APPENDIX K: VISUAL STUDY

Visual Impact Report

IMPALA PLATINUM TAILINGS DAM PROJECTS

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NLA

THE PROPOSED TAILINGS DAM PROJECTS AND THE EXPANSION OF ONE OPEN PIT

Specialist Study Report
VISUAL ENVIRONMENT – ASSESSMENT

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EXECUTIVE SUMMARY

Approach adopted for the study

Landscape character, landscape quality and "sense of place" were used to rate the value of the visual resource of the study area (receiving environment). The extent to which the proposed project will affect views in the study area was determined i.e. the visual impact. The severity of the visual impact was rated using visibility, visual intrusion, visual exposure, sense of place and sensitivity criteria. The significance of impact was then determined using a ranking scale based on the Hacking method and criteria.

Findings

The Impala Tailings Dam projects will *definitely* exert a negative impact on the visual environment.

During the construction and operational phases the impact will be *medium* for all sensitive viewing areas when the worst-case scenario is considered.

The impact on tourist route R556 will be *insignificant* for all phases of the project.

At closure phase the impact will continue as *medium* for all sensitive viewing areas in close proximity to the tailings dam, which remains in place.

Mitigation measures are proposed, which primarily relate to 'good housekeeping, during all phases of the project but due to the scale and nature of the proposed activities, the significance of impact rating will not reduce significantly for most communities. However, should the mitigation measures proposed for the reprocessing activities be effectively implemented, the impact on the southern areas of Luka South would be significantly reduced as the proposed earth berm and tree screens would block views to the operation. They would also act as dust collectors.

To facilitate the implementation of mitigation measures a Visual Impact Management Plan should be developed. The plan should include a Landscape Development Plan, which identifies the location and nature of landscaping (earth berms) and tree planting schemes (at the reprocessing operation). These efforts will be concentrated in areas that would maximize the screening of the development from nearby residential areas of Luka South.

It is recommended that the landscape development plan be developed by a landscape architectural practice registered with the South African Council for the Landscape Architectural Profession (SACLAP), and that it be implemented under the supervision of the landscape architect.

***

1.0 INTRODUCTION

1.1 Project

Impala Platinum Limited (Impala) is proposing three projects (the project). The project includes: the development of a new tailings dam (No. 5), re-processing and rehabilitating the footprint of the old tailings dam (No. 1 & 2) and associated waste disposal facility, and expanding two pits as part of the opencast operations. The projects are located within Impala's surface use area at is Rustenburg operations. This area falls within the Rustenburg Local Municipality and the Bojanala Platinum District Municipality in the North West Province. The regional and local settings are presented in Figures 1 and 2 respectively. This visual impact assessment forms part of the EIA process for the project.

1.2 Terms of Reference

- Conduct a field survey of study the area to the extent that the receiving environment can be documented and adequately described.
- Describe the visual resource (i.e. receiving environment);
    - Describe and map the landscape character of the study area. The description of the landscape will focus on the nature and character of the landscape rather than the response of a viewer.
    - Describe the quality of the landscape. Aesthetic appeal is described using recognized contemporary research in perceptual psychology as the basis.
- Describe the sense of place of the study area as to the uniqueness and distinctiveness of the landscape. The primary informant of these qualities is the spatial form and character of the natural landscape together with the cultural transformations associated with the historic/current use of the land.
- Illustrate the proposed tailings dam 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 tailings dam in its landscape context.
- Rate the impact on the visual environment of the proposed tailings dam based on a the method and criteria described below and in Appendix C
- Suggest measures that could mitigate the negative impacts of the proposed project.
- Produce a report outlining the findings.

1.3 Assumption

It is assumed that the expansion to the mining pits would have an insignificant impact on the current baseline visual and aesthetic environment and therefore it is not considered in this study. Kultwanong School and old age home are sensitive receptors in the general area of the pits but visual issues were not raised by these receptors. Also, the visual change in this area is temporary and a continuation of the mining that has recently occurred and been rehabilitated. A second pit is being worked but it is amongst existing mining infrastructure and right near an existing pit and not near any sensitive visual receptors. For these reasons the mining pits are not considered an issue.

NLA have assessed the visual impact of the project from the proposed heritage park koppie (where archaeological remnants are located) area only on the basis that this is the only certain sensitive view point within the boundary of the park. There is no current additional information that enables the assessment of other sensitive view points within the park that may be developed in the potential future of the heritage park.

2.0 AIM OF THE STUDY

The main aim of the study is to ensure that the visual consequences of the proposed project are understood and adequately considered in the planning process. The objectives of the study are to:

- To define the visual resource and sense of place of the study area;
- To identify the sensitive receptors / lines of site;
- To determine and rate the visual impact;
- To simulating the key proposed infrastructure components against the visual baseline;
- To assess the cumulative visual impact; and
- To provide input, together with Metago and other specialists into visual management measures to minimize negative visual impacts.

3.0 APPROACH AND METHODOLOGY

A field survey was undertaken 6 March 2011 and the area scrutinized. Sensitive viewing areas were visited and photographs taken from these areas towards the proposed tailings dam site. The study area is defined as a 7.5 km radius about the proposed project site (Refer to Figure 1). Beyond this distance the proposed tailings dam would be 'absorbed' into its landscape setting and would therefore have an insignificant impact on sensitive views.

Landscape character, landscape quality and sense of place were used to evaluate the *visual resource*. A qualitative evaluation of the landscape is essentially a subjective matter. And in this study the evaluation is determined using the criteria discussed in Appendix A and the professional opinion of the author.

The *landscape impact* of the proposed tailings dam project was measured as the change to the fabric and character and of the landscape caused by the physical presence of the tailings dam.

Visual impacts are a subset of landscape impacts. They relate solely to changes in available views of the landscape, and the effects of those changes on people. The severity of that change (i.e. *visual impact*) is the degree to which the change compromises, enhances or maintains the visual quality of a particular area.

Visual impact is determined using *visual intrusion*, *visibility* and *visual exposure* criteria and is concerned with:

- The direct impacts of the project upon views of the landscape through intrusion or obstruction;
- The overall impact on visual amenity, which can range from degradation through to enhancement;

To arrive at a significance rating the severity of impact is qualified with spatial, duration and probability criteria (refer to Appendix C). The visual impact process is graphically illustrated in the diagram below.

