Booysendal South Expansion: Section 24G and Environmental Authorisation Applications
Visual Impact Assessment Specialist Report
Northam Platinum Limited, South Africa

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<td>Riaan van der Merwe</td>
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<tr>
<td>Project Manager Approval</td>
<td>Amanda Pyper</td>
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**Disclaimer**

This report was prepared exclusively for Amec Foster Wheeler by GISM (Pty) Ltd. The quality of information, conclusions and estimates contained herein are consistent with the level of effort involved in GISM (Pty) Ltd services and based on: i) information available at the time of preparation, ii) data supplied by outside sources and iii) the assumptions, conditions and qualifications set forth in this report. This report is intended for use by the above client subject to the terms and conditions of its contract with GISM (Pty) Ltd. Any other use of, or reliance on, this report by any third party is at that party’s sole risk.
Executive Summary

Visual Impact Assessments (VIA) primarily assess the landscape and visual impacts associated with proposed activities and infrastructure. This VIA specifically relates to the proposed expansion activities planned for Booysendal Platinum Pty Ltd (the Project). The VIA is done in support of the Section 24G Application, EMP Amendment and associated environmental authorisation processes. The Project is located in the Mpumalanga and Limpopo Provinces of the Republic of South Africa. The VIA includes the Zone of Visual Influence (ZVI), which includes an approximate 10 km buffer area around the operations.

The assessment describes the visual baseline and aspects that could affect the visual baseline considering i.e. the level of visual modification (magnitude) by calculating the area from which the project can be seen (i.e. ZVI), the viewing distance and the capacity of the landscape to visually absorb structures and forms placed upon it and the characteristics of potential receptors. The VIA then makes a statement regarding the significance of visual impacts through considering the capacity of the landscape to accommodate change by assigning visual receptor sensitivity to potential visual receptors (i.e. residents). The VIA also considered potential cumulative impacts which could result mainly due to landscape modifications as a result of mining related development in the area.

The landscape and visual assessment methodology are both quantitative and qualitative and based on the following:

- **An initial desktop analysis**: through which the spatial digital terrain model (DTM) and project design data were analysed and manipulated using ArcGIS. This allowed the gaining of an understanding of the landscape, location of potential sensitive receptors, the scenic value and sense of place and an initial understanding of the absorption capacity of the landscape.

- **Field survey**: The purpose of the field survey was to: identify representative viewpoints to gain a better understanding of the sense of place, the character of the landscape to accommodate and absorb change; and to understand the receptors that may be affected by the project.

- **Data analysis and modelling**: ArcGIS was used to determine the ZVI through terrain, topographical and land cover modelling of the various infrastructure components. Additional modelling was done to determine the visual impact index (VII), therefore the magnitude and extent of the various infrastructure components and the potential combined visibility thereof on the various receptors. Finally, representative views as experienced by local residents were used for the photographic simulations. The photographic simulation shows the proposed activity superimposed onto the existing landscape scene.

The visual impact assessment indicates that visual impacts would result from the construction and operational phase of the proposed Project. Specifically, impacts would result from the Aerial Material Transport (e.g. ARS Route); the Tailings Storage Facility 2 (TSF2) being seen from
sensitive viewpoints (residents); and the negative effects on the scenic quality and sense of place of the landscape within the project area, especially the southern section.

It was determined that the likelihood, duration, and spatial extent scores of the various identified visual impacts were relatively high (3 - 4), and the receptor sensitivity low to moderate (1 - 3). The magnitude score was calculated taking in consideration the area from which the project can be seen (i.e. ZVI), the viewing distance and the capacity of the landscape to visually absorb structures and forms placed upon it and rated as negative low. The low magnitude score will ultimately reduce the significance of the overall impact to a minor significance score and therefore an overall minor visual impact for the proposed project, assuming all mitigation measures suggested in this report are followed and successfully implemented.

Mitigation measures may not reduce the visual impact significantly as the proposed activity cannot be screened sufficiently, mainly due to the scale and dimensions of the proposed infrastructure (e.g. ARS route and TSF2). The mitigation measures for the proposed activity will need to focus on effective rehabilitation of the disturbed areas. Limited surface disturbance and prompt rehabilitation are prerequisite conditions if the severity of impact is to be reduced.

During the construction and operational phase a visual monitoring programme would be based on parameters such as the visibility of lights at night and airborne dust. At closure the success of rehabilitation would be based on removal of the ARS, rehabilitation of TSF2, and the rate and percentage of vegetation recovery. Monitoring will continue after closure to ensure that the rehabilitation is successful and that the vegetation is self-sustaining.

**It is recommended that the proposed project is approved and acceptable from a visual impact assessment prospective.**
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<tr>
<td>ARS</td>
<td>Aerial Material Transport</td>
</tr>
<tr>
<td>BS1/2</td>
<td>Booysendal South 1/2</td>
</tr>
<tr>
<td>BS3</td>
<td>Booysendal South 3</td>
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<tr>
<td>BS4</td>
<td>Booysendal South 4 (Everst)</td>
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<tr>
<td>DTM</td>
<td>Digital Terrain Model</td>
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<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<td>EMP</td>
<td>Environmental Management Plan</td>
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<tr>
<td>GIS</td>
<td>Geographic Information System</td>
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<tr>
<td>GN R</td>
<td>General Notice Regulation</td>
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<tr>
<td>IFC PS</td>
<td>International Finance Corporation Performance Standards on Environmental and Social Sustainability, 2012</td>
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<tr>
<td>NEMA</td>
<td>National Environmental Management Act, 107 of 1998</td>
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<tr>
<td>NPAES</td>
<td>National Protected Area Expansion Strategy</td>
</tr>
<tr>
<td>mamsl</td>
<td>Metres above mean sea level</td>
</tr>
<tr>
<td>TSF</td>
<td>Tailings Storage Facility</td>
</tr>
<tr>
<td>VAC</td>
<td>Visual Absorption Capability</td>
</tr>
<tr>
<td>VIA</td>
<td>Visual Impact Assessment</td>
</tr>
<tr>
<td>VII</td>
<td>Visual Impact Index</td>
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<td>ZVI</td>
<td>Zone of Visual Influence</td>
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1. INTRODUCTION

Amec Foster Wheeler on delegation from the client, Northam Platinum Limited appointed GISM (Pty) Ltd to undertake a Visual Impact Assessment (VIA) in support of the Environmental Impact Assessment (EIA) and Environmental Management Programme (EMP) Amendment, Section 24 G Application and other environmental processes for the proposed expansion of Booysendal South Expansion project (herein mentioned as the project).

The VIA report focuses on the project area and includes the extent of the ‘Zone of Visual Influence’ (ZVI), approximately a 10 km buffer area around the operations (See section 3.3.1). It identifies the key visual aspects that may be associated with the project and assesses and address the visual effects of the proposed project on the receiving environment.

1.1 Location and Study Area

The Northam Platinum Booysendal Pty Limited Project is located in the Limpopo and Mpumalanga Provinces of South Africa. Northam Platinum Limited (Northam) purchased the Booysendal section of the Der Brochen Mining Operation from Rustenburg Platinum Mines Limited (Anglo Platinum) early in 2008. Development of Booysendal Mine commenced in 2011 in the area known as Booysendal North (BN). Booysendal also purchased the bordering Everest Platinum Mine (Everest) from Aquarius Platinum in 2015. The Everest Mine has since been incorporated into the Booysendal operation but has been under care and maintenance since 2012.

The project area is situated in a relative remote area and falls within the boundaries of the Greater Sekhukhune and Greater Ehlanzeni District Municipalities. The closest towns are Steelpoort and Lydenburg, with the mine being adjacent to the Anglo Platinum Der Brochen Platinum Project. Figure 1-1 indicates the position of the project and the proposed expansions. The study area includes the proposed project components (Booysendal South 1/2, Booysendal South 3 - Booysendal South 4, Merensky Portals (South and North), aerial material transport, access roads, TSF2, stockpiles and associated infrastructure and the extent of the ZVI (approximately a 10 km buffer area around the operations).

1.2 Regional and International Importance

The proposed project area is not in a legally protected national park or internationally recognised protected area; although there are a number of nationally protected areas, and National Protected Area Expansion Strategy (NPAES) Focus Areas close to the project site, these include (refer to Figure 1-2):

- De Berg Nature Reserve;
- Verloren Vallei Nature Reserve;
• Kudu Private Nature Reserve; and

• National Protected Area Expansion Strategy (NPAES) Focus Areas (Mpumalanga Mesic Grasslands and Northeast Escarpment).
Figure 1-1: Location of the proposed project area.
Figure 1-2: Protected areas near the proposed project area.
1.3 Purpose of the Study

This VIA primarily assesses the potential visual impacts associated with the proposed Project expansion activities and infrastructure. It includes the extent of the ZVI, approximately a 10km buffer area around the operations.

The purpose of this VIA is to determine the impact of the proposed project on the visual and aesthetic character of the study area. The rationale for this VIA is that the proposed activity may fundamentally alter the landscape character and sense of place of the local environment.

The primary objective of this VIA is therefore to describe the potential impact of the proposed activity on the visual character and sense of place of the area. This assessment will consist of the following:

- Determine the visual character of the study area by evaluating environmental components such as topography, hydrology, and land cover;
- Identify elements of particular visual quality that could be affected by the proposed project;
- Define the extent of the affected visual environment, the viewing distance and the critical views/visual receptors that may be affected by the proposed project;
- Identify and define potential receptors according to the sensitivity of receptors; and
- Recommend mitigation measures to reduce the potential visual impacts generated by the proposed project.

1.4 Legal Requirements

The VIA is a requirement in terms of the EIA regulations (2014) (GN No R 982, R 983, R984 and R 985) promulgated under the National Environmental Management Act (Act No. 107 of 1998) (NEMA) as amended.

The International Finance Corporation (IFC) Performance Standard 1 describes the requirements for Social and Environmental Assessment and Management Systems, which also apply to visual and landscape assessment. The IFC standards for social and environmental impact assessment and management were therefore taken into consideration in the completion of the VIA.

An accepted international guideline for VIA is the ‘Guidelines for Landscape and Visual Impact Assessment’ (GLVIA, Third Edition, 2013) published by the Landscape Institute and the Institute of Environmental Assessment and Management (UK), which provides detail of international best practices and technical methodology for VIA.
Nationally the ‘Guideline for involving visual & aesthetic specialists in EIA processes,’ by Oberholzer (2005) was developed to provide guidelines and general good practices for specialist visual input into the EIA process in South Africa. These guidelines are used extensively and will be used as a guide for this assessment. Together these documents provide the basis for the level and approach of this report.

1.5 Specialist Details

Riaan van der Merwe completed his undergraduate and Honours degrees (Military Geography) at the University of the Stellenbosch and a Post Graduate Diploma in Science, majoring in Geographic Information Systems (GIS)/Remote Sensing and Environmental Management at the University of Witwatersrand. He is registered with the South African Council for Professional and Technical Surveyors (PLATO) and a member of the Geo-Information Society of South Africa (GISSA). He has undertaken visual impact assessments for the last 10 years both for the public and private sectors. Assessments range from the development of mining sites/infrastructure, commercial developments, linear infrastructure such as power lines and residential developments. Riaan is responsible for the report writing and visual impact assessment. Refer to Appendix B.

1.6 Declaration of Independence

I, Riaan van der Merwe, act as the independent specialist/s in the environmental authorisations and EMP amendment processes for the Booysendal South Expansion Project. I performed the work relating to the environmental authorisation applications in an objective manner, even if this results in views and findings that are not favourable to the applicant.

I declare that there are no circumstances that may compromise my objectivity in performing such work. I have expertise in conducting the Visual Impact Assessment specialist study and report relevant to the environmental authorisation applications. I confirm that I have knowledge of the relevant environmental Acts, Regulations and Guidelines that have relevance to the proposed activity and my field of expertise and will comply with the requirements therein.

I have no, and will not engage in, conflicting interests in the undertaking of the activity.

- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has, or may have, the potential of influencing any decision to be taken with respect to the application by the competent authority; and

- the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
All particulars furnished by me in this report are true and correct. I realise that a false declaration is an offence in terms of regulation 48 of the National Environmental Management Act, 107 of 1998 (NEMA) and is punishable in terms of section 24F of the Act.

Riaan van der Merwe

1.7 Report Structure

The report is structured as follows:

- Chapter 1: Introduction: Presents the project and introduces the site, outlines terms of reference for the VIA, and report structure;

- Chapter 2: Methodology: Provides a brief description of the field survey and the relevant methodology used as part of the VIA;

- Chapter 3: Results: Define the scope and scale of the proposed project, provides a baseline of the exiting visual resource, established the ZVI, view distance and visual absorption capability;

- Chapter 4: Impact Assessment: Individual visual impacts are identified and the significance of the specific impact calculated;

- Chapter 5: Mitigation and Control: Outlines the key mitigation measures to be taken into consideration in the detailed design of the project based on the Landscape Character and VIA; and

- Chapter 6: Monitoring: Outlines the key monitoring requirements.
2. METHODOLOGY

2.1 Defining Visual Assessment

Visual appraisal is concerned with the changes that arise in the composition of existing views as a result of changes to the landscape, people’s responses to the changes and to the overall effects on visual amenity. Changes may result in adverse (negative) or beneficial (positive) effects. The word ‘visual’ as used within this report is taken from the broadest meaning to include visual, scenic, aesthetic, wellbeing, biodiversity, cultural and amenity values represented by the built and natural environment, which in totality can be described as the area’s sense of place. The nature of a landscape and visual assessment requires both objective analysis and subjective professional judgement. Accordingly, the assessment is based on best practice, information and data analysis techniques and uses subjective professional judgement and quantifiable methods wherever possible.

