FINAL

Visual Impact Assessment

Mn48 MINE PROJECT

Worley Parsons and Royal Haskoning DHV (2019)

GYLA

Graham A Young **Landscape Architect**

Mn48 Mine PROJECT

NORTHERN CAPE PROVINCE

Submitted to:

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Report Revision No:	*DRAFT*
Date Issued:	20 August 2020
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Signed:

Reference: 054_2020: Mn48 Mine Project, Northern Cape Province

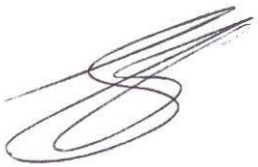
EXPERTISE OF SPECIALIST

Name:	Graham A Young
Qualification:	BL (Toronto) ML (Pretoria)
Professional Registration:	South African Council for the Landscape Architectural Profession (SACLAP) Fellow Institute of Landscape Architects of South Africa (FILASA)
Experience in Years:	40 years
Experience	Graham Young is a registered landscape architect with interest and experience in landscape architecture, urban design, and environmental planning. He holds degree in landscape architecture from the Universities of Toronto (BL) and Pretoria (ML). He has carried out visual impact assessments in Canada and throughout Africa, where he has spent most of his working life. He has served as President of the Institute of Landscape Architects of South Africa (ILASA) and as Vice President of the Board of Control for Landscape Architects. He is a Fellow of the ILASA and a professionally registered landscape architect in South Africa (SACLAP). He is Secretary General for the International Federation of Landscape Architect, Africa Region (IFLA Africa). He runs his own practice, Graham A Young Landscape Architect (GYLA). A specialty is Visual Impact Assessments for which he has been cited with an Institute of Landscape Architects of South Africa (ILASA), Merit Award (1999). Aspects of this work also include landscape characterization studies, end-use studies for quarries and computer modelling and visualization. He has completed over 300 specialist reports for projects and conducted several VIA reviews. He has served as a specialist witness in legal cases involving visual impact issues. Mr Young helped develop the *Guideline for Involving Visual and Aesthetic Specialists in EIA Processes* (Oberholzer 2005) and produced a research document for Eskom, *The Visual Impacts of Power Lines* (2009). In 2011 he produced '*Guidelines for involving visual and aesthetic specialists'* for the Aapravasi Ghat Trust Fund Technical Committee, who manage a World Heritage Site in Mauritius, along with the *Visual Impact Assessment Training Module Guideline Document* for the same client.

DECLARATION OF INDEPENDENCE

I, Graham Young, declare that –

- I am contracted as the Lehating Mine Amendment Project.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant.
- I declare that there are no circumstances that may compromise my objectivity in performing such work.
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the National Environmental Management Act (Act 107 of 1998), 2014 Environmental Impact Assessment Regulations (as amended on 7 April 2017), and any guidelines that have relevance to the proposed activity.
- I will comply with the Act, regulations and all other applicable legislation.
- I will consider, to the extent possible, the matters listed in Regulation 13.
- I have no, and will not engage in, conflicting interests in the undertaking of the activity.
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing – any decision to be taken with respect to the application by the competent authority; and – the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 16 (1)(b)(iii).



Graham A. Young FILASA PrLArch Reg. No. 87001

03 August 2020

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SPECIALIST REPORTING REQUIREMENTS

Specialist Reporting Requirements According to Appendix 6 of the National Environmental Management Act (Act 107 of 1998), Environmental Impact Assessment Regulation 2014 (as amended on 7 April 2017)	
Requirement	**Relevant section in report**
Details of the specialist who prepared the report	Page iii, Appendix E
The expertise of that person to compile a specialist report including a curriculum vitae	Page iii, Appendix E
A declaration that the person is independent in a form as may be specified by the competent authority	Page iv
An indication of the scope of, and the purpose for which, the report was prepared;	Section 1.3 – 1.4
An indication of the quality and age of base data used for the specialist report;	Section 3.2
A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 7 & 13
The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1.4
A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 3
Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure	Section 10
An identification of any areas to be avoided, including buffers	N/A
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figures 3 and 5
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.5
A description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 12
Any mitigation measures for inclusion in the EMPr;	Section 11
Any conditions for inclusion in the environmental authorisation	Section 11
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 11
A reasoned opinion whether the proposed activity, activities or	Section 14

Specialist Reporting Requirements According to Appendix 6 of the National Environmental Management Act (Act 107 of 1998), Environmental Impact Assessment Regulation 2014 (as amended on 7 April 2017)	
Requirement	**Relevant section in report**
Portions thereof should be authorised regarding the acceptability of the proposed activity or activities; and	
If the opinion is that the proposed activity, or activities or portions thereof should be authorised, and avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 11
A description of any consultation process that was undertaken during the course of carrying out the study	N/A
A summary and copies if any comments that were received during any consultation process	N/A
Any other information requested by the competent authority.	N/A

ACRONYMS, ABBREVIATIONS & GLOSSARY

Acronyms & Abbreviations	
BAR	Basic Assessment Report
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme in terms of Section 102 of the Mineral and Petroleum Resources Development Act (No. 28 of 2002).
GYLA	Graham A Young Landscape Architect
SACLAP	South African Council for the Landscape Architectural Profession
VIA	Visual Impact Assessment
TSF	Tailings Storage Facility
VAC	Visual Absorption Capacity
ZPI	Zone of Potential Influence

Glossary	
Aesthetic Value	Aesthetic value is the emotional response derived from the experience of the environment with its natural and cultural attributes. The response can be either to visual or non-visual elements and can embrace sound, smell and any other factor having a strong impact on human thoughts, feelings and attitudes (Ramsay, 1993). Thus, aesthetic value encompasses more than the seen view, visual quality or scenery, and includes atmosphere, landscape character and sense of place (Schapper, 1993).
Aesthetically significant place	A formally designated place visited by recreationists and others for the express purpose of enjoying its beauty. For example, tens of thousands of people visit Table Mountain on an annual basis. They come from around the country and even from around the world. By these measurements, one can make the case that Table Mountain (a designated National Park) is an aesthetic resource of national significance. Similarly, a resource that is visited by large numbers who come from across the region probably has regional significance. A place visited primarily by people whose place of origin is local is generally of local significance. Unvisited places either have no significance or are "no trespass" places. (after New York, Department of Environment 2000).
Aesthetic impact	Aesthetic impact occurs when there is a detrimental effect on the perceived beauty of a place or structure. Mere visibility, even startling visibility of a project proposal, should not be a threshold for decision

	making. Instead a project, by its visibility, must clearly interfere with or reduce (i.e. visual impact) the public's enjoyment and/or appreciation of the appearance of a valued resource e.g. cooling tower blocks a view from a National Park overlook (after New York, Department of Environment 2000).
Cumulative Effects	The summation of effects that result from changes caused by a development in conjunction with the other past, present or reasonably foreseeable actions.
Landscape Character	The individual elements that make up the landscape, including prominent or eye-catching features such as hills, valleys, woods, trees, water bodies, buildings, and roads. They are generally quantifiable and can be easily described.
Landscape Impact	Landscape effects derive from changes in the physical landscape, which may give rise to changes in its character and how this is experienced (Institute of Environmental Assessment & The Landscape Institute, 1996).
Study area	For the purposes of this project the Study Area refers to the proposed project footprint / project site as well as the 'zone of potential influence' (the area defined as the radius about the centre point of the project beyond which the visual impact of the most visible features will be insignificant) which is a 10,0km radius surrounding the proposed project footprint / site.
Project Footprint / Site	For the purposes of this report the Project *site* / *footprint* refers to the actual layout of the project as described.
Sense of Place (genius loci)	Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. *A genius locus* literally means 'spirit of the place' (Lynch 1992).
Sensitive Receptors	Sensitivity of visual receptors (viewers) to a proposed development.
Viewshed analysis	The two-dimensional spatial pattern created by an analysis that defines areas, which contain all possible observation sites from which an object would be visible. The basic assumption for preparing a viewshed analysis is that the observer eye height is 1,8m above ground level.
Visibility	The area from which project components would potentially be visible. Visibility depends upon general topography, aspect, tree cover or other visual obstruction, elevation, and distance.
Visual absorption capacity	Visual absorption capacity is defined as the landscape's ability to absorb physical changes without transformation in its visual character and quality. The landscape's ability to absorb change ranges from low capacity areas, in which the location of an activity is likely to cause visual change in the character of the area, to high capacity areas, in which the

	visual impact of development will be minimal (Amir & Gidalizon 1990).
Visual Exposure	Visibility and visual intrusion qualified with a distance rating to indicate the degree of intrusion and visual acuity, which is also influenced by weather and light conditions.
Visual Impact	Visual effects relate to the changes that arise in the composition of available views because of changes to the landscape, to people's responses to the changes, and to the overall effects with respect to visual amenity.
Visual Intrusion	The nature of intrusion of an object on the visual quality of the environment resulting in its compatibility (absorbed into the landscape elements) or discord (contrasts with the landscape elements) with the landscape and surrounding land uses.
Worst-case Scenario	Principle applied where the environmental effects may vary, for example, seasonally to ensure the most severe potential effect is assessed.
Zone of Potential Visual Influence	By determining the zone of potential visual influence, it is possible to identify the extent of potential visibility and views which could be affected by the proposed development. Its maximum extent is the radius around an object beyond which the visual impact of its most visible features will be insignificant primarily due to distance.

EXECUTIVE SUMMARY

Lehating Mining (Pty) Ltd (Lehating) holds a mining right and approved Environmental Management Programme report (EMPr) for the development of a new underground manganese mining operation near Black Rock in the Joe Morolong Local Municipality (Lehating Mine), located in the John Taolo Gaetsewe District Municipality, Northern Cape Province. The approved mine will be located on Portion 1 of the farm Lehating 741 (refer to Figure 1). Immediately adjacent and to the south of Lehating, Khwara Manganese (Pty) Ltd (Khwara) holds an approved EMPr for underground mining of manganese on portion 2 of the farm Wessels 227 and the remaining extent and portion 3 and 4 of the farm Dibiaghomo 226. The Khwara underground resource will be accessed via/through the Lehating mine, using Lehating's approved surface infrastructure. In this regard, no surface infrastructure will be established as part of the Khwara Mine. Neither the Lehating nor Khwara Mine have been developed.

Khwara and Lehating have entered into an agreement which combines the two adjacent, mineral resources and surface rights comprising the Khwara and Lehating Mines into a single, high-grade manganese mining company known as Mn48 (Pty) Ltd (Mn48). Mn48 is now proposing to consolidate the Lehating and Khwara mining right areas and associated EMPRs. In addition, Lehating needs to amend its approved surface infrastructure layout to cater for the above consolidation of operations (SLR 2020:2).

Graham A Young Landscape Architect (GYLA) was commissioned by SLR Consulting (South Africa) (Pty) Ltd to carry out a visual impact assessment (VIA) of the Amendment Project. The VIA contributes to the amended and consolidated EMPr and the environmental process being followed for the Mn48 project. The VIA therefore focuses on the potential impact of the amended surface infrastructure layout, when compared with the approved Lehating Mine layout.

Project Site and Study Area

The Mn48 project infrastructure is located on Portion 1 of the farm Lehating 741 approximately 20km north west of Hotazel and 9km directly north of Black Rock Mine and village (Refer to Figure 1). No infrastructure is planned on the remaining farms.

Aim of the Specialist Study

The main aim of the study is to ensure that the visual/aesthetic consequences of the proposed Mn48 Project (the Project) are understood and adequately considered in the Environmental Impact Assessment (EIA) process in terms of Appendix 6 of the EIA Regulations 2014. Mitigation measures will be proposed, where appropriate.

Assumptions, Uncertainties and Limitations

The following assumptions limitations have been made in the study:

- The extent of the study area is determined by the zone of potential influence, which in this study relates to a radius of 10,0km around the Mn48 site. At 10,0km and beyond the Mn48 project would recede into background views by virtue of: the relative position of the viewer in a landscape that comprises flat to rolling topography; and/or be screened by existing vegetation and/or; due to

distance from the viewer.

- The description of Project components is based on what has been supplied to the author prior to the date of the site visit.
- No alternatives to the Project layout and site have been proposed as these are limited "given that the ore body is fixed, and the configuration of surface infrastructure is planned accordingly." (SLR 2020:4).
- The visual sensitivity to the project is assumed to be low based on the findings of the original EIA, which states, " …it is anticipated that the public and the community receptors will not be overly sensitive to the development given the presence of the existing mine infrastructure as well as other mining operations to the south of the study area. Moreover, visual impacts have not been raised as a concern by any stakeholders to date." (SLR 2014:7-47).
- The viewshed analyses have therefore been included only as a comparative analysis between the 'approved' Lehating layout and the proposed 'amended' Mn48 layout, which is the focus of this VIA.

Terms of Reference

A specialist study is required to assess the potential visual impacts arising from the Project based on the general requirements for a comprehensive VIA and the professional opinion of the author. The following terms of reference was established:

- Conduct a field survey of the proposed project area and photograph the area from sensitive viewing points (site visit was undertaken on the 9 July 2020).
- Describe the landscape character, quality and assess the visual resource of the study area.
- Describe the visual characteristics of the components of the Mn48 project.
- Comment on the potential impact of the Project when compared with the approved Lehating EMPr layout.
- Make a reasoned opinion whether the proposed Mn48 activities or portions thereof should be authorised regarding the acceptability of the proposed activity or activities.

Alternatives

As part of its Bankable Feasibility Study, Mn48 mine has considered various technology alternatives, for example the development of a decline vs. a vertical shaft and underground vs. aboveground crushing. Site layout alternatives are limited given that the ore body is fixed, and the configuration of surface infrastructure is planned accordingly.

Findings

The existing visual condition of the landscape that may be affected by the proposed Mn48 project has been described confirming that there has been very little to no change since 2014 when the study (SLR 2014) for the approved Lehating EMPr was approved. The study area's scenic quality has been rated *low* to *moderate* within the context of the sub-region and potential viewing areas and landscape types identified and mapped indicating potential sensitivity to the proposed Mn48 development. Sensitivity to the Project is considered

low primarily due to the mining nature and character of the study area and that the public have not raised visual issues as a concern[1].

Offsets equivalent to the current heights and proposed final heights of the most prominent features of the Mn48 Project were used to generate theoretical viewsheds that illustrate potential visibility of the project during operation. The visibility of the approved Lehating Mine was also generated and compared with the amended Mn48 project model. The amended Project will cause an insignificant increase in potential visibility.

Visual impacts will be caused by activities associated with the Mn48 project. However, what is being assessed in this report, is the *difference* between the approved Lehating Mine and the proposed amended Mn48 Project. When compared, the significance of visual impact (based on the worst-case scenario – i.e. a poorly managed mine) will be *high* in both scenarios.

With mitigation the impact, again for both scenarios, is rated *moderate,* i.e. the impact will cause a partial loss of or alteration to key landscape elements and visual characteristics of the baseline. i.e. the impact will cause a moderate alteration (cumulative) to the visual quality of the study area due to the physical presence, scale, and size of the project infrastructure. Targets, limits, and thresholds of concern may occasionally be exceeded and are likely to require some intervention. Occasional complaints can be expected from the nearby homesteads. Mitigation is required to contain the negative impact of the worst-case (unmanaged) scenario.

This study shows that there is no increase in the significance of cumulative visual impact of the Mn48 Project relative to the Lehating EMPr approved Project. Management measures are possible and required to ensure, that at closure, the site has been effectively rehabilitated and can be sustained in the long term.

Cumulative effect of the Project

The impact of mining activities south of the project site along with the general deterioration of the extreme southern portion of the study area's landscape, has had a negative effect on the quality of the original natural landscape. The physical presence of the proposed Mn48 project will cause a moderate negative increase in impact in the sub-region, assuming effective mitigation and rehabilitation (i.e. a well-managed scenario), that control visual impacts associated with the worst-case scenario.

Opinion of the Author

It is the opinion of the author that all aspects of the Mn48 project, from a potential visual impact perspective, should be approved provided that the mitigation/management measures are effectively implemented, managed, and monitored in the long term.

*** GYLA ***

[1] This is an assumption at this point as the public participation process has not yet been completed. It is based on the fact that the Project site is located within and area already developed for mining and that there are few highly sensitive exposed viewing areas within the study area and the results of the SLR 2014 EIA which confirmed this.

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1. INTRODUCTION

1.1 Project Overview and Background

Lehating holds a mining right and approved Environmental Management Programme report (EMPr) for the development of a new underground manganese mining operation near Black Rock in the Joe Morolong Local Municipality (Lehating Mine), located in the John Taolo Gaetsewe District Municipality, Northern Cape Province. The approved mine will be located on Portion 1 of the farm Lehating 741 (refer to Figure 1). Immediately adjacent and to the south of Lehating, Khwara Manganese (Pty) Ltd (Khwara) holds an approved EMPr for underground mining of manganese on portion 2 of the farm Wessels 227 and the remaining extent and portion 3 and 4 of the farm Dibiaghomo 226. The Khwara underground resource will be accessed via/through the Lehating mine, using Lehating's approved surface infrastructure. In this regard, no surface infrastructure will be established as part of the Khwara Mine. Neither the Lehating nor Khwara Mine have been developed.

Khwara and Lehating have entered into an agreement which combines the two adjacent, mineral resources and surface rights comprising the Khwara and Lehating Mines into a single, high-grade manganese mining company known as Mn48 (Pty) Ltd (Mn48). Mn48 is now proposing to consolidate the Lehating and Khwara mining right areas and associated EMPRs. In addition, Lehating needs to amend its approved surface infrastructure layout to cater for the above consolidation of operations (SLR 2020:2).

Graham A Young Landscape Architect (GYLA) was commissioned by SLR Consulting (South Africa) (Pty) Ltd to carry out a visual impact assessment (VIA) of the Amendment Project. The VIA contributes to the amended and consolidated EMPr and the environmental process being followed for the project. The VIA therefore focuses on the potential impact of the amended surface infrastructure layout, when compared with the approved Lehating Mine layout.

1.2 Project site and Proposed Study area

The project infrastructure is located on Portion 1 of the farm Lehating 741 approximately 20km north west of Hotazel and 9km directly north of Black Rock Mine and village (Refer to Figure 1). No infrastructure is planned on the remaining farms.

1.3 Objective of the Specialist Study

The main aim of the study is to ensure that the visual/aesthetic consequences of the proposed Amendment Project (the Project) are understood and adequately considered in the Environmental Impact Assessment (EIA) process in terms of Appendix 6 of the EIA Regulations 2014. Mitigation measures will be proposed, where appropriate.

1.4 Terms and Reference

A specialist study is required to assess the potential visual impacts arising from the Project based on the general requirements for a comprehensive VIA and the professional opinion of the author. The following terms of reference was established:

- Conduct a field survey of the proposed project area and photograph the area from sensitive viewing points (site visit was undertaken on the 9 July 2020).
- Describe the landscape character, quality and assess the visual resource of the study area.

- Describe the visual characteristics of the components of the Project.
- Comment on the potential impact of the Project when compared with the approved EMPr layout.
- Make a reasoned opinion whether the proposed amendment activities or portions thereof should be authorised regarding the acceptability of the proposed activity or activities.

