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REPORT

BATHLAKO MINING LIMITED

Visual Impact Assessment for the Proposed Additional Mining Activities at Groenfontein, Vogelstruisnek and Vlakfontein

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Table of Contents

1.0 INTRODUCTION 4

1.1 Background and project description 4

1.2 Project phases 4

2.0 TERMS OF REFERENCE 6

3.0 ASSUMPTIONS AND LIMITATIONS 6

4.0 METHODOLOGY 7

4.1 Delineation of study area for the assessment 8

5.0 BASELINE VISUAL CONDITIONS 9

5.1 Regional landscape character 9

5.2 Study area landscape character 9

5.2.1 Topography 9

5.2.2 Water bodies 9

5.2.3 Vegetation cover 10

5.2.4 Land cover and land use 10

5.2.5 Sense of place/genus loci 10

5.2.6 Vogelstruisnek photos 12

5.2.7 Vlakfontein/Groenfontein photos 13

5.3 Landscape visual resource value 14

5.4 Visual absorption capacity 16

5.5 Visual receptors sensitivity and incidence 16

6.0 IMPACT ASSESSMENT 18

6.1 Visual impact assessment criteria 18

6.1.1 Zone of theoretical visibility 18

6.1.1.1 Vlakfontein/Groenfontein 18

6.1.1.2 Vogelstruisnek 18

6.1.2 Visual intrusion 20

6.1.3 Visual exposure 20

6.2 Impact magnitude methodology 21

6.2.1 Visual absorption capacity weighting factor 21

6.2.2 Receptor sensitivity weighting factor 22

6.2.3 Impact magnitude determination 22

6.3 Impact magnitude determination 23

6.4 Impact significance rating methodology 26

6.5 Operations Phase 27

6.6 Decommissioning and Closure Phase 27

6.7 Cumulative impacts 28

7.0 MITIGATION AND MONITORING MEASURES 28

7.1 Basic mitigation strategy 28

7.2 Operations phase 29

7.2.1 Progressive rehabilitation 29

7.2.2 Dust entrainment 29

7.3 Decommissioning and closure phase 30

7.4 Residual impacts after closure 30

8.0 CONCLUSION 30

9.0 SOURCES 30

TABLES

Table 1: Visual resource value assessment criteria 15

Table 2: Receptor Sensitivity Criteria 17

Table 3: Weighting factor as a result of landscape VAC 21

Table 4: Weighting factor for receptor sensitivity criteria 22

Table 5: Scoring system for assessment of magnitude of development components 22

Table 6 – Impact Magnitude Point score range 23

Table 7: Impact magnitude assessment of Operations Phase related impacts 24

Table 8: Impact magnitude assessment of Decommissioning/Closure Phase related impacts 25

Table 9: Impact assessment methodology 26

Table 10: Operational phase impact assessment 27

Table 11: Decommissioning and closure phase impact assessment (best-case scenario) 27

FIGURES

Figure 1: Location of Ruighoek Mine and proposed opencast mining activities 5

Figure 2: Methodology for the visual impact assessment 8

Figure 3: Photo positions map 11

Figure 4: Photo 1 – view of the Vogelstuisnek site looking southeast, showing the westernmost ridges of the Pilanesberg range in the background 12

Figure 5: Photo 2 – view from west of the Vogelstruisnek site looking east 12

Figure 6: Photo 3 – view from east of the Vogelstruisnek site looking west, with the ridges located west of Bapong and Phalane in the background 13

Figure 7: Photo 4 – view from east of the Vlakfontein site, looking west 13

Figure 8: Photo 5 – view from further north, east of the Vlakfontein site and looking west 14

Figure 9: Photo 6 – view from the northernmost extent of the Vlakfontein site, to the east and towards the Pilanesberg range 14

Figure 10: Zone of theoretic visibility of the proposed Vogelstruisnek, Groenfontein and Vlakfontein opencast mining areas 19

Figure 11: Visual Exposure Graph 21

APPENDICES

APPENDIX A
Document Limitations

1.0 INTRODUCTION

1.1 Background and project description

Bathlako Mining Ltd (Bathlako) owns and operates the Ruighoek open cast Chrome Mine (Ruighoek mine) on the farm Ruighoek 169 JP, west of the Pilanesberg Game Reserve in the Magisterial District of Mankwe in the Northwest Province. Batlhako is considering the development of opencast chrome ore mining operations on the farms Groenfontein 138 JP, Vlakfontein 164 JP and Vogelstruisnek 173 JP (Figure 1). These areas have been opencast mined in the past and partially rehabilitated. No new infrastructure will be constructed as part of the project, as the chrome ore will be hauled to Bathlako Mining's nearby Ruighoek Chrome Mine, where it will be processed through the existing plant.

Batlhako Mining has applied to the Department of Minerals and Energy (DME, Klerksdorp Regional Office) for a mining right in terms of the Mineral and Petroleum Resources Development Act (No 28 of 2002, hereafter MPRDA). Under the MPRDA Regulations, Batlhako is required to submit an Environmental Management Plan (EMP) which describes how the environmental impacts of the proposed development will be managed and mitigated. The EMP must be based on an Environmental Impact Assessment (EIA).

Golder Associates Africa (Pty) Ltd, an independent company, is conducting the EIA process for Batlhako Mining. This Visual Impact Assessment (VIA) has been conducted as one of the specialist assessments supporting these processes.

1.2 Project phases

Construction phase: The proposed activity is that of opencast mining only and no additional plant infrastructure will be constructed as part of the project. The construction phase will only consist of limited preparatory work prior to commencement of the operational phase; and will from a visual perspective be indistinct from the operational phase and will therefore not be separately assessed further.

Operational phase: The operational phase will create the greatest visual impact, as it will result in the greatest degree of alteration of the visual landscape and will be the longest in duration. Opencast mining will continue to take place for a total period of approximately xxxxxxxxxxxx years; however the area of greatest impact will continuously change as mining and subsequent progressive rehabilitation takes place.

Decommissioning and closure phase: Progressive rehabilitation will to a certain degree result in the site being systematically returned to a pre-mining state throughout the operational phase. During decommissioning, all remaining areas that have been detrimentally affected by mining will be re-contoured and re-vegetated. However a number of permanent changes to the landscape, such as alterations to the topography and composition of the vegetation cover, will likely remain after mine closure.