2.2 Survey Period and Area Covered

One photographic and field reconnaissance survey was undertaken from 9 - 10 February 2016 of the site and the surrounding area. The study area was scrutinized to the extent that the receiving environment could be documented and adequately described. Data collected during the site visit allowed for a comprehensive description and valuation of the receiving environment, quality of the scenic resource, valuation of the sense of place, as well as the scope and extent of the proposed Project. Local homesteads/settlements and roads were identified as critical views/sensitive receptors and visited in order to determine sensitivity and visual exposure of these receptors (refer to Section 3.4).

The photography survey was undertaken using a digital Canon camera and 50mm equivalent lens. Overlapping (50%) landscape format photographs were taken which are joined together using computer software to create a single panoramic image for each viewpoint. The photographer also notes the GPS location of the viewpoint and takes bearings to visible landmarks whilst at the viewpoint. For reference refer to Appendix C with regards to photo locations and photo orientation.

2.3 Methodology

The assessment of landscape and visual impacts is both quantitative and qualitative. The assessment describes what would be affected and how it will be affected. The level of visual
modification (magnitude), makes a judgement regarding the capacity of the landscape to accommodate change by assigning a visual receptor sensitivity and then assesses the significance of the resulting impact. These factors and the ways in which they are combined to identify the extent of visual impact are outlined in the following sections:

- **Project Components**: In order to understand the scope and scale of the proposed project the physical characteristics of the project components were described and illustrated. Refer to section 3.1;

- **Landscape Baseline**: To evaluate the impacts of the proposed project, the inherent scenic values of the landscape were determined by describing the setting, visual character and the sense of place;

- **Magnitude Assessment**: Estimate the magnitude of the visual impact by assessing the following factors:
  - Define the extent of the which the project can have on the visual environment by identifying all possible observation sites from which the proposed infrastructure would be visible (i.e. ZVI) and the viewing distance from these observation site;
  - Determine the visual absorption potential (i.e. ability of the landscape to accommodate the proposed project from a visual perspective);

- **Sensitive Visual Receptors**: Determine the sensitivity of the critical views/visual receptors that may be affected by the proposed project (e.g. residents, motorist and tourist);

- **Spatial Modelling**: Modelling of Visual Impacts using GIS software based on the spatial data, landscape analysis and the findings obtained from the field survey;

- **Impact Assessment**: The significance of the visual and landscape impact is calculated by taking in consideration the sum of the likelihood, duration, extent, and sensitivity of the visual impact. This is then multiplied with the magnitude of the impact to determine the significance of the impact (Significance = (Likelihood + duration + extent + sensitivity) x magnitude). The impact assessment was further aided by the modelling of potential impacts; and

- **Mitigation and Monitoring Requirements**: Suggest measures that could mitigate the negative impacts of the proposed project and recommend monitoring requirements.

The visual assessment methodology was undertaken based on the following activities:

- An initial desktop analysis: through which the spatial digital terrain model (DTM) and project design data were analysed and manipulated using GIS software (e.g. ArcGIS). This allowed gaining an understanding of the landscape, location of potential sensitive receptors, the scenic
value and sense of place and an initial understanding of the absorption capacity of the landscape.

- Field survey: The purpose of the field survey was to identify representative viewpoints; to gain a better understanding of the sense of place, the character of the landscape to accommodate and absorb change; and to understand the receptors that may be affected by the project.

- Data analysis and modelling: GIS software was used to determine the ZVI through terrain, topographical and land cover modelling of the various infrastructure components. Additional modelling was done to determine the visual impact index therefore the magnitude and extent of the various infrastructure components and the potential combined visibility thereof on the various receptors. Finally a representative view as experienced by residents was used for the photographic simulation. The before and after photographic simulation show the proposed activity superimposed onto the existing landscape scene.

3. RESULTS

3.1 Description of the Project Components

For operational purposes Booysendal is divided into two main areas:

- The existing 2011 UG2 and Merensky operation known as Booysendal North (BN); and

- The Booysendal South (BS1/BS2; BS3, BS4 (ex-Everest operation), Merensky expansion and linear infrastructure corridors);

The Booysendal South Expansion Project will involve infrastructure and mining development that will lead to a doubling of the current BN production of 220,000ktpm to 450,000ktpm. The Booysendal South Expansion Project focusses on four development areas with linear infrastructure between the various areas:

3.1.1 Area 1 - BS1/2 Complex

The bulk of the Booysendal South Expansion Project will be associated with BS1/2 and will consist of a new portal, emergency escape portal and associated surface infrastructure complex from where the UG2 reef will be mined. The BS1/2 complex is located on a central section of the farm Buttonshope 51JT.

Activities which has commenced (S24G activities) include:
- Infilling of more than 5 cubic meters within the 100-year flood line of the Groot Dwars River for the establishment of the portal terrace and the main river crossing over the Groot Dwars River;
- Diversion of two unnamed tributaries of the Groot Dwars River upstream of the BS1/2 Shaft Complex;
- Clearance of more than 300m² of CBA and clearance of approximately 6ha of vegetation in total for the construction of the portal and the infrastructure described herein;
- Stockpile and terracing for the BS1/2 portal within the 100m flood line of an unnamed tributary of the Groot Dwars River;
- Construction of a pollution control dam, a sewage treatment plant and a drinking water treatment plant, mine dewatering, process water tanks and water storage tanks which requires authorization in terms of the National Water Act, 36 of 1998 for Section 21 b, f, j and g water uses;
- Construction of a crusher plant and an associated conveyor system which will transport the ore to a new silo and from there to an Aerial Rope conveyor system at the edge of the BS1/2 terrace;
- Construction of an Aerial Rope conveyor system from BS1/2 to BS4. This will constitute clearance of vegetation more than the NEMA listed activity threshold as well as infilling of more than 5 cubic meters in a drainage line for one of the towers;
- Construction of a bridge across the Groot Dwars River;
- Storage facilities for diesel, dangerous and hazardous chemicals in excess of the NEMA listed activity thresholds; and
- Construction of a 132kVA powerline from BN to BS1/2 (to commence shortly). The electricity supply is required for operation of the mining activities and the conveyor system;
- Oil separators and settlers for storm water;
- Various water infrastructure at BS1/2 including a raw water tank of 8,500m³; process water storage tank of 812m³; potable water storage tank of 10m³; potable water treatment plant with a throughput capacity of 15m³/h; sewage treatment plant with a capacity of 30m³/h; pollution control dam with a capacity of 14,000m³;
- Pipeline from BS4 to BS1/2 – 80m³/h less than 120cm in diameter.
- Vent fans at BS1/2 (to commence). The vent fans are an integral part of the BS1/2 operations;
- Construction of a 13,2 meter wide road with a servitude of 30 meters from BN to BS1/2. Construction of this road has already commenced. The western section of the road mainly follows the alignment of an existing exploration track of 4m. Vegetation clearance of the servitude and construction of 14 culverts commenced. Although sections along this road have also historically been disturbed due to agricultural practices, there are sections that fall within the CBA; and
- Potable water will be provided from the TKO dam, while process and make-up water will be from the fissure water and Valley Boxcut PCD.
The infrastructure associated with BS1/2 is included in Project No. 7826150206. All the infrastructure included except for the small section of the ARS from BS1/2 to BN will form part of the Section 24G application.

Activities associated with BS1/2 which are to commence at a later stage and which will be included as part of the normal EIA/EMP application process includes:

- Aerial Rope conveyor system between BS1/2 and BN; and
- Emergency escape portal north of the main BS1/2 portal.

3.1.2 Area BS3

Underground mine on the southern section of the farm Buttonshope 51JT. The mine will be accessed through an underground tunnel from BS1/2. All infrastructure and activities associated with BS3 are future activities and will therefore be included on the normal EIA/EMP process.

3.1.3 Area BS4

Construction of the following activities (refer to Figure 3-3) have commenced at BS4 (Everest) and are included in the Section 24G application:

- Reworking and replacing of tailings on the existing TSF1 at BS4;
- Backfilling of the underground workings with tailings;
- Upgrade the storm water management system at BS4 using the Storm Water Management Plan developed by SLR in 2011, as basis for the upgrades. The following upgrades were or will be done:
  - Upgrade of the storm water drainage at and downstream of the portal;
  - Upgrade of the clean and dirty water separation system upstream of the existing TSF and to the east of the existing portal and workshop complex;
  - Upgrade and lining of the plant pollution control dam (PCD); Decommissioning and rehabilitation of the workshop PCD;
  - Upgrade of the northern portal PCD;
  - Upgrade of the sewage treatment plant at the workshop; and
  - Construction of a PCD at the valley boxcut.
- Water supply pipeline from the TKO dam to BS1/2;
- Increase in the size of the ore stockpile (ROM);
- Silt trap at the upstream point of the conveyor system;

Future activities which will be included in the normal EIA/EMP process for BS4 include:

- The future TSF 2 and RWD to the north on the kiwi farm footprint; and
- Return water pipeline from the RWD to the plant.
Figure 3-1: Project Components
Figure 3-2: BS1/2 Site Layout
Figure 3-3: BS4 Layout
3.2 Landscape Baseline

The following sections discuss the environmental parameters which have a direct impact on the aesthetic, biodiversity, cultural, sense of place and general wellbeing value of the area.

3.2.1 Topography and Hydrology

The proposed project is located within the Groot-Dwarsrivier valley which is characterised by rugged topography (steep slopes and narrow V-shaped valleys) with the relief measuring between 940m and 2330m above sea level. Die Berg peak at 2330m, and is the highest natural point in Mpumalanga. Refer to Figure 3-4.

The prominent north-south trending Steenkamps Mountains extend across the study area, with two deeply incised valleys lying in a north-south direction between the mountain ranges. Within these valley floors are the Groot-Dwarsrivier in the east and the Klein-Dwarsrivier in the west (both flowing northwards through the area). The Groot-Dwarsrivier valley is the biggest and most impressive of the valleys. The mountains define the upper reaches of the Groot-Dwarsrivier valley and create an impressive backdrop to the study area. BS1/2, BS3 as well as the Merensky portals and associated infrastructure are located in the Groot-Dwarsrivier valley. A ‘terrace valley’ within the broader Groot-Dwarsrivier valley, lies to the east of the steeper valley. BS4 is located on this “terrace valley”. It is flatter in profile and less spectacular in visual appeal than the lower Groot-Dwarsrivier valley. The valley terrace topography roles gently to the north and west. The nature of the topography (mountainous terrain) within the ZVI will significantly screen and block extended views of the proposed infrastructure. Refer to Section 3.3.3.

The Groot-Dwarsrivier runs through the proposed project area and drains into the Der Brochen Dam (refer to Figure 3-5). The Klein-Dwarsrivier is situated approximately 7km to the west and the Waterval River approximately 10km to the east of the proposed Booysendal Mine. Several drainage lines also occur within the project area which drain into one of the rivers mentioned above.
Figure 3-4: Topography
3.2.2 Vegetation

Due to the variations in the topography and the presence of drainage lines as well as the perennial Groot-Dwarsrivier in the bottom of the valley, numerous vegetation zones are present within the project area. According to the Vegetation Atlas of South Africa, Lesotho and Swaziland, the project area falls within three vegetation types, namely the Sekhukhune Mountain Bushveld, Lydenburg Montane Grassland and Sekhukhune Montane Grassland vegetation types. The bulk of the proposed infrastructure footprint occurs in the Sekhukhune Mountain Bushveld, with areas of Sekhukhune Montane Grassland vegetation in the higher areas on the eastern, southern and western sides of the Groot-Dwarsrivier valley. On the eastern part of the ZVI there is an area of Lydenburg Montane Grassland.

These vegetation types are typical in the Limpopo and Mpumalanga provinces and are found on the mountains and undulating hills above the Sekhukhune plains. Typically the vegetation profile consists of open and closed savannah areas with average height of 2.5m to 5m. Grasses and shrubs form the lower canopy of vegetation. The nature of the vegetation within the ZVI will contribute in screening the proposed infrastructure to some extent. Refer to Section 3.3.3.
3.2.3 Transportation Networks

The project area is located within a remote part of the Mpumalanga and Limpopo Provinces and is relatively inaccessible via road. The current transport network within the immediate area mainly comprises of a network of informal dirt tracks and pathways. The nearest main road is the R577 Main Road (Roosenekal – Lydenburg road) which forms part of the Steenkampsberg Pass. The ZVI analysis indicates that the proposed infrastructure will not be visible from the R577 main road. Refer to section 3.3.1.

3.2.4 Land Use

The project area is situated in a remote rural area, which up until recently saw very little human activity. This is the result of:

- The steep Groot-Dwarsrivier valley combined with the rocky soils and low rainfall, which is not suitable for crop agriculture in the area;
- The steep gradients in the area and rocky soils leading to stock farming being marginal in the area; and
- The Groot-Dwarsrivier valley that is bordered by tall mountains to the east, west and south making accessibility and thoroughfare difficult, therefore limiting human activity in the area.
- Most of the direct surrounding land is owned by mining houses.

