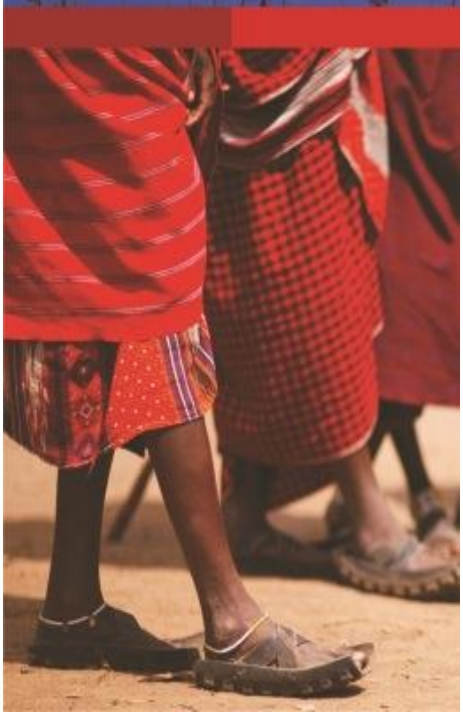

DIGBY WELLS
ENVIRONMENTAL

Proposed Open Pit Magnetite Mine and Concentrator Plant, Mokopane, Limpopo Province

Visual Impact Assessment

Project Number:

VMC3049

Prepared for:

Pamish Investments No. 39 (Pty) Ltd

July 2015

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This document has been prepared by Digby Wells Environmental.

Report Type:	**Visual Impact Assessment**
Project Name:	**Proposed Open Pit Magnetite Mine and Concentrator Plant, Mokopane, Limpopo Province**
Project Code:	**VMC3049**

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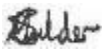
Stephanie Mulder *BSc (Hons: cum laude)*	Report Writer		July 2015
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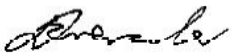
Karsten Drescher *MSc (cum laude)*	External Reviewer		July 2015

EXECUTIVE SUMMARY

Digby Wells Environmental (Digby Wells) has been appointed by Pamish Investments No. 39 (Pty) Ltd (Pamish Investments) as the independent Environmental Assessment Practitioner (EAP) to conduct the Environmental Impact Assessment (EIA) for the proposed Magnetite Mine Project. This includes the associated specialist studies and the required Public Participation Process (PPP). The environmental considerations for the impact assessment phase of the EIA included a Visual Impact Assessment (VIA).

The proposed Magnetite Mine Project is located on the Northern Limb of the Bushveld Igneous Complex. The study area and surrounds are characterised by traditional authorities consisting of numerous rural settlements and the associated agricultural land used for subsistence farming. The project area falls within the Mogalakwena Local Municipality and the Waterberg District Municipality of the Limpopo Province, South Africa. The proposed project is situated approximately 35 km north-west (straight line distance) of Mokopane (formerly known as Potgietersrus) and 65 km west (straight line distance) of Polokwane (formerly known as Pietersburg).

The project area is relatively flat with the exception of the mountainous area in the north-west corner and some isolated rocky outcrops and ridges. The most significant of these ridges is Malokong Hill situated on the eastern side of the project area. The topographical model indicates that the elevation of the project area increases from 955 metres above mean sea level (m.a.m.s.l.) in the Mogalakwena River valley running through the southern part of the project area to 1 265 m.a.m.s.l. on the Malokong Hill on the eastern boundary of the project area. The majority of the project area has gentle slopes of less than 3.5°. Moderate slopes of between 3.6° and 12.1° occur at the foot of the ridge areas. The steepest slopes occur on the ridges and range between 12.2° and 46.8°. The slope aspect / direction of the project area is not in any specific direction.

The relatively flat topography of the project area and surrounds is expected to provide only minimal screening. The mountainous area to the north-west and the isolated rocky outcrops and ridges will provide screening of the proposed project from those areas on the opposite side of the mountains and ridges. The receiving environment is characterised by subsistence agriculture and livestock grazing with little of the natural Bushveld vegetation remaining. The agricultural and natural vegetation will only provide minimal screening of the proposed development.

A viewshed is a geographical area, defined by the topography, within which a particular feature will be visible (Oberholzer, 2005). The theoretical viewshed model for the proposed Magnetite Mine Project was refined to a practical viewshed model with a buffer of 10 km around the proposed infrastructure and divided into areas that are likely to experience different categories of visual exposure. Due to the nature of the receiving environment it is unlikely that the proposed infrastructure will be visible beyond this 10 km buffer. The

practical viewshed model depicts the area from which the proposed Magnetite Mine Project is likely to be visible. This practical viewshed covers an area of 413.5 km².

The receiving environment of the proposed project has a high visual sensitivity as there are highly visible and potentially sensitive areas in the landscape. This is due to the largely rural sense of place of the receiving environment as well as the proximity of numerous villages and the Malokong Hill heritage site. The proposed project has a high visibility and a high visual exposure as it will be visible from a large area and will be dominant in the landscape and clearly noticeable to the viewer. The project also has a high visual intrusion as it results in a noticeable change and is discordant with the surroundings. The receiving environment and receptors of the proposed Magnetite Mine Project have a high sensitivity. The receiving environment has a low Visual Absorption Capacity (VAC) because there is little screening by the topography and vegetation.

The open pits and the low and lower grade stockpiles will have a permanent and irreversible negative visual impact. The pits will only be partially backfilled with waste rock after mining is complete and the voids will remain. The low and lower grade stockpiles will not be processed at this stage but will remain on the surface indefinitely. This impact will become reversible if the low and lower grade stockpiles are processed in the future. According to Oberholzer (2005), the proposed Magnetite Mine Project will therefore have a very high visual impact on the receiving environment. This impact could potentially be reduced to a high visual impact if the recommended mitigation measures are implemented.

During the closure phase, the negative impacts can be reduced by implementing various mitigation measures; the most important of these is rehabilitation with the emphasis being on re-contouring the site and reconstructing the surface water and drainage lines. The success of this rehabilitation will influence the overall long term impact of the proposed project on the topography and visual / aesthetic character of the receiving environment.

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LIST OF ABBREVIATIONS AND ACRONYMS

BIC	Bushveld Igneous Complex
CD: NGI	Chief Directorate: National Geospatial Information
CV	Curriculum Vitae
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
ELC	European Landscape Convention
FEL	Front End Loader
GHG	Greenhouse Gas
ha	Hectares
IFC	International Finance Corporation
km	Kilometres
LHD	Load Haul Dump
LoM	Life of Mine
m.a.m.s.l.	Metres above mean sea level
m	Metres
mm	Millimetres
µm	Micrometres
MML	Main Magnetite Layer
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEM: PAA	National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)
NEM:WA	National Environmental: Waste Act, 2008 (Act No. 59 of 2008)
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
PFS	Pre-Feasibility Study
PPP	Public Participation Process
RLS	Rustenburg Layer Suite
RoM	Run of Mine
tpa	Tonnes per annum
TSF	Tailings Storage Facility
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
WRD	Waste Rock Dump

1 Introduction

“Visual, scenic and cultural components of the environment can be seen as a resource, much like any other resource, which has a value to individuals, to society and to the economy of the region” (Oberholzer, 2005). A Visual Impact Assessment (VIA) is a specialist study performed to identify the visual impacts of the proposed project on the receiving environment.

This report describes the current topography and visual / aesthetic character of the receiving environment and the expected visual impacts of the proposed Magnetite Mine Project. The impacts are described and rated, and mitigation measures presented to reduce the negative impacts and enhance the benefits of the proposed project.

A study was conducted to identify and evaluate the surface features using ArcGIS 3D Analyst Extension to create a topographical model, and the resultant slope intensity, slope aspect and viewshed models.

2 Project Description

The purpose of this Chapter is to present a description of the proposed project, including an analysis of the geological conditions (including the mineral resource), the mining method as well as project related and associated infrastructure. The information presented is extrapolated from the Pre-Feasibility Study (PFS) that was undertaken by the Applicant in 2015.

2.1 Mineral Resource

The applicant has undertaken a Scoping Study in June 2014 to determine the viability of the project. The discussion of the mineral resource presented below is based on the findings of the Scoping Study.

The project is located on the Bushveld Igneous Complex (BIC). The BIC consists of a lower sequence of layered mafic and ultramafic rocks known as the Rustenburg Layer Suite (RLS) and an overlying unit of granites known as the Lebowa Granite Suite. These layered rocks occur in three areas known as the Western, Northern and Eastern limbs. The project is located in the Northern Limb of the Bushveld Complex.

Within the project site, two titano - magnetite zones have been identified, namely the vanadium-rich Main Magnetite Layer (MML) and the iron and titanium-rich P-Q zone. The MML consists of two massive titano-magnetite layers separated by a parting consisting of lower concentrations of titano-magnetite.

The target mineral for the proposed mine is vanadiferous titano-magnetite of the MML, which will be processed to produce magnetite concentrate which will ultimately be processed into

Vanadium[1]. Other minerals which may be found in association with the MML and have been included in the Mining Right Application are: Vanadium, Titanium, Iron Ore, Phosphate, Platinum Group Metals, Gold, Cobalt, Copper, Nickel, Chrome and all minerals found in association with these elements. A second orebody, referred to as the P-Q Zone may also be potentially mined at a later stage. The MML resource occurs up to a depth of 120 m whilst the P-Q Zone occurs at a depth of 400 m. The A,B and C zones are the zones determined as potential future resource zones with A and C being referred to as *low* grade hanging wall and Zone C being referred to as *lower* grade hanging wall.

2.2 Mining Method

Open pit mining is considered the optimal mining method based on the thickness and positioning of the mineral resource.

Open pit mining is proposed to be undertaken outwards from the middle of the strike length advancing north and south to an initial depth of 20 m below the surface then to 40 m and thereafter to 60 m, and 80 m. A bench height of 10 m will be used to allow for the separate loading of the two ore layers and the parting. There are two open pits planned, which are separated by the D4380 Provincial Road, the approximate footprint of the north (Pit 1) and south (Pit 2) open pits are 129 ha and 66 ha respectively.

The Life of Mine (LoM) is approximately 30 years with a Run of Mine (RoM) of up to one million tonnes per annum (tpa). The open pit mining will involve the activities as described in the sections below.

2.2.1 Vegetation and Topsoil Stripping

The vegetation will be cleared with a dozer while larger trees will be felled and removed. Any protected tree or plant species that requires relocation, will be removed prior to this activity once the necessary authorisation has been received. Rocky outcrops may require surface blasting before being loaded and hauled away. Unless of some value e.g. as aggregate, this rock will be treated as waste and dumped into the Waste Rock Dump (WRD).

The MML is covered by 2 m of soil which will be stripped to expose the outcrop. Both topsoils and subsoils will be stripped and loaded onto trucks which will then be placed in designated soil stockpile areas. There are two topsoil stockpiles proposed as part of the project, a northern and southern stockpile which are approximately 32 ha and 8 ha respectively. The topsoil will be used in rehabilitation of the open pits and / or the cladding of the WRDs as they are developed.

[1] The processing of the magnetite concentrate into Vanadium has not been considered as part of this EIA process and is subject to a separate environmental authorisation approval process, should the applicant choose to pursue this option. Currently, the intention is to either truck or rail the magnetite for further processing into Vanadium at another operation or exported as Magnetite.

2.2.2 Drill and Blast of Overburden Material and Target Material

To expose the mineral resource, the overburden or hard rock above the mineral resource must be broken up (blasted where necessary) and removed.

It is anticipated that the initial MML will be freely dug or ripped with a dozer to facilitate easier loading however in some cases blasting will be used particularly for the MML upper and MML lower as well as the parting between these layers (low grade material).

Blast holes will be drilled using a drill rig to the length of the bench/ bench height (10 m). A 4 m by 4 m pattern with 150 mm diameter drill hole diameters has been selected. Once the drilling is completed, the blast-holes will be loaded with bulk explosives. The selection of the type of explosives and accessories will be determined by local conditions e.g. how 'wet' the drill holes are found to be. The explosive column will be detonated by a primer initiated with a non-electric detonating cord. To ensure proper blast sequencing and to minimize adverse effects, the blasts are typically controlled using in-hole delays and / or surface delays.

2.2.3 Truck-and-Shovel

As the open pit progresses and the depth increases the low grade hanging wall, which in effect becomes the overburden will be mined via the traditional truck-and-shovel method and stored as a lower grade ore stockpile. The parting between the MML upper and MML lower resource is also considered to be low grade material, which will be trucked and stored as a low grade stockpile.

The MML upper and MML lower and target material will be loaded onto 25 tonne dump trucks using Front End Loaders (FEL) and transported to the Run of Mine (RoM) tip.

2.3 Mining Sequence

The mining of the two pits will be sequential with Pit 1 being mined for the first 17 years, before mining at Pit 2 commences. Pit 2 top soiling activities will commence during the final two years of Pit 1 to allow for the deposition of low and lower grade hanging wall ore from Pit 2 into the defined deposition dump areas.

It is necessary to mine the various defined mineral horizons in an overall ratio through-out the mines life to ensure that the later years of the mines life are not encumbered with high low grade to high grade mining ratios.

2.4 Mineral Processing

Ore will be transported from the open pit to the concentrator plant by dump trucks. A concentrator plant will be constructed for initial processing. Ore processing will commence with crushing which is undertaken in three stages and produces material with a size of 44 millimetres (mm). Based on typical industry performance, the plant is assumed to perform for 5 500 operational hours per annum (i.e. 358 operating days per annum, with an 80% utilisation of 80% availability).

Material from the crushed material stockpile will then be reclaimed and processed through a conventional rodmill-ballmill combination to produce a product of 53 micrometres (µm). Following grinding, magnetite will be recovered through a three-stage low intensity magnetic separation circuit. The magnetic separation product will be dried by a filter press and stockpiled for further processing in a concentrate shed, while the non-magnetic waste will be disposed of at the proposed tailings dam through a tailings pipeline. The concentrator will also include a laboratory, plant office, water treatment plant, workshop/ yard and control room. Additional infrastructure will also include internal road network, piping and concentrate stockpile area. Refer to Figure 1 for a flow diagram of the proposed concentrate process.

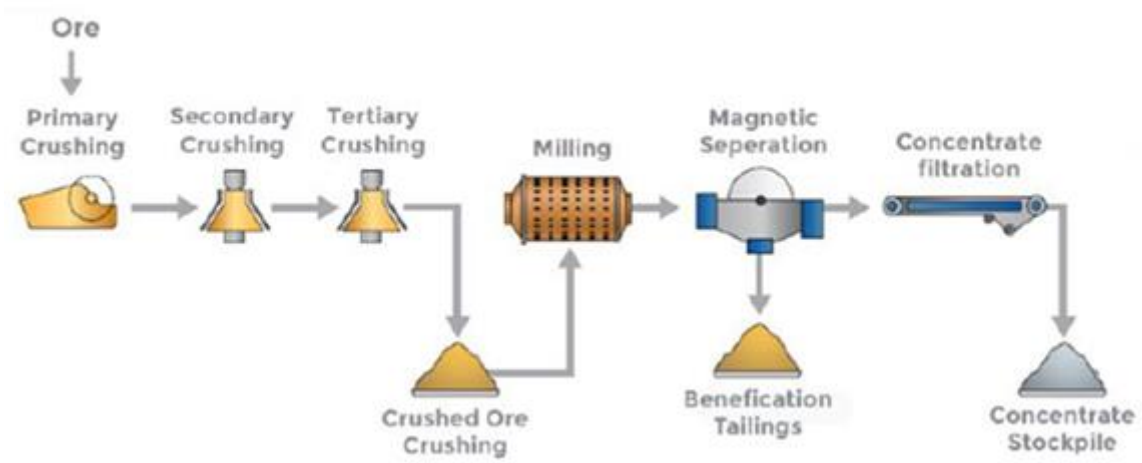

Figure 1: Process Flow Diagram of the Concentrator Plant

Source: VMIC, February 2014

2.5 Waste Rock Dumps and Low/ Lower Grade Stockpiles

Due to the nature of the resource the mining waste volumes are relatively low in that what would in a typical open pit mine be designated as overburden or waste is actually a potential resource.

The WRD will be created during the development of the open pits. It is proposed that approximately 80% of waste rock produced will be deposited on the working benches from mining activities. The remaining 20% of the waste rock dump will be disposed of at a waste rock dump, using Load Haul Dump (LHD) vehicles. There are two proposed WRDs, the northern WRD is located adjacent to the plant area and will be 4 ha in area, whilst the southern WRD will be approximately 7.5 ha in area. Both WRDs are expected to reach a maximum height of 18 m.

Storm water diversion trenches or swales will be constructed around the upstream sides of the WRD to direct clean surface water run-off around and away from the WRD. A drainage trench around the WRD will be constructed to divert run-off from the side slopes of the WRD.

As discussed above, the A, B and C zones are the zones determined as potential future resource Zones with A being referred to as low grade ore and Zone C being referred to as

lower grade ore. Each pit therefore has an associated low grade and lower grade ore stockpile. The footprints of the low grade and lower grade ore stockpiles for Pit 1 are 70.5 ha and 59.5 ha respectively. The footprints of the low grade and lower grade ore stockpiles for Pit 2 are 60 ha and 43.5 ha respectively. The Low and Lower Grade stockpile areas will not exceed 70m in height.

2.6 Tailings Dam

The tailings dam will be constructed as a conventional tailings dam. Tailings will be pumped to the tailings dam at 327 000 tpa. The slurry will contain 30% solids. The tailings material will have a particle size 80% smaller than 75 µm. The total volume of the tailings dam will be 9.8 million tonnes with a footprint of 58 ha and a height of 30 m.

A penstock system will decant water off the top of the tailings dam, which will then be pumped back to the plant via the return water dam. The tailings material has been classified as a Type 3 Waste (according to the NEM:WA Regulations) and will be lined with a Class C Liner.