1.5 Assumption, Uncertainties and Limitations

The following assumptions limitations have been made in the study:

- The extent of the study area is determined by the zone of potential influence, which in this study relates to a radius of 10,0km around the Project site. At 10,0km and beyond the Project would recede into background views by virtue of: the relative position of the viewer in a landscape that comprises flat to rolling topography; and/or be screened by existing vegetation and/or; due to distance from the viewer. Refer to Views 2 and 4 in Figure 4-1 and 4-2 respectively, which illustrate the effect of mining infrastructure on the horizon line at 10,9km (View 2) and 7,6km (View 4). At these distances the effect is minimal within the context of the landscape.
- The description of project components is based on what has been supplied to the author prior to the date of the site visit.
- No alternatives to the Project layout and site have been proposed as these are limited “given that the ore body is fixed, and the configuration of surface infrastructure is planned accordingly.” (SLR 2020:4).
- The visual sensitivity to the project is assumed to be low based on the findings of the original EIA, which states, “ …it is anticipated that the public and the community receptors will not be overly sensitive to the development given the presence of the existing mine infrastructure as well as other mining operations to the south of the study area. Moreover, visual impacts have not been raised as a concern by any stakeholders to date.” (SLR 2014:7-47).
- The accuracy of the viewshed analysis depends on the quality of the input digital surface model (DSM). Readily available digital contours for the area are limited to 20m contours. We have interpolated these down to 1m intervals to get better accuracy. However, these types of viewshed investigations (using readily available GIS software and terrain contours only) are limited in their accuracy due to their inability to incorporate vegetation information. To be more accurate at predicting visibility, the analysis requires “a 3D model of a tree/plant and a layer indicating the spatial distribution and density of vegetation on the landscape. The possibility of indicating both, the spatial and density distribution of tree/plants, and the three dimensional model representing vegetation is currently not available to the author”. (Llobera 2007:799). On-site observations indicated that most views from within the study area would actually be blocked to the mine. And that no unobstructed views would be available, even within the middle to foreground of views. The viewshed analyses have therefore been included only as a comparative analysis between the ‘approved’ layout and the proposed ‘amended’ layout, which is the focus of this VIA.

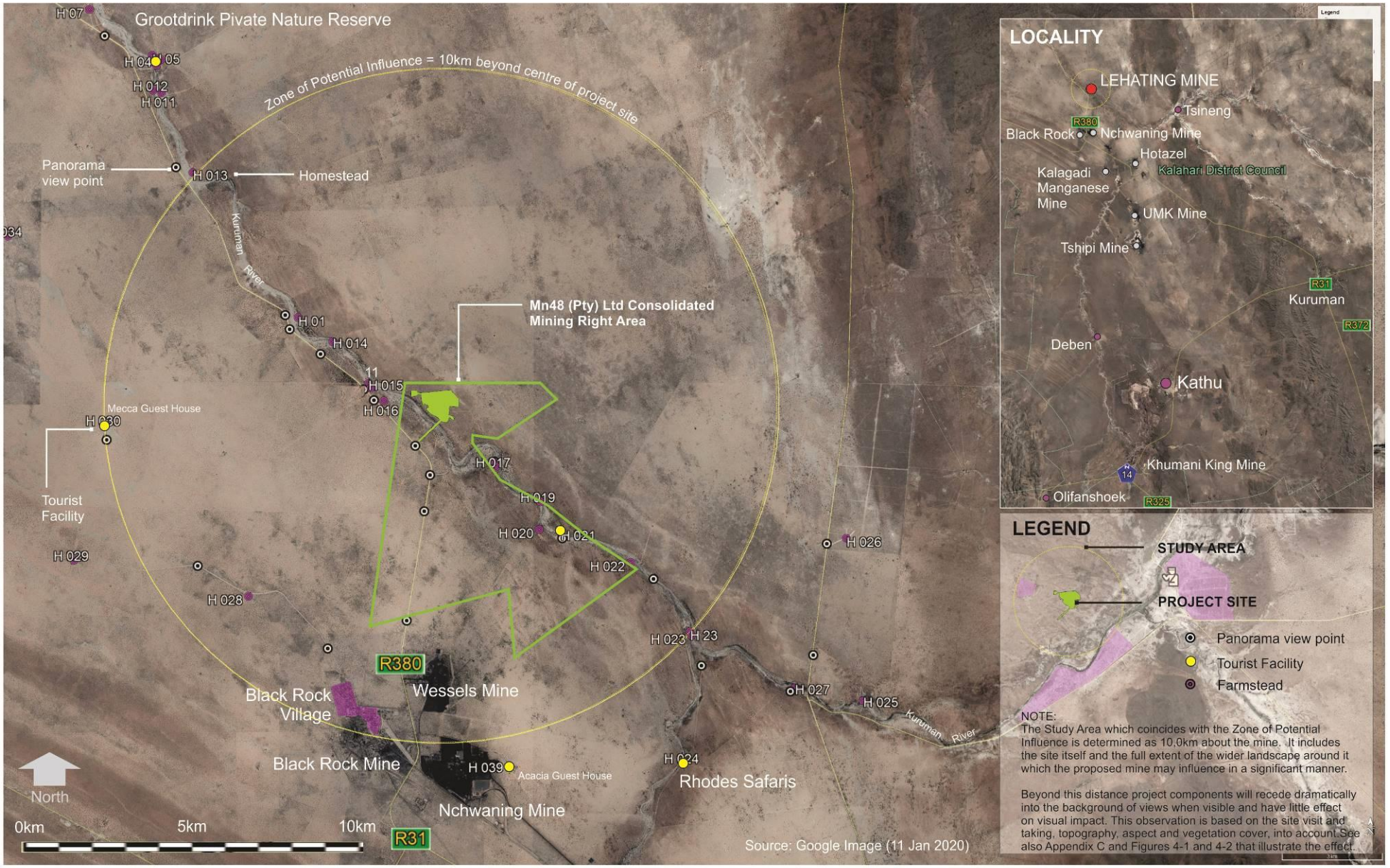

Figure 01: LOCALITY AND STUDY AREA

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082 462 1491

2. LEGAL REQUIREMENTS AND GUIDELINES

This report adheres to the following legal requirements and guideline documents.

2.1 National Legislation and Guidelines

National Environmental Management Act (Act 107 of 1998), EIA Regulations

The specialist report is in accordance with the specification on conducting specialist studies as per Government Gazette (GN) R 982 of the National Environmental Management Act (NEMA) Act 107 of 1998, as amended. The mitigation measures as stipulated in the specialist report can be used as part of the Environmental Management Programme (EMPr) and will be in support of the Environmental Impact Assessment (EIA) and Appendix 6 of the EIA Regulations 2014, as amended on 7 April 2017.

Western Cape Department of Environmental Affairs & Development Planning: Guideline for Involving Visual and Aesthetic Specialists in EIA Processes Edition 1 (CSIR, 2005)

Although the guidelines were specifically compiled for the Province of the Western Cape[2] they provide guidance that is appropriate for any EIA process. The Guideline document also seeks to clarify instances when a visual specialist should get involved in the EIA process.

[2] The Western Cape Guidelines are the only official guidelines for visual impact assessment reports in South Africa and are regarded as best practice throughout the country.

3. APPROACH AND METHODOLOGY

3.1 Approach

The assessment of likely effects on a landscape resource and on visual amenity is complex since it is determined through a combination of quantitative and qualitative evaluations. When assessing visual impact, the worst-case scenario is considered. Landscape and visual assessments are separate, although linked, procedures.

The landscape, its analysis, and the assessment of impacts on the landscape all contribute to the baseline for visual impact assessment studies. The assessment of the potential impact on the landscape is carried out as an impact on an environmental resource, i.e. the physical landscape. Visual impacts, on the other hand, are assessed as one of the interrelated effects on people (i.e. the viewers and the impact of an introduced object into a view or scene).

3.1.1 The Visual Resource

Landscape character, landscape quality (Warnock & Brown 1998) and “sense of place” (Lynch 1992) are used to evaluate the visual resource i.e. the receiving environment. A qualitative evaluation of the landscape is essentially a subjective matter. In this study the aesthetic evaluation of the study area is determined by the professional opinion of the author based on site observations and the results of contemporary research in perceptual psychology.

Aesthetic value is the emotional response derived from the experience of the environment with its natural and cultural attributes. The response is usually to both visual and non-visual elements and can embrace sound, smell and any other factor having a strong impact on human thoughts, feelings, and attitudes (Ramsay 1993). Thus, aesthetic value is more than the combined factors of the seen view, visual quality, or scenery. It includes atmosphere, landscape character and sense of place (Schapper 1993). Refer also to Appendix B for further elaboration.

Studies for perceptual psychology have shown human preference for landscapes with higher visual complexity, for instance scenes with water or topographic interest. Based on contemporary research, landscape quality increases where:

- Topographic ruggedness and relative relief increase.
- Water forms are present.
- Diverse patterns of grassland and trees occur.
- Natural landscape increases and man-made landscape decreases.
- Where land use compatibility increases – there is not discord (Crawford 1994).

Aesthetic appeal (value) is therefore considered high when the following are present (Ramsay 1993):

- Abstract qualities: such as the presence of vivid, distinguished, uncommon or rare features or abstract attributes.
- Evocative responses: the ability of the landscape to evoke particularly strong responses in community members or visitors.
- Meanings: the existence of a long-standing special meaning to a group of people or the ability of the landscape to convey special meanings to viewers in general.
- Landmark quality: a feature that stands out and is recognized by the broader community.

And conversely, it would be low where:

- Limited patterns of grasslands and trees occur.
- Natural landscape decreases and man-made landscape increases.
- And where land use compatibility decreases – there is discord (Crawford 1994).

In determining the quality of the visual resource for the study area, both the objective and the subjective or aesthetic factors associated with the landscape are considered. Many landscapes can be said to have a keen sense of place, regardless of whether they are scenically beautiful. However, where landscape quality, aesthetic value and a powerful sense of place coincide, the visual resource or perceived value of the landscape is very high. The criteria given in Appendix B are used to assess landscape quality, sense of place and ultimately to determine the aesthetic value of the study area.

3.1.2 Sensitivity of Visual Resource

The sensitivity of a landscape or visual resource is the degree to which a landscape type or area can accommodate change arising from a development, without detrimental effects on its character i.e. a high visual absorption capacity. “This means the ability of the landscape receptor (whether is be the overall character or quality/condition of a particular landscape type or area, or an individual element and/or feature, or a particular aesthetic and perceptual aspect) to accommodate the proposed development without undue consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies.” (LiIEMA 2013:89).

3.1.3 Sense of Place

Central to the concept of sense of place is that the landscape requires uniqueness and distinctiveness. The primary informant of these qualities is the spatial form and character of the natural landscape taken together with the cultural transformations and traditions associated with the historic use and habitation of the area. According to Lynch (1992), sense of place is the extent to which a person can recognize or recall a place as being distinct from other places – as having a vivid, unique, or at least particular, character of its own. Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. In some cases, the values allocated to the place are similar for a wide spectrum of users or viewers, giving the place a universally recognized and therefore, strong sense of place.

The study area’s sense of place is derived from the emotional, aesthetic, and visual response to the environment, and therefore it cannot be experienced in isolation. The landscape context must be considered. The combination of the natural landscape (highveld) together with the manmade structures (residential

areas, roads, and utilities) contribute to the sense of place for the study area. It is this combination that define the study area, and which establish its visual and aesthetic identity.

3.1.4 Sensitive Viewer Locations

The sensitivity of visual receptors and views are dependent on the location and context of the viewpoint, the expectations and occupation or activity of the receptor or the importance of the view, which may be determined with respect to its popularity or numbers of people affected, its appearance in guidebooks, on tourist maps, and in the facilities provided for its enjoyment and references to it in literature or art.

Typically, sensitive receptors may include:

- Users of all outdoor recreational facilities including public rights of way, whose intention or interest may be focused on the landscape.
- Communities where development results in negative changes in the landscape setting or valued views enjoyed by the community.
- Occupiers of residential properties with views negatively affected by the development.

Views from residences and tourist facilities/routes are typically the most sensitive since they are frequent and of long duration.

Other, less sensitive, receptors include:

- People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value);
- People traveling through or past the affected landscape in cars or other transport modes.
- People at their place of work.

For a detailed description of the methodology to determine the value of a visual resource, refer to Appendix A. Image 1 below, graphically illustrates the visual impact process used to determine the significance of visual impact of the Project.

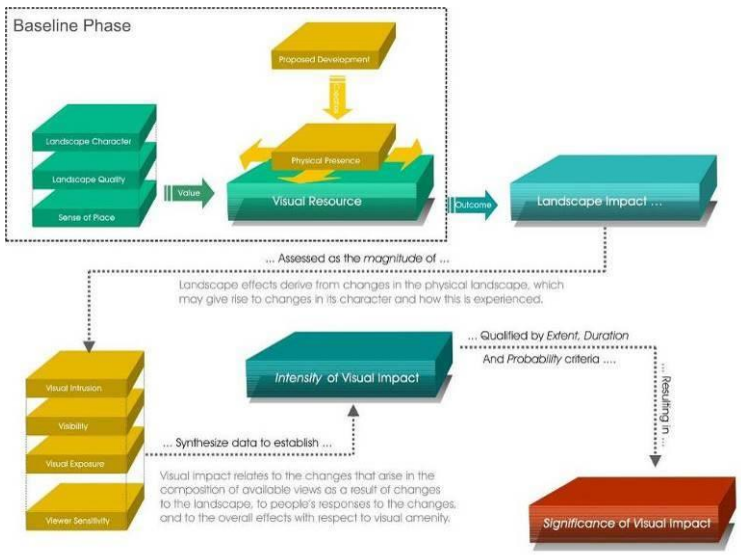

Image 1: Visual Impact Process

3.1.5 Landscape Effects

The landscape impact of a proposed development is measured as the change to the fabric, character, and quality of the landscape as a resource, caused by the physical presence of the proposed development (LiIEMA 2013:35). Identifying and describing the nature of change in the landscape brought about by the proposed new development is based on the professional opinion of the author supported by photographic simulations. It is imperative to depict the change to the landscape in as realistic a manner as possible (Van Dortmont in Lange, 1994) and to identify and describe and illustrate likely visual effects. In order to do this, photographic panoramas were taken from key viewpoints and altered using computer simulation techniques to illustrate the physical nature of the proposed project in its final form within the context of the landscape setting. The resultant change to the landscape is then potentially observable and an assessment of the anticipated visual intrusion can be made.

3.1.6 Visual Effects

Visual impacts are a subset of landscape impacts and are the effects on views and visual amenity (LiIEMA 2013:35). Visual impacts relate to the changes that arise in the composition of available views because of changes to the landscape, to people's responses to the changes, and to the overall effect with respect to visual amenity. Visual impact is therefore measured as the change to the existing visual environment (i.e. views) caused by the intervention and the extent to which that change compromises (negative impact) or enhances (positive impact) or maintains the visual quality of the scene as perceived by people visiting, working or living in the area. This approach reflects the layman's concerns, which normally are:

- Will I be able to see the new development?
- What will it look like?
- Will the development affect views in the area and if so how?

Landscape and visual impacts do not necessarily coincide. Landscape impacts can occur with the absence of visual impacts, for instance where a development is wholly screened from available public views, but nonetheless results in a loss of landscape elements and landscape character contained within a localized area (the site and its immediate surrounds).

3.1.7 *Intensity* of Visual Impact

The severity of visual impact is determined using visual intrusion, visibility, and visual exposure criteria (Hull, R.B. and Bishop, I.E., 1988), qualified by the sensitivity of viewers (visual receptors) towards the proposed development. The severity of visual impact is therefore concerned with:

- The overall impact on the visual amenity, which can range from degradation through to enhancement.
- The direct impacts of the development upon views of the landscape through intrusion or obstruction.
- The reactions of viewers who may be affected.

3.1.8 Significance of Visual Impact

A combined quantitative and qualitative methodology, as supplied by the Environmental Practitioner, was

used to describe the significance of impacts. Significance of impact is rated as *consequence* of impact X the *probability* of the impact occurring. Consequence is determined using intensity, spatial scale, and duration criteria. A summary of each of the qualitative descriptions along with the equivalent quantitative rating scale is given in Annexure D.

3.2 Methodology

The following method was used for the Project:

- Site visit: A field survey was undertaken, and the study area scrutinized to the extent that the receiving environment could be documented and adequately described. The site visit took place on the 9 July 2020.
- Project components: The physical characteristics of the project components were described and illustrated.
- General landscape characterization: The visual resource (i.e. receiving environment) was mapped using the field survey and Google Earth baseline information. The description of the landscape focused on the nature of the land rather than the response of a viewer (refer to Appendix A).
- The character of the landscape was described and rated in terms of its aesthetic appeal using recognized contemporary research in perceptual psychology as the basis, and its sensitivity as a landscape receptor.
- The sense of place of the study area was described as to its uniqueness and distinctiveness. The primary informant of these qualities was the spatial form and character of the natural landscape together with the cultural transformations associated with the historic / current use of the land.
- Illustrations, in very basic simulations, of the proposed project were overlaid onto panoramas of the landscape, as seen from nearby sensitive viewing points to give the reviewer an idea of the scale and location of the proposed project within their landscape context;
- Visual intrusion (contrast) of the proposed project was determined by simulating its physical appearance from these sensitive viewing areas.
- The visibility of the proposed project was determined using computer generated viewshed analyses.
- The impact on the visual environment and sense of place of the proposed project was rated based on a professional opinion and the method described above; and
- Measures that could mitigate the negative impacts of the proposed project were recommended.

4. DESCRIPTION OF THE PROJECT

Figure 2 illustrates the approved surface infrastructure layout (with the heights of the tallest structures) compared with the proposed amended layout. Figure 2-1 illustrates the detailed infrastructure amendments along with the heights of the tallest project components. Figure 2-2 illustrates computer generated aerial perspectives of the amended surface infrastructure layout from various angles.

The surface infrastructure amendments include (SLR 2020:3):

- The relocation of the primary crushing facilities from underground to surface;
- The extension of the footprint and capacity of the approved Waste Rock Dump (WRD);
- The addition of a second Pollution Control Dam (PCD), and relocation of the footprint of the already approved PCD (note that the previously proposed emergency control dam will no longer be required);
- General re-configuration of approved surface infrastructure on the farm Lehating 741;
- The revision of the site Stormwater Management Plan (SWMP) due to the changes of the surface infrastructure layout; and
- The establishment of proposed new support infrastructure such as a helicopter pad and weighbridge..

In addition to the above, the approved EMPr for the farm Lehating, specifies the need for a Tailings Storage Facility (TSF). A TSF will no longer be required in the amended plan. The project has made a fundamental change to the mineral processing methodology whereby a dry screening process will be used, instead of a wet screening process which would produce tailings.

It is anticipated that the Mn48 mine development will commence in 2022. The underground Khwara resource will be mined from the north (i.e. from the Lehating side) and the planned Life of Mine (LOM) with both the Khwara and Lehating resources combined will be 28 years (SLR 2020:3).

