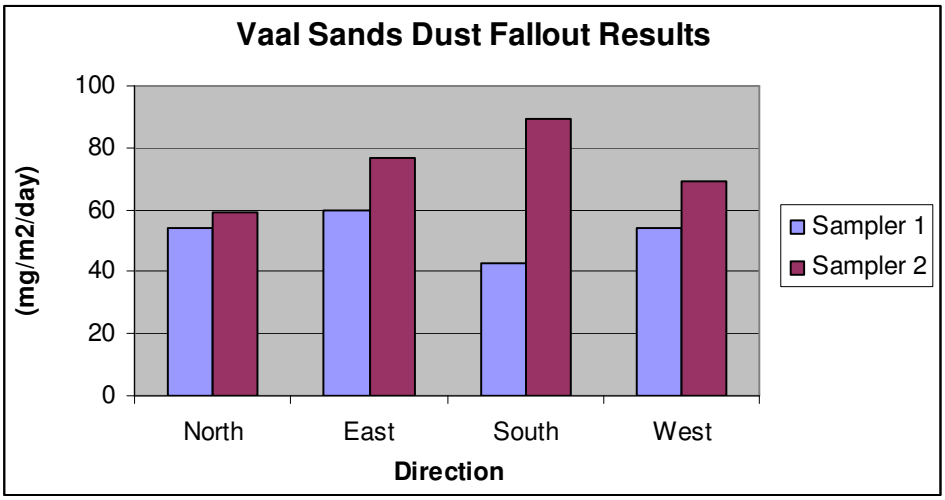

Figure 5-4: Total dust fall recorded for each sampler

Table 5-7: Dust fall, target, action and alert thresholds for dust deposition (SANS 1929:2005)

Level	Dust fall Rate (mg/m^2/day)	Permitted Frequency of Exceedances
Target	300	
Action residential	600	Three within any year, no two sequential months.
Action industrial	1 200	Three within any year not sequential months.
Alert threshold	2 400	None. First exceedance requires remediation and compulsory report to authorities.

Station 2 recorded the highest levels of fallout material during this sampling run. Several factors may have contributed to this including the amount of rainfall that occurred during this period. Station 2 was located in the northern side of the potential site and recorded levels of 294 mg/m²/day which are below the target level. Station 1 recorded slightly lower levels of 211 mg/m²/day.

These dust levels where recorded prior to mining operations commencing on site, and it is recommended that dust sampling be carried out to obtain current dust fall out levels.

5.10 Noise

A calibrated Quest (Model 2500) impulse and precision integrating sound level meter was used to determine the current noise levels on site. The results of these readings have been summarised in Table 5-8 below.

Table 5-8: Noise level results

Measurement point	Period	SANS 10103	L_{Aeq} (dBA)	Remarks
1	Day	70	40.0	Wind blowing. Quiet.
	Day	70	42.1	Birdsong. Wind blowing.
2	Day	70	40.5	Quiet. Wind blowing.
	Day	70	40.9	Quiet.
3	Day	70	40.9	Quiet. Wind blowing.
	Day	70	41.2	Bird song. Quiet.
4	Day	70	42.6	Quiet. Wind blowing.
	Day	70	43.8	Wind blowing.
5	Day	70	41.6	Quiet.
	Day	70	41.1	Quiet. Voices of people in distance.
6	Day	70	51.9	Car passes measurement point.
	Day	70	43.9	Voices of people in distance, otherwise quiet.

Based on the daytime results from the baseline environmental noise measurements it is noted that the Leq levels measured below the SANS guidelines for the maximum allowable outdoor daytime limit for ambient noise in rural districts. . The noise sources that were influencing the baseline measurements at the time of the noise survey were bird song as well as vehicular noise. The overall noise level is indicative of a rural district.

5.11 Natural vegetation / plant life

5.11.1 General description of the vegetation in the region

5.11.1.1 Description of the biome

The area falls in the Grassland Biome of South Africa (Rutherford & Westfall, 1986). The Grassland Biome is found on the high central plateau of South Africa, and the inland areas of Kwazulu-Natal and the Eastern Cape. The topography is mainly flat and rolling, but includes the escarpment itself. The altitude covered by this biome varies from near sea level to 2 850 m above sea level.

5.11.1.2 Description of the vegetation type

The specific bioregion is the Central Free State Grassland (Mucina & Rutherford, 2006). Its distribution is predominantly located in the Free State and into some parts of Gauteng. It stretches between Sasolburg and Dewetsdorp. Towns that are also closely linked with this bioregion are Kroonstad, Ventersburg, Steynsrus, Winburg, Lindley and Edenville.

The landscape generally consists of undulating plains supporting short grassland in its most natural state. The common grass in its natural state is the *Themeda triandra,* while in its more degraded state common grasses are *Eragrostis curvula and Eregrostis chloromelas*. When overgrazed and compacted by livestock the low-lying areas with heavy clay soils become susceptible to *Acacia karoo* encroachment.

5.11.2 General description of the vegetation at the project site

Disturbed grassland occurs at the site, surrounding the concrete base where the proposed washing plant will be constructed. There are a line of exotic trees found where the proposed settling dam is to be situated, and these trees are exotics. The project will allow for the elimination of the alien trees.

The grassland in this region is considered to be sourveld, primarily due to high rainfall (>625 mm per annum), cold winters, and slightly acidic soils. As such, these grasses are particularly unpalatable in winter with a low nutritional value (Low & Rebelo, 1996).

The mining area is almost completely surrounded by roads, train tracks or housing, which creates a large edge effect and subsequently very small areas of natural vegetation. This is exacerbated by the dumping of refuse on these natural areas. Variation within the northern section was very limited due to dumping, grazing and unplanned fires; therefore the one sample site within this area was adequate. Within the southern section the area seemed to be more heterogeneous, open fields and a large burnt area necessitating more sample sites. A summary and the location of the sample sites have been listed below (see Table 5-9). The location of the sample plots can be seen in Plan 11.

Table 5-9: Location and description of sample plots.

Site No.	Latitude	Longitude	Site Description
1	S 26° 45' 53.4"	E027° 58' 08.7"	In clump of trees
2	S 26° 45' 29.0"	E027° 57' 56.6"	Burnt area, mostly grassland, no trees
3	S 26° 46' 41.3"	E027° 58' 03.5"	Clump of trees surrounding uniform grassland
4	S 26° 45' 39.1"	E027° 57' 06.1"	Grassland used for dumping
5	S 26° 46' 20.7"	E027° 58' 15.5"	Uniform, old cultivated field
6	S 26° 45' 09.3"	E027° 56' 03.3"	Overgrazed grassland, dumping being done

5.11.3 Vegetation identified in the greater study area

Table 5-10 lists the main plant species found. Diagnostic species included *Cynodon dactylon,* which was the most common species found and occurred in all the sample plots, and *Hyparrhenia hirta*, which was found mostly along the unused dirt roads of the project area and is known to thrive in mismanaged veld areas

The majority of the grass species found were increaser species, which are predominantly pioneer or sub-climax species. This means they are the first or second category in plant succession making them hardy species, usually unpalatable in nature (Tainton, 1999).

Table 5-10: Main plant species found during the survey

Species	Common name	Ecological status	Status
Cynodon dactylon	Couch Grass	Increaser 2	Diagnostic
Hyparrhenia hirta	Common Thatching Grass	Increaser 1	Diagnostic
Monocimbian cyrisiforme	Boat grass	Climax decreaser	Dominant
Sporobolus africanus	Ratstail dropseed	Increaser 3	Dominant
Tagetes minuta	Tall Khaki Weed	Alien Invasive	Prominent

5.11.4 Exotic and invasive plant species recorded

The Conservation of Agricultural Resources Act regards weeds as alien plants with no known useful economic purpose that should be eradicated. Invader plants, also considered by the Act, are also of alien origin but may serve useful purposes as ornamentals, as sources of timber, or may have other benefits. These plants need to be managed in order to prevent them from spreading.

The exotic and invader species found in the study area are listed in Table 5-11, where Category 1 implies a significant impact and Category 3 a minimal impact.

Table 5-11: Exotic and invasive species recorded during the survey

Species	Common name	Ecological status	Growth form
Bidens pilosa	Common Black-jack	Not Listed	Herb

Species	Common name	Ecological status	Growth form
Eucalyptus camaldulensis	Red River Gum	Cat. 2	Tree
Tagetes minuta	Tall Khaki Weed	Not Listed	Herb
Cotoneaster lacteus	Showberry	Not Listed	Shrub
Opuntia ficus-indica	Sweet Prickly pear	Cat. 1	Succulent shrub
Pinus patula	Patula pine	Cat. 2	Tree
Populus x canscens	Grey poplar	Cat. 3	Tree
Conyza bonariensis	Horseweed	Not Listed	Herb

5.11.5 Red data plant species

No red data plant species were recorded during the survey.

5.12 Animal life

5.12.1 Mammals observed and recorded in the study area

Signs of three mammal species, *Lepus saxatilis* (shrub/savanah hare), a Mongoose species and a Steenbok (*Raphicerus campestris*) were recorded during the field survey. Due to the disturbance of the natural vegetation and the large amount of human activity on and around the site, it is not expected that any of the primates, larger carnivores or Artiodactyla will be present.

5.12.1.1 Red data mammals

No red data mammal species were recorded during the survey. Given the anthropogenic activities surrounding the site, which includes housing, roads and agricultural land, the presence of these animals is highly unlikely.

5.12.2 Birds

A total of 10 birds were recorded during the survey. All birds observed and recorded during the survey are listed in Table 5-12. The mobility of birds and their large home ranges means the actual observed species are not the only bird species that could occur in the area. Furthermore the timing of the survey, which was in the late dry season, means food items for these birds would have been scarce forcing them to forage over a larger area and making sightings more difficult. The birds which could possible occur in the area are listed in Appendix 3.

Table 5-12: Bird species observed

Scientific name	Common name	Status	Plot found
Vanellus armatus	Blacksmith Plover	Common resident	1
Euplectes orix	Red Bishop	Common resident	1
Vanellus coronatus	Crowned Plover	Common resident	1
Euplectes progne	Long-tailed Widowbird	Resident	3
Colius striatus	Mouse bird	Common resident	2
Bubulcus ibis	Cattle egret	Common resident	1
Acridotheres tristis	Indian myna	Common resident	2
Streptopelia capicola	Cape Turtle-Dove	Common resident	5

5.12.2.1 Red data birds

No red data or endangered bird species were observed during the survey. The fact that common resident species were scarce indicates that rare species will be very unlikely to occur here (Barnes, 2000).