Storm water diversion trenches or swales will be constructed around the upstream sides of the tailings dam to direct clean surface water run-off around and away from the tailings dam. Paddocks will be constructed around the perimeter of the tailings dam to contain run-off from the side slopes.

A 6 m wide waste rock road will be constructed around the perimeter of the tailings for access during operations, routine inspections and maintenance. A perimeter fence around the tailings dam will be installed.

3 Terms of Reference

Digby Wells Environmental (Digby Wells) has been appointed by Pamish Investments No. 39 (Pty) Ltd (Pamish Investments) as the independent Environmental Practitioner (EAP) to conduct the Environmental Impact Assessment (EIA) for the proposed Magnetite Mine Project. This includes the associated specialist studies and the required Public Participation Process (PPP). The environmental considerations for the impact assessment phase of the EIA included a VIA for the proposed Magnetite Mine Project.

4 Expertise of the Specialist

A Declaration of Independence and Curriculum Vitae (CV) are attached in Appendix A and B.

5 Relevant Legislation

The following international, national and regional documents form part of the legislative and policy framework of the visual assessment.

5.1 International Conventions

The European Landscape Convention (ELC) created by the Council of Europe, was the first international convention to focus exclusively on landscapes. The purpose of this convention is to promote effective management and planning of landscapes. It was signed by the United Kingdom government in 2006 and became binding from 2007. Public documents that explore the impacts of large scale developments, as defined in the ELC, on any landscape should take into account the effects of these developments. A landscape means “an area, as perceived by people, whose character is the result of the action and interaction of natural and / or human factors” i.e. the natural, visual and subjectively perceived landscape, (Contesse, 2011; European Landscape Convention, 2007).

There is no regional or local scale legislation pertaining to mining activities and visual assessments exclusively but visual assessments are relevant to the International Finance Corporation’s (IFC) Performance Standards and this will be treated as a best practice guideline.

IFC Performance Standard 3: Resource Efficiency and Pollution Prevention is applicable to the visual assessment. Performance Standard 3 recognises that increased economic activity and urbanisation often generate increased levels of pollution to air, water and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional and global levels. For the purposes of this Performance Standard, the term ‘pollution’ is used to refer to both hazardous and non-hazardous chemical pollutants in the solid, liquid, or gaseous phases, and includes other components such as pests, pathogens, thermal discharge to water, Greenhouse Gas (GHG) emissions, nuisance odours, noise, vibration, radiation, electromagnetic energy and the creation of potential visual impacts including light (IFC, 2012).

The Environmental, Health and Safety Guidelines for Mining therefore need to be considered (World Bank, 2007):

“Mining operations, and in particular surface mining activities, may result in negative visual impacts to resources associated with other landscape uses such as recreation or tourism. Potential contributors to visual impacts include high walls, erosion, discoloured water, haul roads, waste dumps, slurry ponds, abandoned mining equipment and structures, garbage and refuse dumps, open pits, and deforestation. Mining operations should prevent and minimise negative visual impacts through consultation with local communities about potential post-closure land-use, incorporating visual impact assessment into the mine reclamation process. Reclaimed lands should, to the extent feasible, conform to the visual aspects of the surrounding landscape. The reclamation design and procedures should take into consideration the proximity to public viewpoints and the visual impact within the context of

the viewing distance. Mitigation measures may include strategic placement of screening materials including trees and use of appropriate plant species in the reclamation phase as well as modification of the placement of ancillary and access roads."

5.2 National Legislation and Policy

At a national level, the following legislative documents potentially apply to the topography and visual assessment:

- Regulations in Chapter 5 (Integrated Environmental Management) of the NEMA and the Act in its entirety. The Act states that "the State must respect, protect, promote and fulfil the social, economic and environmental right of everyone…" Landscape is both moulded by, and moulds, social and environmental features;
- Section 23(1)(d) of the MPRDA, where it is mentioned that a mining right will be granted if "the mining will not result in unacceptable pollution, ecological degradation or damage to the environment". Visual pollution is a form of environmental pollution and therefore needs to be considered under this section. Holders of rights granted in terms of the MPRDA must at all times give effect to the general objectives of integrated environmental management laid down in Chapter 5 of the NEMA. The Regulations promulgated in terms of the NEMA, with which holders of rights must comply, provide for the assessment and evaluation of potential impacts, and the setting of management plans to mitigate such impacts.
- The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) and related provincial regulations – in some instances there are policies or legislative documents that give rise to the protection of listed sites. The NHRA states that it aims to promote "good management of the national estate, and to enable and encourage communities to nurture and conserve their legacy so that it may be bequeathed for future generations". A holistic landscape whose character is a result of the action and interaction and / or human factors has strong cultural associations as societies and the landscape in which they live are affected by one another in many ways; and
- Section 17 of the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) (NEM: PAA) sets out the purposes of the declaration of areas as protected areas which includes the protection of natural landscapes. Landscapes are defined by the natural, visual and subjectively perceived landscape; these aspects of a landscape are intertwined to form a holistic landscape context.

6 Project Area

The proposed Magnetite Mine Project is located on the Northern Limb of the Bushveld Igneous Complex. The project area for the proposed Magnetite Mine Project is defined as the Mining Right Area. The project area and surrounds are characterised by traditional authorities consisting of numerous rural settlements and the associated agricultural land used for subsistence farming. Plan 1 (Appendix C) illustrates the regional setting of the project area.

The project area falls within the Mogalakwena Local Municipality and the Waterberg District Municipality of the Limpopo Province, South Africa. The proposed project is situated approximately 35 km north-west (straight line distance) of Mokopane (formerly known as Potgietersrus) and 65 km west (straight line distance) of Polokwane (formerly known as Pietersburg). The Bakenberg Traditional Council and the villages of Basogadi, Malokong, Mothoathoase and Sepharane fall within the project area. The villages within 10 km of the project area include but are not limited to: Ditlotswana, Eseldrift, Ga-Mokwena, Groesbeek, Haakdoring, Kaditshwene, Limburg, Lyden, Malokongskop, Mapela and the Mapela Traditional Council, Mokamole, Mosate, Pudiakagopa, Rooivaal and Taolome.

The residential areas and road users in the project area and surrounds are all potential visual receptors of the proposed project. The closest towns and settlements, as well as their direct distance from the project / mining right area and proposed infrastructure and direction from the proposed infrastructure are summarised in Table 1. All distances are straight line distances measured from the edge of the project area to the centre of the towns / settlements unless otherwise stated.

Table 1: Closest Towns and Settlements

Name	Type	Direct Distance from Project / Mining Right Area	Direct Distance from Proposed Infrastructure	Direction from Proposed Infrastructure
Bakenberg Traditional Council	Traditional Council	Within Mining Right Area	2.2 km	WNW
Basogadi	Settlement	Within Mining Right Area	0.9 km	W
Malokong	Settlement	Within Mining Right Area	4 km	N
Mothoathoase	Settlement	Within Mining Right Area	0.9 km	W
Sepharane	Settlement	Within Mining Right Area	2.5 km	SW
Taolome	Settlement	0.2 km	6.1 km	N

Name	Type	Direct Distance from Project / Mining Right Area	Direct Distance from Proposed Infrastructure	Direction from Proposed Infrastructure
Malokongskop	Settlement	0.6 km	1.7 km	E
Pudiakagopa	Settlement	0.6 km	3.2 km	N
Ditlotswana	Settlement	0.7 km	1.7 km	E
Kaditshwene	Settlement	0.8 km	7 km	W
Mosate	Settlement	0.9 km	3.4 km	WNW
Ga-Mokwena	Settlement	1.5 km	7.9 km	N
Haakdoring	Settlement	2 km	8.3 km	WNW
Rooivaal	Settlement	2.2 km	3.9 km	E
Eseldrift	Settlement	2.3 km	10.2 km	W
Lyden	Settlement	2.4 km	10.4 km	WSW
Mapela Traditional Council	Traditional Council	5 km	6.7 km	SE
Limburg	Settlement	5.7 km	10.7 km	NE
Mokamole	Settlement	7.2 km	16.3 km	SW
Groesbeek	Settlement	8.3 km	16.1 km	W
Mogalakwenastroom	Settlement	13.4 km	19.1 km	NW
Sterkwater	Settlement	14 km	16.5 km	SSE
Mapela	Settlement	14.7 km	16.3 km	SE
Gilead	Settlement	16.6 km	24.3 km	NNE
Matlala	Settlement	19.8 km	23.7 km	ENE
Mahwelereng	Settlement	29.9 km	31.5 km	SE
Mashashane	Settlement	31.2 km	32.4 km	ESE
Melkrivier	Settlement	34 km	42.9 km	WSW
Mokopane (Potgietersrus)	Secondary Town	35 km	36.7 km	SE

The N11 national route and the R518 regional road are situated 5 km east and 2.5 km south of the project area respectively. The D3507, D3534, D3537 and D4380 district roads run through the project area and the D192, D1958, D3500, D3505, D3521 and D3550 district roads are within 5 km of the project area. The N11 national route is used by tourists travelling through Limpopo and to Botswana and Zimbabwe.

The project area and surrounds consists of numerous rural settlements and the associated agricultural land used for subsistence farming interspersed with areas of natural Bushveld that are typically used for livestock grazing. The only operational mine in the area is the Anglo Platinum Mogalakwena Platinum Mine situated approximately 5 km south-east of the project area. The proposed Ivanplats Platreef Mine is approximately 21 km south-east of the project area. The receiving environment can be described as having a largely unaltered rural sense of place. Plan 2 (Appendix C) illustrates the local setting of the project area.

The proposed Magnetite Mine Project covers an area of approximately 10 100 ha. The coordinates of the centre of the project area are 23° 53’ 18.150” S and 28° 46’ 29.455” E. The project area is situated on the farms Vogelstruisfontein 765 LR, Vriesland 781 LR, Vleigekraal 783 LR, Schoonoord 786 LR and portions Re/1, Re/2, 3, 4, 5 and 6 of the farm Bellevue 808 LR.

The project area falls within the Limpopo River Catchment Area. The Mogalakwena River flows through the southern half of the project area and is joined by the Sterk River which flows into the project area from the south. The Borobela River has its source approximately 1.5 km north-east of the project area and flows through the project area in a south-westerly direction to join the Mogalakwena River. These three main rivers have wide flat floodplains and numerous tributaries that drain the project area and surrounds. Soil erosion is evident along these drainage lines and attention must be paid to the management of the activities that affect the topography so as to prevent further soil erosion.

The nearest Important Bird Area (IBA) is the Waterberg System situated 14 km south of the project area. The Bellevue Nature Reserve is situated 12 km north of the project area, the Moepel Nature Reserve is situated 14 km west of the project area, the Witvinger Nature Reserve is situated 19 km south-east of the project area, the Entabeni Nature Reserve is situated 22 km south of the project area, and the Masebe Nature Reserve is situated 23 km north-west of the project area (Plan 1, Appendix C). Protected areas such as nature reserves, and recreational and tourism areas are considered sensitive visual receptors.

7 Aims and Objectives

The aim of this VIA is to determine the nature of the project area and the impact of the proposed Magnetite Mine Project on the visual / aesthetic character of the surrounding landscape. The following objectives have been identified to achieve this aim:

- Examine aerial photography available for the project area (CD: NGI, 2010);
- Create and examine topographical, slope intensity, slope aspect and viewshed models in ArcGIS;

- Describe the topography and visual / aesthetic character of the receiving environment;
- Determine the size of the viewshed area;
- Identify potential receptors within the viewshed area;
- Determine the potential visual impacts; and
- Recommend measures to mitigate impacts and enhance benefits.

8 Knowledge Gaps

A VIA is open to subjectivity. This subjectivity is due to the different opinions receptors have of a proposed project. A receptor may be partial to the fact that the proposed project is occurring in an area, which becomes a source of economic upliftment for a community, whereas another receptor may view a proposed project as a negative factor which could hamper tourism or recreational activities.

Many factors can enhance or reduce the visual impact of the proposed project. Vegetation near a receptor's viewpoint can greatly reduce that receptor's view of the proposed project. Other factors such as weather / climatic conditions and seasonal change can also affect a receptor's view. It is, therefore, difficult to determine the visual impact of the proposed project from the viewpoint of each individual receptor. Consequently, this report focuses on the size of the viewshed area. Several key viewpoints were selected for the photomontages to provide an example of the expected views of the proposed project (refer to Section 10.4 below).

Detailed contour relief data was not available for the project area and surrounds. The topographical model was created using the available 20 metre contour relief data from Chief Directorate: National Geo-Spatial Information (CD: NGI). This data is generalised and some of the topography detail is lost. Contour relief data with a resolution of 5 metres or less is required to create more accurate topographical and viewshed models; however, this data was not available for this project.

The practical viewshed model was only created for daytime conditions. A night time site visit is required to determine the potential impact of lighting from the propose Magnetite Mine Project at night. The visibility of night time lighting from the nearby Anglo Platinum Mogalakwena Platinum Mine would be used to determine the expected visual impact of night time lighting. This night time site visit was not conducted due to safety / security concerns.

9 Methodology

The VIA was performed using surveyed geographically referenced information and aerial photography, together with the professional opinion of an experienced visual impact assessor.

9.1 Characterisation of Visual Impacts

The expected visual impact of the proposed Magnetite Mine Project was categorised based on the type of receiving environment and the type of development as detailed in Table 2 (Oberholzer, 2005). This table provides an indication of the visual impacts that can be expected for different types of developments in relation to the nature of the receiving environment. According to Oberholzer (2005), the proposed Magnetite Mine Project is classified as a **Category 5 development** (Table 3). The receiving environment can be described as having **high scenic, cultural or historical significance** due to the proximity of the Malokong Hill on the eastern boundary of the project area. The remnants of several stonewalled settlements are visible on Malokong Hill and these settlements are culturally significant as they are linked to the Makapan Valley World Heritage Site (WHS). The Malokong Hill is described in more detail in the Heritage Impact Assessment Report. It is therefore expected that the proposed Magnetite Mine Project will have a **very high visual impact** on the receiving environment. This will be verified in the investigation to follow.

Table 2: Categorisation of Expected Visual Impact (adapted from Oberholzer, 2005)

Type of Environment	Type of Development (Low to High Intensity)				
	Category 1 Development	**Category 2 Development**	**Category 3 Development**	**Category 4 Development**	**Category 5 Development**
Protected / wild areas of international, national or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high, scenic, cultural or historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	**Very high visual impact expected**
Areas or routes of medium scenic, cultural or historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected

Areas or routes of low scenic, cultural or historical significance	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected
Disturbed or degraded sites / run down urban areas / wasteland	Little or no visual impact expected. Possible benefits	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

Table 3: Key to Categorisation of Development (adapted from Oberholzer, 2005)

Type of Development	Examples of Development
Category 1	Nature reserves, nature related recreation, camping, picnicking, trails and minimal visitor facilities.
Category 2	Low-key recreation / resort / residential type development, small-scale agriculture / nurseries, narrow roads and small-scale infrastructure.
Category 3	Low density resort / residential type development, golf or polo estates, low to medium-scale infrastructure.
Category 4	Medium density residential development, sports facilities, small-scale commercial facilities / office parks, one-stop petrol stations, light industry, medium-scale infrastructure.
Category 5	High density township / residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large-scale infrastructure generally. Large-scale development of agricultural land and commercial tree plantations. **Quarrying and mining activities with related processing plants.**

9.2 Visual / Aesthetic Character and Topography

A desktop study was conducted to evaluate the topography of the receiving environment and CD: NGI aerial photography flown in 2012 of the area was examined to determine the surface features. The available vector GIS data was used to determine the relative location of the features surrounding the project area.

A topographical model was created using ArcGIS 3D Analyst Extension. The model was created using the 20 metre contour relief data available from CD: NGI.

The resultant topographical model was then used to create slope intensity and slope aspect models using the Slope and Aspect tools of ArcGIS 3D Analyst Extension. The slope model indicates the slope degree and was classified using the Jenks Natural Breaks method.

The information gathered from the above desktop study was verified with a site visit. The combined information from the desktop study and the site visit forms the basis of this report.

9.3 Viewshed Analysis

The resultant topographical model was used to create a viewshed model using the Viewshed Tool of the ArcGIS 3D Analyst Extension. This viewshed model illustrates the areas from which the proposed project will potentially be visible taking into account the estimated height of the proposed infrastructure (Table 4) and the proposed plant area infrastructure (Table 5). The viewshed modelling tool does not work with negative infrastructure heights so all below ground infrastructure (pits and trenches) has been modelled with a height of 0 metres. The infrastructure listed in Table 4 is illustrated on Plan 3 (Appendix C).

Table 4: Infrastructure Heights for Viewshed Modelling

Infrastructure	Height
Low Grade Stockpiles	70 m
Lower Grade Stockpiles	70 m
Tailings Dam	30 m
Topsoil Stockpiles	30 m
Waste Rock Dumps	18 m
Plant Area	Refer to Table 5 below
Contractor's Camp	6 m
PCD	2 m (assumed)
Return Water Dam	2 m (assumed)
Stormwater Dam	2 m (assumed)
Pipeline	1 m (assumed)
Pits	0 m
Site Roads	0 m
Dirty Water Trench	0 m
Solution Trench	0 m
Storm Water Trench	0 m

Table 5: Plant Area Infrastructure Heights

Process Area	Process Unit	Height
Crushing	Primary Crusher	12 m
	Secondary Screening and Crushing	21 m
	Tertiary Screening	20 m
	Tertiary Crusher	20 m
	Mill Feed Stockpile	22 m
Milling	Milling	12 m
Separation	Separation	12 m
Product Thickening	Product Thickening	9 m
Concentrate Dispatch	Concentrate Shed	9 m
Tailings Treatment	Tailings Treatment	12 m
Utilities	Utilities	8 m
Infrastructure	Laboratory	6 m
	Plant Office and Control Room	6 m
	MCC's	6 m

The concept of viewshed modelling is depicted in Figure 2. The topography denotes whether or not a development will be visible from a receptor. In Figure 2 below the development is only visible from the receptors within the valley and on the slopes of the hills facing it. The development will be hidden from all receptors beyond the first hills.