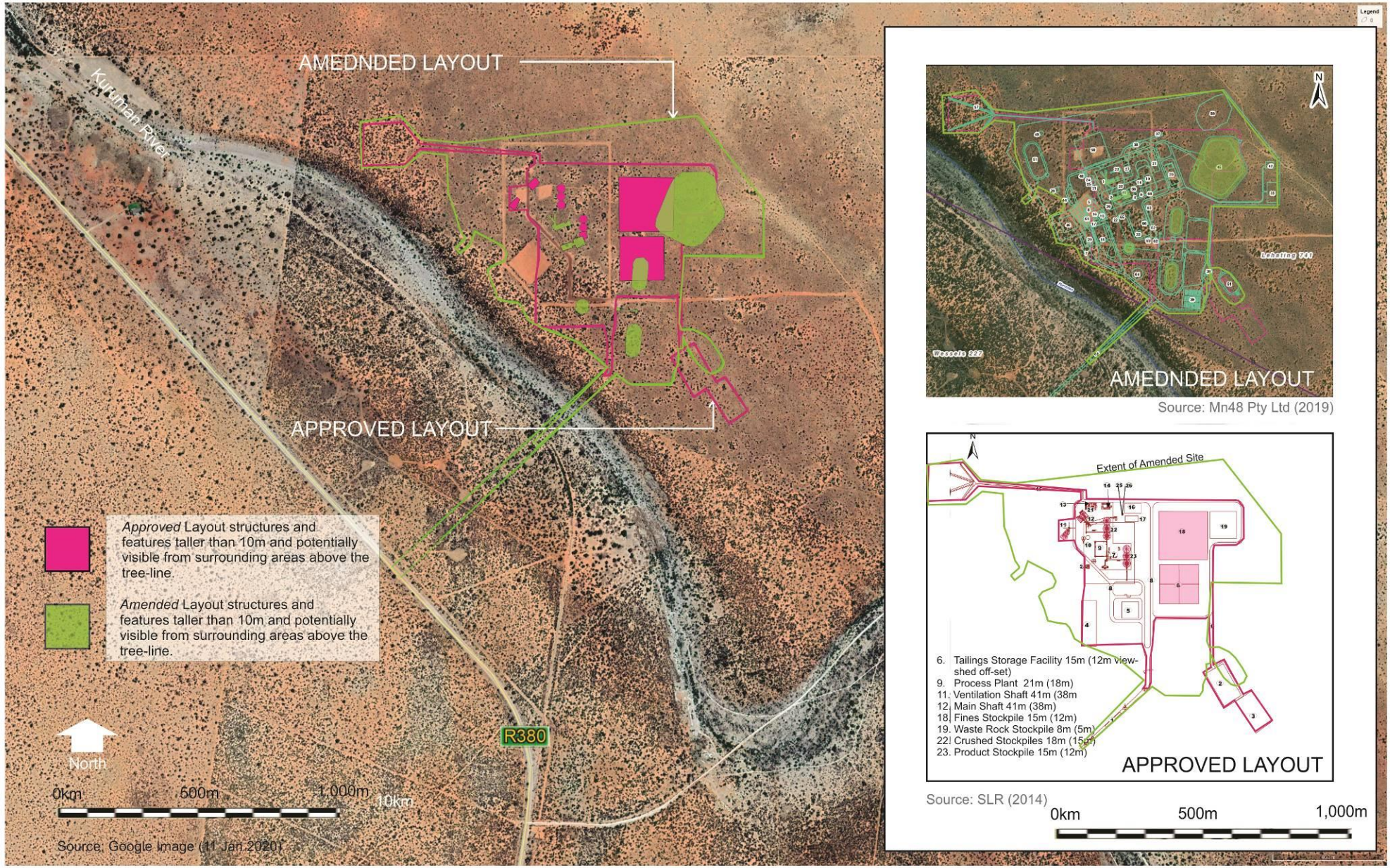

Figure 02: LAYOUT - APPROVED vs AMENDED (Mn48 MINE) INFRASTRUCTURE

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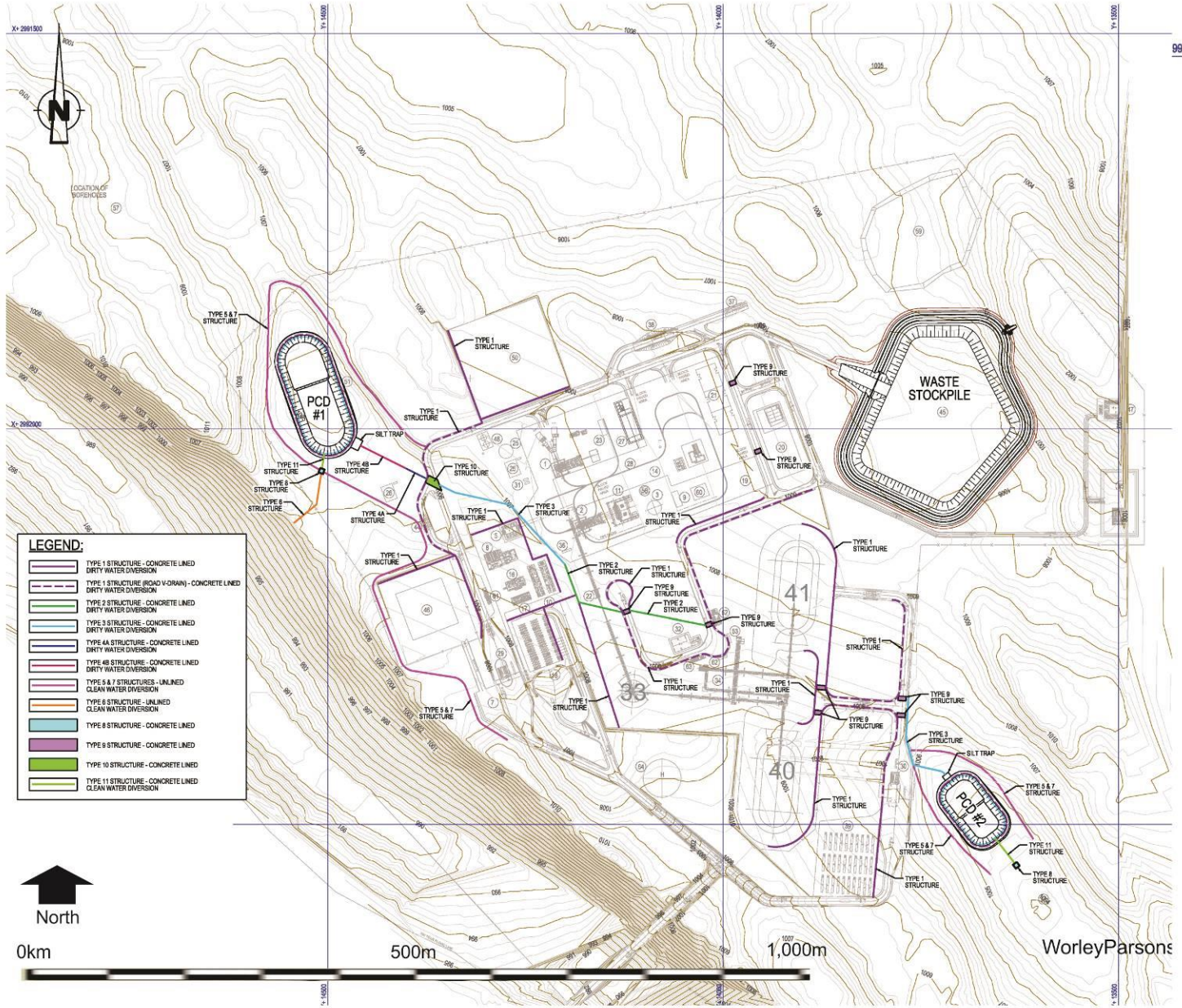

	LEGEND	HEIGHT (m)
No	DESCRIPTION	
1	VENT SHAFT	41 (38 viewshed off-set)
2	MAIN SHAFT & HEADGEAR	41 (38)
3	1-1200 KL TANK	
5	LAMP & CRUSH ROOM	
7	DELIVERY TRUCK PARKING	
8	CHANGE HOUSE/LAUNDRY	
9	COMPRESSORS	
10	OFFICES	
11	PERMANENT WINDER HOUSE	20 (17)
14	EMULSION STORAGE	
16	TRAINING CENTRE	
17	MEDICAL STATION	
18	PARKING & BUS TERMINAL	
19	BULK FUEL STORAGE	
20	SALVAGE YARD	
21	OPEN STORAGE	
22	PRIMARY CRUSHER	
23	CONVEYANCE STORAGE	20 (17)
24	RAW WATER TANK	
25	WATER TREATMENT	
26	SEWAGE TREATMENT	
27	STORE BUILDING	
28	CASSETTE LOADING	
29	MAIN ACCESS SECURITY	
30	TRUCKING ACCESS SECURITY	
31	CORE SHED AREA	
32	SURFACE WORKSHOPS & GARAGE	
33	CRUSHED ORE STOCKPILE	18 (15)
34	CRUSHING & SCREENING PLANT	21 (18)
35	EXPLOSIVES MAGAZINE	
36	PROTO	
37	EMERGENCY SAND STOP	
38	BRAKE TEST RAMP	
39	PRODUCT TRUCK PARKING	
40	30 000m³ FINES STOCKPILE	15 (12)
41	30 000m³ LUMPY STOCKPILE	15 (12)
44	WEIGH BRIDGE	
45	WASTE STOCKPILE	8 (5 m)
46	ESKOM SUB-STATION	
47	EXPLOSIVE DESTRUCTION BUNKER	
48	FIRE WATER PUMP STATION	
49	DECLINE PORTAL	
50	CONTRACTORS LAY DOWN AREA	
51	POLLUTION CONTROL DAM & SILT TRAP	
52	PLANT OFFICES	
53	LABORATORY	
56	ROPE STORAGE	
57	WELL FIELDS	
59	TOP SOIL STOCKPILE	
60	CABLE STORE	
61	CLIENT MAIN SUB STATION	
62	PLANT CONTROL ROOM	
63	PLANT SUB STATION	
64	HELICOPTER LANDING PAD	

Figure 02-1: LAYOUT - Mn48 MINE INFRASTRUCTURE

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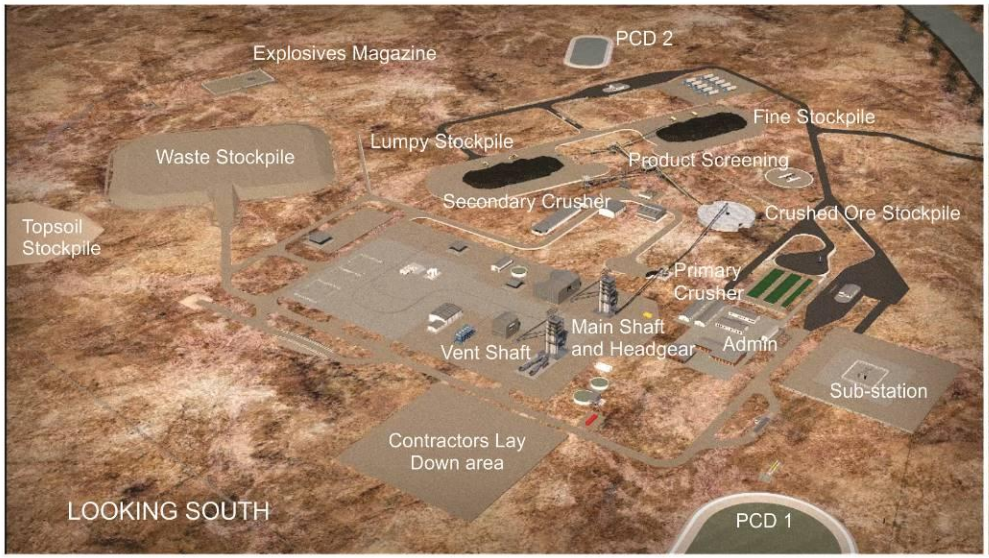

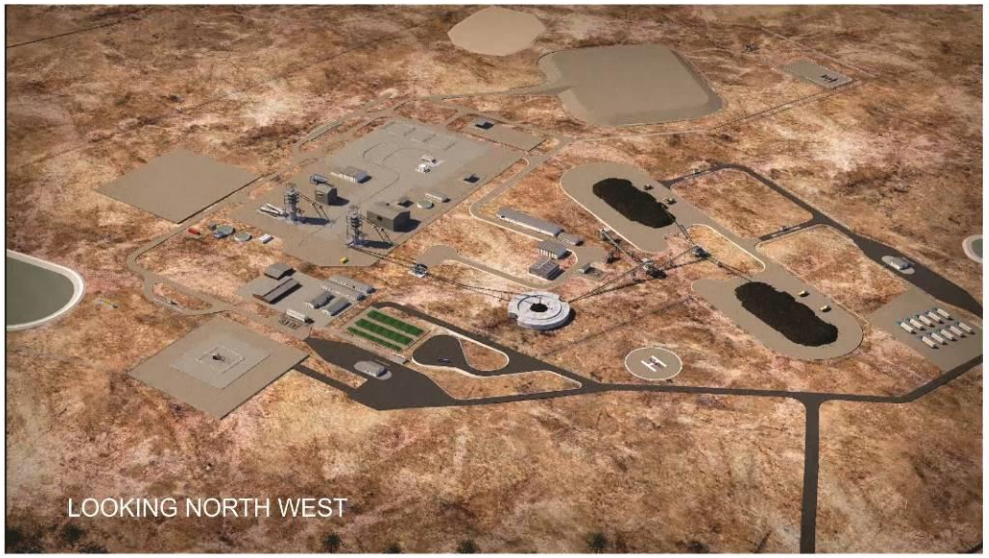

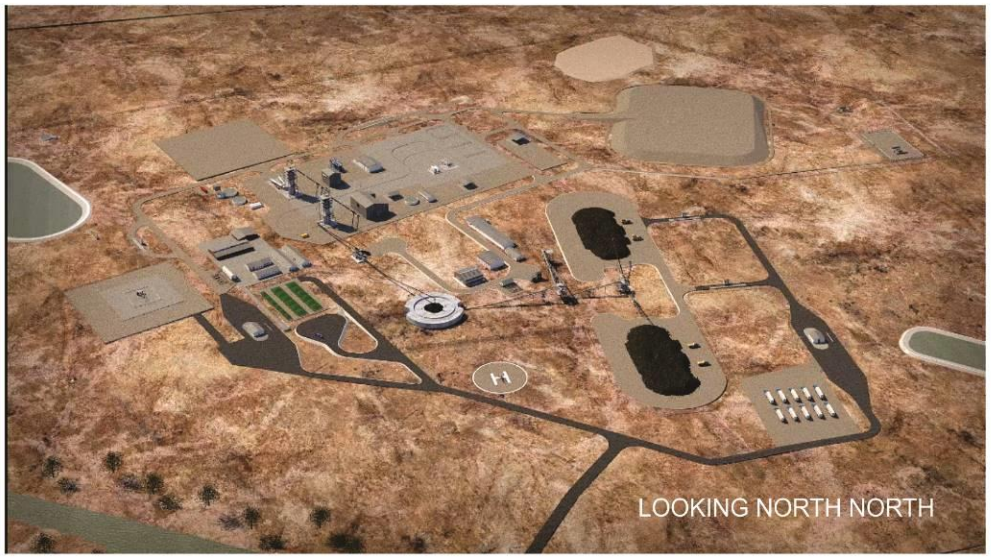

Source: WorleyParsons and Royal Haskoning DHV

Figure 02-2: LAYOUT - Mn48 MINE: AERIAL PERSPECTIVES

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5. PROJECT ALTERNATIVES

As part of its Bankable Feasibility Study, Mn48 has considered various technology alternatives, for example the development of a decline vs. a vertical shaft and underground vs. aboveground crushing. Site layout alternatives are limited (as illustrated in Figure 2-1) given that the ore body is fixed, and the configuration of surface infrastructure is planned accordingly.

6. VISUAL ISSUES

Visual issues typical associated with mining projects and which may be caused by activities and infrastructure in all mine phases are:

- Who will be able to see the development?
- What will it look like and will it contrast with the receiving environment?
- Will the development affect sensitive receptors in the area and if so how?
- What will be the impact of the development during the day and at night?
- Can potential impact be effectively mitigated?
- What will the cumulative impact be?

The more significant visual impacts relate to the larger infrastructure components such as the mineralized waste facilities, shaft infrastructure and the highest structures. These potential impacts, are compared with the layout as indicated in the approved EMPr for the project, will be considered and rated in later sections of the report.

Project phase and link to activities/infrastructure (SLR 2014: 7-46) for both the approved and amended projects.

Table 1: Visual issues per project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works General site management Other support services and amenities	Earthworks Civil works Main and Ventilation Shafts Transport systems Non-mineralized waste management Mineralised waste management (waste rock dumps) General site management Other support services and amenities	Non-mineralized waste management Mineralised waste management (waste rock dumps) Transport systems General site management Other support services and amenities Demolition	Waste Rock dumps remaining in perpetuity Rehabilitation Maintenance and aftercare

7. THE ENVIRONMENTAL SETTING

7.1 Landscape Character

The regional landscape is characterized by open, undulating to flat sandy plains. The study area is located in the Savanna Biome of the far northern parts of the Northern Cape, within the Eastern Kalahari Savanna, Kalahari Duneveld and Azonal Vegetation Bioregions. The vegetation units associated with the Mining Right Area correspondingly are, Kathu Bushveld, Gordonia Duneveld, and Southern Kalahari Mekgacha (Mucina and Rutherford 2006). The characteristics of the landscape are illustrated in Figures 4-1 to 4-7 and the distribution of the landscape character types is illustrated in Figure 5. Infrastructure is limited to the Southern Kalahari Mekgacha vegetation unit.

The natural landscape comprises three main landscape types associated with these vegetation units. The flat to rolling plains of the Kathu Bushveld which compromise most of the study area, with a medium-tall tree layer with *Vachellia erioloba* (Camel Thorn trees) in places, but mostly open, undulating plains that include *Boscia albitrunca* (Shepherd's Tree) as the prominent indicator species. The shrub and grass layers are variable in cover, mostly dependant on the amount of grazing that has taken place. The main drainage line that crosses diagonally across the study area from south-east to north-west, is the Kuruman River, and is associated with the other two types. Gordonia Duneveld occurs at the south-eastern edge of the study area. It comprises parallel dunes of about 3 – 8m above the plains, with open shrubland and ridges of grassland on the dune crests. The vegetative cover in this landscape type is the lowest comprising small tree species and shrub species.

The project site falls within the Southern Kalahari Mekgacha vegetation unit, which parallels the Kuruman River valley for the remainder of the study area. It is characterised with sparse, patchy grasslands, sedgelands and low herblands on the bottom of the dry riverbed. Low shrublands occur in place with patches of taller shrubland on the banks of the river. Relatively tall *Vachellia erioloba* can form a dominant but scattered belt along the river's upper banks. This is the case for much of the study area, including at the project site (Mucina and Rutherford 2006).

According to Mucina and Rutherford 2006 these vegetation units are 'least threatened', with '1-2% already transformed. However, mining activities form a major component in the far south of the study area, extending south to Sishen (Figure 5). Farming (livestock grazing with cattle, goats and sheep) is the main activity in the study area with some game farming in the far north and south-eastern sectors.

Refer to Figure 3, which identifies the location of the panoramas in Figures 4-1 to 4-7, which illustrate the nature and landscape character of the study area. Figure 5 illustrates the various land-use types and their location.

7.1.1 Infrastructure and roads

A number of mining operations occur at the southern extreme of the study area adjacent the R308 road. These are N'Chwaning and Wessels, which are still operating and Black Rock and Hotazel (decommissioned, SLR 2014: 1-49). The un-surfaced R380 runs north of these mines along the southern

side of the Kuruman River and to the south of the planned infrastructure. Various un-surfaced farm roads are present in the south-western section of the study area and in the Kuruman River south of the site. There are no major power lines in the study area, other than those (132kV) that feed the mines south of the project site. (Figure 3)

7.1.2 Farmsteads

Two farmsteads are located in the west and south-western part of the study area. The majority occur along the Kuruman River. The closest two homesteads are located immediately west of the project site to the immediate south of the river. (Numbers H15 and H 16 – Boerdraai Farmhouse on Figure 3). The north-western to south eastern sector does not contain occupied farmhouses.