5.12.3 Reptiles

The presence of reptiles in the area, specifically snakes, was confirmed, some visually and others through indicators such as shedded snake skin. A Mozambican spitting cobra (*Naja mossambica*) was observed by the soil scientist . Human presence has meant an increase in the rodent population. These rodents, being a cornerstone in the cobra diet, would have meant a steady food supply for the snakes. Other snakes could also occur on the site for the same reason, if habitat requirements permit. During the survey one snake was seen that could possibly have been a Brown House snake (*Lamprophis fuliginosus*) although it could not be positively identified.

5.12.4 Frogs

No frogs were sighted or heard during the animal survey. This could be attributed to the the lack of surface water found at the site.

5.13 Sites of archaeological ad cultural interest

A Heritage Impact Assessment (HIA) was completed in 2007 for the approved EMP. In accordance with the National Heritage Resources Act (Act 25 of 1999 – NHRA), a HIA comprises of archival, historical and cartographic data, representing valuable supporting tools in discovering and identifying significant archaeological and heritage resources (Matakoma, 2006).

During the archaeological and heritage survey, three sites of archaeological and heritage significance were found within the footprint of the proposed mining area. According to the current mining plans for the proposed project, site MHC003 will be protected from mining related developments (Plan 12). If this option is not viable, it is recommended that site MHC003 be re-evaluated when vegetation conditions makes it possible for better visibility of the area.

All three archaeological sites found in the study area are not found in the project area, and will therefore not be impacted by the amendment of the mining plan and inclusion of the washing plant.

5.14 Sensitive landscapes

There are no sensitive areas around the proposed mining area. The study area has been historically mined and majority is disturbed, resulting in the presence of sensitive area having being disturbed during previous land uses.

5.15 Visual aspects

Visually, the area of interest consists of an open field with grass and trees. There is a concrete floor where the proposed washing plant is to be situated. Abandoned buildings can be seen from the project area. These buildings are currently being demolished or being secured for security reasons.

There is however, the Bertha Village that lies to the west of the site, which houses employees from the Anglo coal mine as well as the ESKOM power station. Large ESKOM power lines run through the centre of the proposed area, north of the Bertha Village and are clearly visible on site.

The project site is situated in such a way that form the main road which runs adjacent to the Copper Sunset mining operation, the washing plant and associated infrastructure can not be seen. The project area can only be seen from in side the mining site.

5.16 Traffic and Safety

The R82 and the R716 are the main routes in the vicinity of the proposed mine. The R716 links up with the R82 which is linked to Vereeniging. There are currently approximately 200 trucks leaving the mining site daily. These trucks vary in size from $4m^3$ – $22m^3$.

With the introduction of the washing process, the traffic is expected to increase to approximately 220 trucks per day, with the sizes of these trucks remaining the same.

5.17 Regional socio-economic structure

5.17.1 Population density, growth and location

Within the Metsimaholo municipality, the total population was estimated at 177 500 in 2001. Population influxes have tended to occur in the Sasolburg and Denysville areas due to the presence of mining activities and perceived job opportunities. In terms of racial population distribution, the following figure shows that Black people from the majority of the population within Metsimaholo, being followed by White people and minimal Asian and Coloured populations as seen in

Figure 5-5.

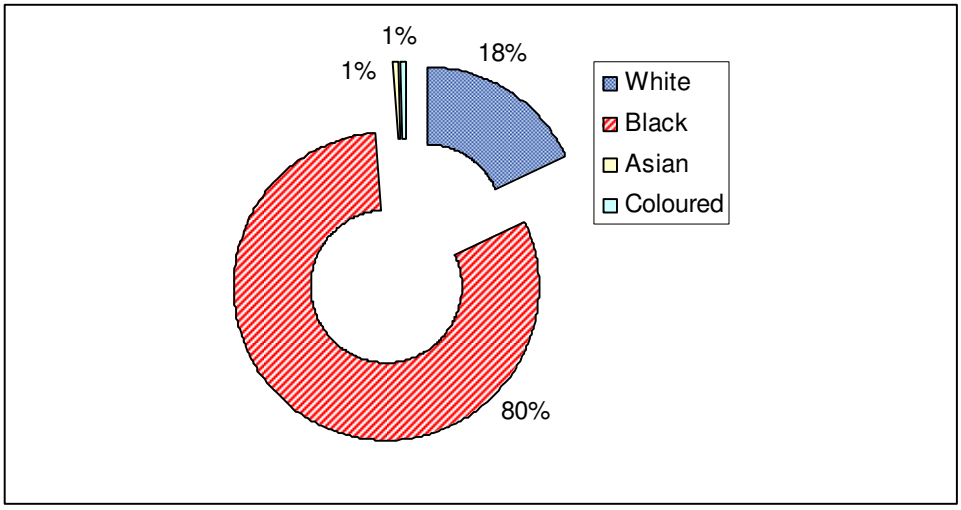

Figure 5-5: Population composition within Metsimaholo, 2001

5.17.2 Major economic activities and sources of employment

While mining and industry dominate the Sasolburg and Denysville area of the municipality, agricultural activities tend to dominate the remainder of the region. A fairly significant portion of the area is currently under cultivation, with this being attributed to the relative availability of water for irrigation purposes. Stock farming dominates this sector (46%), focusing primarily on grazing and dairy farming. In terms of plant products, maize, sunflowers and sorghum tend to be the most popular crops.

5.17.3 Unemployment estimate for the area

Unemployment rates within the local municipality vary greatly, depending on the exact location and its proximity to the industrial and mining hubs of the area. Sasolburg, for example, experiences unemployment of less than 20%, while areas such as Zamdela and Metsimoholo experience between 58% – 70% unemployment. Rural areas tend to be isolated from access to employment opportunities, thus these households generally display lower income levels and higher levels of poverty.

5.17.4 Housing – demand and availability

The figure below (

Figure 5-6) provides a depiction of the type of housing available within the Metsimaholo municipal area as a whole.

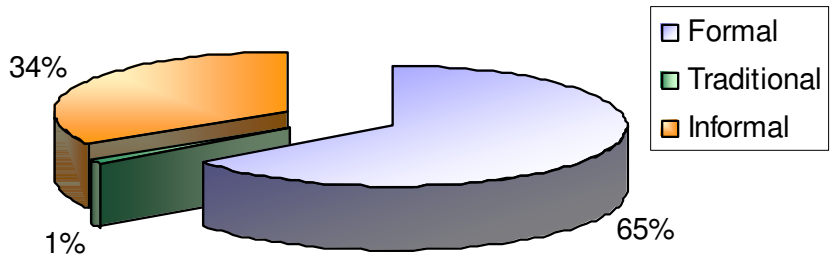

Figure 5-6: Housing availability within Metsimaholo, 2001

It can be seen that the majority of the population has access to formal housing in the municipality (approximately 65%). It should be noted, however, that 1% of the population is still occupying traditional housing structures, and that 34% are living

informally in dwellings of which the construction varies from wood or iron shacks to cardboard and plastic structures.

5.17.5 Social infrastructure

The Metsimaholo area is equipped with 21 Primary Schools and 9 Secondary Schools. In general, the teacher:learner ratio within these facilities is regarded to be acceptable, although the quality of school buildings and relevant equipment is seen to be problematic.

There is currently one hospital situated within the Metsimaholo local region, namely the Sasolburg Hospital. Eight fixed clinics are also situated in the area, as well as one community health centre. This provision is not sufficient when one considers the total population of the area. Community members have prioritised the provision of an HIV/AIDS centre for orphans, as well as increased HIV/AIDS awareness programmes within communities.

Within the existing health facilities, a lack of equipment and low maintenance of infrastructure have been identified as challenges, as has the under-resourcing of facilities in terms of available staff members.

5.17.6 Water supply

The diagram below (

Figure 5-7) provides a depiction of the level of water provision available within Metsimaholo.

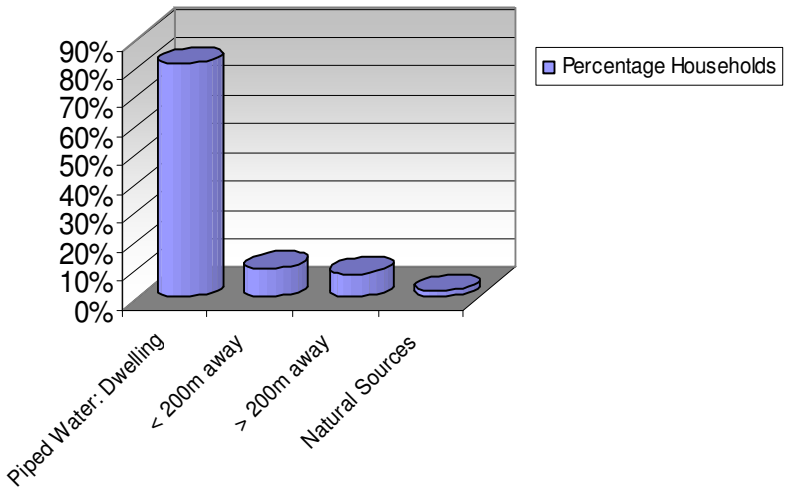

Figure 5-7: Level of water provision within Metsimaholo, 2001

It can be seen from the above figure that the regional population generally has access to good quality piped water within their households. Only approximately 10% of people receive a water supply which is considered to be below Reconstruction and Development Programme (RDP) standards.

5.17.7 Power supply

It can be seen in Figure 5-8 below that the majority of households within Metsimaholo have access to electricity for lighting purposes, while 21% still rely on the use of candles for this purpose.

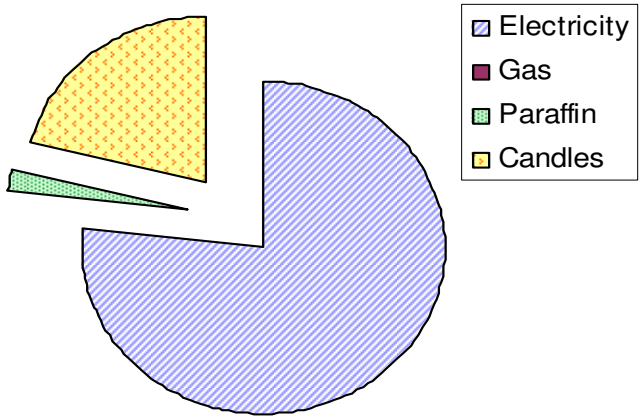

Figure 5-8: Electricity provision within Metsimaholo, 2001

Current electricity shortages within the country as a whole have meant that the local IDP document prioritises electricity-use awareness campaigns to encourage the conservative use of this resource. Communities have also cited the provision of electricity to rural areas as being a challenge, as well as the provision of adequate street- and area lighting. The upgrading of the existing system is important in the immediate area of Bankfontein's operation

5.18 Interested and affected parties

The following organisations and individuals are considered to be the key stakeholders for Copper Sunset's operation. A full Interested and Affected Party (I&AP) register is included in the Public Participation Process (PPP) Report (Appendix 4).

