Visual Impact Assessment Report

Proposed Kusile 60 Year Ash Disposal Facility, Gauteng / Mpumalanga Province

Mitha Cilliers (Pr LArch)

Newtown Landscape Architects

PROPOSED KUSILE 60 YEAR ASH DISPOSAL FACILITY PROJECT

BRONKHORSTSPRUIT, GAUTENG PROVINCE / OGIES MPUMALANGA PROVINCE

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Reference:	Kusile 60 Year Project

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Experience	Graham is a landscape architect with thirty years' experience. He has worked in Southern Africa and Canada and has valuable expertise in the practice of landscape architecture, urban design and environmental planning. He is also a senior lecturer, teaching urban design and landscape architecture at post and under graduate levels at the University of Pretoria. He specializes in Visual Impact Assessments and has won an Institute of Landscape Architects Merit Award for his VIA work.

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Experience	Yonanda Martin has been doing visual impact assessments for Newtown Landscape Architects since 2006. She has experience in a wide range of visual impact assessments which include visual impacts for game lodges, transmission lines, roads, mines and telecommunication masts. Projects that she worked on include: • **Eskom Ngwedi Substation** (PBAI), North West Province • **NBC Belfast Project** (Exxaro), Mpumalanga • **Tamboti Platinum Mine** (Metago), Limpopo • **De Wittekrans** (GCS), Mpumalanga • **Dorsfontein West Expansion** (GCS (Pty) Ltd), Kriel • **Ferreira Coal Mining** (GCS (Pty) Ltd), Ermelo • **Eskom Honingklip** (Kv3 Engineers), Muldersdrift • **SANRAL PWV3** (Jeffares & Green), Hartbeespoort

Name	Mitha Cilliers
Qualification	Pr LArch
Professional Registration	South African Council for the Landscape Architectural Profession (SACLAP)
Experience in Years	9 years
Experience	Mitha is a landscape architect with nine years experience. She has worked as Landscape Architect in South Africa and Angola and has valuable expertise in the practice of landscape architecture and environmental planning. She has been working on visual impact assessments for Newtown Landscape Architects since 2008. She has experience in a wide range of visual impact assessments which include visual impacts for game lodges, transmission lines, solar parks and mines.

ACRONYMS, ABBREVIATIONS & GLOSSARY

Acronyms & Abbreviations	
CSIR	Council for Scientific and Industrial Research
EIA	Environmental Impact Assessment
IFC	International Finance Corporation
NLA	Newtown Landscape Architects
SACLAP	South African Council for the Landscape Architectural Profession
VIA	Visual Impact Assessment

Glossary	
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).
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 virtue of 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 purpose of this report the Kusile 60 Year Project 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 15km radius surrounding the proposed project footprint / site.
Project Footprint / Site	For the purpose of this report the Kusile 60 Year Ash Dump Project *site* / *footprint* refers to the actual layout of the project.
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. *Genius loci* literally means 'spirit of the place'.
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 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 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 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

Newtown Landscape Architects (NLA) was commissioned by Zitholele Consulting to carry out a Visual Impact Assessment (VIA) for the proposed Kusile 60 year Ash Disposal Project half way between Bronkhorstspruit, Gauteng Province and Ogies, Mpumalanga Province ("the Project"). This Ash Disposal Facility will service the new coal fired Kusile Power Station, currently under construction. The proposed Kusile 60 Year Ash Disposal Project forms an integral part of the power station storing the residue of the coal combustion process and would have a storage operations lifetime of 60 years.

The Project would encompass the following components:

- A dry ash disposal facility of estimated 1500 ha (including associated infrastructure such as stackers, ash water return dams, pipelines and conveyors).
- A conveyor belt for the transportation of ash to the ash disposal facility.
- The waste stream comprises of a combined bottom ash and fly ash waste stream.
- Services including electricity and water supply in the form of power lines, pipelines, and associated infrastructure; as well as
- Access and maintenance roads to the site.

Five alternative sites have been identified for further investigation during a Site Screening Exercise conducted by Jones Wagner Consulting Civil Engineers. From the comparative analysis *Site A* was identified as the preferred alternative as it would result in the least spread of support infrastructure such as the conveyors and maintenance roads and is located directly adjacent to Kusile Power Station. *Site A* was therefore further assessed in terms of its impact on the receiving visual environment – landscape character (physical) and sense of place (perceptual).

The landscape is characterised by an undulating topography in the east growing more mountainous towards the west. A couple of small kopies occur randomly within the study area. Various perennial and no-perennial streams interweave through the study area. Grassland is also associated with wetlands and water bodies that speckle the study area. From the discussion in Section 6.2, the sense of place was determined to be mixed industrial / pastoral.

The *severity* of visual impact had been rated as ***moderate***. The Project would be prominent but may not necessarily be considered to be substantially uncharacteristic when set within the attributes of the receiving landscape. Construction of the Kusile Power Station would have been completed and the station fully operational by the time of the implementation of the ash disposal facility. The Project would in most instances be viewed against a backdrop including the Kusile Power Station.

It should however be noted that after the life time of the power station, it may be disassembled and demolished thus reducing the negative visual impact. The ash disposal facility however, would remain on site after its operational life has been completed. This dump will then become part of the characteristics of the landscape. It is therefore very important that the ash disposal facility should be rehabilitated in a way that would be best fitting into the natural (undisturbed) features of the environmental setting at the end of the

operational life of the facility.

Section 10 proposed some mitigation to consider and apply during the life time of the Project. The intention of these mitigation measures is to reduce the negative impact that would result from the implementation of the Project, on the visual environment – landscape characteristics (physical) and sense of place (perceptual).

The *Significance* of the Construction and Operational Phases, both prior to and after the correct and effective application of mitigation measures, was rated as ***high***. This is due to the fact that residents and travellers will still be able to see the construction and operational activities due to the landscape character and height of structures. Mitigation will only partially obstruct views. The body of the facility would remain after the operational life time. However it can be rehabilitated to blend in with the natural environmental setting to reduce the contrast between the facility and the surrounding landscape character. Thus the *Significance* rating dropped from a '4' *before mitigation* to '3.7' *after mitigation* which was however not enough to result in a drop in significance rating.

Even though mitigation measures would not result in a lower *Significance* rating, the client is still encouraged to implement these measures to the best practice as it would definitely result in a lower *severity* of the visual impact on the affected high sensitivity locations, farmsteads and residences, within the study area.

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1. INTRODUCTION

1.1 Project Overview and Background

Newtown Landscape Architects (NLA) was commissioned by Zitholele Consulting to carry out a Visual Impact Assessment (VIA) for the proposed Kusile 60 year Ash Disposal Project half way between Bronkhorstspruit, Gauteng Province and Ogies, Mpumalanga Province ("the Project"). This Ash Disposal Facility will service the new coal fired Kusile Power Station, currently under construction. The proposed Kusile 60 Year Ash Disposal Project forms an integral part of the power station storing the residue of the coal combustion process and would have a storage operations lifetime of 60 years.

Five alternative sites have been identified for further investigation during a Site Screening Exercise conducted by Jones Wagner Consulting Civil Engineers.

1.2 Proposed Study Area

As stated above, the project site is situated half way between Bronkhorstspruit, Gauteng Province and Ogies, Mpumalanga Province between the N4 and N12 national roads within an area of approximately 13 500ha within a radius of 15km around the new Kusile Power Station. Refer to Figure 1 below for the location of the study area.

1.3 Objective of the Specialist Study

The main aim of the visual impact specialist study is to ensure that the visual / aesthetic consequences of the proposed project are understood and adequately considered in the environmental planning process. This report will compare the anticipated impacts of the 5 identified alternatives on the receiving landscape and sensitive viewer locations. In the final assessment phase the preferred alternative will be evaluated in terms of its anticipated impact on the receiving visual environment. Detailed mitigation measures that could reduce the impact of the Project, will also be proposed after the impact assessment section.

1.4 Terms and Reference

The following terms of reference were established for the Visual Impact Assessment. For a full description of the terms of reference, please refer to the Specialist Quotation and Appointment letter.

1.4.1 Scoping Phase – Baseline Survey

This phase involves a site visit over one and a half days (including travel time). The study area will be visited and data collected and photographs taken from potential sensitive viewing locations. Data collected during the site visit will allow for a comprehensive description and characterization of the receiving environment and would identify issues that may need to be addressed in the impact assessment phase should it be required. This phase will conclude with a comparative analysis of the five identified site alternatives.

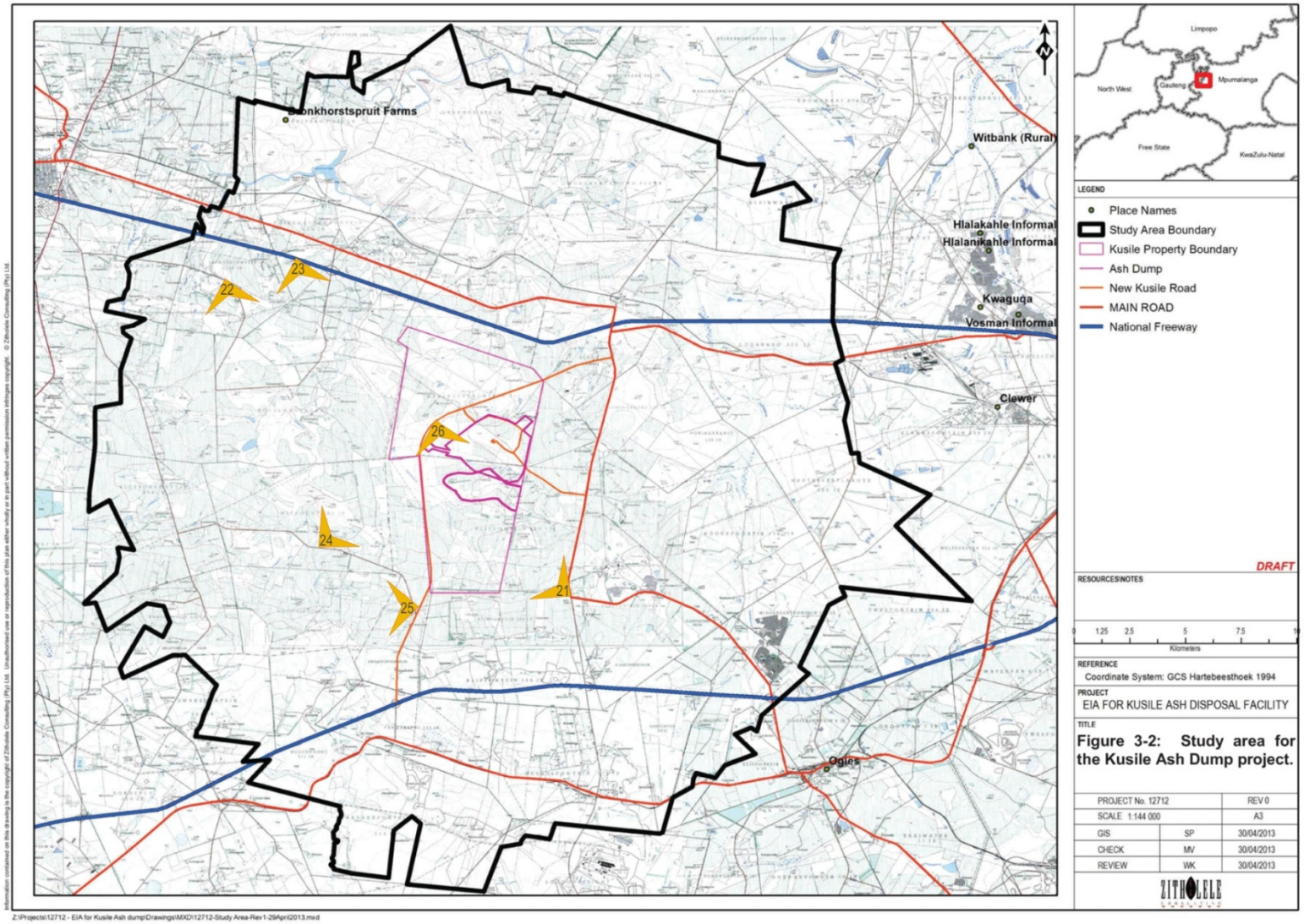

Figure 1: STUDY AREA LOCALITY & PANORAMA VIEWS - Kusile 60 Year Ash Disposal Facility

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1.4.2 Evaluation Phase - Impact Assessment

This phase involves the determination of impacts and would utilize modelling techniques that establish visual intrusion, visibility and visual exposure of the project components. These criteria are required to rate the magnitude of the impact. The significance of the impact will be determined using the format/criteria provided by Zitholele. A full specialist report will be produced. The report will read as a 'stand-alone' document that can be incorporated into the EIA.