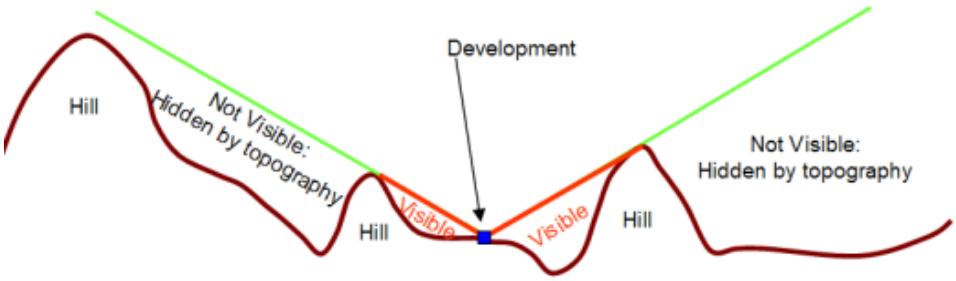

Figure 2: Theoretical Background of Viewshed Modelling

A theoretical viewshed model and a practical viewshed model were created. This viewshed model is based on the topography only and does not take the screening effect of vegetation into account. The natural Makhado Sweet Bushveld and isolated areas of Central Sandy Bushveld has been transformed by subsistence agriculture and livestock grazing and little natural vegetation remains. The vegetation of the project area and surrounds is not expected to provide noticeable screening of the proposed development.

The theoretical viewshed model was then refined to a practical viewshed model by dividing the viewshed area into areas that are likely to experience different categories of visual exposure. Visual exposure and visual impact of a development diminishes exponentially with distance (Oberholzer, 2005).

The findings of the site visit were used to determine these categories. Figure 3 illustrates that the dumps of the Anglo Platinum Mogalakwena Platinum Mine are clearly visible from a distance of approximately 4.5 km. In Figure 4 the Anglo Platinum Mogalakwena Platinum Mine is just noticeable at a distance of approximately 8.3 km from where the photograph was taken. These photographs were taken during the daytime with clear conditions.

The following categories were used for the practical viewshed model:

- 0 – 5 km: Potentially high visual exposure;
- 5 – 8 km: Potentially moderate visual exposure; and
- 8 – 10 km: Potentially low visual exposure.

Figure 3: View of the Anglo Platinum Mogalakwena Platinum Mine from 4.5 km

Figure 4: View of the Anglo Platinum Mogalakwena Platinum Mine from 8.3 km

10 Findings

10.1 Visual / Aesthetic Character and Topography

This section provides the results obtained from the analysis of the topographical, slope intensity and slope aspect models created in ArcGIS.

The project area is relatively flat with the exception of the mountainous area in the north-west corner and some isolated rocky outcrops and ridges. The most significant of these ridges is Malokong Hill situated on the eastern side of the project area. Ridges are known to create a multitude of unique habitats for both faunal and floral species increasing the expected biodiversity of the area. Ridges also have significant cultural value as historical settlements were located on ridges for safety and strategic advantage. Stone walling from these historical settlements has been identified on the ridges within the project area.

The topographical model indicates that the elevation of the project area increases from 955 metres above mean sea level (m.a.m.s.l.) in the Mogalakwena River valley running through the southern part of the project area to 1 265 m.a.m.s.l. on the Malokong Hill on the eastern boundary of the project area. Plan 4 (Appendix C) illustrates the topographical model and features of the project area.

The majority of the project area has gentle slopes of less than 3.5°. Moderate slopes of between 3.6° and 12.1° occur at the foot of the ridge areas. The steepest slopes occur on the ridges and range between 12.2° and 46.8°. Plan 5 (Appendix C) illustrates the slope model of the project area.

The slope aspect / direction of the project area is not in any specific direction. The project area slopes in various different directions as illustrated by the aspect model (Plan 6, Appendix C).

The relatively flat topography is expected to provide only minimal screening of the proposed project. The mountainous area to the north-west and the isolated rocky outcrops and ridges will provide screening of the proposed project from those areas on the opposite side of the mountains and ridges.

According to Mucina and Rutherford (2006) the dominant vegetation type of the proposed project area and surrounds is Makhado Sweet Bushveld with isolated areas of Central Sandy Bushveld. Much of the area has been transformed by subsistence agriculture and livestock grazing and little natural vegetation remains. The agricultural and natural vegetation will only provide minimal screening of the proposed development.

10.2 Viewshed Model

A viewshed is a geographical area, defined by the topography, within which a particular feature will be visible (Oberholzer, 2005). The theoretical viewshed model for the proposed Magnetite Mine Project is illustrated in Plan 7 (Appendix C). This model was refined to a practical viewshed model (Plan 8, Appendix C) with a buffer of 10 km around the proposed infrastructure and divided into areas that are likely to experience different categories of visual exposure. Due to the nature of the receiving environment it is unlikely that the proposed infrastructure will be noticeable beyond this 10 km buffer. The practical viewshed model depicts the area from which the proposed Magnetite Mine Project is likely to be visible. This practical viewshed covers an area of approximately 413.5 km². The viewshed areas for the categories are listed in Table 6 below.

Table 6: Viewshed Area per Category

Category	Impact	Viewshed Area
0 – 5 km	Potentially High Visual Exposure	161.4 km²
5 – 8 km	Potentially Moderate Visual Exposure	138.3 km²
8 – 10 km	Potentially Low Visual Exposure	113.8 km²

10.3 Sensitive Receptors

The potential visual receptors identified within the practical viewshed include residents of the surrounding farms and small holdings. These visual receptors are indicated as receptor points on Plan 8 (Appendix C).

A total of 138 potential visual receptor points were identified within the practical viewshed area. The number of potential visual receptor points within each category is shown in Table 7.

Table 7: Number of Potential Visual Receptor Points per Category

Category	Impact	Number of Receptor Points
0 – 5 km	Potentially High Visual Exposure	19
5 – 8 km	Potentially Moderate Visual Exposure	79
8 – 10 km	Potentially Low Visual Exposure	40

Residents of the villages within 10 km of the proposed infrastructure are also potential visual receptors. These potentially affected areas are indicated by the receptor polygons on Plan 8 (Appendix C). The villages in each category are listed in Table 8 below.

Table 8: Villages per Category

Category	Villages
0 – 5 km: Potentially High Visual Exposure	▪ Bakenberg Traditional Council ▪ Basogadi ▪ Ditlotswana ▪ Malokong ▪ Malokongskop ▪ Moshate ▪ Mothoathoase ▪ Pudiakagopa ▪ Rooival ▪ Sephrane
5 – 8 km: Potentially Moderate Visual Exposure	▪ Ga-Mokwena ▪ Kaditshwene ▪ Mapela Traditional Council ▪ Taolome
8 – 10 km: Potentially Low Visual Exposure	▪ Haakdoring ▪ Lyden

The practical viewshed covers an area of approximately 413.5 km². Within this area, only 30.1 km² or 7.3% is covered by villages (receptor polygons). Table 9 indicates the area and percentage of the viewshed area consisting of villages per category.

Table 9: Area and Percentage of Receptor Polygons per Category

Category	Impact	Viewshed Area	Receptor Polygon Area	Percentage
0 – 5 km	Potentially High Visual Exposure	161.4 km²	16.4 km²	10.2 %
5 – 8 km	Potentially Moderate Visual Exposure	138.3 km²	9.2 km²	6.7%
8 – 10 km	Potentially Low Visual Exposure	113.8 km²	4.5 km²	4.0%

The proposed Magnetite Mine Project will be visible from most parts of the Malokong Hill heritage site. This site falls within the category of potentially high visual exposure.

Road users on the N11 national road, D1958, D3375, D3500, D3505, D3507, D3534, D3537, D3550 and D4380 district roads within the practical viewshed area will also have views of the proposed Magnetite Mine Project. The N11 national route is used by tourists travelling through Limpopo and to Botswana and Zimbabwe.

Existing mines and associated mining infrastructure have not been considered as visual receptors.

10.4 Photomontages

This section presents the photomontages created from photographs taken during a field visit on 11 June 2015. Plan 9 (Appendix C) indicates the viewpoint (position) and view direction in which the photographs were taken.

The photomontages were created using GIMP version 2 software. The scale of the images was measured by comparing the length of an object in the photo to the length of the object in reality. This scale was then used to calculate the size of the proposed infrastructure based on the estimated heights of the proposed infrastructure (Table 4 and Table 5).

The infrastructure is then overlaid onto the original photograph in their respective locations (based on the line of sight from the point the photograph was taken) to give an approximation of what the view will look like before and during the operation of the mine. The foreground of the photograph was extracted from the original photograph and replaced on top of the infrastructure to give a realistic representation of the view from the viewpoint.

The infrastructure overlaid on the photographs is an example and does not reflect accurate depictions of the proposed infrastructure, i.e. the plant depicted on Figure 10 is not the actual proposed plant but an example of a similar plant and the proposed plant will be of equivalent height and footprint area. The photomontages provide an indication of what the landscape might potentially look like in the future.

10.4.1 Viewpoint 1

Viewpoint 1 is located on the south-eastern boundary of the project area. The photograph was taken looking in a north-westerly direction along the D4380 road towards the proposed Magnetite Mine Project. Figure 5 illustrates the current view from Viewpoint 1. Figure 6 illustrates the potential future view from Viewpoint 1. The southern topsoil stockpile is approximately 2 km and the southern low and lower grade stockpiles are approximately 3.4 km from Viewpoint 1 on the left side of the road. The TSF is approximately 1.4 km from Viewpoint 1 on the right side of the road. The proposed Magnetite Mine Project is expected to have a negative visual impact on road users of the D4380 road. The proposed project will be visible from the road as one drives towards the project area.

Figure 5: Current View from Viewpoint 1

Figure 6: Potential Future View from Viewpoint 1

10.4.2 Viewpoint 2

Viewpoint 2 is located on the D4380 road within the project area near pit 2. The photograph was taken looking in a south-westerly direction towards the proposed southern lower grade stockpile and waste rock dump. Figure 7 illustrates the current view from Viewpoint 2. Figure 8 illustrates the potential future view from Viewpoint 2. The southern lower grade stockpile is approximately 1 km and the southern waste rock dump is approximately 1.3 km from Viewpoint 2. The southern lower grade stockpile will be a significant feature in the landscape from Viewpoint 2. This is likely to alter the current sense of place and the proposed Magnetite Mine Project is expected to have a negative visual impact on road users of the D4380 road. The proposed project will be visible from the road as one drives through the project area.

Figure 7: Current View from Viewpoint 2

Figure 8: Potential Future View from Viewpoint 2

10.4.3 Viewpoint 3

Viewpoint 3 is located at the intersection of the D4380 and D3507 roads. The photograph was taken looking in a north-easterly direction towards the proposed plant and northern low grade stockpile. Figure 9 illustrates the current view from Viewpoint 3. Figure 10 illustrates the potential future view from Viewpoint 3. The plant is approximately 300 m and the northern low grade stockpile is approximately 0.9 km from Viewpoint 3. The northern low grade stockpile will dominate the landscape from Viewpoint 3. This is likely to alter the current sense of place and the proposed Magnetite Mine Project is expected to have a negative visual impact on road users of the D4380 road. The proposed project will be visible from the road as one drives through the project area.

Figure 9: Current View from Viewpoint 3

Figure 10: Potential Future View from Viewpoint 3

10.4.4 Viewpoint 4

Viewpoint 4 is located on the eastern edge of Bakenberg village. The photograph was taken looking in a south-easterly direction across the proposed Magnetite Mine Project. Figure 11 illustrates the current view from Viewpoint 4. Figure 12 illustrates the potential future view from Viewpoint 4. The northern low grade stockpile is approximately 1.7 km and the southern low grade stockpile is approximately 2.5 km from Viewpoint 4. The two low grade stockpiles will dominate the landscape from Viewpoint 4 and it is likely that Malokong Hill will no longer be visible from Bakenberg village. This is likely to alter the current sense of place and the proposed Magnetite Mine Project is expected to have a negative visual impact on the residents living on the outskirts of Bakenberg village and other nearby villages. The proposed project will be visible from the outskirts of Bakenberg village and other nearby villages.

Figure 11: Current View from Viewpoint 4

Figure 12: Potential Future View from Viewpoint 4

10.4.5 Viewpoint 5

Viewpoint 5 is located within Pudiakagopa village. The photograph was taken looking in a south-easterly direction across the proposed Magnetite Mine Project. Figure 13 illustrates the current view from Viewpoint 5. Figure 14 illustrates the potential future view from Viewpoint 5. The northern lower grade stockpile is approximately 2.8 km and the northern topsoil stockpile is approximately 3.9 km from Viewpoint 5. Currently the view from viewpoint 5 is of the agricultural fields with the hills in the background but in future the stockpiles will be the central focus from Viewpoint 5. This is likely to alter the current sense of place and the proposed Magnetite Mine Project is expected to have a negative visual impact on the residents living on the outskirts of Pudiakagopa village and other nearby villages. The proposed project will be visible from the outskirts of Pudiakagopa village and other nearby villages.

Figure 13: Current View from Viewpoint 5

Figure 14: Potential Future View from Viewpoint 5

11 Discussion

The proposed Magnetite Mine Project will have a negative impact on the receiving environment. The greatest visual impact will be from the open pits, low and lower grade stockpiles, TSF, topsoil and waste rock dumps as these cover a large area. The height of the stockpiles, TSF and dumps will also increase the visual impact. The construction of the plant and other surface infrastructure will have a lesser visual impact as it only covers a small part of the project area.

11.1 Visibility of the Project

The visibility of the project refers to the viewshed area. Oberholzer (2005) describes this as "the geographic area from which the project will be visible". The visibility of the project is also related to the number of receptors affected. The proposed Magnetite Mine Project has a **high visibility** as it is visible from a large area (practical viewshed of approximately 413.5 km^2) with numerous visual receptors.

11.2 Visual Exposure

Visual exposure is "based on the distance from the project area to selected viewpoints" and "tends to diminish exponentially with distance" (Oberholzer, 2005). The proposed Magnetite Mine Project has a **high exposure** as it will be dominant in the landscape and clearly noticeable to the viewer. This is due to the large area covered by the project and the height of the stockpiles, TSF and dumps.

11.3 Visual Sensitivity of the Area

The visual sensitivity of the area refers to “the inherent visibility of the landscape, usually determined by a combination of topography, landform, vegetation cover and settlement pattern” (Oberholzer, 2005). The receiving environment of the proposed Magnetite Mine Project has a **high visual sensitivity** as there are highly visible and potentially sensitive areas in the landscape. This is due to the largely rural sense of place of the receiving environment as well as the proximity of numerous villages and the Malokong Hill heritage site to the proposed Magnetite Mine Project.

11.4 Visual Sensitivity of the Receptors

The visual sensitivity of receptors is dependent on the nature of the receptors. Receptors in residential areas or nature reserves have a high sensitivity while receptors in industrial or mining areas have a low sensitivity. The identified receptors (residents of the villages within 10 km of the proposed infrastructure, road users) of the proposed Magnetite Mine Project have a **high sensitivity** as they consist of residential areas situated in scenic areas. The Malokong Hill heritage site is also a sensitive receptor of the proposed Magnetite Mine Project.

11.5 Visual Absorption Capacity (VAC)

The visual absorption capacity (VAC) refers to “the potential of the landscape to conceal the proposed project” (Oberholzer, 2005). The receiving environment of the proposed Magnetite Mine Project has a **low VAC** because there is little screening by the topography and vegetation.

11.6 Visual Intrusion

The visual intrusion of the project refers to “the level of compatibility or congruence of the project with the particular qualities of the area, or its sense of place”. Visual intrusion is “related to the idea of context and maintaining the integrity of the landscape or townscape” (Oberholzer, 2005). The proposed Magnetite Mine Project has a **high visual intrusion** as it results in a noticeable change and is discordant with the surroundings.

12 Impact Assessment

12.1 Assessment Methodology

The methodology utilised to assess the significance of potential social and heritage impacts is discussed in detail below. The significance rating formula is as follows:

Significance = Consequence x Probability x Nature

Where

Consequence = Intensity + Extent + Duration

And

Probability = Likelihood of an Impact Occurring

And

Nature = Positive (+1) or Negative (-1) Impact

The weight assigned to the various parameters for positive and negative social and heritage impacts is provided for in the formula and is presented in Table 10. The probability consequence matrix for social and heritage impacts is displayed in Table 11, with the impact significance rating described in Table 12.