**Residential**

The project area is largely undeveloped and rural with some smaller settlements to the east (Petlas and Chomas Families) of the project area, and some individual homesteads (Groenewald and Nel homesteads) located mainly to the immediate southeast of the project area. Refer to section 3.4.1 and Figure 3-7, Figure 3-8, Figure 3-9 and Figure 3-9. Some homesteads are also located to the west of the Groot-Dwarsrivier valley (located on the eastern boundary of the Klein-Dwarsrivier valley) but the analyses (refer to section 3.3.) reveal that these homesteads will not be affected directly by the proposed development.

Some residents were approached in order to request permission where necessary to gain access, take photographs and gather field notes but this level of assessment excludes surveys to establish viewer preference and thereby their specific sensitivity.
Figure 3-7: The Petlas Settlement to the East

Figure 3-8: The Groenewald Homestead to the South East
Figure 3-9: The Nel Homestead to the South East

Agricultural

The land adjacent to land owned by the mine is owned by other mining houses, farmers and for the most part is not used for large scale commercial farming but is rather small-scale farming. Some of the farms are used as holiday destinations and as 4X4 driving tracks. Agricultural activities are mainly located to the east of the proposed operations.

Mining

Mining activities have been established recently and include BN and exiting BS4 operations located to the north and east respectively. Mining activities at BN include the concentrator plant, tailings dam and associated infrastructure. Refer to Figure 3-10 and Figure 3-11. The area north of BN is characterised by extensive mining activities by various mining houses.
Figure 3-10: Booyendal North Mine (to the north of the proposed Project)

Figure 3-11: The Everest Operations to the East
3.2.5 Sense of Place

Central to the concept of sense of place is that the landscape requires uniqueness and distinctiveness. The primary informant of these qualities is the spatial form and character of the natural landscape taken together with the cultural transformations and traditions associated with the historic use and habitation of the area. The study area is divided into three distinct areas (northern, southern and eastern sections), each with its own visual character and sense of place. The various ridge lines form a natural barrier between the northern/southern section and the eastern section (refer to Figure 3-13).

**Northern Section**

The visual character of the northern section is dominated by conventional mining activities (BN, Anglo Platinum-Glencore Mototolo JV, Glencore’s Helena Mine followed by Glencore’s Magareng and Thorncliffe Mines and further north the Assmang Dwarsriver Mine, Anglo Platinum’s Twickenham Mine and to the west the African Rainbow Minerals’ Two Rivers Mine, and associated infrastructure (refer to Figure 3-12 and Figure 3-14). Operational and security lighting associated with the various mines generate direct light and a general glow within this section at night. Mining and associated activities provide the northern section with a distinct sense of place associated with commercial mining and exploration activities.

**Figure 3-12: Existing mining activities within the northern section.**
Figure 3-13: Sense of Place - Section Boundaries
Figure 3-14: Existing Mining Operations
Southern Section

The area is located in a natural, elevated 'vessel' that opens to the north and which is contained by the dramatic Steenkampsberg Mountains on three sides. From higher vantage points the rural nature and rugged character of the scene is evident. These factors combine to create the perception that the place has a rather unique natural and biodiversity quality and character. However, there is a sense that the beauty and ‘wildness’ of the area is being compromised to the north with the presence of the existing mining operation and its necessary support infrastructure. The southern section of the Groot-Dwarsrivier valley is not inhabited and not easily accessible, this combined with the visual splendour of the landscape adds to the uniqueness of this section (Please refer to Figure 3-15). These characteristics as mentioned, provide this section with a distinct aesthetic and natural sense of place. This section also includes the ridge line associated with the Klein-Dwarsrivier valley to the west and homesteads located within the Klein-Dwarsrivier valley.

Eastern Section

The eastern section has a rural character and is more accessible and populated than the southern section. The area is associated with limited agriculture and some existing mining activities located at BS4. Operational and security lighting associated with the existing BS4 operations generates direct light and a general glow at night.
The surrounding area was previously associated with commercial Kiwi fruit production and the visual remains of the industry are still present (please refer to Figure 3-16). Smaller settlements and some individual homesteads are located within this section. The smaller settlements are mainly associated with subsistence farming. Historically some of the inhabitants worked on the Kiwi farms and at the existing BS4 operations. Although the landscape has been impacted by the existing mining operation and invasive plant species, some settlements and limited farm homesteads, the sense of place of the study area is established with the combination of natural valleys and the surrounding mountains. The typical character is that of a rural area within a natural landscape.

In summary thus, it has been established that the study area represents three distinct areas, each with its associated visual character and sense of place. All sections have a relatively moderate to high sense of place dominated by mining, rural or agricultural activities. From the baseline information the area most vulnerable to a change in the sense of place is the southern section of the proposed project due to the scale and extent of the proposed operations. The impact on sense of place can be reduced by adhering to the mitigating measures suggested in chapter 5 of this document.

**Figure 3-16: Remnants (windbreak) of the commercial Kiwi farm in the Eastern Section**
3.2.6 Visual Quality and Character

The visual perception of the proposed activity is influenced by the combination of the extent to which the activity is visible (level of visibility) and the response of individuals to what they see. A major influence on the perception of people in relation to the proposed mining activity will be the visual character and quality of the landscape in which they would be located. Natural landscape areas such as national parks and riverside areas are valued for their high visual quality. The expansion of mining activities and associated infrastructure may be seen as a negative impact on these areas of high visual quality. In contrast, areas which are degraded are less valued due to their low visual quality.

Scenic Value

The once spectacular and ‘wild’, rural landscape, especially in the Southern section, is being compromised by the presence of ‘foreign’, seemingly ‘out of place’ activities associated with the existing mining operations, prospecting sites, Eskom power lines and the encroachment of alien vegetation, located within the northern and eastern sectors. For this reason and when taken together, the whole study area’s (e.g. 10 km buffer area) aesthetic value is reduced to moderate.

Tourism Value

Related to the scenic value of a specific area is the tourism value attached to that associated area. The southern section is regarded as an area with a high scenic and eco-tourism potential (Please refer to Figure 3-17). Potential eco-tourism activities could include tourist accommodation, trout angling, 4x4 trails, hiking and camping. This scenic area is currently not utilised (or very limited) for tourist activities but has the potential to be further developed, although recent mining activities has degraded this potential considerably, especially towards the north. Places of interest near the project area are the De Berg walking trail and conservation area, Verlorenvlei Nature Reserve and the Steenkampsberg Pass. The northern and eastern sectors are limited to mining, settlements and agriculture within the ZVI.
3.3 Magnitude of the Visual Impact

This section describes the aspects considered in order to determine the magnitude of the visual impact on the area. The criteria include the area from where the project can be seen (i.e. ZVI), the viewing distance and the capacity of the landscape to visually absorb structures and forms placed upon it (i.e. Visual Absorption Capability, or VAC).

3.3.1 The Zone of Visual Influence

In order to determine the potential extent of visibility of the project, a ZVI analysis was conducted. The ZVI is defined as the ‘area within which a proposed development may have an influence or effect on visual amenity’ (GLVIA, Glossary). A ZVI analysis was carried out to define all possible sites from where the infrastructure would be visible. A ZVI map therefore illustrates the potential (or theoretical) visibility of an object in the landscape. The phrase “potential visibility” is used to describe the result because the analysis does not take into account any landscape artefacts such as trees, woodland, buildings etc. The visibility analysis therefore considers the worst-case scenario, using line-of-sight i.e. ignoring vegetation cover and other structures and is based on topography alone. The ZVI also does not take into account the effects of weather and atmospheric conditions in reducing visual range. The ZVI analysis assists the process of identifying possible affected viewers and the extent of the effected environment. The results are not intended to show the actual visibility of an object; they are intended to indicate where the object may be visible from.
Actual visibility can only accurately be determined by a site survey since there are a multitude of local variables that may affect lines of sight. On the other hand, a ZVI does show where an object definitely cannot be seen.

A ZVI analysis was prepared using the ESRI ArcGIS Viewshed routine. This creates a raster image that indicates the visibility (or not) of the points modelled. The first step in the production of a ZVI map is to obtain a computer representation of the ground surface in the vicinity of the proposed development, referred to as a Digital Terrain Model (DTM). This DTM is created using digital elevation data. The data may take a number of forms but most commonly it is a combination of contours and spot heights. For this project topographic data was obtained for the site and the surrounding environment at 5m contour interval to create the DTM. The DTM was draped over the topographic data (rivers, roads, villages, etc.) to complete the model used to generate the ZVI analysis.

As the ZVI model calculates the proposed infrastructure visible from ground level, a measure of viewing height is required. This was set at 1.5 metres above ground level (average viewer height). The offset height for each specific proposed infrastructure component (e.g. ARS Route, BS2, etc.) was extracted from the preliminary site layout drawings and added to the baseline DTM. The offset heights varied from 2.4m – 65m for components of the ARS Route, 6m to 12m for the BS2 surface infrastructure, 36m for the TSF and 10m for the power line.

Visibility is affected by earth curvature and the refraction (bending) of light through the atmosphere, particularly at greater distances. Therefore this effect was included in the ZVI calculation as its absence will tend to overestimate visibility.

Refer to Figure 3-18 to Figure 3-23 which spatially depicts the ZVI for each major project component (ARS Route, Main Access Road, BS2, Power line, vent shafts at BS1 and BS3 and the TSF at BS4).

It is apparent from the models and maps that the ARS Route will be visible for sensitive receptors (Groenewald/Nel homesteads and Petlas/ Chomas settlements) for only a small section of the proposed route (<20%) as it traverse the valley ridge towards the BS4. Views within the Groot-Dwarsrivier valley are considerable but the area is uninhibited. Visual screening will be inadequate due to the ARS route dimensions.

BS1/2, BS3 and the stockpiles will not be directly visible from any sensitive receptor. The valley ridges block extensive views towards the east and west and contain the viewshed within the Groot-Dwarsrivier valley which is uninhibited.

As with the ARS route, views of the power line and access route will be visible from sensitive receptors (Groenewald homestead and Petlas settlement) for only a small section of the proposed route as it traverses the valley ridge towards BS4. It is anticipated that localised vegetation cover will reduce the visibility significantly.
The new TSF 2 will be visible to the Groenewald/Nel homesteads and Petlas/Chomas settlements sensitive receptors, but the mountainous terrain blocks extensive views towards the east and west and contain the viewshed mainly within the upper “terrace” of the Groot-Dwarsrivier valley. Localised vegetation cover will not be able to screen the new TSF 2 sufficiently due to its physical dimensions and location.

Some residents (e.g. Western Homestead) have reported potential sensitivity to light pollution. These residents will not be able to observe any operational and security lights directly. The cumulative impact of the additional lights may create a general glow in the Groot-Dwarsrivier valley but it is very unlikely that it will impact the residents, as the ridge line between the residents (western homesteads) and BS1/2 area is around >700m in height. Mitigation measure will reduce this risk considerably. Refer to Chapter 0.

Using the criteria in Table 3-1, visibility of the proposed project from the surrounding areas during the construction and operational phases will be moderate due to the fact that the combined viewshed is visible from less than half the ZVI. For the purposes of this study the visibility has been reduced to Low, as the majority of the viewshed will be contained within the Groot-Dwarsrivier valley which is uninhabited.

Table 3-1: ZVI evaluation for proposed Booysendal Mine EMP Amendment Project

<table>
<thead>
<tr>
<th>High</th>
<th>Moderate</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the project and its infrastructure is visible from over half the zone of potential influence, and/or views are mostly unobstructed.</td>
<td>If the project and its infrastructure are visible from less than half the zone of potential influence, and/or views are partially obstructed.</td>
<td>If the project and its infrastructure is visible from less than a quarter of the zone of potential influence, and/or views are mostly obstructed.</td>
</tr>
</tbody>
</table>
Figure 3-18: Zone of Visual Influence: ARS
Figure 3-19: Zone of Visual Influence: Main Access Road
Figure 3-20: Zone of Visual Influence: BS1/2
Figure 3-21: Zone of Visual Influence: Power Line
Figure 3-22: Zone of Visual Influence: Vents (Emergency Escape Portal – BS3)
Figure 3-23: Zone of Visual Influence: TSF
3.3.2 The Viewing Distance

The visual impact of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases (Hull and Bishop, 1988). Thus, the visual impact at 1000m would be approximately a quarter of the impact as viewed from 500m. Consequently, at 2000m, it would be one sixteenth of the impact at 500m. Therefore the greater the distance from the proposed infrastructure, the lower the impact, as the development will take up a smaller portion of the view.

The area, defined as the radius from the boundary of the proposed infrastructure, beyond which the visual impact of the most visible features will be insignificant was established at 10km. Over 10km the impact of the proposed infrastructure would have diminished considerably due to the diminishing effect of distance and atmospheric conditions (haze) on visibility. On the other hand, the visual impact of the project components within a distance of 2000m or less would be at its maximum. View distance is rated using four increments of severity, each with their respective qualification and contribution to visual impact (Refer to Table 3-2 below).

Table 3-2: View distance evaluation

<table>
<thead>
<tr>
<th></th>
<th>High Exposure (significant contribution to visual impact)</th>
<th>Moderate Exposure (moderate contribution to visual impact)</th>
<th>Low Exposure (minimal influence on visual impact)</th>
<th>Insignificant Exposure (negligible influence on visual impact)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 – 2km</td>
<td>2 - 5km</td>
<td>5km – 10km</td>
<td>Over 10km</td>
</tr>
<tr>
<td>Residents</td>
<td>Applicable</td>
<td>Applicable</td>
<td>Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Tourist</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Motorist (Local traffic excluded)</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>
Figure 3-18, to Figure 3-22 it is clear that some of sensitive residential viewer locations (Groenewald/Nel homesteads and Petlas settlement) are located between the 0 – 2km buffer areas from the proposed project. Therefore, the proposed project would be in the fore to middle ground of these sensitive views depending on range. This results in a high visual exposure for the proposed project site from these viewing points.