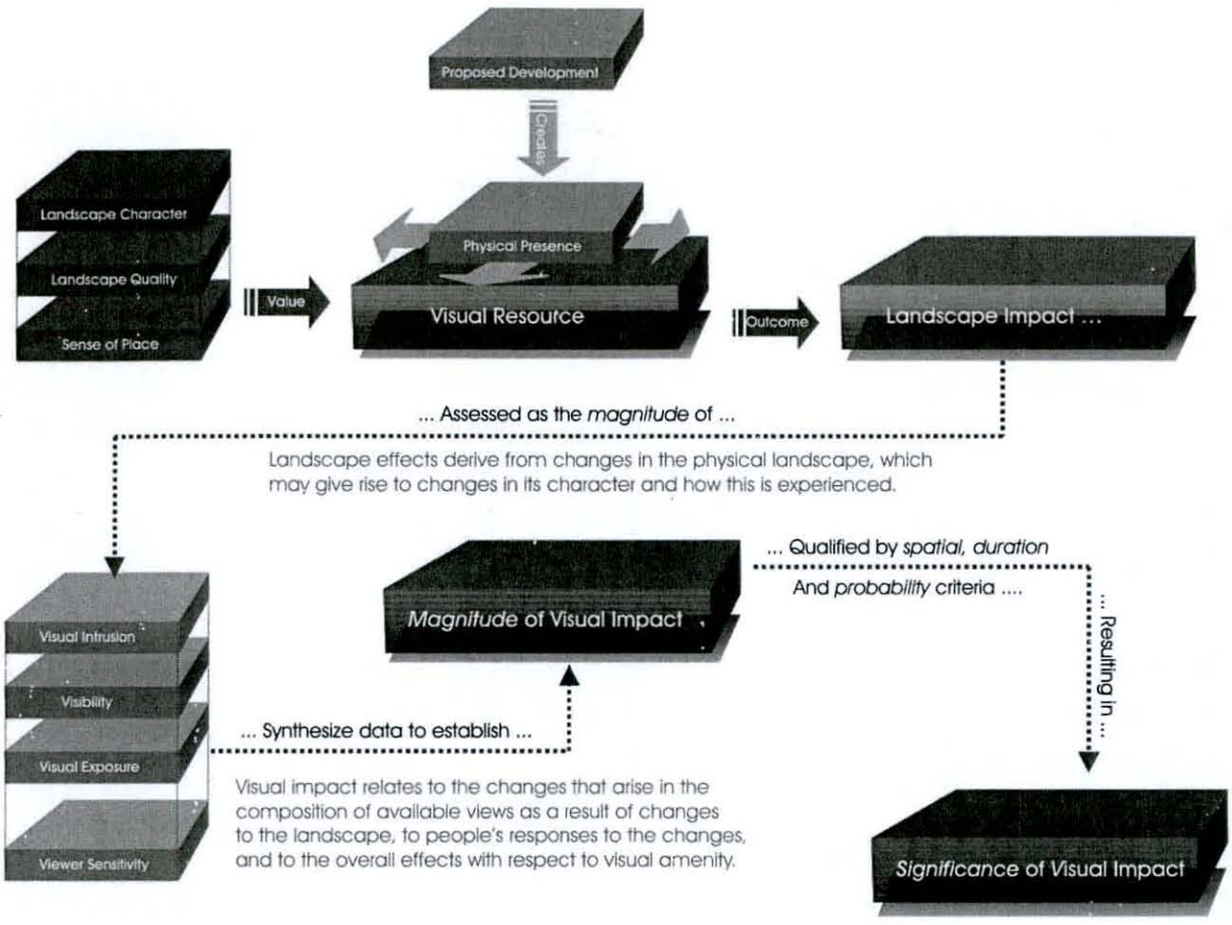


Diagram 1: Visual impact Process

4.0 DESCRIPTION OF THE PROJECT

4.1 Tailings Dam

Figure 2 illustrates the layout of the proposed new tailings dam. Its design tonnage is approximately 20 000 000 tonnes per annum (tpa) at a dry density of 1.7 tonnes per cubic metre. Initially part of this 20 000 000 tpa will be directed to the existing tailings dam (3 & 4), but ultimately the whole tonnage will be placed on the new tailings dam (No.5). The footprint of the tailings dam will be approximately 550ha. The final height of the proposed tailings dam is estimated to be 40m. The side slopes will be constructed at approximately 1 vertical : 4 horizontal. Diversions Runoff diversions around the southern and north eastern sides of the tailings dam that directs clean surface run off away from the tailings dam and return water dam. There will be a compacted toe wall around the perimeter of the dam of 1m height and slopes approximately 1 vertical : 1.5 vertical.

Establishment of vegetation as the elevation of the tailings dam rises by means of hydro seeding and/ or hand planting.

4.2 Brief description of re-mining process

Typically high pressure pumps in series located in the new pump station adjacent to the dam will supply water to monitor hoses on top of the tailings dam. These water monitor hoses will re-pulp the old tailings, which are then directed via gravity over a primary screen to a large vertical spindle pump located on a floating barge. The vertical spindle pump will then pump the slurry over the dam wall into a sump c/w secondary screen (note: the screens are required to remove fine vegetation / trash)

Typically slurry pumps in series will then pump the slurry via a new pipeline(s) to the existing Central Concentrator plant where it will be processed. The size and amount of pipelines required will vary according to the reclamation rate.

As the localised mining moves, the area will be de-vegetated.

5.0 THE ENVIRONMENTAL SETTING

5.1 Landscape Character

The study area is situated in an area of gently undulating plains at an average altitude of 1 130 metres above mean sea level (mamsl). The topography in the study area is mostly flat, gently sloping to the drainage lines, which eventually feed the Elands River system. Hills, rising up to 250m above the plain, occur along the eastern edge of the study area (refer to Figures 3, 4 and 5).

The proposed new tailings dam project site is primarily situated in the Marikana thornveld type in close proximity to the divide between Marikana and Zeerust thornveld. These occur mostly along the eastern edge of the study area (refer to Figures 3,4,5,7 and 8) and are characterised by open to dense short thorny woodland dominated by *Acacia* species with a grassy herbaceous layer. The hills (Figures 3, 4 and 5) tend to have a denser cover with rocky outcrops prevalent. Tall shrubs can also be found on the hills along with a dense grass cover.

The old tailings dam and the associated waste disposal facility are situated in totally disturbed areas with no naturally occurring vegetation. The proposed open pit expansion is located in the Marikana thornveld. The vegetation types are described further below. However, as a result of Impala's mining activities, the natural vegetation in the mine lease has generally been disturbed and fragmented.

Current land use within the study area comprises settlements in the east (Serube, Mafika and Kanana) and western portions of the site (Luka North and Luka South) and Freedom Park, in the south (refer to Figure 8). The western section of the study area is dominated by Impalas existing mining activities as is illustrated in Figures 6 and 8.

5.2 Sense of Place and Aesthetic Value

Landscapes with greater diversity or containing "distinctive" features are classified as having a higher scenic value than landscapes with low diversity, few distinctive features, or more "common" elements. Generally, the greater the diversity of form, line, texture, and colour in a landscape unit or area, the greater the potential for high scenic value. Scenic quality classifications are:

- High - distinctive landscape often with a strong sense of place
- Moderate - common landscape
- Low - minimal landscape often with a weak sense of place

The study area can be divided into four primary 'land types' each with its dominant landscape characteristic and sense of place and aesthetic value. These are mapped in Figure 8 and include: mining and utility, settlement / built up, rolling grassland plains and the natural hills.

It is difficult to separate out the aesthetic value of a landscape into its component parts, yet an attempt is made here. Using the criteria and values defined in Appendix A along with the discussion on landscape character, the overall visual quality of the study area is rated from *low* (western section – see Figure 6) to *high* (eastern section – see view 5b Figure 4 and View 7 Figure 5), within the context of the sub-region.

The western section of the study area leaves an overriding impression (sense of place) of a flat and relatively featureless natural landscape, dominated by mining, utility and township land uses. These areas are considered to have a *low* visual quality i.e. the landscape generally is negative in character with few, if any, valued features. Scope for positive enhancement could occur. The proposed reprocessing and mining projects occur within this landscape type.

The hills and koppies, which occur along the eastern side of the site create a contained, complex yet coherent spatial dimension, which invites the visitor into a scene dominated by these natural edges and which add 'wildness' to the scene. These factors combine to evoke a strong emotional response in the visitor, created by a landscape that is somewhat unique and has a distinct character of its own. This landscape type has a visual quality that is rated *high* i.e. a 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. It may be sensitive to change in general and may be detrimentally affected if change is inappropriately dealt with.

A moderate value is placed on the plains, which occur in the northern and middle sections of the study area (View 6 Figure 5 and View 12 Figure 7). The proposed new tailings dam

occurs within this landscape type.

A summary of the scenic quality of the various landscape types is contained in Table 1 below.

Table 1: Value of the Visual Resource - Scenic Quality

High	Moderate	Low
Hills and associate plains (eastern sector of study area)	*Grassland plains (central and northern sector of study are)*	*Mining and township areas (western section of study area and south eastern section)*
These landscape types are considered to have a *high* value because they are:	These landscape types are considered to have a *moderate* value because they are:	These landscape types are considered to have a *low* value because they are:
Distinct landscapes that exhibit a very positive character with valued features that combine to give the experience of unity, richness and harmony. They are landscapes that may be considered to be of particular importance to conserve and which have a strong sense of place. They may be sensitive to change in general and may be detrimentally affected if change is inappropriately dealt with.	Common landscapes that exhibit some positive character but which have evidence of alteration /degradation/erosion of features resulting in areas of more mixed character. They are potentially sensitive to change in general and change may be detrimental if inappropriately dealt with but change may not require special or particular attention to detail.	Minimal landscapes generally negative in character with few, if any, valued features due to their inherent characteristics or due to major negative man-made impacts. Scope for positive enhancement could occur.

However, the value of the visual resource when the various landscape types are taken together as being representative of the quality of the study area's areas landscape, the rating is *moderate* within the context of the study area.

5.3 Views

The project sites are visually exposed primarily due to the relatively flat nature of the landscape and the lack of tall vegetation (refer to Figure 3). Public views (sensitive viewing areas) to the project sites would be experienced by people living and visiting the adjacent settlements. These are Serutube (2,5 km distant – see also Figure 3), Mafika (3.0 km distant

– see also View 6 Figure 5), Freedom Park (4.0km immediately south of the proposed tailings dam) and Kanana (5.0 km distant – see also View 7 Figure 5) to the south east of the proposed new tailings dam. Luka South is immediately adjacent to the proposed reprocessing project and Luka North is approximately 5 km north west of the proposed tailings dam site. Babauntswa and Kultwanong School and old age home are located to the south west of the proposed new tailings dam.