Table 10: Impact Assessment Parameter Ratings

Rating	Intensity		Extent	Duration	Probability
	Negative Impacts (Nature = -1)	***Positive Impacts (Nature = +1)***			
7	Irreplaceable loss or damage to biological or physical resources or **highly** sensitive environments. Irreplaceable damage to **highly** sensitive cultural / social resources.	Noticeable, on-going natural and / or social benefits which have improved the overall conditions of the baseline.	International The effect will occur across international borders.	Permanent The impact is irreversible, even with management, and will remain after the life of the project.	Definite There are sound scientific reasons to expect that the impact will definitely occur. > 80% probability
6	Irreplaceable loss or damage to biological or physical resources or **moderate to highly** sensitive environments. Irreplaceable damage to **moderate to highly** sensitive cultural / social resources.	Great improvement to the overall conditions of a large percentage of the baseline.	National Will affect the entire country.	Beyond Project Life The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost Certain / Highly Probable It is most likely that the impact will occur. < 80% probability
5	Serious loss and / or damage to biological or physical resources or **highly** sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly values items.	On-going and widespread benefits to local communities and natural features of the landscape.	Province / Region Will affect the entire province or region.	Project Life (> 15 years) The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely The impact may occur. < 65% probability

Rating	Intensity		Extent	Duration	Probability
	Negative Impacts (Nature = -1)	***Positive Impacts (Nature = +1)***			
4	Serious loss and / or damage to biological or physical resources or **moderately** sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense natural and / or social benefits to some elements of the baseline.	Municipal Area Will affect the whole municipal area.	Long Term 6-15 years and the impact can be reversed with management.	Probable Has occurred here or elsewhere and could therefore occur. < 50% probability
3	Moderate loss and / or damage to biological or physical resources or **low to moderately** sensitive environments, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	Local Extending only as far as the development site area.	Medium Term 1-5 years and the impact can be reversed with minimal management.	Unlikely Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. < 25% probability

Rating	Intensity		Extent	Duration	Probability
	Negative Impacts (Nature = -1)	***Positive Impacts (Nature = +1)***			
2	**Minor loss and / or effects** to biological or physical resources or **low** sensitive environments, not affecting ecosystem functioning. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low impacts experienced by a small percentage of the baseline.	Limited Limited to the site and its immediate surroundings.	Short Term Less than 1 year and is reversible.	Rare / Improbable Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. < 10% probability
1	**Minimal to no loss** and / or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level natural and / or social benefits felt by a very small percentage of the baseline.	Very Limited / Isolated Limited to specific isolated parts of the site.	Immediate Less than 1 month and is completely reversible without management.	Highly Unlikely / None Expected never to happen. < 1% probability

Table 11: Probability / Consequence Matrix for Impacts

Probability	Significance																																					
7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Consequence	**-21**	**-20**	**-19**	**-18**	**-17**	**-16**	**-15**	**-14**	**-13**	**-12**	**-11**	**-10**	**-9**	**-8**	**-7**	**-6**	**-5**	**-4**	**-3**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**

Table 12: Significance Threshold Limits

Score	Description	Rating
109 to 147	A very beneficial impact which may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change.	**Major (positive)**
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and / or social) environment.	Moderate (positive)
36 to 72	A positive impact. The impacts will usually result in positive medium to long-term effect on the natural and / or social environment.	Minor (positive)
3 to 35	A small positive impact. The impact will result in medium to short-term effects on the natural and / or social environment.	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short-term effects on the natural and / or social environment.	Negligible (negative)

Score	Description	Rating
-36 to -72	A minor negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effects on the natural and / or social environment.	Minor (negative)
-73 to -108	A moderate negative impact which may prevent the implementation of the project. These impacts would be considered by as constituting a major and usually a long-term change to the (natural and / or social) environment and result in severe changes.	Moderate (negative)
-109 to -147	A major negative impact which may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and / or irreplaceable.	Major (negative)

12.2 Identification of Project Activities

The activities associated with the proposed Magnetite Mine Project are listed in Table 13 below. The activities highlighted in red are applicable to this VIA.

Table 13: Project Activities

Activity No.	Activity
Construction Phase	
1	Site clearance and vegetation removal
2	Change of land-use from agriculture to mining
3	Topsoil and softs removal and stockpiling
4	Development of access and haul roads
5	Surface infrastructure development such as stormwater channel, bridges, dams, offices and workshops
6	Water abstraction and use
7	Waste generation, storage and disposal (hazardous and general)
8	Use of heavy machinery (haul trucks, FEL, excavators, etc.)
9	Employment and capital expenditure

Activity No.	Activity
Operational Phase	
10	Development of two open pits by drilling and blasting, truck and shovel methods
11	Development of two waste rock dumps
12	Concentrator plant including crushing, grinding and screening
13	Conveyor belts at crushing and grinding sections and for concentrate product and tailings
14	Hauling of waste rock
15	Tailings Storage Facility (TSF)
16	Pollution control dam, water storage dam and associated pipelines
17	Stormwater diversion berms and channels
18	Storage of fuels, process concentrate, maintenance / workshop oils, and explosive storage facilities
19	Waste generation, storage and disposal (hazardous and general)
20	Product storage (magnetite concentrate)
21	Sewerage treatment plant
22	Use of heavy machinery (haul trucks, FEL, excavators, etc.)
23	Employment and operational expenditure
Decommissioning Phase	
24	Dismantling and removal of major equipment and infrastructure
25	Waste generation, storage and disposal
26	Rehabilitation of disturbed areas including stockpile dumps and pits etc.
27	Backfilling of the open pits using waste rock only
Post-Closure Phase	
28	Post-closure monitoring

12.3 Visual Impact Assessment

The project activities listed in Table 13 will be rated according to the impact they will have on the receiving environment, i.e. the environment before development. Negative visual impacts decrease the visual character of the pre-development environment. Neutral visual impacts assist to minimise the negative visual impacts of a development but don't result in a positive visual impact. A positive visual impact only occurs when an area is rehabilitated to a state that is better than the state of the pre-development environment, e.g. a mining area on

previously agricultural land is rehabilitated to an area of natural vegetation and all visible signs of agriculture and mining area removed. Positive visual impacts rarely occur.

12.3.1 Construction Phase

The construction phase is characterised by site development and infrastructure construction. This includes site clearance and vegetation removal, topsoil and softs stockpiling, development of access and haul roads, surface infrastructure development and use of heavy machinery.

The establishment of infrastructure and related construction activities will draw attention to the project area making receptors aware of the development. The construction phase will have negative visual impacts on the receiving environment. The site clearance and vegetation removal and topsoil and softs removal and stockpiling will occur over large parts of the project area and will have a moderate visual impact. The development of access and haul roads and surface infrastructure will have a moderate visual impact. The generation, storage and disposal of waste and the use of heavy machinery will have a minor visual impact.

Criteria	**Details / Discussion**				
Activity No. 1: Site clearance and vegetation removal					
Description of Impact	The removal of vegetation for site clearing will have a negative visual impact on the receiving environment. The project area will become noticeable to the nearby receptors as it will contrast the surrounding areas.				
Mitigation Required	▪ Vegetation should only be removed when and where necessary.				
Parameters	***Extent***	***Duration***	***Intensity***	***Probability***	***Significance Rating***
Pre-Mitigation	3	5	4	7	-84 (Moderate Negative)
Post-Mitigation	3	5	3	6	-66 (Minor Negative)
Activity No. 2: Change of land-use from agriculture to mining					
Description of Impact	The change of land-use from agriculture to mining will have a negative visual impact on the receiving environment. This change in land-use will change the sense of place of the project area and surrounds from a rural sense of place to an industrial sense of place. This impact will be permanent and irreversible as there will always be evidence of the mine visible in the landscape. There will be a permanent and irreversible negative impact from the open pits, waste rock dumps, tailings storage facility and the low and lower grade stockpiles. The pits will only be partially backfilled with waste rock after mining is complete and the voids will remain. Approximately 20 % of the waste rock and the entire tailings storage facility will remain on the surface. The low and lower grade stockpiles will not be processed at this stage but will remain on the surface indefinitely. This impact will become reversible if the low and lower grade stockpiles are processed in the future. The change in land-use will contribute to the cumulative impacts of mining on the				

Criteria	Details / Discussion				
	regional environment. The visibility of the existing and proposed mines in the region will alter the sense of place of the receiving environment from rural to industrial / mining and result in a loss of scenic character and increased visual disturbance.				
Mitigation Required	▪ Ensure that the sides of the pit are not sloped too steep to prevent slope failure; ▪ Ensure that as much of the waste rock as possible is backfilled into the open pits; ▪ Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; ▪ Spread topsoil over the rehabilitated area; ▪ Ensure that surface water and drainage lines are rehabilitated to create a free-draining topography; ▪ Re-vegetate the rehabilitated areas; and ▪ Ensure all mitigation measures outlined in the closure and rehabilitation reports are conducted.				
Parameters	***Extent***	***Duration***	***Intensity***	***Probability***	***Significance Rating***
Pre-Mitigation	4	7	7	7	-126 (Major Negative)
Post-Mitigation	4	7	6	7	-112 (Major Negative)
Activity No. 3: Topsoil and softs removal and stockpiling					
Description of Impact	The removal and stockpiling of topsoil and softs will have a negative visual impact on the receiving environment. Dust from the stockpiles will also have a negative visual impact. These impacts will occur for the life of the project.				
Mitigation Required	▪ Topsoil should only be removed when and where necessary (refer to the Soils, Land Capability, Land Use and Conceptual Soil Stripping Plan Report for further details); ▪ Topsoil stockpiles should be vegetated with grasses (e.g. *Eragrostis chloromelas, Cynodon dactylon, Digitaria eriantha* and *Chloris gayana*) so as to blend into the surrounding landscape; ▪ Limit footprint area of topsoil stockpiles where possible; ▪ Ensure topsoil stockpiles do not exceed the proposed height of 30 m; ▪ Apply dust suppression techniques to limit the dust dispersion from stockpiles; ▪ Plant fast-growing indigenous vegetation in areas where it can conceal the stockpiles and reduce dust generation; and ▪ Ensure vegetation screens of indigenous trees (*Acacia erubescens (d), A. gerrardii (d), A. mellifera subsp. detinens (d), A. rehmanniana (d), Boscia albitrunca (d), Combretum apiculatum (d), Acacia tortillis subsp. heteracantha, Terminalia sericea, Acacia Burkei (d), A. robusta, Sclerocarya birrea subsp. caffra. Burkea africana (d) Combretum apiculatum (d), C zeyheri, Terminalia sericea (d), Ochna pulchra, Peltophorum africanum, Searsia leptodictya*) and shrubs (*Grewia flava, Hibiscus calyphyllus, Lycium shawii, Rhigozum obovatum, Combretum hereoense, Grewia bicolor, G. Monticola, Strychnos pungen*) are built close to receptors (residential areas and roads) and maintained.				

Criteria	Details / Discussion				
Parameters	***Extent***	***Duration***	***Intensity***	***Probability***	***Significance Rating***
Pre-Mitigation	3	5	4	7	-84 (Moderate Negative)
Post-Mitigation	3	5	3	6	-66 (Minor Negative)
Activity No. 4: Development of access and haul roads					
Description of Impact	The development of access and haul roads will have a negative visual impact on the receiving environment. Vehicular activity on the access and haul roads and the resultant dust will also have a negative visual impact.				
Mitigation Required	Roads should be wetted frequently by means of a water bowser to suppress dust.				
Parameters	***Extent***	***Duration***	***Intensity***	***Probability***	***Significance Rating***
Pre-Mitigation	2	3	2	6	-42 (Minor Negative)
Post-Mitigation	2	3	2	5	-35 (Negligible Negative)
Activity No. 5: Surface infrastructure development such as stormwater channels, bridges, dams, offices and workshops					
Description of Impact	The construction of surface infrastructure such as stormwater channels, bridges, dams, offices and workshops will have a negative visual impact on the receiving environment. The surface infrastructure will change the sense of place of the project area from a rural sense of place to an industrial / mining sense of place. These visual impacts will occur until the infrastructure is removed from the site. Construction area lighting at night will have a negative visual impact on the receiving environment. The construction area lighting will be visible from afar and will draw attention to the project area. This will also have a negative impact on the sense of place. The visual impacts from the construction area lighting will occur during the construction phase.				
Mitigation Required	▪ Limit the height and footprint area of surface infrastructure where possible; ▪ Use shade cloth / netting to screen the construction site; ▪ Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape where possible; ▪ Pylons and metal structures should be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, it is recommended that a neutral matt finish be used; ▪ Construction of vegetation berms must be implemented close to surface infrastructure so that vegetation can be established; and ▪ If construction activities take place at night, down lighting must be implemented to minimise light pollution.				
Parameters	***Extent***	***Duration***	***Intensity***	***Probability***	***Significance Rating***

Criteria	Details / Discussion				
Pre-Mitigation	2	5	3	7	-70 (Minor Negative)
Post-Mitigation	2	5	3	6	-60 (Minor Negative)
Activity No. 6: Water abstraction and use					
No visual impact expected					
Activity No. 7: Waste generation, storage and disposal (hazardous and general)					
Description of Impact	Waste storage on site will have a negative visual impact on the receiving environment. This visual impact will occur until the waste is removed from the site.				
Mitigation Required	▪ Limit the footprint area of the waste storage area where possible; ▪ Use shade cloth / netting to screen the waste storage area; ▪ Ensure that all waste is stored in covered skips; and ▪ Limit the quantity and time of waste stored on site.				
Parameters	***Extent***	***Duration***	***Intensity***	***Probability***	***Significance Rating***
Pre-Mitigation	2	3	2	5	-35 (Negligible Negative)
Post-Mitigation	1	3	2	4	-24 (Negligible Negative)
Activity No. 8: Use of heavy machinery (haul trucks, FEL, excavators, etc.)					
Description of Impact	The use of heavy machinery and the resultant dust will also have a negative visual impact. These visual impacts will occur during the construction phase.				
Mitigation Required	▪ Apply dust suppression techniques to limit the dust created by the use of heavy machinery.				
Parameters	***Extent***	***Duration***	***Intensity***	***Probability***	***Significance Rating***
Pre-Mitigation	2	3	2	6	-42 (Minor Negative)
Post-Mitigation	2	3	2	5	-35 (Negligible Negative)

12.3.2 Operational Phase

The operational phase is characterised by the development of the open pits, low and lower grade stockpiles and waste rock dumps, operation of the concentrator plant to produce magnetite concentrate, storage of the magnetite concentrate, operation of the tailings dam and use of heavy machinery.

The open pits and the low and lower grade stockpiles will have a permanent and irreversible negative visual impact. The pits will only be partially backfilled with waste rock after mining is complete and the voids will remain. The low and lower grade stockpiles will not be processed at this stage but will remain on the surface indefinitely. This impact will become reversible if the low and lower grade stockpiles are processed in the future.

Operation of the tailings dam will have a moderate negative visual impact. Operation of the concentrator plant, storage of the magnetite concentrate and use of heavy machinery will have minor negative visual impacts on the receiving environment.

Criteria	**Details / Discussion**				
Activity No. 9: Employment and capital expenditure					
No visual impact expected					
Activity No. 10: Development of two open pits by drilling and blasting, truck and shovel methods and stockpiling of low and lower grade material					
Description of Impact	The development of two open pits by drilling and blasting, truck and shovel methods will have a continual negative visual impact. This visual impact will be permanent and irreversible as the pits will not be backfilled after mining is complete and the voids will remain. Stockpiling of the low grade and lower grade material will also have a negative visual impact on the receiving environment. This impact will be permanent as these stockpiles will not be processed at this stage but will remain on the surface indefinitely. This impact will become reversible if the low and lower grade stockpiles are processed in the future. Dust from the blasting and from stockpiles will also have a negative visual impact. Infrastructure and mine area lighting will be visible at night resulting in a negative visual impact on the receiving environment. These visual impacts will occur for the life of the project.				
Mitigation Required	▪ Plant fast-growing indigenous vegetation in areas where it can conceal the stockpiles and reduce dust generation; ▪ Ensure vegetation screens of indigenous trees (*Acacia erubescens (d), A. gerrardii (d), A. mellifera subsp. detinens (d), A. rehmanniana (d), Boscia albitrunca (d), Combretum apiculatum (d), Acacia tortillis subsp. heteracantha, Terminalia sericea, Acacia Burkei (d), A. robusta, Sclerocarya birrea subsp. caffra. Burkea africana (d) Combretum apiculatum (d), C zeyheri, Terminalia sericea (d), Ochna pulchra, Peltophorum africanum, Searsia leptodictya*) and shrubs (*Grewia flava, Hibiscus calyphyllus, Lycium shawii, Rhigozum obovatum, Combretum hereoense, Grewia bicolor, G. Monticola, Strychnos pungen*) are built close to receptors (residential areas and roads) and maintained; ▪ Ensure low and lower grade stockpiles do not exceed the proposed height of 70 m; ▪ Apply dust suppression techniques to limit the dust created by blasting and from the stockpiles; and ▪ Down lighting must be implemented to minimise light pollution around the mine infrastructure area at night.				
Parameters	***Extent***	***Duration***	***Intensity***	***Probability***	***Significance Rating***
Pre-Mitigation	4	7	7	7	-126 (Major Negative)
Post-Mitigation	3	7	6	7	-112 (Major Negative)
Activity No. 11: Development of two waste rock dumps					

Criteria	Details / Discussion				
Description of Impact	Development of two waste rock dumps will have a negative visual impact on the receiving environment. Dust from the dumps will also have a negative visual impact. These visual impacts will occur for the life of the project.				
Mitigation Required	▪ Overburden should only be removed when and where necessary; ▪ Ensure waste rock dumps do not exceed the proposed height of 18 m; ▪ Apply dust suppression techniques to limit the dust from dumps; ▪ Plant fast-growing indigenous vegetation in areas where it can conceal the stockpiles and reduce dust generation; and ▪ Ensure vegetation screens of indigenous trees (*Acacia erubescens (d), A. gerrardii (d), A. mellifera subsp. detinens (d), A. rehmanniana (d), Boscia albitrunca (d), Combretum apiculatum (d), Acacia tortillis subsp. heteracantha, Terminalia sericea, Acacia Burkei (d), A. robusta, Sclerocarya birrea subsp. caffra. Burkea africana (d) Combretum apiculatum (d), C zeyheri, Terminalia sericea (d), Ochna pulchra, Peltophorum africanum, Searsia leptodictya*) and shrubs (*Grewia flava, Hibiscus calyphyllus, Lycium shawii, Rhigozum obovatum, Combretum hereoense, Grewia bicolor, G. Monticola, Strychnos pungen*) are built close to receptors (residential areas and roads) and maintained.				
Parameters	***Extent***	***Duration***	***Intensity***	***Probability***	***Significance Rating***
Pre-Mitigation	3	5	4	7	-84 (Moderate Negative)
Post-Mitigation	3	5	3	6	-66 (Moderate Negative)
Activity No. 12: Concentrator plant including crushing, grinding and screening					
Description of Impact	Operation of the concentrator plant including crushing, grinding and screening will have a negative visual impact on the receiving environment. Dust from the plant will also have a negative visual impact. Infrastructure and mine area lighting will be visible at night resulting in a negative visual impact on the receiving environment. This visual impact will occur for the life of the project. These visual impacts will occur for the life of the project.				
Mitigation Required	▪ Apply dust suppression techniques to limit the dust from the plant; ▪ Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape where possible; ▪ Pylons and metal structures should be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, it is recommended that a neutral matt finish be used; and ▪ Down lighting must be implemented to minimise light pollution around the mine infrastructure area at night.				
Parameters	***Extent***	***Duration***	***Intensity***	***Probability***	***Significance Rating***
Pre-Mitigation	2	5	3	6	-60 (Minor Negative)
Post-Mitigation	2	5	2	5	-45 (Minor Negative)