Some sensitive viewer locations are also located in the 2-5km (Petlas settlement) and 5-10km (Chomas settlement) buffer areas from the proposed project. Therefore, the proposed project would be in the background and far background respectively of these sensitive views depending on the specific range. This results in a moderate to low visual exposure respectively for the proposed project from these viewing points depending on the range.

**Visual Index Map**

In order to spatially identify areas that may be affected more than others mainly due to views from multiple components and the physical location in relation to these components a Visual Impact Index map were created (refer to Figure 3-24). This map was created by combining the various ZVI maps and rating the areas that could see more than one project component (e.g. 1, 2, 3, 4, 5 or all 6 components). The distance (0 – 2 km, 2 -5 km and 5 -10 km) from the specific components were also rated and incorporated in this analysis. The analysis created a rating of 1 to 18, with 1 being an area which could see all 6 components and is within the 0 – 2 km buffer area (High/High Impact). A rating of 18 in the other hand would correspond to an area which could observe only one project component and is within the 5 – 10 km buffer range (Low/Low Impact).

It is evident from this map that the Groenewald Homestead would theoretically be able to observe four components (i.e. the ARS Route, TSF2, Main Access Road and Power line) and is within the 0 – 2 km buffer area, therefore a visual impact index of 3 (High/ Medium impact). The Nel homestead would be able to observe two component (i.e. the ARS Route and TSF2) and is within the 0 -2 km buffer area with a visual index of 5 (High/ Low impact). The Petlas settlement have a visual impact index of 3 to 9 (High/ Medium and Moderate/Medium impact) and will be able to observe four components (i.e. ARS Route, Main Access Road, Power line and TSF2) and are within the 0 -2 km and 2 - 5 km buffer area. The Chomas settlement will only be able to see the ARS Route and TSF2 are within the 5 -10km buffer area. They have a visual impact index of 17 (Low/Low impact).
Figure 3-24: Visual Impact Index
3.3.3 The Visual Absorption Capacity

Visual absorption capacity (VAC) signifies the ability of the landscape to accept additional human intervention without serious loss of character and visual quality or value. VAC is founded on the characteristics of the physical environment such as:

Degree of Visual Screening

A degree of visual screening is provided by landforms, vegetation cover and/or structures such as buildings. For example, a high degree of visual screening is present in an area that is mountainous and is covered with a forest compared to an undulating and mundane landscape covered in grass.

Terrain variability

Terrain variability reflects the magnitude of topographic elevation and diversity in slope variation. A highly variable terrain will be recognised as one with great elevation differences and a diversity of slope variation creating talus slopes, cliffs and valleys. An undulating landscape with a monotonous and repetitive landform will be an example of low terrain variability.

Land Cover

Land cover refers to the perceivable surface of the landscape and the diversity of patterns, colours and textures that are presented by the particular land cover (i.e. urbanised, cultivated, forested, etc.). Areas which have a high visual absorption capacity are able to easily accept objects so that their visual impact is less noticeable. Conversely areas with low visual absorption capacity will suffer a higher visual impact from structures imposed on them.

A representative view as experienced by residents was used for the photographic simulation. The before and after simulation illustrated in Figure 3-25 to Figure 3-28, show the proposed activity superimposed onto the existing landscape scene. The simulation illustrates the visual absorption potential of the affected landscape when viewed from the Petlas Settlement and the Groenewald homestead (note that these simulation may vary from the actual impact).

It is evident from the simulation as viewed from the Petlas Settlement that the TSF2 will be totally visible and that the Plant PCD would be obscured by vegetation growth in the middle ground of the view. It is clear from the simulation as viewed from the Groenewald homestead that the power line and main access road would be obscured by vegetation growth in the middle ground of the view. The ARS Route is visible in the background crossing the ridge towards the existing BS4 operation. The TSF2 is visible in the far background.

It is apparent that the ability of the landscape surrounding the proposed operations to ‘visually absorb’ the proposed project is high (low impact) due to the following:

- The proposed project is situated on a diverse landform type (mountainous terrain);
• The degree of visual screening is substantial due to the mountainous terrain and vegetation cover which blocks extended views of the proposed infrastructure, especially in the southern and northern sections; and

• The colour and contrast of the proposed project corresponds with the colour of the existing mining activities/degraded environment of the immediate surrounding area (e.g. BS4 operations) when viewed from the sensitive residential visual receptors (homesteads and settlements).

The landscape therefore has a high visual absorption capacity and will suffer a low visual impact from the proposed activity imposed on it (refer to Table 3-3).

<table>
<thead>
<tr>
<th>Table 3-3: Visual absorption capacity evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Criteria</strong></td>
</tr>
<tr>
<td>Visual Absorption Capacity (VAC)</td>
</tr>
</tbody>
</table>
Figure 3-25: View from the Petlas Settlement (Southern direction) – Before
Figure 3-26: View from Petlas (South-Western direction) – After
Figure 3-27: View from the Groenewald homestead (north-western direction) - Before
Figure 3-28: View from Groenewald Homestead (north-western direction) – After
3.3.4 Analysis

The magnitude of the visual impact is determined using the ZVI, viewing distance, and visual absorption capability. Table 3-4 summarises the results of the criteria used to determine the magnitude of the visual impact. These results are based on worst-case scenarios when the impact of all factors (ZVI, Visual Distance and VAC) is considered together.

<table>
<thead>
<tr>
<th>Quality of Visual Resource</th>
<th>Factors use to determine magnitude</th>
<th>Magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to construction</td>
<td>High to Low</td>
<td></td>
</tr>
<tr>
<td>Construction &amp; Operational Phase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assuming mitigation is successful</td>
<td>Low</td>
<td>High to Low</td>
</tr>
<tr>
<td>Closure Phase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Assuming mitigation is successful)</td>
<td>Low</td>
<td>High to Low</td>
</tr>
</tbody>
</table>

According to the results tabulated in Table 3-4 the magnitude of visual impact associated with the proposed project, during the construction and operational phase, will be low if concurrent rehabilitation is implemented, while during the closure phase the visual impact will be low assuming that mitigation measures are successful.

3.4 Sensitive Visual Receptors

Main roads (R577), tourism attractions (De Berg walking trail and Steenkampsberg Pass) and local homesteads/settlements within the ZVI (10km buffer area), were regarded as critical view zones against which the visual impact would be evaluated. Critical views were determined during the field trip and from the provided surface layout maps.
Viewer groups are a collection of viewers that are involved with similar activities and experience similar views of the proposed development. Within the receiving environment, specific visual receptors experience different views of the proposed development. They will be affected due to the alteration of their views and are therefore identified as part of the receiving and affected environment. The visual receptors are grouped according to the similarities in views. The visual receptors included in this study are:

- Residents;
- Tourists; and
- Motorists.

The visual receptors will be affected because of alterations to their views due to the proposed project. In order to determine the sensitivity of these visual receptors a commonly used rating system is utilised (refer to Table 3-5). This is a generic classification of visual receptors and enables the visual impact specialist to establish a logical and consistent visual receptor sensitivity rating for viewers who are involved in different activities without engaging in extensive public surveys.

<table>
<thead>
<tr>
<th>Visual receptor sensitivity</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exceptional</strong></td>
<td>Views from major tourist or recreational attractions or viewpoints promoted for or related to appreciation of the landscape, or from important landscape features.</td>
</tr>
<tr>
<td><strong>High</strong></td>
<td>Users of all outdoor recreational facilities including public and local roads or tourist alternatives whose attention or interest may be focussed on the landscape; Communities where the development results in changes in the landscape setting or valued views enjoyed by the community; Residents with views affected by the development.</td>
</tr>
<tr>
<td><strong>Moderate</strong></td>
<td>People engaged in outdoor sport or recreation (other than appreciation of the landscape).</td>
</tr>
<tr>
<td><strong>Low</strong></td>
<td>People at their place of work or focussed on other work or activity; Views from urbanised areas, commercial buildings or industrial zones; People travelling through or passing the affected landscape on transport alternatives.</td>
</tr>
</tbody>
</table>

### Table 3-5: Visual receptor sensitivity

#### 3.4.1 Residents

In the case of static views, such as views from buildings, the visual relationship between an activity and the landscape will not change. The cone of vision is relatively wide and the viewer tends to...
scan back and forth across the landscape. Residents of the affected environment are therefore classified as visual receptors of high sensitivity owing to their sustained visual exposure to the proposed development as well as their attentive interest towards their living environment.

This level of assessment excludes resident specific surveys to establish specific viewer preference and thereby their specific sensitivity, but it is the author’s professional opinion that the localised visual perceptions of the economically marginalised settlements within the project area may be influenced rather by the short term economic and job opportunities that will exist rather than the direct visual perception of the project. This may not be applicable to all residents as mentioned. Residents are therefore classified as low and high sensitivity rather than just high for purposes of this project.

**Figure 3-29: Some dwellings within the Petlas settlement.**

### 3.4.2 Tourists

Tourists are regarded as visual receptors of exceptionally high sensitivity. Their attention is focused towards the landscape which they essentially utilise for enjoyment purposes and appreciation of the quality of the landscape.

The existing mining activities at Booysendal North have already degraded the visual integrity of the surrounding area especially in the northern section of the project area. This will be augmented by the expansion of the proposed project and would impact negatively on the tourist's expectations.
The De Berg walking trail and the Steenkampsberg Pass are within the ZVI, but are not within the viewshed of the proposed operations. It is therefore predicted that tourist will not be affected by the proposed project (Please refer to Figure 3-24).

3.4.3 Motorists

Motorists are generally classified as visual receptors of low sensitivity due to their momentary views and experience of the proposed development. Under normal conditions, views from a moving vehicle are dynamic as the visual relationship between the activity and the vehicle are constantly changing as well as the visual relationship between the activity and the landscape in which they are seen. The view cone for motorists, particularly drivers, is generally narrower than for static views. Motorists will therefore show low levels of sensitivity as their attention is focused on the road and their exposure to roadside objects is brief. The ZVI analysis indicates that the proposed infrastructure will not be visible from the R577 main road. The proposed infrastructure will be visible for some local roads in the direct vicinity of BS4, mainly used by local residents and mine employees. Refer to section 3.3.1.
4. IMPACT ASSESSMENT

4.1 Impact Description

Various risk sources for the visual impact have been identified for the construction, operational and closure phases and can be classified as negative.

Construction Phase

The activities that are expected to cause visual impacts during construction would be:

- Excessive clearing of vegetation and stripping of topsoil for site preparation, temporary access roads, and open and un-rehabilitated landscape scarring leading to erosion and the formation of dongas;

- Cut and fill slopes of access roads and portals become highly visible if not re-vegetated and shaped to blend in with the existing topography;

- The extent and intensity of the security and construction lighting at night; and

- Dust from construction activities and access roads.

Operational Phase

The activities that are expected to cause visual impacts during operational phase would be:

- The TSF2, ARS Route, stockpiles and localised cuts and fills, could remain aesthetically incompatible with surrounding landscape. Infrastructure and stockpile edges may not blend in with the landscape and or cut slopes may be too steep to be adequately re-vegetated. This may result in a permanent change to the existing visual quality of visually sensitive areas;

- The extent and intensity of the security and operational lighting at night consisting out of the following:
  - 150W bulk head lights and 400W flood lights (pole mounted) at the box cut area and pollution control dam; and
  - General lighting for surface workshops.
• The need to keep servitudes clear of vegetation, will result in landscape scarring;

• Dust from operational activities and access roads; and

• Presence of the associated infrastructure and equipment.

**Closure Phase**

The decommissioning phase will commence once the mining operations has reached the end of life, and will involve:

• Dismantling of ancillary infrastructure; and

• Removal and rehabilitation of linear infrastructure where necessary (e.g. pipelines and ARS Route).

• Rehabilitation of the TSF2:
  
  • The TSF2 surface will be reshaped and profiled to retain runoff;

  • The surface will be vegetated; and

  • Surface water run off drainage measures will be established to control erosion where necessary.

During the closure phase the disturbed areas will be rehabilitated and re-vegetated, although concurrent rehabilitation is recommended for all phases. The overall objectives of closure will be to remove infrastructure, rehabilitate the disturbed areas and to ensure that the site is made safe and to control erosion and pollution emanating from the former mine area.

### 4.2 Impact Assessment

Significance is a measure of the response of viewers to the changes that occur. It represents the interaction between humans and the landscape changes that they observe. The potential significance of the visual impact will primarily result from changes to the visual character of the area within the ZVI. The nature of these changes will depend on measurable factors such as visual extent (level of visibility), viewing distance, and the visual absorption capacity of the surrounding landscape and therefore the magnitude of the visual impact. Other factors are subjective, such as the visual perception of people viewing the activity as the response to visible changes in the landscape may vary significantly between individuals.
The significance of impact was determined using a ranking scale, based on terminology from Amec Foster Wheeler. When the magnitude and receptor sensitivity of impact is qualified, the significance of the impact can be predicted taking into account the extent, duration and probability of the proposed activity (refer to Table 4-1 to Table 4-7).

Table 4-1: Operational and security lighting: 24G activities.