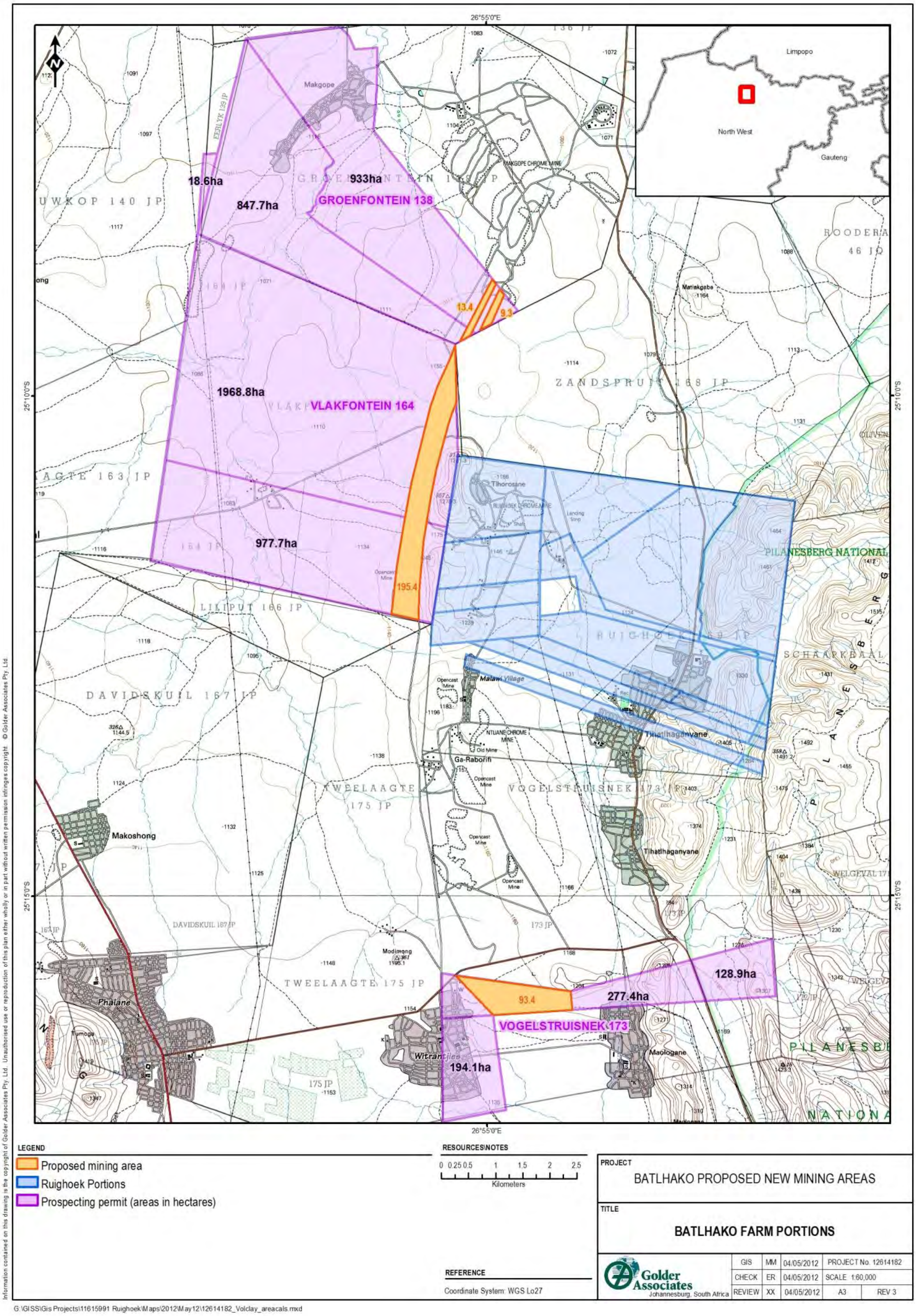

Figure 1: Location of Ruighoek Mine and proposed opencast mining activities

2.0 TERMS OF REFERENCE

The terms of reference for the VIA were to determine the potential visual impacts of the proposed project components on potential viewers or receptors, in terms of the visual context within which the activity will take place; and to develop mitigation strategies to address these. In order to achieve this aim, the following four steps were followed:

- Describing the visual resource value of the project study area by way of a baseline investigation; and subsequently characterising the nature, quality and resultant visual sensitivity of the potentially impacted area;
- Determining the change in the visual resource that would be brought about by elements of the proposed project and how visible this change will be from the surrounding areas;
- Describing the expected visual impacts of the key project components; and
- Recommending mitigation measures to reduce the potential visual impacts of the project.

3.0 ASSUMPTIONS AND LIMITATIONS

The following assumptions and qualifications are relevant specifically to the field of VIA and the findings of this study:

- Determining the value, quality and significance of a visual resource or the significance of the visual impact that any activity may have on it, in absolute terms, is not achievable. The value of a visual resource is partly determined by the viewer and is influenced by that person's socio-economic, cultural and specific family background and is even subject to fluctuating factors such as emotional mood. This situation is compounded by the fact that the conditions under which the visual resource is viewed can change dramatically due to natural phenomena such as weather, climatic conditions and seasonal change (CKA, 2008). Visual impact cannot therefore be measured simply and reliably, as is for instance the case with water, noise or air pollution. It is therefore impossible to conduct a visual assessment without relying to some extent on the expert professional opinion of a qualified consultant, which is inherently subjective. The subjective opinion of the visual consultant is however unlikely to materially influence the findings and recommendations of this study, as a wide body of scientific knowledge exists in the industry of visual impact assessment, on which findings are based;
- Certain of the parameters and criteria used to evaluate the visual quality of the landscape, as well as the magnitude of any potential visual impact caused, are specific to the study area and proposed interventions of this project. Interpretation of some of the concepts in this document would not apply when determining for instance the visual impact of a resort and recreational facilities in a rural context;
- Due to the nature of visual assessments, the photographical site assessment provided the primary source of information on which most of the arguments are based. The baseline assessment commenced with a photographic assessment of the site carried out by Golder, which was conducted on 02 February 2012. A review of available aerial photography and topographical maps, as well as the project Scoping Report and layout maps of the proposed project was conducted;
- Photos were taken with a Sony α200 digital camera and Sigma lens at various zoom factors ranging from 24 to 50. GPS points were taken at each photo location using a Garmin GPS60. The orientation of each view was determined using landmarks as reference points in each photo and correlating them with an aerial photograph of the study area.
- The Digital Elevation Model (DEM) was developed for an area of approximately a 10km radius around the proposed mining property. The DEM was developed from the 30 m ASTER GDEM (release 2) data. ASTER GDEM is a product of METI and NASA.
  - ASTER = Advanced Spaceborne Thermal Emission and Reflection Radiometer

- GDEM = Global Digital Elevation Model
- METI = Ministry of Economy, Trade, and Industry (United States of America)
- NASA = National Aeronautics and Space Administration

- Viewsheds were developed based on the position and height of key proposed infrastructure. The viewshed was modelled on the above-mentioned DEM using Global Mapper 10® software. The receptor height was set to 1.5 m. Viewsheds were created from each of the proposed pits, namely the 2 northern pits (Vlakfontein/Groenfontein), and the southern pit (Vogelstruisnek); and
- Due to the conceptual nature of the layout and designs used for the proposed project, the findings of this report are of a general nature and proposed mitigation may need to be reviewed and updated when final construction drawings have been produced for the actual project implementation.

4.0 METHODOLOGY

The VIA specialist study followed the following methodology, as illustrated by Figure 2:

- Describing the visual baseline condition or landscape character in terms of:
  - Natural elements; and
  - Human-made elements.
- Determining the visual quality of the landscape in terms of:
  - Topography and visual horizon;
  - The presence of water elements such as streams or dams;
  - Vegetation cover; and
  - Presence of human activity and land uses.
- Determining the visual absorption capacity of the receiving landscape;
- Determining the receptor sensitivity to the proposed project,
- Determining the magnitude of the impact, by considering the proposed project in terms of aspects of VIA, namely:
  - Visibility;
  - Visual intrusion; and
  - Visual exposure.

Assessing the impact significance by relating the magnitude of the visual impact to:

- Its duration; and
- Geographical extent.

- Describing the impact according to additional criteria:
  - Direction;
  - Frequency; and
  - Reversibility;

- Recommending mitigation measures to reduce the potential visual impacts of the project.

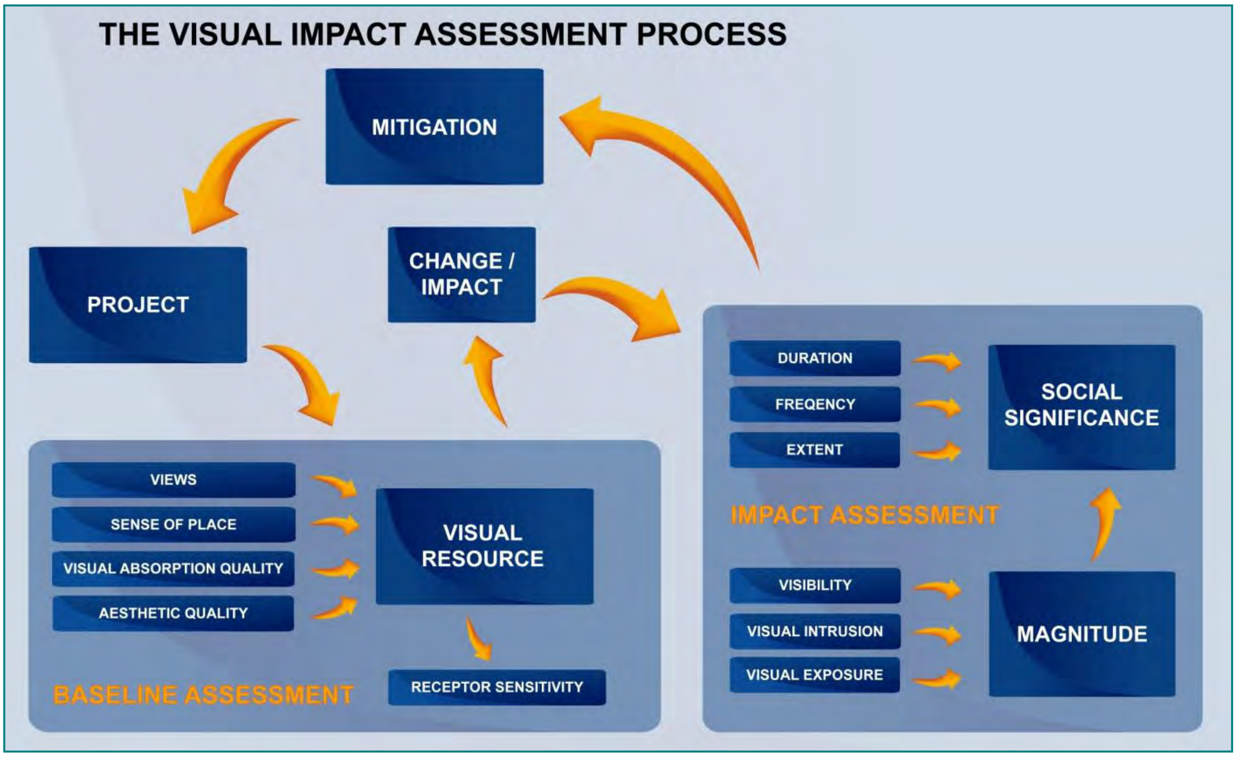

Figure 2: Methodology for the visual impact assessment

4.1 Delineation of study area for the assessment

The study area for the VIA is based on the spatial extent of the opencast mining areas and related infrastructure and activities of the project, as well as an associated buffer area. A visual impact will be caused by all visible infrastructural components and activities that will take place as part of the project, as well as all areas where the physical appearance of the landscape will be altered by earthworks and construction activities. In these areas, the existing land cover will be replaced or the environment will be physically altered; and will therefore be visually directly impacted upon.