Criteria	Details / Discussion				
Activity No. 13: Conveyor belts at crushing and grinding sections and for concentrate product and tailings					
No visual impact expected					
Activity No. 14: Hauling of waste rock					
Description of Impact	Vehicular activity on the haul roads will have a negative visual impact on the receiving environment. Dust from vehicular activity will also have a negative visual impact. These visual impacts will occur for the life of the project.				
Mitigation Required	▪ Roads should be wetted frequently by means of a water bowser to suppress dust.				
Parameters	***Extent***	***Duration***	***Intensity***	***Probability***	***Significance Rating***
Pre-Mitigation	2	5	2	5	-45 (Minor Negative)
Post-Mitigation	2	5	2	4	-36 (Minor Negative)
Activity No. 15: Tailings Storage Facility (TSF)					
Description of Impact	Operation of the tailings storage facility will have a negative visual impact on the receiving environment. Infrastructure and mine area lighting will be visible at night resulting in a negative visual impact on the receiving environment. This visual impact will occur for the life of the project.				
Mitigation Required	▪ Plant fast-growing indigenous vegetation in areas where it can conceal the stockpiles and reduce dust generation; ▪ Ensure tailings storage facility do not exceed the proposed height of 30 m ▪ Ensure vegetation screens of indigenous trees (*Acacia erubescens (d), A. gerrardii (d), A. mellifera subsp. detinens (d), A. rehmanniana (d), Boscia albitrunca (d), Combretum apiculatum (d), Acacia tortillis subsp. heteracantha, Terminalia sericea, Acacia Burkei (d), A. robusta, Sclerocarya birrea subsp. caffra. Burkea africana (d) Combretum apiculatum (d), C zeyheri, Terminalia sericea (d), Ochna pulchra, Peltophorum africanum, Searsia leptodictya*) and shrubs (*Grewia flava, Hibiscus calyphyllus, Lycium shawii, Rhigozum obovatum, Combretum hereoense, Grewia bicolor, G. Monticola, Strychnos pungen*) are built close to receptors (residential areas and roads) and maintained; and ▪ Down lighting must be implemented to minimise light pollution around the mine infrastructure area at night.				
Parameters	***Extent***	***Duration***	***Intensity***	***Probability***	***Significance Rating***
Pre-Mitigation	3	5	4	7	-84 (Moderate Negative)
Post-Mitigation	3	5	3	6	-66 (Moderate Negative)
Activity No. 16: Pollution control dam, water storage dam and associated pipelines					
No visual impact expected					

Criteria	Details / Discussion				
Activity No. 17: Stormwater diversion berms and channels					
No visual impact expected					
Activity No. 18: Storage of fuels, process concentrate, maintenance / workshop oils, and explosive storage facilities					
No visual impact expected					
Activity No. 19: Waste generation, storage and disposal (hazardous and general)					
Description of Impact	Waste storage on site will have a negative visual impact on the receiving environment. This visual impact will occur until the waste is removed from the site.				
Mitigation Required	▪ Limit the footprint area of the waste storage area where possible; ▪ Use shade cloth / netting to screen the waste storage area; ▪ Ensure that all waste is stored in covered skips; and ▪ Limit the quantity and time of waste stored on site.				
Parameters	***Extent***	***Duration***	***Intensity***	***Probability***	***Significance Rating***
Pre-Mitigation	2	5	2	5	-45 (Minor Negative)
Post-Mitigation	1	5	2	4	-32 (Negligible Negative)
Activity No. 20: Product storage (magnetite concentrate)					
No visual impact expected					
Activity No. 21: Sewerage treatment plant					
No visual impact expected					
Activity No. 22: Use of heavy machinery (haul trucks, FEL, excavators, etc.)					
Description of Impact	The use of heavy machinery and the resultant dust will also have a negative visual impact. These impacts will occur for the life of the project.				
Mitigation Required	▪ Apply dust suppression techniques to limit the dust created by the use of heavy machinery.				
Parameters	*Extent*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	2	5	2	5	-45 (Minor Negative)
Post-Mitigation	2	5	2	4	-36 (Minor Negative)
Activity No. 23: Employment and operational expenditure					
No visual impact expected					

12.3.3 Decommissioning Phase

The decommissioning phase is characterised by the dismantling and removal of major equipment and infrastructure and the rehabilitation of disturbed areas including waste rock dumps. The surface infrastructure is relatively small scale and its removal will have a minor

neutral impact. The spreading of topsoil, profiling and contouring and re-vegetation will have a moderate visual impact.

The open pits and the low and lower grade stockpiles will have a permanent and irreversible negative visual impact. The pits will only be partially backfilled with waste rock after mining is complete and the voids will remain. The low and lower grade stockpiles will not be processed at this stage but will remain on the surface indefinitely. This impact will become reversible if the low and lower grade stockpiles are processed in the future.

Criteria	**Details / Discussion**				
Activity No. 24: Dismantling and removal of major equipment and infrastructure					
Description of Impact	Dismantling and removal of major equipment and infrastructure will have a minor negative visual impact on the receiving environment. Once the infrastructure is removed, this activity will have an overall neutral visual impact on the receiving environment. This will help to reverse some of the changes that occurred when the infrastructure was constructed.				
Mitigation Required	▪ Apply dust suppression techniques to limit the dust from the demolition area; ▪ Use shade cloth / netting to screen the demolition area; and ▪ Limit the quantity and time of rubble stored on site.				
Parameters	***Extent***	***Duration***	***Intensity***	***Probability***	***Significance Rating***
Pre-Mitigation	2	3	2	7	-49 (Minor Negative)
Post-Mitigation	2	3	1	6	-36 (Minor Negative)
Activity No. 25: Waste generation, storage and disposal					
Description of Impact	Waste storage on site will have a negative visual impact on the receiving environment. This visual impact will occur until the waste is removed from the site.				
Mitigation Required	▪ Limit the footprint area of the waste storage area where possible; ▪ Use shade cloth / netting to screen the waste storage area; ▪ Ensure that all waste is stored in covered skips; and ▪ Limit the quantity and time of waste stored on site.				
Parameters	***Extent***	***Duration***	***Intensity***	***Probability***	***Significance Rating***
Pre-Mitigation	2	3	2	5	-35 (Negligible Negative)
Post-Mitigation	1	3	2	4	-24 (Negligible Negative)
Activity No. 26: Rehabilitation of disturbed areas including stockpile dumps and pits etc.					
Description of Impact	Rehabilitation of disturbed areas including stockpile dumps and pits will have a minor negative impact on the receiving environment. Once this activity is complete, it will have a neutral visual impact on the receiving environment and will assist to return the project area to a state similar to the pre-mining state.				

Criteria	Details / Discussion				
Mitigation Required	▪ Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography (refer to the Conceptual Rehabilitation Plan Report for further details); ▪ Spread topsoil over the rehabilitated area; ▪ Ensure that surface water and drainage lines are rehabilitated to create a free-draining topography; ▪ Re-vegetate the rehabilitated areas; and ▪ Ensure all mitigation measures outlined in the closure and rehabilitation reports are conducted.				
Parameters	***Extent***	***Duration***	***Intensity***	***Probability***	***Significance Rating***
Pre-Mitigation	3	3	5	7	-77 (Minor Negative)
Post-Mitigation	3	3	3	6	-54 (Minor Negative)
Activity No. 27: Backfilling of the open pits using waste rock only					
Description of Impact	Backfilling of the open pits will have a minor negative visual impact on the receiving environment. Vehicular activity on the haul roads will have a negative visual impact on the receiving environment. Dust from vehicular activity and the movement of waste rock will also have a negative visual impact. The open pits will only be partially backfilled with waste rock after mining is complete and the voids will remain resulting in a permanent negative visual impact.				
Mitigation Required	▪ Apply dust suppression techniques to limit the dust created by the hauling of waste rock; ▪ Ensure that the sides of the pit are not sloped too steep to prevent slope failure; ▪ Ensure that as much of the waste rock as possible is backfilled into the open pits; and ▪ Ensure all mitigation measures outlined in the closure and rehabilitation reports are conducted.				
Parameters	***Extent***	***Duration***	***Intensity***	***Probability***	***Significance Rating***
Pre-Mitigation	2	3	3	7	-56 (Minor Negative)
Post-Mitigation	2	3	2	6	-42 (Minor Negative)

12.3.4 Post-Closure Phase

The post-closure phase is characterised by continuous monitoring. This monitoring will not have an impact on the visual / aesthetic character of the receiving environment. However, there will be a permanent and irreversible negative impact from the open pits, waste rock dumps, tailings storage facility and the low and lower grade stockpiles. The pits will only be partially backfilled with waste rock after mining is complete and the voids will remain. Approximately 20 % of the waste rock and the entire tailings storage facility will remain on the surface. The low and lower grade stockpiles will not be processed at this stage but will

remain on the surface indefinitely. This impact will become reversible if the low and lower grade stockpiles are processed in the future.

Activity No. 28: Post-closure monitoring
No visual impact expected

13 Cumulative Impacts

There is an abandoned granite mine on the eastern side of the project area and two small-scale operational granite mines (African Red and Bestaf) outside the south-western boundary of the project area. The only large-scale operational mine in the area is the Anglo Platinum Mogalakwena Platinum Mine situated approximately 5 km south-east of the project area. The proposed Ivanplats Platreef Mine is approximately 21 km south-east of the project area. These existing mines have impacts on the visual aesthetics / character of the regional environment. There are also several companies holding prospecting rights in the Mokopane area. The possible development of these mines as well as the development of the proposed Magnetite Mine Project will add to these existing visual impacts. The visibility of these large developments will alter the sense of place of the receiving environment from rural to industrial / mining and result in a loss of scenic character and increased visual disturbance.

13.1 Social

The project area and surrounds are characterised by traditional authorities consisting of numerous rural settlements and the associated agricultural land used for subsistence farming. This gives the region a rural sense of place. The existing and proposed mining projects change the sense of place to an industrial / mining sense of place and result in a loss of scenic character and increased visual disturbance. The landscape will transform from one dominated by rural communities and agriculture into one dominated by mining and industry. Refer to the Social Impact Assessment Report for further details.

13.2 Heritage

The proposed Magnetite Mine Project is situated in a highly sensitive cultural landscape. The Malokong Hill is situated on the eastern boundary of the project area. The remnants of several stonewalled settlements are visible on Malokong Hill and these settlements are culturally significant as they are linked to the Makapan Valley World Heritage Site (WHS). The change of the sense of place as a result of existing and proposed mining projects will result in a negative impact on the local and regional heritage resources. Refer to the Heritage Impact Assessment Report for further details.

14 Mitigation Measures and Environmental Management Plan

The Environmental Management Plan (EMP) has been described according to the project activities to provide an understanding of what objectives and recommended management measures are required to minimise the environmental impacts arising from these activities. The management measures are described in Table 14.

Table 14: Mitigation and Management Plan

Project Activities	Receiving Environment	Objectives	Management and Mitigation Measures	Legal Requirements	Recommended Action Plans	Duration	Responsible Person	Significance Before Mitigation	Significance After Mitigation
Construction Phase									
Activity 1: Site clearance and vegetation removal	Visual	▪ To minimise the negative visual impact caused by site clearance and vegetation removal.	▪ Vegetation should only be removed when and where necessary.	N/A	Mining Plan	Construction	Mining Contractor	Moderate	Minor
Activity 2: Change of land-use from agriculture to mining	Visual	▪ To minimise the negative visual impact caused by the change of land-use from agriculture to mining.	▪ Ensure that the sides of the pit are not sloped too steep to prevent slope failure; ▪ Ensure that as much of the waste rock as possible is backfilled into the open pits; ▪ Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; ▪ Spread topsoil over the rehabilitated area; ▪ Ensure that surface water and drainage lines are rehabilitated to create a free-draining topography; ▪ Re-vegetate the rehabilitated areas; and ▪ Ensure all mitigation measures outlined in the closure and rehabilitation reports are conducted.	N/A	Rehabilitation Plan	Project Life	Environmental Officer	Major	Major
Activity 3: Topsoil and softs removal and stockpiling	Visual	▪ To minimise the negative visual impact caused by topsoil and softs removal and stockpiling.	▪ Topsoil should only be removed when and where necessary (refer to the Soils, Land Capability, Land Use and Conceptual Soil Stripping Plan Report for further details); ▪ Topsoil stockpiles should be vegetated with grasses (e.g. *Eragrostis chloromelas, Cynodon dactylon, Digitaria eriantha* and *Chloris gayana*) so as to blend into the surrounding landscape; ▪ Limit and footprint area of topsoil stockpiles where possible; ▪ Ensure topsoil stockpiles do not exceed the proposed height of 30 m; ▪ Apply dust suppression techniques to limit the dust dispersion from stockpiles; ▪ Plant fast-growing indigenous vegetation in areas where it can conceal the stockpiles and reduce dust generation; and ▪ Ensure vegetation screens of indigenous trees (*Acacia erubescens (d), A. gerrardii (d), A. mellifera subsp. detinens (d), A. rehmanniana (d), Boscia albitrunca (d), Combretum apiculatum (d), Acacia tortillis subsp. heteracantha, Terminalia sericea, Acacia*	N/A	Mining Plan Air Quality Management Plan	Construction	Mining Contractor	Moderate	Minor

Project Activities	Receiving Environment	Objectives	Management and Mitigation Measures	Legal Requirements	Recommended Action Plans	Duration	Responsible Person	Significance Before Mitigation	Significance After Mitigation
			Burkei (d), A. robusta, Sclerocarya birrea subsp. caffra. Burkea africana (d) Combretum apiculatum (d), C zeyheri, Terminalia sericea (d), Ochna pulchra, Peltophorum africanum, Searsia leptodictya) and shrubs (*Grewia flava, Hibiscus calyphyllus, Lycium shawii, Rhigozum obovatum, Combretum hereoense, Grewia bicolor, G. Monticola, Strychnos pungen*) are built close to receptors (residential areas and roads) and maintained.						
Activity 4: Development of access and haul roads	Visual	▪ To minimise the negative visual impact caused by development of access and haul roads.	▪ Roads should be wetted frequently by means of a water bowser to suppress dust.	N/A	Mining Plan Air Quality Management Plan	Construction	Mining Contractor	Minor	Negligible
Activity 5: Surface infrastructure development such as stormwater channels, bridges, dams, offices and workshops	Visual	▪ To minimise the negative visual impact caused by surface infrastructure development; and ▪ To minimise the negative visual impact caused by construction area lighting at night.	▪ Limit the height and footprint area of surface infrastructure where possible; ▪ Use shade cloth / netting to screen the construction site; ▪ Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape where possible; ▪ Pylons and metal structures should be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, it is recommended that a neutral matt finish be used; ▪ Construction of vegetation berms must be implemented close to surface infrastructure so that vegetation can be established; and ▪ If construction activities take place at night, down lighting must be implemented to minimise light pollution.	N/A	Mining Plan	Construction	Mining Contractor	Minor	Minor
Activity 6: Water abstraction and use	No visual impact expected								
Activity 7: Waste generation, storage and disposal (hazardous and general)	Visual	▪ To minimise the negative visual impact caused by waste stored on site.	▪ Limit the footprint area of the waste storage area where possible; ▪ Use shade cloth / netting to screen the waste storage area; ▪ Ensure that all waste is stored in covered skips; and ▪ Limit the quantity and time of waste stored on site.	N/A	Mining Plan	Construction	Mining Contractor	Negligible	Negligible