<table>
<thead>
<tr>
<th>Impact Component</th>
<th>Impact 1</th>
<th>Significance prior to Mitigation</th>
<th>Significance with Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Operational and security lighting (construction and operational phase)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk/ Impact</td>
<td>Light sources at night, particularly poorly directed security flood lighting, can influence the visual impact of the development. Unobstructed light sources can cause a general glow in the area and will be visible from significantly longer distances than any structural features during daylight hours.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Phase (during which impact will be applicable) CO = construction, OP = operational, CL = Closure and post-closure</td>
<td>CO, OP</td>
<td>Negative</td>
<td></td>
</tr>
<tr>
<td>Nature of Impact</td>
<td>Direct: The impact of the proposed project after sunset will be direct for people travelling along adjacent local roads and local population living within the surrounding area. Residents and motorists would not be able to see the operational and security lighting from BS1/2 but rather a general glow emanating from the valley may be present. Cumulative: Operational and security lighting in and around the different sites might contribute to the cumulative effect of lights from the existing BS4 operation (e.g. general glow).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Impact</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likelihood/ probability</td>
<td>Likely It is predicted that residents would not be able to see the operational and security lighting from BS1/2 directly as topography will screen any direct views from potential sensitive receptors. The cumulative impact caused by the general glow from the operational and security lighting is likely without mitigation. Mitigation measures could limit this general glow effectively.</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Duration</td>
<td>Long term: Potential impacts could be mitigated or remediated once operations cease at the end of life of mine with dismantling of operational and security lighting equipment.</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
Extent
Area of Influence
Wider region (e.g. mainly contained within the Groot-Dwarsrivier valley due to topography) as unobstructed light sources can cause a general glow in the area and will be visible from significantly longer distances than any structural features during daylight hours.

Receptor Sensitivity
Low: localised visual perceptions of the economically marginalised communities of the population may be influenced rather by the short term economic and job opportunities that will exist rather than the direct visual perception of the project.
Moderate: Some residents (e.g. Western Homestead) have reported potential sensitivity to light pollution. These resident will not be able to observe any operational and security lights directly. The cumulative impact of the additional lights may create a general glow in the Groot-Dwarsrivier valley but it is very unlikely that it will impact the residents as the ridge line between the residents (western homesteads) and BS1/2 is around >700m in height. Mitigation measure will reduce this risk considerably.

Magnitude
Low (Negative): Refer to Table 3-4.

Impact Significance
Minor: Although the likelihood, duration, and spatial extent score are relative high, the magnitude score is low. This reduces the significance of the operational and security lighting impact to a minor significance score and therefore a minor impact without mitigation.

Mitigating and Monitoring Requirements
Required Management Measures
Security flood lighting and operational lighting should only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas (e.g. Nearby homesteads and local roads). Wherever possible, lights should be directed downwards and shielded to avoid illuminating the sky and minimizing light spills.

Required Monitoring (if any)
Long-term monitoring of light pollution should be implemented to assess effectiveness of mitigation measures. A grievance mechanism must be put in place in order for them to have a vehicle to raise their concerns. This could include environmental forum meetings and grievance register.

Responsible for implementation
Environmental Officer and Mine Manager

Impact Finding
Impact can be managed through mitigation measures.

Table 4-2: Operational and security lighting: EIA/EMP activities.

<table>
<thead>
<tr>
<th>Impact Component</th>
<th>Impact 1</th>
<th>Significance prior to Mitigation</th>
<th>Significance with Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Operational and security lighting (construction and operational phase)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk/ Impact</td>
<td>Light sources at night, particularly poorly directed security flood lighting, can influence the visual impact of the development. Unobstructed light sources can cause a general glow in</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
the area and will be visible from significantly longer distances than any structural features during daylight hours.

<table>
<thead>
<tr>
<th>Project Phase (during which impact will be applicable) CO = construction, OP = operational, CL = Closure and post-closure</th>
<th>Nature of Impact</th>
<th>Type of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO, OP</td>
<td>Negative</td>
<td>Residents and local motorists would be able to see the operational and security lighting from infrastructure located at BS4 (e.g. the TSF, Plant PCD, etc.). The impact of the proposed project after sunset will therefore be direct for people travelling along adjacent local roads and local population living within the surrounding area. Operational and security lighting in and around the different sites might contribute to the cumulative effect of lights from the existing BS4 operation (e.g. general glow).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Define Significance Categories</th>
<th>Significance Prior to Mitigation</th>
<th>Significance With Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likelihood/ probability</td>
<td>Likely</td>
<td>3</td>
</tr>
<tr>
<td>Duration</td>
<td>Long term: Potential impacts could be mitigated or remediated once operations cease at the end of life of mine with dismantling of operational and security lighting equipment.</td>
<td>3</td>
</tr>
<tr>
<td>Extent</td>
<td>Area of Influence (Vicinity of BS4) as unobstructed light sources can cause a general glow in the area and will be visible from significantly longer distances than any structural features during daylight hours.</td>
<td>3</td>
</tr>
<tr>
<td>Receptor Sensitivity</td>
<td>Low: localised visual perceptions of the economically marginalised communities of the population may be influenced rather by the short term economic and job opportunities that will exist rather than the direct visual perception of the project. Moderate: Some residents (e.g. Western Homestead) have reported potential sensitivity to light pollution. These residents will not be able to observe any operational and security lights directly. The cumulative impact of the additional lights may create a general glow in the Groot-Dwarsrivier valley but it is very</td>
<td>1 - 3</td>
</tr>
</tbody>
</table>
unlikely that it will impact the residents (western homesteads) as the ridge line between the residents (western homesteads) and BS4 is around >300m in height but also BS4 is located 7km to the east. Mitigation measure will reduce this risk considerably.

<table>
<thead>
<tr>
<th>Magnitude</th>
<th>Low (Negative): Refer to Table 3-4.</th>
<th>1</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact Significance</td>
<td>Minor: Although the likelihood, duration, and spatial extent scores are relative high, the magnitude score is low. This will reduce the significance of the operational and security lighting impact to a minor significance score and therefore a minor impact without mitigation.</td>
<td>Minor</td>
<td>12</td>
</tr>
</tbody>
</table>

**Mitigating and Monitoring Requirements**

<table>
<thead>
<tr>
<th>Required Management Measures</th>
<th>Security flood lighting and operational lighting should only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas (e.g. Nearby homesteads and local roads). Wherever possible, lights should be directed downwards and shielded so as to avoid illuminating the sky and minimizing light spills.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Monitoring (if any)</td>
<td>Long-term monitoring of light pollution should be implemented to assess effectiveness of mitigation measures.</td>
</tr>
<tr>
<td>Responsibility for implementation</td>
<td>Environmental Officer and Mine Manager</td>
</tr>
</tbody>
</table>

**Impact Finding**

Impact Finding
Impact can be managed through mitigation measures.

**Table 4-3: Infrastructure aesthetically incompatible with surrounding landscape: 24G activities.**

<table>
<thead>
<tr>
<th>Impact Component</th>
<th>Impact 2</th>
<th>Significance prior to Mitigation</th>
<th>Significance with Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Infrastructure aesthetically (e.g. access roads) incompatible with surrounding landscape. (Construction, operational and closure phase)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk/ Impact</td>
<td>The infrastructure (ARS, power lines etc.) and localised cuts and fills, could remain aesthetically incompatible with surrounding landscape. Edges may not blend in with the landscape or cut slopes may be too steep to be adequately re-vegetated. This may result in a permanent change to the existing visual quality of visually sensitive areas and therefore negative impact.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Phase (during which impact will be applicable) CO = construction, OP = operational, CL = Closure and post-closure Nature of Impact</td>
<td>CO, OP, CL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nature of Impact</td>
<td>Direct: The impact of the proposed project will be direct for people travelling along adjacent local roads and the local population living within the surrounding area. Residents in close vicinity of the BS4 operations would be able to observe a small section of the ARM Route, power line and main access route. Residents will not be able to directly observe any other proposed infrastructure.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Cumulative: The expansion of the mining activities of the proposed project may increase the population growth and expand other associated infrastructure and economic activities, possibly reducing the visual quality of the visual resource further if not managed. Therefore an overall cumulative degradation of the sense of place and visual resource quality is predicted.

<table>
<thead>
<tr>
<th>Define Significance Categories</th>
<th>Significance Prior to Mitigation</th>
<th>Significance With Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likelihood/ probability</td>
<td>Definite likelihood: Since mitigation measures may not reduce the visual impact sufficiently due to the scale of the proposed infrastructure (ARS Route). Views of the proposed infrastructure will mainly be screened by topography (BS1/BS2). The proposed infrastructure that is visible (ARS Route) will be very limited in extent and will be visually absorbed by the existing operations at BS4 or screened by localised vegetation cover.</td>
<td>4</td>
</tr>
<tr>
<td>Duration</td>
<td>Long-term</td>
<td>3</td>
</tr>
<tr>
<td>Extent</td>
<td>Area of Influence: The scale dimensions and nature of the proposed ARS route will allow extended views thereby influencing the wider region.</td>
<td>3</td>
</tr>
<tr>
<td>Receptor Sensitivity</td>
<td>Low: localised visual perceptions of the economically marginalised communities of the population may be influenced rather by the short term economic and job opportunities that will exist rather than the direct visual perception of the project. Moderate: other residents.</td>
<td>3</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Low (Negative): Refer to Table 3-4.</td>
<td>1</td>
</tr>
<tr>
<td>Impact Significance</td>
<td>Moderate: Although the likelihood, duration, and spatial extent scores are relative high, the Magnitude score is low. This will ultimately reduce the significance of the Infrastructure aesthetically incompatible with surrounding landscape impact to a moderate significance score and therefore a moderate impact without mitigation.</td>
<td>Moderate 13 1</td>
</tr>
</tbody>
</table>

Mitigating and Monitoring Requirements

- Required Management Measures
  To reduce the potential of glare external surfaces of buildings and structures should be articulated or textured to create interplay of light and shade. Avoid shiny or bare metal. It is advisable to direct the slope of roofs away from critical views (e.g. homesteads and settlements).

- Required Monitoring (if any)

- Responsibility for implementation
  Environmental Officer and Mine Manager

Impact Finding

- Impact Finding
  Mitigation measures may not reduce the visual impact sufficiently due to the scale of the proposed infrastructure but the overall significance of the impact after mitigation will be low.
Table 4-4: Infrastructure aesthetically incompatible with surrounding landscape: EIA/EMP activities.

<table>
<thead>
<tr>
<th>Impact Component</th>
<th>Impact 2</th>
<th>Significance prior to Mitigation</th>
<th>Significance with Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Infrastructure aesthetically incompatible with surrounding landscape. (Construction, operational and closure phase)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk/ Impact</td>
<td>The infrastructure (TSF2) and localised cuts and fills, could remain aesthetically incompatible with surrounding landscape. Edges may not blend in with the landscape or cut slopes may be too steep to be adequately re-vegetated. This may result in a permanent change to the existing visual quality of visually sensitive areas and therefore negative impact.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Phase (during which impact will be applicable) CO = construction, OP = operational, CL = Closure and post-closure</td>
<td>CO, OP, CL</td>
<td>Negative</td>
<td></td>
</tr>
<tr>
<td>Nature of Impact</td>
<td>Direct: The impact of the proposed project will be direct for people travelling along adjacent local roads and the local population living within the surrounding area. Residents would be able to observe the TSF2 directly. Cumulative: The expansion of the mining activities of the proposed project may increase the population growth and expand other associated infrastructure and economic activities, possibly reducing the visual quality of the visual resource further if not managed. Therefore an overall cumulative degradation of the sense of place and visual resource quality is predicted.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Define Significance Categories

<table>
<thead>
<tr>
<th>Likelihood/ probability</th>
<th>Significance Prior to Mitigation</th>
<th>Significance With Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definite likelihood: Since mitigation measures may not reduce the visual impact sufficiently due to the scale of the proposed infrastructure (TSF2).</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Duration</td>
<td>Long-term</td>
<td>3</td>
</tr>
<tr>
<td>Extent</td>
<td>Area of Influence: The scale dimensions and nature of the proposed TSF2 will allow extended views thereby influencing the wider region.</td>
<td>3</td>
</tr>
<tr>
<td>Receptor Sensitivity</td>
<td>Low: localised visual perceptions of the economically marginalised communities of the population may be influenced rather by the short term economic and job opportunities that will exist rather than the direct visual perception of the project. Moderate: other residents.</td>
<td>3</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Low (Negative): Refer to Table 3-4.</td>
<td>1</td>
</tr>
<tr>
<td>Impact Significance</td>
<td>Moderate: Although the likelihood, duration, and spatial extent scores are relative high, the Magnitude score is low. This reduces the significance of the infrastructure aesthetically incompatible with surrounding landscape impact to a moderate significance score and</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>10</td>
</tr>
</tbody>
</table>

Project No.: 7826150206
therefore a moderate impact without mitigation.

Mitigating and Monitoring Requirements

Required Management Measures

It is recommended that the TSF2 be designed with the aim of closure in mind. The design process should specifically address the geometry of the TSF2. The maximum height, area and shape of the TSF2 should be designed with regard to the area of land available, and as far as practical the final angle and shape of the TSF should blend with the natural landscape, providing that surface stability can be achieved. Where appropriate the TMF2 should have a geometry that is irregular and does not look made-made.

The gradient of the side slopes must be designed to accommodate self-succession of natural vegetation. Long unbroken slopes allow surface runoff to accelerate and may produce erosion gullies. For these reasons it is recommended to design slopes of no greater than 20°, with benches every 7 - 10 metres of vertical height. Slopes below 20° will have reduced erosion hazards and will have a better chance for re-vegetation to be successful.