7.1.3 Tourism

During the site visit, two main attractions where observed. The Grootdrink Private Nature Reserve, north west, but outside, the study area and Rhodes Safaris, in the south eastern sector. Associated with these operations are 'lodges' for accommodation. Two guest houses were also identified, the Mecca Guest House, immediately west of the site at the extreme of the study area, and the Acacia Guest House, immediately outside the study area, east of the Nchwaning mine. It is assumed that the game farms cater to hunting activities as might other farms in the area. (Figure 3)

7.1.4 Agriculture

The study area is mostly open agricultural land comprised of a flat to rolling savanna as described in 7.1 above. (Figure 3)

7.1.5 Communities/urban

Black Rock is located 10km south of the project site and at the edge of the study area. Hotazel (20 km south east of the site) and Tsineng, (20km east of the project site) are the only other residential communities and are located outside the study area. (Figure 3)

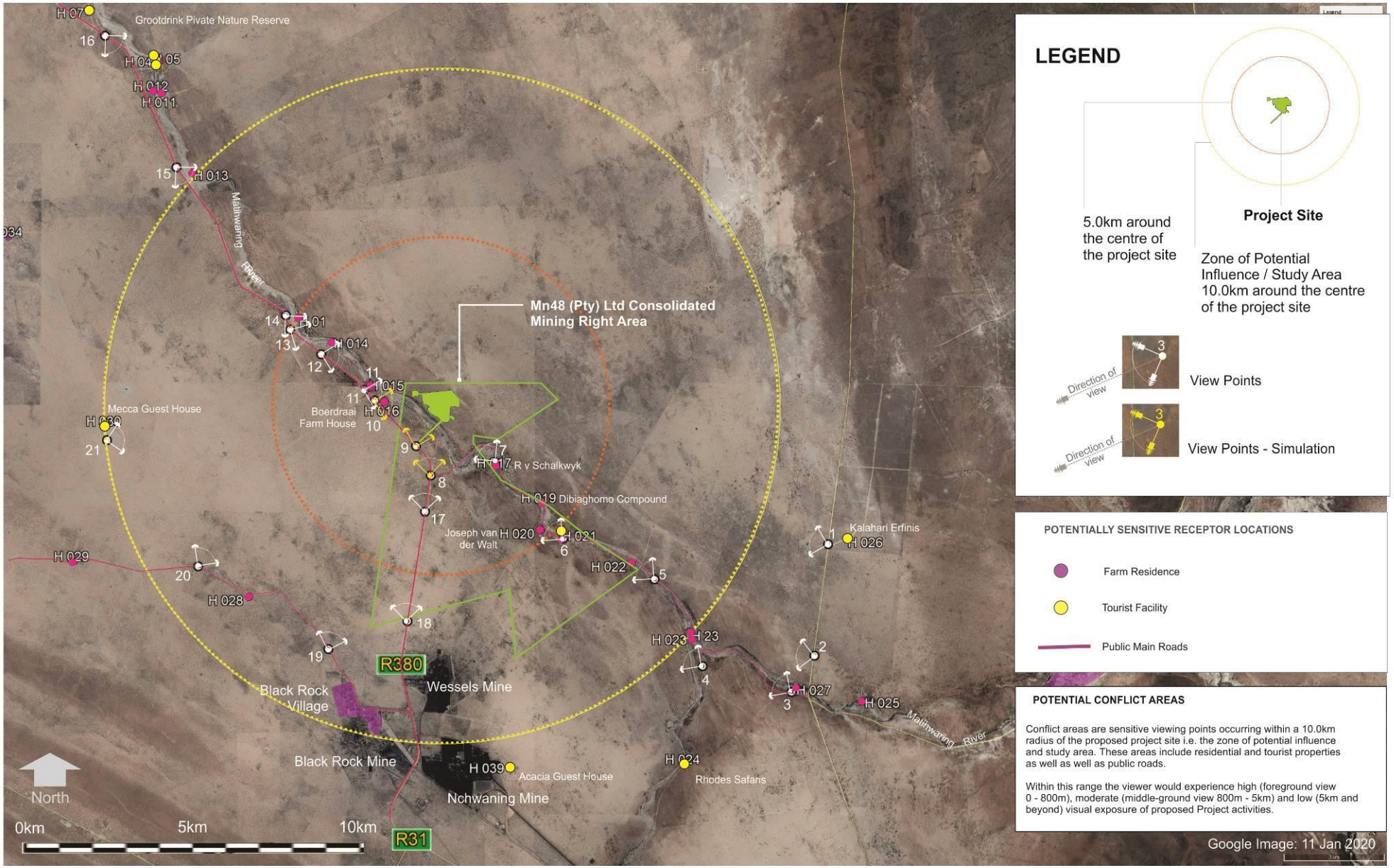

Figure 03: VIEWING POINTS AND VISUAL RECEPTORS

For panoramas refer to Figures 4-1 to 4-7

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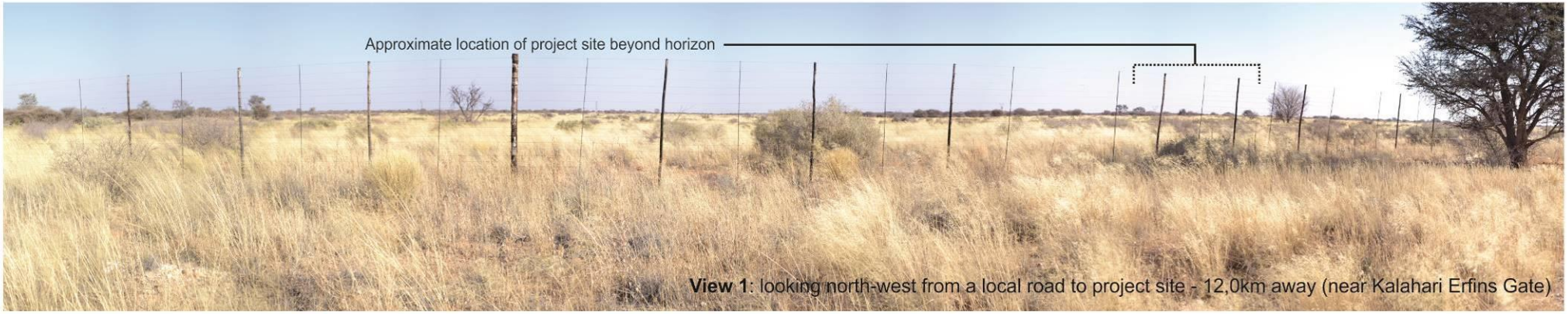

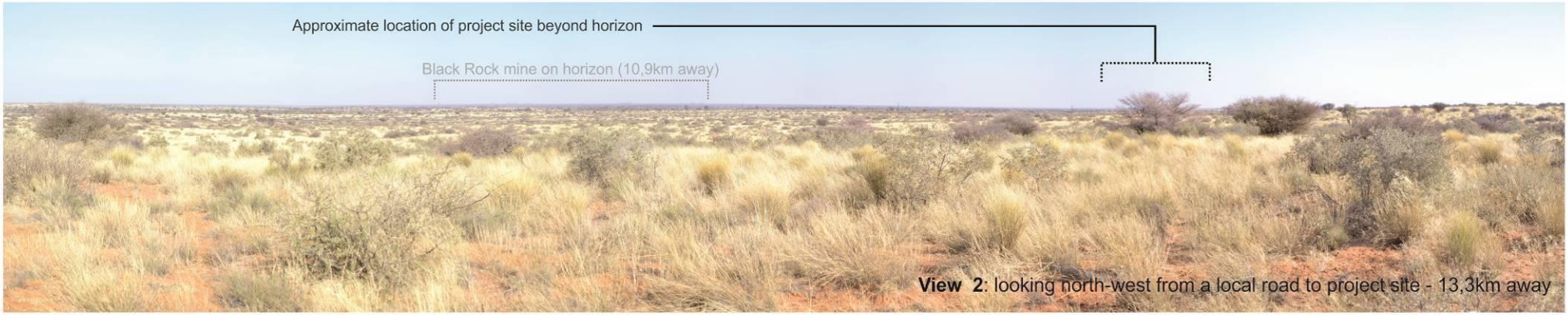

Figure 04-1: LANDSCAPE CHARACTER - Views 1, 2 and 3

Refer to Figure 3 for location of viewing points and homesteads

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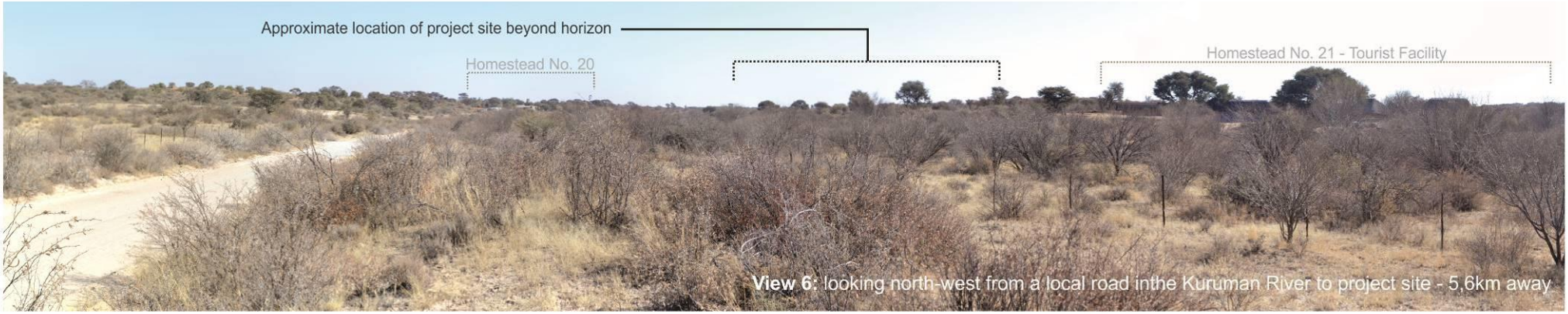

Figure 04-2: LANDSCAPE CHARACTER - Views 4, 5 and 6

Refer to Figure 3 for location of viewing points and homesteads

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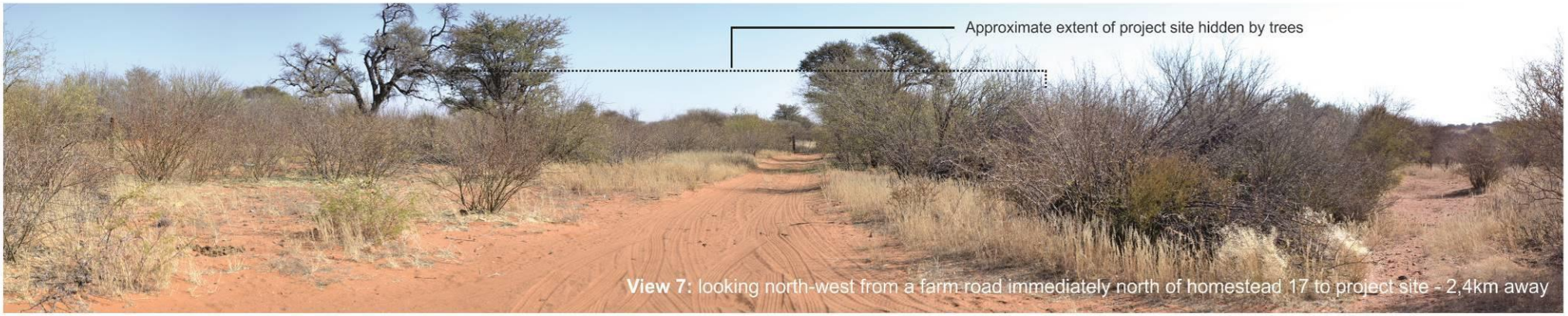

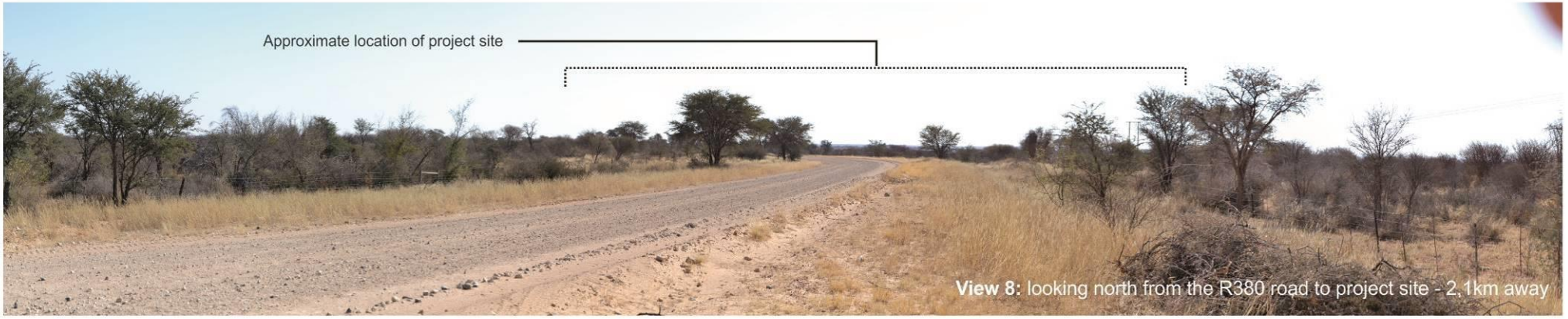

Figure 04-3: LANDSCAPE CHARACTER - Views 7, 8 and 9

Refer to Figure 3 for location of viewing points and homesteads

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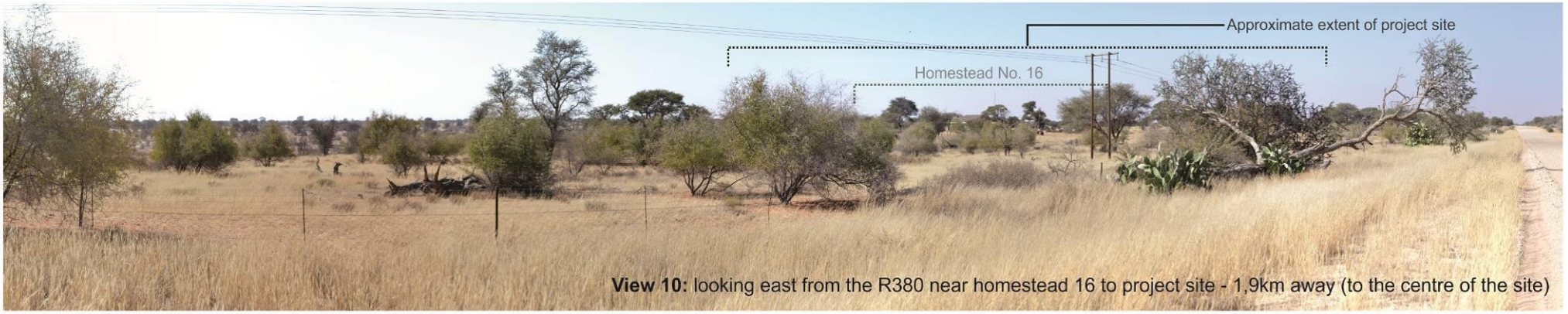
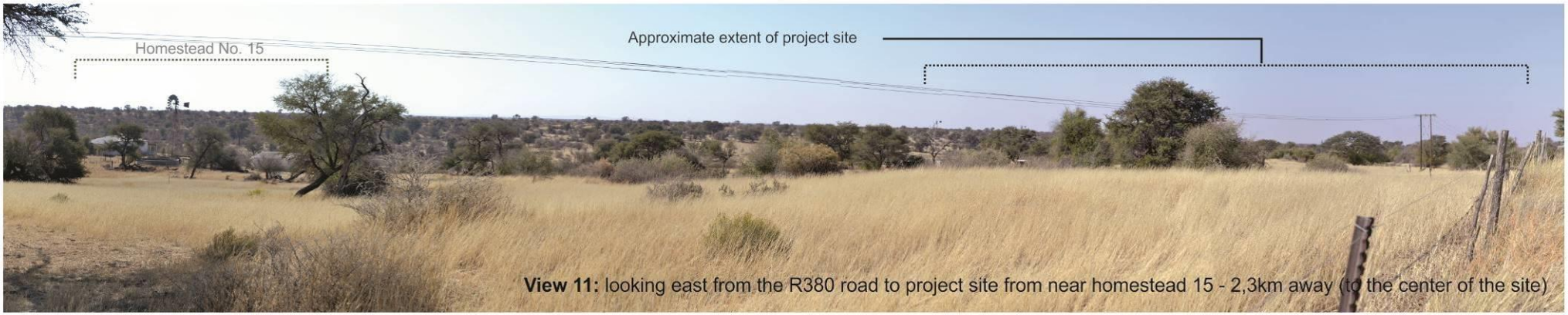


View 10: looking east from the R380 near homestead 16 to project site - 1,9km away (to the centre of the site)



View 11: looking east from the R380 road to project site from near homestead 15 - 2,3km away (to the center of the site)

View 12: looking south east from the R380 to project site from near homestead 016 3,8 km away (to the centre of the site)

Figure 04-4: LANDSCAPE CHARACTER - Views 10, 11 and 12

Refer to Figure 3 for location of viewing points and homesteads

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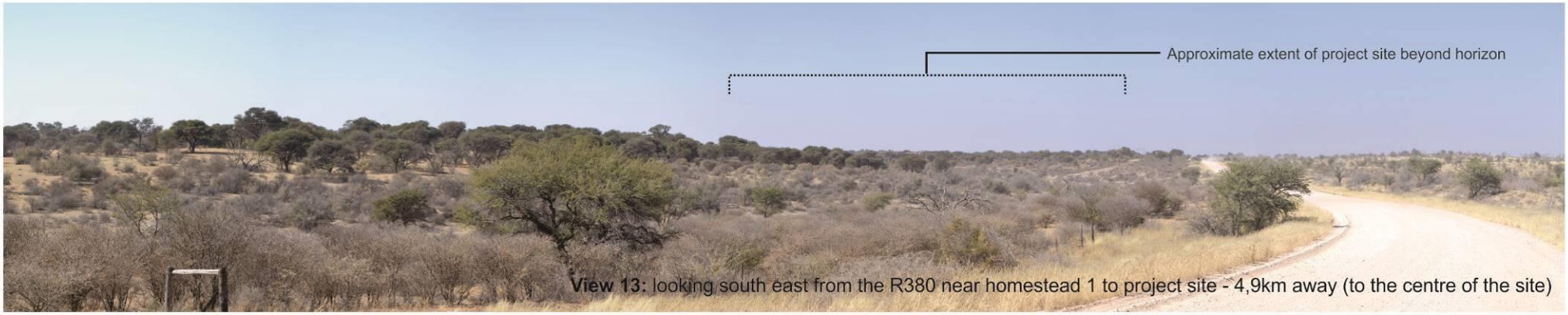