The areas from which these proposed landscape alterations are expected to potentially be visible are defined as the study area. For the purposes of the VIA, the study area was defined as a 10km radius around the project footprint described above. The distance of 10km was selected based on the assumption that the human eye cannot distinguish significant detail beyond this range. Even though the flat to gently rolling topography numerous elevated viewing positions within the study area may make it possible to see over greater distances from some locations, features that are this far away are no longer clearly discernible or are at most inconspicuous; and therefore the visual impact beyond this range is considered negligible.

For the purposes of this VIA, the term “site” refers to the areas that will physically be affected by the project infrastructure and activities. Similarly the term “study area” refers to the area potentially affected by the project and indicates the 10km radius visual study area. The proposed mining activity will take place in two separate areas, namely the Vogelstruisnek; and Vlakfontein and Groenfontein sites. Hence two separate sites have been defined for the purposes of the VIA, i.e. “Vogelstruisnek site” and “Vlakfontein/Groenfontein site” respectively. However the study area is a single continuous area that includes both sites, as these are located within 10km of each other. The delineation of the study area is indicated on Figure 10.

5.0 BASELINE VISUAL CONDITIONS

5.1 Regional landscape character

Landscape character is a description of the natural (physical and biological) and human-made (land-use) attributes within the study area. This description is primarily an objective, visually-orientated perspective and does not include the underlying ecological or geophysical processes within the landscape. Furthermore this section does not address how the landscape attributes are perceived by viewers, as this is discussed in Section 5.2.

The region within which the proposed opencast mining activity will take place consists of two vastly different topographical landscapes. The existing mine and the proposed mining extensions are situated in an area that is primarily gently rolling to almost flat, punctuated by a number of geographically isolated hills and ridges. In contrast, the Pilanesberg ring complex which is the result of an ancient, extinct volcano is characterised by prominent, roughly concentric mountains and ridge lines some 20 to 25 kilometres in diameter.

The region is located in the semi-arid Northwest Province and many of the watercourses are non-perennial. Subsequently these features are not visually prominent and are rather distinguished by the larger, denser trees often growing along them, than by visible water.

The natural vegetation cover of large parts of the region consists of deciduous, open to dense short thorny woodland, dominated by Acacia species and a dense grass layer, although more dense vegetation generally occurs along the larger drainage lines, along ridgelines and valleys. Agricultural activity has altered the character of the vegetation cover in some areas, where large swaths of land currently are or show evidence of having been used for grazing or crop production purposes. This is most prominent in the area west of Ruighoek mine, where a patchwork of old or overgrown grazing lands and dirt roads dots the landscape. Areas of active crop production also occur near the settlements south of the mine, and to a lesser extent in other locations. A number of other mines are also located in and around the study area, where the vegetation cover has been completely removed and the landscape extensively transformed.

The study area is largely rural or undeveloped; however various settlements occur south and west of Ruighoek mine. Tlhatlaganyane, Maologane, Mabebeleng (Figure 6), Modimong, Bapong, Batlhalerwa, Kwa-Makoshong, Mabeskraal and Seolong occur in a crescent from southeast to northwest around the site, whereas Makgope, Molorwe, Bohule and Boriteng occur to the north.

5.2 Study area landscape character

The following landscape character description is informed by the photo positions map (Figure 3) as well as photos of the Vogelstruisnek (Figure 4 to Figure 6) and Vlakfontein/Groenfontein (Figure 7 to Figure 9) sites, found at the end of Section 5.2 of this report.

5.2.1 Topography

The majority of both the Vogelstruisnek and Vlakfontein/Groenfontein sites are located in very gently rolling to almost flat areas that have few prominent or distinguishing topographical features. However, the southern extent of the Vlakfontein mining area is bordered to the east by the isolated ridge against which the existing Ruighoek mine is located. Furthermore, the eastern extent of the proposed Vogelstruisnek open pit mining is located approximately 1.4km from a ridge associated with the Pilanesberg formation. A significant part of the eastern section of the study area also extends into the Pilanesberg range.

5.2.2 Water bodies

Neither of the sites are characterised by prominent water features or drainage lines; and runoff channels in the study area are more likely to be visually distinguished by the associated riparian vegetation and larger trees growing along them than by visible water. However, the north-south orientated watercourse located some 2.5km west of the Vlakfontein/Groenfontein site has an incised and well-defined channel in most areas that is prominent in short-range views. This watercourse also has an extensive wetland area associated with it and is likely to be inundated after heavy runoff events, which will create a much more prominent, albeit temporary visual element in the landscape.

5.2.3 Vegetation cover

The vegetation cover of both sites has in most instances been disturbed to some extent, although the impacts are not always visually prominent. The vegetation cover in the vicinity of the Vogelstruisnek site and specifically around Maologane and Witpoortjie/Modimong townships has been disturbed by agricultural activity, with localised mining activity also in evidence between these townships. However, the vegetation cover in the eastern part of this site is somewhat denser with clumps of larger shrubs and trees.

The Vlakfontein/Groenfontein has been mined and partially rehabilitated in the past; and the site is largely dominated by grasslands with more sparse distribution of larger shrubs and trees. The vegetation cover becomes denser along the foothills of the Ruighoek mine ridge. Some agricultural activity and disturbance is also in evidence in the southern parts of the Vlakfontein site. Furthermore the riparian vegetation associated with the watercourse west of the site is visually distinct from that of the rest of the study area.

5.2.4 Land cover and land use

The study area is largely rural or undeveloped; however various settlements occur especially south and west of the existing Ruighoek mine. The townships of Witrandjie and Maologane are located directly west and east of the Vogelstruisnek mining area, whereas Mabeskraal is located some 6.5km west of the Vlakfontein mining area. Other townships include Tlhatlaganyane, Bapong, Phalane, Mahobieskraal, Maologane, Mabebeleng, located in the southern part of the study area; and Modimong, Batlhalerwa, Kwa-Makoshong, Seolong, Makgope, Molorwe, Bohule and Boriteng, occurring to the north.

The mines in the region are the most prominent manmade elements the study area, even though their visual significance decreases over distance. Apart from the existing Ruighoek mining operations, some opencast mining activity also takes place to the north and south and further along the north-eastern edge of the study area.

Asphalt roads connect the aforementioned settlements with one another and a number of gravel roads lead to the mines and other destinations within the study area. Two high-mast power lines also traverse the study area from north to south, to the east and west of the existing Ruighoek mine respectively.

5.2.5 Sense of place/genus loci

According to Lynch (Lynch, 1992), sense of place is "the extent to which a person can recognise or recall a place as being distinct from other places, as having a vivid or unique, or at least particular character of its own". Thus, sense of place means that a site has a uniqueness or distinctiveness, which distinguishes it from other places. The primary informant of these qualities is the spatial form and character of the natural landscape together with the cultural transformation associated with historic use and habitation. A landscape can be said to have a strong sense of place, regardless of whether it is considered to be scenically beautiful or not. Where high landscape quality and strong sense of place coincides, the visual resource is considered to be high.

The sense of place of a site is determined during the site assessment, by considering the site itself in terms of its broader context. This step is at least partially subjective, as individuals may attach different values to a landscape due to their cultural and socio-economic background, personal experiences, etc.

Using the above definition, the sense of place of the study area can be described in terms of three distinct zones or areas. The Pilanesberg ring complex is considered to have strongly positive sense of place, owing to the very prominent, landmark quality of the concentric mountains and visually distinct vegetation cover. Similarly, the existing mining areas also have a distinct sense of place, as they are prominent in the visual landscape; and are characterised by strongly contrasting landforms and elements. However, these areas are considered to have a negative sense or place as they are considered visually intrusive within the study area. The remainder of the study area does not have a strongly defined sense of place, as it is not characterised by distinct, “memorable” features.