The scope of work is itemized below for ease of reference. If however there are aspects that need elaboration please let me know.

1.5 Assumption, Uncertainties and Limitations

For the significance rating it is assumed that all proposed mitigation measures would be implemented correctly and effectively.

2. LEGAL REQUIREMENTS AND GUIDELINES

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

2.1 National Guidelines

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

The specialist report is in accordance to the specification on conducting specialist studies as per Government Gazette (GN) R 543 of the National Environmental Management Act (NEMA) Act 107 of 1998. The mitigation measures as stipulated in the specialist report can be used as part of the Environmental Management Plan (EMP) and will be in support of the Environmental Impact Assessment (EIA).

The NEMA Protected Areas Act (57 of 2003)

The main aim of the Act is to identify and protect natural landscapes. According to the 2010 regulations there are specific regulations for compilation of specialist report. This VIA report adheres to these specifications.

The National Heritage Resources Act (25 of 1999)

The Act is applicable to the protection of heritage resources and includes the visual resources such as cultural landscapes, nature reserves, proclaimed scenic routes and urban conservation areas.

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 it provides guidance that will be appropriate for any EIA process. The Guideline document also seeks to clarify instances when a visual specialist should get involved in the EIA process.

2.2 International Guidelines

World Bank's IFC Standards

The World Bank's IFC Standards: Environmental, Health and Safety Guidelines for Mining refers to Visual Impact Assessments by stating that:

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

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

The specialists study is in accordance to the IFC Performance Standards (Performance Standard 1: Social and Environmental Assessment and Management Systems) for the undertaking of Environmental Assessments and contributes to the EIA for the proposed Project.

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. (The Landscape Institute with the Institute of Environmental Management and Assessment, 2002). When assessing visual impact the worst-case scenario is taken into account. 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 particular view or scene).

3.1.1 The Visual Resource

Landscape character, landscape quality (Warnock, S. & Brown, N., 1998) and “sense of place” (Lynch, K., 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 particular 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. On the basis of 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 (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 particular group of people or the ability of the landscape to convey special meanings to viewers in general;
- Landmark quality: a particular 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 (after Crawford, 1994).

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. 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 particular landscape type or area can accommodate change arising from a particular development, without detrimental effects on its character. Its determination is based upon an evaluation of each key element or characteristic of the landscape likely to be affected. The evaluation will reflect such factors such as its quality, value, contribution to landscape character, and the degree to which the particular element or characteristic can be replaced or substituted (Institute of Environmental Assessment & The Landscape Institute, 1996:87).

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 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.

Because the sense of place of the study area is derived from the emotional, aesthetic and visual response to the environment, it cannot be experienced in isolation. The landscape context must be considered. With this in mind, the combination of the natural landscape (mountains, streams and the vegetation) together with the manmade structures (residential areas, roads, mining activities and power lines) contribute to the sense of place for the study area. It is these land-uses, which define the area and establish its 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. This 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.

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 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.

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 traveling through or past the affected landscape in cars or other transport modes;
- People at their place of work.

Views from residences and tourist facilities / routes are typically more sensitive, since views from these are considered to be frequent and of long duration.

3.1.5 Landscape Impact

The landscape impact of a proposed development is measured as the change to the fabric, character and quality of the landscape caused by the physical presence of the proposed development. Identifying and describing the nature and intensity (severity) of change in the landscape brought about by the proposed new facility 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). 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 observable and an assessment of the anticipated visual intrusion can be made.

3.1.6 Visual Impact

Visual impacts are a subset of landscape impacts. 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 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 within a localized area (the site and its immediate surrounds).

3.1.7 Severity 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 ash disposal facility upon views of the landscape through intrusion or obstruction;
- The reactions of viewers who may be affected.

For a detailed description of the methodology used in this study, refer to Appendix B, C and D. Image 1 below, graphically illustrates the visual impact process:

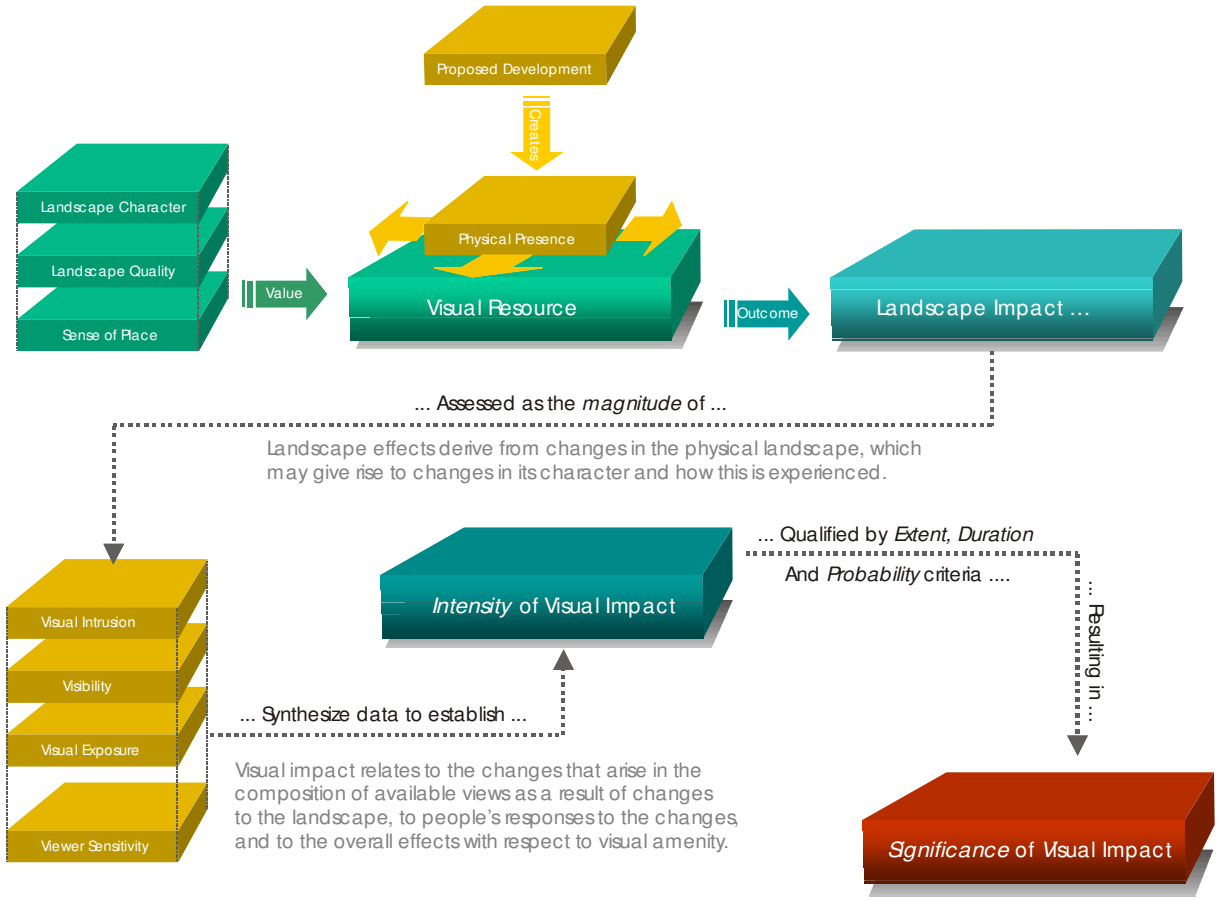

Image 1: Visual Impact Process

3.1.8 Significance of Visual Impact

A combined quantative and qualitative methodology, as supplied by the Environmental Practitioner, was used to describe the impacts for: significance, spatial scale, temporal scale, probability and degree of certainty. A summary of each of the qualitative descriptions along with the equivalent quantative rating scale is given in Annexure D.

3.2 Methodology

The following method was used:

- 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;
- 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 field survey and GIS mapping technology. The description of the landscape focused on the nature of the land rather than the response of a viewer (refer to Appendix B);
- The **landscape character** of the study area was described. The description of the landscape focused on the nature and character of the landscape rather than the response of a viewer;
- The **quality of the landscape** was described. Aesthetic appeal was described using recognized contemporary research in perceptual psychology as the basis;
- The **sense of place** of the study area was described as to the uniqueness and distinctiveness of the landscape. 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 sensitive viewing areas;
- The **visibility** of the proposed project was determined;
- 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 below; and
- Measures that could mitigate the negative impacts of the proposed project were recommended.

4. DESCRIPTION OF THE PROJECT

The Project would encompass the following components:

- A dry ash disposal facility of estimated 1500 ha (including associated infrastructure such as stackers, ash water return dams, pipelines and conveyors).
- A conveyor belt for the transportation of ash to the ash disposal facility.
- The waste stream comprises of a combined bottom ash and fly ash waste stream.
- Services including electricity and water supply in the form of power lines, pipelines, and associated infrastructure; as well as
- Access and maintenance roads to the site.

The maximum heights (worst case scenario) for the 5 options are as follow:

A	95m
B	75m
C	95m
F	80m
G	85m

Refer to Figure 2 below for the site layout.