Project Activities	Receiving Environment	Objectives	Management and Mitigation Measures	Legal Requirements	Recommended Action Plans	Duration	Responsible Person	Significance Before Mitigation	Significance After Mitigation
Activity 8: Use of heavy machinery (haul trucks, FEL, excavators, etc.)	Visual	▪ To minimise the negative visual impact caused by the use of heavy machinery; and ▪ To minimise the negative visual impact caused by dust from the use of heavy machinery.	▪ Apply dust suppression techniques to limit the dust created by the use of heavy machinery.	N/A	Mining Plan Air Quality Management Plan	Construction	Mining Contractor	Minor	Negligible
Activity 9: Employment and capital expenditure	No visual impact expected								
Operational Phase									
Activity 10: Development of two open pits by drilling and blasting, truck and shovel methods	Visual	▪ To minimise the negative visual impact caused by development of two open pits by drilling and blasting, truck and shovel methods; ▪ To minimise the negative visual impact caused by stockpiling or low and lower grade material; ▪ To minimise the negative visual impact caused by dust from the stockpiles; and ▪ To minimise the negative visual impact caused by infrastructure and mining area lighting at night.	▪ Plant fast-growing indigenous vegetation in areas where it can conceal the stockpiles and reduce dust generation; ▪ Ensure vegetation screens of indigenous trees (*Acacia erubescens (d), A. gerrardii (d), A. mellifera subsp. detinens (d), A. rehmanniana (d), Boscia albitrunca (d), Combretum apiculatum (d), Acacia tortillis subsp. heteracantha, Terminalia sericea, Acacia Burkei (d), A. robusta, Sclerocarya birrea subsp. caffra. Burkea africana (d) Combretum apiculatum (d), C zeyheri, Terminalia sericea (d), Ochna pulchra, Peltophorum africanum, Searsia leptodictya*) and shrubs (*Grewia flava, Hibiscus calyphyllus, Lycium shawii, Rhigozum obovatum, Combretum hereoense, Grewia bicolor, G. Monticola, Strychnos pungen*) are built close to receptors (residential areas and roads) and maintained; ▪ Ensure low and lower grade stockpiles do not exceed the proposed height of 70 m; ▪ Apply dust suppression techniques to limit the dust created by blasting and from the stockpiles; and ▪ Down lighting must be implemented to minimise light pollution around the mine infrastructure area at night.	N/A	Mining Plan Air Quality Management Plan	Operational	Mining Contractor	Major	Major
Activity 11: Development of two waste rock dumps	Visual	▪ To minimise the negative visual impact caused by stockpiling of waste rock; and ▪ To minimise the negative visual impact caused by dust from the	▪ Overburden should only be removed when and where necessary; ▪ Ensure waste rock dumps do not exceed the proposed height of 18 m; ▪ Apply dust suppression techniques to limit the dust from dumps; ▪ Plant fast-growing indigenous vegetation in	N/A	Mining Plan Air Quality Management Plan	Operational	Mining Contractor	Moderate	Minor

Project Activities	Receiving Environment	Objectives	Management and Mitigation Measures	Legal Requirements	Recommended Action Plans	Duration	Responsible Person	Significance Before Mitigation	Significance After Mitigation
		stockpiles.	areas where it can conceal the stockpiles and reduce dust generation; and ▪ Ensure vegetation screens of indigenous trees (*Acacia erubescens (d), A. gerrardii (d), A. mellifera subsp. detinens (d), A. rehmanniana (d), Boscia albitrunca (d), Combretum apiculatum (d), Acacia tortillis subsp. heteracantha, Terminalia sericea, Acacia Burkei (d), A. robusta, Sclerocarya birrea subsp. caffra. Burkea africana (d) Combretum apiculatum (d), C zeyheri, Terminalia sericea (d), Ochna pulchra, Peltophorum africanum, Searsia leptodictya*) and shrubs (*Grewia flava, Hibiscus calyphyllus, Lycium shawii, Rhigozum obovatum, Combretum hereoense, Grewia bicolor, G. Monticola, Strychnos pungen*) are built close to receptors (residential areas and roads) and maintained.						
Activity 12: Concentrator plant including crushing, grinding and screening	Visual	▪ To minimise the negative visual impact caused by dust from operation of the concentrator plant including crushing, grinding and screening; and ▪ To minimise the negative visual impact caused by infrastructure and mining area lighting at night.	▪ Apply dust suppression techniques to limit the dust from the plant; ▪ Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape where possible; ▪ Pylons and metal structures should be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, it is recommended that a neutral matt finish be used; and ▪ Down lighting must be implemented to minimise light pollution around the mine infrastructure area at night.	N/A	Mining Plan Air Quality Management Plan	Operational	Mining Contractor	Minor	Minor
Activity 13: Conveyor belts at crushing and grinding sections and for concentrate product and tailings	No visual impact expected								
Activity 14: Hauling of waste rock	Visual	▪ To minimise the negative visual impact caused by vehicular activity on the haul roads; and ▪ To minimise the negative visual impact caused by dust from vehicular activity.	▪ Roads should be wetted frequently by means of a water bowser to suppress dust.	N/A	Mining Plan Air Quality Management Plan	Operational	Mining Contractor	Minor	Minor

Project Activities	Receiving Environment	Objectives	Management and Mitigation Measures	Legal Requirements	Recommended Action Plans	Duration	Responsible Person	Significance Before Mitigation	Significance After Mitigation
Activity 15: Tailings storage facility (TSF)	Visual	▪ To minimise the negative visual impact caused by the operation of the tailings storage facility; and ▪ To minimise the negative visual impact caused by infrastructure and mining area lighting at night.	▪ Plant fast-growing indigenous vegetation in areas where it can conceal the stockpiles and reduce dust generation; ▪ Ensure tailings storage facility do not exceed the proposed height of 30 m ▪ Ensure vegetation screens of indigenous trees (*Acacia erubescens (d), A. gerrardii (d), A. mellifera subsp. detinens (d), A. rehmanniana (d), Boscia albitrunca (d), Combretum apiculatum (d), Acacia tortillis subsp. heteracantha, Terminalia sericea, Acacia Burkei (d), A. robusta, Sclerocarya birrea subsp. caffra. Burkea africana (d) Combretum apiculatum (d), C zeyheri, Terminalia sericea (d), Ochna pulchra, Peltophorum africanum, Searsia leptodictya*) and shrubs (*Grewia flava, Hibiscus calyphyllus, Lycium shawii, Rhigozum obovatum, Combretum hereoense, Grewia bicolor, G. Monticola, Strychnos pungen*) are built close to receptors (residential areas and roads) and maintained; and ▪ Down lighting must be implemented to minimise light pollution around the mine infrastructure area at night.	N/A	Mining Plan	Operational	Mining Contractor	Moderate	Minor
Activity 16: Pollution control dam, water storage dam and associated pipelines	No visual impact expected								
Activity 17: Stormwater diversion berms and channels	No visual impact expected								
Activity 18: Storage of fuels, process concentrate, maintenance / workshop oils, and explosive storage facilities	No visual impact expected								

Project Activities	Receiving Environment	Objectives	Management and Mitigation Measures	Legal Requirements	Recommended Action Plans	Duration	Responsible Person	Significance Before Mitigation	Significance After Mitigation
Activity 19: Waste generation, storage and disposal (hazardous and general)	Visual	▪ To minimise the negative visual impact caused by waste stored on site.	▪ Limit the footprint area of the waste storage area where possible; ▪ Use shade cloth / netting to screen the waste storage area; ▪ Ensure that all waste is stored in covered skips; and ▪ Limit the quantity and time of waste stored on site.	N/A	Mining Plan	Operational	Mining Contractor	Minor	Negligible
Activity 20: Product storage (magnetite concentrate)	No visual impact expected								
Activity 21: Sewerage treatment plant	No visual impact expected								
Activity 22: Use of heavy machinery (haul trucks, FEL, excavators, etc.)	Visual	▪ To minimise the negative visual impact caused by the use of heavy machinery; and ▪ To minimise the negative visual impact caused by dust from the use of heavy machinery.	▪ Apply dust suppression techniques to limit the dust created by the use of heavy machinery.	N/A	Mining Plan Air Quality Plan	Operational	Mining Contractor	Minor	Minor
Activity 23: Employment and operational expenditure	No visual impact expected								
Decommissioning Phase									
Activity 24: Dismantling and removal of major equipment and infrastructure	Visual	▪ To increase the neutral visual impact caused by the removal of major equipment and infrastructure; and ▪ To minimise the negative visual impact caused by the dismantling and removal of major equipment and infrastructure.	▪ Apply dust suppression techniques to limit the dust from the demolition area; ▪ Use shade cloth / netting to screen the demolition area; and ▪ Limit the quantity and time of rubble stored on site.	N/A	Rehabilitation Plan	Decommissioning	Environmental Officer	Minor	Minor
Activity 25: Waste generation, storage and disposal	Visual	▪ To minimise the negative visual impact caused by waste stored on site.	▪ Limit the footprint area of the waste storage area where possible; ▪ Use shade cloth / netting to screen the waste storage area; ▪ Ensure that all waste is stored in covered skips; and	N/A	Rehabilitation Plan	Decommissioning	Environmental Officer	Negligible	Negligible

Project Activities	Receiving Environment	Objectives	Management and Mitigation Measures	Legal Requirements	Recommended Action Plans	Duration	Responsible Person	Significance Before Mitigation	Significance After Mitigation
			▪ Limit the quantity and time of waste stored on site.						
Activity 26: Rehabilitation of disturbed areas including stockpiles dumps and pits etc.	Visual	▪ To increase the neutral visual impact caused by profiling and contouring to create a free-draining topography; ▪ To increase the neutral visual impact caused by the spreading of topsoil; and ▪ To increase the neutral visual impact caused by re-vegetation of the rehabilitated areas.	▪ Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography (refer to the Conceptual Rehabilitation Plan Report for further details); ▪ Spread topsoil over the rehabilitated area; ▪ Ensure that surface water and drainage lines are rehabilitated to create a free-draining topography; ▪ Re-vegetate the rehabilitated areas; and ▪ Ensure all mitigation measures outlined in the closure and rehabilitation reports are conducted.	N/A	Rehabilitation Plan	Decommissioning	Environmental Officer	Minor	Minor
Activity 27: Backfilling of the open pits using waste rock only	Visual	▪ To increase the neutral visual impact caused by backfilling the pits with waste rock.	▪ Apply dust suppression techniques to limit the dust created by the hauling of waste rock; ▪ Ensure that the sides of the pit are not sloped too steep to prevent slope failure; ▪ Ensure that as much of the waste rock as possible is backfilled into the open pits; and ▪ Ensure all mitigation measures outlined in the closure and rehabilitation reports are conducted.	N/A	Rehabilitation Plan	Decommissioning	Environmental Officer	Minor	Minor
Post-Closure Phase									
Activity 28: Post-closure monitoring	No visual impact expected								

14.1 General Mitigation

According to Bush et al (1979), vegetation screening is the best mitigation measure to conceal a development. Figure 15 illustrates the screening effect of vegetation. It is recommended that any vegetation which may potentially conceal the proposed development be left undisturbed, especially on the project boundary and around infrastructure. Vegetation left undisturbed along the perimeter of the project has the ability to conceal the proposed infrastructure from nearby receptors. Figure 16 illustrates the effect of cleared vegetation allowing direct views of the proposed infrastructure.

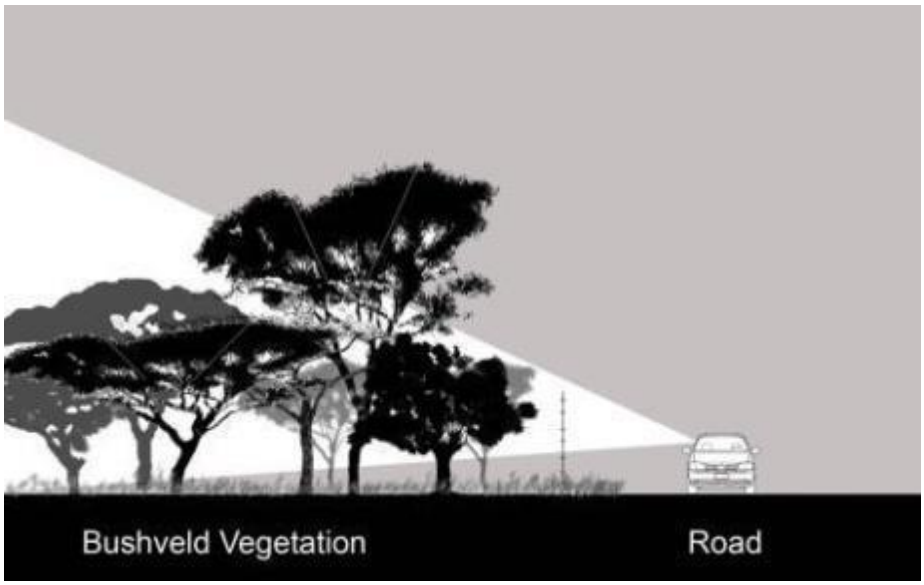

Figure 15: Screening Effect of Vegetation

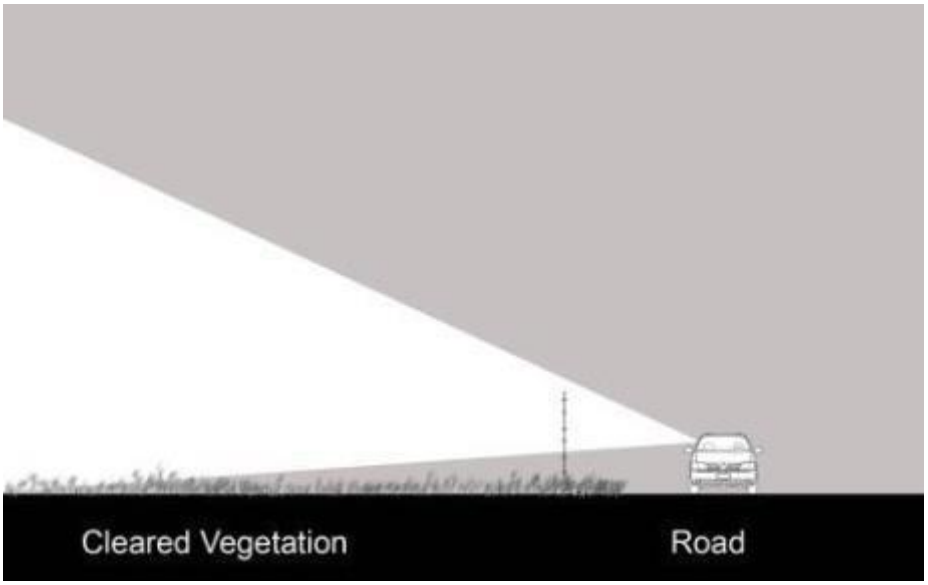

Figure 16: Effect of Cleared Vegetation

Other general mitigation measures that should be implemented where possible include:

- As much existing vegetation as possible should be retained, specifically bushes and trees if present. This will assist to conceal the development;
- Areas susceptible to dust should be frequently wetted by means of a water bowser. It is extremely important to suppress the visual aspects of dust to avoid creating the impression of a polluting industry;
- Down lighting must be implemented to minimise light pollution at night; and
- An appropriate grievance mechanism should be developed to respond to grievances from receptors that relate to visual aspects.

15 Monitoring Programme

The following monitoring activities should be undertaken on a monthly basis for the life of the project:

- Dust monitoring and management as per the Air Quality Monitoring Plan (reducing the dust on site will reduce the visual impact of dust);
- Vegetation screens need to be maintained and protected against fire and utilisation of the vegetation for fire wood, etc.; and
- Grievances from visual receptors must be monitored and addressed through a Grievance Mechanism.

16 Comments and Responses

No comments were received on the Visual Impact Assessment Report.

17 Recommendations

It is recommended that the mitigation measures detailed in Table 14 above are implemented to reduce the impact that the proposed Magnetite Mine Project will have on the visual character of the receiving environment. Vegetation and topsoil should only be removed when and where necessary to avoid exposing larger areas for longer periods of time which could result in soil erosion and increased visual disturbance.

The most important mitigation aspect is rehabilitation of the site. The success of this rehabilitation will influence the overall long term impacts of the proposed project. Where possible, it is of utmost importance that the topography of the site be re-contoured and profiled to create a free-draining topography that resembles the pre-mining topography as closely as possible. It is also essential to reconstruct all pre-development surface water and drainage lines to ensure that a free-draining surface is created and that the surface water flow returns to its original state. After re-contouring and profiling the site, it should be covered with topsoil and re-vegetated to complete the rehabilitation process.

The stockpiles will stand out in the surrounding area and will have a long term visual impact. If the stockpiles could be spread to reduce the height, the visual impact could be reduced. In addition, rehabilitation (vegetating) of these large features can significantly reduce the visual impacts.

18 Conclusion

The proposed Magnetite Mine Project will have negative visual impacts on the receiving environment. The open pits and the low and lower grade stockpiles will have a permanent and irreversible negative visual impact. The pits will only be partially backfilled with waste rock after mining is complete and the voids will remain. The low and lower grade stockpiles will not be processed at this stage but will remain on the surface indefinitely. This impact will become reversible if the low and lower grade stockpiles are processed in the future.

During the closure phase, the negative impacts can be reduced by implementing various mitigation measures; the most important of these is rehabilitation with the emphasis being on re-contouring the site and reconstructing the surface water and drainage lines. The success of this rehabilitation will influence the overall long term impact of the proposed project on the topography and visual / aesthetic character of the receiving environment.

The receiving environment of the proposed Magnetite Mine Project has a high visual sensitivity as there are highly visible and potentially sensitive areas in the landscape. This is due to the largely rural sense of place of the receiving environment as well as the proximity of numerous villages and the Malokong Hill heritage site to the proposed Magnetite Mine Project. The topography of the project area and surrounds is relatively flat and is expected to provide only minimal screening of the proposed project. The mountainous area to the north-west and the isolated rocky outcrops and ridges will provide screening of the proposed project from those areas on the opposite side of the mountains and ridges. The receiving environment is characterised by subsistence agriculture and livestock grazing with little of the natural Bushveld vegetation remaining. The agricultural and natural vegetation will only provide minimal screening of the proposed development.

The theoretical viewshed model for the proposed Magnetite Mine Project was refined to a practical viewshed model with a buffer of 10 km around the proposed infrastructure and divided into areas that are likely to experience different categories of visual exposure. Due to the nature of the receiving environment it is unlikely that the proposed infrastructure will be visible beyond this 10 km buffer. The practical viewshed model depicts the area from which the proposed Magnetite Mine Project is likely to be visible. This practical viewshed covers an area of 413.5 km².

The proposed Magnetite Mine Project has a high visibility and a high visual exposure as it will be visible from a large area and will be dominant in the landscape and clearly noticeable to the viewer. The proposed project has a high visual intrusion as it results in a noticeable change and is discordant with the surroundings.

The receiving environment and receptors of the proposed Magnetite Mine Project have a high sensitivity. The receiving environment has a low VAC because there is little screening by the topography and vegetation. According to Oberholzer (2005), the proposed Magnetite Mine Project will therefore have a very high visual impact on the receiving environment. This impact could potentially be reduced to a high visual impact if the recommended mitigation measures are implemented.