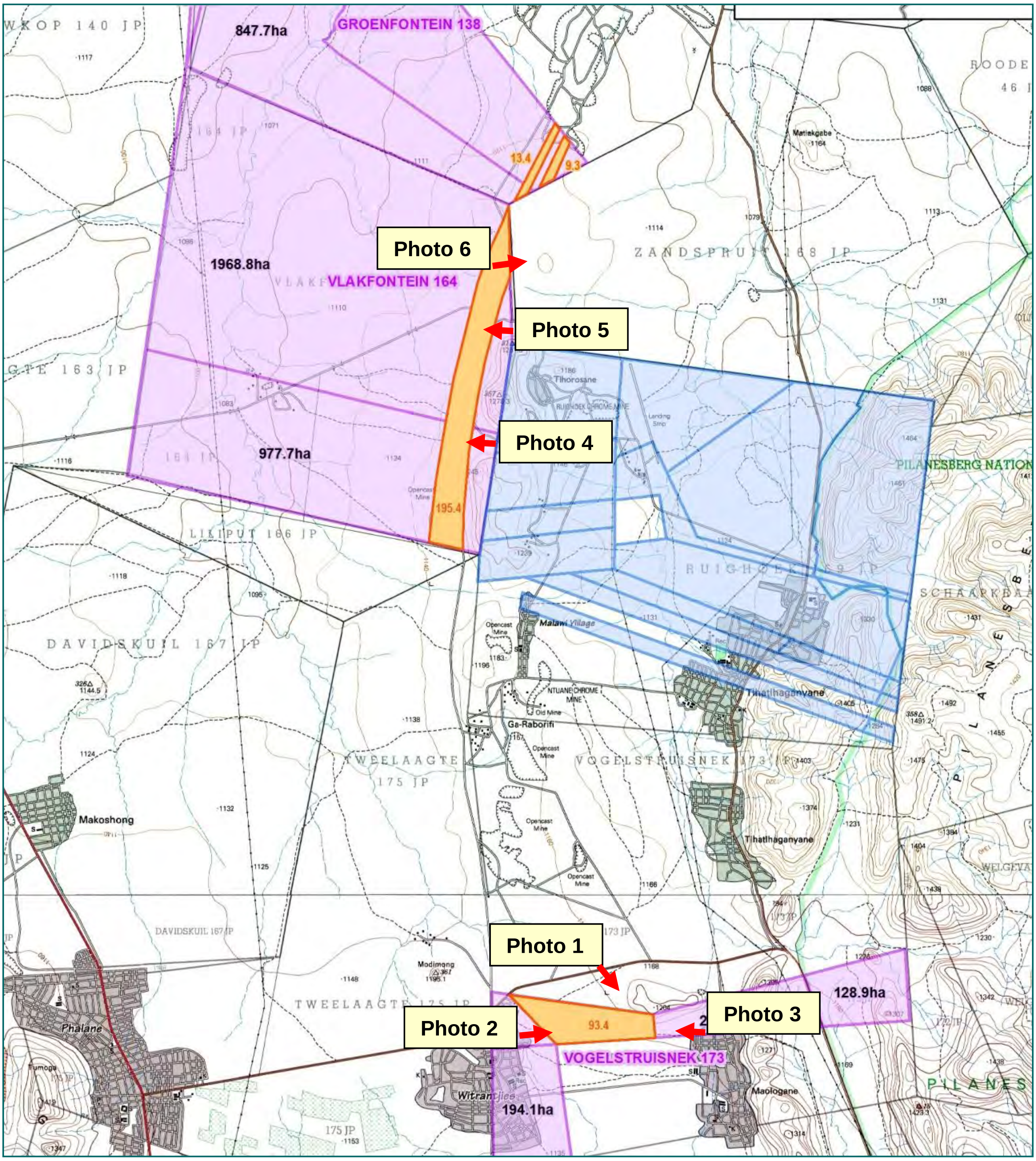

Figure 3: Photo positions map

5.2.6 Vogelstruisnek photos

Figure 4: Photo 1 – view of the Vogelstuisnek site looking southeast, showing the westernmost ridges of the Pilanesberg range in the background

Figure 5: Photo 2 – view from west of the Vogelstruisnek site looking east

Figure 6: Photo 3 – view from east of the Vogelstruisnek site looking west, with the ridges located west of Bapong and Phalane in the background

5.2.7 Vlakfontein/Groenfontein photos

Figure 7: Photo 4 – view from east of the Vlakfontein site, looking west

Figure 8: Photo 5 – view from further north, east of the Vlakfontein site and looking west

Figure 9: Photo 6 – view from the northernmost extent of the Vlakfontein site, to the east and towards the Pilanesberg range

5.3 Landscape visual resource value

Aesthetic appeal refers not only to the visual quality of elements within an environment, but also to the way in which combinations of elements in an environment appeal to our senses; which determines its visual resource value. Studies of perceptual psychology have shown human preferences for landscapes with a higher visual complexity, rather than homogeneous ones (Young, 2007). On the basis of contemporary research by Crawford (Crawford, 1994), landscape quality increases when:

- Prominent topography features and rugged horizon lines exist;
- Water bodies such as streams or dams are present;
- Untransformed indigenous vegetation cover dominates; and
- Limited presences of human activity or land uses that are not considered visually intrusive prevail.

Further to these factors, Table 1 indicates how visual resource value is assessed. The assessment combines visual quality attributes (views, sense of place and aesthetic appeal) with landscape character and gives the landscape a high, moderate or low visual resource value. When assessing the value of a landscape as visual resource, it is also necessary to consider the landscape in the context of where it is located. Although a visual landscape may be considered less impressive than others located far off or in other countries, it may be appealing because of its specific attributes compared to other landscapes nearby. In this way, what may be commonplace when placed in another visual context may be special or exceptional when viewed within its present context.

Table 1: Visual resource value assessment criteria

Level	Criteria
High	Pristine or near-pristine condition / little to no visible human intervention visible/ characterised by highly scenic or attractive features / Areas that exhibit a strong positive character with valued features that combine to give the experience of unity, richness and harmony. These are landscapes that may be considered to be of particular importance to conserve and which may be sensitive to change.
Moderate	Partially transformed or disturbed landscape / human intervention visible but does not dominate view / scenic appeal of landscape partially compromised / noticeable presence of incongruous elements / Areas that exhibit positive character but which may have evidence of degradation / erosion of some features resulting in areas of more mixed character. These landscapes are less important to conserve, but may include certain areas or features worthy of conservation.
Low	Extensively transformed or disturbed landscape / human intervention dominates available views / scenic appeal of landscape greatly compromised / visual prominence of widely disparate or incongruous land uses and activities / Areas generally negative in character with few, if any, valued features. Scope for positive enhancement frequently occurs.

Using the criteria in the Table 1 and the landscape character assessment in Section 5.2, the following statements are made regarding the visual resource value of the study area; as well as Vogelstruisnek and Vlakfontein/Groenfontein sites respectively:

- Neither site is characterised by prominent topographical landforms, although both sites are located within viewing distance of and are therefore visually associated with prominent ridges;
- Neither site is located on, adjacent to or in close proximity of a visually prominent watercourse or open body of water;
- The vegetation cover of both sites is representative of that of the greater region and shows signs of disturbance from historic human activity. Furthermore, at both sites denser plant cover and larger specimens are located in the areas where some topographical ruggedness or outcrops exist; and

- Both sites of the proposed mining activity are located on areas with limited human activity; however both sites are also located in the vicinity of the existing Ruighoek mine and substantial human settlement areas.

Based on the above summary, three distinct visual resource categories can be identified within the study area:

- The section of the study area occupied by the Pilanesberg ring complex is rated as having a high visual resource value due to the presence of prominent topographical features, rocky outcrops, varied vegetation cover, low levels of development or disturbance; and resultant highly positive sense of place. Similarly, a number of other outcrops and ridgelines, including the ridge against which the existing Ruighoek mine is situated, are considered to be of high visual resource value;
- The existing mines and settlement areas are of low resource value, as these areas are extensively transformed and retain little to none of their pre-existing character and have a negative sense of place; and
- The remaining and largest part of the study area, which includes both the Vogelstruisnek and Vlakfontein/Groenfontein sites, is of moderate visual resource value. These areas currently show limited signs of human transformation, but are not characterised by strongly appealing or distinctive features.

5.4 Visual absorption capacity

Visual absorption capacity (VAC) can be defined as “an estimation of the capacity of the landscape to absorb development without creating a significant change in visual character or producing a reduction in scenic quality” (Oberholzer, 2005). The ability of a landscape to absorb development or additional human intervention is primarily determined by the vegetation cover, topographical landforms and existing human structures.

A further major factor is the degree of visual contrast between the proposed new project and the existing elements in the landscape. If, for example, a visually prominent industrial development already exists in an area, the capacity of that section of landscape to visually “absorb” additional industrial structures is higher than that of a similar section of landscape that is still in its natural state. VAC is therefore primarily a function of the existing land use and cover, in combination with the topographical ruggedness of the study area and immediate surroundings.

The VAC of a landscape is again determined by taking a series of representative photographs during the site visit and then relating them to available aerial photographs or topographical maps. In this fashion, areas of differing VAC potential can be spatially delineated, if relevant.