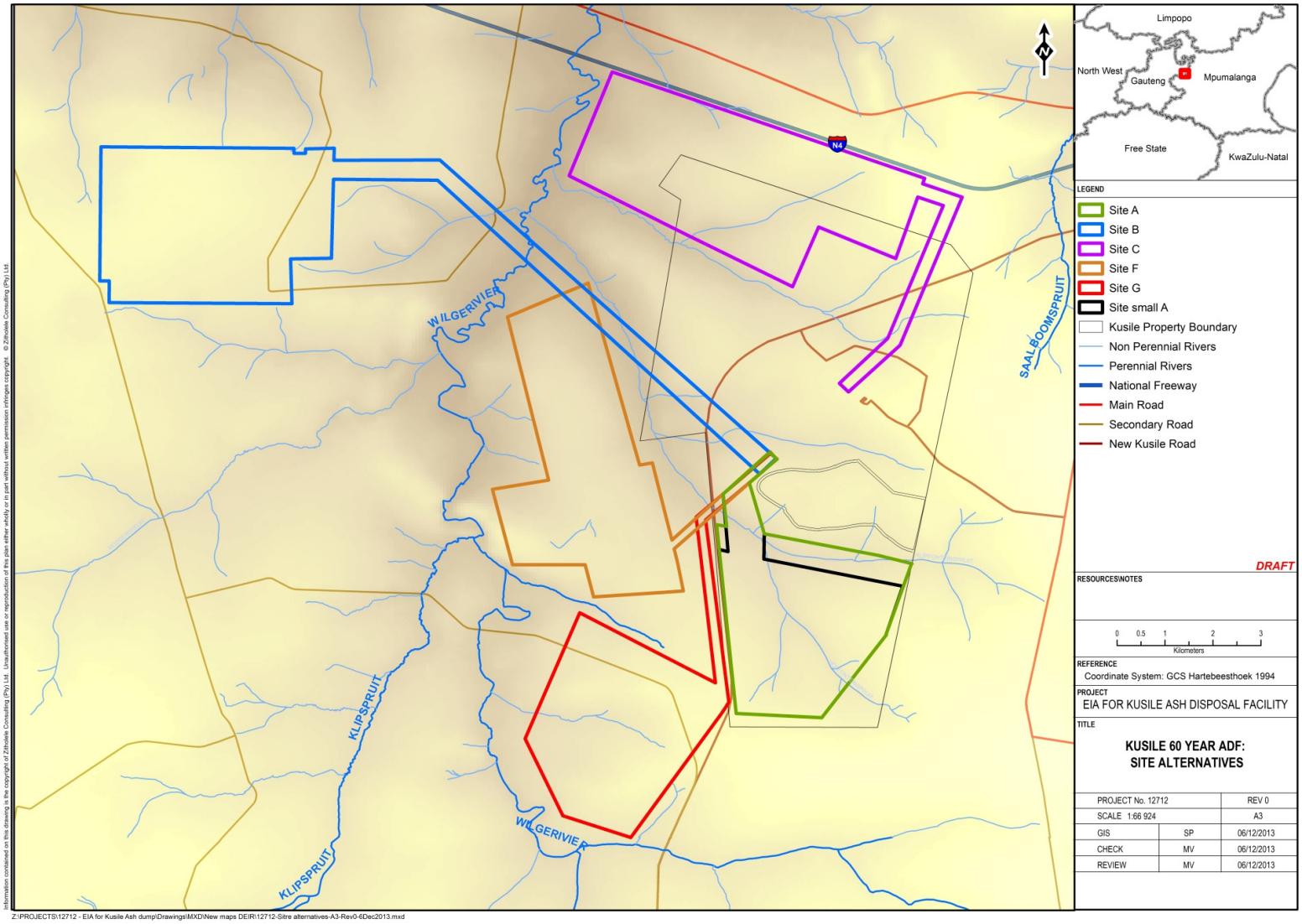

Figure 2: ALTERNATIVE SITES - Kusile 60 Year Ash Disposal Facility

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5. THE ENVIRONMENTAL SETTING

5.1 The Study Area

For the following section, refer to views 1 to 20 on Figures 3 to 9. The locations for panorama views are indicated on Figure 1.

For the most of it, the base line environment has been altered by mining and agricultural activities to such an extent that minimal indigenous and endemic ('natural') vegetation species occur. Where 'natural' vegetation occurs, it has been infested with exotic and invasive species. Originally the natural vegetation consisted of grassland species and wetland species. Shrubbery and trees were very sparse and scattered. In terms of climate the study area has warm wet summers, which results in a an undulating sea of rolling greens where as winter months are characterised by cold dry weather with heavy frost resulting in bleak yellows from the dry grass. Crop production also adds to the seasonal variety in colours.

5.2 Surrounding Land Use

5.2.1 Residential

The residential character of the study area consists of farmsteads (Views 1 & 2, Figure 3) and associated workers housing (views 2 and 3, Figure 3) as well as a couple of small towns. Voltargo (view 3, Figure 3), associated with Eskom's power stations, is the nearest and is located approximately 7km south-east of the new Kusile Power Station. Phola community is located approximately 11km to the south-east of Kusile Power Station. The town of Ogies is located approximately 17km to the south-east of Kusile power station. Both Phola and Ogies are closely related with the mining industries located within the study area. The town of Bronkhorstspruit is located approximately 19km to the north-west of Kusile Power Station. Bronkhorstspruit is also associated with the industries and the mining activities within the study area. Witbank is the nearest major town and is located approximately 27km to the north-east of Kusile Power Station.

5.2.2 Agriculture

The larger part of the study area consists of farmlands that can be divided into two types of agricultural activities namely produce cultivation and livestock farming. Produce cultivation includes: cultivated crop lands (views 5 and 6, Figure 4) and agricultural tunnels growing berries (view 7, Figure 5) and other produce. The second type is livestock farming which includes: grazing by beef (view 8, Figure 5) or dairy herds (view 9, Figure 5) as well as a piggery (view 10, Figure 5). Two chicken farms for egg production are also located in the southern section of the study area. Agricultural activities are mostly concentrated in the western section of the study area.

5.2.3 Infrastructure, Industries and Mining

Mining and industrial activities are mostly concentrated in the western section of the study area. Mining and industries focus mostly on coal (view 12, Figure 6) and sand (view 11, Figure 6) mining. Infrastructure include the existing Kendal (view 13, Figure 7) and currently being constructed, Kusile (view 14, Figure 7), Power Stations. Various mains and transmission power lines criss-cross the study area in various directions

(views 15 and 16, Figure 7).

5.2.4 Transportation systems

Two main transportation systems provide access to and through the study area: national, provincial and local (farm) road systems as well as railway servitudes. The current R545 provincial road runs through just east of the Kusile Power Station and joins the N4 to the N12 in a north-south direction. Lone Rock Road is a newly built, tarred road providing access to the Kusile Power Station from the west of the plant. Railway lines run more or less parallel to the N4, N12 and R555 between Ogies and Witbank.

5.3 Landscape Character

Landscape character types are landscape units refined from the regional physiographic and cultural data derived from 1:50 000 topographical maps, aerial photographs and information gathered on the site visit. Dominant landform and land use features (e.g., hills, rolling plains, valleys and urban areas) of similar physiographic and visual characteristics, typically define landscape character types.

The study area consists of three dominant natural landscape types: hills and koppies, gently to moderately undulating plains with ridge lines and valleys, which form part of the Saalklapspruit sub catchment. The landscape is characterised by an undulating topography in the east growing more mountainous towards the west. A couple of small kopies occur randomly within the study area. Refer to views 17 to 20 on Figures 8 and 9. Various perennial and no-perennial streams interweave through the study area. Grassland is also associated with wetlands and water bodies that speckle the study area.

View 5: crop production

View 6: crop production

Figure 4: LANDSCAPE CHARACTER (Views 5 - 6) - Kusile 60 Year Ash Disposal Facility

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View 7: organic berry cultivation

View 8: livestock farming - cattle

View 9: livestock farming - dairy production

View 10: livestock farming - piggery

Figure 5: LANDSCAPE CHARACTER (Views 7 - 10) - Kusile 60 Year Ash Disposal Facility

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View 11: sand mining

View 12: coal mining activities

Figure 6: LANDSCAPE CHARACTER (Views 11 & 12) - Kusile 60 Year Ash Disposal Facility

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View 13: Kendal Power Station

View 14: Kusile Power Station, currently under construction

View 15: power lines

View 16: power lines

Figure 7: LANDSCAPE CHARACTER (Views 13 - 16) - Kusile 60 Year Ash Disposal Facility

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View 17: topography - undulating topography with hills / koppie and ridge line

View 18: hills and ridge lines in topography

Figure 8: LANDSCAPE CHARACTER (Views 17 & 18) - Kusile 60 Year Ash Disposal Facility

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View 19: flat open plains in the southern section of the study area

View 20: flat open topography in the northern section of the study area

Figure 9: LANDSCAPE CHARACTER (Views 19 & 20) - Kusile 60 Year Ash Disposal Facility

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6. VISUAL RESOURCE

6.1 Visual Resource Value / Scenic Quality

The spatial distribution of the landscape types discussed in 5.3 is illustrated in Figure 10: Visual Resource. The figure also rates the relative scenic quality of each type and its landscape sensitivity.

Scenic quality ratings (using the scenic quality rating criteria described in Appendix C) were assigned to each of the landscape types defined in Figure 10: Visual Resource. The *highest* value is assigned to the ridge lines, hills and koppies, rivers, wetlands, water courses and water bodies as well as 'natural' grassland vegetation.

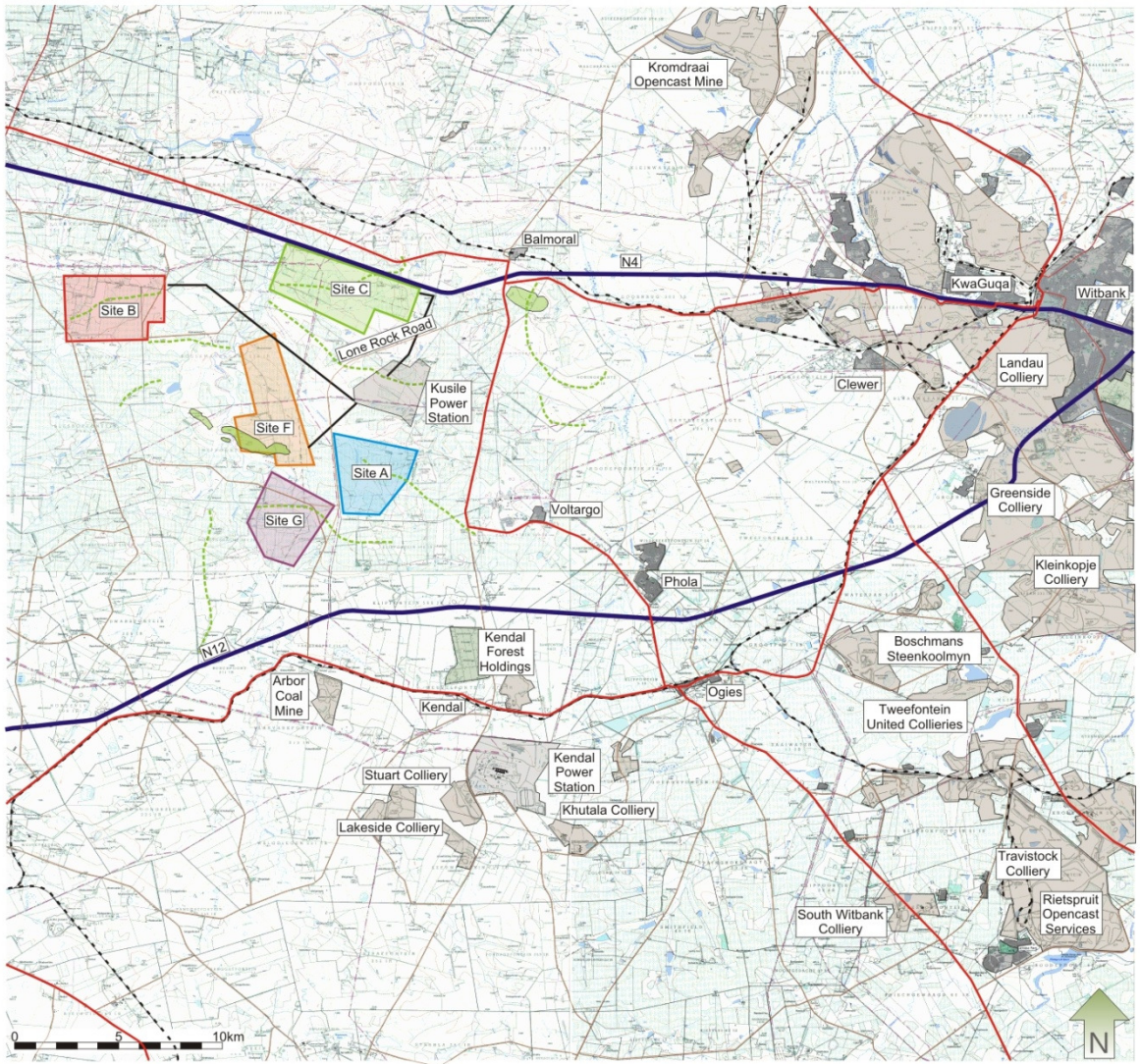
The agricultural fields and roads were rated as *moderate*. The landscape types with the *lowest* scenic quality were railway lines, power lines, towns / townships and built up areas as well as the mining / industrial areas and power stations. The combination of these ratings resulted in the overall study area to be regarded as having a ***moderate to low*** visual resource value. A summary of the visual resource values is tabulated in Table 1 below.