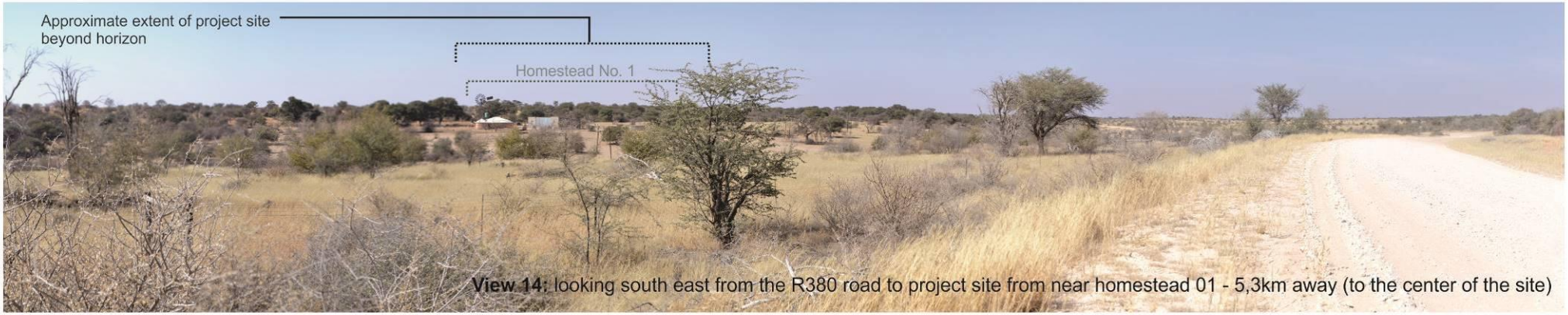

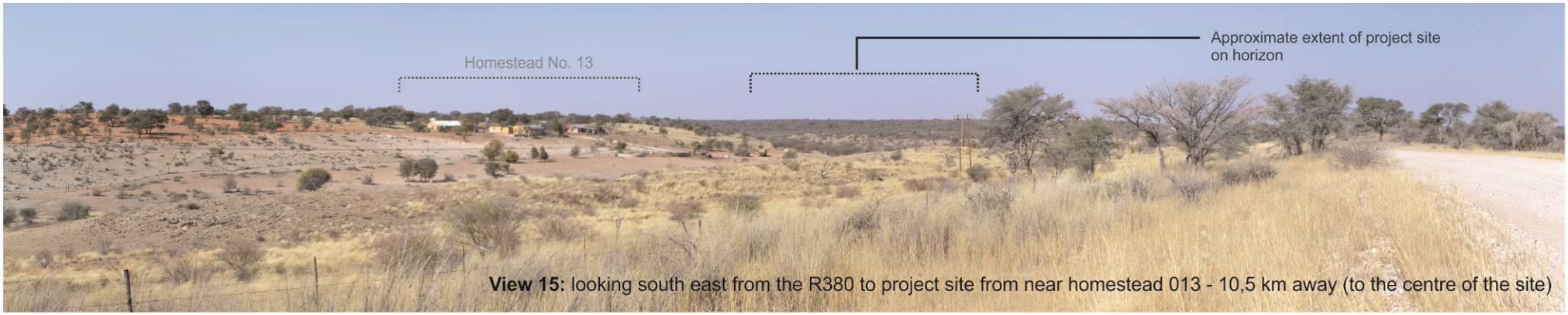

Figure 04-5: LANDSCAPE CHARACTER - Views 13, 14 and 15

Refer to Figure 3 for location of viewing points and homesteads

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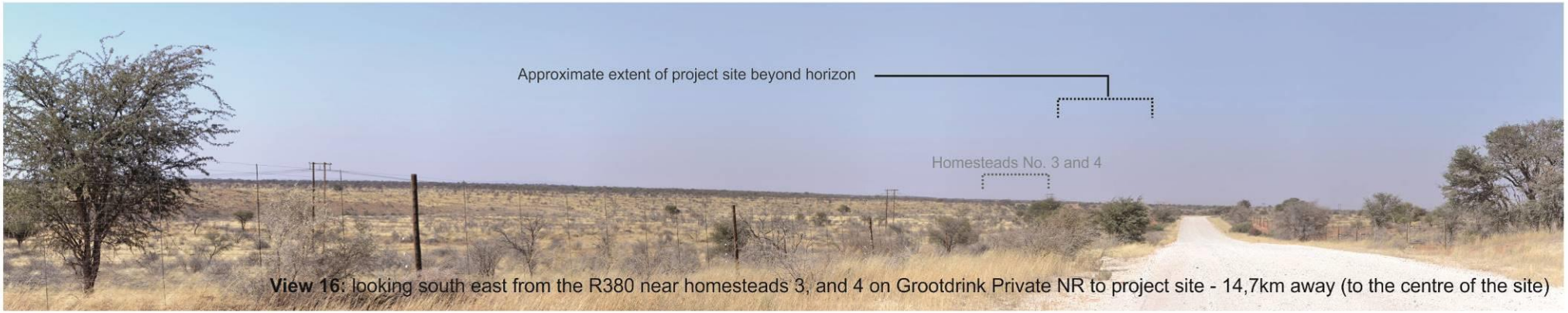
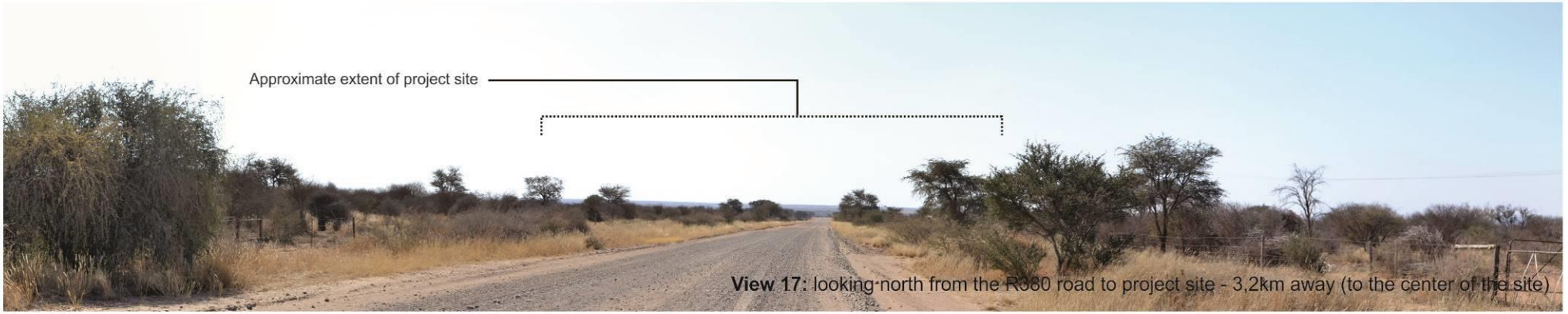
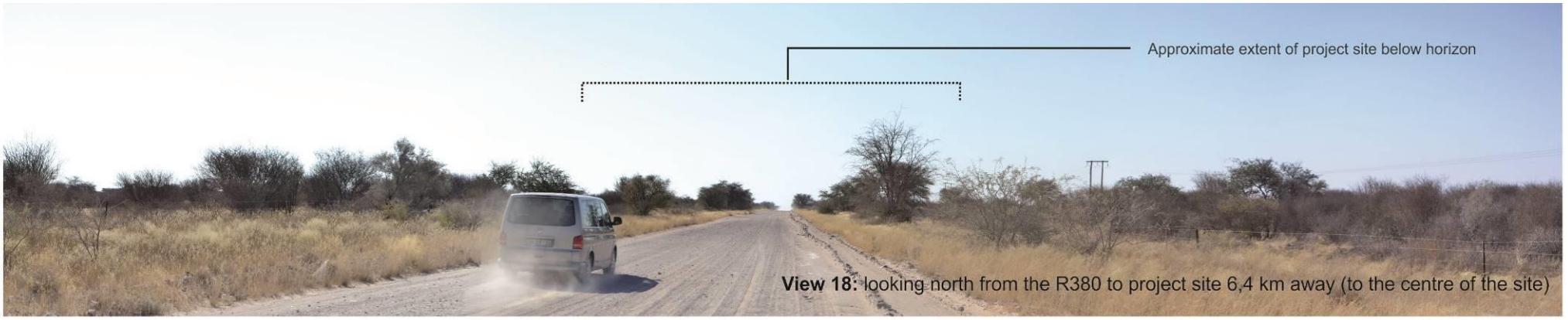


View 16: looking south east from the R380 near homesteads 3, and 4 on Grootdrink Private NR to project site - 14,7km away (to the centre of the site)



View 17: looking north from the R380 road to project site - 3,2km away (to the center of the site)



View 18: looking north from the R380 to project site 6,4 km away (to the centre of the site)

Figure 04-6: LANDSCAPE CHARACTER - Views 16, 17 and 18

Refer to Figure 3 for location of viewing points and homesteads

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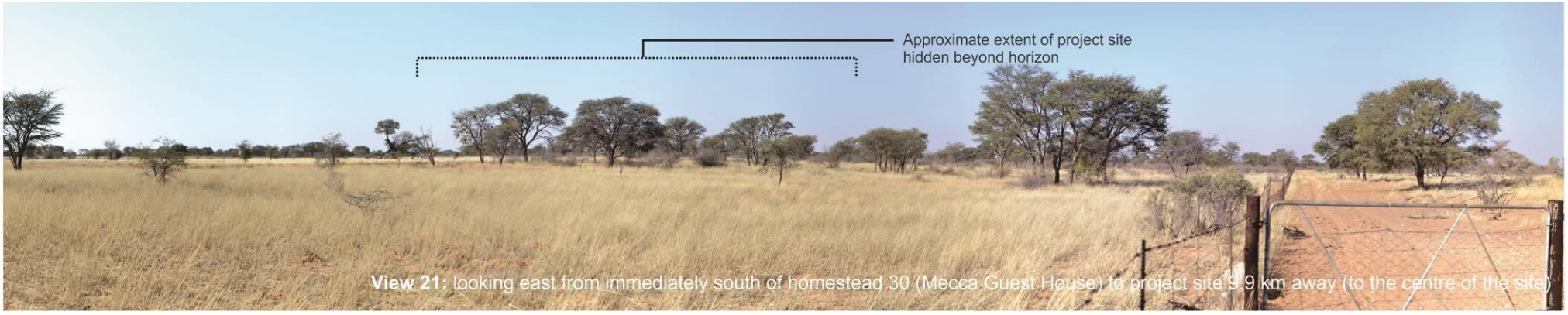
View 19: looking north east from a local farm road north of Black Rock to the project site - 7,9km away (to the centre of the site)

View 20: looking north from a local farm road to project site - 8,6km away (to the center of the site)



View 21: looking east from immediately south of homestead 30 (Mecca Guest House) to project site 9,9 km away (to the centre of the site)

Figure 04-7: LANDSCAPE CHARACTER - Views 19, 20 and 21

Refer to Figure 3 for location of viewing points and homesteads

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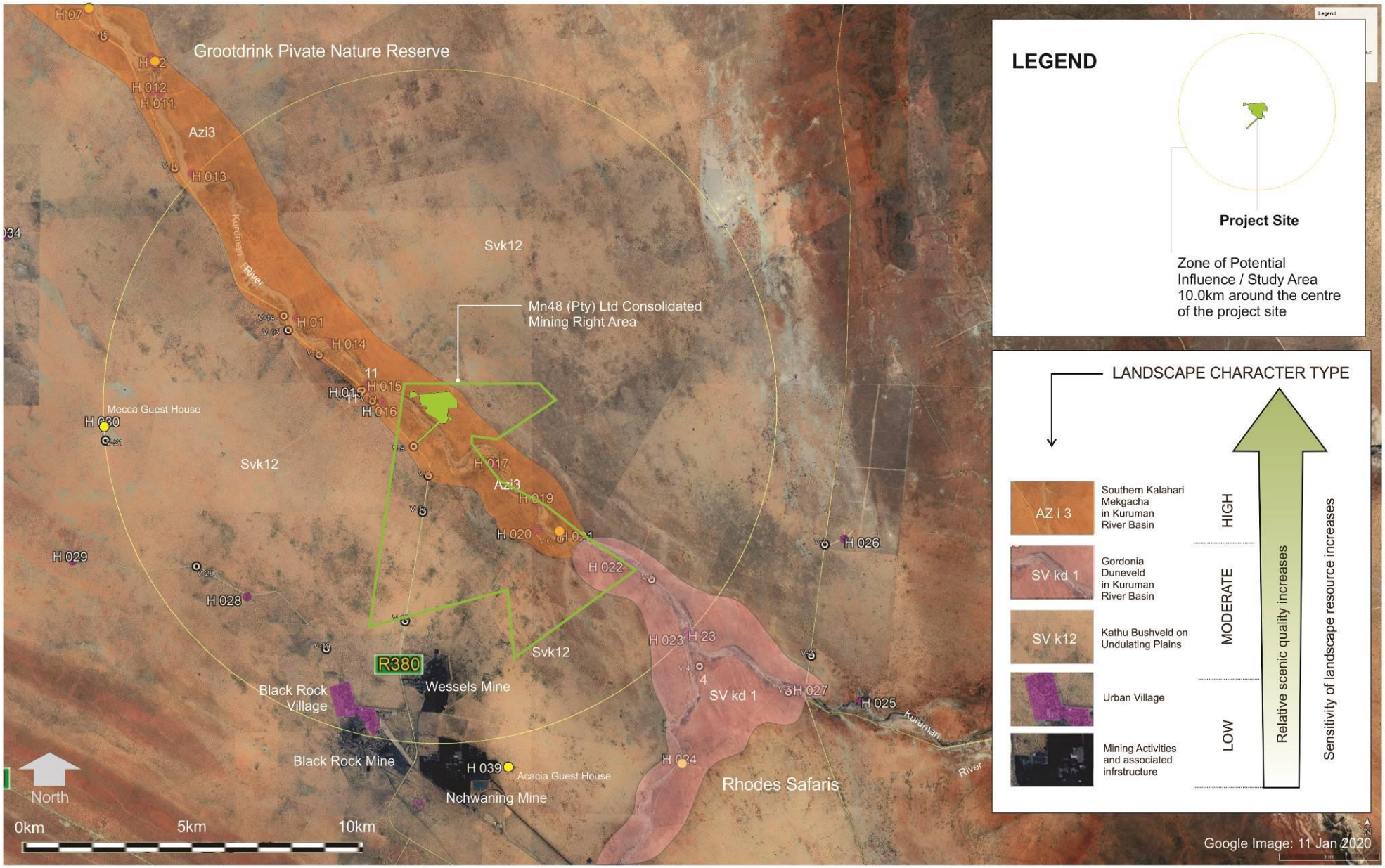

Figure 05: LANDSCAPE TYPES AND SENSITIVITIES

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8. VISUAL RESOURCE

8.1 Visual Resource Value / Scenic Quality

The scenic quality (using the scenic quality rating criteria described in Appendix A) of the study area is primarily derived from the landscape character described above and illustrated as landscape character types in Figure 5. Reference is also made to the panoramas in Figure 4–1 to 4-7.

When the criteria listed in Appendix A are taken together, an overall rating within the context of the sub-region, of *moderate* to *high* is allocated to the study area. A *low* rating is, however, assigned to the far southern section of the study area, where existing mines have caused general sense of deterioration/degradation to the landscape. A moderate rating is allocated to the open savanna (Kathu Bushveld) and moderately high rating for Kuruman River and its associated embankments. A summary of the visual resource values (after LI-IEMA 2013), within the context of the sub-region, is tabulated in Table 1 below.

Table 2: Value of the Visual Resource

High Kuruman River and associated embankments	**Moderate** Open savanna (Kuruman Bushveld and Gordonia Duneveld) associated with surroundings farms	**Low** Mine and utility infrastructure
This landscape type is considered to have a *high* value because it is a: Distinct landscape that exhibits a very positive character with valued features that combine to give the experience of unity, richness and harmony. It is a landscape that may be of particular importance to conserve and which has a strong sense of place.	This landscape type is considered to have a *moderate* value because it is a: Common landscape that exhibits some positive character, but which has evidence of alteration / degradation/ erosion of features resulting in areas of more mixed character.	This landscape type is considered to have a *low* value because it is a: Minimal landscape generally negative in character with few, if any, valued features.
Sensitivity: It is sensitive to change in general and will be detrimentally affected if change is inappropriately dealt with.	Sensitivity: It is potentially sensitive to change in general and change may be detrimental if inappropriately dealt with	Sensitivity: It is not sensitive to change

These values reflect those allocated to the study area in the original SLR EIA report (2014:1-38) which states, “Although numerous mining related structures dominate the landscape to the south of the [study] area, the overall scene surrounding the project area is characterised by the Kuruman River channel and associated sand dune, open views with grazing lands and associated activities. The result is a landscape with a high to moderate scenic quality. It follows that the highest value visual resource described above is

also the most sensitive to changes. In contrast, areas, which are not considered to have a high scenic value, are expected to be the least sensitive to change such as the mining and community areas."

8.2 Sense of Place

According to Lynch (1992) sense of place is the extent to which a person can recognize or recall a place as being distinct from other places - as having a vivid, or unique, or at least particular, character of its own. The sense of place for the study area derives from the combination of all landscape types and their impact on the senses. The activities and land-uses in the study area are common to the northern parts of the Northern Cape, where the main economies are primarily mining and agriculture, which along with the flat wide-open spaces provide the study area with its character and relatively strong sense of place.

However, the presence of major mining activities in the southern extreme of the study area (and extension of the major mining areas that stretch north from the Sishen area), represent signs of visual and aesthetic deterioration when compared with the nature and landscape baseline. Refer to the views in Figures 4-1 to 4-7 and the aerial photograph in Figure 3.

8.3 Summary

These baseline findings confirm the original EIA report's statement, i.e. "When considering landscape character, scenic quality, visual resource, sense of place and visual receptors the baseline includes two distinct areas of differing visual value. The areas located to the north, east and west of the proposed project site have a high visual value [and strong sense of place]. The developed areas to the [far] south of the [study area] site have a lower value [and are impacting on the sense of place and scenic quality of the study area]." (SLR 2014: 1-39)

9. LANDSCAPE IMPACT

The *landscape impact* (i.e. the change to the fabric and character of the landscape caused by the physical presence of the intervention) of the Project is considered *high.* The development of the project site, when understood within the context of a landscape considered highly sensitive to change (Figure 5), would cause major change in the physical qualities and aesthetics of the site and its immediate surroundings.

However, as the extent of the proposed amended site and infrastructure layout (Mn48 mine) closely replicate that of the approved Lehating EMPr, minimal change will occur between the two options and therefor the landscape impact of the amended project is considered minimal.

10. VISUAL IMPACT

Visual impacts will be caused by activities associated with the proposed Amendment Project. However, what is being assessed in this report, is the *difference* during construction, operation and at closure, between the *approved* project and *amended* Projects.

10.1 Sensitive Viewers and Locations

Figure 3 identifies potential sensitive receptor locations (farmsteads and Black Rock Village) from which the amended project activities could potentially be visible. These include sections of the R380 and the two local roads indicated in Figure 3. Sensitive receptors are people living near the project site as indicated on Figure 3 and people travelling along the R380 or local roads. However, due to the nature of the sub-region, and the fact that a major area south of the study area is dominated by mining activities, visual sensitivity towards the proposed mine is considered low. Also, the public did not raise visual impact as a concern during the public participation process for the approved EMPr (Lehating project) (SLR 2014:7-47). The table below sets out potential sensitivities. These have not changed since the original Lehating project was approved in 2014.

Table 3: Potential Sensitivity of Visual Receptors

High	**Moderate**	**Low**
Farmsteads north-west, south west and south east of the mine	Travellers on the R380 and two local un-paved roads visiting nearby farms and farmsteads.	Employees of the mines in the sub-region
Occupiers of residential properties with views affected by the development.	People travelling through or past the affected landscape in vehicles or other transport routes.	Visitors and people working within the study area and travelling along local roads whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view.

10.2 Visibility

The ‘zone of potential influence’ (ZPI) for both the approved and amended project layouts is the same as indicated in Figure 6. The figure also shows the theoretical viewshed for both layouts. The ZPI was set at 10,0km, as at this distance, the impact of project activities would have diminished to the extent that they recede into the background and/or views to the site would be screened by existing vegetation and structures. Refer to Figures 4-2 and 4-2 which illustrate who the infrastructure at existing mines if barely visible at distances of 13,3km and 7,6km respectively.

In determining the potential visibility of both the approved and amended layouts (Mn48) final heights of the highest structures were used. Refer to Figures 2 and 2-1. The visibility model is based on topographic relief alone (it has not factored in the tree cover) and therefore is considered the worst-case scenario and is therefore a theoretical model. The model was tested on site, where it became clear that most views to the site from within the study area, would be blocked by existing vegetation due to the flat nature of the landscape. This scenario is true for both the approved Lehating and amended Mn48 project layouts and infrastructure. Refer to Figures 4-1 to 4-7.

The viewsheds in Figure 6 indicate the theoretical visibility of both layouts. These analyses have modelled the final heights of the highest structures for both options i.e. the vent shaft (41m), main shaft and headgear (41m), crushing and screening plant (21m), permanent winder house and conveyance storage (20m), and the fines and lumpy stockpiles (15m). The viewsheds are virtually identical for both the approved and amended layouts with only a small area at the far east of the study area showing potential increased visibility for the Mn48 layout.

10.3 Visual Exposure

Visual exposure is determined by qualifying visibility (as indicated on Figure 6) with a distance rating to indicate the degree of potential intrusion and visual acuity. It is likely that some of the proposed Mn48 project infrastructure and activities will be visible from the R380, which is approximately 1,3km from the mine as well as local residents (Homesteads 15 (I,8km) and 16 (I,4km) indicated on Figure 3. However, as the simulations in Figures 7-1 to 7-3 indicate only the upper sections of the tallest structures would not be blocked by vegetation. Exposure for both the approved Lehating and amended Mn48 layouts would be the same.