The VAC varies somewhat throughout the study area, due to the differing vegetation cover and topographical character. However, the overall VAC of the study area is considered to be moderate, as the vegetation cover, existing mining development and township areas have the ability to absorb a level of visual change. Although no mining activity is proposed within the Pilanesberg ring complex, this area is however considered to have a low level of VAC, as any mining activity or other development will be highly prominent here.

5.5 Visual receptors sensitivity and incidence

Receptors for visual impacts are people that might see the proposed development, as visual impact is primarily an impact concerned with human interest. Receptor sensitivity refers to the degree to which an activity will actually impact on receptors; and depends on how many persons see the project, how frequently they are exposed to it and their perceptions regarding aesthetics. The receptors around the project can be classified for high, moderate or low visual sensitivity as indicated in **Table 2**.

Table 2: Receptor Sensitivity Criteria

Visual Quality Score	Site Specific Criteria
Amount of people that will see the project (exposure factor):	
High	Towns and cities, along major national roads (e.g. thousands of people)
Moderate	Villages, typically less than 1000 people.
Low	Less than 100 people (e.g. a few households)
Receptor perception regarding the project and visual landscape (perceived landscape value factor):	
High	People attach a high value to aesthetics, such as in or around a game reserve or conservation area, and the project is perceived to significantly impact on this value of the landscape.
Moderate	People attach a moderate value to aesthetics, such as smaller towns, where natural character is still plentiful and in close range of residency.
Low	People attach a low value to aesthetics, when compares to employment opportunities, for instance. Environments have already been transformed, such as cities and towns.

For the purposes of this VIA, three distinct visual receptor groups have been identified:

Local residents: A large number of people live in the various settlements in the area and will potentially be visually exposed to the expanded opencast mining operations. Depending on their location, some of the local residents may experience the expanded operations as intrusive. However, mining is not an unfamiliar occurrence in the region and most of the settlements are located several kilometres away from the mine, the obvious exceptions being Witrandjie, Maologane and Tlhatlaganyane, which are situated close to the Vogelstruisnek site. Mining is also an important source of employment and locals may perceive the proposed expanded mining operations as an opportunity. It is therefore difficult to assign a representative visual sensitivity rating for this receptor group, but it is expected to range from indifferent to moderate. For this reason, this group has been given a low sensitivity rating.

Local tourism attraction operators and tourists: Local tourism relies heavily on the scenic nature of the region and includes attractions such as game viewing, recreation and adventure sport opportunities. It is therefore highly likely that the operators of existing tourism attractions, as well as visitors to them, will be negatively inclined towards the proposed mining extensions. This group has therefore been rated as being highly sensitive to the project, although it is likely that only a small number of people from this receptor group will be impacted upon by the proposed opencast mining activities.

Air travellers: Air travel-based tourism, such as chartered aeroplane, helicopter and hot air balloon trips, also occurs in the region. The expanded mining operations will be highly visible from the air, although this receptor group constitutes a very small number of potentially affected persons. This receptor group is rated as being highly sensitive to the proposed project.

Road users have not been identified as a separate receptor group, as all travellers in the area are assumed to belong to one of the above receptor groups.

In summary, by far the largest percentage of potential visual receptors is not expected to be significantly impacted by the project. Furthermore, the small number persons that may view the mine as intrusive are not expected to view it from close by and/or will have a very low frequency of exposure to it. Accordingly, the average receptor sensitivity to the project is expected to be moderate to low; but that a large amount of people will be affected by the project.

6.0 IMPACT ASSESSMENT

6.1 Visual impact assessment criteria

As noted earlier, when considering attempts to classify or score something that is inherently subjective and influenced by individual interpretation, results will not be absolute and can only be measured against the criteria and parameters that have been assigned for their assessment. The assessment criteria used to determine impact magnitude are based on principles commonly used in visual assessment and addresses concepts that are expected to be universally understood and experienced, as further discussed below.

6.1.1 Zone of theoretical visibility

The zone of theoretical visibility is defined as the sections of the study area from which a proposed development may be visible; and is determined by conducting a viewshed analysis using Geographic Information System (GIS) software. The system has three-dimensional topographical modelling capabilities, including viewshed and line-of-sight analyses (cross-sections). The extents of the opencast mining areas are superimposed onto a digital elevation model (DEM) of the site, to produce a viewshed. The DEM as well as viewshed analysis results are then draped over a topo-cadastral map or aerial photograph, in order to increase the legibility of the results.

This process is followed to give a clearer indication of which areas will be most affected, which will in turn aid in the assessment of visual receptors, visual impact and the design and installation of visual mitigation measures. The results of the viewshed analysis are shown in Figure 10.

6.1.1.1 Vlakfontein/Groenfontein

The viewshed analysis indicates that on average, the expected level of visibility of the Vlakfontein/Groenfontein open pits will increase as the viewer moves away from the pits; and that the pits will be most visible from approximately 3km onwards. The greatest area of visibility is expected to the north and east of the pits; although the ridgeline directly east of the Vlakfontein open pit clearly interrupts the viewshed of this pit in numerous locations.

Various townships located north, east and west of the Vlakfontein/Groenfontein pits are expected to be affected; however the viewshed is for the largest part very fragmented in these locations, due to the influence of local topographical features. The overall level of visibility of the Vlakfontein/Groenfontein pits is expected to be low, as the pits will not be visible from the greatest part of the study area.

6.1.1.2 Vogelstruisnek

The Vogelstruisnek viewshed is largely restricted to the east, west and especially south of the open pit, and is expected to be almost completely screened from view to the north. However, the townships of Witpoortjie/Modimong and Maologane, as well as Batlhalerwa and Thlathlonganyane, are expected to be visually affected by the opencast mining activities. The overall level of visibility of the Vogelstruisnek open pit is also expected to be low within the study area, as the pits will not be visible from the greatest part of the study area.

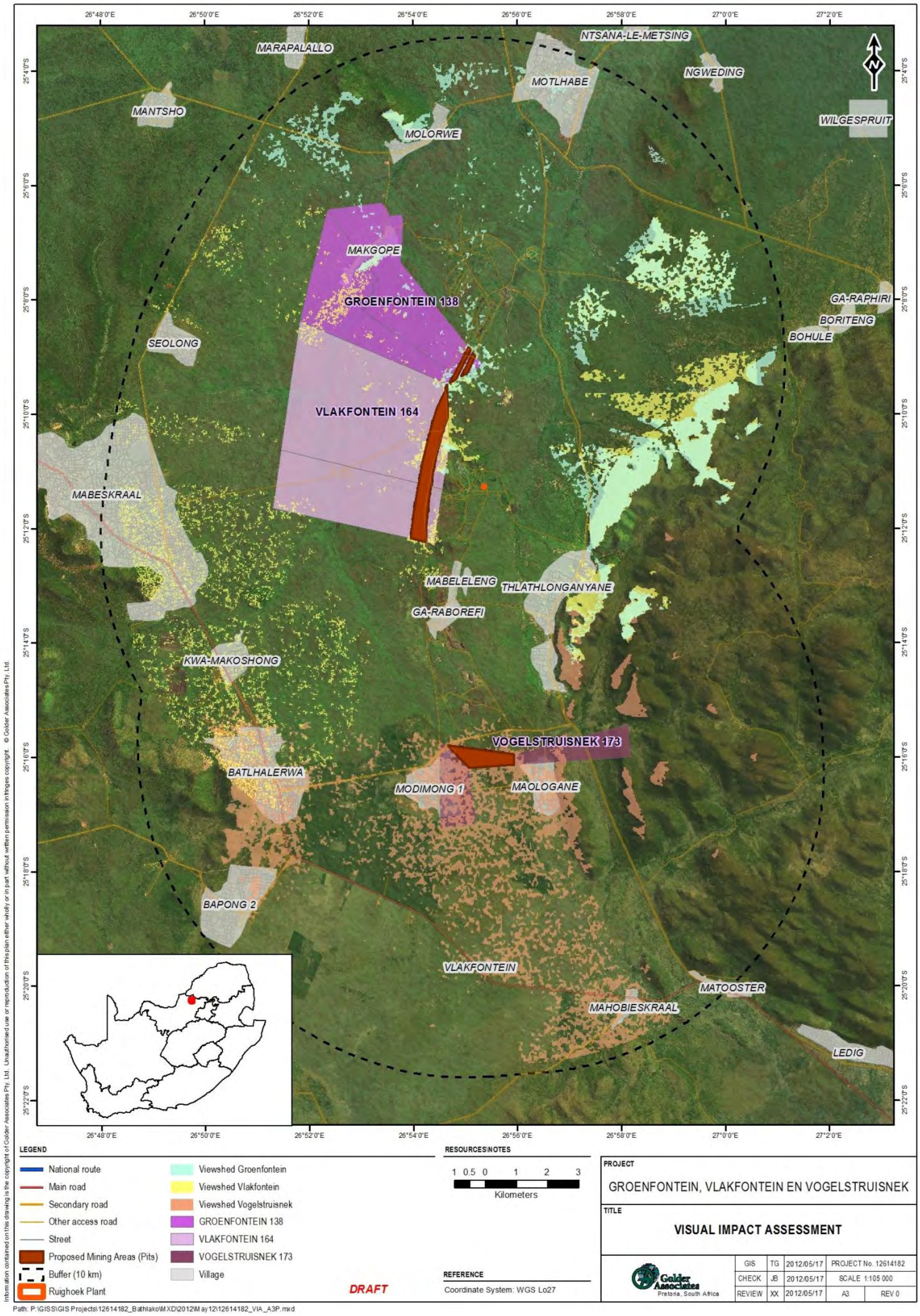

Figure 10: Zone of theoretic visibility of the proposed Vogelstruisnek, Groenfontein and Vlakfontein opencast mining areas

6.1.2 Visual intrusion

Visual intrusion deals with how well the project components fit into the ecological and cultural aesthetic of the landscape as a whole. An object will have a greater negative impact on scenes considered to have a high visual quality than on scenes of low quality, because the most scenic areas have the "most to lose".