Top-soiling and grass seeding of the side slopes of the TSF2 should form part of concurrent rehabilitation of the TSF2. A combination of indigenous trees and shrubs should be planted adjacent to the TSF2 and auxiliary infrastructure as a 'buffer' and to partially screen views to the TSF2 were feasible.

Required Monitoring (if any)

Annual external compliance monitoring of the TSF2 against the recommended management requirements

Responsibility for implementation

Environmental Officer and Mine Manager, External Auditor

Impact Finding

Mitigation measures may not reduce the visual impact sufficiently due to the scale of the proposed infrastructure during the operational phase. But concurrent rehabilitation will assist in reducing the visual impact.

Table 4-5: Landscape scarring: 24G activities.

<table>
<thead>
<tr>
<th>Impact Component</th>
<th>Impact 3</th>
<th>Significance prior to Mitigation</th>
<th>Significance with Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Landscape Scarring (Construction, operational and closure phase)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk/ Impact</td>
<td>Excessive clearing and stripping of topsoil for site preparation, temporary access roads, the need to keep servitudes clear of vegetation, cuts and fills and unnatural topographical features (stockpiles) have resulted in landscape scarring and therefore a negative impact.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Phase (during which impact will be applicable) CO = construction, OP = operational, CL = Closure and post-closure Nature of Impact</td>
<td>CO, OP CL</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Impact</td>
<td>Direct: Excessive clearing and stripping of vegetation and topsoil for mine infrastructure lead to direct landscape scarring. This together with possible clearance for power lines and pipelines could result in a cumulative impact in terms of degradation of the visual resource and sense of place.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Define Significance Categories</td>
<td>Significance Prior to Mitigation</td>
<td>Significance With Mitigation</td>
</tr>
</tbody>
</table>
Likelihood/probability
Likely: As vegetation and topsoil removal will cause landscape scarring in the area.
Duration
Long term: Potential impacts could be mitigated or remediated once operations cease at the end of life of mine with reforestation and rehabilitation programs.
Extent
Area of influence: As clearance for access roads and utility servitudes will also be required.
Receptor Sensitivity
Low: Residents will not be able to directly view these impacted areas (BS1/2, access road and stockpiles).
Magnitude
Low: Please refer to Table 3-4.
Impact Significance
Minor: Although the likelihood, duration, and spatial extent scores are relative high, the receptor sensitivity and Magnitude scores are low. This will ultimately reduce the significance of the landscape scarring impact to a minor significance score and therefore a minor impact without mitigation.

Mitigating and Monitoring Requirements
Required Management Measures
Encouraging vegetation regrowth in disturbed areas can reduce the visual scarring of the landscape and potentially reduce the visual impacts on potential visual receptors.
Required Monitoring (if any)
Long-term monitoring of vegetation rehabilitation should be implemented to assess effectiveness of mitigation measures.
Responsibility for implementation
Environmental Officer and Mine Manager

Impact Finding
Impact Finding
Impact can be managed through vegetation rehabilitation program.

Table 4-6: Landscape scarring: EIA/EMP activities.

<table>
<thead>
<tr>
<th>Impact Component</th>
<th>Impact</th>
<th>Significance prior to Mitigation</th>
<th>Significance with Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Landscape Scarring (Construction, operational and closure phase)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk/Impact</td>
<td>Excessive clearing and stripping of topsoil for site preparation, temporary access roads, the need to keep servitudes clear of vegetation, cuts and fills and unnatural topographical features (TSF) will result in landscape scarring and therefore a negative impact.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Phase (during which impact will be applicable)</td>
<td>CO = construction, OP = operational, CL = Closure and post-closure</td>
<td>CO, OP CL</td>
<td></td>
</tr>
<tr>
<td>Nature of Impact</td>
<td>Negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Impact</td>
<td>Direct: Excessive clearing and stripping of vegetation and topsoil for mine infrastructure will lead to direct landscape scarring. This together with possible clearance for pipelines could result in a cumulative impact in terms of degradation of the visual resource and sense of place.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Define Significance Categories

<table>
<thead>
<tr>
<th>Likelihood/ probability</th>
<th>Significance Prior to Mitigation</th>
<th>Significance With Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likely: As vegetation and topsoil removal will cause landscape scaring in the area.</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Duration</th>
<th>Significance Prior to Mitigation</th>
<th>Significance With Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long term: Potential impacts could be mitigated or remediated once operations cease at the end of life of mine with reforestation and rehabilitation programs.</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Extent</th>
<th>Significance Prior to Mitigation</th>
<th>Significance With Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of Influence: As clearance for access roads and utility servitudes will also be required.</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Receptor Sensitivity</th>
<th>Significance Prior to Mitigation</th>
<th>Significance With Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low: Residents will be able to directly view these impacted areas (TSF2). Localised visual perceptions of the economically marginalised communities of the population may be influenced by the short term economic and job opportunities that will exist rather than preserving the landscape character and sense of place of the surrounding area. Moderate: other residents.</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Magnitude</th>
<th>Significance Prior to Mitigation</th>
<th>Significance With Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low: Please refer to Table 3-4.</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Impact Significance</th>
<th>Significance Prior to Mitigation</th>
<th>Significance With Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor: Although the likelihood, duration, and spatial extent scores are relative high, the receptor sensitivity and Magnitude scores are low. This will ultimately reduce the significance of the landscape scarring impact to a minor significance score and therefore a minor impact without mitigation.</td>
<td>Minor 12</td>
<td>Not Significant 8</td>
</tr>
</tbody>
</table>

### Mitigating and Monitoring Requirements

- **Required Management Measures**: Encouraging vegetation regrowth in disturbed areas can reduce the visual scarring of the landscape and potentially reduce the visual impacts on potential visual receptors.

- **Required Monitoring (if any)**: Long-term monitoring of vegetation rehabilitation should be implemented to assess effectiveness of mitigation measures.

- **Responsibility for implementation**: Environmental Officer and Mine Manager

- **Impact Finding**: Impact Finding

Impact Finding: Impact can be managed through vegetation rehabilitation program.

---

**Table 4-7: Alteration of current landscape character and sense of place: 24G and EIA/EMP activities.**

<table>
<thead>
<tr>
<th>Impact Component</th>
<th>Impact 4</th>
<th>Significance Prior to Mitigation</th>
<th>Significance with Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Alteration of current landscape character and sense of place.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk/ Impact</td>
<td>The construction of the proposed project components and associated infrastructure may change the form and character of the natural landscape and thereby the current uniqueness and distinctiveness of the current sense of place, especially in the southern section.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
BOOYSENDAL MINE ENVIRONMENTAL AUTHORISATIONS
VISUAL IMPACT ASSESSMENT REPORT
MAY 2017

<table>
<thead>
<tr>
<th>Project Phase (during which impact will be applicable) CO = construction, OP = operational, CL = Closure and post-closure</th>
<th>CO, OP CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of Impact</td>
<td>Negative</td>
</tr>
</tbody>
</table>

| Type of Impact | Direct: From the baseline information the area most vulnerable to an alteration of its current sense of place and landscape character is the southern section of the proposed project, mainly due to the scale and extent of the proposed operations (especially the ARS Route and access road). The “opening up” of the Groot-Dwarsrivier Valley by road access will alter the sense of remoteness within this section. The change to the fabric and character of the landscape caused by the physical presence of a development of the proposed project will have a direct impact and will disturb a moderate percentage of the proposed project site directly. The expansion of the mining activities of the project may increase the population growth and expand other associated infrastructure and economic activities, possibly changing the landscape character and sense of place in the eastern and northern section. Therefore an overall cumulative impact on the current sense of place is predicted. Cumulative landscape scarring as result of cumulative clearance within the Groot-Dwarsrivier valley. |

<table>
<thead>
<tr>
<th>Define Significance Categories</th>
<th>Significance Prior to Mitigation</th>
<th>Significance With Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likelihood/ probability</td>
<td>Definite likelihood: Since mitigation measures may not reduce the sense of place impact sufficiently due to the scale of the proposed infrastructure.</td>
<td>4</td>
</tr>
<tr>
<td>Duration</td>
<td>Permanent: Potential impacts could be mitigated or remediated once operations cease at the end of life of mine with rehabilitation programs but the scale and extent of the operations will modify the landscape character and sense of place of the surrounding area permanently.</td>
<td>4</td>
</tr>
<tr>
<td>Extent</td>
<td>Area of Influence: The scale, dimensions and nature of the proposed infrastructure (ARS Route and BS1/2) will allow extended views within the Groot-Dwarsrivier valley and may alter the economic activities/population growth in the region thereby influencing the landscape and sense of place in the wider area.</td>
<td>3</td>
</tr>
<tr>
<td>Receptor Sensitivity</td>
<td>Low: Localised visual perceptions of the economically marginalised communities of the population may be influenced by the short term economic and job opportunities that will exist rather than preserving the landscape character and sense of place of the surrounding area. Moderate: other residents.</td>
<td>3</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Moderate to High: Refer to Table 3-4.</td>
<td>1</td>
</tr>
<tr>
<td>Impact Significance</td>
<td>Moderate: Although the likelihood, duration, spatial extent scores are relative high, the magnitude sensitivity score are low. This will ultimately reduce the significance of the alteration of current landscape character and</td>
<td>Moderate 14 1</td>
</tr>
</tbody>
</table>
Mitigating and Monitoring Requirements

Required Management Measures
An ecological approach to rehabilitation and vegetative screening measures, as opposed to a horticultural approach to landscaping should be adopted. For example communities of indigenous plants enhance bio-diversity and blend well with existing vegetation. This ecological approach to landscaping costs significantly less to maintain than conventional landscaping methods and is more sustainable and would fit in more with the character of the landscape.

Required Monitoring (if any)
Monitoring will continue annually, and for a minimum period of 3 years after closure to ensure that the rehabilitation is successful and that the vegetation is self-sustaining. At closure the success of rehabilitation would be based on the rate and percentage of vegetation recovery.

Responsibility for implementation
Environmental Officer and Mine Manager

Impact Finding

Although ecological rehabilitation will assist in some degree in restoring the sense of place, the "opening up" of the Groot-Dwarsrivier Valley by road access will permanently alter the sense of place and is irreversible.

Table 4-8: Ecosystem Service (ES) assessment: 24G and EIA/EMP activities.

<table>
<thead>
<tr>
<th>Service</th>
<th>ES Category</th>
<th>Description</th>
<th>Additional information (including threats, and availability of alternatives to ES)</th>
<th>Relevant habitats</th>
<th>Importance to Beneficiaries</th>
<th>Replaceability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreation and aesthetic enjoyment</td>
<td>Cultural Services</td>
<td>It is assumed that scenic wilderness areas form the core recreation amenity in this area due to the high positive aesthetic appeal.</td>
<td>Removal of scenic wilderness areas to install mine infrastructure will reduce the scenic quality of the immediate area and therefore the recreation and aesthetic value of the surrounding environment.</td>
<td>Pristine/Natural habitats.</td>
<td>Low Localised visual perceptions of the economically marginalised communities of the population may be influenced by the short term economic and job opportunities that will exist rather than the direct visual perception of the project.</td>
<td>High - Low Spatial alternatives are dependent upon type of sensitive receptor. For local residents the views are irreplaceable as the views are static, whereas local motorist the views are dynamic.</td>
</tr>
</tbody>
</table>
4.3 Alternative Impact Assessment

Northam Platinum has considered various technology and locality alternatives for the Project. Potential visual impacts associated with each alternative have been considered. This section makes provision for an analysis of potential interactions associated with the Project location and technology alternatives specifically focused on visual impacts.

4.3.1 Transport of Ore (24G and EMP Amendment).

Ore has to be transported from the Booysendal central and north complexes to BS4. For this purpose three alternatives were considered. Refer to Table 4-9.

Table 4-9: Alternative Impact Identification – Transport of Ore Service

<table>
<thead>
<tr>
<th>Trucking – Alternative 1</th>
<th>Overland Conveying - Alternative 2</th>
<th>Aerial Ropecon – Preferred Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive clearing and stripping of vegetation and topsoil for road construction. This may result in a permanent change to the existing visual quality of visually sensitive areas and therefore negative impact.</td>
<td>The Overland Conveyor could remain aesthetically incompatible with surrounding landscape.</td>
<td>The Aerial Ropecon could remain aesthetically incompatible with surrounding landscape.</td>
</tr>
<tr>
<td>Light pollution should ore be transported at night via vehicles. Although the impact is temporary in nature and the direct impact will most likely be screened by the topography; the light pollution will increase the overall glare at night and therefore result in a negative impact.</td>
<td>The conveyor may not blend in with the landscape. This may result in a permanent change to the existing visual quality of visually sensitive areas and therefore negative impact.</td>
<td>The Aerial Ropecon may not blend in with the landscape. This may result in a permanent change to the existing visual quality of visually sensitive areas and therefore negative impact.</td>
</tr>
<tr>
<td>This together with possible clearance for power lines and pipelines could result in a cumulative impact in terms of degradation of the visual resource.</td>
<td>This together with possible clearance for power lines and pipelines could result in a cumulative impact in terms of degradation of the visual resource.</td>
<td>This together with possible clearance for power lines and pipelines could result in a cumulative impact in terms of degradation of the visual resource.</td>
</tr>
</tbody>
</table>
From a visual impact assessment perspective this alternative is preferred as a road will be constructed for the all alternatives nevertheless. The road alternative will also be less visible than the proposed Conveyor/Aerial Ropecon.