- The Department of Mineral & Energy;
- The Department of Water Affairs and Forestry;
- The Department of Environment Affairs and Tourism;
- The Department of Health;
- Fezile Dabi Municipality;

- Metsimaholo Municipality;
- Community and Social Development;
- Sasolburg Chamber of Commerce;
- Save the Vaal;
- Community Health Clinic;
- Mine Workers Union; and
- Vaalpark Residents Association.

6 PUBLIC PARTICIPATION PROCESS

Public participation involves those interested in, or affected by the proposed development in highlighting issues of concern and in assisting the project designers to take account of locally relevant conditions as opposed to imposing a socially and environmentally insensitive design onto an environment. The following section details the Public Participation Process (PPP) that has been followed for this project.

6.1 Methodology

The participation process undertaken is discussed below.

6.1.1 Site Inspection

A site inspection of the proposed site and surrounding environment was undertaken in May 2007. The site visit aimed at gaining a broad overview of the settlements and geography of the project area to assist in developing an appropriate PPP for the project.

6.1.2 Identification of Interested and Affected Parties (I&APs)

I&APs were identified at the start of the project by means of Windeed searches, networking and from previous projects undertaken in the area. Identification of I&APs also took place through responses to newspaper advertisements. (Refer to Appendix 4 for the detailed list of I&APs).

Two I&AP groups were identified.

6.1.2.1 Authorities

The I&AP authority group can be split into provincial and local. These are listed below (the first four bullets refer to provincial structures and the remaining two refer to local structures):

- Department of Economic Development, Environment and Tourism (DEDET);

- Department of Health (DH);
- Department of Mineral Resources (DMR);
- Department of Water Affairs (DoWA);
- Fezile Dabi District Municipality; and
- Metsimaholo Local Municipality.

6.1.2.2 Public

The second group is the general public and is listed as follows:

- Property owners;
- Residents;
- Neighbouring mines;
- Commerce and industry;
- Environmental groups; and
- Ward councillors.

A list of directly affected and surrounding landowners is provided in Table 6-1 and the land tenure map (Appendix A of Appendix 4) shows where the directly affected and surrounding landowners and occupiers are situated.

Table 6-1: Directly affected and surrounding landowners / occupiers

Farm name	**Ptn Number**	**Name of Landowner/ Occupant**
Bankfontein 9 Heilbron RD	RE	Anglo Operations ltd
Bankfontein 9 Heilbron RD	7, 11, 12, 18, 23	Home Start Real Estates CC
Bankfontein 9 Heilbron RD	17	Rosherville Properties Pty Ltd
Lethabo Power Station 1814 Heilbron	RE	Eskom Holdings

Farm name	Ptn Number	Name of Landowner/ Occupant
RD		
Maccaw Vlei 121 Heolbron RD	RE	Anglo Operations Ltd
Modderfontein 1279 Heilbron RD	RE	Jacob van Niekerk
Rietfontein 152 Heilbron RD	RE	Anglo Operations
Zandfontein 259 Heilbron RD	RE, 5	Anglo Operations
Zandfontein 259 Heilbron RD	3, 8, 14	Home Start Real Estates CC
Zandfontein 259 Heilbron RD	13	Rosherville Properties Pty Ltd

6.2 Documentation developed

Various information sharing documents were compiled in order to distribute information about the proposed project to I&APs. The documentation developed is described below and the documents can be found in Appendix 4.

6.2.1 Background information document

A Background Information Document (BID) was compiled and distributed to all I&APs. The BID included information regarding the locality and extent of the proposed project, a description of the project, as well as the Environmental Authorisation and PPP that would be followed.

A call for comments letter and registration sheet were included as part of the BID. This provided people with an opportunity to raise any issues, comments, and concerns regarding the proposed project, and requested people to register as I&APs.

6.2.2 Newspaper advertisement and on-site notice boards

In compliance with environmental regulations, a newspaper advertisement was published in the 'Vaal Weekly' on 31 March 2010 to advertise the Section 102 Amendment to the existing EMPR.

A newspaper advertisement was published on 8 September 2010 to advise I&APs that the Section 102 Amended EMPR was available for public review.

6.3 Consultation with stakeholders

6.3.1 Meetings

No meetings were held with stakeholders as this project is a Section 102 Amendment to an existing EMP and meetings are not required by the MPRDA. No requests for meetings were made by I&APs.

6.4 Amended EIA/EMP Report

The EIA/EMP report will be made available for comment from 13 September 2010 to 13 October 2010 at the following venues;

- Metsimaholo public library;
- Copper Sunset, Farm Bankfontein 9 HD;
- Digby Wells website www.digbywells.co.za; and
- A Compact Disc (CD) of the report will be made available to I&APs on request.

The draft EMP Report will be made available for review for 30 days. I&APs were informed of the availability of the EMP, PPP reports by E-mail, Fax and Post from 9th to 10th of September 2010. This review period gave I&APs a further opportunity to give inputs into the process, and to ensure that their issues, comments and concerns have been included and addressed in the EMP.

No comments were received from the public on the EMP Report.

6.5 Telephonic and written consultation

No Telephonic or written correspondence was received from I&APs throughout this project.

6.6 Notification of record of decision

Once Environmental Authorisation (Record of Decision) has been issued by the relevant authority all registered I&APs will be notified of the decision and the appeal procedure.

6.7 Findings

Very little interest by I&APs was shown in this project. Only two registration forms were returned. The registration form from New Vaal Colliery had no comments or concerns listed. The registration form received from Mons Farm had one concern which is discussed below in Table 6-2. There are no developments close to the project area except for the Lethabo Power Plant.

Table 6-2: Issues table

Reference	Name & Organisation	Issue Raised	Response
Registration form: 19-04-201-	Marius Parodi: Mons Farms	The farm has a borehole which is very fragile and it supplies water for farming and domestic use. The water table in the area is low and should large quantities of water be pumped out the borehole may dry up.	Copper Sunset are under the impression that the borehole referred to in this comment is not situated on the project area, and is not the borehole which the operation will be using. The water abstracted will be from the underground workings and the volume is minimal, as the majority of the water used is recycled through the process.

A public participation process applicable for this project was initiated and continued throughout the environmental authorisation process. It presented I&APs with relevant and accessible project information as it became available. Only one I&AP made any comments regarding the project. These comments have been addressed in the relevant section of the EMP.

7 ASSESSMENT OF ENVIRONMENTAL IMPACTS RESULTING FROM IDENTIFIED ALTERNATIVE LAND USE AND DEVELOPMENTS

In accordance with the MPRDA, alternative land uses in the area must be identified and their potential impacts on the environment identified, however, a mining right application has already been granted for the operation. This amendment deals with an area which falls within the existing mining right

7.1 Potential alternative land use and developments

The site is currently being mined. The introduction of the proposed infrastructure is aimed to contribute to the current land use, therefore, no alternative land uses could be considered.

7.2 Comparative impact assessment

For purposes of the comparative assessment, the rating process that is followed to provide a relative indication of the environmental significance of anticipated impacts for agriculture and housing is not as rigorous as the numerical process that is followed for mining impacts below, but is still based on the accepted risk assessment methodology of "Risk = Probability x Consequence". The environmental significance indicated for each aspect for mining is obtained from the post-mitigation significance rating obtained from the EIA in section 8, below. The methodology followed for the rating of agricultural and housing impacts is the same as the methodology that was followed for the EIA.

It must be noted that this amendment is compiled for the area to be affected by the wash plant and all related dams. The area is small and can not be effectively used for agriculture or housing and, the addition of washing plant will compliment the current operation.

Table 7-1: Summary of comparative impact assessment

	Washing plant and Associated Infrastructure (adding to mining)	Agriculture (stock & crop)	Housing
Topography	Issue: Topography will have to be reshaped. Permanent, negative impact of moderate severity. Medium-low significance.	Negligible or no impact.	Negligible or no impact.
Geology	Negligible or no impact	Negligible or no impact.	Negligible or no impact.
Soil	Issue: Soil disturbance and erosion. Possible medium term, negative impact of moderate severity, however the soild in the project area are in a 'disturbed state'. Low significance.	Issue: Grazing and crop farming may cause loss of soil through erosion and compaction of soil as well as nutrient depletion. Possible medium-short term, site specific, negative impact of moderate severity. Medium-low significance.	Issue: Soil loss through compaction, erosion and the construction of houses and roads may occur. Possible medium-long term, site specific, negative impact of moderate severity. Medium-low significance.
Surface water	Issue: Contamination through hydrocarbon spillages and high count of total dissolved solids. Possible medium term,	Issue: Fertiliser, pesticides and animal waste in surface water. Possible medium-	Issue: Domestic waste/effluent and household chemical compounds in surface water.

	Washing plant and Associated Infrastructure (adding to mining)	Agriculture (stock & crop)	Housing
	negative impact of moderate severity. Medium-low significance.	short term, local, negative impact of moderate severity. Medium-low significance.	Possible long term, site specific, negative impact of moderate severity. Medium-low significance.
Groundwater	Issue: Contamination of groundwater through hydrocarbon spillages, incorrect disposal of the different waste streams, and decrease in groundwater table due to use of groundwater for the washing plant operation Short term, negative impact of moderate severity. Medium significance.	Issue: Fertiliser, pesticides and animal waste in groundwater, and use of groundwater for irrigation Possible medium term, local, negative impact of moderate severity. Medium significance.	Issue: Domestic waste/effluent and household chemical compounds in groundwater. Possible medium term, site specific, negative impact of moderate severity. Low significance.
Land Capability and Land Use	Issue: Surface disturbance Possible medium term, negative impact with low severity. Low significance.	Issue: Poor farming practices may decrease land capability through erosion and nutrient reduction. Possible medium-short term, site specific, negative impact of moderate	Issue: Production land will be reduced. Possible permanent, local, long term negative impact that will cause serious impairment of the ecosystems. High significance.