All these public views are however from a relatively low vantage point as is evident in the photographs illustrated in Figures 4, 5, 9, 13, 14 and 15 respectively. The result of this is that the sites would only be visible from the periphery of the residential areas and from the roads that service these settlements and the mining area (refer to Figure 1).

Views from R510 would mostly be blocked by township development and the hills that run along the eastern side of the project area. Views from the R556 and D513 would be open and orientated towards the proposed sites, but would mostly be distant i.e. over 5.0 km from the sites.

The author is not aware of tourist properties in the area, however a heritage site proposed in the Royal Bafokeng Nation Masterplan for the area (Welbekend – see Figure 1) is proposed immediately east of the proposed tailings dam site. Views from this vantage point could be close-up and in the foreground of views to the west (i.e. towards the project sites) if the entire site is developed. However, at the time of writing the report there is no clear information that confirms how the area would be developed. We do know that the archaeological finds are located near the top of the koppies and it is therefore from these viewing points that sensitive views to the site are assessed.

6.0 LANDSCAPE and VISUAL IMPACT

6.1 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 projects will be *high* due primarily to the change that will result from the initial scarring and disturbance of the landscape and the scale of the operations. This will be particularly so for the tailings dam site, which would require the removal of a substantial amount of woody vegetation. During

the construction phase the landscape change will be evident with the removal of vegetation and the extensive earthworks required to create the facility and to affect the reprocessing process.

Once construction has been completed and the operation begins, an obvious change to the landscape characteristics of the site will remain evident. However, as stated in the approach, the physical change to the landscape at the project site must be understood in visibility and aesthetic terms of the study area.

6.2 Visibility and visual exposure

The 'zone of potential influence' i.e. the distance beyond which views to the project sites would not be greatly influenced by the presence of its proposed structures, was set at 7,5 km. The study area used to determine visual impact is therefore limited to a radius of 7,5 km about the project sites. 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 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 viewshed analysis depicted in Figure 16, confirms this and illustrates that the projects would potentially be visible from within a majority of places within the zone of potential influence i.e. *highly* visible because the development is potentially visible from over half the zone of potential influence, and views are would mostly unobstructed. Table 2 below summarizes this.

Table 2: Visibility of project components

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

The construction of the proposed tailings dam would result in *moderate* exposure (viewed in the middle-ground of a scene) to people living in and visiting the western edges of Seretube and Mafika and people visiting the koppies within the Welbekend Heritage Area. Due to topographic relief, project components would not be visible from Kana and only the higher portions of the tailings dam would be visible from Freedom Park but would appear in the background of the view.

The southern and eastern sections of Luka South would be *highly* exposed to the reprocessing activities but people would not see the proposed new tailings dam as the existing tailings dam would block views to it.

The eastern sections of Luka North would have *low* exposure to the north western side of the new tailings dam as these areas are over 5 km from the township and the reprocessing project would not be visible as Luka South would block views to it.

Although views to the proposed tailings dam from the D513 and R 556 would be open and unobstructed, visual exposure would be very *low* as the viewer would be over 6 km from the activity.

6.2 Visual Intrusion

Visual intrusion is directly related to *landscape impact* and the nature of intrusion (physical characteristics) of a project component on the visual quality of the environment and its compatibility / discord with the landscape and surrounding land use.

Section 5.3 describes the public areas (sensitive viewing sites) from which the project sites would potentially be visible. Although visibility is high, virtually every public view to the project sites would be from a low perspective and have mining infrastructure as a backdrop or at least within the view (refer to Figures 3, 4, 5 and 6). This is because the residential areas and public roads are located generally to the east, south and immediate west of the sites and are not elevated above the plain. The proposed project activities would tend to 'blend' with and be associated with the characteristics of the existing landscape and be absorbed into the scene.

The photo simulation in Figure 9 illustrates this phenomenon, which is typical of views from the northern section of Serutube. The proposed new tailings dam would be viewed against the backdrop of the existing tailings dam and be 'absorbed' into the scene. This ultimately makes it difficult to see. The most dramatic change to the existing scene would occur primarily during the construction phase and before the side slopes are vegetated. Even from a raised position in the hills behind Seretube, or the koppies at the Welbekend Heritage area the intrusive nature of the new tailings dam would be relatively low as is illustrated in Figure 10 or when the viewer moves closer to the tailings dam (near the south end of the proposed Welbekend heritage area) as is shown if Figure 11.

Figure 12 illustrates that the proposed tailings dam would have an insignificant effect on views from the 'internal' road (typical also of views from Freedom Park) south of the site.

As has been stated the proposed new tailings dam would not be visible from most parts of Luka South as is illustrated in Figure 13. The reprocessing activity would be visible to people living and visiting the southern sectors of the township however the activity would not contrast dramatically with activities already in the immediate vicinity of the township.

People living in Luka North and travelling along the D513 and R556 would barely notice the proposed new tailings dam and the intrusive nature of the activity on these viewing areas is low to insignificant as is illustrated in Figures 14 and 15.

Table 3 below summarizes the visual intrusion criteria and rates the worst case scenario for project components either individually or collectively on sensitive viewing area.

Table 3: Visual Intrusion

High	Moderate	Low	Positive
	For Luka South, Serutube and Mafika and sections of the 'internal' local roads proposed and Welbekend Heritage area	*For Kanana, Freedom Park, and Luka North*	

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.

6.4 Severity of Visual Impact

Visual impact is 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 quality of views in the area as perceived by people visiting, working or living in the area.

6.4.1 Impact on sense of place

For the reasons given in the Section 6.2, the project is expected to have a cumulative negative impact on the sense of place of the study area. The presence of mining and processing activities contributes to the current sense of place (as described in Section 5.1), albeit a negative contribution, and therefore helps establish the aesthetic characteristics for the study area. The proposed reprocessing, mining and new tailings dam will therefore have a negative impact on the visual quality of the study area but to a far lesser degree than would have been the case if no other mining processing activities where present. Nevertheless, this does not mean that methods to reduce the impact of project should be considered.

Perhaps the aspect that would have the greatest visual impact is the impact of the project at night. The lights associated with the reprocessing activities would contribute to the already prevalent light pollution generated by existing mining and urban areas.

6.4.2 Severity of Visual Impact

The *severity* of the visual impact is assessed using the worst-case scenario, the synthesis of the criteria given in Appendix B and the discussion in the body of this report. 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 & The Landscape Institute (1996). The impact on sensitive viewing areas will vary and thus ratings are given for the various sectors of the study area.

Table 4: *Severity* of Visual Impact

High	Moderate	Low	Negligible
	For Luka South, Serutube and Mafika and sections of the 'internal' local roads and for the proposed Welbekend Heritage area	*For Luka North*	*For Kanana, Freedom Park, D513 and R556*

A 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 the introduction of elements considered to be uncharacteristic when set within the attributes of the receiving landscape.	I.e. Pre-development landscape or view and the 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 the 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 the 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.

7.0 MITIGATING MEASURES

When considering mitigation measures to reduce the visual impact, three rules should be considered. Mitigation measures should be:

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

To address these measures the following principles should be considered:

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

The following actions are proposed for each site:

7.1 Site Development

- Ensure that all existing vegetation, especially along the periphery of the site is retained during the construction phase to act as visual screens and dust collectors and to break the monotony that would be evident of vast expanses of exposed earth.

7.2 Earthworks

- Dust suppression techniques should be in place at all times during the construction and operational phases.
- Only the footprint of the proposed site should be exposed. In all other areas the vegetation should be retained.

7.3 Screening

Screening should be introduced along the edges of the reprocessing site and the proposed new tailings dam (No. 5) as described below, to screen close-up views.

- Where the vegetation intrudes onto the site it should be retained.
- An ecological approach to landscaping is recommended. Should plants be introduced into the project, choice should be guided by ecological rather than horticultural principles.
- for Where possible / feasible build a small earth berm of approximately 3m in height with 1 (v):3(h) side slopes along the north-western and south-western edges of the reprocessing site. Indigenous trees and shrubs should be planted in clumps.

7.5 Access Roads

- Internal roads should be surfaced to minimise dust. During the construction phase all dirt roads will require an effective dust suppression management programme such as regular watering and / or the use of non-polluting chemicals that will retain moisture in the road surface.
- Where a paved road surface is required, paving materials with 'earthy' tones that complement the natural red/brown colours and textures of the soils in the area should be used.

7.6 Lighting

The negative impact 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 site – this is especially relevant where the project activities are exposed to residential properties in Luka South.
- Avoid high pole top security lighting along the periphery of the site and use only lights that are activated on illegal entry to the site.