4.3.2 Access Road from BS1/2 to BS3 Alternatives (EMP Amendment)

The following potential impacts can potentially be associated with route alternatives. Refer to Table 4-10.

<table>
<thead>
<tr>
<th>Preferred Alternative 1 – Existing Exploration Access Road</th>
<th>Alternative 2 – New Road</th>
<th>No-go Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>From a visual impact assessment perspective this alternative is preferred as a road will be constructed on an existing road limiting additional landscape scarring.</td>
<td>Increased direct visual impact due to additional landscape scarring resulting from additional clearing.</td>
<td>Status Quo</td>
</tr>
</tbody>
</table>

4.3.3 TMF Alternatives (EMP Amendment)

Three options were considered. The reuse of the existing TSF, the new TSF 2, or a combination of TSF 1 and TSF 2. Refer to Table 4-11.

<table>
<thead>
<tr>
<th>Alternative 1 – Reuse of TSF 1</th>
<th>Alternative 2 – Construction of TSF 2</th>
<th>Preferred Alternative – TSF 1 and TSF 2</th>
<th>No-go Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>From a visual impact assessment perspective, Alternative 1 – Reuse of TSF 1 is the preferred option as the area is already degraded. An increase in the physical dimensions of TSF 1 may alter the current visual resource and not blend in with the landscape. This may</td>
<td>The TSF 2 could remain aesthetically incompatible with surrounding landscape. The TSF 2 may not blend in with the landscape. This may result in a permanent change to the existing visual quality of visually sensitive areas and therefore negative impact.</td>
<td>The TSF 2 could remain aesthetically incompatible with surrounding landscape. The TSF 2 may not blend in with the landscape. This may result in a permanent change to the existing visual quality of visually sensitive areas</td>
<td>Status Quo</td>
</tr>
</tbody>
</table>
result in a permanent change to the existing visual quality of visually sensitive areas and therefore negative impact.

This together with possible clearance for pipelines and auxiliary infrastructure could result in a cumulative impact in terms of degradation of the visual resource. and therefore negative impact.

An increase in the physical dimensions of TSF 1 may alter the current visual resource and not blend in with the landscape. This may result in a permanent change to the existing visual quality of visually sensitive areas and therefore negative impact.

This together with possible clearance for pipelines and auxiliary infrastructure could result in a cumulative impact in terms of degradation of the visual resource.

## 4.3.4 Transmission Line Alternatives (Section 24G)

Four options were considered. Refer to Table 4-12.

### Table 4-12: Alternative Impact Identification – Transmission Lines (Section 24G)

<table>
<thead>
<tr>
<th>Alternative 1: 33kVA from BS4 to BS1/2 within the main access road reserve</th>
<th>Alternative 2: 132 kVA from BS4 to BS1/2 within the main access road reserve</th>
<th>Alternative 3: 33kVA van Booysendal North following exploration road.</th>
<th>Preferred Alternative – 132 kVA from Booysendal North within main road reserve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission line potentially visible to sensitive receptors.</td>
<td>Transmission line potentially visible to sensitive receptors.</td>
<td>Transmission line not visible to sensitive receptors.</td>
<td>From a visual impact assessment perspective this alternative is preferred as a transmission line will be constructed within the main road reserve and not visible to sensitive receptors.</td>
</tr>
</tbody>
</table>
4.3.5 Mining BS3 Alternatives (EMP Amendment)

Two options were considered. Refer to Table 4-13.

<table>
<thead>
<tr>
<th>Alternative 1: Mining via a portal system</th>
<th>Preferred Alternative: Mining through an underground tunnel from BS2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portal not visible to sensitive receptors.</td>
<td>From a visual impact assessment perspective this alternative is preferred as a tunnel will not be visible to any sensitive receptors.</td>
</tr>
</tbody>
</table>

4.3.6 Mining at BS1/2 Alternatives (Section 24G)

Two options were considered. Refer to Table 4-14: Alternative Impact Identification – Mining at BS1/2 (Section 24G) Table 4-14.

<table>
<thead>
<tr>
<th>Alternative 1: Mining from two portals at BS1 and a separate BS2</th>
<th>Preferred Alternative: One portal system which are split into two separate underground adits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portals not visible to sensitive receptors. Increase landscape scarring due to additional portal.</td>
<td>From a visual impact assessment perspective this alternative is preferred as a portal will not be visible to any sensitive receptors. Reduce landscape scarring versus alternatives.</td>
</tr>
</tbody>
</table>

4.3.7 Stockpile Areas (Section 24G)

Two areas were considered. Refer to Table 4-14: Alternative Impact Identification – Mining at BS1/2 (Section 24G) Table 4-15.

<table>
<thead>
<tr>
<th>Topsoil Stockpile</th>
<th>Spoil Stockpile</th>
</tr>
</thead>
<tbody>
<tr>
<td>From a visual impact assessment perspective this position is preferred as a topsoil stockpile will not be visible to any sensitive receptors.</td>
<td>From a visual impact assessment perspective this position is preferred as a spoil stockpile will not be visible to any sensitive receptors.</td>
</tr>
</tbody>
</table>
4.3.8 Main Access Road Alignment (Section 24G)

Two areas were considered. Refer to Table 4-14: Alternative Impact Identification – Mining at BS1/2 (Section 24G)Table 4-16.

<table>
<thead>
<tr>
<th>Alternative 1: Route Alignment</th>
<th>Preferred Route alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased direct visual impact due to additional landscape scarring resulting from additional clearing.</td>
<td>From a visual impact assessment perspective this position is preferred as the route is shorter resulting in a reduction of landscape scaring versus the alternative alignment.</td>
</tr>
</tbody>
</table>
5. MITIGATION AND CONTROL

5.1 Design Control Measures

The aim of mitigation is to avoid, reduce and where possible remedy or offset, any significant negative (adverse) effects on the environment arising from the proposed activity (GLVIA; 2013).

In considering measures to effect mitigation, there are three rules to consider. Mitigation measures should be:

- Economically feasible;
- Effective (time allowed for implementation and provision for management/maintenance); and
- Visually acceptable (within the context of the existing landscape).

To address these measures the following principles should be considered:

- Mitigation should be planned to fit into the existing landscape character. They should respect and build upon landscape distinctiveness;
- Mitigation should primarily aim to blend the proposed development into its surroundings and generally reduce its visibility; and
- It should be recognised that many mitigation measures, especially planting/rehabilitation, are not immediately effective.

General Recommendations

Mitigation measures may not reduce the visual impact significantly as the proposed activity cannot be screened sufficiently, mainly due to the scale and dimensions of the proposed infrastructure (e.g. ARS Route and TSF2). The mitigation measures for the proposed activity will need to focus on effective rehabilitation of the disturbed areas.

5.2 Construction Phase

**TSF2 (Expansion EIA/EMP)**

It is recommended that the TSF2 be designed with the aim of closure in mind. The design process should specifically address the geometry of the TSF. The maximum height, area and shape of the
TSF2 should be designed with regard to the area of land available, and as far as practical the final angle and shape of the TSF2 should blend with the natural landscape, providing that surface stability can be achieved. Where appropriate the TSF2 should have a geometry that is irregular and does not look made-made.

The gradient of the side slopes must be designed to accommodate self-succession of natural vegetation. Long unbroken slopes allow surface runoff to accelerate and may produce erosion gullies. For these reasons it is recommended to design slopes of no greater than 20°, with benches every 7 - 10 metres of vertical height. Slopes below 20° will have reduced erosion hazards and will have a better chance for re-vegetation to be successful.

**Site Preparation and Maintenance (24G and Expansion EIA/EMP)**

- The minimum amount of existing vegetation and topsoil should be removed from construction areas. Ensure, wherever possible, all existing natural vegetation is retained;
- Eradication of vegetation should be done in a ‘natural manner’, avoiding harsh straight lines, but should be kept to the smallest footprint areas possible;
- All areas affected by the activity will need to be rehabilitated and re-vegetated. This includes the areas beyond the proposed project such as temporary access roads, etc.
- Rehabilitate disturbed areas as soon as practically possible after construction. This should be done to restrict extended periods of exposed soil;
- The sites should be kept neat and tidy at all times; and
- Litter and dust management measures should be in place at all times.

**Access Roads (24G and Expansion EIA/EMP)**

During construction of the relevant infrastructure, construction roads will require an effective dust suppression management programme such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface.

Where a paved surface is required use dark paving materials that complement the natural brown colours and textures of the soil and rock in the area rather than light coloured materials i.e. concrete colours should be avoided.

**Dust Suppression (24G and Expansion EIA/EMP)**

During the construction of the mine measures must be taken to reduce dust, as cumulatively this could lead to a visual impact on a wider audience due to the scale of the dust that could be generated. Suitable dust suppression must be undertaken during construction and active dust
management must be undertaken when the infrastructure and activities associated with the project becomes operational.

In addition, the retention of vegetation and the re-establishment of groundcover will automatically reduce (mitigate) particulate emissions associated with wind erosion. Please refer to the Booysendal Operations Air Quality Management Plan for more detail.

**Light Pollution (24G and Expansion EIA/EMP)**

Light pollution should be seriously and carefully considered and kept to a minimum wherever possible as light at night travels great distances.

Security flood lighting and temporary lighting should only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas (e.g. Nearby homesteads/Settlements). Wherever possible, lights should be directed downwards and shielded so as to avoid illuminating the sky and minimizing light spills.

### 5.3 Operational Phase

**TSF2 (Expansion EIA/EMP)**

Top-soiling and grass seeding of the side slopes of the TSF2 should form part of concurrent rehabilitation of the TSF. A combination of indigenous trees and shrubs should be planted adjacent to the TSF2 and auxiliary infrastructure as a ‘buffer’ and to partially screen views to the TSF2 were feasible.

**Buildings and Structures (24G and Expansion EIA/EMP)**

Structures that are required to be built from steel or concrete can be painted a dark natural tone fitting with the surrounding environment. Olive greens and tans can be used at the base of buildings, fading to lighter colours, with the top section of the buildings painted a light grey to merge with the skyline. Tall structure’s roofs should be painted a ‘dirty’ grey or light blue. A principle to note is that lighter tones advance toward the viewer while darker tones recede from the viewer. Pure whites, blacks and bright colours should be avoided. To reduce the potential of glare external surfaces of buildings and structures should be articulated or textured to create interplay of light and shade. Avoid shiny or bare metal. It is advisable to direct the slope of roofs away from critical views (e.g. homesteads and settlements).

**Landscaping and Design (24G and Expansion EIA/EMP)**

An ecological approach to rehabilitation and vegetative screening measures, as opposed to a horticultural approach to landscaping should be adopted. For example communities of indigenous
Plants enhance bio-diversity and blend well with existing vegetation. This ecological approach to landscaping costs significantly less to maintain than conventional landscaping methods and is more sustainable. It is important that landscaping be done concurrently from the onset of construction and throughout the operational phase and to rehabilitate exposed areas as soon as possible after construction activities are complete. Only indigenous vegetation should be used for rehabilitation / landscaping purposes.

Trees and shrubs can be used to screen structures and break stark contrasting lines if carefully planned and positioned. Where structures are silhouetted when viewed from local roads, the harsh lines can be broken by planting fast growing indigenous trees along the edges of the stockpiles, BS2, and the BS4 area. Encouraging vegetation growth in disturbed areas can reduce the visual scarring of the landscape and potentially reduce the visual impacts on potential visual receptors. The re-vegetation of the disturbed areas around the proposed infrastructure during the operational phase should be considered only if it does not interfere with operations or pose a risk to the health and safety of people and animals.

**Light Pollution (24G and Expansion EIA/EMP)**

Light pollution should be seriously and carefully considered and kept to a minimum wherever possible as light at night travels great distances. Security flood lighting and operational lighting should only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas (e.g. Nearby homesteads/Settlements). Wherever possible, lights should be directed downwards and shielded so as to avoid illuminating the sky and minimizing light spills.

**Dust Suppression (24G and Expansion EIA/EMP)**

During the operation of the mine measures must be taken to reduce dust, as cumulatively this could lead to a visual impact on a wider audience due to the scale of the dust that could be generated. Suitable dust suppression must be undertaken during construction and active dust management must be undertaken when the infrastructure and activities associated with the project becomes operational. In addition, the retention of vegetation and the re-establishment of groundcover will automatically reduce (mitigate) particulate emissions associated with wind erosion. Please refer to the Booysendal Operations Air Quality Management Plan for more detail.

### 5.4 Decommissioning and Rehabilitation Phase

**TSF2 (Expansion EIA/EMP)**

The TSF2 geometry and design should be optimised considering not only construction but rehabilitation and re-vegetation costs and to provide suitable final land forms for the establishment of mixed native vegetated area, thereby minimising the long term visual impact of the infrastructure by creating acceptable landforms compatible with the adjacent landscape. It is recommended that
a registered Professional Landscape Architect assist with the final design and rehabilitation plan for the TSF.

**Revegetation/Rehabilitation**

An ecological approach to rehabilitation, as opposed to a horticultural approach to landscaping should be adopted. For example communities of indigenous plants enhance bio-diversity and blend well with existing vegetation. This ecological approach to landscaping costs significantly less to maintain than conventional landscaping methods and is more sustainable. It is recommended to cover and seed areas where buildings and equipment have been removed and waste facilities to stabilise surfaces for the long term.
6. MONITORING

6.1 Objectives and Targets

During the construction and operational phase a visual monitoring programme would largely be based on visual reconnaissance at ground level. This would be based on parameters such as the visibility of lights at night from surrounding visual receptors and airborne dust (refer to Table 6-1). Concurrent rehabilitation should be implemented by the Environmental Officer with the support of the Mine Manager. Please also refer to the Booysendal Operations Air Quality Management Plan for more detail. A grievance mechanism could be put in place in order for residents to have a vehicle to raise their concerns. This could include environmental forum meetings and/or a grievance register.