	Washing plant and Associated Infrastructure (adding to mining)	Agriculture (stock & crop)	Housing
		severity. Low significance.	
Air quality	Issue: Dust will be generated by earth moving equipment and operation of the washing plant. Possible short term, negative impact. Low significance.	Issue: The use of agricultural implements e.g. ploughing will increase dust levels. Possible medium-short term, site specific, negative impact. Low significance.	Issue: Construction of houses may cause a temporary increase in dust levels. Possible short term, insignificant site specific, negative impact. Low significance.
Noise	Issue: Increase in noise levels could lead to species migration. Impact is expected to be short term and moderately negative, and the area is currently being impacted by mining. Medium-low significance.	Issue: Noise levels will increase with the use of farming implements. Possible short term, site specific, insignificant, negative impact. Low significance.	Issue: Noise associated with human habitation. Possible permanent, local, negative impact. Medium-low significance.
Animal life	Issue: Increasing footprint of mine may result in species migration. Possible medium-short term,	Issue: Farming activities may cause a decrease in habitat due to grazing/lands.	Issue: Expansion of housing may cause a reduction in habitat. Possible permanent,

	Washing plant and Associated Infrastructure (adding to mining)	Agriculture (stock & crop)	Housing
	negative impact of minor severity. Medium-low significance.	Possible medium term, site specific, negative impact of moderate severity. Medium-low significance.	site specific, negative impact of moderate severity. High significance.
Vegetation	Issue: Loss of vegetation. Possible medium-short term, negative impact of minor severity. Medium-low significance.	Issue: Farming activities may cause a reduction of indigenous plant species due to grazing/lands. Possible medium term, site specific, negative impact. Medium-low significance.	Issue: Expansion of housing may cause reduction in indigenous plant species. Possible permanent, site specific, negative impact of moderate severity. High significance.
Regional socio-economic structure	Issue: Possible opportunity for employment to locals. Positive impact of medium-high significance	Issue: No change expected	Issue: No change expected

8 POTENTIAL ENVIRONMENTAL IMPACTS

This section identifies potential impacts of the construction of a new washing plant, settling dam and a return water dam. Please note that these impacts have been based upon specialist studies baseline information conducted during 2007 for the current approved EMP.

8.1 Significance Assessment Methodology

In order to clarify the purpose and limitations of the impact assessment methodology, it is necessary to address the issue of subjectivity in the assessment of the significance of environmental impacts. Even though Digby Wells and the majority of environmental impact assessment practitioners, propose a numerical methodology for impact assessment, one has to accept that the process of environmental significance determination is inherently subjective. The weight assigned to the each factor of a potential impact, and also the design of the rating process itself, is based on the values and perception of risk of members of the assessment team, as well as that of the I&AP's and authorities who provide input into the process. Whereas the determination of the spatial scale and the duration of impacts are to some extent amenable to scientific enquiry, the severity value assigned to impacts is highly dependent on the perceptions and values of all involved.

It is for this reason that it is crucial that all environmental impact assessments (EIA's) make reference to the environmental and socio-economic context of the proposed activity in order to reach an acceptable rating of the significance of impacts. Similarly, the perception of the probability of an impact occurring is dependent on perceptions, aversion to risk and availability of information.

It has to be stressed that the purpose of the EIA process is not to provide an incontrovertible rating of the significance of various aspects, but rather to provide a structured, traceable and defendable methodology of rating the relative significance of impacts in a specific context. The methodology employed for environmental impact assessment is divided into two distinct phases, namely, impact identification and impact assessment.

8.2 Impact Identification

Impact identification is performed by use of an Input-Output model which serves to guide the assessor in assessing all the potential instances of ecological and socio-economic change, pollution and resource consumption that may be associated with the activities required during the construction, operational, closure and post-closure phases of the project.

Outputs may generally be described as any changes to the biophysical and socio-economic environments, both positive and negative in nature, and also include the product and waste produced by the activity. Negative impacts could include gases, effluents, dust, noise, vibration, other pollution and changes to the bio-physical environment such as damage to habitats or reduction in surface water quantity. Positive impacts may include the removal of invasive vegetation, construction of infrastructure, skills transfer or benefits to the socio-economic environment. During the determination of outputs, the effect of outputs on the various components of the environment (e.g. topography, water quality, etc.) is considered.

During consultation with I&APs perceived impacts were identified. These perceived impacts will become part of the impact assessment and significance rating in order to differentiate between probable impacts and perceived impacts.

8.3 Impact Rating

The impact rating process is designed to provide a numerical rating of the various environmental impacts identified by use of the Input-Output model. As discussed above, it has to be stressed that the purpose of the EIA process is not to provide an incontrovertible rating of the significance of various aspects, but rather to provide a structured, traceable and defendable methodology of rating the relative significance of impacts in a specific context. This gives the project proponent a greater understanding of the impacts of his project and the issues which need to be addressed by mitigation and also give the regulators information on which to base their decisions.

The equations and calculations were deviated using Aucamp (2009).

The significance rating process follows the established impact/risk assessment formula:

Significance = Consequence x Probability

Where *Consequence = Severity + Spatial Scale + Duration*

And *Probability = Likelihood of an impact occurring*

The matrix calculates the rating out of 147, whereby Severity, Spatial Scale, duration and probability is rated out of seven. The weight assigned to the various parameters for positive and negative impacts in the formula.

Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in the EMP. The significance of an impact is then determined and categorised into one of four categories, as indicated in Table 8-1, which is extracted from Figure 8-1. In accordance with Regulation 51 of the MPRDA, management actions will be assigned for all identified impacts. The impact assessments parameters are described in Table 8-2.

Table 8-1: Significance threshold limits

Significance		
High	**108- 147**	
Medium-High	**73 - 107**	
Medium-Low	**36 - 72**	
Low	**0 - 35**	

Significance

Probability / Likelihood	Consequence (severity + scale + duration)								
	1	3	5	7	9	11	15	18	21
1	1	3	5	7	9	11	15	18	21
2	2	6	10	14	18	22	30	36	42
3	3	9	15	21	27	33	45	54	63
4	4	12	20	28	36	44	60	72	84
5	5	15	25	35	45	55	75	90	105
6	6	18	30	42	54	66	90	108	126
7	7	21	35	49	63	77	105	126	147

Figure 8-1: Probability Consequence Matrix

Table 8-2: Impact assessment parameter ratings

Rating	Severity		Spatial scale	Duration	Probability
	Environmental	Social, cultural and heritage			
7	Very significant impact on the environment. Irreparable damage to highly valued species, habitat or eco system. Persistent severe damage.	Irreparable damage to highly valued items of great cultural significance or complete breakdown of social order.	International The effect will occur across international borders	Permanent: No Mitigation No mitigation measures of natural process will reduce the impact after implementation.	Certain/ Definite. The impact will occur regardless of the implementation of any preventative or corrective actions.
6	Significant impact on highly valued species, habitat or ecosystem.	Irreparable damage to highly valued items of cultural significance or breakdown of social order.	National Will affect the entire country	Permanent: Mitigation Mitigation measures of natural process will reduce the	Almost certain/Highly probable It is most likely that the impact will occur.

Rating	Severity		Spatial scale	Duration	Probability
	Environmental	Social, cultural and heritage			
				impact.	
5	Very serious, long-term environmental impairment of ecosystem function that may take several years to rehabilitate	Very serious widespread social impacts. Irreparable damage to highly valued items	Province/ Region Will effect the entire province or region	Project Life The impact will cease after the operational life span of the project.	LikelyThe impact may occur.
4	Serious medium term environmental effects. Environmental damage can be reversed in less than a year	On-going serious social issues. Significant damage to structures / items of cultural significance	Municipal Area Will affect the whole municipal area	Long term 6-15 years	Probable Has occurred here or elsewhere and could therefore occur.
3	Moderate, short-term effects but not affecting ecosystem function. Rehabilitation requires intervention of	Ongoing social issues. Damage to items of cultural significance.	Local Local extending only as far as the development site area	Medium term 1-5 years	Unlikely Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that

Rating	Severity		Spatial scale	Duration	Probability
	Environmental	**Social, cultural and heritage**			
	external specialists and can be done in less than a month.				the impact will occur.
2	Minor effects on biological or physical environment. Environmental damage can be rehabilitated internally with/ without help of external consultants.	Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Limited Limited to the site and its immediate surroundings	Short term Less than 1 year	Rare/ improbable Conceivable, but only in extreme circumstances and/ or has not happened during lifetime of the project but has happened elsewhere. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures
1	Limited damage to minimal area of low significance, (eg ad hoc spills within plant area). Will have no	Low-level repairable damage to commonplace structures.	Very limited Limited to specific isolated parts of the site.	Immediate Less than 1 month	Highly unlikely/None Expected never to happen.

Rating	Severity		Spatial scale	Duration	Probability
	Environmental	Social, cultural and heritage			
	impact on the environment.				

The below description are for the introduction of the additional infrastructure and not the entire mining operation, as a full impact assessment was carried out for the mining right application. Please see Appendix 5 for the impact matrix.

8.4 Construction Phase

8.4.1 Topography

The topography of the site will experience a slight impact. The concrete base has been in existence prior to the mining right being granted to Copper Sunset under the former Vaal Sands. The washing plant will be constructed on the concrete base.

The topography will be altered with the construction of the settling dam wall and the RWD. An earth wall will be constructed at the deepest point of the settling dam so as to contain the silted water extracted from the washing plant. The earth excavated to deepen the settling pond will be used to construct the earth wall of the dam. The earth excavated for the RWD will be used as earth walls to act as berm walls surrounding the RWD.

8.4.2 Geology

No impacts are expected.

8.4.3 Soil

The potential impact on soil during the construction phase will be from the settling dam and the RWD. The soil will be disturbed by the deepening of the dams and it will be exposed to erosion of wind and water. This will occur when the soil is used to construct

the earth walls. These will be exposed due to a lack in vegetation, where the roots of plants bind the soil together. This impact is expected to be of low significance.

Other impacts that may result during construction are oil leakages from the machinery. This impact is expected to be of medium-low significance.

8.4.4 Land capability and land use

The deterioration and destruction of soil will lead to an impacted land capability.

The land use will be changed from natural veld or grassland to that of mining, however, it must be noted, that the area around the site is currently being mined. This will run its course until the end of life for the mine.

8.4.5 Ground and surface water

Ground and surface water may be impacted by contamination through hydrocarbon spillages or leaks from machinery on site. The contamination may filter through the soil and into the groundwater or alternatively may be washed away with the surface run-off. The significance of this impact is expected to be low.