Table 1: Value of the Visual Resource
(After The Landscape Institute with the Institute of Environmental Management and Assessment (2002))

High ridge lines hills & koppies, rivers, wetlands, water courses, water bodies, 'natural' grassland vegetation	**Moderate** agricultural fields, roads	**Low** railway lines, power lines, towns / townships / built up areas, mining / industrial areas, power stations
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 considered to 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	

6.2 Sense of Place

The sense of place for the proposed study area derives from the combination of all landscape types and their impact on the senses. The combination of the various landscape elements, as mentioned above, gives the area a mixed industrial / pastoral sense of place.



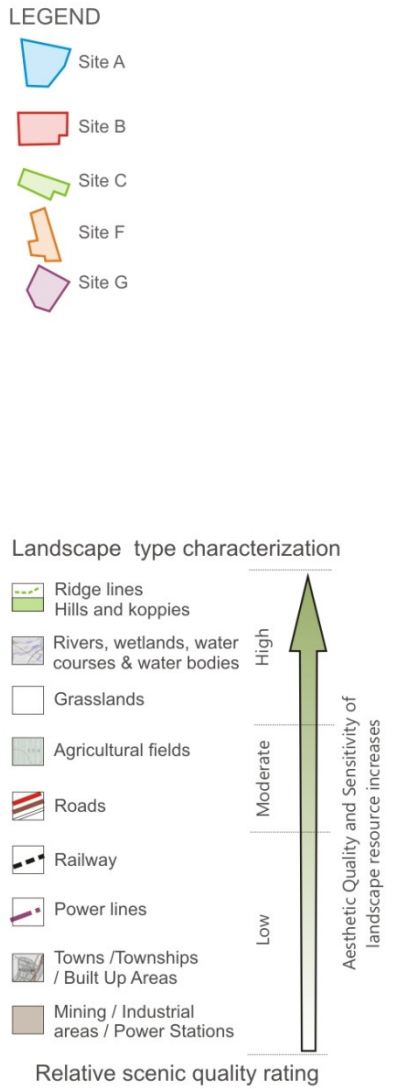


Figure 10: VISUAL RESOURCE - Kusile 60 Year Ash Disposal Facility

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7. VISUAL RECEPTORS

7.1 Views

Due to the moderately undulating topography in combination with the low height of the grassland and crop vegetation, views within the study area are expansive and mostly open. The project would be visible from public roads running through the study area as well as from point locations such as farmsteads and residences.

7.1.1 Sensitive Viewers and Sensitive Viewer Locations

Views from roads would be temporary and as the study area is not a tourist destination; travellers through the study area will not be regarded as sensitive. Sensitive viewer locations would be those from farmsteads and residences within the study area.

Table 2: Potential Sensitivity of Visual Receptors – the Project

High farmsteads / residences	**Moderate** travelers	**Low** visitors / employees
Visitors of tourist attractions and travelling along local routes, 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.	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.	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.

8. COMPARATIVE ANALYSIS

The following comparative analysis will compare the proposed ash disposal facilities to each other in terms of:

- Current land use.
- Landscape character.
- Distance from similar land uses (mining / industrial).
- Sensitive viewer locations.

Table 3: Comparative Analysis

	Site A View 21, Figure 11	**Site B** View 22, Figure 12	**Site C** View 23, Figure 13	**Site F** View 24, Figure 14	**Site G** View 25, Figure 15
Current land use	Agriculture	Agriculture	Grazing	Agriculture	Agriculture
Landscape character	Undulating topography bisected by two streams.	Located on a ridge line with flat to moderately undulating topography.	Located on an exposed slope with a ridge line. A small stream with associated wetlands bisect the site.	More hilly than moderately undulating. A small stream with associated wetland is located on site.	Quite undulating topography also with a small koppie in the western section of the proposed facility location.
Distance from similar land uses (mining / industrial)	Approximately 1.6km south of the Kusile Power Station Approximately 500m west and 1km north of existing open cast mining activities.	Approximately 10km west of the Kusile Power Station.	Approximately 2km north-west of Kusile Power Station. Approximately 300m west, 600m and 2.6km north-west of existing opencast mining activities.	Opposite the Lone Rock Road approximately 1.8km west of Kusile Power Station.	Opposite the Lone Rock Road approximately 4km south-west of Kusile Power Station, with some open cast mining activities located approximately 1km south-west of the dump.
Sensitive viewer locations	Approximately 400m south-west, 1.6km north-west, and 700m north of the nearest farmsteads / residences.	Approximately 600m south, 1km to the north, and 250m to the north-east of the nearest farmsteads / residences.	Approximately 300m north-east, 150m, east, and on top of farmsteads and residences on its western side and north-western corner.	Located directly adjacent to farmsteads and residences in the north. Approximately 500m north and 300m east of the nearest farmsteads / residences.	Located approximately 350m south, 300m west, 450m north-east, 530m and south-east 600m of the nearest farmsteads / residences.
Visibility	The sloping topography would screen views from the south-east. Views from the north-west would be open.	Located on a ridge line, thus highly visible unless screened by vegetation in the foreground of a viewer.	Located on an exposed slope with a ridge line, thus highly visible unless screened by vegetation in the foreground of a viewer.	A ridge line just to the west would contain the views from the west. Views from the east would be open.	The sloping topography would screen visibility from the west. Views from the east would be open and exposed.

In terms of land use and vegetation cover the result is similar for all the sites due to the uniformness of the

landscape character within the study area. All of the sites have at least two sensitive viewers in the foreground, some have more and others have sensitive viewers in the middle ground as well. The most determining factor would thus be the distance from Kusile as the ideal would be to condense and group similar activities and visually intrusive elements and activities.

From the discussion in the table above *site B* would be the *least preferred* alternative due to its distance from Kusile as well as for it being located directly on a ridge line. *Site C* is also very exposed and located on a ridge line. It has two sensitive viewers within the foreground zone, one located approximately 150m from the site and the other located approximately 600m from the site. *Site C* would also include a borrow pit area that is located approximately 1.9km south of Kusile thus spreading the proposed infrastructure even further apart. *Site F* has two sensitive viewers directly adjacent to the site as well as two other sensitive viewers within the foreground zone. *Site F* is also located on the opposite side of Lone Rock road from Kusile Power Station. *Site G* has the most sensitive viewers within the foreground zone.

The professional opinion from the author is that *Site A* would be the *preferred alternative* as *Site A* would result in the least spread of support infrastructure such as the conveyors and maintenance roads, is located on the same side of the road and directly adjacent to Kusile Power Station. In terms of sensitive viewers, it has two in the foreground and one in the middle ground distances.

The following sections of the report will assess the visual impact of Site A, the preferred alternative, on the receiving environment.

Figure 11: ALTERNATIVE SITE A - Kusile 60 Year Ash Disposal Facility

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Figure 12: ALTERNATIVE SITE B - Kusile 60 Year Ash Disposal Facility

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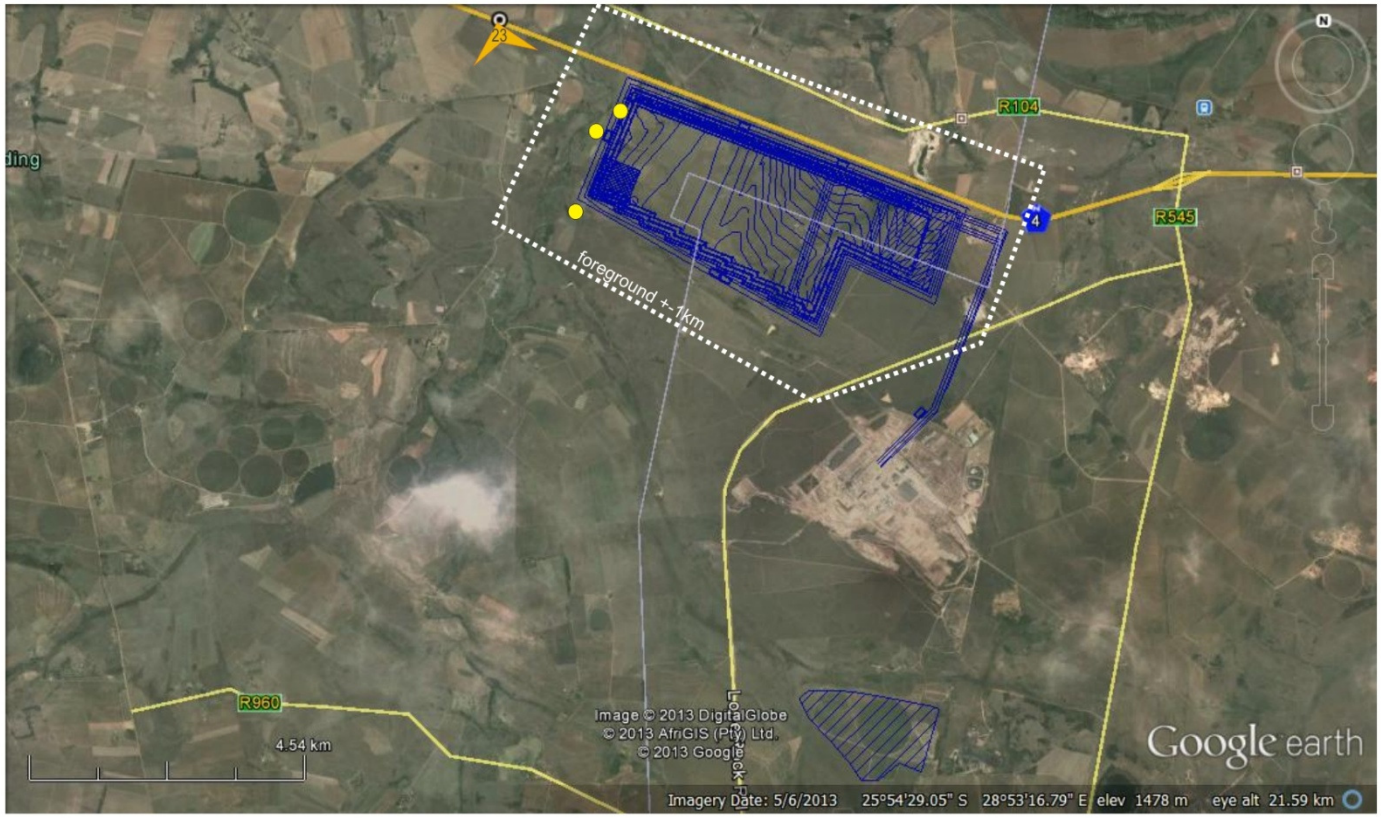