8.0 SIGNIFICANCE OF VISUAL IMPACT

The **alternatives** for the proposed tailings dam as described in the Scoping Report were considered and it is our opinion that the proposed alternative should be the preferred option as in this location the facility would be the greatest distance from nearby residential

communities.

Table 5 summarizes the activities that will have an impact on the visual environment. It also describes the type of impact during the construction, operational and decommissioning phases. The severity of impact, rated in Table 4, is qualified with spatial, duration and probability criteria to determine the *significance* of the visual impact. The criteria used in Table 5 are summarised in Appendix C (Hacking Method). The significance of the impact is predicted using the worst-case scenario of an activity. Mitigation measures are possible but even when applied properly to best practice mining and processing procedures, the reduction in impact, although significant, is not substantial enough to significantly reduce the impact of the proposed activities. This is primarily due to the nature, scale and form of the proposed processes and features. The ratings with mitigation assume that the measures as proposed in Section 7.0 are effectively applied.

Table 5: Visual Impact Assessment – Construction / Operational Phase / Closure

Luka South, Serutube and Mafika and sections of the 'internal' local roads and the Welbekend Heritage Area

Potential Visual Impact	ENVIRONMENTAL SIGNIFICANCE							
	Before mitigation				After mitigation			
	C	x	P	SIG	C	x	P	SIG
Construction Phase	M		H	**M**	M		H	**M**
Construction activities, topographical change, removal of vegetation, surface disturbance, dust, visual disturbance, new tailings dam, water supply lines, return dam, access roads, earthworks. Construct earth berm and plant trees along northern and southern edges of tailings dam 1 and 2.								
Operational Phase	M		H	**M**	M		H	**M**
New tailings dam will grow in height, topsoil stockpiles, some dust will be generated by activates un-surfaced roads will create dust, water supply lines, side wall will be progressively vegetated. Tailings dam 1 and 2 reprocessing: site establishment of temporary offices, portable toilets, temporary workshop and wash bay and temporary non-mineralised waste storage facilities; clearing of vegetation in accordance with the relevant								

biodiversity management procedures; stripping and stockpiling of soil resources in accordance with the relevant soil conservation procedures; establishment of stormwater facilities such as diversion berms, various drains, and trenches; construction of pipelines; and construction of service roads and fences.						
Decommissioning Rehabilitation of tailings dam 1 and 2 site; Establishment of a rehabilitation site office, temporary workshop and wash bay, portable toilets, and temporary non-mineralised waste storage facilities; Earth moving for clearing and shaping the footprint; Placement of the capping and topsoil layers where relevant; Re-vegetation of the waste disposal facility and tailings footprint; Construction of the water management facilities to divert surface runoff; and installation of groundwater monitoring boreholes if required; side slopes of tailings dam 5 completely rehabilitated and managed – tailings dam remains.	M	H	**M**	M	H	**M**

Table 6: Visual Impact Assessment – Construction / Operational Phase / Closure

For Luka North

Potential Visual Impact	ENVIRONMENTAL SIGNIFICANCE					
	Before mitigation			After mitigation		
	C	P	SIG	C	P	SIG
Construction Phase Construction activities, topographical change, removal of vegetation, surface disturbance, dust, visual disturbance, new tailings dam, water supply lines, return dam, access roads, earthworks. Construct earth berm and plant trees along northern and southern edges of tailings dam 1 and 2.	L	L	**L**	L	L	**L**
Operational Phase New tailings dam will grow in height, topsoil stockpiles, some dust will be generated by activates un-surfaced roads will create dust, water supply lines, side wall will be progressively vegetated. Tailings dam 1 and 2 reprocessing: site establishment of temporary offices, portable toilets, temporary workshop and wash bay and temporary non-	M	L	**L**	M	L	**L**

mineralised waste storage facilities; clearing of vegetation in accordance with the relevant biodiversity management procedures; stripping and stockpiling of soil resources in accordance with the relevant soil conservation procedures; establishment of stormwater facilities such as diversion berms, various drains, and trenches; construction of pipelines; and construction of service roads and fences.						
Decommissioning Rehabilitation of tailings dam 1 and 2 site; Establishment of a rehabilitation site office, temporary workshop and wash bay, portable toilets, and temporary non-mineralised waste storage facilities; Earth moving for clearing and shaping the footprint; Placement of the capping and topsoil layers where relevant; Re-vegetation of the waste disposal facility and tailings footprint; Construction of the water management facilities to divert surface runoff; and installation of groundwater monitoring boreholes if required; side slopes of tailings dam 5 completely rehabilitated and managed – tailings dam remains.	L	L	L	L	L	L

8.0 **CONCLUSION**

The Impala Tailings Dam projects will *definitely* exert a negative on the visual environment.

During the construction and operational phases the impact will be *medium* for all sensitive viewing areas when the worst-case scenario is considered.

The impact on tourist route R556 will be *insignificant* for all phases of the project.

At closure phase the impact will continue as *medium* for all sensitive viewing areas in close proximity to the tailings dam, which will remain in place.

Mitigation measures are proposed, which primarily relate to 'good housekeeping, during all phases of the project but due to the scale and nature of the activities, the significance of impact rating will not reduce significantly for most communities. However, should the mitigation measures proposed for the reprocessing activities be implemented, the impact on the southern areas of Luka South would be significantly reduced as the proposed earth berm and tree screens would block views to the operation.

To facilitate the implementation of mitigation measures a Visual Impact Management Plan should be developed. The plan should include a Landscape Development Plan, which identifies the location and nature of landscaping (earth berms) and tree planting schemes (at the reprocessing operation). These efforts will be concentrated in areas that would maximize the screening of the development from nearby residential areas of Luka South.

It is recommended that the landscape development plan be developed by a landscape architectural practice registered with the South African Council for the Landscape Architectural Profession (SACLAP), and that it be implemented under the supervision of the landscape architect.

*** NLA ***

APPENDIX A: DETERMINING THE VALUE OF A VISUAL RESOURCE

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, woods, trees, water bodies, buildings and roads. They are generally quantifiable and can be easily described.

Landscape character is 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 Quality
(after Crawford 1994 and The Visual Resource Management System, Developed by The Bureau of Land Management (BLM) in the Department of the Interior of the USA Government).

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 - topography becomes more interesting as it gets steeper or more massive, or more severely or universally sculptured;
- Where water forms are present - The degree to which water dominates the scene is the primary consideration in selecting the rating score;
- 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 considering "colour" are variety, contrast, and harmony.
- Where diverse patterns of grasslands and trees occur - 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. Consider also smaller scale vegetational features which add striking and intriguing detail elements to the landscape (e.g. gnarled or wind beaten trees, and Quiver trees);
- 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.
- Where natural landscape increases and man-made landscape decreases;
- And where land use compatibility increases and land use edge diversity decreases - 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.

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). Refer also to Appendix A for further elaboration.

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 Beauty of Visual Resource

In determining the scenic 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

Derived from The Landscape Institute with the Institute of Environmental Management and Assessment (2002)

High (Distinct)	Moderate (Common)	Low (Minimal)
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.

Scenic Quality Inventory and Evaluation Chart

(Developed by: The Bureau of Land Management (BLM), In the Department of the Interior of the USA Government)

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	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**
Color	Rich color combinations, variety or vivid color; or pleasing contrasts in the soil, rock, vegetation, water or snow fields. **5**	Some intensity or variety in colors and contrast of the soil, rock and vegetation, but not a dominant scenic element. **3**	Subtle color 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	Distinctive, though somewhat similar to others	Interesting within its setting, but fairly

	region. Consistent chance for exceptional wildlife or wildflower viewing, etc. *** 5+**	within the region. **3**	common within the region. **1**
Cultural modifications	Modifications add favorably 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**

APPENDIX B: METHOD FOR DETERMINING THE *SEVERITY* OF LANDSCAPE AND VISUAL IMPACT

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 vie, but merely a statement of the fact of potential visibility. The visibility of a development and its contribution to visual impact is predicted using the criteria listed below:

Visibility

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

Visual Exposure

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

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

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

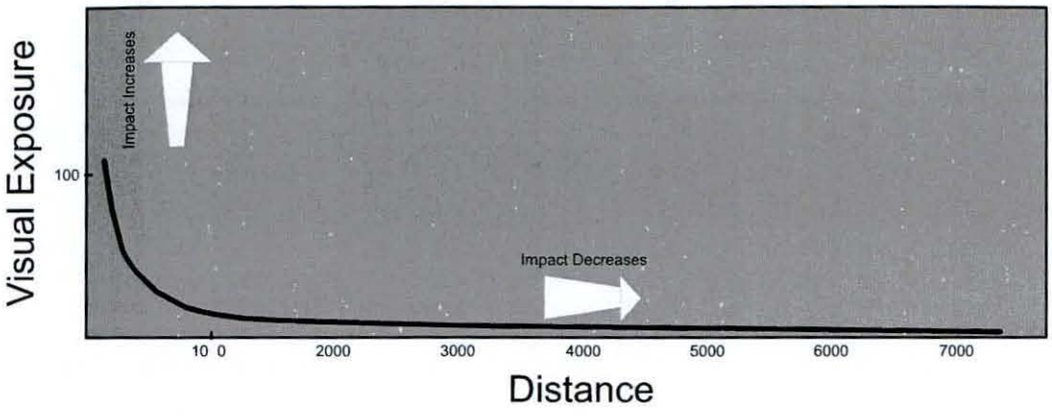
Areas seen from 800m to 5.0km are considered middle ground; vegetation appears as outlines or patterns. Depending on topography and vegetation, middle ground is sometimes considered to be up to 8.0km.