8.4.6 Air quality

Dust levels on site will be raised during the construction phase due to the increase in vehicle and machine activity. Depending on the timing of construction, the impact may be exacerbated during the winter months thereby increasing the ability for dust particles to become airborne. The clearing of vegetation and stripping of any topsoils during this phase will contribute to dust generation. Dust suppression measures should be put in place to minimise this impact.

The impact will be of medium-high significance due to the risk to human health both on site and offsite in the surrounding communities. A dust management programme will decrease the significance of the impact to medium-low.

8.4.7 Noise

Noise levels will increase during the construction phase. The increase will only occur during the daylight hours when construction occurs.

8.4.8 Flora

Construction of the settling dam and RWD will involve the removal of vegetation. The proposed construction site would require the elimination of the exotic trees and the removal of grasses. The vegetation will also be impacted on by dust generation. Dust will be deposited on leaves, which affects transpiration and photosynthesis. Closure of stomata means there will be little or no respiration and this may lead to death of the plants, especially in winter or dry seasons when there is no rain. The impact is expected to be low, as the washing plant will be constructed on a existing concrete floor and the associated infrastructure will be constructed is a small area, of disturbed grassland.

8.4.9 Fauna

The noise created by the vehicles and the machines may result in the fauna of the area migrating away from the site. The effect may also be exacerbated by the natural vegetation being destroyed, therefore, a smaller habitat will result in animals migrating to find new habitats. It must, however noted that the area is currently being used for mining and the fauna of the area would have moved due to the current operations, therefore, the addition of the washing plant is expected to have a low impact.

8.4.10 Sites of archaeological and cultural interest

No sites of archaeological or cultural interest will be impacted on by the construction activities.

8.4.11 Sensitive landscapes

There are no sensitive landscapes in the area. No impacts are expected.

8.4.12 Visual aspects

The construction of the washing plant and dams will have a moderate, negative impact on the local population.

8.4.13 Regional socio-economic structure

During the construction phase a slight increase in employment opportunities may result for construction contractors situated in the region. Due to the fact that only a small amount of infrastructure will be constructed on site, and the small scale of the operations, the total benefit of the construction phase will not be highly significant.

8.4.14 Interested and affected parties

Activities related to construction will likely cause increases in the amount of dust and noise in the directly adjacent areas. This will slightly affect nearby stakeholders in as far as the enjoyment of their properties is concerned and dust may also have impacts where crop production is concerned. However, this impact will be extremely limited in nature due to the isolation of the proposed construction site as well as the low level of human activity in the nearby area.

The presence of contractors during the construction phase of the project is expected to slightly affect IAPs with regard to trespassing and security issues.

8.5 Operational Phase

8.5.1 Topography

No impacts are expected.

8.5.2 Geology

No impacts are expected.

8.5.3 Soils

The removal of vegetation during the construction phase may leave the soil exposed during the operational phase. Bare earth walls will experience wind and water erosion. Without vegetation these walls will be subjected to increased surface run-off and winds. Thus this may compromise the integrity of the dam walls.

Hydrocarbon spillages may occur from the use of the front-end loader tipping excavated sand from the pit into the ore bin. If a spillage occurs this will contaminate and pollute the soil profile.

The soil at the project site is already disturbed. The impact of the operation of the washing plant is expected to be medium.

8.5.4 Ground and surface water

Hydrocarbon spillages may occur as a result from both the front-end loader and from trucks collecting general sand. These potential spillages may negatively impact on both the surface and ground water quality of the area. This is expected to medium-low.

The groundwater regime will be impacted upon by water abstraction from the borehole. This water will be abstracted to supplement the return water dam, should insufficient volumes be available in the RWD.

8.5.5 Land capability and Land Use

No impacts are expected.

8.5.6 Air quality

During the operational phase the most dust will be produced by vehicle and machinery movement around the site. Target areas for dust suppression should be the haul roads, loading areas and hopper as these are the areas of most activity and the areas most prone to producing fallout dust. Dust suppression measures should be in place.

8.5.7 Noise

During the operational phase the noise levels will increase due to the use of machinery and trucks. The noise will be restricted to the daylight hours as no mining is expected to take place after dark.

8.5.8 Flora

Dust created during the collection of sand from the washing plant may have a negative effect on vegetation due to dust deposition on leaves, which affects transpiration and photosynthesis.

8.5.9 Fauna

Noise created during operation will cause animals, birds and reptiles to avoid the site as far as possible, however, with the current mining be carried out on site, the impact is expected be low in significance

8.5.10 Sites of archaeological and cultural interest

There are no sites in the project area, and there for no impacts are forseen.

8.5.11 Sensitive landscapes

There are no sensitive landscapes in the area. No impacts are expected.

8.5.12 Visual aspects

The washing plant will be visible and will have a negative impact, however, the area where the proposed construction will take place is not visible from the road, and general public, therefore the impact will be of a low significance

8.5.13 Regional socio-economic structure

The use of the washing plant will have a positive impact as skills of the employees of Copper Sunset will be enhanced, as well as further expansion of the industry in the region.

8.5.14 Interested and affected parties

The operation of the washing plant may increase the amount of dust and noise experienced by adjacent landowners. Depending on the season and the strength of the wind, dust may cause a further reaching impact into the general region. This will likely affect nearby stakeholders in as far as the enjoyment of their properties is concerned and dust may also have impacts where crop production is concerned.

8.6 Decommissioning Phase

During the decommissioning phase all the buildings and structures will be removed and rehabilitation of the area will be completed.

8.6.1 Topography

The reshaping of the topography will restore the earth walls to their original location thereby reflecting its original status and capacity.

8.6.2 Geology

No impacts are expected.

8.6.3 Soils

Reshaping of the topography by using the soil from the earth walls will initially leave these soils exposed to wind and water erosion. Thus mitigation measures need to be completed effectively so that vegetation growth may re-establish itself in exposed areas, thereby eliminating most of the risk associated with wind and water erosion.

Soils may also be contaminated during the decommissioning by hydrocarbon spillages from vehicles and heavy machinery.

8.6.4 Ground and surface water

Heavy vehicles and machinery used during decommissioning could cause surface and ground water contamination through hydrocarbon spillages.

The potential incorrect disposal of domestic waste at the site by staff and contractors may have an impact on both surface and ground water quality.

The groundwater system will be able to recharge once the borehole has been closed appropriately.

8.6.5 Land capability and Land use

The decommissioning of the infrastructure will impact neutrally on the land capability and land use, as it will be returned to prior the use of the washing plant, and following the decommissioning and closure of the entire mining operation, the land capability and use could be returned to grazing capability.

8.6.6 Air Quality

During decommissioning, the relevant infrastructure will be removed and there will be a temporary increase in the amount of vehicles and machinery on site. This will increase the potential for the creation of fallout dust on site. The rehabilitation activities will also increase the dust levels as soil stockpiles are dug up and replaced over disturbed areas. Whilst these rehabilitated areas are still being vegetated, the risk for dust creation during strong winds will be high and this will need to be managed.

8.6.7 Noise

Heavy vehicles and machinery used during decommissioning will have an impact on the noise levels of the area.

8.6.8 Flora

The temporary increase of vehicles and machinery on site will increase the levels of dust. This once again may have a negative effect on vegetation due to dust deposition on leaves, which affects transpiration and photosynthesis.

Exposed and/or rehabilitated areas will be prone to the ingress of alien and exotic vegetation.

8.6.9 Fauna

There will be no impact to animals, birds or reptiles on site during decommissioning. However, once the decommissioning process has ended the likelihood of animals returning to the area will increase.

8.6.10 Sites of archaeological and cultural interest

No impacts are expected.

8.6.11 Sensitive landscapes

No impacts are expected.

8.6.12 Visual aspect

Rehabilitation of the area will allow for the area to be returned to a similar state previous to that of the construction of the washing plant, posing a neutralising impact on the visual aspect of the area.

8.6.13 Regional socio-economic structure

During mine closure, employees will be susceptible to losing their jobs and hence their income. The families of these employees are often dependent on this income for survival, and therefore employee households are thus very vulnerable to this impact.

8.6.14 Interested and affected parties

During the decommissioning of the infrastructure, there is likely to be a short term increase in dust and noise pollution, through the dismantling of infrastructure, rehabilitation, and related decommissioning activities. Over the long-term, however, the impact is likely to be neutralising in nature as the noise and dust associated with washibg plant operations will be ceased and the area will be returned to its original state.

9 CUMULATIVE IMPACTS

Cumulative effects are caused by the accumulation and interaction of multiple stresses affecting the parts and the functions of ecosystems. Of particular concern is the knowledge that ecological systems sometimes change abruptly and unexpectedly in response to apparently small incremental stresses. For purposes of this report, cumulative impacts have been defined as "the changes to the environment caused by an activity in combination with other past, present, and reasonably foreseeable human activities".

Where cumulative impacts are expected to be significant, these have been discussed below.

9.1 Soil

Mining and agricultural activities increase the potential for soil loss through erosion and degradation. An increase in erosion could also lead to siltation of streams and rivers. However, the use of the washing plant, settling dam and RWD will only have a temporary effect on the surrounding soil.

9.2 Ground water

Current utilisation of local aquifer systems coincides with the principle land uses of stock farming and to provide domestic water supply. The planned mining activities will not lead to a loss of groundwater for farming and domestic water supply and no major impacts are expected to deteriorate water quality or quantity. Regionally, mining has a significant impact on ground water quality and quantity through acid mine drainage and changes in storage capacity in opencast and underground workings. The current industry stance is to manage groundwater on a catchment basis as management on an individual mine basis is not effective due to inter mine flow. The mining companies, DWA and water users associations need to establish a working relationship to allow for the integrated management of cumulative impacts.

9.3 Land capability

Mining and agricultural activities in the area have already impacted on the land capability. The cumulative impact on land capability will increase in significance due to the existence of other mines in the area. After rehabilitation land capability should be restored to at least a grazing capability.

9.4 Air quality

Agricultural activities, the Bankfontein operation and other mining activities in the area could cause higher levels of dust in the area. After closure dust levels on site should return to their natural state. Once the vegetation has re-established itself in the disturbed areas, the risk of dust fallout will be insignificant.

9.5 Flora

Cumulative impacts on vegetation are negative, but almost all negative impacts can be mitigated with the proper measures. On a national level much of South Africa's grassland has already been impacted due to mining, agriculture and urban development. Regionally, these activities have also impacted on vegetation. Most of the vegetation in the area has already been disturbed due to agricultural activities and this increases the cumulative impact.

9.6 Fauna

As fauna in the area has already been disturbed by agricultural and industrial developments, as well as the current mining operation, the removal of habitat may have significant negative cumulative impacts on local fauna, especially where grassland fauna and dependant species are concerned.