Based on the findings of this VIA only (not taking into account the findings of any other studies), from a visual perspective it is recommended that the proposed Magnetite Mine Project does not proceed. This is due to the highly sensitive receiving environment and the permanent and largely irreversible negative visual impacts expected.

19 References

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Appendix A: Declaration of Independence

Digby Wells and Associates (South Africa) (Pty) Ltd

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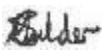
I, Stephanie Mulder as duly authorised representative of Digby Wells and Associates (South Africa) (Pty) Ltd., hereby confirm my independence (as well as that of Digby Wells and Associates (South Africa) (Pty) Ltd.) and declare that neither I nor Digby Wells and Associates (South Africa) (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of Pamish Investments No. 39 (Pty) Ltd, other than fair remuneration for work performed, specifically in connection with the proposed Magnetite Mine Project, Limpopo Province.



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Full name: Stephanie Claire Mulder

Title/ Position: Unit Manager: GIS

Qualification(s): BSc Honours in Geography

Experience (years): 8.5 years

Registration(s): GISSA

Appendix B: CV

STEPHANIE MULDER

Mrs Stephanie Mulder

Unit Manager: GIS

Digby Wells Environmental

1 EDUCATION

2006: BSc (Hons) Geography (cum laude) at University of Johannesburg

Major subjects: Philosophy and Research Methodology; Strategic Environmental Planning; Geographic Information Systems (GIS); Urban Geography; Geomorphology

2003 to 2005: BSc Geography and Informatics with Financial Orientation at University of Johannesburg

Major subjects: Geography; Informatics

Ancillary subjects: Mathematics, Analytical Techniques, Financial Management, Accounting, Business Management

2 TRAINING

2012: Diplôme D'Études en Langue Française – DELF A1 (La Commission Nationale du DELF et du DALF)

2011: ArcPad for ArcGIS (ESRI)

2011: Mining for Non-Miners (Snowden)

2009: Emerging Management Development Programme (EMDP) (University of Pretoria in association with the Public Administration Leadership and Management academy (PALAMA) and the School of Public Management and Administration)

2008: Building Geodatabases (ESRI)

2008: Geodatabase Design Concepts (ESRI)

2007: Introduction to ArcGIS I (ESRI)

3 LANGUAGE SKILLS

English (excellent)

Afrikaans (good)

French (intermediate)

4 PROFESSIONAL AFFILIATIONS

Geographic Information Society of South Africa (GISSA)

International Association of Impact Assessment South Africa (IAIASA)

5 EMPLOYMENT

September 2009 to present:	Digby Wells Environmental
January 2007 to August 2009:	Statistics South Africa

6 EXPERIENCE

I have experience in using Geographic Information Systems (GIS) as a digital cartographic and spatial analytical tool. As a GIS Specialist at Statistics South Africa I was responsible for maintaining the geodatabase and I gained experience working with vector data, aerial photography and satellite imagery. I was responsible for the data preparation and mapping for the Community Survey 2007 Digital Atlas CD. I assisted with map production for surveys and user requests for spatial data. I also worked on the Dwelling Frame Project, Placename and Enumerator Area Demarcation.

My responsibilities at Digby Wells currently include but are not limited to:

- Management of the GIS unit;
- Generation of maps for projects;
- Conducting Topography and Visual Impact Assessments (T&VIAs);
- Review of GIS maps and T&VIA Reports;
- Assisting with the maintenance of the GIS databases by storing all electronic files in a well organised structure;
- Expanding and improving the GIS databases by identifying gaps and sources of additional mapping data;
- The production of spatial information in map format;
- Application of GPS technology, aerial photo and satellite images.
- Assessing digital databases to ensure a high level of accuracy of data available at all times; and
- Spatial analyses relating to environmental projects.

7 PROJECT EXPERIENCE

My project experience at Digby Wells includes but is not limited to:

Year	Client	Project	Responsibility	Location
2015	Anker Coal	Elandsfontein and Golfview Baseline Studies	Mapping	Mpumalanga, South Africa
2015	Anker Coal	Elandsfontein and Golfview Closure Cost Assessments	3D modelling and closure calculations Mapping	Mpumalanga, South Africa
2015	Anker Coal	Elandsfontein and Golfview IWULAs	Mapping	Mpumalanga, South Africa
2015	Anker Coal	Golfview Rehabilitation Plan	3D modelling and volume calculations Mapping	Mpumalanga, South Africa
2015	BECSA (South 32)	KPSX: Weltevreden EIA	Topography and Visual Impact Assessment Supervise mapping	Mpumalanga, South Africa
2015	CDC Group	Fauna and Flora, and Social Studies	Data compilation Mapping	DRC
2015	Fountain Capital	Oakleaf Open Pit Coal Mine EIA	Assist with Topography and Visual Impact Assessment Supervise mapping	Gauteng, South Africa
2015	Gold One	Sibanye WRTRP EIA	Topography and Visual Impact Assessment Supervise mapping	Gauteng, South Africa
2015	Harmony Gold	Closure Cost Assessment 2015	3D modelling and closure calculations Supervise mapping	Free State, Gauteng and North West, South Africa
2015	Lanxess Mining	Lanxess Chrome Mine Section 102 EMP Amendment	Topography and Visual Impact Assessment Mapping	North West, South Africa
2015	Pamish Investments	Magnetite EIA	Topography and Visual Impact Assessment Mapping	Limpopo, South Africa

2015	Sasol Mining	Sigma Interactive Map and Document Management System	Project Manager	Mpumalanga, South Africa
2014	AECOM	EIA for Management of AMD from the Eastern Basin	Assist with Topography and Visual Impact Assessment Supervise mapping	Gauteng, South Africa
2014	BECSA (South 32)	KPSX: South EIA	Topography and Visual Impact Assessment Supervise mapping	Mpumalanga, South Africa
2014	Ergo	Pipeline GIS Audit	Project Manager	Gauteng, South Africa
2014	Exxaro	Tshikondeni Closure Plan	Mapping	Limpopo, South Africa
2014	Genesis Analytics	Evaluation of Environmental Governance	Interviews, Research and Report Compilation	South Africa
2014	Glencore Xstrata	Tavistock EMP	Mapping	Mpumalanga, South Africa
2014	Harmony Gold	Closure Cost Assessment 2014	3D modelling and closure calculations Supervise mapping	Free State, Gauteng and North West, South Africa
2013	Amara Sega	Cluff Sega RAP	Data compilation Mapping	Burkina Faso
2013	Anglo American Thermal Coal	Dalyshope Coal Mine EIA	Topography and Visual Impact Assessment Mapping	Limpopo, South Africa
2013	Aureus Mining Inc	New Liberty Gold Mine RAP	Questionnaire design Data compilation and analysis Mapping	Liberia
2013	Glencore Xstrata	GIS Phase 2 Project	Project Manager	Mpumalanga, South Africa
2013	Glencore Xstrata	Closure Cost Assessment 2013	3D modelling and closure calculations Supervise mapping	Mpumalanga, South Africa

2013	Harmony Gold	Closure Cost Assessment 2013	3D modelling and closure calculations Supervise mapping	Free State, Gauteng and North West, South Africa
2013	Platreef Resources	Platreef EIA	Topography and Visual Impact Assessment Mapping	Limpopo, South Africa
2013	Rhodium Reefs	Rhodium Reefs EIA	Topography and Visual Impact Assessment	Limpopo, South Africa
2013	Vedanta	Vedanta IPP EIA	Topography and Visual Scoping Study Mapping	Limpopo, South Africa
2012	Bokoni Platinum Mine	Bokoni Water Balance	Mapping	Limpopo, South Africa
2012	Platreef Resources	Platreef Agricultural Survey	Project Manager Data compilation Mapping	Limpopo, South Africa
2012	Platreef Resources	Platreef Skills and Business Survey	Project Manager Digital survey methodology Data compilation and analysis	Limpopo, South Africa
2012	Xstrata Coal	Closure Cost Assessment 2012	3D modelling and closure calculations Supervise mapping	Mpumalanga, South Africa
2012	Xstrata Coal	Consolidated EIA EMP for Tavistock	Mapping	Mpumalanga, South Africa
2011	DRD Gold	Crown Knights Reclamation of Sand Dump 4/A/6 (Lycaste)	Topography and Visual Impact Assessment Mapping	Gauteng, South Africa
2011	DRD Gold	Crown Pipeline Audit	Mapping	Gauteng South Africa
2011	DRD Gold	Crown Consolidated EMP	Mapping	Gauteng, South Africa
2011	Koidu	Koidu RAP	Questionnaire design Data compilation and analysis	Sierra Leone

2011	Rand Gold	Gounkoto RAP	Fieldwork Mapping	Mali
2011	ResGen	Boikarabelo Railway EIA	Topography and Visual Impact Assessments	Limpopo, South Africa
2011	ResGen	Boikarabelo Power Station EIA	Topography Impact Assessment Mapping	Limpopo, South Africa
2011	Temo Coal	Temo Coal Mine EIA	Topography and Visual Impact Assessments	Limpopo, South Africa
2011	Universal Coal	Brakfontein Social and Environmental Screening Study	Mapping	Mpumalanga, South Africa
2011	Universal Coal	Roodekop EIA	Mapping	Mpumalanga, South Africa
2011	Xstrata Coal	Closure Cost Assessment 2011	3D modelling and closure calculations Mapping	Mpumalanga, South Africa
2011	Xstrata Alloys	Lesedi Power Station EIA	Topography Impact Assessment Mapping	Mpumalanga, South Africa
2010	DRD Gold	Crown Pipeline EIA	Mapping	Gauteng, South Africa
2010	DRD Gold	Crown City Deep Reclamation of Slimes Dam 4/L/2	Mapping	Gauteng, South Africa
2010	DRD Gold	Crown City Deep Reclamation of Slimes Dams 3/L/40 & 3/L/42	Mapping	Gauteng, South Africa
2010	Galaxy Gold	Galaxy Gold Mine EIA	Topography and Visual Impact Assessments Mapping	Mpumalanga, South Africa
2010	HCI Coal	Nokuhle Colliery EIA	Topography Impact Assessment Mapping	Mpumalanga, South Africa
2010	HCI Coal	Palesa Extension EIA	Topography and Visual Impact Assessments	Mpumalanga, South Africa

			Mapping	
2010	Mmamabula	Mookane Domestic Power Project	Mapping	Botswana
2010	ResGen	Boikarabelo Coal Mine EIA	Mapping	Limpopo South Africa
2010	Xstrata Coal	Closure Cost Assessment 2010	3D modelling and closure calculations Mapping	Mpumalanga, South Africa
2010	Xstrata Coal	Zonnebloem Colliery EIA	Mapping	Mpumalanga, South Africa
2009	BHP Billiton	Naudesbank & Vaalbank Baseline Studies	Mapping	Mpumalanga, South Africa
2009	MSA	Nkwe Social Survey	Mapping	Limpopo, South Africa
2009	Sasol Mining	Syferfontein Colliery EIA	Mapping	Mpumalanga, South Africa
2009	Universal Coal	Kangala Coal Mine EIA	Mapping	Mpumalanga, South Africa
2009	Xstrata Coal	Community Baseline Survey	Data analysis Mapping	Mpumalanga, South Africa
2009	Xstrata Coal	Tavistock EMPR	Mapping	Mpumalanga, South Africa

Appendix C: Plans

Plan 1: Regional Setting

Plan 2: Local Setting

Plan 3: Infrastructure Layout

Plan 4: Topographical Model

Plan 5: Slope Model

Plan 6: Aspect Model

Plan 7: Theoretical Viewshed Model

Plan 8: Practical Viewshed Model

Plan 9: Viewpoints for Photomontages

Plan 1

Pamish Investments Magnetite Mine EIA

Regional Setting

Legend

- Project Area
- Secondary Town
- Other Town
- Settlement
- Main Road
- National Road
- Railway Line
- River
- Dam
- Local Municipal Boundary
- Protected Areas
- Important Bird Areas (Birdlife, 2013)

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Projection: Transverse Mercator	Ref #: scm.VMC3049.201408.102
Datum: WGS 1984	Revision Number: 2
Central Meridian: 29°E	Date: 20/08/2014

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Plan 2

Pamish Investments Magnetite Mine EIA

Local Setting

Legend

- Project Area
- Settlement
- National / Arterial Route
- Main Road
- Minor Road
- Track
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan / Stream
- Local Municipal Boundary

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Kilometres

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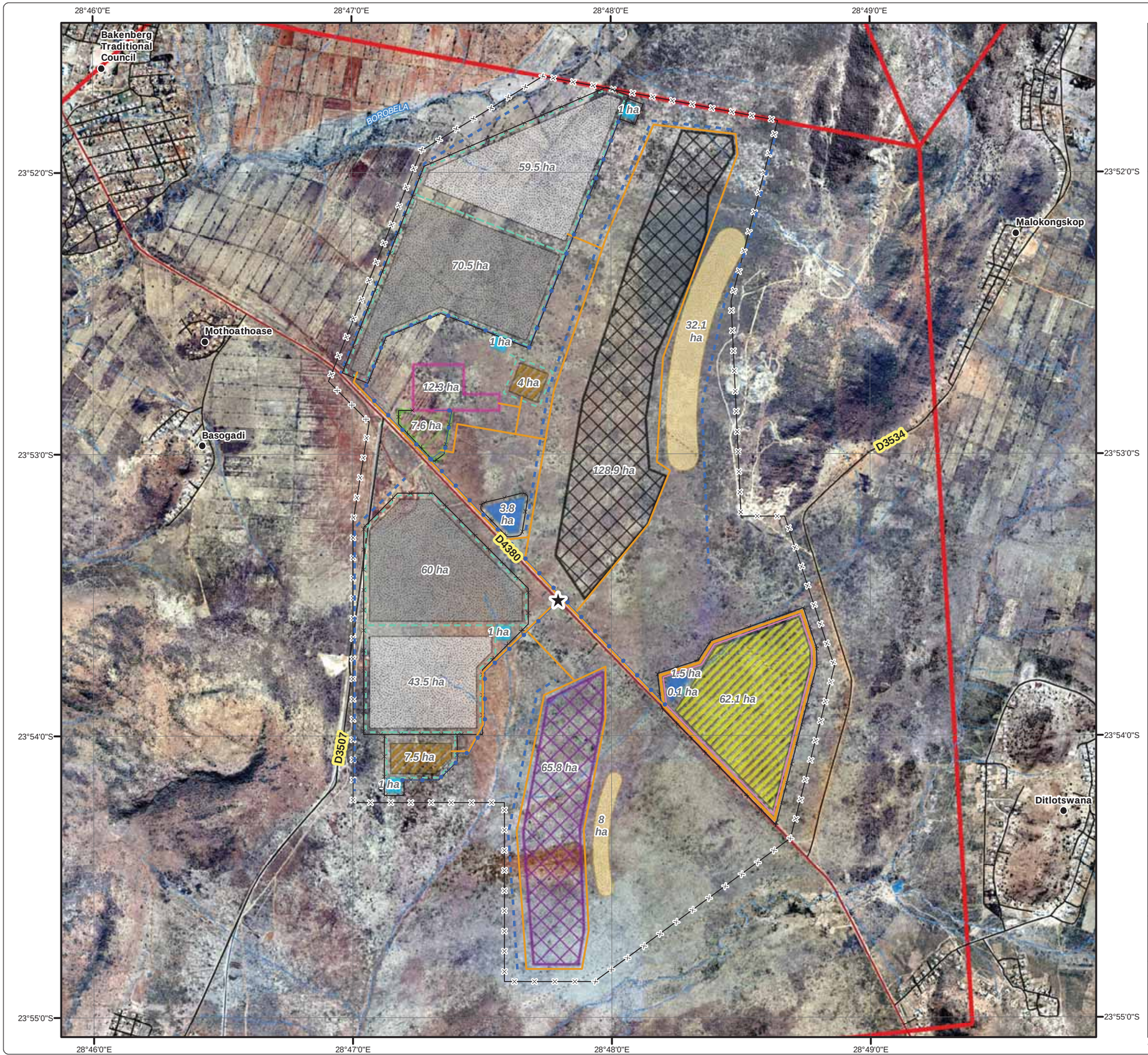
Plan 3

Pamish Investments Magnetite Mine EIA

Infrastructure Layout



Legend

- Project Area
- Settlement
- Main Road
- Minor Road
- Track
- Non-Perennial Stream
- Dam Wall
- Dam / Lake

Infrastructure

- Access Point
- Dirty Water Trench (17128 m)
- Fence (18103 m)
- Perimeter Fence (16478 m)
- Pipeline (8100 m)
- Site Road (25504 m)
- Solution Trench (3557 m)
- Storm Water Trench (12732 m)
- Contractor's Camp (7.6 ha)
- Low Grade Stockpile (130.5 ha)
- Lower Grade Stockpile (103 ha)
- PCD (4 ha)
- Pit 1 (128.9 ha)
- Pit 2 (65.8 ha)
- Plant Area (12.3 ha)
- Return Water Dam (0.1 ha)
- Stormwater Dam (5.3 ha)
- Tailings Dam (62.1 ha)
- Topsoil Stockpile (40.1 ha)
- Waste Rock Dump (11.5 ha)

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Revision Number: 6
Date: 29/06/2015