Figure 13: ALTERNATIVE SITE C - Kusile 60 Year Ash Disposal Facility

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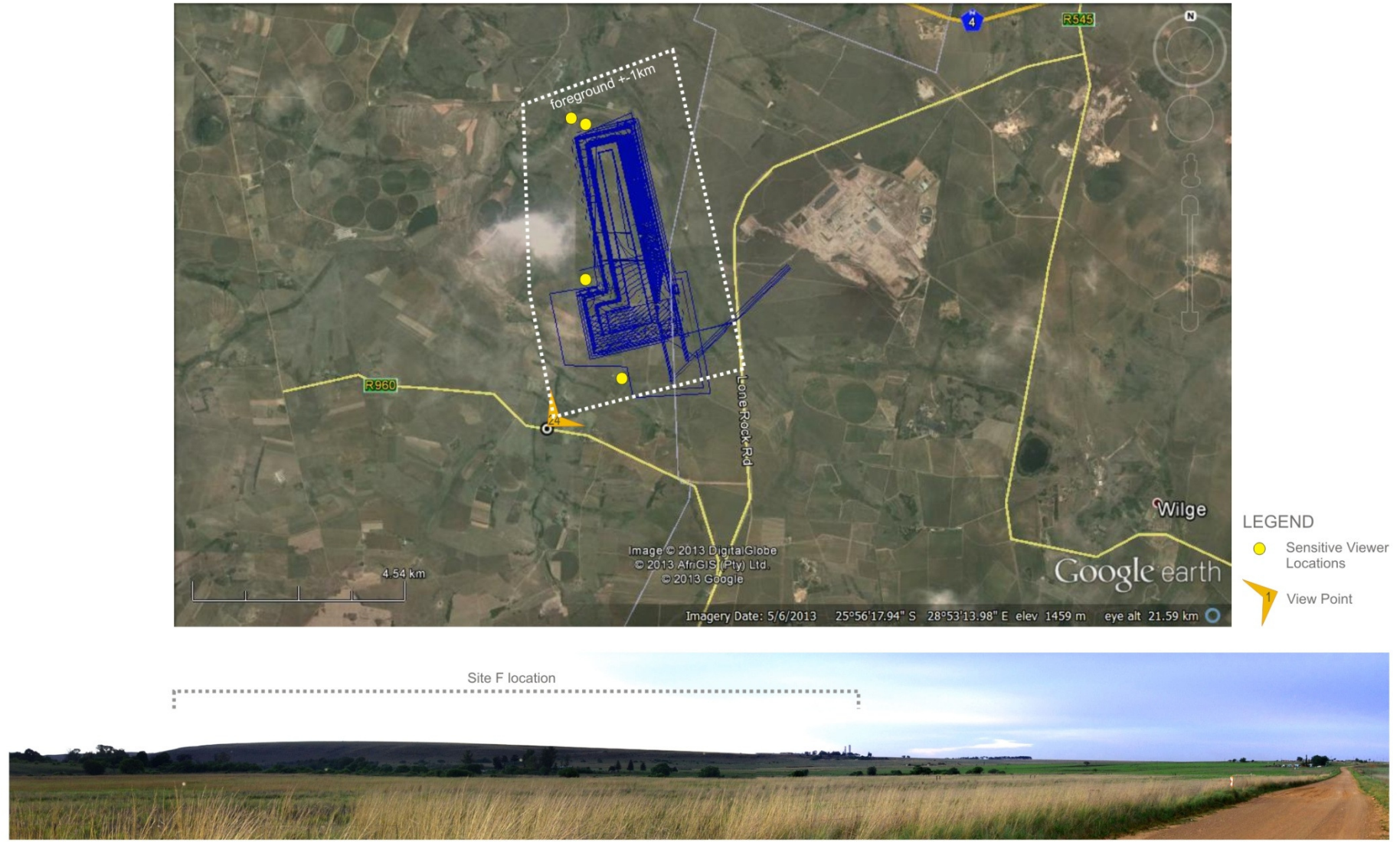

Figure 14: ALTERNATIVE SITE F - Kusile 60 Year Ash Disposal Facility

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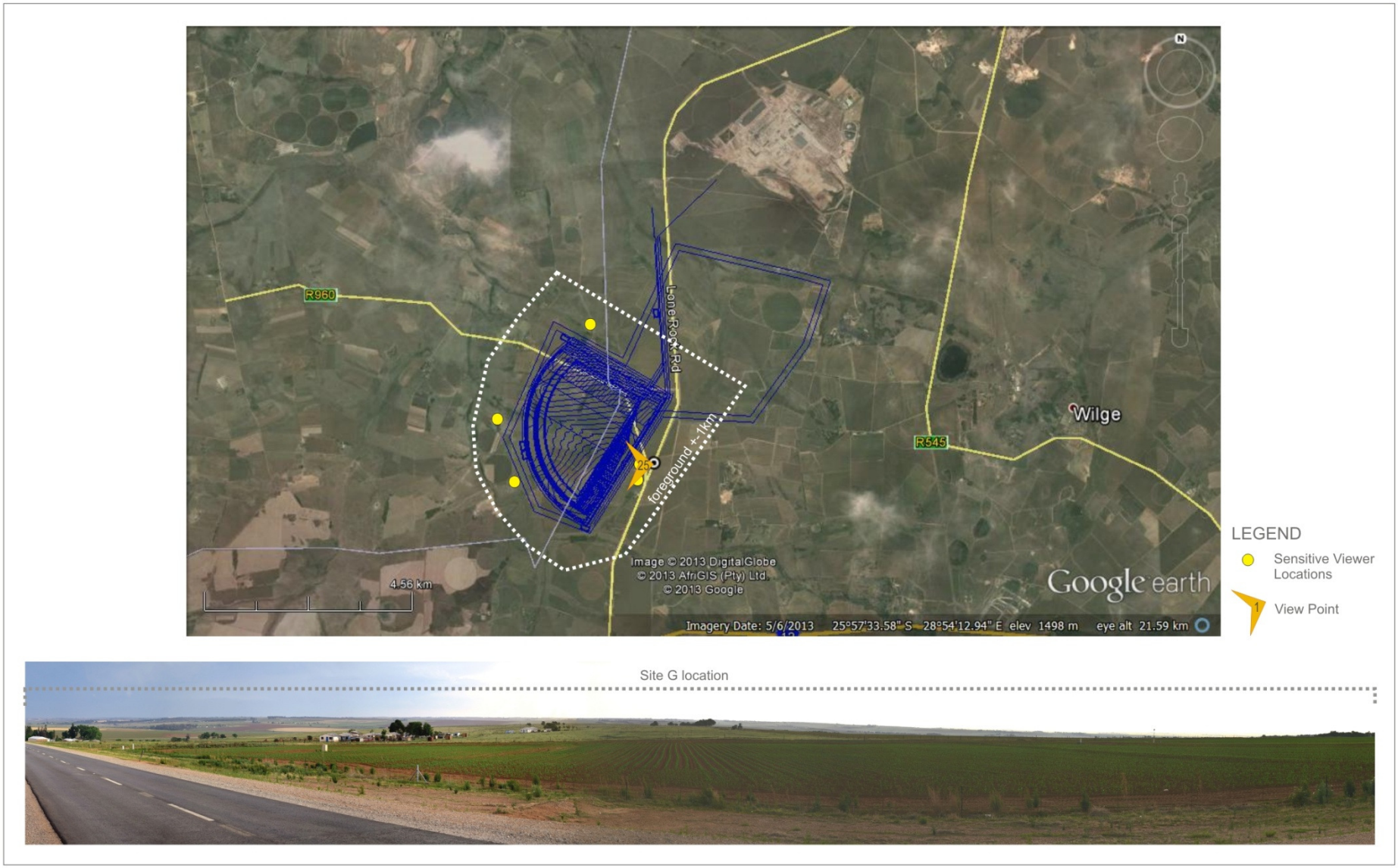

Figure 15: ALTERNATIVE SITE G - Kusile 60 Year Ash Disposal Facility

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9. LANDSCAPE AND VISUAL IMPACT

9.1 Landscape Impact

The *landscape impact* (i.e. the change to the fabric and character of the landscape caused by the physical presence of a development) of the proposed project will be ***high*** as the physical impact of the implementation of the ashing project will disturb a great percentage of the proposed project site. The main disturbance would be during the operational phase of the project. Since the ash facility will remain, the visual impact will continue after the operational life of the ash facility.

However, as stated in the approach, the physical change to the landscape should be understood in visibility and aesthetic terms within the context of the study area. The following sections discuss the effect that the proposed project activities will have on the visual and aesthetic environment.

9.2 Severity of Visual Impact

The severity of visual impact is determined using visibility, visual intrusion, visual exposure and viewer sensitivity criteria. When the severity of impact is qualified with spatial, duration and probability criteria the significance of the impact can be predicted (refer to Appendix C).

9.2.1 Visual Intrusion

Visual intrusion deals with the notion of contextualism i.e. how well does a project component fit into the cultural aesthetic of the landscape as a whole? As discussed in Section 5.3, the study area is characterised by a gently to moderately undulating topography with some randomly located small koppies as well as scattered wetlands and pans. Vegetation within the study area is mainly agricultural croplands with clusters of exotic shrubs and trees where the natural grassland has been disturbed. The residential component includes farmsteads and residences as well as the towns of Voltargo and Phola. The industrial component includes the Kusile Power Station (currently under construction) with associated power lines and substations, transport infrastructure such as the roads and railways as well as some opencast mining activities.

The Project entails a new ash disposal facility for the Kusile Power Station which is currently under construction. Once the Power Station is completed and operational, the ash disposal facility would be in context with one aspect of the surrounding land use. The future New Largo open cast mining activities would add to the mining / industrial elements and further reduce the contrast in land use and surrounding activities within the study area even though a large portion of the study area consists of agricultural activities.

Should the continuous ash disposal facility not be mitigated the visual intrusion would be much worse as the contrast in colour, form, size and texture would be clear and prominent.

The visual intrusion of the Project after sunset would form an extension of the activities associated with the Kusile Power Station and thus add cumulatively to the anticipated scenario.

Table 4 rates and summarises visual intrusion of the project components when the *worst case scenario (no mitigation)* is taken into account.

Table 4: Visual Intrusion

High	Moderate	Low	Positive
Because the proposed project: - Has a substantial negative effect on the visual quality of the landscape;	Because the proposed project: - Has a moderate negative effect on the visual quality of the landscape;	Because the proposed project:	The proposed project: - Has a beneficial effect on the visual quality of the landscape;
- Contrasts dramatically with the patterns or elements that define the structure of the immediate landscape;	- **Contrasts with the patterns or elements that define the structure of the landscape**;	- Contrasts minimally with the patterns or elements that define the structure of the landscape;	- Enhances the patterns or elements that define the structure of the landscape;
- Contrasts with land use, settlement or enclosure patterns of the immediate environment;	- **Is partially compatible with land use (utilities) patterns of the general area**;	- is mostly compatible with land use, (utility) patterns;	- Is compatible with land use, settlement or enclosure patterns.
- Cannot be 'absorbed' into the landscape from key viewing areas.	- Is partially 'absorbed' into the landscape from key viewing areas.	- is 'absorbed' into the landscape from key viewing areas.	
Result: Notable change in landscape characteristics over an extensive area and/or intensive change over a localized area resulting in major changes to key views	***Result:*** **Moderate change in landscape characteristics over localized area, resulting in a moderate change to key views**	*Result* Moderate change in landscape characteristics over localized area resulting in a minor change to a few key views.	*Result* Positive change in key views.

Sections that are placed in bold are applicable to the proposed Project.

In light of the findings in Table 4 and the discussion above, the visual intrusion of the proposed Project will be ***moderate*** since the Project is partially compatible with land use, (utility) patterns. It would however contrast with the patterns or elements that define the structure of the landscape. The Project would however result in a moderate change in landscape characteristics over an extensive area resulting in a moderate changes to key views.

9.2.2 Visibility and Visual Exposure

In determining the visibility of the project the 'zone of potential influence' was established and is regarded to be 15km. Over 15km the impact of the proposed activities would have diminished due to the diminishing effect of distance (the project recedes into the background) and atmospheric conditions (haze) on visibility. Also, at this distance the features would appear in the background of a view and thus begin to be 'absorbed'

into the landscape setting.

Visual exposure of the project is determined by the proximity of the viewer to the proposed new project component. The impact of an object in the foreground (0 – 0.8km) is greater than the impact of that same object in the middle ground (0.8km – 3km) which, in turn is greater than the impact of the object in the background (greater than 3km) of a particular scene. Therefore the visibility and visual exposure for viewers within 0.8km of the proposed project will be high, for viewers between 0.8km and 3km it will be moderate and beyond 3km it will be low.