9.7 Visual aspect

Other mining activities as well as agricultural activities in the region have already impacted visually on the area. The significance of the cumulative impact will increase. Rehabilitation should decrease the significance of these impacts.

9.8 Traffic and safety

Sand will be transported to various locations depending on where the client is situated. Different routes will thus be used. An increase in the amount of large trucks in the region will thus occur. This will increase the cumulative possibility of road and pedestrian accidents.

9.9 Regional and socio-economic structure

Operations at Copper Sunset will contribute to the economic growth locally and regionally. Together with other mining activities in the area the significance of this positive impact will be higher.

10 ENVIRONMENTAL OBJECTIVES

10.1 Environmental objectives and goals

The environmental objectives for the construction and operational phases are to:

- Protect the biophysical environment from any impacts that can not be mitigated and that will negatively impact on biodiversity on a regional scale;
- Preserve the water resources in line with the objectives of the integrated catchments management and thereby ensure that the limited available resources are utilised to the maximum benefit of the country and its inhabitants;
- To ensure that activities are carried out so as to aid rehabilitation;
- To ensure a safe environment for people to live in as is stipulated in the constitution.

The specific objectives for the construction, operational, decommissioning and closure phases are given for each aspect in Chapter 11.

10.2 Socio-economic objectives and goal

The following socio-economic objectives should be attained during the operation and decommissioning phases of the project:

- Adhere to an open and transparent communication procedure with stakeholders at all times;
- Ensure that accurate and timeous information is communicated to IAPs;
- Ensure that information is communicated in a manner which is understandable and accessible to IAPs;
- Enhance project benefits and minimise negative impacts through intensive consultation with stakeholders;

- Assemble adequate, accurate, appropriate, and relevant socio-economic information relating to the context of the mining operation;
- Ensure an atmosphere of equality and non-discrimination among the workforce;
- Contribute to the development of functional literacy and numeracy among employees through Adult Basic Education and Training;
- Empower the workforce to develop skills that will equip them to obtain employment in other sectors of the economy;
- Contribute to the development of a self-reliant community surrounding the mine's area of operation;
- Ensure that retrenchments and decommissioning take place in a legally compliant and humane manner;
- Adhere to principles of international best practice in all socio-economic activities; and
- Contribute to meaningful upliftment and development of rural communities within the area.

11 MANAGEMENT OF IDENTIFIED ENVIRONMENTAL IMPACTS

Those impacts identified during the impact assessment must be mitigated to reduce or eliminate negative effects of the project.

Each phase of the project has been considered and management measures for each impact have been discussed below (Table 11-1 to Table 11-3).

11.1 Construction Phase

The impacts managed during the construction phase have been listed below in Table 11-1.

Table 11-1: Environmental Management Measures for the Construction Phase

Activity	Aspect	Objectives	Mitigation/Management measure	Frequency of mitigation	Recommended Action Plans	Responsible Person	Significance after mitigation
1. Removal of topsoil	Soil	Prevent or limit the occurrence of erosion	Removal of topsoils must be kept to a minimum; use soil to create earth walls for dams; vegetate these dam walls to prevent erosion	Construction Phase	Rehabilitation plan	Environmental officer	Low
	Soil	Prevent hydrocarbon spillages	Machinery must be serviced regularly	As required	Spill prevention and action plan	Environmental officer	Low
2. Construction of infrastructure	Soil	Prevent hydrocarbon spillages	Machinery must be serviced regularly	As required	Spill prevention and action plan	Environmental officer	Low
	Surface Water	Prevent hydrocarbon spillages	Machinery must be serviced regularly	As required	Spill prevention and action plan	Environmental officer	Low
	Ground Water	Prevent hydrocarbon spillages	Machinery must be serviced regularly	As required	Spill prevention and action plan	Environmental officer	Low
	Land Capability	To prevent total deterioration of the area	Rehabilitation must take place during the life of mine so that not all land capability in not completely destroyed	Throughout the life of mine	Rehabilitation plan	Environmental officer	Low
	Land Use	To prevent total deterioration of the area	Rehabilitation must take place during the life of mine so that not all land capability in not completely destroyed	Throughout the life of mine	Rehabilitation plan	Environmental officer	Low
	Noise	Minimise the noise where possible	Machinery must be serviced regularly & where possible silencers must be added to machinery	As required	Noise monitoing plan	Environmental officer	Medium-low
	Flora	Prevent habitat destruction and dust pollution	Contractors must keep within designated areas; Red Data species must be identified, removed and relocated; remove alien and invasive species	As required	Dust monitoring and rehabilitation plan	Contractor	Low
	Fauna	Prevent habitat destruction	Contractors need to be made aware of rare and endangered species possibly occurring in the area; any pollution of soil, water and vegetation which can cause harm to animal life will be prevented	Throughout the life of mine	Rehabilitation plan	Contractor	Low
	Regional & Socio-Economic Structure	Enhance positive aspect of employment creation	Where possible local service providers and contractors will be recruited	Throughout the life of mine	Social and labour plan	HR manager	Low

Activity	Aspect	Objectives	Mitigation/Management measure	Frequency of mitigation	Recommended Action Plans	Responsible Person	Significance after mitigation
	Interested & Affected Parties	Minimise illegal trespassing on adjacent land and minimise dust and noise pollution	Employees will be informed that trespassing is an offence; the construction phases to be executed to professional standards	Throughout the life of mine	Mine plan	Mine manager	Low
3.Vehicular Movement	Air Quality	Apply dust suppression measures	Quarterly monitoring of dust levels; Water truck to operate on haul and access roads & water should contain a binding agent to soak into the soil	Throughout the life of mine	Dust monitoring and control plan	Environmental officer	Medium-low

11.2 Operational Phase

The impacts managed during the operational phase have been listed below in Table 11-2.

Table 11-2: Environmental Management Measures for the Operational Phase

Activity	Aspect	Objectives	Mitigation/Management measure	Frequency of mitigation	Recommended Action Plans	Responsible Person	Significance after mitigation
4. Washing Plant Operation	Soil	Prevent hydrocarbon spillages; limit the occurrence of erosion	Machinery must be serviced regularly; the removal of topsoil must be kept to a minimum	As required	Spill Prevention and action plan	Environmental officer	Low
	Ground Water	Prevent hydrocarbon spillages	Machinery must be serviced regularly	As required	Spill prevention plan	Environmental officer	Low
	Surface Water	Prevent unnecessary removal of vegetation	Removal of vegetation must be kept to a minimum	Throughout the life of mine	Rehabilitation plan	Environmental officer	Low
	Air Quality	Minimise dust creation by implementing suppression measures	Quarterly monitoring of dust levels; Water truck to operate on haul and access roads & water should contain a binding agent to soak into the soil	As required	Dust monitoring plan	Environmental officer	Low
	Noise	Minimise the noise where possible	Machinery must be serviced regularly & where possible silencers must be added to machinery	As required	Noise monitoring plan	Environmental officer	Low
	Flora	Prevent habitat destruction, dust pollution and manage and control plant species	Contractors must keep within designated areas; Red Data species must be identified, removed and relocated; remove alien and invasive species	Throughout the life of mine	Rehabilitation plan	Environmental officer	Low

Activity	Aspect	Objectives	Mitigation/Management measure	Frequency of mitigation	Recommended Action Plans	Responsible Person	Significance after mitigation
	Fauna	Prevent habitat destruction	Contractors need to be made aware of rare and endangered species possibly occurring in the area; any pollution of soil, water and vegetation which can cause harm to animal life will be prevented	Throughout the life of mine	Environmental awareness plan	Environmental officer	Low
	Regional & Socio-Economic Structure	Enhance positive aspect of employment creation	Where possible local service providers and contractors will be recruited	Throughout the life of mine	Social and labour plan	HR Manager	Low
	Interested & Affected Parties	Minimise illegal trespassing on adjacent land and minimise dust and noise pollution	Employees will be informed that trespassing is an offence; public participation process will continue throughout the life of the project; suppression of dust and noise pollution efforts must continue	Throughout the life of mine	Induction and social and labour plan	Health and Safety Officer	Low
3 Vehicular Movement	Soil	Prevent hydrocarbon spillages; prevent the unnecessary compaction of soil; limit the occurrence of erosion	Limit the movement of heavy machinery to roads; machinery must be services regularly; the removal of topsoil must be kept to a minimum	Throughout the life of mine	Spillage prevention and action plan	Environmental officer	Low
	Ground Water	Prevent hydrocarbon spillages	Machinery must be serviced regularly	As required	Spillage prevention and action plan	Environmental officer	Low
	Air Quality	Minimise dust creation by implementing suppression measures	Quarterly monitoring of dust levels; Water truck to operate on haul and access roads & water should contain a binding agent to soak into the soil	Throughout the life of mine	Dust monitoring plan	Environmental officer	Low
	Noise	Minimise the noise where possible	Machinery must be serviced regularly & where possible silencers must be added to machinery	As required	Noise monitoring plan	Environmental officer	Low
	Flora	Prevent habitat destruction, dust pollution and manage and control plant species	Contractors must keep within designated areas; Red Data species must be identified, removed and relocated; remove alien and invasive species	Throughout the life of mine	Rehabilitation plan	Environmental officer	Medium-low

Activity	Aspect	Objectives	Mitigation/Management measure	Frequency of mitigation	Recommended Action Plans	Responsible Person	Significance after mitigation
	Fauna	Prevent habitat destruction	Contractors need to be made aware of rare and endangered species possibly occurring in the area; any pollution of soil, water and vegetation which can cause harm to animal life will be prevented	Throughout the life of mine	Mine plan and rehabilitation plan	Environmental officer	Medium-low
	Regional & Socio-Economic Structure	Enhance positive aspect of employment creation	Where possible local service providers and contractors will be recruited	Throughout the life of mine	Social and labour plan	HR Manager	Low
	Interested & Affected Parties	Minimise illegal trespassing on adjacent land and minimise dust and noise pollution	Employees will be informed that trespassing is an offence; the construction phases to be executed to professional standards	Throughout the life of mine	Induction and mine plan	Health and Safety Officer	Low
5. Temporary stockpilling of rinsed product	Soil	To prevent deterioration of the area	The collection time of the product should be at a minimum	Throughout the life of mine	Mine plan and rehabilitation plan	Mine Manager and Environmental Officer	Low
6. Abstraction of Water	Ground Water	Limit the amount of ground water abstraction	Only abstract the amount needed for the process	Throughout the life of mine	Water Use License	Mine Manager and Environmental Officer	Medium-low
7. Storing & disposing of water	Ground Water	Limit the amount of ground water abstraction to store water	Only abstract the amount needed for the process	Throughout the life of mine	Water Use License	Mine Manager and Environmental Officer	Medium-low
	Surface Water	Limit the surface area	Only store the amount of water needed for the washing plant process	Throughout the life of mine	Water Use License	Mine Manager and Environmental Officer	Low

11.3 Decommissioning and Post-Closure Phase

The impacts managed during the decommissioning and post-closure phases have been listed below in Table 11-3.