Table 4: Sensitive Receptors – Visual Exposure

	Foreground view i.e. 0 – 800m from Project Site	Middle-ground view i.e. 800m to – 5,0km from Project Site	Background view i.e. > 5,0km from Project Site
Homesteads 15 and 16 And R380 south west of the site		**X** partially blocked by vegetation; only upper levels of tall structures would be visible	
Remaining homesteads, guest houses and sections of the R380 throughout the study area		**X** not visible obstructed by vegetation	**X** not visible blocked by vegetation and/or topographic relief
Black Rock Village			**X** not visible obstructed by vegetation

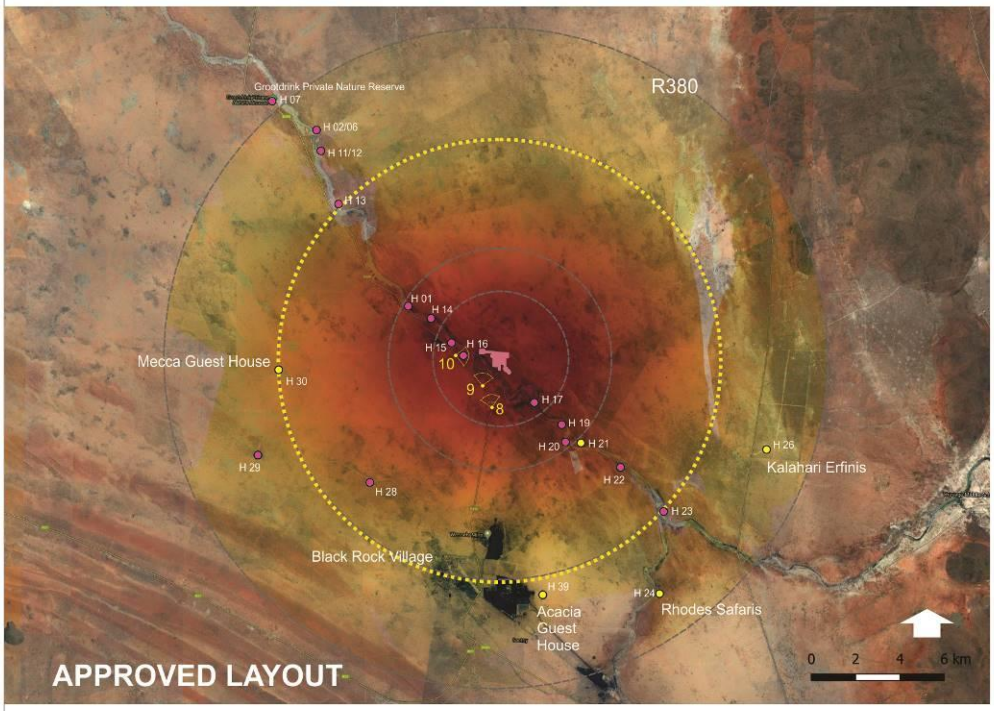
10.4 Visual Intrusion

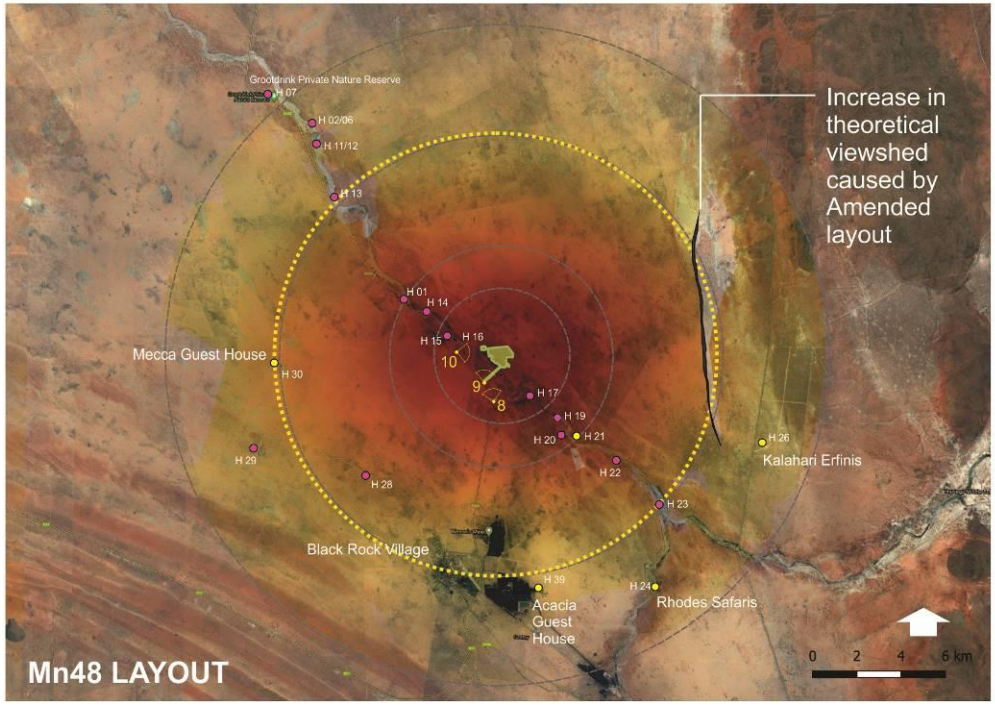
Visual intrusion deals with the notion of contextualism i.e. how well does a project component fit with or disrupt / enhance the ecological and cultural aesthetic of the landscape as a whole? And ties in with the concept of visual absorption capacity (VAC), which for the project site, is high due its context within a flat savannah covered landscape. The simulations in Figures 7-1 to 7-3 illustrate the effect that the amended Project infrastructure will have on views when seen from three typical partially exposed viewing areas located on the R380 north-west, south-west and west of the project site (refer to Figure 3 for these locations). Although the infrastructure will differ from the rural nature of the site and its immediate surroundings (but similar to existing mining activities south of the site), the result will be *insignificant* to *moderate* for nearby homesteads and the R380 road (see Table 5) as the existing landscape would 'absorb'

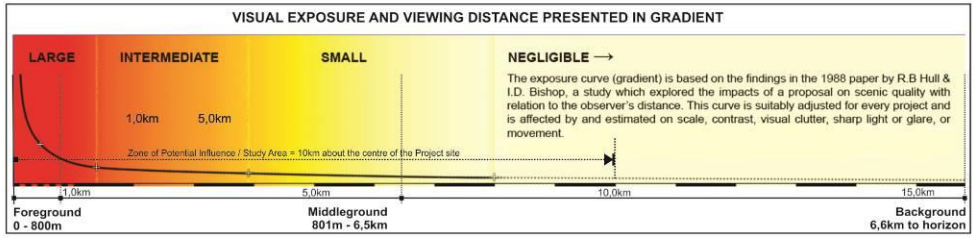
most of the infrastructure, with only the tallest elements protruding above the tree line. Again, this scenario applies to both the approved Lehating and proposed Mn48 projects.

Table 5: Visual Intrusion

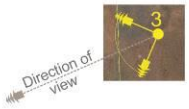
High None	**Moderate** Homesteads 15 and 16 and the section of the R380 immediately south west of the site	**Low to insignificant** Remainder of the study area
The Project would have a substantial negative effect on the visual quality (sense of place) of the landscape relative to the baseline landscape because it would: - Contrast with the patterns or elements that define the structure of the landscape.	• The Project would have a moderate negative effect on the visual quality (sense of place) of the landscape. • Contrast moderately with the current patterns or elements that define the structure of the landscape. • Be partially compatible with land use (industrial), settlement or enclosure patterns of the general area;	The Project would have a minimal effect on the visual quality (sense of place) of the landscape. - Contrasts minimally with the patterns or cultural elements (mines) that define the structure of the landscape. - Is mostly compatible with land use patterns;
RESULT: Notable change in landscape characteristics over an extensive area and an intensive change over a localized area resulting in major changes in key views.	*RESULT:* Moderate change in landscape characteristics over localized area resulting in a moderate change to key views.	*RESULT:* Minimal change resulting in a minor to insignificant (or no) change to key views from sensitive viewing areas.







The exposure curve (gradient) is based on the findings in the 1988 paper by R.B Hull & I.D. Bishop, a study which explored the impacts of a proposal on scenic quality with relation to the observer's distance. This curve is suitably adjusted for every project and is affected by and estimated on scale, contrast, visual clutter, sharp light or glare, or movement.



View Points - Simulation

LEGEND

Project Site

Zone of Potential Influence / Study Area 10.0km around the centre of the project site

POTENTIALLY SENSITIVE RECEPTOR LOCATIONS

- Farm Residence
- Tourist Facility
- Public Main Roads

Note:
The accuracy of the viewshed analysis depends on the quality of the input digital surface model (DSM). Readily available digital contours for the area are limited to 20m contours. We have interpolated these down to 1m intervals to get better accuracy. However, these types of viewshed investigations (using readily available GIS software and terrain contours only) are limited in their accuracy due to their inability to incorporate vegetation information. On-site observations indicated that most views from within the study area would actually be blocked to the mine. And that no unobstructed views would be available, even within the middle to foreground of views.

The viewshed analyses have therefore been included only as a comparative analysis between the 'approved' layout and the proposed 'amended' layout, which is the focus of this VIA.

Figure 06: VIEWSHED_APPROVED AND Mn48 LAYOUTS

GYLA
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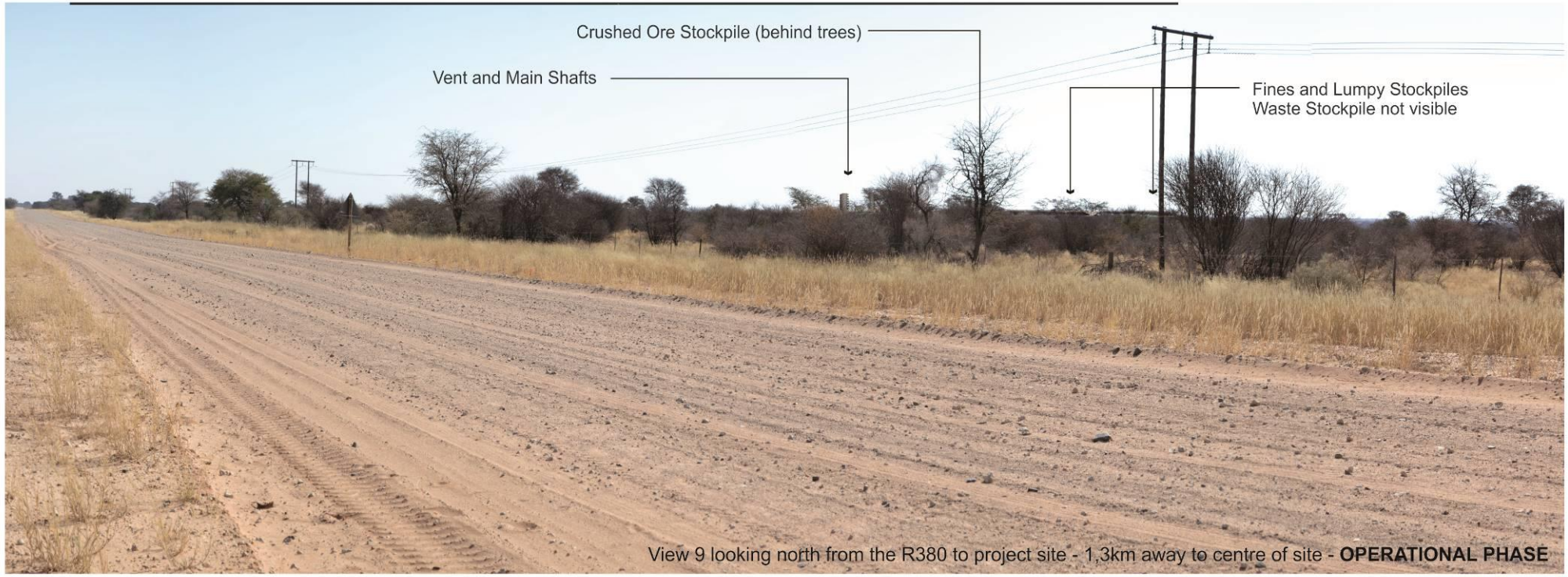

Figure 07-2: SIMULATION AT CLOSURE, VIEW 9 - Lehating Amendment

Refer to Figure 2-2 for an aerial view of the site and Figure 3 for the location of the view point

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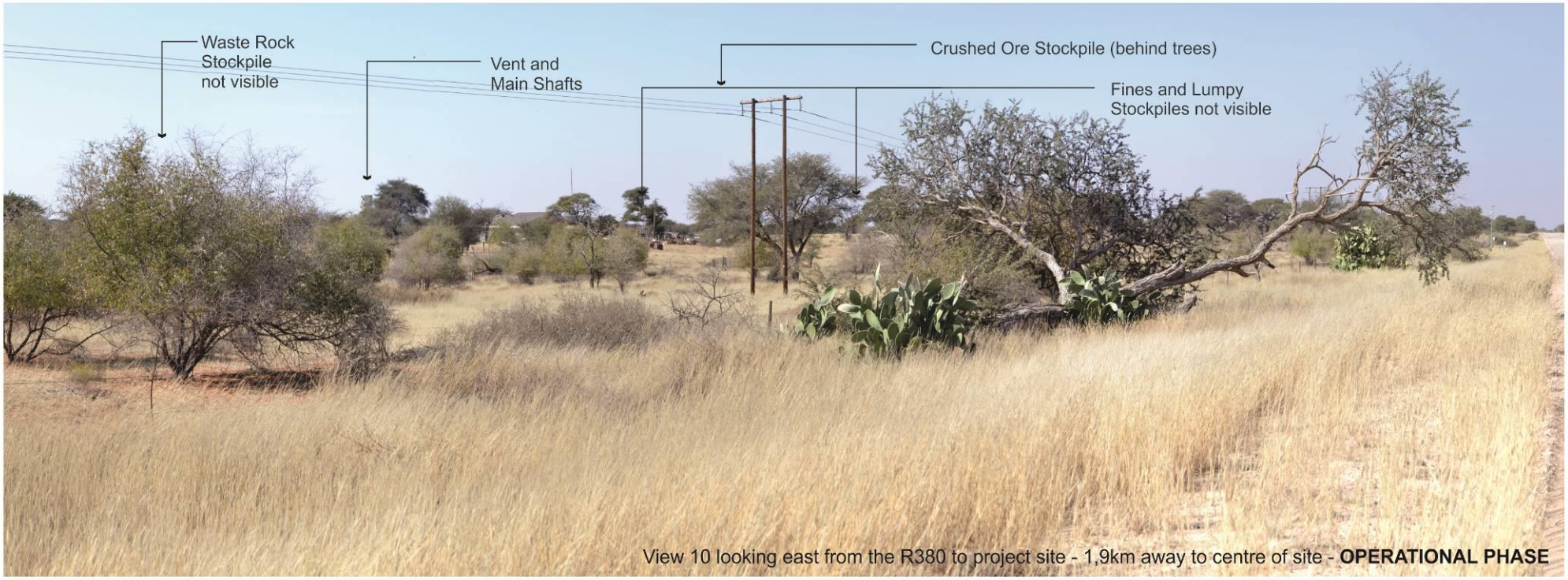

Figure 07-3: SIMULATION VIEW 10 - Mn48 MINE

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10.5 Severity of Impact

Referring to the discussions above and using visibility, visual exposure and visual intrusion[3] criteria, the severity of visual impact of the Project is rated in Table 5 below for both the EMPr approved Lehating and amended Mn48 scenarios. The results tabulated below in Table 6 indicate that the severity of visual impact (based on the worst case scenario i.e. impact on closest homesteads) is *moderate* in the mitigated and unmitigated scenario of project phases prior to closure, as the project (both scenarios) will cause a partial loss of or alteration to key landscape elements and visual characteristics of the baseline. Refer also to Figures 7-1 to 7-3 which simulate the Mn48 layout, superimposed on panoramas of the existing landscape.

Table 6: Severity of Impact: Unmitigated and Mitigated – Both Scenarios

High	Moderate	Low	Negligible
Construction, operation and decommissioning			
Total loss of or major alteration to key elements / features / characteristics of the baseline. i.e. Pre-development landscape or view and / or introduction of elements considered to be totally uncharacteristic when set within the attributes of the receiving landscape. High scenic quality impacts would result.	**Partial loss of or alteration to key elements / features / characteristics of the baseline.** **i.e. Pre-development landscape or view and / or introduction of elements that may be prominent but may not necessarily be substantially uncharacteristic when set within the attributes of the receiving landscape.** **Moderate scenic quality impacts would result**	.	Very minor loss or alteration to key elements/features/characteristics of the baseline. i.e. Pre-development landscape or view and / or introduction of elements that is not uncharacteristic with the surrounding landscape – approximating the 'no change' situation. Negligible scenic quality impacts would result.
Closure - Mitigated			
		Minor loss of or alteration to key elements / features / characteristics of the baseline. **i.e. Pre-development landscape or view and / or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape.** **Low scenic quality impacts would result**	

[3] *Visual Intrusion:* The nature of intrusion or contrast (physical characteristics) of a project component on the visual quality of the surrounding environment and its compatibility/discord with the landscape and surrounding land use, within the context of the landscape's VAC.

11. MANAGEMENT MEASURES

The main objective of the mitigation measures is to limit negative visual impacts. In considering mitigating measures three rules are considered - the measures should be feasible (economically), effective (how long will it take to implement and what provision is made for management / maintenance) and acceptable (within the framework of the existing landscape and land use policies for the area). To address these, the following principles have been established:

- Mitigation measures should be designed to suit the existing landscape character and needs of the locality. They should respect and build upon landscape distinctiveness.
- It should be recognized that many mitigation measures, especially the establishment of planted screens and rehabilitation, are not immediately effective. This would be the case in the study area, due to its dry environment and the slow growth of plant materials that could be used to screen views.

The following general measures are suggested and should be included as part of the Environmental Management Programme (EMPr). It should be noted that the approved layout included a TSF, which would have been a residual feature. The TSF has however been removed from the Mn48 layout and the only remaining feature on the site would be the Waste Rock Facility.

11.1 Earthworks

- Earthworks to shape the development site, should be executed in such a way that only the footprint and a small 'construction buffer zone' around the proposed development areas is exposed. In all other areas, the natural occurring vegetation (grasses through to tall trees), should be retained, especially along the periphery of the site along its western boundary. Dust suppression techniques should be in place always during all phases of the project, where required. **The approximately 5m high dunes that parallel the western boundary are important as they form a visual screen to the lower levels of project structures, stockpiles and activities and should not be disturbed.**
- All topsoil that occurs within the proposed footprint of an activity must be removed and stockpiled for later use. The construction contract must include the stripping and stockpiling of topsoil. Topsoil would be used later during the rehabilitation phase. The presence of degraded areas and disused construction roads, which are not rehabilitated, will increase the overall visual impact.
- All cut and fill slopes and areas affected by construction work should be progressively top-soiled and re-vegetated as soon as possible.
- The cut and fill embankments created to establish terraces associated with the various activities (i.e. sub-station, contractors lay down area, shaft areas, stockpile areas, crusher and admin areas) should be shaped to blend in with the adjacent natural contours. Terraces slopes should not exceed more than 1:3 in order to establish vegetation that has the effect of softening the 'scars' of any cut and fill.

11.2 Waste Stockpile

- Harsh, steep engineered slopes (maximum slope 1:3) should be avoided as these could impose an additional impact on the landscape by contrasting dramatically with the existing rolling topography. The waste stockpile is the most visible surface feature that will remain at closure and it is important

that a long-term view of their integration with the surrounding landscape be taken.

- The reclaimed landscape should be no more stable than the adjacent undisturbed landscape; designed with gentler slopes, and drainage systems that do not concentrate run-off.
- Maintain the final landform height and slope angles for the waste stockpile as low as possible.
- Grass and tree seeding of the dump should be undertaken to emulate the groupings of natural vegetation in adjacent areas and mimic where possible the within the Southern Kalahari Mekgacha vegetation type (Mucina and Rutherford 2006).
- Dust control by vegetation cover and other not toxic chemicals.

11.3 Landscaping and ecological approach

- Where new vegetation is proposed to be introduced to the site and onto the waste dump, an ecological approach to rehabilitation, as opposed to a horticultural approach should be adopted. For example, communities of indigenous plants enhance biodiversity, a desirable outcome for the project rehabilitation. This approach can significantly reduce long term costs as less maintenance would be required over conventional methods one the vegetation is established.

11.4 Structures and associated infrastructure

- Paint all structures with colours that reflect and compliment the colours of the surrounding landscape.
- To reduce the potential of glare, the external surfaces of structures should be articulated or textured to create interplay of light and shade. Avoid pure whites and blacks.