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

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

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

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 synthesizing 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 judgment. (Institute of Environmental Assessment and The landscape Institute (1996)).

***Severity* of Visual Impact**

High	Moderate	Low	Negligible
Total loss of or major alteration to key elements/features/charact eristics of the baseline.	Partial loss of or alteration to key elements/features/charact eristics of the baseline.	Minor loss of or alteration to key elements/features/charact eristics of the baseline.	Very minor loss or alteration to key elements/features/charact eristics 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)).

APPENDIX C: IMPACT ASSESSMENT METHODOLOGY (Metago)

The impact assessment methodology is based on the Hacking method of determination of the significance of impacts (Hacking, 1998). Part A provides the definition for determining impact consequence (combining severity, spatial scale and duration) and impact significance (the overall rating of the impact). Impact consequence and significance are determined from Part B and C. The interpretation of the impact significance is given in Part D.

PART A: DEFINITION AND CRITERIA*		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of severity, spatial extent and duration**
Criteria for ranking of the SEVERITY of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate / measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable / will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable / will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional / national

PART B: DETERMINING CONSEQUENCE					
SEVERITY = L					
DURATION	Long term	**H**	**Medium**	**Medium**	**Medium**
	Medium term	**M**	**Low**	**Low**	**Medium**
	Short term	**L**	**Low**	**Low**	**Medium**
SEVERITY = M					
DURATION	Long term	**H**	**Medium**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**High**
	Short term	**L**	**Low**	**Medium**	**Medium**
SEVERITY = H					
DURATION	Long term	**H**	**High**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**High**
	Short term	**L**	**Medium**	**Medium**	**High**
			L	**M**	**H**
			Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional / national
			SPATIAL SCALE		

PART C: DETERMINING SIGNIFICANCE					
PROBABILITY (of exposure to impacts)	Definite / Continuous	**H**	**Medium**	**Medium**	**High**
	Possible / frequent	**M**	**Medium**	**Medium**	**High**
	Unlikely / seldom	**L**	**Low**	**Low**	**Medium**
			L	**M**	**H**
			CONSEQUENCE		

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
High	It would influence the decision regardless of any possible mitigation.
Medium	It should have an influence on the decision unless it is mitigated.
Low	It will not have an influence on the decision.

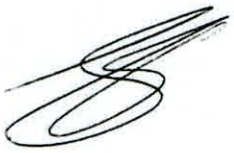
***H = high, M= medium and L= low and + denotes a positive impact.**

APPENDIX D: DECLERATION OF INDEPENDENCE

Declaration of Independence

I, Graham A Young 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: Graham Young



Signature:

Date: 2011 05 12

APPENDIX E: CURRICULUM VITAE - GRAHAM A YOUNG

Graham is a registered landscape architect with interest and experience in landscape architecture, urban design and environmental planning. He holds a degree in landscape architecture from the University of Toronto and has practiced in Canada and Africa, where he has spent most of his working life. During his 30 year career he has received numerous Institute of Landscape Architects of South Africa and other industry awards. He has published widely on landscape architectural issues and has had projects published both locally and internationally in design journals and books. In addition to being a founding member of Newtown Landscape Architects he is currently a senior lecturer, teaching landscape architecture and urban design at post and under graduate levels, at the University of Pretoria. He has been a visiting studio critic at the University of Witwatersrand and University of Cape Town. A 'niche' specialty of his is Visual Impact Assessments for which he was cited with an ILASA Merit Award in 1999.

EXPERIENCE:

Current — **NEWTOWN LANDSCAPE ARCHITECTS cc.** ***Founding Member***
Responsible for project management, landscape design, urban design, and visual impact assessment.
Senior Lecturer: Department of Architecture, University of Pretoria.

1991 - 1994
1988 - 1989 — **GRAHAM A YOUNG LANDSCAPE ARCHITECT** - ***Sole proprietor***
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;
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:

Intermediate Phase(S'kumbuto, Moshate and Uitspanplek), Freedom Park: ILASA Merit Award (2009)

Corniche Bay Resort, Mauritius: ILASA Merit Award (2009)

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: Loerie Awards Gold Statue (2008)

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:

Johannesburg Inner City Park Design competition – with MMA architects (2009) Finalist and considered "the strongest concept" by the adjudication panel.

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/AUTHOR:

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http://www.saiea.com/case_studies09/07%20PeakingPowerPlant.pdf

- *Visual Impact Assessment of a Peaking Power Plant, KwaZuluNatal*

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

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

Van Ueffelen, C. ***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 Pre*cinct, Soweto, Gauteng.

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

- *Moroka Dam Parks* Precinct, Soweto, Gauteng.

Research panel: Oberholzer, B. ***Guideline for involving visual & aesthetic specialists in EIA processes: Edition 1.*** CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town. (2005)

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- *Riverside Government Complex* (KWPNLA), Nelspruit, Mpumalanga;

Numerous publications in industry journals.

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Ittelson, W.H., Proshansky, H.M., Rivlin, L.g. and Winkel, G.H. (1974). *An Introduction to Environmental Psychology.* Holt, Rinehart and Winston, New York.

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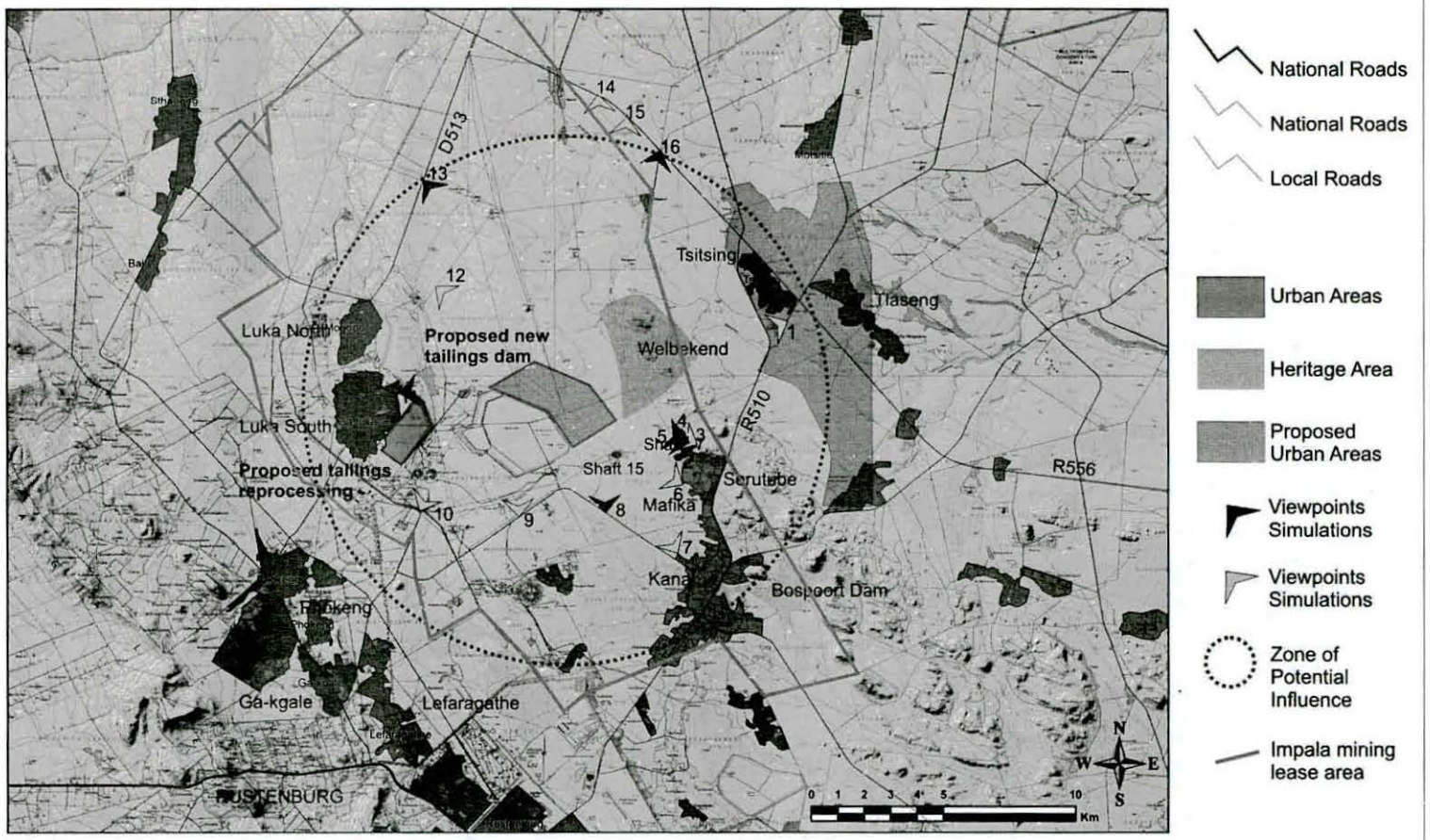