9.2.2.1 Day Time

Even though the area has a gently to mildly undulating topography the proposed Project will be visible from less than half the Zone of Potential Influence. Refer to Table 5 below. Views towards the ash disposal facility would be expansive and mostly unobstructed from roads within the study area. In terms of roads within the study area, the N4 and local roads would be mostly affected. Along the N4, the nearest views would have the ash disposal facility appear in the middle ground of the viewers. The structures (ash disposal facility and stackers) would be mostly screened by the topography when viewed from the N12. The structures would appear in the background of these views. The undulating topography would assist to partially screen the structures from longer distant views, mostly from the west. Views from farmsteads are mostly, at least partially screened, by existing garden vegetation. As stated in the comparative analysis, the structures would appear in the foreground of two sensitive viewers and in the middle ground of one sensitive viewer. Table 6 below, summarises the visual exposure of the Project.

After closure and rehabilitation, the Project would remain visible as the ash disposal facility will remain on site. The negative impact can however be reduced by implementing mitigating measures as described in Section 9 below. Tables 4 and 5 below are based on the worst-case scenario (no mitigation).

Table 5: Visibility of the proposed Project

High	Moderate	Low
Visual Receptors If the project 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 project 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 project 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.

Sections that are placed in bold are applicable to the proposed Project.

Refer to Figure 16 below for the viewshed analysis.

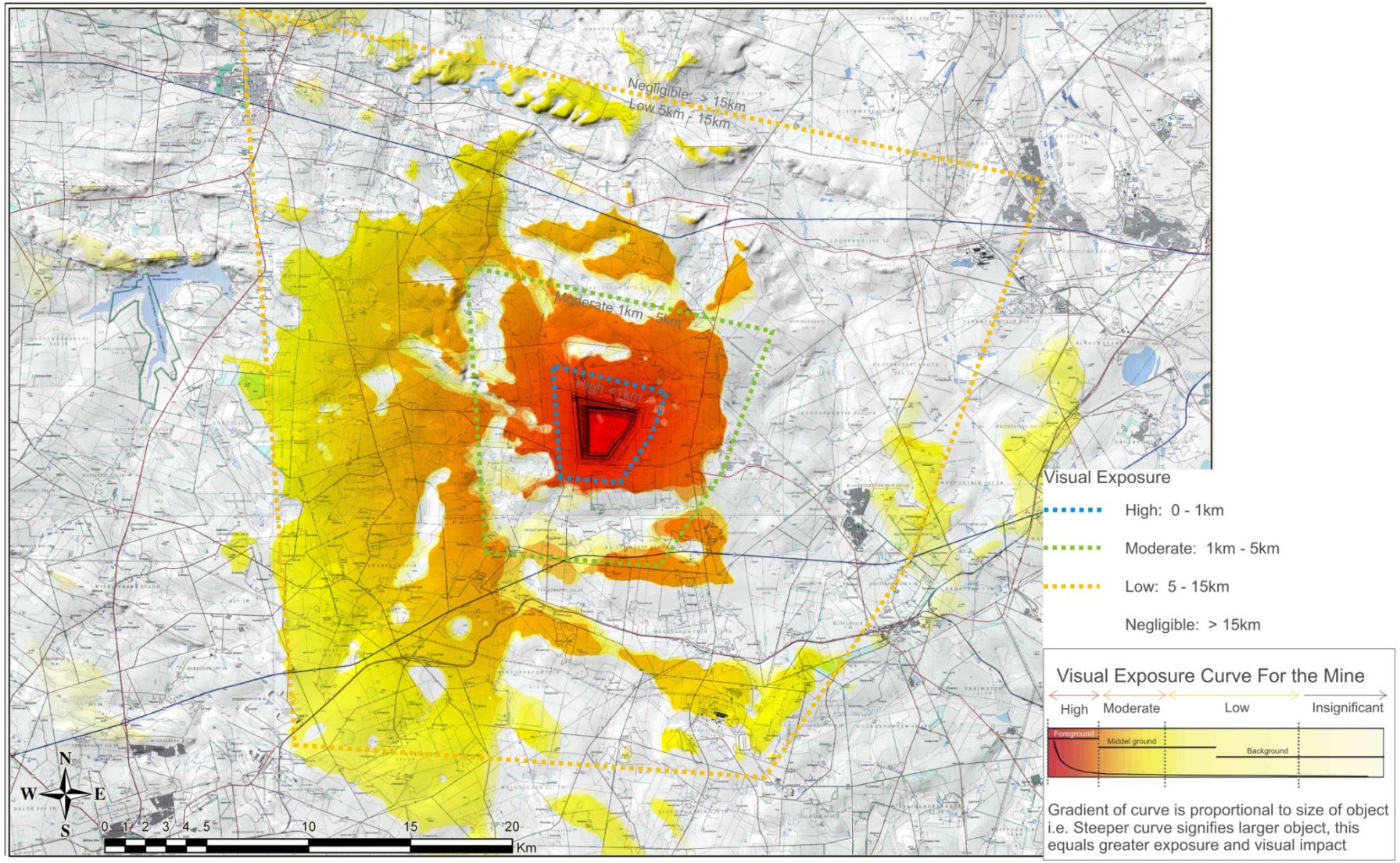

Figure 16: VIEWSHED - Kusile 60 Year Ash Disposal Facility

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Visual exposure can be summarised as tabulated below.

Table 6: Visual Exposure of the proposed Project

	High Exposure (significant contribution to visual impact)	Moderate Exposure (moderate contribution to visual impact)	Low Exposure (minimal influence on visual impact)	Insignificant Exposure (negligible influence on visual impact)
Roads (N4, N12 and local)	**0 – 0.8 km**	**0.8 – 3.0 km**	**3.0 – 15.0 km**	**Over 15.0 km**
Farmsteads	**0 – 0.8 km**	**0.8 – 3.0 km**	3.0 – 10.0 km	Over 10.0 km

Sections that are placed in bold are applicable to the proposed Project.

9.2.2.2 Night Time

The proposed Project will add cumulatively to the effect of the existing lights from Kusile Power Station and other mining activities at night.

9.2.3 Severity of Visual Impact

In qualifying the criteria used to establish the severity of visual impact, 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 & The Landscape Institute, 1996). These results are based on *worst-case scenarios* when the impact of all aspects is taken together and when viewed from the various sensitive viewing points as indicated in Table 7 below.

According to the results tabulated in Table 7 below the *severity* of visual impact will be ***moderate***. The Project would be prominent but may not necessarily be considered to be substantially uncharacteristic when set within the attributes of the receiving landscape. Construction of the Kusile Power Station would have been completed and the station fully operational by the time of the implementation of the ash disposal facility project. The implementation of the Project would thus only result in a partial loss of / alteration to key elements / features / characteristics of the baseline. The Project would in most instances be viewed against a backdrop including the Kusile Power Station.

It should however be noted that after the life time of the power station, it may be disassembled and demolished thus reducing the negative visual impact. The ash disposal facility would remain on site after its operational life has been completed. This ash disposal facility will then become part of the characteristics of the landscape. It is therefore very important that the ash disposal facility should be rehabilitated in a way that would be best fitting into the natural (undisturbed) features of the environmental setting at the end of the operational life of the ash disposal facility. Section 10 below proposes some mitigation to consider and apply during the life time of the Project. The intention of these mitigation measures is to reduce the negative impact that would result from the implementation of the Project, on the visual environment – landscape characteristics (physical) and sense of place (perceptual).

Table 7: Severity of Impact of the proposed Project

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 considered to be substantially uncharacteristic when set within the attributes of the receiving landscape**.	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.	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.
High scenic quality impacts would result.	**Moderate scenic quality impacts would result**	Low scenic quality impacts would result.	Negligible scenic quality impacts would result.

Sections that are placed in bold are applicable to the proposed Project.

The following images (views 25 and 26 on Figures 17 and 18 respectively) illustrate what the potential visual impact is expected to be.

CURRENT VIEW: View 25 - along the R545, looking west towards Site A

NEAR THE END OF OPERATIONAL LIFE

Figure 17: SIMULATION (View 25) - Kusile 60 Year Ash Disposal Facility

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CURRENT VIEW: View 26 - along Lone Rock Road, looking south towards Site A

NEAR THE END OF OPERATIONAL LIFE

Figure 18: SIMULATION (View 26) - Kusile 60 Year Ash Disposal Facility

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10. MITIGATION MEASURES

In considering mitigating measures there are three rules that were 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 considered:

- 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.

The following mitigation measures are suggested. It should however be kept in mind that even though the ash disposal facility will be rehabilitated the structure will still be intrusive and visible and therefore the impact after mitigation would not be significantly less than before mitigation.

10.1 Project Area Development

- It is proposed that as little vegetation as possible be removed during the construction phase.
- Ensure, wherever possible, all existing natural vegetation is retained and incorporated into the project site rehabilitation.

10.2 Earthworks

- Dust suppression techniques should be in place at all times during the construction, operational, the decommissioning and closure phases.
- Only the footprint and a small 'construction buffer zone' around the proposed Project should be exposed. In all other areas, the natural vegetation should be retained.

10.3 Landscaping

- If at all possible the ash disposal facility should be shaped in such a way that it could be rehabilitated to blend in with the contours of the surrounding landscape.
- The side slopes should be designed in such a way that they are articulated to form natural shaded areas.
- A registered Professional Landscape Architect could assist with the final design of the ash disposal facility.
- A registered Professional Landscape Architect should be appointed to assist with the rehabilitation plan for the ash disposal facility.
- Rehabilitate / restore exposed areas as soon as possible after construction activities are complete.
- Only indigenous vegetation should be used for rehabilitation / landscaping purposes.

10.4 Access and Haul Roads

During construction, operation, rehabilitation and closure of the Project, access and haul roads will require an effective dust suppression management programme, such as the use of non-polluting chemicals that will retain moisture in the road surface.

10.5 Lighting

Even though the area is already light up at night, light pollution should still be seriously and carefully considered and kept to a minimum. Security lighting should only be used where absolutely necessary and carefully directed.

The negative impact of night lighting, glare and spotlight effects, can be mitigated using the following methods:

- Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the ash disposal facility.
- Light public movement areas (pathways and roads) with low level 'bollard' type lights and avoid post top lighting
- Avoid high pole top security lighting along the periphery of the project site and use only lights that are activated on movement at illegal entry to the site.
- Use security lighting at the periphery of the site that is activated by movement and are not permanently switched on.

11. SIGNIFICANCE

A combined quantitative and qualitative methodology, as supplied by the Environmental Practitioner, was used to describe the impacts for: significance, spatial scale, temporal scale, probability and degree of certainty. A summary of each of the qualitative descriptions along with the equivalent quantitative rating scale is given in Annexure C.

Table 8 below summarises the results of the criteria used to determine the significance of the visual impact. The ratings for impact with mitigation assume that the mitigation measures are implemented as described in Section 10.

Table 8: Summary of Visual Impacts and Mitigation Measures of the Proposed Project

KUSILE 60YEAR ASH DUMP PROJECT (for the visual impact on residents within and travellers through the study area)								
Construction Phase								
Environmental Impacts	**Magnitude**	**Spatial Scale**	**Duration Scale**	**Degree of Probability**	**Degree of Certainty**	***Significance* without Mitigation** ***Significance* with Mitigation**	**Mitigation Measures**	**Mitigation Potential**
• The proposed project is located in a landscape of moderate value that, by the time of the implementation of the Project, already includes negative visual elements. • Construction activities (start up) will contrast minimally with the patterns or elements that define the structure of the landscape. Construction activities would however result in a moderate change in landscape characteristics over an extensive area resulting in a moderate changes to key views. • Construction activities will add to the cumulative negative effect on the visual quality of the landscape.	Moderate (3)	Regional / Provincial (4)	Permanent (5)	It's going to happen (5)	Probable	**(4) High** **(4) High**	• Dust suppression techniques should be in place at all times during the construction phase. • As much vegetation as possible should be kept during site clearance. • Rehabilitate / restore exposed areas as soon as possible after construction activities are complete. • Avoid high pole top security lighting along the periphery of the project area and use only lights that are activated on illegal entry to the project area. • Light public movement areas (pathways and roads) with low level 'bollard' type lights and avoid post top lighting.	Although mitigation measures will be implemented due to the landscape character and height of structures residents and travellers will still be able to see the construction activities. Mitigation will only partially obstruct views.