6.2 Monitoring Locations

Monitoring locations should include all residential sensitive receptors locations as identified within this report. Please refer to Figure 3-24 for locations.

6.3 Monitoring Methodologies

At closure the success of rehabilitation would be based on the rate and percentage of vegetation recovery. Monitoring will continue after closure to ensure that the rehabilitation is successful and that the vegetation is self-sustaining. The success of rehabilitation will also largely be dependent upon the control of invasive or alien species.

Table 6-1: Monitoring Plan

<table>
<thead>
<tr>
<th>Impact</th>
<th>Monitoring Locations</th>
<th>Parameters</th>
<th>Person Responsible</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visibility of lights at night</td>
<td>At local visual receptor areas (e.g. homesteads, settlements)</td>
<td>Disturbance to sensitive visual receptors within the project study area.</td>
<td>Environmental Officer</td>
<td>Biannually</td>
</tr>
<tr>
<td>Vegetation growth</td>
<td>Rehabilitated infrastructure and plant areas</td>
<td>Vegetation density, species analysis, soil fertility</td>
<td>Environmental Officer</td>
<td>Annually, and for 3 years after closure</td>
</tr>
<tr>
<td>Airborne dust</td>
<td>Based on air quality assessment report</td>
<td>Based on air quality assessment report</td>
<td>Environmental Officer</td>
<td>Quarterly</td>
</tr>
</tbody>
</table>
6.4 Monitoring records

All monitoring records required under this management plan will be kept on file in the SHEQ Department for a period of not less than five years following measurement. After this period the records will be safely stored in an archive.

Analysed data will be captured on the Booysendal Environmental Database. This is the responsibility of the Senior Environmental Officer.
7. SUMMARY AND CONCLUSION

7.1 Gap Analysis

The following assumptions and limitations are applicable to this study:

- The basis for this assessment is that scenic wilderness areas form the core of eco-tourism due to the high positive aesthetic appeal.

- Site layout plans of the proposed project as received in May and October 2016 (M0413-3000-G010 and 00413-IH-000-04 PROPOSED INFRASTRUCTURE) and in May 2017 were used for the purposes of this assessment. Any changes to these site layout plans are not addressed within this report.

- No lighting plans, architectural design/style or colour schemes were available at the onset of the VIA specialist study;

- Airborne dust pollution to be based on air quality assessment report;

- This level of assessment excludes surveys to establish viewer preference and thereby their sensitivity. For example; localised visual perceptions of the economically marginalised communities of the population may be influenced by the short term economic and job opportunities that will exist rather than the direct visual perception of the project;

- The major limitation of this study is the unavoidable subjectivity relating to the assessment of landscape and visual impacts; and

- Findings will also be restricted to information on hand, as well as the quality and extent of spatial data (e.g. 5m contours).

7.2 Conclusion

The potential visual impact of the proposed project has been evaluated against international accepted criteria to determine the impact it will have on the landscape character and the viewers that have been identified in the project area.

Visual impacts would result from the construction and operational phase of the proposed project. Specifically, impacts would result from the ARS Route and TSF2 being seen from sensitive viewpoints (residents) and the negative effects on the scenic quality and sense of place of the landscape of the project area, especially the southern section.
It was determined that the likelihood, duration, and spatial extent scores of the various identified visual impacts were relatively high (3 - 4), and the receptor sensitivity low to moderate (1 - 3). The magnitude score was calculated taking in consideration the area from which the project can be seen (i.e. ZVI), the viewing distance and the capacity of the landscape to visually absorb structures and forms placed upon it and rated as negative low. The low magnitude score will ultimately reduce the significance of the overall impact to a minor significance score and therefore an overall minor visual impact for the proposed project, assuming all mitigation measures suggested in this report are followed and successfully implemented.

It is therefore recommended that the proposed project is approved and acceptable from a visual impact assessment prospective.
8. REFERENCES


Ladislav Mucina & Michael C. Rutherford (eds). 2006, The Vegetation of South Africa, Lesotho and Swaziland. SANBI. "Vegmap"


APPENDICES
APPENDIX A

Impact Significance Rating Definitions
Impact Significance Rating Definitions

Likelihood, duration, extent, magnitude, sensitivity and significant ratings should be based on the following scoring scheme:

**Likelihood:**

<table>
<thead>
<tr>
<th>1 = Unlikely</th>
<th>2 = Possible</th>
<th>3 = Likely</th>
<th>4 = Definite Likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low to no probability of occurrence with the implementation of management measures</td>
<td>Possible that impact may occur from time to time</td>
<td>Distinct / realistic possibility that impacts will occur if not managed and monitored</td>
<td>Impacts will occur even with the implementation of management measures</td>
</tr>
</tbody>
</table>

**Duration:**

<table>
<thead>
<tr>
<th>1 = Temporary</th>
<th>2 = Short Term</th>
<th>3 = Long Term</th>
<th>4 = Permanent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible to within a short period of time to mitigate / immediate or fairly quick progress with management implementation &lt;3 yr</td>
<td>Impacts reversible within a short period of time +3 to 5 yrs</td>
<td>Impacts will only cease after the operational life +/- 50 yrs</td>
<td>Long term, beyond mine closure or irreplaceable</td>
</tr>
</tbody>
</table>

**Extent:**

<table>
<thead>
<tr>
<th>1 = Localised</th>
<th>2 = Site</th>
<th>3 = Area of Influence</th>
<th>4 = Regional/ Provincial/ National</th>
</tr>
</thead>
<tbody>
<tr>
<td>Localised to specific area of activities</td>
<td>Confined to the site</td>
<td>The extent of the impacts will affect the wider area of Influence</td>
<td>Importance of the impact is of regional provincial or national importance</td>
</tr>
</tbody>
</table>

**Magnitude (negative):**
## BOOYSENDAL MINE ENVIRONMENTAL AUTHORISATIONS
### VISUAL IMPACT ASSESSMENT REPORT
### MAY 2017

### Magnitude (positive):

<table>
<thead>
<tr>
<th>-1 = Low</th>
<th>-2 = Minor</th>
<th>-3 = Moderate</th>
<th>-4 = High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deterioration of baseline conditions or functions are negligible Nuisance Will not cause any material change to the value or function of the receptor/s Emissions will comply with legal limits Emissions contained within footprint within limits</td>
<td>Moderate deterioration, partial loss of habitat / biodiversity/ social functions or resources, Emissions at times exceed legal limits Emissions reach outside project footprint</td>
<td>Reversible although substantial illness, injury, loss of habitat, loss of resources Notable deterioration of functions Impact on biodiversity Causes a change in the value or function of receptor but does not fundamentally affect its overall viability Emissions regularly exceed legal limits Emissions will affect the wider region Livelihood of sensitive receptors are impacted</td>
<td>Mainly irreversible Causes a significant change in the environment affecting the viability, value and function of the receptors Substantial impact and loss of biodiversity Death/ loss of receptors Loss of livelihood Emissions do not comply with regulations Impact on listed species</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>+1 = Low</th>
<th>+2 = Minor</th>
<th>+3 = Moderate</th>
<th>+4 = High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slight enhancement of baseline conditions or functions Potential pollution sources are removed Slight positive change to the value or function of the receptor/s Emissions contained within footprint within limits</td>
<td>Minor enhancement, of habitat / biodiversity/ social functions or resources, Better control of emissions Project assist in management and control of emissions</td>
<td>Substantial improvement in human health habitat, and ecosystem services Notable improvement of functions Moderate improvement of biodiversity Causes a change in the value or function of receptor and improves overall viability Emissions regularly improve Livelihood of sensitive receptors are improved</td>
<td>Significant positive change in the environment viability, value and function Substantial impact and improvement of biodiversity Better protection of receptors Development of livelihood Emissions improve to comply with regulations Protection of listed species</td>
</tr>
</tbody>
</table>

## Sensitivity:

<table>
<thead>
<tr>
<th>1 = Low</th>
<th>2 = Moderate Low</th>
<th>3 = Moderate</th>
<th>4 = High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areas already subjected to significant degradation</td>
<td>Partially degraded area</td>
<td>Regionally designated sites / habitats</td>
<td>Nationally or internationally</td>
</tr>
</tbody>
</table>
## Significance

The significance of the impact is calculated as follow:

\[
\text{Significance} = (\text{Likelihood} + \text{duration} + \text{extent} + \text{sensitivity}) \times \text{magnitude}
\]

<table>
<thead>
<tr>
<th>Magnitude</th>
<th>Likelihood + duration + extent + sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low ((+/-) \leq 4)</td>
</tr>
<tr>
<td>Low (1)</td>
<td>Not significant</td>
</tr>
<tr>
<td>Minor (2)</td>
<td>Not significant</td>
</tr>
<tr>
<td>Moderate (3)</td>
<td>Minor</td>
</tr>
<tr>
<td>High (4)</td>
<td>Moderate</td>
</tr>
</tbody>
</table>
APPENDIX B

Staff CV’s
RIAAN VAN DER MERWE

GIS Consultant

Current projects

- Booyendal Expansion EMP Amendment, RSA
- Storm Mountain Daimand Mine, Environmental Impact Assessment, Lesotho
- Aberdeen Environmental Impact Assessment, RSA
- Molopo Strategic Environmental Assessment, RSA

Core skills

GIS Mapping and Modelling
Remote Sensing
Visual Impact Assessments

Professional Summary and Qualifications

Riaan has 20 years working experience of which the past 10 years has been in the environmental consulting field where he has gained extensive experience in the fields of GIS, Visual Impact Assessments, Remote Sensing and Image Processing. Projects that he has been involved with range from:

- Spatial analysis and modelling for various mining and engineering projects (environmental risk assessment, site selections, etc.).
- Hydrological modelling and hydrogeology related mapping.
- 3D visualization and modelling for mining and power generation projects.
- Visual impact assessments for the various mining and environmental projects (specialist studies for EIA’s).
- Utility infrastructure mapping for major industrial facilities.
- Environmental sensitivity assessment (thematic mapping) for numerous environmental projects (EIA’s & SEA’s).
- Feasibility studies (site selection process) for various mining related infrastructure (plants, mega tailings dams, power stations & distribution lines, pipelines, etc.).
• Land cover and land cover change analysis utilising remote sensing and image processing software.
• GIS technical training and support for corporate clients.
• GPS data collection, GIS data capturing, editing, database designing, analysis, & quality checking/assurance.

He holds a Post Graduate Diploma in Environmental Science completed at the University of Witwatersrand and an Honours Degree in Military Geography from the University of Stellenbosch. He has worked on projects based in South Africa, Australia, Côte d'Ivoire, Namibia, Mozambique, Lesotho, and Malawi.

Memberships/affiliations
Registered with the South African Council for Professional and Technical Surveyors (PLATO) and a member of the Geo-Information Society of South Africa (GISSA).

Representative projects

► Independent Visual Impact Assessment Specialist for the Richmond Park Mix Used Development, South Africa.
► Independent Visual Impact Assessment Specialist for the Black Rock 132kV Power line, South Africa.
► Independent Visual Impact Assessment Specialist for the Somkele Anthracite Mine, South Africa.
► Independent Landscape and Visual Impact Assessment Specialist for the Yaoure Gold Project, Côte d'Ivoire.
► GIS Consultant for the Nerang Water Provision Pipeline Extension Project, Gold Coast, Queensland, Australia Client: SEQWater.
► Remote Sensing Specialist for the qualitative field verification of vegetation cover Gorongosa National park, Sofala Province, Mozambique.
► Remote Sensing Specialist for the Miracle Project, Lilongwe, Malawi and the Usutu Colliery Closure Cost Assessment, Mpumalanga, South Africa.
► GIS Consultant for various EIA’s, IWULAs and IWWMPs projects, RSA, Client: Local Municipalities and Mining Companies.
- GIS Consultant for the Evander Mega Dump Strategic Site Selection Project, Mpumalanga, South Africa.
- GIS Consultant for the TGME Mega Dump GIS Site Selection, Mpumalanga, South Africa.
- GIS Consultant for the Pan African TSF Site Selection Project, North West, South Africa.
APPENDIX C

Photographic Survey
Figure C-1: View up the Groot-Dwarsrivier valley in a southern direction.
Figure C-2: Towards the location of BS1/2: View in an eastern direction.
Figure C-3: The Groot-Dwarsrivier valley: View in an easterly direction.
Figure C-4: Location of BS1/2: view in a westerly direction.
Figure C-5: View from BS1/2 towards the east northeast.
Figure C-6: View from BS1/2 up the Groot-Dwarsrivier valley in a south south-eastern direction.
Figure C-7: Booysendal North operations within the northern section.
Figure C-8: View down the Groot-Dwarsrivier valley in a northern direction. Note the Der-Brochen dam in the far background.
Figure C-9: View within the Groot-Dwarsrivier valley towards the Everest Mine operations just over the ridge: View in a north-eastern direction.
Figure C-10: BS4 operation: view in a north-western direction.
Figure C-11: View from the Nel Homestead towards the BS4 operation: view in a north-western direction.
Figure C-12: View from the Petlas Settlements: view in a south-western direction.
Figure C-13: The Petlas settlement: view in a north-eastern direction.