The visual impact of a proposed landscape alteration also decreases as the complexity of the context within which it takes place, increases. If the existing visual context of the site is relatively simple and uniform any alterations or the addition of human-made elements tend to be very noticeable, whereas the same alterations in a visually complex and varied context do not attract as much attention. Especially as distance increases, the object becomes less of a focal point because there is more visual distraction, and the observer's attention is diverted by the complexity of the scene (Hull and Bishop, 1988).

The greatest part of the study area has a distinctly rural character, despite the presence of existing mining activity in places. The proposed open pit mining and associated overburden and waste rock dumps will greatly contrast with the surrounding untransformed areas; and will therefore be visually intrusive. For this reason, the opencast mining areas are expected to be moderately intrusive.

Furthermore, it is important to take cognisance of the fact that opencast mining of the LG5 and LG6 seams to the north and south of the existing Ruighoek mine, which is subject to a separate environmental authorisation process, is also planned. If authorisation for this mining is granted, the visual resource value of the study area will be further adversely affected and in which case the proposed Vogelstruisnek and Vlakfontein/Groenfontein opencast mining will likely be considered less intrusive.

6.1.3 Visual exposure

Visual exposure describes the degree to which receptor will be exposed to a proposed project, and is primarily a function of distance. Receptors that are located, or that come within close proximity of a source of visual impact, are described as having a greater level of visual exposure in terms of the potential impact. The inverse relationship of distance and visual impact is well recognised in visual analysis literature and in this sense; the significance of a visual impact diminishes over distance.

Visibility is a description of the level to which project components can be seen and are obscured by other elements and topographical landforms within the study area. The visual impact of a development also diminishes at an exponential rate as the distance between the observer and the object increases – refer to Figure 11. Relative humidity and fog in the area directly influence the effect. Increased humidity causes the air to appear greyer, diminishing detail. Thus, the impact at 1000m would be 25 % of the impact as viewed from 500m. At 2000 m it would be 10 % of the impact at 500m. The inverse relationship of distance and visual impact is well recognised in visual analysis literature (Hull and Bishop, 1988) and was used as important criteria for this study.

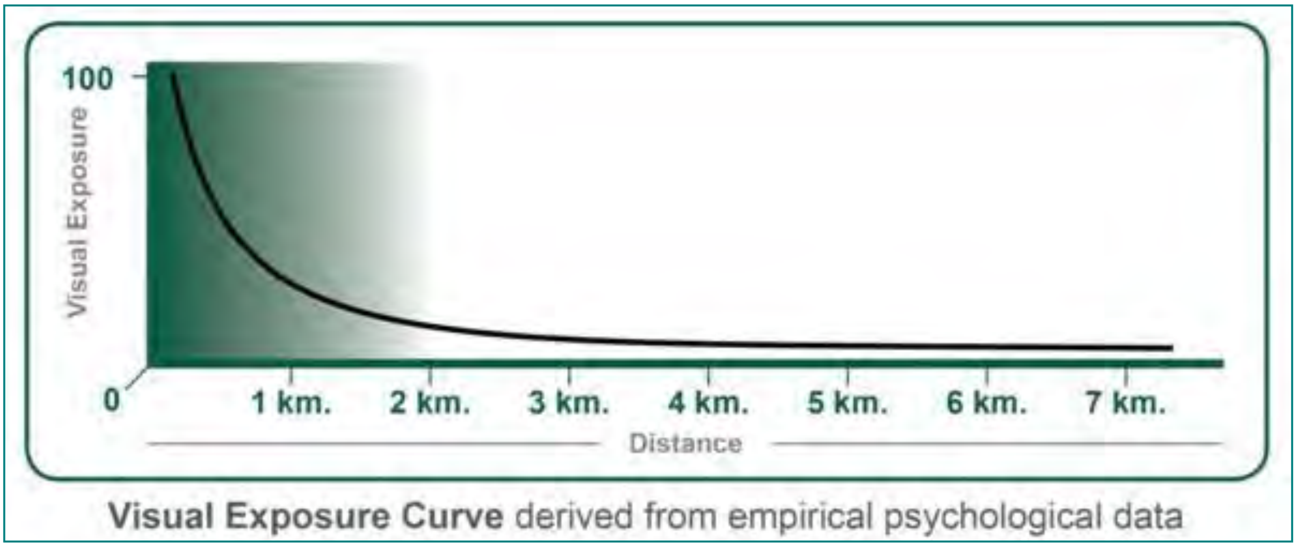

Figure 11: Visual Exposure Graph

Using the above premise and graph, it can be seen that visual exposure is very significant or high up to approximately 500m and that it then decreases significantly. From approximately 2km onwards the influence of distance on visual exposure, in terms of visual impact, changes relatively little and in most instances is considered to be of little significance, or low.

As can be seen in Figure 10, the majority of receptors in terms of the Vlakfontein/Groenfontein sites are located further than 2km from the open pits; and will therefore have a low visual exposure to the activity. However, the edges of the Vogelstruisnek open pit will only be located several hundred meters from Modimong/Witpoortjie and Maologane; and will therefore result in high visual exposure.

6.2 Impact magnitude methodology

The magnitude of a visual impact is determined by considering the visual resource value and VAC of the landscape within which the project will take place (Sections 5.2 to 0), the receptors potentially affected by it (Section 0), together with the level of visibility of the project components, their degree of visual intrusion and the potential visual exposure of receptors to the project (Section 6.1).

Weighting factors are applied to account for the VAC and receptor sensitivity to the project, as explained below.

6.2.1 Visual absorption capacity weighting factor

In order to account for the fact that visual impacts are expected to be more intrusive in landscapes with a lower VAC than in those with a higher VAC (regardless of the visual quality of the landscape) a weighting factor is incorporated into the impact magnitude determination, as indicated in Table 3:

Table 3: Weighting factor as a result of landscape VAC

Visual Resource Value of Receiving Landscape	High VAC	Medium VAC	Low VAC
Low visual resource value	1.2	1.2	1.0
Medium resource value	1.2	1.0	0.8
High resource value	1.0	0.8	0.8

6.2.2 Receptor sensitivity weighting factor

Based on the number of people that are likely to be exposed to a visual impact and their expected perception of the visual landscape and project as set out in Table 2 above, a weighting factor is determined as per Table 4 which accounts for receptor sensitivity during impact magnitude determination.

Table 4: Weighting factor for receptor sensitivity criteria

Receptor perception regarding project and visual landscape (perceived landscape value factor):	Amount of people that will see the project (exposure factor):		
	Many - Towns and cities, along major national roads, e.g. thousands of people	Moderate - Villages, typically less than 1000 people.	Few - Less than 100 people, e.g. a few households
High	1.2	1.2	1.0
Moderate	1.2	1.0	0.8
Low	1.0	0.8	0.8

6.2.3 Impact magnitude determination

Using the visual baseline, receptor sensitivity and impact assessment criteria, impact magnitude for the purposes of this VIA was calculated using the following formula as shown in Table 5 below.