Table 11-3: Environmental Management Measures for the Decommissioning and Post-Closure Phase

Activity	Aspect	Objectives	Mitigation/Management measure	Frequency of mitigation	Recommended Action Plans	Responsible Person	Significance after mitigation
8. Decommissioning of Infrastructure	Soil	Prevent hydrocarbon spillages; limit the occurrence of erosion	Machinery must be serviced regularly; ensure rehabilitation efforts are completed effectively	As required	Spill prevention and action plan	Environmental Officer	Low
	Surface Water	Prevent hydrocarbon spillages	Machinery must be serviced regularly	As required	Spill prevention and action plan	Environmental Officer	Low

Activity	Aspect	Objectives	Mitigation/Management measure	Frequency of mitigation	Recommended Action Plans	Responsible Person	Significance after mitigation
	Ground Water	Prevent hydrocarbon spillages	Machinery must be serviced regularly	As required	Spill prevention and action plan and Groundwater monitoring	Environmental Officer	Low
	Air Quality	Minimise dust creation by implementing suppression measures	Water truck to operate on haul and access roads & water should contain a binding agent to soak into the soil	Throughout the life of mine	Dust monitoring plan	Environmental Officer	Medium-low
	Noise	Minimise the noise where possible	Machinery must be serviced regularly & where possible silencers must be added to machinery	As required	Noise monitoring plan	Environmental Officer	Medium-Low
	Flora	Prevent habitat destruction, dust pollution and manage and control plant species	Contractors must keep within designated areas; Red Data species must be identified, removed and relocated; remove alien and invasive species	Throughout the life of mine	Rehabilitation plan	Environmental Officer	Low
	Regional & Socio-Economic Structure	Minimise negative impact associates with job losses	Opportunity must be given to re-skill current employees to make them employable in other mining industries or other industries	Throughout the life of mine	Social and Labour Plan	HR Manager	Low
	Interested & Affected Parties	Minimise dust creation by implementing suppression measures and limit noise pollution	Water truck to operate on haul and access roads & water should contain a binding agent to soak into the soil; where possible silencers must be added to machinery	As required	Dust monitoring plan	Environmental Officer	Low
9. Rehabilitation of Area	Soil	Limit exposure to erosion processes; limit soil compaction	Rehabilitate the area to prevent soil erosion by wind and water; machine operators must keep to designated areas; compacted areas may ripped to loosen soil	As required	Rehabilitation plan	Environmental Officer & Mine manager	Low
	Flora	Establish healthy indigenous vegetation cover; prevent ingress of alien invasive species	The moment disturbed areas become available they must be rehabilitated with a seed mix; an exotic and invader programme must be implemented	Throughout the life of mine	Rehabilitation plan	Environmental Officer	Low
	Fauna	Recreate habitat to encourage increased animal population	Rehabilitate such that animals can return to rehabilitated land	Once possible	Rehabilitation plan	Environmental Officer	Low
	Visual	To remove all negative visual impacts	Remove all buildings; rehabilitate and re-vegetate areas	Decommissioning phase	Rehabilitation plan	Environmental Officer	Low
	Topography	Rehabilitate the area back to its original state	Ensure rehabilitation efforts are complete	Decommissioning phase	Rehabilitation plan	Environmental Officer	Low

Activity	Aspect	Objectives	Mitigation/Management measure	Frequency of mitigation	Recommended Action Plans	Responsible Person	Significance after mitigation
	Interested & Affected Parties	Enhance overall positive impact associated with mine closure	Area must resemble its previous state; surface infrastructure to be dismantled; decommissioning activities must cause minimal disturbance to surrounding community	Decommissioning phase & Post Closure phase	Social and Labour Plan	Environmental Officer	N/A

12 EMERGENCY RESPONSE PLAN

An emergency response plan had been drafted in the previous EIA/EMP submitted under Vaal Sands. Thus it is believed that no new emergency response plan is required. The emergency response plan has been re-iterated for the site below:

The emergency response plan details the procedures to be followed in the event of any emergency. This plan will be drawn up and placed around the mine where it will be easily viewed. The plan will contain evacuation routes and a list of emergency numbers. It is advisable that the mine tests the emergency response plan by running training and simulations, in order to identify any weaknesses.

Emergencies that have been listed here include: accidents, fires, hydrocarbon spillages and flooding.

If the emergency has potential to affect surrounding communities, they will be alerted via alarm signals or contacted in person. The surrounding community will be informed prior to mining taking place of the potential dangers and emergencies that exist, and the actions to be taken in such emergencies.

Communication is vital in an emergency and thus communication devices, such as mobile phones, radios, pagers or telephones, must be placed around the mine. In the case of an emergency, a checklist of emergency response actions appropriate to the emergency and participants in controlling a specific emergency must be consulted and the relevant units notified. In this case, many of the emergency services will be sourced from Vereeninging, the nearest town.

The checklist includes:

- Fire department;
- Police;
- Emergency health services such as ambulances, paramedic teams, poisons centres;

- Hospitals, both local and for evacuation for specialist care;
- Public health authorities;
- Environmental agencies, especially those responsible for air, water and waste issues;
- Other industrial facilities in the locality with emergency response facilities;
- Public works and highways departments; and
- Public information authorities and media organisations.

The following is a list of potential emergencies that could occur.

12.1 Accidents

In the case of a medical accident or problem, a first aid kit will be available on the mine.

- A checklist of emergency response participants must be consulted and the relevant units notified. In this case, many of the emergency services will be sourced from the nearest main town, Vereeniging.

The following numbers should be made accessible to all mine staff:

- Fire department: Emergency number 10177 / 016 440 1000 (Vereeniging Fire Department);
- Police: Emergency number 10111/ 016 457 1003 (Viljoinsdrift Police Department);
- Emergency health services such as ambulances & paramedic teams: 10111 / 016 440 1000 (Vereeniging Ambulance); and
- Hospitals, both local and for evacuation and specialist care: 10111/ 016 930 2000 (Vereeniging Sebokeng Provincial Hospital) / 016 440 5000 (Vereeniging Medi Clinic).

12.2 Fire

Veld fires and fires resulting from other sources must be handled with extreme caution. Fire extinguishers will be placed at strategic points around the mine and will be kept in a serviceable condition.

The procedure for fire safety is the following:

- Occupants of the mine should be alerted in the event of a fire;
- In the event of a small fire the fire extinguishers placed around the mine should be used to contain and extinguish the fire;
- In the event of a large fire, the local area council's fire department will be consulted; and
- All staff will receive training in response to a fire emergency on site.

12.3 Hydrocarbon Spillage

Hydrocarbons such as diesel, petrol, and oil will be kept on site as fuel for the mine machinery. In the event of a spillage, procedures must be put into place to ensure that there are minimal impacts to the surrounding environment.

The procedure for spillages is the following:

- In the event of a small spillage, the soil will be excavated and treated;
- In the event of a large spillage, adequate emergency equipment for spill containment or collection such as additional supplies of booms and absorbent materials will be available and if required, a specialised clean up crew will be called in to decontaminate the area; and
- After a major spill water quality samples of any water sources utilised within 500 m from the spill will be monitored for hydrocarbons for the next three months on a monthly basis and further remediation recommended based on the results thereof.

The contact numbers for emergency services and local authorities:

Authorities	Contact number
Vaal River System Regional Offices	016 371 1121
DWA: Free State Province (Bloemfontein)	051 405 9000
SAPD: Emergency number	10111
Vereeniging SAPD	016 450 2911
Emergency health services such as ambulances & paramedic teams (Vereeniging ambulance)	016 440 1000 10177 (Emergencies)
Sebokeng Provincial Hospital	016 930 2000
Vereeniging Medi Clinic	016 440 5000 016 440 5440 (24hour emergency unit)

13 ENVIRONMENTAL MONITORING PROGRAMMES AND PERFORMANCE ASSESSMENTS

Environmental monitoring programmes and performance assessments were developed under the previous EIA/EMP, thus it is believed no new monitoring programmes be drafted. However, some of the sensitive areas defined under the environmental impacts need to be given careful attention, therefore the environmental monitoring programmes previously stated are re-iterated below.

13.1 Air Quality

13.1.1 Aim and Objectives

The aim of this monitoring programme is to establish the baseline fallout levels and to observe the conditions on sight, and to monitor any changes in the conditions. Annual monitoring of the dust fallout will ensure that there is a very low chance of any detrimental effects to the surrounding environments.

13.1.2 Position

The position of the samplers is essential to the interpretation of the results, and needs to take into account the historical directional wind data for the area, and topographical features that may affect the wind direction.

Before the samplers are erected on site the area is surveyed using topographical maps and historical climate data to determine the various wind flow patterns and topographical features that may influence the dispersion patterns of fallout dust on site. Once these factors have been determined the location of the dust buckets is pinpointed taking into consideration the position of various infrastructure on site which require monitoring such as the pit and haul roads. The buckets are filled with distilled water and left out on site for a period of a month; from there the buckets are transported to a reputable laboratory for analysis.

13.1.3 Frequency

Dust samples will be analysed monthly to establish the current baseline air quality for the site, and will continue for the life of the mine.

13.1.4 Methodology

All samples will be taken in accordance to Department of Environmental Affairs (DEA) and World Bank guidelines.

13.1.5 Precautionary measures

The following measures have to be in place when taking the samples from the single bucket samplers;

- The buckets must be labelled using a marker pen and masking tape according to which sampling point they are located; and
- Bucket lids must be placed firmly on the sample buckets.

The following measure has to be in place when re-setting the sampler:

- Buckets must be ¾ full with distilled water and one teaspoon of bleach to ensure they do not dry out and algae does not accumulate inside the buckets.

13.1.6 Sample Submission

All the samples must be submitted to a reputable laboratory with a quality management plan.

13.1.7 Analysis

Analysis of samples should take place within one week of collection to ensure the accuracy of the results. The sample bucket lids should not be removed at any stage after the lid has been placed on the bucket at the site until the samples have reached the laboratory. The constituents to be analysed for are displayed in Table 13-1.