Operational Phase								
Environmental Impacts	**Magnitude**	**Spatial Scale**	**Duration Scale**	**Degree of Probability**	**Degree of Certainty**	***Significance* without Mitigation** ***Significance* with Mitigation**	**Mitigation Measures**	**Mitigation Potential**
• The proposed project is located in a landscape of moderate value that already includes negative visual elements. • Operational activities will be prominent but may not necessarily be considered to be substantially uncharacteristic due to the presence of the Kusile Power Station and being located adjacent to it. Operational activities would however result in a moderate change in landscape characteristics over an extensive area resulting in a moderate changes to key views. • Operational activities will add to the cumulative negative effect on the visual quality of the landscape.	Moderate (3)	Regional / Provincial (4)	Permanent (5)	It's going to happen (5)	Probable	**(4) High** **(4) High**	• Dust suppression techniques should be in place at all times during the operational phase. • If at all possible the ash dump should be shaped in such a way that it blends with the contours of the surrounding landscape. • The side slopes should be designed in such a way that they are articulated to form natural shaded areas. • Avoid high pole top security lighting along the periphery of the project area and use only lights that are activated on illegal entry to the project area. • Light public movement areas (pathways and roads) with low level 'bollard' type lights and avoid post top lighting.	Although mitigation measures will be implemented due to the landscape character and height of structures residents and travellers will still be able to see the operational activities. Mitigation will only partially obstruct views.

Rehabilitation & Post Closure								
Environmental Impacts	**Magnitude**	**Spatial Scale**	**Duration Scale**	**Degree of Probability**	**Degree of Certainty**	***Significance* without Mitigation** / ***Significance* with Mitigation**	**Mitigation Measures**	**Mitigation Potential**
• The proposed project is located in a landscape of moderate value that already includes negative visual elements. • After rehabilitation and the correct and effective implementation of the proposed mitigation measures, the negative impact could be reduced even thought the structure would remain permanently and become part of the landscape.	Moderate (3)	Regional / Provincial (4)	Permanent (5)	It's going to happen / has occurred (5)	Probable	**(4) High**	• Dust suppression techniques should be in place at all times during the rehabilitation process. • The dump should be capped with the appropriate system ending with a good layer of topsoil on top where after it should be re-vegetated. • Only use indigenous plant species. • Ensure that all plant material has properly established during the maintenance phase.	The body of the dump would remain after the operational life time. However it can be rehabilitated to blend in with the natural environmental setting to reduce the contrast between the dump and the surrounding landscape character.
	Low (2)					**(3.7) High**		

12. CONCLUSION

The *Significance* of the Construction and Operational Phases, both prior to and after the correct and effective application of mitigation measures, was rated as ***high***. This is due to the fact that residents and travellers will still be able to see the construction and operational activities due to the landscape character and height of structures. Mitigation will only partially obstruct views. The body of the ash disposal facility would remain after the operational life time. However it can be rehabilitated to blend in with the natural environmental setting in order to reduce the contrast between the dump and the surrounding landscape character. Thus the *Significance* rating dropped from a '4' to '3.7' which was however not enough to result in a drop in significance category.

Even though mitigation measures would not result in a lower *Significance* rating, the client is still encouraged to implement these measures to the best practice as it would definitely result in a lower *severity* of the visual impact on the affected high sensitivity locations, farmsteads and residences, within the study area.

****NLA****

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In order 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 particular combinations of natural (physical and biological) and cultural (land use) factors and how people perceive these. The visual dimension of the landscape is a reflection of 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 particular 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. On the basis of 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 badlands, 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 very 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 visual harmony. **2**	Modifications add little or no visual variety to the area, and introduce no discordant elements. **0**	Modifications add variety but are very discordant and promote strong 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 a very positive character with valued features that combine to give the experience of unity, richness and harmony. These are landscapes that may be considered to be of particular importance to conserve and which may be sensitive 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.

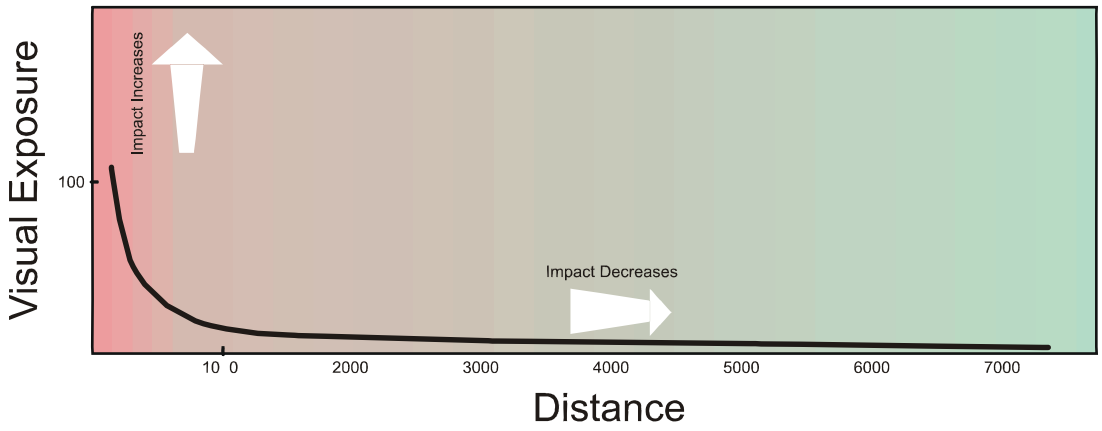
Areas seen from 800m to 3.0km are considered middle ground; vegetation appears as outlines or patterns. Depending on topography and vegetation, middle ground is sometimes considered to be up to 8.0km.

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 Figure below.

Effect of Distance on Visual Exposure



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.		

Severity 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)).

Magnitude (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 considered to 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)).

- Colour;
- Shape or form;
- Scale;
- Texture; and
- Reflectivity.

9.3 IMPACT ASSESSMENT METHODOLOGY

The impacts will be ranked according to the methodology described below. Where possible, mitigation measures will be provided to manage impacts. In order to ensure uniformity, a standard impact assessment methodology will be utilised so that a wide range of impacts can be compared with each other. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in **Table 9-1**.

Table 9-1: Quantitative rating and equivalent descriptors for the impact assessment criteria

Rating	Significance	Extent Scale	Temporal Scale
1	VERY LOW	*Proposed site*	Incidental
2	LOW	*Study area*	Short-term
3	MODERATE	*Local*	Medium-term
4	HIGH	*Regional / Provincial*	Long-term
5	VERY HIGH	*Global / National*	Permanent

A more detailed description of each of the assessment criteria is given in the following sections.

9.3.1 *Significance Assessment*

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these since their importance in the rating

scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1 000 km^2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in **Table 9-2** below.

Table 9-2: Description of the significance rating scale

Rating		Description
5	Very high	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	High	Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	Moderate	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	Low	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	Very low	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity are needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	No impact	There is no impact at all - not even a very low impact on a party or system.

9.3.2 *Spatial Scale*

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in **Table 9-3.**

Table 9-3: Description of the significance rating scale

Rating		Description
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of impacts possible, and will be felt at a regional scale (District Municipality to Provincial Level).
3	Local	The impact will affect an area up to 10 km from the proposed site.
2	Study Site	The impact will affect an area not exceeding the Eskom property.
1	Proposed site	The impact will affect an area no bigger than the ash disposal site.

9.3.3 *Duration Scale*

In order to accurately describe the impact it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in **Table 9-4**.

Table 9-4: Description of the temporal rating scale

Rating		Description
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium term	The environmental impact identified will operate for the duration of life of facility.
4	Long term	The environmental impact identified will operate beyond the life of operation.
5	Permanent	The environmental impact will be permanent.

9.3.4 *Degree of Probability*

Probability or likelihood of an impact occurring will be described as shown in **Table 9-5** below.

Table 9-5: Description of the degree of probability of an impact occurring

Rating	Description
1	Practically impossible
2	Unlikely
3	Could happen
4	Very Likely
5	It's going to happen / has occurred

9.3.5 *Degree of Certainty*

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used as discussed in **Table 9-6**. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 9-6: Description of the degree of certainty rating scale

Rating	Description
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.
Don't know	The consultant cannot, or is unwilling, to make an assessment given available information.

9.3.6 *Quantitative Description of Impacts*

To allow for impacts to be described in a quantitative manner in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus the total value of the impact is described as the function of significance, spatial and temporal scale as described below:

Impact Risk = (SIGNIFICANCE **+** *Spatial* **+** Temporal) X Probability

3 **5**

An example of how this rating scale is applied is shown below:

Table 9-7: Example of Rating Scale

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
	LOW	*Local*	Medium-term	*Could Happen*	
Impact to air	**2**	***3***	**3**	**3**	**1.6**

Note: The significance, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a criteria rating of 2,67. The probability (3) is divided by 5 to give a probability rating of 0,6. The criteria rating of 2,67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

The impact risk is classified according to five classes as described in the **Table 9-8** below.

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Table 9-8: Impact Risk Classes

Rating	Impact Class	Description
0.1 – 1.0	**1**	**Very Low**
1.1 – 2.0	**2**	**Low**
2.1 – 3.0	**3**	**Moderate**
3.1 – 4.0	**4**	**High**
4.1 – 5.0	**5**	**Very High**

Therefore with reference to the example used for air quality above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a low impact.

9.3.7 *Cumulative Impacts*

It is a requirement that the impact assessments take cognisance of cumulative impacts. In fulfilment of this requirement the impact assessment will take cognisance of any existing impact sustained by the operations, any mitigation measures already in place, any additional impact to environment through continued and proposed future activities, and the residual impact after mitigation measures.

It is important to note that cumulative impacts at the national or provincial level will not be considered in this assessment, as the total quantification of external companies on resources is not possible at the project level due to the lack of information and research documenting the effects of existing activities. Such cumulative impacts that may occur across industry boundaries can also only be effectively addressed at Provincial and National Government levels.

Using the criteria as described above an example of how the cumulative impact assessment will be done is shown below:

Table 9-9 - Example of cumulative impact assessment

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Initial / Existing Impact (I-IA)	**2**	**2**	**2**	*1*	0.4
Additional Impact (A-IA)	**1**	***2***	**1**	*1*	0.3
Cumulative Impact (C-IA)	**3**	***4***	**2**	*1*	0.6
Residual Impact after mitigation (R-IA)	**2**	***1***	**2**	*1*	0.3

As indicated in the example above the Additional Impact Assessment (A-IA) is the amount that the impact assessment for each criterion will increase. Thus if the initial impact will not increase, as shown for temporal scale in the example above the A-IA will be 0, however, where the impact will increase by two orders of magnitude from 2 to 4 as in the spatial scale

the A-IA is 2. The Cumulative Impact Assessment (C-IA) is thus the sum of the Initial Impact Assessment (I-IA) and the A-IA for each of the assessment criteria.

In both cases the I-IA and A-IA are assessed without taking into account any form of mitigation measures. As such the C-IA is also a worst case scenario assessment where no mitigation measures have been implemented. Thus a Residual Impact Assessment (R-IA) is also made which takes into account the C-IA with mitigation measures. The latter is the most probable case scenario, and for the purpose of this report is considered to be the final state Impact Assessment.