MP = [(Visual Resource Value x VAC Weighting Factor)] x [(Visibility + Visual Intrusion + Visual Exposure)] x Receptor Sensitivity Weighting Factor

Table 5: Scoring system for assessment of magnitude of development components

Visual Resource Value of landscape (How pristine or unique is the landscape?)	Visual absorption capacity (what is the capacity of the landscape to absorb visual change?)	Visibility (Based on zone of theoretic visibility modelled for the project)	Visual Intrusion (How does the project fit in with the surroundings)	Visual exposure (View distance – how far is the activity from receptors?)	Receptor Sensitivity
3 (sensitive, e.g. river floodplains, ridges or other unique landforms, and with strong sense of place)	Factor 1.2 – Low (refer to Table 3)	3 (activity is highly visible from receptor, little/no screening effect)	3 (not at all, contrasts strongly with surrounding landscape and land use)	3 (high, within 500 m)	Factor 1.2 - High (refer to Table 2 and Table 4)
2 (no specific unique landforms,	Factor 1.0 – Moderate (refer	2 (activity is only partially visible,	2 (moderately, some similar activities are	2 moderate distance (up to	Factor 1.0 - Moderate (refer to Table 2 and

Visual Resource Value of landscape (How pristine or unique is the landscape?)	Visual absorption capacity (what is the capacity of the landscape to absorb visual change?)	Visibility (Based on zone of theoretic visibility modelled for the project)	Visual Intrusion (How does the project fit in with the surroundings)	Visual exposure (View distance – how far is the activity from receptors?)	Receptor Sensitivity
though natural landscape provides aesthetically pleasing character)	to Table 3)	moderate screening present)	located in the regional study area)	2000 m)	Table 4)
1 (not sensitive, such as urban setting which has been transformed)	Factor 0.8 – High (refer to Table 3)	1 (activity is only slightly/not visible because of topography vegetation and other screening)	1 (fits into the surrounding – does not conflict with land use)	1 (far, further than 2000 m)	Factor 0.8 - Low (refer to Table 2 and Table 4)

Using the above equation and the parameters in Table 5, the maximum possible Magnitude Point score is 38.9 points. The possible range of MP scores is then categorised as indicated in the first two columns of Table 6 below. For the purposes of magnitude assessment and to be in line with the agreed project impact assessment methodology, the various categories are re-scored as indicated in the third column of the table below:

Table 6 – Impact Magnitude Point score range

MP Score	Magnitude rating	Re-scored MP for impact Significance rating purpose
31.1≤	Very high/don't know	10
25.1-31.0	High	8
19.1-25.0	Moderate	6
13.1-19.0	Low	4
7.1-13.0	Minor	2
≤7	None	0

6.3 Impact magnitude determination

Using the methodology established in Section 6.0 above, the magnitude of operations Phase (Table 7) and Closure Phase impacts (Table 8) was determined. The Construction Phase was not considered for the purposes of this VIA, as no new infrastructure will be created and the construction or "preparatory" phase impacts would essentially be similar to those of operations, but of far lesser significance.

Table 7: Impact magnitude assessment of Operations Phase related impacts

Impact	Site visual resource value	Visual Absorption Capacity Factor	Level of visibility	Visual intrusion	Visual exposure	Receptor sensitivity factor	Overall impact magnitude (refer to Table 6)	Re-scored impact magnitude for Impact Significance purpose
Vlakfontein/Groenfontein – visual intrusion and reduction of landscape visual quality as a result of open pit mining	Moderate (2)	1.0	Low (1)	Moderate (2)	Low (1)	1.2	9.6	Minor (2)
Vogelstruisnek – visual intrusion and reduction of landscape visual quality as a result of open pit mining	Moderate (2)	1.0	Low (1)	Moderate (2)	High (3)	1.2	14.4	Low (4)
Vlakfontein/Groenfontein - dust pollution during mining	Moderate (2)	1.2*	Moderate (2)**	Moderate (2)	Low (1)	1.2	14.4	Low (4)
Vogelstruisnek - dust pollution during mining	Moderate (2)	1.2*	Moderate (3)**	Moderate (2)	High (3)	1.2	23.04	Moderate (6)

MP = [(Visual Resource Value x VAC Weighting Factor)] x [(Visibility + Visual Intrusion + Visual Exposure)] x Receptor Sensitivity Weighting Factor

* Airborne dust cannot be screened by the landscape; and a Low VAC factor has therefore been assumed

** A high level of visibility has been assumed for airborne dust during mining, as this aspect cannot be reliably modelled for viewshed analysis purposes

Table 8: Impact magnitude assessment of Decommissioning/Closure Phase related impacts

Impact	Site visual resource value	Visual Absorption Capacity Factor	Level of visibility	Visual intrusion	Visual exposure	Receptor sensitivity factor	Overall impact magnitude (refer to Table 6)	Re-scored impact magnitude for Impact Significance purpose
Vlakfontein/Groenfontein – reduction in visual intrusion and improvement of landscape visual quality as a result of rehabilitation (positive impact)	Moderate (2)	1.0	Low (1)	Low (1)	Low (1)	1.2	7.2	Minor (2+)
Vogelstruisnek – reduction in visual intrusion and improvement of landscape visual quality as a result of rehabilitation (positive impact)	Moderate (2)	1.0	Low (1)	Low (1)	High (3)	1.2	12	Minor (2+)

MP = [(Visual Resource Value x VAC Weighting Factor)] x [(Visibility + Visual Intrusion + Visual Exposure)] x Receptor Sensitivity Weighting Factor

6.4 Impact significance rating methodology

The significance of the impacts identified during the impact assessment phase were determined using the approach outlined below. This approach incorporates two aspects for assessing the potential significance of impacts (utilising terminology from the Department of Environmental Affairs and Tourism Guideline document on EIA Regulations, April 1998), namely occurrence and severity, which are further sub-divided as follows:

The methodology as illustrated in Table 9 was used to determine the impact significance for each project phase and is discussed in Sections 6.5 and 6.6 below.

Table 9: Impact assessment methodology

Occurrence		**Severity**	
Probability of occurrence	Duration of occurrence	Magnitude (severity) of impact	Scale / extent of impact
To assess each impact, the following four ranking scales are used:			
PROBABILITY		**DURATION**	
5 - Definite/don't know		5 - Permanent	
4 - Highly probable		4 - Long-term	
3 - Medium probability		3 - Medium-term (8-15 years)	
2 - Low probability		2 - Short-term (0-7 years) (impact ceases after the operational life of the activity)	
1 - Improbable		1 – Immediate	
0 - None			
SCALE		**MAGNITUDE**	
5 - International		10 - Very high/don't know	
4 - National		8 - High	
3 - Regional		6 - Moderate	
2 - Local		4 - Low	
1 - Site only		2 - Minor	
0 - None			

The significance of the two aspects, occurrence and severity, is assessed using the following formula:
SP (significance points) = (magnitude + duration + scale) x probability
The maximum value is 150 significance points (SP). The impact significance points are assigned a rating of high, medium or low with respect to their environmental impact as follows:

SP >75	Indicates **high** environmental significance	An impact which could influence the decision about whether or not to proceed with the project regardless of any possible mitigation.
SP 30 – 75	Indicates **moderate** environmental significance	An impact or benefit which is sufficiently important to require management and which could have an influence on the decision unless it is mitigated.
SP <30	Indicates **low** environmental significance	Impacts with little real effect and which should not have an influence on or require modification of the project design.
+	Positive impact	An impact that is likely to result in positive consequences/effects.

Potential impacts were assessed using the above calculation and rating system, and mitigation measures were proposed for all relevant project phases (construction to decommissioning).

6.5 Operations Phase

Table 10: Operational phase impact assessment

Potential Visual Impact	ENVIRONMENTAL SIGNIFICANCE											
	Before mitigation						After mitigation					
	M	D	S	P	Total	SP	M	D	S	P	Total	SP
Vlakfontein/Groenfontein – visual intrusion and reduction of landscape visual quality as a result of open pit mining	2	3	2	5	35	M	2	3	2	5	35	M
Vogelstruisnek – visual intrusion and reduction of landscape visual quality as a result of open pit mining	4	3	2	5	45	M	4	3	2	5	45	M
Vlakfontein/Groenfontein - dust pollution during mining	4	3	2	4	36	M	2	3	2	3	21	L
Vogelstruisnek - dust pollution during mining	6	3	2	4	44	M	4	3	2	3	27	L

During the operational phase the opencast mining activities at both the Vlakfontein/Groenfontein and Vogelstruisnek sites are expected to result in a visual impact of moderate significance, as it will result in the large-scale removal of existing vegetation cover and alteration of the natural topography of the affected areas. The resultant landscape will be visually intrusive in terms of the existing visual context, which nevertheless has nevertheless already been transformed by existing and historic mining; and by agricultural activities to a lesser extent. The degree and positions from which the mining activity at the respective sites will be visible will vary significantly; and will also be influenced by where the open pit/box cut is located at a given point in time. However, mining operations will continually transform an increasingly large area of the site and the effects will last for a considerable period of time after backfilling and rehabilitation has taken place in any specific location. It is anticipated that progressive rehabilitation will be done as mining progresses; however very few additional mitigation measures to address visual impacts of mining during the operational phase exist.

Furthermore, opencast mining operations invariably raise dust as a result of blasting, loading, hauling, and dumping of material and the moving haul trucks will also have visual impact. If not mitigated, the dust plume and especially dust fallout on vegetation in surrounding untransformed areas can be very unsightly and result in a visual impact of at least moderate significance; especially where located near settled areas as is the case with the Vogelstruisnek site. However a number of industry standard mitigation measures exist that if properly implemented, could reduce the significance of this impact to low. These measures are indicated in 7.2.2 below and are detailed in the air quality assessment specialist report.