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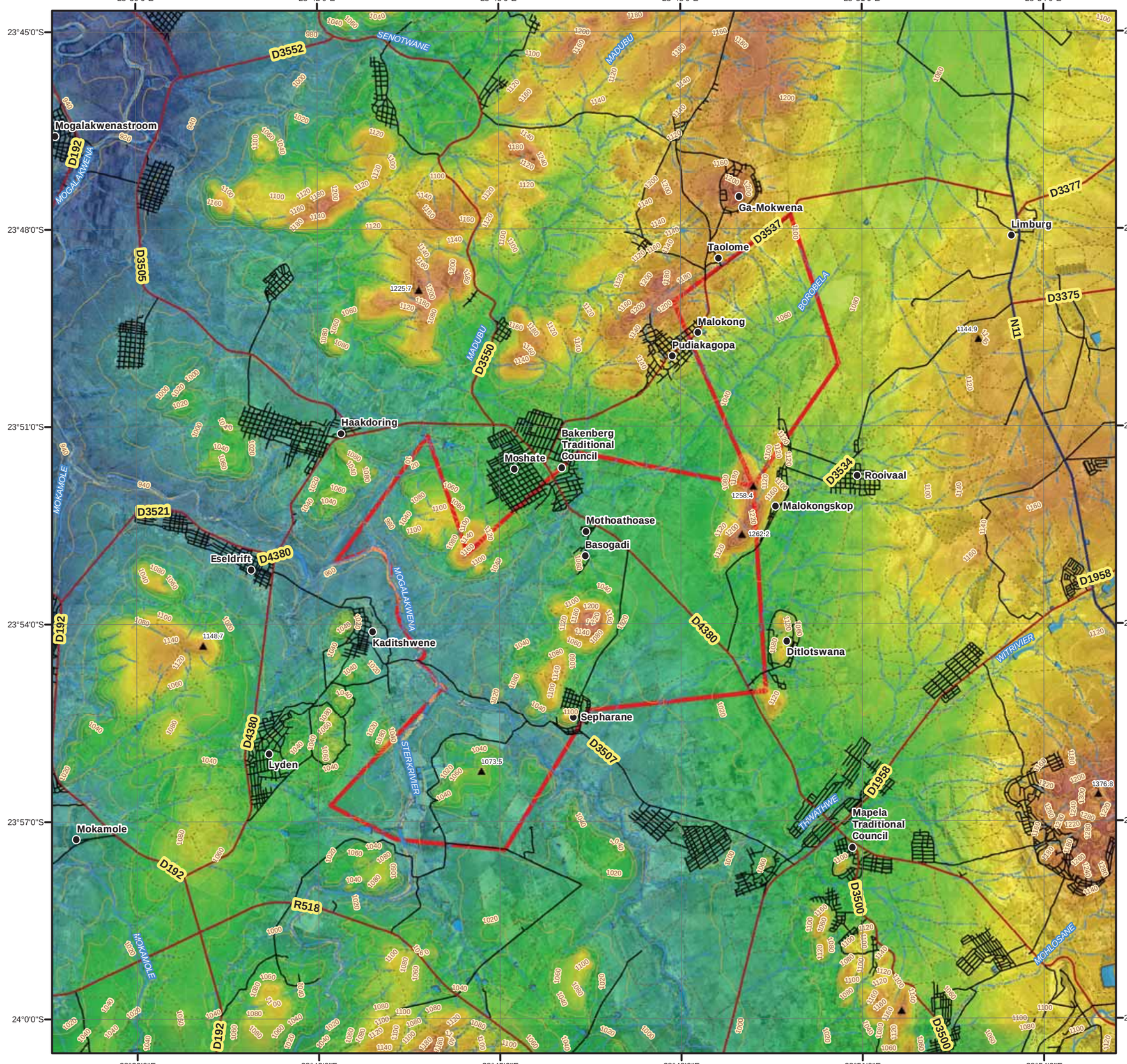
Plan 4

Pamish Investments Magnetite Mine EIA

Topographical Model



Legend

- Project Area
- Settlement
- Trig Beacon
- National / Arterial Route
- Main Road
- Minor Road
- Track
- Contour (20 m)
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan / Stream

Topographical Model Elevation (m.a.m.s.l.)

High : 1382

Low : 900

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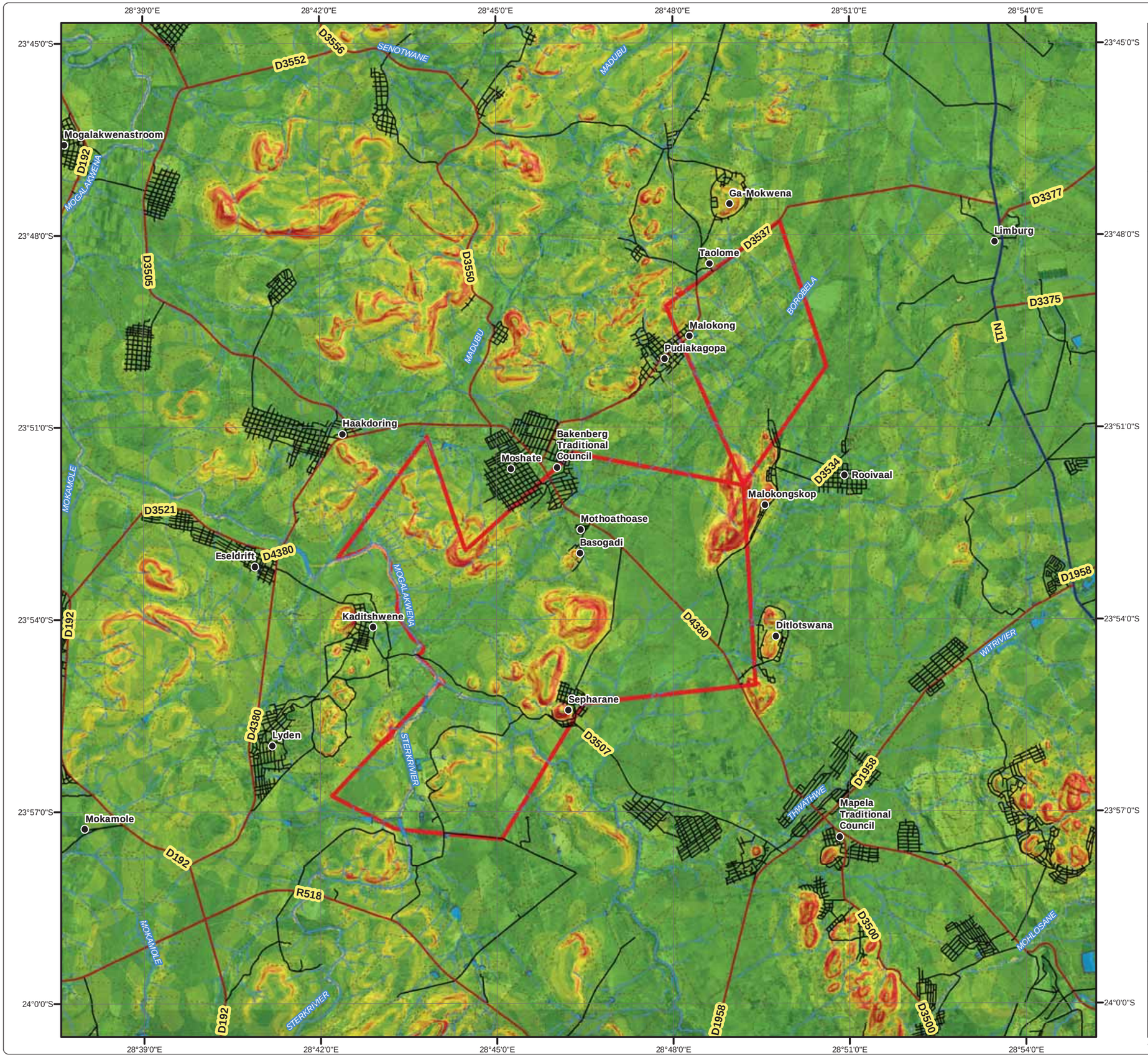
Plan 5

Pamish Investments Magnetite Mine EIA

Slope Model



Legend

- Project Area
- Settlement
- National / Arterial Route
- Main Road
- Minor Road
- Track
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan / Stream

Slope Model

Degree (°)

- 0 - 1.2
- 1.3 - 3.7
- 3.8 - 7.4
- 7.5 - 12.3
- 12.4 - 18.4
- 18.5 - 26
- 26.1 - 52.2

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Date: 06/07/2015

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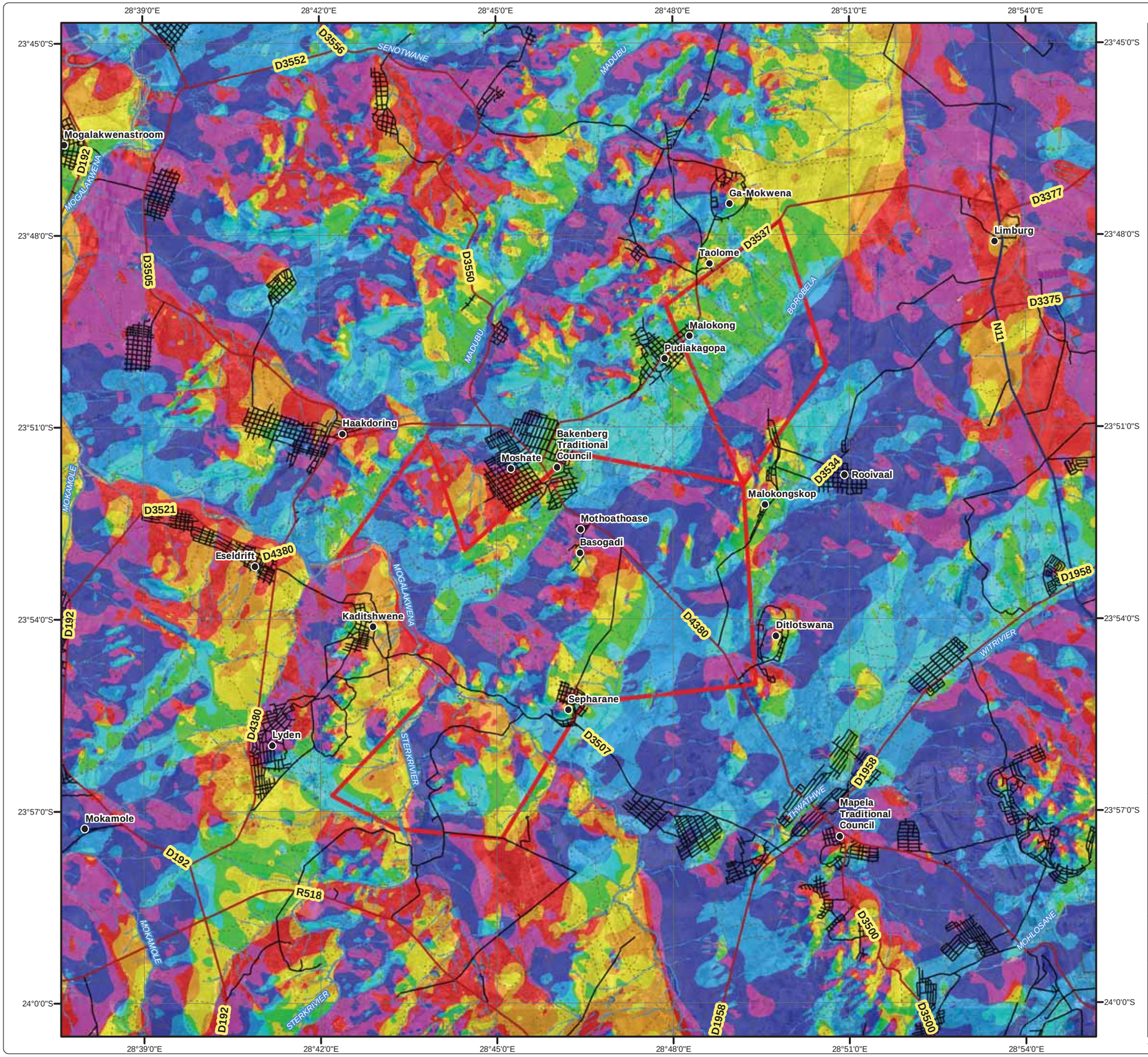
Plan 6

Pamish Investments Magnetite Mine EIA

Aspect Model



Legend

- Project Area
- Settlement
- National / Arterial Route
- Main Road
- Minor Road
- Track
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan / Stream

Aspect Model

- Flat (-1)
- North (0-22.5)
- Northeast (22.5-67.5)
- East (67.5-112.5)
- Southeast (112.5-157.5)
- South (157.5-202.5)
- Southwest (202.5-247.5)
- West (247.5-292.5)
- Northwest (292.5-337.5)
- North (337.5-360)

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Plan 7

Pamish Investments Magnetite Mine EIA

Theoretical Viewshed Model

Legend

- Project Area
- Settlement
- National / Arterial Route
- Main Road
- Minor Road
- Track
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan / Stream

Theoretical Viewshed Model

- Not Visible
- Potentially Visible

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Date: 06/07/2015

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Plan 8

Pamish Investments Magnetite Mine EIA

Practical Viewshed Model

Practical Viewshed Model

- 0 - 5 km: Potentially High Visual Exposure
- 5 - 8 km: Potentially Moderate Visual Exposure
- 8 - 10 km: Potentially Low Visual Exposure

Legend

- Project Area
- Settlement
- National / Arterial Route
- Main Road
- Minor Road
- Track
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan / Stream
- 10 km Buffer of Infrastructure

Receptor Points

- High (19)
- Moderate (79)
- Low (40)

Receptor Polygons

- High
- Moderate
- Low

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Date: 06/07/2015

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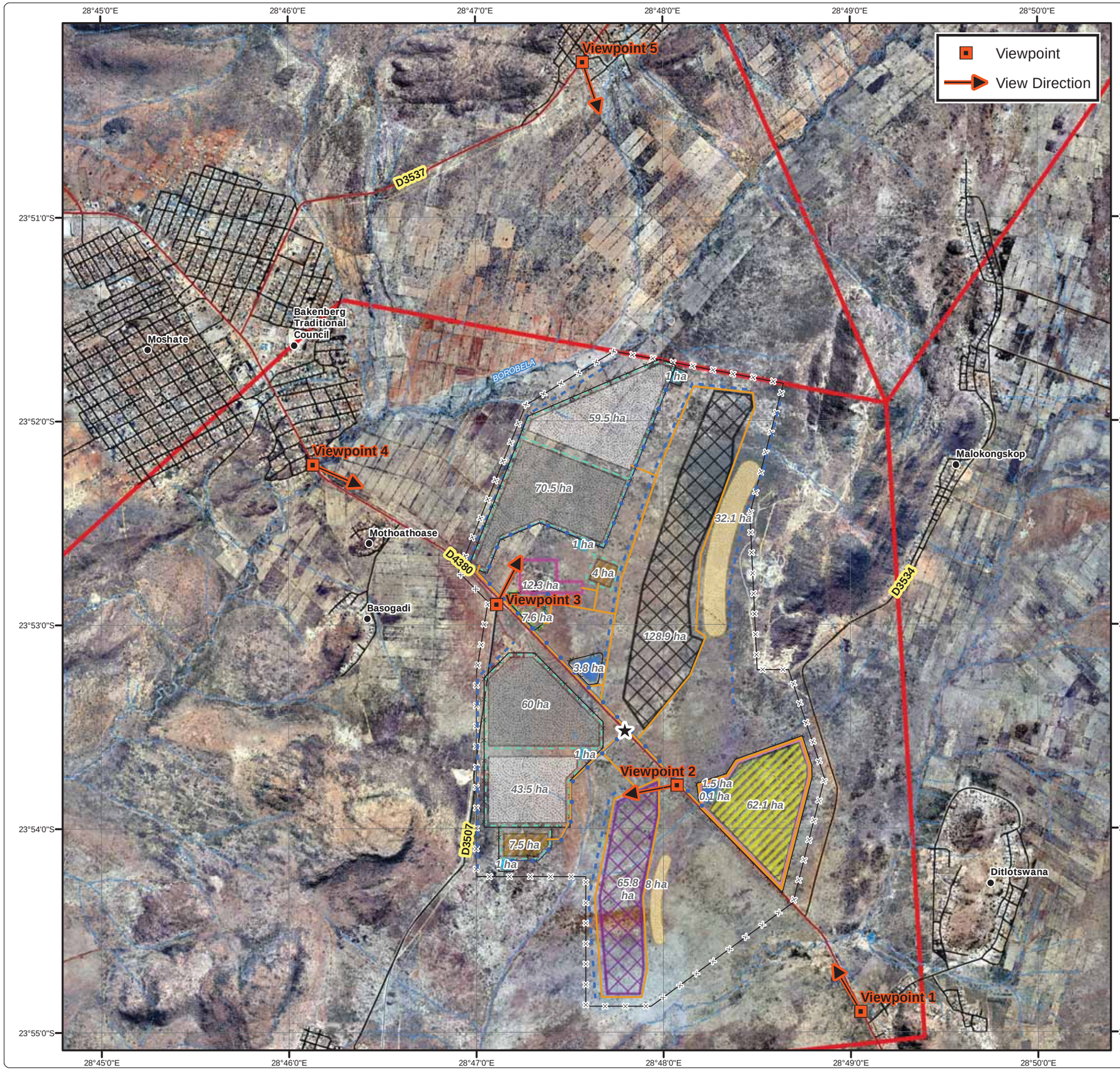
Plan 9

Pamish Investments Magnetite Mine EIA

Viewpoints for Photomontages



Legend

- Project Area
- Settlement
- Main Road
- Minor Road
- Track
- Non-Perennial Stream
- Dam Wall
- Dam / Lake

Infrastructure

- Access Point
- Dirty Water Trench (17128 m)
- Fence (18103 m)
- Perimeter Fence (16478 m)
- Pipeline (8100 m)
- Site Road (25504 m)
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- Stormwater Dam (5.3 ha)
- Tailings Dam (62.1 ha)
- Topsoil Stockpile (40.1 ha)
- Waste Rock Dump (11.5 ha)

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Revision Number: 2
Date: 06/07/2015

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