11.5 Structures and associated infrastructure

Light pollution is largely the result of bad lighting design, which allows artificial light to shine outward and upward into the sky, where it's not wanted, instead of focusing the light downward, where it is needed. Ill designed lighting washes out the darkness of the night sky and radically alters the light levels in rural areas where light sources shine as 'beacons' against the dark sky and are generally not wanted. Of all the pollutions faced, light pollution is perhaps the most easily remedied. Simple changes in lighting design and installation yield immediate changes in the amount of light spilled into the atmosphere. The following are measures that must be considered in the lighting design of the Project, particularly at the management and service platforms:

- Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the site i.e. lights are to be aimed away from residential areas and the R380 road west of the site.
- Avoid high pole top security lighting along the periphery of the site and use only lights that are activated on illegal entry to the site.

Minimise the number of light fixtures to the bare minimum, including security lighting.

11.6 Good housekeeping

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

12. SIGNIFICANCE OF IMPACT

The following tables summarise the consequence and significance of the visual impact of the proposed Amended scenario. These results are based on worst-case scenario when the impacts of all aspects of the Project are taken together using the impact criteria in Appendix C (SLR 2020). Consequence of impact is a function of intensity, duration, and spatial extent (SLR 2020).

Table 7: Determining the CONSEQUENCE of Visual Impact – Mn48 Layout

Project Activity	***Unmitigated* summary of the cumulative rated visual impact per phase of the project**				***Mitigated* summary of the cumulative rated visual impact per phase of the project**			
	Severity	**Duration**	**Spatial Scale**	**Conse-quence**	**Severity**	**Duratio n**	**Spatial Scale**	**Conse-quence**
Construction, operation, and decommissioning	M	H	M	**H**	M	M	M	**M**
Closure	M	H	M	**H**	L	L	L	**L**

The severity of impact, rated in Table 6, is further qualified with *consequence* (Table 7) and *probability* criteria (SLR 2020 Appendix C) to determine the *significance* (Table 8) of the visual impact. i.e. Significance = consequence x probability.

Table 8: SIGNIFICANCE of Visual Impact – Mn48 Layout

Potential Visual Impact	**ENVIRONMENTAL SIGNIFICANCE**							
	Unmitigated				**Mitigated**			
	Con	**x**	**Prob**	**SIG**	**Con**	**x**	**Prob**	**SIG**
Construction, operation and decommissioning								
It *must* have an influence on the decision. Substantial mitigation will be required.	H		H	**H**				
It should have an influence on the decision. Mitigation will be required.					M		M	**M**
Closure								
It should have an influence on the decision. Mitigation will be required.	H		M	**M**				
Unlikely that it will have a real influence on the decision. Limited mitigation is likely to be required.					L		**L**	**L**

Note: Con = Consequence; Prob = Probability ; SIG = Significance

12.1 Comparison between the Approved Lehating layout and the proposed Mn48 Layout

The unmitigated and mitigated significance of impact for the various phases including closure of the Mn48 Mine project, is the same as that of the approved EMPr for the Lehating mine. The approved EMPr commited Lehating Mine to management measures similar to those proposed in Section 11 for the Mn48 Mine.

The landscape impact of both the approved and amended scenarios is similar because the extent of their site boundaries and proposed infrastructure is mostly the same (Figures 2, 2-1 and 2-2). The approved scenario, however, included a TSF, which falls away in the Mn48 mine. The Mn48 mine layout on the other hand, has a larger waste dump and some infrastructure is proposed beyond the western boundary of the approved scenario (Eskom sub-station and PCD), resulting in a slightly larger total project footprint and therefore a slight increase in landscape impact. The tallest structures, i.e. the vent and main shafts are the same for both scenarios, with only a slight difference in location i.e. in the approved layout the shafts are 100m closer to the closest homestead (no. 16 – Boerdraai Farmhouse), but this is insignificant in terms of potential visual impact differential between the two scenarios.

The significance of impact of the Mn48 as in indicated in Table 8, predicts the same significance rating as for the approved EMPr Lehating layout (SLR 2014:7-48).

13. CUMULATIVE EFFECT

Cumulative landscape and visual effects (impacts) result from changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future. They may also affect the way in which the landscape is experienced. Cumulative effects may be positive or negative. Where they comprise a range of benefits, they may be considered to form part of the mitigation measures.

Cumulative effects can also arise from the intervisibility of a range of developments (i.e. other mines in the area) and /or the combined effects of individual components of the proposed development occurring in different locations or over a period. The separate effects of such individual components or developments may not be significant, but together they may create an unacceptable degree of adverse effect on visual receptors within their combined visual envelopes. Intervisibility depends upon general topography, aspect, tree cover or other visual obstruction, elevation and distance, as this affects visual acuity, which is also influenced by weather and light conditions (LI-IEMA (2013)).

13.1 Cumulative effect of the Project

The impact of mining activities south of the project site along with the general deterioration of the extreme southern portion of the study area's landscape, has had a negative effect on the quality of the original natural landscape. The physical presence of the proposed Mn48 Project will cause a moderate negative increase in impact in the sub-region, assuming effective mitigation and rehabilitation (i.e. a well-managed scenario), that control visual impacts associated with the worst-case scenario.

14. CONCLUSION

The existing visual condition of the landscape that may be affected by the proposed Mn48 Project has been described confirming that there has been very little to no change since 2014 when the study (SLR 2014) for the approved Lehating EMPr was approved. The study area's scenic quality has been rated *low* to *moderate* within the context of the sub-region and potential viewing areas and landscape types identified and mapped indicating potential sensitivity to the proposed development. Sensitivity to the project is considered *low* primarily due to the mining nature and character of the study area and that the public have not raised visual issues as a concern[4].

Offsets equivalent to the current heights and proposed final heights of the most prominent features of the Mn48 Project were used to generate theoretical viewsheds that illustrate potential visibility of the project during operation. The visibility of the approved Lehating Project was also generated and compared with the Mn48 Project model. The Mn48 Project will cause an insignificant increase in potential visibility.

Visual impacts will be caused by activities associated with the amended Project. However, what is being assessed in this report, is the *difference* between the approved Lehating Project and the proposed Mn48 Project. When compared, the significance of visual impact (based on the worst-case scenario – i.e. a poorly managed mine) will be *high* in both scenarios.

With mitigation the impact, again for both scenarios, is rated *moderate,* i.e. the impact will cause a partial loss of or alteration to key landscape elements and visual characteristics of the baseline. i.e. the impact will cause a moderate alteration (cumulative) to the visual quality of the study area due to the physical presence, scale, and size of the project infrastructure. Targets, limits, and thresholds of concern may occasionally be exceeded and are likely to require some intervention. Occasional complaints can be expected from the nearby homesteads. Mitigation is required to contain the negative impact of the worst-case (unmanaged) scenario.

This study shows that there is no increase in the significance of cumulative visual impact of the Mn48 Project relative to the Lehating EMPr approved Project. Management measures are possible and required to ensure, that at closure, the site has been effectively rehabilitated and can be sustained in the long term.

Opinion of the author

It is the opinion of the author that all aspects of the Mn48 Project, from a potential visual impact perspective, should be approved provided that the mitigation/management measures are effectively implemented, managed, and monitored in the long term.

** GYLA **

[4] This is an assumption at this point as the public participation process has not yet been completed. It is based on the fact that the Project site is located within and area already developed for mining and that there are few highly sensitive exposed viewing areas within the study area and the results of the SLR 2014 EIA which confirmed this.

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To reach an understanding of the effect of development on a landscape resource, it is necessary to consider the different aspects of the landscape as follows:

Landscape Elements and Character

The individual elements that make up the landscape, including prominent or eye-catching features such as hills, valleys, savannah, trees, water bodies, buildings and roads are generally quantifiable and can be easily described.

Landscape character is therefore the description of pattern, resulting from combinations of natural (physical and biological) and cultural (land use) factors and how people perceive these. The visual dimension of the landscape reflects the way in which these factors create repetitive groupings and interact to create areas that have a specific visual identity. The process of landscape character assessment can increase appreciation of what makes the landscape distinctive and what is important about an area. The description of landscape character thus focuses on the *nature of the land*, rather than the response of a viewer.

Landscape Value – all encompassing (Aesthetic Value)

Aesthetic value is the emotional response derived from the experience of the environment with its particular natural and cultural attributes. The response can be either to visual or non-visual elements and can embrace sound, smell and any other factor having a strong impact on human thoughts, feelings and attitudes (Ramsay 1993). Thus, aesthetic value encompasses more than the seen view, visual quality or scenery, and includes atmosphere, landscape character and sense of place (Schapper 1993).

Aesthetic appeal (value) is considered high when the following are present (Ramsay 1993):

- *Abstract qualities*: such as the presence of vivid, distinguished, uncommon or rare features or abstract attributes.
- *Evocative responses*: the ability of the landscape to evoke particularly strong responses in community members or visitors.
- *Meanings*: the existence of a long-standing special meaning to a particular group of people or the ability of the landscape to convey special meanings to viewers in general.
- *Landmark quality*: a feature that stands out and is recognised by the broader community.

Sense of Place

Central to the concept of a sense of place is that the place requires uniqueness and distinctiveness. The primary informant of these qualities is the spatial form and character of the natural landscape together with the cultural transformations and traditions associated with historic use and habitation. According to Lynch (1992) sense of place "is the extent to which a person can recognize or recall a place as being distinct from other places - as having a vivid, or unique, or at least particular, character of its own". Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. In some cases, these values allocated to the place are similar for a wide spectrum of users or viewers, giving the place a universally recognized and therefore, strong sense of place.

Scenic Quality

Assigning values to visual resources is a subjective process. The phrase, “beauty is in the eye of the beholder,” is often quoted to emphasize the subjectivity in determining scenic values. Yet, researchers have found consistent levels of agreement among individuals asked to evaluate visual quality.

Studies for perceptual psychology have shown human preference for landscapes with a higher visual

complexity particularly in scenes with water, over homogeneous areas. Based on contemporary research landscape quality increases when:

- Topographic ruggedness and relative relief increase.
- Where water forms are present.
- Where diverse patterns of grasslands and trees occur.
- Where natural landscape increases and man-made landscape decreases.
- And where land use compatibility increases and land use edge diversity decreases (Crawford 1994).

Scenic Quality - Explanation of Rating Criteria:

(After The Visual Resource Management System, Department of the Interior of the USA Government, Bureau of Land Management)

Landform: Topography becomes more interesting as it gets steeper or more massive, or more severely or universally sculptured. Outstanding landforms may be monumental, as the Fish River or Blyde River Canyon, the Drakensberg or other mountain ranges, or they may be exceedingly artistic and subtle as certain pinnacles, arches, and other extraordinary formations.

Vegetation: (Plant communities) Give primary consideration to the variety of patterns, forms, and textures created by plant life. Consider short-lived displays when they are known to be recurring or spectacular (wildflower displays in the Karoo regions). Consider also smaller scale vegetational features, which add striking and intriguing detail elements to the landscape (e.g., gnarled or wind beaten trees, and baobab trees).

Water: That ingredient which adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration in selecting the rating score.

Colour: Consider the overall colour(s) of the basic components of the landscape (e.g., soil, rock, vegetation, etc.) as they appear during seasons or periods of high use. Key factors to use when rating "colour" are variety, contrast, and harmony.

Adjacent Scenery: Degree to which scenery outside the scenery unit being rated enhances the overall impression of the scenery within the rating unit. The distance which adjacent scenery will influence scenery within the rating unit will normally range from 0-8 kilometres, depending upon the characteristics of the topography, the vegetative cover, and other such factors. This factor is generally applied to units which would normally rate incredibly low in score, but the influence of the adjacent unit would enhance the visual quality and raise the score.

Scarcity: This factor provides an opportunity to give added importance to one or all of the scenic features that appear to be relatively unique or rare within one physiographic region. There may also be cases where a separate evaluation of each of the key factors does not give a true picture of the overall scenic quality of an area. Often it is a number of not so spectacular elements in the proper combination that produces the most pleasing and memorable scenery - the scarcity factor can be used to recognize this type of area and give it the added emphasis it needs.

Cultural Modifications: Cultural modifications in the landform / water, vegetation, and addition of structures should be considered and may detract from the scenery in the form of a negative intrusion or complement or improve the scenic quality of a unit.

Scenic Quality Inventory and Evaluation Chart

(After The Visual Resource Management System, Department of the Interior of the USA Government, Bureau of Land Management)

Key factors	Rating Criteria and Score		
Landform	High vertical relief as expressed in prominent cliffs, spires, or massive rock outcrops, or severe surface variation or highly eroded formations including major badlands or dune systems; or detail features dominant and exceptionally striking and intriguing such as glaciers. **5**	Steep canyons, mesas, buttes, cinder cones, and drumlins; or interesting erosional patterns or variety in size and shape of landforms; or detail features which are interesting though not dominant or exceptional. **3**	Low rolling hills, foothills, or flat valley bottoms; or few or no interesting landscape features. **1**
Vegetation and landcover	A variety of vegetative types as expressed in interesting forms, textures, and patterns. **5**	Some variety of vegetation, but only one or two major types. **3**	Little or no variety or contrast in vegetation. **1**
Water	Clear and clean appearing, still, or cascading white water, any of which are a dominant factor in the landscape. **5**	Flowing, or still, but not dominant in the landscape. **3**	Absent, or present, but not noticeable. **0**
Colour	Rich colour combinations, variety or vivid colour; or pleasing contrasts in the soil, rock, vegetation, water or snow fields. **5**	Some intensity or variety in colours and contrast of the soil, rock and vegetation, but not a dominant scenic element. **3**	Subtle colour variations, contrast, or interest; generally mute tones. **1**
Influence of adjacent scenery	Adjacent scenery greatly enhances visual quality. **5**	Adjacent scenery moderately enhances overall visual quality. **3**	Adjacent scenery has little or no influence on overall visual quality. **0**
Scarcity	One of a kind; or unusually memorable, or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing, etc. National and provincial parks and conservation areas *** 5+**	Distinctive, though somewhat similar to others within the region. **3**	Interesting within its setting, but fairly common within the region. **1**
Cultural modifications	Modifications add favourably to visual variety while promoting	Modifications add little or no visual variety to the area, and introduce no	Modifications add variety but are very discordant and promote strong

	visual harmony. **2**	discordant elements. **0**	disharmony. **4**

Scenic Quality (i.e. value of the visual resource)

In determining the quality of the visual resource both the objective and the subjective or aesthetic factors associated with the landscape are considered. Many landscapes can be said to have a strong sense of place, regardless of whether they are considered to be scenically beautiful but where landscape quality, aesthetic value and a strong sense of place coincide - the visual resource or perceived value of the landscape is considered to be very high.

When considering both objective and subjective factors associated with the landscape there is a balance between landscape character and individual landscape features and elements, which would result in the values as follows:

Value of Visual Resource – expressed as Scenic Quality
(After The Landscape Institute with the Institute of Environmental Management and Assessment (2002))

High	Moderate	Low
Areas that exhibit an incredibly positive character with valued features that combine to give the experience of unity, richness and harmony. These are landscapes that may be of importance to conserve and which may be sensitive change in general and which may be detrimental if change is inappropriately dealt with.	Areas that exhibit positive character, but which may have evidence of alteration to /degradation/erosion of features resulting in areas of more mixed character. Potentially sensitive to change in general; again, change may be detrimental if inappropriately dealt with but it may not require special or particular attention to detail.	Areas generally negative in character with few, if any, valued features. Scope for positive enhancement frequently occurs.

A visual impact study analysis addresses the importance of the inherent aesthetics of the landscape, the public value of viewing the natural landscape, and the contrast or change in the landscape from the project.

For some topics, such as water or air quality, it is possible to use measurable, technical international or national guidelines or legislative standards, against which potential effects can be assessed. The assessment of likely effects on a landscape resource and on visual amenity is more complex, since it is determined through a combination of quantitative and qualitative evaluations. (The Landscape Institute with the Institute of Environmental Management and Assessment (2002).

Landscape impact assessment includes a combination of objective and subjective judgements, and it is therefore important that a structured and consistent approach is used. It is necessary to differentiate between judgements that involve a degree of subjective opinion (as in the assessment of landscape value) from those that are normally more objective and quantifiable (as in the determination of magnitude of change). Judgement should always be based on training and experience and be supported by clear evidence and reasoned argument. Accordingly, suitably qualified and experienced landscape professionals carry out landscape and visual impact assessments (The Landscape Institute with the Institute of Environmental Management and Assessment (2002),

Landscape and visual assessments are separate, although linked, procedures. The landscape baseline, its analysis and the assessment of landscape effects all contribute to the baseline for visual assessment studies. The assessment of the potential effect on the landscape is carried our as an effect on an environmental resource, i.e. the landscape. Visual effects are assessed as one of the interrelated effects on population.

Landscape Impact

Landscape impacts derive from changes in the physical landscape, which may give rise to changes in its character and from effects to the scenic values of the landscape. This may in turn affect the perceived value ascribed to the landscape. The description and analysis of effects on a landscape resource relies on the adoption of certain basic principles about the positive (or beneficial) and negative (or adverse) effects of change in the landscape. Due to the inherently dynamic nature of the landscape, change arising from a development may not necessarily be significant (Institute of Environmental Assessment & The Landscape Institute (2002)).

Visual Impact

Visual impacts relate to the changes that arise in the composition of available views as a result of changes to the landscape, to people's responses to the changes, and to the overall effects with respect to visual amenity. Visual impact is therefore measured as the change to the existing visual environment (caused by the physical presence of a new development) and the extent to which that change compromises (negative impact) or enhances (positive impact) or maintains the visual quality of the area.

To assess the magnitude of visual impact four main factors are considered.

Visual Intrusion:	The nature of intrusion or contrast (physical characteristics) of a project component on the visual quality of the surrounding environment and its compatibility/discord with the landscape and surrounding land use.
Visibility:	The area/points from which project components will be visible.
Visual exposure:	Visibility and visual intrusion qualified with a distance rating to indicate the degree of intrusion.
Sensitivity:	Sensitivity of visual receptors to the proposed development

Visual Intrusion / contrast

Visual intrusion deals with the notion of contextualism i.e. how well does a project component fit into the ecological and cultural aesthetic of the landscape as a whole? Or conversely what is its contrast with the receiving environment. Combining landform / vegetation contrast with structure contrast derives overall visual intrusion/contrast levels of high, moderate, and low.

Landform / vegetation contrast is the change in vegetation cover and patterns that would result from construction activities. Landform contrast is the change in landforms, exposure of soils, potential for erosion scars, slumping, and other physical disturbances that would be noticed as uncharacteristic in the natural landscape. Structure contrast examines the compatibility of the proposed development with other structures in the landscape and the existing natural landscape. Structure contrast is typically strongest where there are no other structures (e.g., buildings, existing utilities) in the landscape setting.

Photographic panoramas from key viewpoints before and after development are presented to illustrate the nature and change (contrast) to the landscape created by the proposed development. A computer simulation technique is employed to superimpose a graphic of the development onto the panorama. The extent to which the component fits or contrasts with the landscape setting can then be assessed using the following criteria.

- Does the physical development concept have a negative, positive, or neutral effect on the quality of the landscape?
- Does the development enhance or contrast with the patterns or elements that define the structure of the landscape?
- Does the design of the project enhance and promote cultural continuity, or does it disrupt it?

The consequence of the intrusion / contrast can then be measured in terms of the sensitivity of the affected landscape and visual resource given the criteria listed below. For instance, within an industrial area, a new sewage treatment works may have an insignificant landscape and visual impact; whereas in a *valued* landscape it might be considered to be an intrusive element. (Institute of Environmental Assessment & The landscape Institute (1996)).

Visual Intrusion

High	Moderate	Low	Positive
If the project: - Has a substantial negative effect on the visual quality of the landscape. - Contrasts dramatically with the patterns or elements that define the structure of the landscape. - Contrasts dramatically with land use, settlement or enclosure patterns. - Is unable to be 'absorbed' into the landscape.	If the project: - Has a moderate negative effect on the visual quality of the landscape. - Contrasts moderately with the patterns or elements that define the structure of the landscape. - Is partially compatible with land use, settlement or enclosure patterns. - Is partially 'absorbed' into the landscape.	If the project: - Has a minimal effect on the visual quality of the landscape. - Contrasts minimally with the patterns or elements that define the structure of the landscape. - Is mostly compatible with land use, settlement or enclosure patterns. - Is 'absorbed' into the landscape.	If the project: - Has a beneficial effect on the visual quality of the landscape. - Enhances the patterns or elements that define the structure of the landscape. - Is compatible with land use, settlement or enclosure patterns.