6.6 Decommissioning and Closure Phase

Table 11: Decommissioning and closure phase impact assessment (best-case scenario)

Potential Visual Impact	ENVIRONMENTAL SIGNIFICANCE											
	Before mitigation						After mitigation					
	M	D	S	P	Total	SP	M	D	S	P	Total	SP
Vlakfontein/Groenfontein – reduction in visual intrusion and improvement of landscape visual quality as a result of rehabilitation	2+	4	2	3	24	L+	4+	4	2	4	32	M+
Vogelstruisnek – reduction in visual intrusion and improvement of	2+	4	2	3	24	L+	4+	4	2	4	32	M+

landscape visual quality as a result of rehabilitation												

The decommissioning and closure in terms of the Vlakfontein/Groenfontein and Vogelstruisnek sites mainly refers to rehabilitation that will still occur after mining has been completed, as no additional plant infrastructure will be constructed for the project. Once mining has been completed, the rehabilitation of all remaining areas affected by mining will see the site being gradually returned to a condition that more closely resembles the pre-mining condition and as such will constitute a positive visual impact. If the minimum industry standard rehabilitation measures are followed a positive impact of low significance is expected; however a number of additional mitigation measures are specified in 7.2 which may further increase the positive changes over time to be of moderate significance.

6.7 Cumulative impacts

The cumulative impact assessment considers this project within the context of other similar land uses, in the local and greater regional context.

A number of other mines occur within the study area in addition to Ruighoek mine itself; furthermore additional opencast and underground mining rights at Ruighoek mine are also being applied for under a separate environmental authorisation process. It is therefore anticipated that the expanded opencast mining at the Vlakfontein/Groenfontein and Vogelstruisnek sites will, if approved, result in a cumulative negative visual impact within the study area. The possibility of further mining projects occurring in the area in the future cannot be discounted and the degree to which visual impacts would accumulate would depend on the distances and topography between the projects, the degree to which the visual impacts of various projects can be mitigated, and the number of receptors.

In the light of the fact that mining is not an uncommon occurrence in the region, it may be argued that any potential cumulative impact that may occur in the future is not likely to be of extreme significance. Nevertheless, the cumulative impact will be negative and it is expected to further detract from the visual appearance and sense of place of the visual study area.

7.0 MITIGATION AND MONITORING MEASURES

7.1 Basic mitigation strategy

Visual mitigation can usually be approached in two ways, and usually a combination of the two methodologies is most effective. The first option is to implement measures that attempt to reduce the visibility of the structures and site disturbances, caused by the activity. Thus, an attempt is made to "hide" the visual impact from view by placing visually appealing, or visually less disruptive elements between the viewer and the activity causing a visual impact.

The second category of visual mitigation measures aims to minimise the size and impact of the disturbance itself, and usually involves altering disturbances or structures in such a way that they are visually less disruptive. This can be done by decreasing the size of disturbances (e.g. stockpiles and buildings); or shaping, positioning, colouring and/or covering them in such a way that they blend in with the surrounding scenery to a certain degree. By shaping elements in an appropriate fashion, covering it with topsoil, re-seeding it with indigenous grasses, etc., their visual impact can be reduced somewhat.

As a result of the nature of the proposed activity, namely that of opencast mining, the possibility of obscuring the source of the visual impact is somewhat limited, especially seeing as screening measures either take some time to establish (as is the case with vegetative screens) or may be unsightly in themselves (such as screening berms, if not properly shaped and grassed). The most significant visual mitigation will therefore be achieved by ensuring that continuous rehabilitation is done as soon and effective as possible throughout operations and prior to closure; and that sufficient aftercare and maintenance occurs. The proposed visual mitigation measures during the operational and decommissioning/closure phases are discussed below.

7.2 Operations phase

7.2.1 Progressive rehabilitation

It is anticipated that during the operations phase, limited scope for visual mitigation will exist in terms of the opencast pit and associated overburden/waste rock stockpiles. The most effective method of limiting the visual impact of mining will therefore be to ensure that progressive backfilling and rehabilitation of the mining void occurs as soon as possible and that re-vegetation is done as soon as is feasible.

In order to ensure that the visual impact during operations is minimised and to limit the potential residual impact after mining has ended, the implementation of a number of additional measures is required:

- A large number of *Aloe sp*. specimens occur along sections of the areas that will be mined. As many of these plants as possible, as well as any other species that have a reasonable likelihood of being transplanted successfully, must be harvested beforehand from all areas that will be affected by mining. These plants must be maintained in a dedicated area and re-planted as part of the rehabilitation of the opencast mining areas. It is recommended that a suitably qualified botanist be consulted in this regard.
- If effective topsoil stripping and conservation measures are employed, it is likely that a measure of natural re-vegetation will occur once the stored topsoil has been replaced. However, additional hand-seeding with appropriate indigenous pioneer grass species must be done to accelerate the rate of re-vegetation.
- As much of the existing natural rock armouring found on site must be recovered prior to the commencement of mining and must be retained for rehabilitation purposes. Large rocks and boulders that have been weathered by exposure to the elements should be reinstated in the landscape in natural formations and as close to their original positions as possible. This measure will assist in the ecological rehabilitation and overall appearance of the affected areas.
- An attempt must be made to re-instate the pre-mining landforms throughout operations. Although other requirements such as long-term stability and free-draining conditions must be considered, final landforms that greatly contrast with the surrounding natural topography must be avoided. This requirement also requires that all soft spoil and topsoil be conserved for use during rehabilitation.
- In order to prevent unsightly and ecologically detrimental erosion damage, steep or bare slopes must be rehabilitated as soon as possible and the extent of working areas kept as small as possible;
- Where the erosion of any embankment or area that has been cleared of vegetation occurs, soil stabilisation measures must be implemented immediately and all eroded areas rehabilitated. The cause of the erosion must subsequently be established and appropriate preventative measures to prevent erosion recurring must be taken, and must be designed and their implementation supervised by a hydrological or agricultural engineer;
- Locally indigenous species only should be used for rehabilitation purposes; and
- General principles of good site management must be implemented in order to ensure that the appearance of the site is as acceptable as possible.

7.2.2 Dust entrainment

- Wetting down of all haul roads and expansive clearings must be done as required to prevent additional visual impact from possible dust plumes. Access ramps into the mining pit should also be wetted during high wind conditions, when airborne dust is usually problematic.
- Areas temporarily affected by construction and operational activities should be re-vegetated as soon as possible to prevent the liberation of dust from these areas.
- Progressive rehabilitation of the backfilled opencast pits should be scheduled so that these areas are re-vegetated as soon as possible.

- All further measures specified in the air quality assessment that is being conducted for the project must be adhered to, as these will likely further aid in reducing the visual impact of airborne dust.

7.3 Decommissioning and closure phase

Continuous rehabilitation of the opencast mining areas will significantly reduce the extent of closure-related mitigation required. However, a number of additional mitigation measures are recommended during decommissioning of the mine, namely:

- It is anticipated that best-practice methods will be followed regarding decommissioning, closure and subsequent rehabilitation of the entire site. All visible surface infrastructures should therefore be dismantled and removed during decommissioning and all remaining areas subsequently re-shaped to be as natural in appearance as possible.
- All mining-affected areas remaining at the end of operations msut profiled to be free-draining, as close in appearance to the surrounding topography as possible and a rigorous vegetation layer established on the final landforms.
- Ongoing monitoring and maintenance of the rehabilitation areas will be required in order to ensure that they establish successfully and that erosion does not occur. The growth of the vegetation should be continuously monitored, however due to the unpredictable nature of vegetation growth the effectiveness of the re-vegetation will only become apparent after several years. Where specimens die, grow poorly or do not effect sufficient coverage the cause of the problem should be established and the afflicted specimens replaced, or a more suitable alternative established, based on a case-to-case basis. All erosion damage, as well as the underlying cause thereof, must be repaired as soon as it is identified.
- The post-closure land use plan compiled for the project should take into consideration all present and likely future land uses surrounding the site, to ensure that the site is successfully re-integrated into the existing landscape fabric. It is recommended that a specialist consultant be appointed for this purpose and that the special design aspects be addressed by a professional landscape architect.

7.4 Residual impacts after closure

Once mining has ceased and all rehabilitation has been completed, the landscape will to some extent be returned to its pre-mining condition and will be shaped to be as natural in appearance as possible. Some permanent residual visual impact will occur, as the topography of the affected areas will be permanently altered and the appearance of the land cover will be somewhat different from what it was prior to mining commencing. It is therefore of crucial importance that a rigorous management plan be implemented for all post-closure rehabilitation measures.

8.0 CONCLUSION

Based on the results of the visual baseline and impact assessment it is concluded that the proposed opencast mining can be supported; provided that all visual mitigation measures as specified in this report are implemented as required.

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APPENDIX A

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