9.3.8 *Notation of Impacts*

In order to make the report easier to read the following notation format is used to highlight the various components of the assessment:

- Significance or magnitude- IN CAPITALS
- Temporal Scale – in underline
- Probability – in *italics and underlined*
- Degree of certainty - in **bold**
- Spatial Extent Scale – in *italics*

9.4 ENVIRONMENTAL IMPACT REPORT

Once the Scoping Report and the Plan of Study for the EIA is accepted by the DEA, Zitholele will begin the Environmental Impact Report.

The Environmental Impact Report will include the activity description; site / area and corridor assessments; public participation; a description of the issues and assessment of the site. The specialist studies results will be summarised and integrated into the Environmental Impact Report.

The WMLA Report will include all the technical information generated by the Design of the Facility, the Site Survey and the Operating Plan. In addition all the documents required by DEA for the waste license will also be included. These include the emergency and response plan, the closure and rehabilitation plan and the waste hierarchy implementation plan.

9.5 ENVIRONMENTAL MANAGEMENT PROGRAMME

An Environmental Management Programme (EMP), in the context of the Regulations, is a tool that takes a project from a high level consideration of issues down to detailed workable mitigation measures that can be implemented in a cohesive and controlled manner. The objectives of an EMP are to minimise disturbance to the environment, present mitigation

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.

APPENDIX E: DECLERATION OF INDEPENDENCE

Declaration of Independence

I, Mitha Cilliers hereby declare that Newtown Landscape Architects cc, an independent consulting firm, has no interest or personal gains in this project whatsoever, except receiving fair payment for rendering an independent professional service.

Consultant name: Mitha Cilliers

Signature: 

Date: 26 May 2014

Since 1994

Graham Young PrLArch

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Graham is a landscape architect with thirty years' experience. He has worked in Southern Africa and Canada and has valuable expertise in the practice of landscape architecture, urban design and environmental planning. He is also a senior lecturer, teaching urban design and landscape architecture at post and under graduate levels at the University of Pretoria. He also specializes in Visual Impact Assessments.

EXPERIENCE: NEWTOWN LANDSCAPE ARCHITECTS cc. *Member*

Current — Responsible for project management, landscape design, urban design, and visual impact assessment.

Senior Lecturer: Department of Architecture, University of Pretoria.

1991 - 1994 — **GRAHAM A YOUNG LANDSCAPE ARCHITECT - *Sole proprietor***

1988 - 1989 — Designed major transit and CBD based urban design schemes; designed commercial and recreational landscapes and a regional urban park; participated in inter-disciplinary consulting teams that produced master plans for various beachfront areas in KwaZulu Natal and a mountain resort in the Drakensberg.

1989 - 1991 — **CANADA - *Free Lance***

Designed golf courses and carried out golf course feasibility studies (Robert Heaslip and Associates); developed landscape site plans and an end-use plan for an abandoned mine (du Toit, Allsopp and Hillier); conducted a visual analysis of a proposed landfill site.

1980 - 1988 **KDM (FORMERLY DAMES AND MOORE)** - *Started as a Senior Landscape Architect and was appointed Partner in charge of Landscape Architecture and Environmental Planning in 1984*. Designed commercial, corporate and urban landscapes; completed landscape site plans; developed end-use master plans for urban parks, college and technikon sites; carried out ecological planning studies for factories, motorways and a railway line.

1978 - 1980 **DAYSON & DE VILLIERS - *Staff Landscape Architect***

Designed various caravan parks; designed a recreation complex for a public resort; conducted a visual analysis for the recreation planning of Pilgrims Rest; and designed and supervised the installation of various private gardens.

EDUCATION:

Bachelor of Landscape Architecture, 1978, (BLArch), University of Toronto, Canada;
Completing a master's degree in Landscape Architecture, University of Pretoria; Thesis: Visual Impact Assessment;
Senior Lecturer - Department of Architecture, University of Pretoria.

PROFESSIONAL:

Registered Landscape Architect – South African Council for Landscape Architectural Profession (2001);
Board of Control for Landscape Architects of South Africa (1987) – Vice Chairman 1988 to 1989;
Professional Member - Institute of Landscape Architects Southern Africa (1982) – President 1986 - 1988;
Member Planning Professions Board 1987 to 1989;
Member International Association of Impact Assessment;

AWARDS:

Torsanlorenzo International Prize, Landscape design and protection 2nd Prize Section B: Urban Green Spaces, for Intermediate Phase Freedom Park (2009)
Phase 1 and Intermediate Phase Freedom Park: Special Mention World Architecture Festival, Nature Category (2008)
Moroka Park Precinct, Soweto: ILASA Merit Award for Design (2005) and Gold Medal United Nations Liveable Communities (LivCom) Award (2007)
Isivivane, Freedom Park: ILASA Presidential Award of Excellence Design (2005)
Information Kiosk, Freedom Park: ILASA Merit Award for Design (2005)
Moroka – Mofola Open Space Framework, Soweto: ILASA Merit Award for Planning (2005)
Mpumalanga Provincial Government Complex: ILASA Presidential Award of Excellence (with KWP Landscape Architects for Design (2003)

Specialist Impact Report: Visual Environment, Sibaya Resort and Entertainment World: ILASA Merit Award for Environmental Planning (1999);
Gillooly's Farm, Bedfordview (with Dayson and DeVilliers): ILASA Merit Award for Design;

COMPETITIONS:

Pan African Parliament International Design competition – with MMA architects (2007) Finalist
Leeuwpan Regional Wetland Park for the Ekurhuleni Metro Municipality (2004) Landscape Architectural Consultant on Department of Trade and Industries Building (2002) – Finalist
Landscape Architecture Consultant on Project Phoenix Architectural Competition, Pretoria (1999): Winner;
Mpumalanga Legislature Buildings (1998): Commissioned;
Toyota Fountain (1985): First Prize - commissioned;
Bedfordview Bike/Walkway System - Van Buuren Road (1982): First Prize - commissioned;
Portland Cement Institute Display Park (1982): Second Prize

CONTRIBUTOR:

Joubert, O, 10 Years + *100 Buildings – Architecture in a Democratic South Africa Bell-Roberts Gallery and Publishing*, South Africa (2009)

- Freedom Park Phase 1 and Intermediate Phase (NBGM), Pretoria, Gauteng

Galindo, M, *Collection Landscape Architecture*, Braun, Switzerland (2009)

- Freedom Park Phase Intermediate Phase (NBGM), Pretoria, Gauteng

In *1000 X Landscapes*, Verlagshaus Braun, Germany (2008)

- Freedom Park Phase 1 and Intermediate Phase (NBGM), Pretoria, Gauteng
- Riverside Government Complex (NLAKWP), Nelspruit, Mpumalanga;
- Moroka Dam Parks Precinct, Soweto, Gauteng.

In *Johannesburg: Emerging/Diverging Metropolis*, Mendrision Academy Press, Italy (2007)

- Moroka Dam Parks Precinct, Soweto, Gauteng.

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B.Sc Degree in Environmental Science from the University of North West, Potchefstroom Campus (2003). M.Sc Degree in Ecological Remediation and Sustainable Utilization from the University of North West, Potchefstroom Campus (2007). She is currently employed by Newtown Landscape Architects working on the following projects.

EXPERIENCE: Environmentalist: Newtown Landscape Architects

Responsible for the environmental work, which includes Basic Assessments, Environmental Impact Assessments (Scoping & EIA), Environmental Management Plans (EMP), Environmental Auditing as well as Visual Impact Assessments.

Current Projects:

Orchards Extension 49-53, Pretoria - Environmental Impact Assessment and Environmental Management Plan

Tanganani Ext 8, Johannesburg - Environmental Impact Assessment and Environmental Management Plan

Diepsloot East Development, Diepsloot **-** Environmental Impact Assessment and Environmental Management Plan

Klerksoord Ext 25 & 26, Pretoria – Environmental Impact Assessment

Ennerdale Ext 16, Johannesburg - Environmental Impact Assessment and Environmental Management Plan

Glen Marais Ext 102 & 103, Kempton Park - Basic Assessment and Environmental Management Plan

Princess Plot 229, Princess - Environmental Assessment (S24G Application)

Uthlanong Drive Upgrade – Mogale City Local Municipalty project in Kagiso, Basic Assessment for the upgrade of the stormwater and the roads

Luipaardsvlei Landfill Site – Mogale City Local Municipalty project in Krugersdorp, the expansion of the existing landfill site.

MCLM Waste Water Treatment Works – Mogale City Local Municipalty project in Magaliesburg, the expansion of the existing facility.

Rand Uranium (Golder Associates Africa (Pty) Ltd), Randfontein – VIA

Dorsfontein West Expansion (GCS (Pty) Ltd), Kriel – VIA

Mine Waste Solutions (GCS (Pty) Ltd), Stilfontein – VIA

Ferreira Coal Mining (GCS (Pty) Ltd), Ermelo – VIA

De Wittekrans Mining (GCS (Pty) Ltd), Hendrina – VIA

EDUCATION:

May 2009	Public Participation Course, International Association for Public Participation, Golder Midrand
May 2008	Wetland Training Course on Delineation, Legislation and Rehabilitation, University of Pretoria.
April 2008	Environmental Impact Assessment: NEMA Regulations – A practical approach, Centre for Environmental Management: University of North West.
Feb 2008	Effective Business Writing Skills, ISIMBI
Oct 2007	Short course in Geographic Information Systems (GIS), Planet GIS

Jan 2004 – April 2007	M.Sc Degree in Ecological Remediation and Sustainable Utilization, University of North West, Potchefstroom Campus. Thesis: Tree vitality along the urbanization gradient in Potchefstroom, South Africa.
Jan 2001 – Dec 2003	B.Sc Degree in Environmental Science, University of Potchefstroom

PROFESSIONAL REGISTRATION:

Sep 2009	Professional National Scientist – 400204/09

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Mitha is a landscape architect with nine years experience. She has worked as Landscape Architect in South Africa and Angola and has valuable expertise in the practice of landscape architecture and environmental planning. She is currently employed by Newtown Landscape Architects.

EXPERIENCE:

Current *Landscape Architect:*
NEWTOWN Landscape Architects cc.
Visual Impact Assessments
Landscape Maintenance Auditing
Landscape Design

2008 to 2013 *Consultant*:
NEWTOWN Landscape Architects cc.
Visual Impact Assessments
KWP Landscape Architects & Environmental Consultants
Landscape Maintenance Auditing
Landscape Design and draughting
REAL Landscapes
Landscape Design

2005 – 2007 *Landscape Architect:*
KWP Landscape Architects & Environmental Consultants
Landscape design for various types of projects ranging from residential garden design to industrial landscaping, including the landscape upgrade of the SASOL plant in Secunda.

General project administration and documentation including Bill of Quantities, Tender Evaluation and site inspections.

Landscape Maintenance Auditing at the Nelspruit Riverside Government Offices

Preparation of Environmental Impact Assessment Reports for proposed housing developments.

Environmental Control Officer on various residential housing developments.

2003 – 2004 *Candidate Landscape Architect:*

Sigma Gibb – part of the GIBB Africa Group

Co-Landscape Architect on a residential housing estate in Luanda, Angola.

Design and draughting for various projects in Angola.

2003 *Candidate Landscape Architect:*

NEWTOWN Landscape Architects cc.

Design and draughting various projects ranging from private residential gardens to public parks.

Project administration including Bills of Quantities and Tender Evaluation and site inspections

PROFESSIONAL:

Registered Landscape Architect – South African Council for Landscape Architectural Profession (2007)

Committee Member – South African Council for Landscape Architectural Profession (2009 & 2011- - 2012)

EDUCATION:

Bachelor of Landscape Architecture, 2001, (BLArch), University of Pretoria.