Table 13-1: Constituents to be analysed for

Relevant Fall-out Per Bucket	Total Fall-out Per Bucket
mg/m²/day	mg

13.1.8 Data Interpretation

In order to assess the results, the collected dust is filtered through a sub-micronic pre-weighed filter using a vacuum filter bench. Once the wet filtrate has been desiccated by evaporation of any retained moisture, the filter is reweighed to ascertain the collected mass (insoluble particulate). The soluble particulate is assessed by evaporating the catch media and weighing the resulting solids.

The results are then analysed and placed into various graphs and tables that best indicate the dust fallout situation on site. An example of a dust-fallout classification index has been included in Table 13-2.

Table 13-2: World Bank Dust-Fall Classification Index

World Bank Classification	mg/m²/day
Slight	<250
Moderate	251 – 500
Heavy	501 – 1200
Very heavy	>1200

13.1.9 Reporting

A report should then be compiled every three months detailing all findings and includes a full assessment of the results along with conclusions and recommendations for future monitoring on site. These reports should highlight any negative impacts on the air quality due to the mining operations as well as determine the sources of the impacts. The reports will discuss possible actions which can be used to mitigate any negative impacts. Relevant results will be graphed so that trends may be visually observed.

13.1.10 Duration

The programme should be implemented on a monthly basis for the life of the mine. This will only be altered if the sampling data indicates that either more or less sampling is to take place. The programme will be reviewed on an annual basis.

13.1.11 Conclusion

The above programme is sufficient to ensure that monitoring of the fall-out dust at Bankfontein is conducted to the necessary standards. The effectiveness of the mitigatory measures will be evaluated against these.

13.2 Hydrological

13.2.1 Surface Water

Due to the lack of surface water on site, no surface water monitoring will be required.

13.2.2 Ground Water

A ground water monitoring programme will be instituted during the operational phase of the project and will include the following:

- The sampling of the borehole on a three-monthly basis to determine variations in ground water levels; and
- The three-monthly analyses of the chemical constituents of the ground water samples. Samples will be taken by an independent party according to approved SANS sampling procedures and will be submitted to an accredited laboratory for analysis.

Monitoring will, furthermore, be performed monthly for those water quality parameters that may be specified by DWA.

All monitoring data will be compared to the requirements regarding water quality specified by and in terms of the requirements of the National Water Act, 1998 (36 of

1998) (NWA). Currently Digby Wells is compiling a water use license for Copper Sunset.

13.3 Noise Monitoring

Noise monitoring should take place quarterly to ensure that the South African Bureau of Standards (SABS) parameters are adhered to.

13.4 Soil and Vegetation Monitoring

Soil monitoring will be conducted in all soils that are recovered from topsoil stockpiles once placed on rehabilitated areas. Soil condition monitoring will be done by an accredited laboratory, at least six weeks after the application of fertiliser and will test for the following:

- pH (H2O);
- Electrical conductivity (mS/m);
- Calcium (mg/Kg)
- Magnesium (mg/Kg);
- Potassium (mg/Kg);
- Sodium (mg/Kg);
- Cation exchange capacity;
- Phosphorus (Bray I);
- Zinc (mg/Kg);
- Clay percentage; and
- Organic matter content (C %).

Deficiencies identified during testing will be taken into consideration when fertiliser requirements are considered.

Vegetation monitoring will include the annual monitoring of the health of vegetation on re-vegetated areas and will include monitoring for pests and plant diseases, vegetation die-back and the extent of coverage achieved on re-vegetated areas. Monitoring will also record the vegetation progression in areas rehabilitated to a wilderness standard. The detail of the monitoring programme is provided below:

- Sampling technique: the results of the Step point / Wheel point techniques can be used to compile a species list for each sampling site;
- Data analysis: the computer programme Graze can be used for data analysis, as well as to calculate the grazing capacity. This programme also takes other parameters into account, such as accessibility, average annual rainfall, grass cover, tree cover (if present), herb/forb cover and ecological classes of all grass species;
- Time of year: the rainy season will be the best time to do the survey as this is when vegetation, grasses and forbs, are actively growing. The months of February, March and April are recommended;
- Photographs: photographs of each sampling point can be taken at the same time of year, within the same direction and angle (markers can be set out to ensure the margins and angles of each photograph are correct); and
- Points: using a GPS, the location of each sample can be recorded so that the same point can be monitored each year.

14 FINANCIAL PROVISION

In accordance with the requirements of the MPRDA, the policy of the Department of Minerals and Energy, provision for closure must be made and updated on a yearly basis.

The closure costing liabilities for this operation have been calculated in accordance with the DMR guidelines for closure. In addition a calculation based on the observed site conditions was also performed.

14.1 Methodology

The approach followed during this calculation was to assume a “snapshot in time”. Costs have been calculated assuming that the mine would have to close immediately and would have to rehabilitate or remediate the impacts. Savings are possible by the application of a number of different methods of reducing environmental liability during operations or after closure. Conversely a number of environmental liabilities will only be better defined through more study, or as their extent is highlighted during reclamation operations.

Different types of infrastructure and rehabilitation techniques are applied depending on the type of infrastructure that exists. Each type of infrastructure has a particular rate for demolition and these have been summarised in Table 14-1 below.

Table 14-1: Unit rates for the demolition of washing plant and associated infrastructure.

Environmental Liabilities Estimate - Unit Rates.					
No.	**Item**	**Description**	**Unit**	**Rate**	
1	Dam	Remove Sediment - monitor	m³	R	25.97
2	Dam	Flatten the walls	m³	R	7.72
3	Pipelines	On Surface on plinths	Km	R	10,000.00
4	Rehabilitation/clean up	Pick up contaminates	m³	R	60.00
5	Rehabilitation/clean up	Grade an area	ha	R	2,000.00
6	Rehabilitation/clean up	General clean up	m²	R	6.30
7	Rehabilitation/clean up	Rubble - Load and Cart away - less than 500m	m³	R	20.00
8	Rehabilitation/clean up	Replace soil and spread 150mm thick	m²	R	5.00
9	Rehabilitation/clean up	Replace soil and spread 300 mm thick	m²	R	10.00
10	Rehabilitation/clean up	Re-vegetate areas where structures have been removed	Ha	R	22,000.00
11	Rehabilitation/clean up	Bulldoze material - 50m	m³	R	7.00
12	Steel Buildings (borehole case)	1 storey	m²	R	168.00
13	Steelwork	Below 20m high	t	R	1,351.00
14	Sub Station	Demolish	m²	R	263.17
15	Rehabilitation/clean up	Remove by hand - Cart 2km	m³	R	165.00
16	Conveyor		m²	R	112.00

14.2 Provision to the DMR

According to the DMR guidelines Copper Sunset has to provide R 185,560.98 for rehabilitation and closure of the washing plant, settling dam and return water dam. Please note that this excludes an existing concrete platform on which the washing will be built. The cost calculation table is attached in Appendix 6. Using previous experience we estimate that the cost for rehabilitation is approximately R 149,064.64. Digby Wells is of the opinion that the DMR guidelines are of a general nature and do not uniquely consider the nature of the washing plant, settling dam and return water dam. Therefore, it is felt that the Digby Wells calculation is more accurate with regards to the closure and rehabilitation provision required.

A bank guarantee for this amount will be issued to the DMR. This bank guarantee will be reduced as the site is rehabilitated.

15 CLOSURE

The closure and its associated costing have been based upon DME guidelines, now known as the DMR, set out by the Department of Minerals and Energy (2005) in the "Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine". The guidelines stipulate the closure methods for infrastructure and rehabilitation, which are described below. Please note that the guidelines for closure, which specifically relate to this amendment, have been used.

15.1 Washing Plant

All infrastructure associated with the plant needs to be stripped and broken down to natural ground level and be buried next to the plant. This includes any conveyors, foundations and any concrete between buildings. Rehabilitation requires 300mm of topsoil on top of which vegetation needs to be established.

15.2 Steel & reinforced concrete structures & housing, facilities & services

All steel and concrete structures need to be demolished to 1m below ground level. The remaining rubble may be buried adjacent to the building sites. Once the area is demolished the area needs to be covered with 300mm of topsoil and vegetated.

15.3 General Rehabilitation

General surface rehabilitation must involve the shaping of the surface topography to match the surrounding landscape and 300mm of topsoil need to be added to the site. During the process of shaping the landscape proper drainage lines must be properly reinstated into the topography. Any heaps of excess material also need to be removed, this all so that effective re-vegetation can take place.

15.4 Post-closure Management

The site will require a level of management and maintenance after its facilities have been demolished and rehabilitated. A total contingency of 10% on all infrastructure costs has

been allowed. The DMR recommends that 13% be applied for the closure plans etc. but Digby Wells are of the opinion that the demolition of surface infrastructure does not always need detailed engineering design. A 5% allowance has been made for project management costs. The latter two figures have been applied to capital expenditure only.

16 CONCLUSION

In conclusion, the construction of additional infrastructure will broaden the economic opportunity to industrial clients by offering an additional product. The current operation is successful and the additional infrastructure will allow for the further expansion of the operation.

The most significant environmental impacts are the stripping of vegetation and topsoil as well as the possible contamination of soil, surface and groundwater by hydrocarbon spillages. However, if the project is implemented as planned and the necessary management measures instituted then there is no reason from an environmental perspective, why the project should not proceed.

Positive impacts of the project will include the continuation of an employment base in the greater area, the acquisition of skills by workers and associated financial income. It has to be ensured that the financial benefits of the project are used in such a way to offset their long term impacts. The continuation of the mining operation can also assist in the elimination of the exotic flora species which are found on site and at the project site.

The current operation is being carried out adequately and rehabilitation s being carried out con-currently to ensure effective rehabilitation.

The additional infrastructure proposed in this amendment will simply improve the business financially and have limited impact on the receiving environment.

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APPENDIX 1

CURRICULUM VITAE

APPENDIX 2

PLANS AND FIGURES

Plan 1: Regional Setting

Plan 2: Land Tenure

Plan 3: Mining Plan

Plan 4: Project Process

Plan 5: Site Plan

Plan 6: Topography

Plan 7: Geology

Plan 8: Soils

Plan 9: Land Capability

Plan 10: Catchment Boundaries

Plan 11: Fauna and Flora

Plan 12: Archaeological Heritage Sites

APPENDIX 3

EXPECTED BIRD LIST

APPENDIX 4

PUBLIC PARTICIPATION DOCUMENTATION

APPENDIX 5

IMPACT MATRICES

APPENDIX 6

FINANCIAL PROVISION