Result Notable change in landscape characteristics over an extensive area and/or intensive change over a localized area resulting in major changes in key views.	*Result* Moderate change in landscape characteristics over localized area resulting in a moderate change to key views.	*Result* Imperceptible change resulting in a minor change to key views.	*Result* Positive change in key views.

Visual intrusion also diminishes with scenes of higher complexity, as distance increases, the object becomes less of a focal point (more visual distraction), and the observer's attention is diverted by the complexity of the scene (Hull and Bishop (1988)).

Visibility

A viewshed analysis was carried out to define areas, which contain all possible observation sites from which the development would be visible. The basic assumption for preparing a viewshed analysis is that the observer eye height is 1.8m above ground level. Topographic data was captured for the site and its environs at 10 m contour intervals to create the Digital Terrain Model (DTM). The DTM includes features such as vegetation, rivers, roads and nearby urban areas. These features were 'draped' over the topographic data to complete the model used to generate the viewshed analysis. It should be noted that viewshed analyses are not absolute indicators of the level of significance (magnitude) of the impact in the view, but merely a statement of the fact of potential visibility. The visibility of a development and its contribution to visual impact is predicted using the criteria listed below:

Visibility

High	Moderate	Low
Visual Receptors If the development is visible from over half the zone of potential influence, and/or views are mostly unobstructed and/or the majority of viewers are affected.	*Visual Receptors* If the development is visible from less than half the zone of potential influence, and/or views are partially obstructed and or many viewers are affected	*Visual Receptors* If the development is visible from less than a quarter of the zone of potential influence, and/or views are mostly obstructed and/or few viewers are affected.

Visual Exposure

Visual exposure relates directly to the distance of the view. It is a criterion used to account for the limiting effect of increased distance on visual impact. The impact of an object in the foreground (0 – 800m) is greater than the impact of that same object in the middle ground (800m – 5.0 km) which, in turn is greater than the impact of the object in the background (greater than 5.0 km) of a particular scene.

Distance from a viewer to a viewed object or area of the landscape influences how visual changes are perceived in the landscape. Generally, changes in form, line, colour, and texture in the landscape become less perceptible with increasing distance.

Areas seen from 0 to 800m are considered foreground; foliage and fine textural details of vegetation are normally perceptible within this zone.

Areas seen from 800m to 5.0km are considered middle ground; vegetation appears as outlines or patterns.

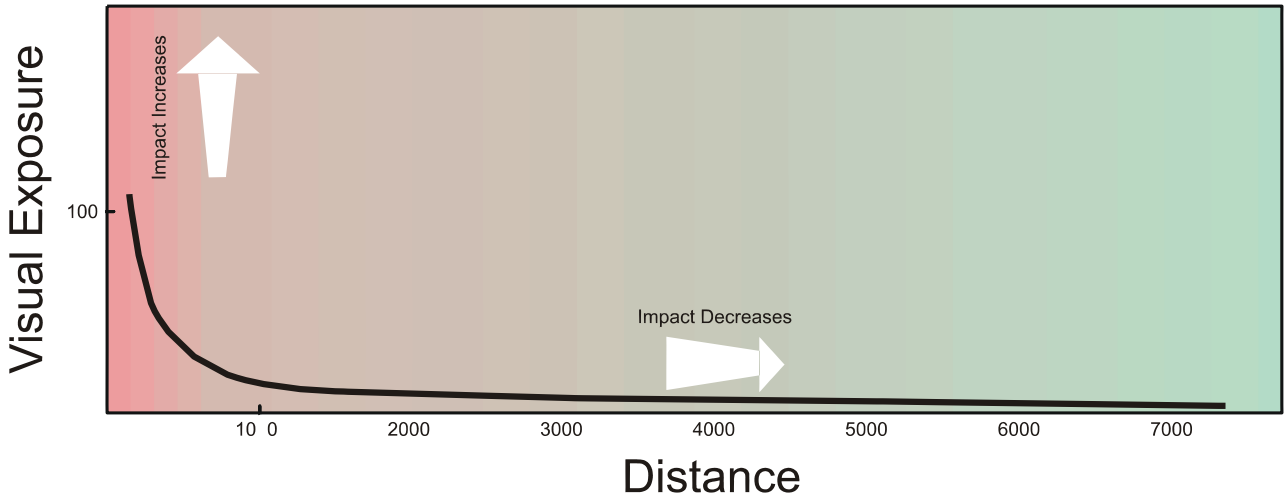
Depending on topography and vegetation, middle ground is sometimes considered to be up to 8.0km.

Areas seen from 5.0km to 8.0km and sometimes up to 16km and beyond are considered background. Landforms become the most dominant element at these distances.

Seldom seen areas are those portions of the landscape that, due to topographic relief or vegetation, are screened from the viewpoint or are beyond 16km from the viewpoint. Landforms become the most dominant element at these distances.

The impact of an object diminishes at an exponential rate as the distance between the observer and the object increases. Thus, the visual impact at 1000 m would be 25% of the impact as viewed from 500 m. At 2000 m it would be 10% of the impact at 500 m. The inverse relationship of distance and visual impact is well recognised in visual analysis literature (e.g.: Hull and Bishop (1988)) and is used as an important criteria for the study. This principle is illustrated in the Figures below.

Effect of Distance on Visual Exposure



View from 10 000 metres

View from 5 000 metres

View from 3 000 metres

View from 1 000 metres

Sensitivity of Visual Receptors

When visual intrusion, visibility and visual exposure are incorporated, and qualified by sensitivity criteria (visual receptors) the magnitude of the impact of the development can be determined.

The sensitivity of visual receptors and views will be depended on:

- The location and context of the viewpoint.
- The expectations and occupation or activity of the receptor.
- The importance of the view (which may be determined with respect to is popularity or numbers of people affected, its appearance in guidebooks, on tourist maps, and in the facilities provided for its enjoyment and references to it in literature or art).

The most sensitive receptors may include:

- Users of all outdoor recreational facilities including public rights of way, whose intention or interest may be focused on the landscape.
- Communities where the development results in changes in the landscape setting or valued views enjoyed by the community.
- Occupiers of residential properties with views affected by the development.
- These would all be high

Other receptors include:

- People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value).
- People travelling through or past the affected landscape in cars, on trains or other transport routes.
- People at their place of work.

The least sensitive receptors are likely to be people at their place of work, or engaged in similar activities, whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view.

In this process more weight is usually given to changes in the view or visual amenity which are greater in scale, and visible over a wide area. In assessing the effect on views, consideration should be given to the effectiveness of mitigation measures, particularly where planting is proposed for screening purposes (Institute of Environmental Assessment & The Landscape Institute (1996).

Sensitivity of Visual Receptors

High	Moderate	Low
Users of all outdoor recreational facilities including public rights of way, whose intention or interest may be focused on the landscape.	People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value).	The least sensitive receptors are likely to be people at their place of work, or engaged in similar activities, whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view (i.e. office and industrial areas).
Communities where the development results in changes in the landscape setting or valued views enjoyed by the community.	People travelling through or past the affected landscape in cars, on trains or other transport routes.	Roads going through urban and industrial areas
Occupiers of residential properties		

with views affected by the development.

Intensity of the Visual Impact

Potential visual impacts are determined by analysing how the physical change in the landscape, resulting from the introduction of a project, are viewed and perceived from sensitive viewpoints. Impacts to views are the highest when viewers are identified as being sensitive to change in the landscape, and their views are focused on and dominated by the change. Visual impacts occur when changes in the landscape are noticeable to viewers looking at the landscape from their homes or from parks, and conservation areas, highways and travel routes, and important cultural features and historic sites, especially in foreground views.

The magnitude of impact is assessed through a synthesis of visual intrusion, visibility, visual exposure and viewer sensitivity criteria. Once the magnitude of impact has been established this value is further qualified with spatial, duration and probability criteria to determine the *significance* of the visual impact.

For instance, the fact that visual intrusion and exposure diminishes significantly with distance does not necessarily imply that the relatively small impact that exists at greater distances is unimportant. The level of impact that people consider acceptable may be dependent upon the purpose they have in viewing the landscape. A particular development may be unacceptable to a hiker seeking a natural experience, or a household whose view is impaired, but may be barely noticed by a golfer concentrating on his game or a commuter trying to get to work on time (Ittleson *et al.,* 1974).

In synthesising these criteria a numerical or weighting system is avoided. Attempting to attach a precise numerical value to qualitative resources is rarely successful, and should not be used as a substitute for reasoned professional judgement. (Institute of Environmental Assessment and The landscape Institute (1996)).

Intensity (Intensity) of Visual Impact

High	Moderate	Low	Negligible
Total loss of or major alteration to key elements/features/characteristics of the baseline.	Partial loss of or alteration to key elements/features/characteristics of the baseline.	Minor loss of or alteration to key elements/features/characteristics of the baseline.	Very minor loss or alteration to key elements/features/characteristics of the baseline.
I.e. Pre-development landscape or view and/or introduction of elements considered to be totally uncharacteristic when set within the attributes of the receiving landscape.	I.e. Pre-development landscape or view and/or introduction of elements that may be prominent but may not necessarily be substantially uncharacteristic when set within the attributes of the receiving landscape.	I.e. Pre-development landscape or view an/or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape.	I.e. Pre-development landscape or view and/or introduction of elements that are not uncharacteristic with the surrounding landscape – approximating the 'no change' situation.

High scenic quality impacts would result.	Moderate scenic quality impacts would result	Low scenic quality impacts would result.	Negligible scenic quality impacts would result.

Cumulative effects

Cumulative landscape and visual effects (impacts) result from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future. They may also affect the way in which the landscape is experienced. Cumulative effects may be positive or negative. Where they comprise a range of benefits, they may be considered to form part of the mitigation measures.

Cumulative effects can also arise from the intervisibility (visibility) of a range of developments and /or the combined effects of individual components of the proposed development occurring in different locations or over a period of time. The separate effects of such individual components or developments may not be significant, but together they may create an unacceptable degree of adverse effect on visual receptors within their combined visual envelopes. Intervisibility depends upon general topography, aspect, tree cover or other visual obstruction, elevation and distance, as this affects visual acuity, which is also influenced by weather and light conditions. (Institute of Environmental Assessment and The landscape Institute (1996)).

APPENDIX C: CRITERIA FOR SIGNIFICANCE OF IMPACT ASSESSMENT

PART A: DEFINITIONS AND CRITERIA*		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of intensity, spatial extent and duration**
Criteria for ranking of the INTENSITY of environmental impacts	**VH**	Severe change, disturbance or degradation. Associated with severe consequences. May result in severe illness, injury or death. Targets, limits and thresholds of concern continually exceeded. Substantial intervention will be required. Vigorous/widespread community mobilization against project can be expected. May result in legal action if impact occurs.
	H	Prominent change, disturbance or degradation. Associated with real and substantial consequences. May result in illness or injury. Targets, limits and thresholds of concern regularly exceeded. Will require intervention. Threats of community action. Regular complaints can be expected when the impact takes place.
	M	Moderate change, disturbance or discomfort. Associated with real but not substantial consequences. Targets, limits and thresholds of concern may occasionally be exceeded. Likely to require some intervention. Occasional complaints can be expected.
	L	Minor (Slight) change, disturbance or nuisance. Associated with minor consequences or deterioration. Targets, limits and thresholds of concern rarely exceeded. Require only minor interventions or clean-up actions. Sporadic complaints could be expected.
	VL	Negligible change, disturbance or nuisance. Associated with very minor consequences or deterioration. Targets, limits and thresholds of concern never exceeded. No interventions or clean-up actions required. No complaints anticipated.
	VL+	Negligible change or improvement. Almost no benefits. Change not measurable/will remain in the current range.
	L+	Minor change or improvement. Minor benefits. Change not measurable/will remain in the current range. Few people will experience benefits.
	M+	Moderate change or improvement. Real but not substantial benefits. Will be within or marginally better than the current conditions. Small number of people will experience benefits.
	H+	Prominent change or improvement. Real and substantial benefits. Will be better than current conditions. Many people will experience benefits. General community support.
	VH+	Substantial, large-scale change or improvement. Considerable and widespread benefit. Will be much better than the current conditions. Favourable publicity and/or widespread support expected.
Criteria for ranking the DURATION of impacts	**VL**	Very short, always less than a year. Quickly reversible
	L	Short-term, occurs for more than 1 but less than 5 years. Reversible over time.
	M	Medium-term, 5 to 10 years.
	H	Long term, between 10 and 20 years. (Likely to cease at the end of the operational life of the activity)
	VH	Very long, permanent, +20 years (Irreversible. Beyond closure)
Criteria for ranking the EXTENT of impacts	**VL**	A part of the site/property.
	L	Whole site.
	M	Beyond the site boundary, affecting immediate neighbours
	H	Local area, extending far beyond site boundary.
	VH	Regional/National

PART B: DETERMINING CONSEQUENCE							
			EXTENT				
			A part of the site/property	Whole site	Beyond the site, affecting neighbours	Local area, extending far beyond site.	Regional/ National
			VL	L	M	H	VH
INTENSITY = VL							
DURATION	Very long	VH	Low	Low	Medium	Medium	High
	Long term	H	Low	Low	Low	Medium	Medium
	Medium term	M	Very Low	Low	Low	Low	Medium
	Short term	L	Very low	Very Low	Low	Low	Low
	Very short	VL	Very low	Very Low	Very Low	Low	Low
INTENSITY = L							
DURATION	Very long	VH	Medium	Medium	Medium	High	High
	Long term	H	Low	Medium	Medium	Medium	High
	Medium term	M	Low	Low	Medium	Medium	Medium
	Short term	L	Low	Low	Low	Medium	Medium
	Very short	VL	Very low	Low	Low	Low	Medium
INTENSITY = M							
DURATION	Very long	VH	Medium	High	High	High	Very High
	Long term	H	Medium	Medium	Medium	High	High
	Medium term	M	Medium	Medium	Medium	High	High
	Short term	L	Low	Medium	Medium	Medium	High
	Very short	VL	Low	Low	Low	Medium	Medium
INTENSITY = H							
DURATION	Very long	VH	High	High	High	Very High	Very High
	Long term	H	Medium	High	High	High	Very High
	Medium term	M	Medium	Medium	High	High	High
	Short term	L	Medium	Medium	Medium	High	High
	Very short	VL	Low	Medium	Medium	Medium	High
INTENSITY = VH							
DURATION	Very long	VH	High	High	Very High	Very High	Very High
	Long term	H	High	High	High	Very High	Very High
	Medium term	M	Medium	High	High	High	Very High
	Short term	L	Medium	Medium	High	High	High
	Very short	VL	Low	Medium	Medium	High	High
			VL	L	M	H	VH
			A part of the site/property	Whole site	Beyond the site, affecting neighbours	Local area, extending far beyond site.	Regional/ National
			EXTENT				

PART C: DETERMINING SIGNIFICANCE							
PROBABILITY (of exposure to impacts)	Definite/ Continuous	**VH**	**Very Low**	**Low**	**Medium**	**High**	**Very High**
	Probable	**H**	**Very Low**	**Low**	**Medium**	**High**	**Very High**
	Possible/ frequent	**M**	**Very Low**	**Very Low**	**Low**	**Medium**	**High**
	Conceivable	**L**	**Insignificant**	**Very Low**	**Low**	**Medium**	**High**
	Unlikely/ improbable	**VL**	**Insignificant**	**Insignificant**	**Very Low**	**Low**	**Medium**
			VL	**L**	**M**	**H**	**VH**
			CONSEQUENCE				

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
Very High	Potential fatal flaw unless mitigated to lower significance.
High	It must have an influence on the decision. Substantial mitigation will be required.
Medium	It should have an influence on the decision. Mitigation will be required.
Low	Unlikely that it will have a real influence on the decision. Limited mitigation is likely to be required.
Very Low	It will not have an influence on the decision. Does not require any mitigation
Insignificant	Inconsequential, not requiring any consideration.

APPENDIX D: CRITERIA FOR PHOTO / COMPUTER SIMULATION

To characterize the nature and magnitude of visual intrusion of the proposed project, a photographic simulation technique was used. This method was used according to Sheppard (in Lange 1994), where a visual simulation is good quality when the following five criteria are met.

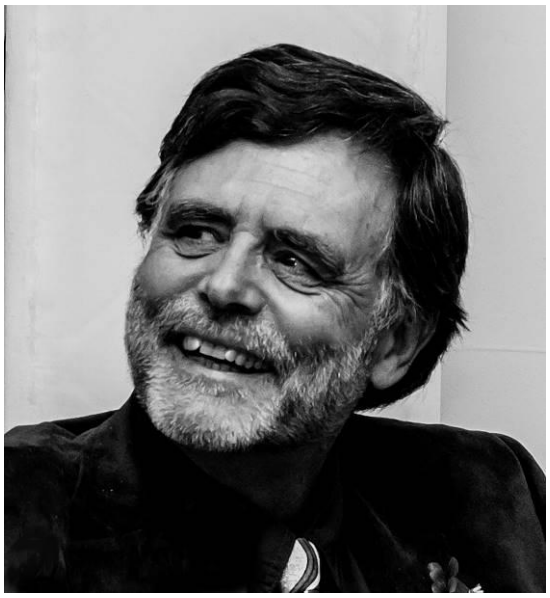
Representativeness:	A simulation should represent important and typical views of a project.
Accuracy:	The similarity between a simulation and the reality after the project has been realized.
Visual clarity:	Detail, parts and overall contents have to be clearly recognizable.
Interest:	A simulation should hold the attention of the viewer.
Legitimacy:	A simulation is defensible if it can be shown how it was produced and to what degree it is accurate.

To comply with this standard it was decided to produce a stationary or static simulation (Van Dortmont in Lange, 1994), which shows the proposed development from a typical static observation points (Critical View Points).

Photographs are taken on site during a site visit with a manual focus, 50mm focal depth digital camera. All camera settings are recorded and the position of each panoramic view is recorded by means of a GPS. These positions, coordinates are then placed on the virtual landscape (see below).

A scale model of the proposal is built in virtual space, scale 1:1, based on CAD (vector) information as supplied by the architect / designers. This model is then placed on a virtual landscape, scale 1:1, as produced by means of GIS software. The accuracy of this depends on the contour intervals.

The camera views are placed on the points as recorded on the virtual landscape. The respective photographs are overlaid onto the camera views, and the orientation of the cameras adjusted accordingly. The light source is adjusted to suit the view. Each view is then rendered as per the process above.



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Visual Impact Assessments

Graham is a registered landscape architect with interest and experience in landscape architecture, urban design and environmental planning. He holds a degree in landscape architecture from the University of Toronto and has practiced in Canada and Africa, where he has spent most of his working life. He has served as President of the Institute of Landscape Architects of South Africa (ILASA) and as Vice President of the Board of Control for Landscape Architects.

During his 30 years plus career he has received numerous ILASA and other industry awards. He has published widely on landscape architectural issues and has had projects published both locally and internationally in, scientific and design journals and books. He was a being a founding member of Newtown Landscape Architects and is also a senior lecturer, teaching landscape architecture and urban design at post and under graduate levels, at the University of Pretoria. He has been a visiting studio critic at the University of Witwatersrand and University of Cape Town and in 2011 was invited to the University of Rhode Island, USA as their Distinguished International Scholar for that year. Recently, Graham resigned from NLA and now practices as a Sole Proprietor.

A niche specialty of his is Visual Impact Assessment for which he was cited with an ILASA Merit Award in 1999. He has completed over 250 specialist reports for projects in South Africa, Canada and other African countries. He was on the panel that developed the *Guideline for Involving Visual and Aesthetic Specialists in EIA Processes* (2005) and produced a research document for Eskom, *The Visual Impacts of Power Lines* (2009). In 2011, he produced '*Guidelines for involving visual and aesthetic specialists'* for the Aapravasi

Ghat Trust Fund Technical Committee (they manage a World Heritage Site) along with the *Visual Impact Assessment Training Module Guideline Document.*

*** GYLA ***