Figure1: Locality

Figure 2: Layout

Figure 3: Landscape Character

View 5a Looking towards existing tailings dam and shaft 15 from immediately north of Serutube

View 5b Looking north towards heritage area from immediately north of Serutube

Figure 4: Landscape Character

View 6 looking north from Mafika toward existing tailing dam

View 7 looking north from koppie north of Kanana towards site with shafts 15 and 17 in view

Figure 5: Landscape Character

View 9 looking north from internal road towards existing tailings facility

View 10 north east from internal road to existing tailings facility

Figure 6: Landscape Character

View 12 looking south east from within mining area to existing tailings dam

View 14 looking south from R556 towards existing tailings dam

Figure 7: Landscape Character

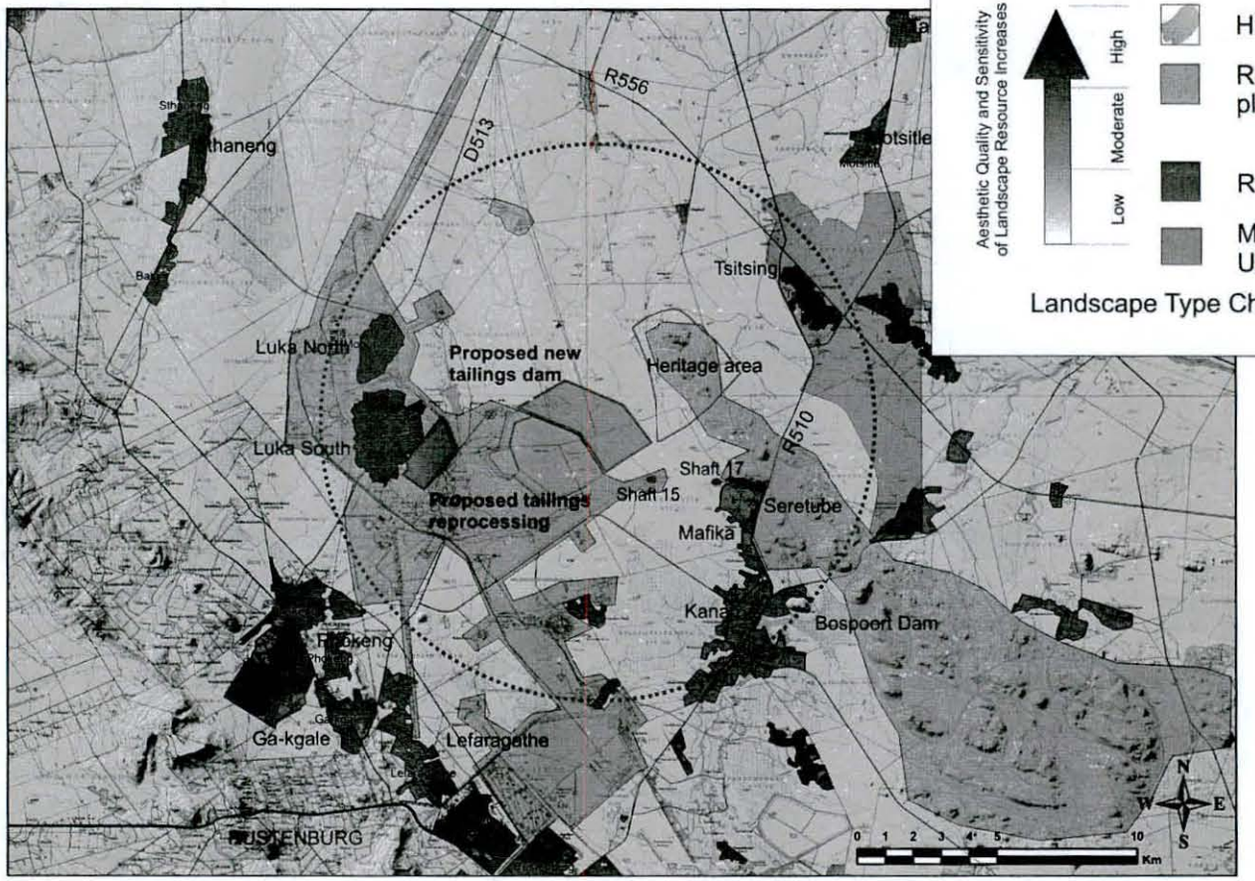


Figure 8: Visual Resource

Figure 9: Simulation - View 2

Before: from koppie behind Serutube looking north west

After

Figure 10: Simulation - View 4

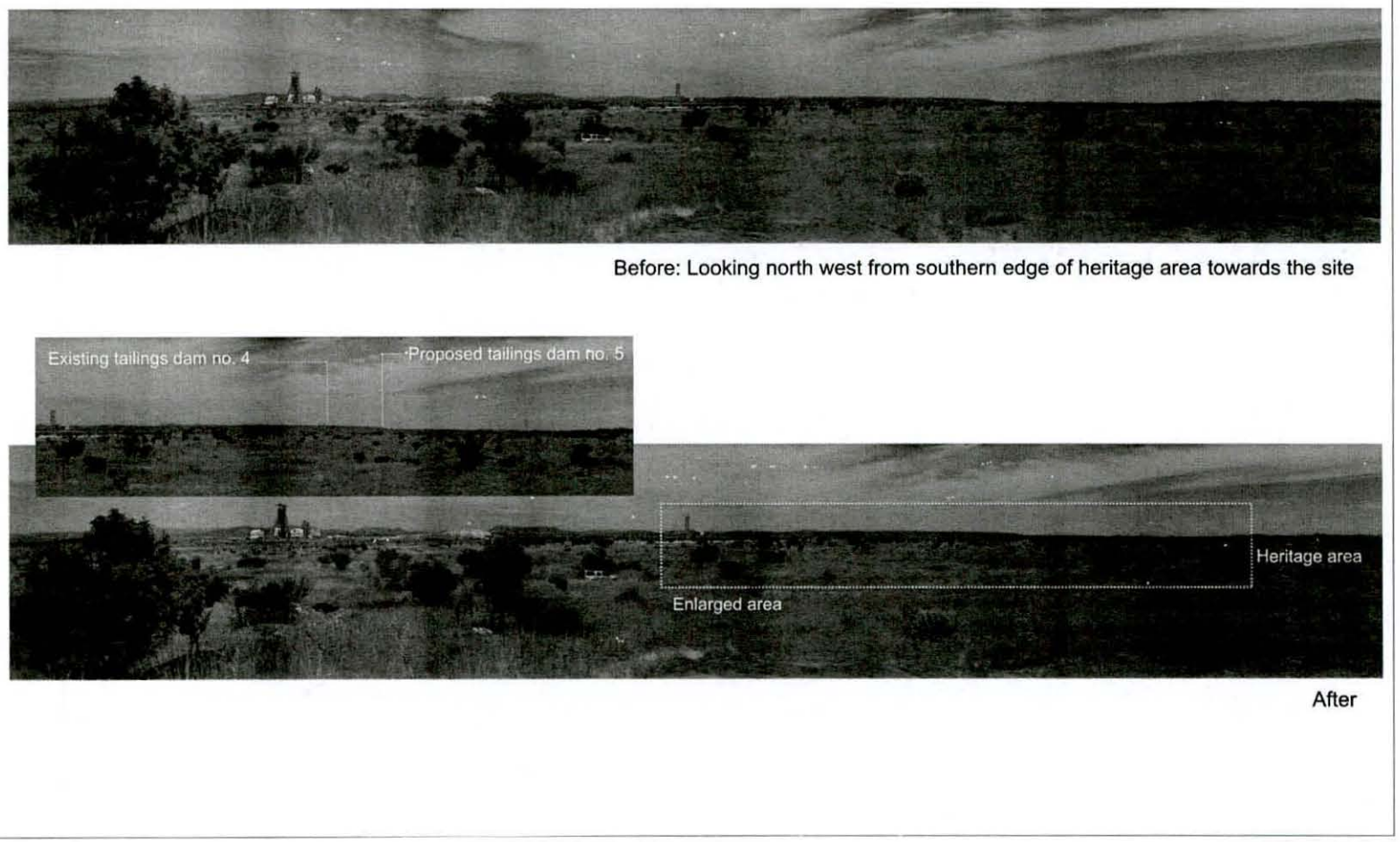
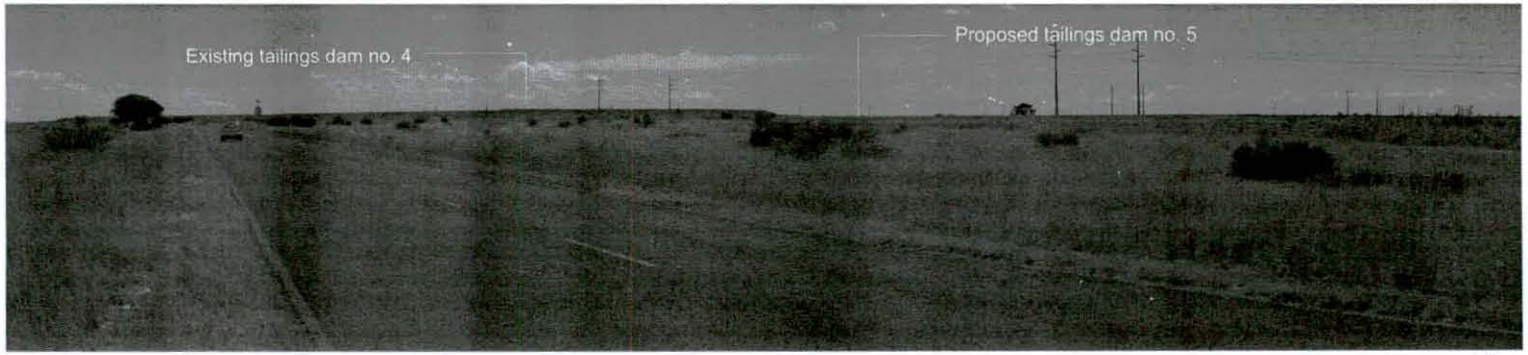


Figure 11: Simulation - View 5

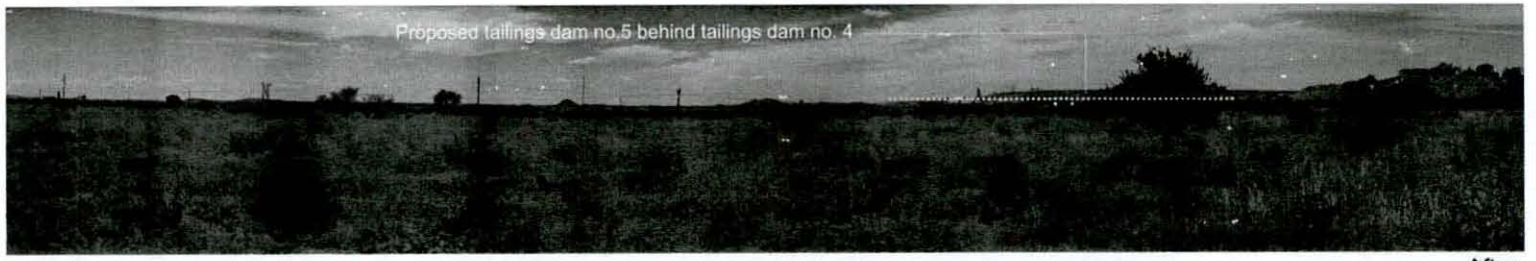
Before: Looking north from internal road north of Kanana towards the site



After

Figure 12: Simulation - View 8

Before: Looking east from east side of Luka South towards site



After

Figure 13: Simulation - View 11

Before: Looking south from D513 towards the site

After

Figure 14: Simulation - View 13

Figure 15: Simulation - View 16

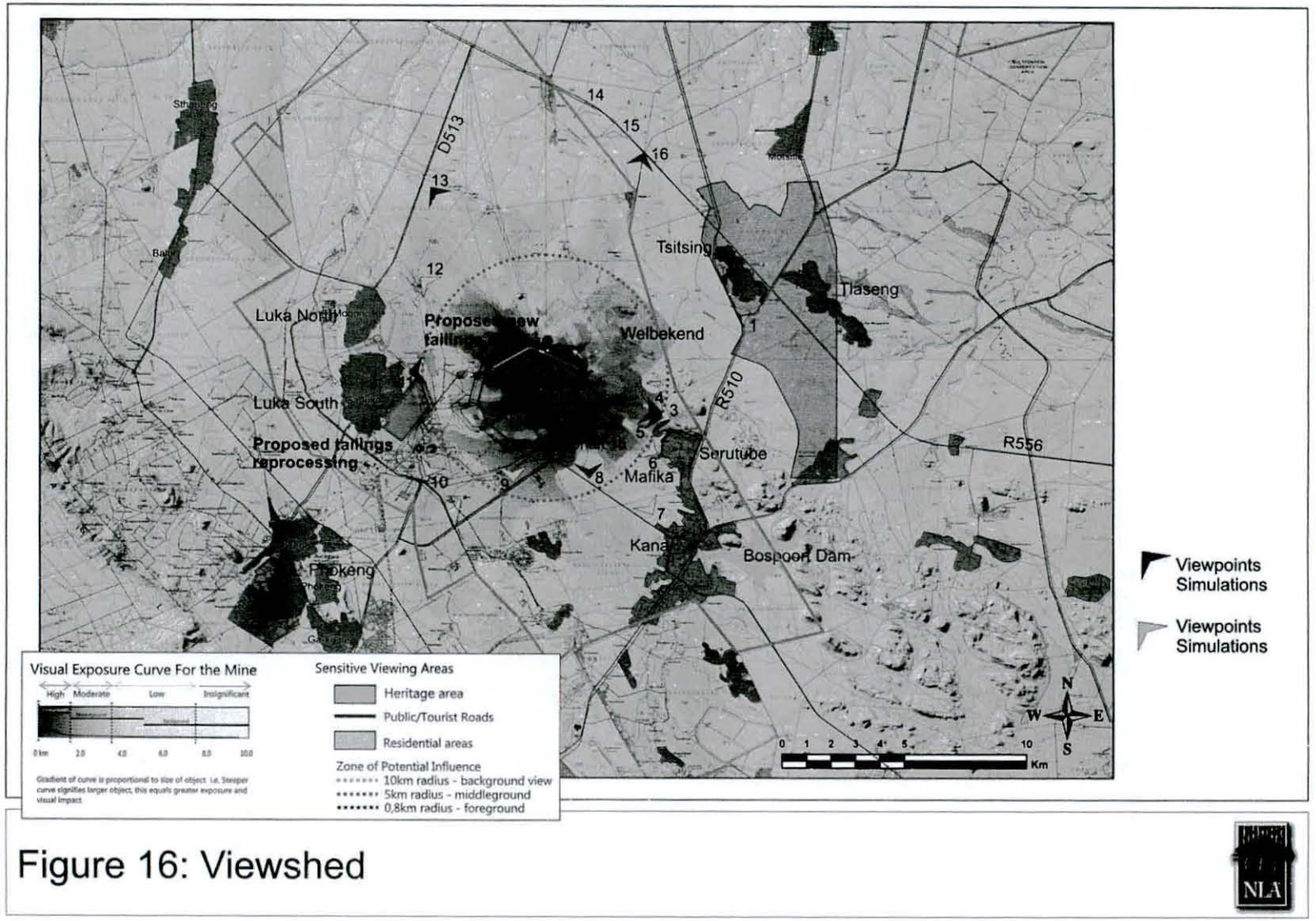


Figure 16: Viewshed

APPENDIX L: HERITAGE AND CULTURAL STUDY

Prepared for:

METAGO ENVIRONMENTAL ENGINEERS (PTY) LTD

IMPALA PLATINUM LIMITED – RUSTENBURG OPERATIONS (IMPALA)

A PHASE I HERITAGE IMPACT ASSESSMENT (HIA) STUDY FOR IMPALA PLATINUM LIMITED'S (IMPALA) PROPOSED NEW TAILINGS FACILITY AND OPEN CAST MINING AREAS IN THE RUSTENBURG (BAFOKENG) DISTRICT OF THE NORTH-WEST PROVINCE

Prepared by:

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August 2011

EXECUTIVE SUMMARY

A Phase I Heritage Impact Assessment (HIA) study as required in terms of Section 38 of the National Heritage Resources Act (Act 25 of 1999) was done for Impala Platinum Ltd – Rustenburg Operations (Impala) for the development of a proposed new Tailings Dam (No. 5) and Open Cast expansion operations in the Rustenburg (Bafokeng) District in the North-West Province

The aims with the Phase I HIA study were the following:

- To determine if any of the types and ranges of heritage resources (the 'national estate') as outlined in Section 3 of the National Heritage Resources Act (No 25 of 1999) do occur in the Project Area and, if so, to establish the significance of these heritage resources.
- To establish whether these heritage resources will be affected by the Impala Project and, if so, to propose mitigation measures for those heritage resources that may be affected.

The Phase I HIA study for the proposed Tailings Dam and Open Cast mines (Project Area) revealed none of the types and ranges of heritage resources as outlined in Section 3 of the National Heritage Resources Act (No 25 of 1999).

There is consequently no reason from a heritage point of view why the proposed Impala Project should not continue.

General

If any heritage resources of significance are exposed during the Impala Project the South African Heritage Resources Authority (SAHRA) should be notified immediately, all development activities must be stopped and an archaeologist accredited with the Association for Southern African Professional Archaeologist (ASAPA) should be notified in order to determine appropriate mitigation measures for the discovered finds. This may include obtaining the necessary authorisation (permits) from SAHRA to conduct the mitigation measures.

1 INTRODUCTION

This document contains the report on the results of a Phase I Heritage Impact Assessment (HIA) study which was done for Impala Platinum Limited – Rustenburg Operations (Impala) in the Rustenburg (Bafokeng) District in the North-West Province.

Focused archaeological research has been conducted in the North-West Province for more than four decades. This research consists of surveys and of excavations of Stone Age and Iron Age sites as well as the recording of rock art and historical sites. The Mpumalanga Province has a rich heritage comprised of remains dating from the pre-historical and from the historical (or colonial) periods of South Africa. Pre-historical and historical remains in the North-West Province of South Africa therefore form a record of the heritage of most groups living in South Africa today.

Various types and ranges of heritage resources that qualify as part of South Africa's 'national estate' as outlined in Section 3 of the National Heritage Resources Act (No 25 of 1999) occur in the North-West Province (see Box 1, next page).

Box 1: Types and ranges of heritage resources (the national estate) as outlined in Section 3 of the National Heritage Resources Act, 1999 (No 25 of 1999).

The National Heritage Resources Act (Act No 25 of 1999, Art 3) outlines the following types and ranges of heritage resources that qualify as part of the National Estate, namely:

(a) places, buildings structures and equipment of cultural significance;
(b) places to which oral traditions are attached or which are associated with living heritage;
(c) historical settlements and townscapes;
(d) landscapes and natural features of cultural significance;
(e) geological sites of scientific or cultural importance;
(f) archaeological and palaeontological sites;
(g) graves and burial grounds including-
(i) ancestral graves;
(ii) royal graves and graves of traditional leaders;
(iii) graves of victims of conflict;(iv) graves of individuals designated by the Minister by notice in the Gazette;
(v) historical graves and cemeteries; and
(vi) other human remains which are not covered by in terms of the Human Tissues Act, 1983 (Act No 65 of 1983);
(h) sites of significance relating to the history of slavery in South Africa;
(i) movable objects, including -
(i) objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
(ii) objects to which oral traditions are attached or which are associated with living heritage;
(iii) ethnographic art and objects;
(iv) military objects;
(v) objects of decorative or fine art;
(vi) objects of scientific or technological interest; and
(vii) books, records, documents, photographs, positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1(xiv) of the National Archives of South Africa Act, 1996 (Act No 43 of 1996).

The National Heritage Resources Act (Act No 25 of 1999, Art 3) also distinguishes nine criteria for places and objects to qualify as 'part of the national estate if they have cultural significance or other special value ...'. These criteria are the following:

(a) its importance in the community, or pattern of South Africa's history;
(a) its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
(b) its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
(c) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
(e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
(f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;
(g) its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
(h) its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa;
(i) sites of significance relating to the history of slavery in South Africa

2 TERMS OF REFERENCE

Impala intends to establish a new Tailings Dam referred to as the tailings dam No. 5 as well as the expansion of two open pits (Pit14 and Pit9U_B) in the Rustenburg (Bafokeng) District in the North-West Province. These mining related activities may impact on any of the types and ranges of heritage resources as outlined in Section 3 of the National Heritage Resources Act (No 25 of 1999) (see Box 1) which may occur in the Project Area.

In order to comply with legislation, Impala requires knowledge of the presence, relevance and the significance of any heritage resources that may occur in the Project Area in order to take pro-active measures with regard to any heritage resources that may be affected by the Impala Project. Metago Environmental Engineers (Pty) Ltd, the environmental company responsible for compiling the Environmental Impact Assessment report for Impala therefore commissioned the author to undertake a Phase I Heritage Impact Assessment (HIA) study for the proposed Project Area.

The aim with the Phase I HIA study is as follows:

- To determine if any of the types and ranges of heritage resources (the 'national estate') as outlined in Section 3 of the National Heritage Resources Act (No 25 of 1999) occur in the Project Area and, if so, to establish the significance of these heritage resources.
- To establish whether these heritage resources will be affected by the Impala Project and, if so, to propose mitigation measures for these heritage resources.

3 THE PROJECT AREA

3.1 Location

Impala proposes to implement the following projects: the development of a new Tailings Dam (No 5.), re-processing and rehabilitating the footprint of an existing Tailings Dam (No 1 and 2)) and an associated waste disposal facility and expanding its current open cast operations that are currently being mined as part of the open cast mining operations.

The proposed projects are all located within Impala's Converted Mine lease area which is part of the heartland of the Rustenburg (Bafokeng) District which falls under the Rustenburg Local Municipality in the Bojanala Platinum District Municipality in the North-West Province (Rustenburg East [2527CB]: 1: 50 000 topographical map) (Figure 3).

3.2 The components of the Impala Project

For the purpose of this study, the Phase I HIA study will only focus on the following developmental components:

- The development of the No 5 Tailings Dam which will be positioned adjacent to the current operational dam (No 3 and 4). The new Tailings Dam will require the establishment of supporting infrastructure such as slurry delivery lines, return water facilities and pumping stations. The estimated life of the tailings facility is expected to be 30 years.
- The expansion of one Open Cast mine pit (Pit 14) which will be situated adjacent to the Kutlwanong School. Current opencast mining operations will be applied.
- The establishment of a second Open Cast mine pit (Pit 9U_B) on opposite sides of the main road leading to Impala from the south.

The development of the No 5 Tailings Dam and two Open Cast mining areas is referred to as the Impala Project whilst the surface areas to be affected by these mining related activities and infrastructure are referred to as the Project Area.

Impala's existing tailings dam (No. 1&2) does not form part of the project scope as this is an existing facility and will therefore not impact on any heritage/ cultural resources.

3.3 Within a cultural landscape

The Project Area is located in the heartland of the former sphere of influence of the Late Iron Age and historical Bafokeng people. The Project Area therefore is part of a cultural landscape which warrants a brief description to demonstrate its place in the local and regional cultural history of the North-West Province (see Part 5, 'Contextualising the Project Area').

4 METHODOLOGY

This Phase I HIA study was conducted by means of the following:

- Surveying the proposed Project Area with a vehicle and sensitive spots on foot.
- Briefly surveying literature relating to the pre-historical and historical context of the Project Area;
- Consulting maps of the proposed Project Area.
- Consulting archaeological (heritage) data bases.
- Consulting spokespersons regarding the possible presence of heritage resources such as graveyards.
- Synthesising all information obtained from the fieldwork survey, literature review, maps, heritage data bases and spokespersons into this report.

4.1 Fieldwork

The proposed Project Area was surveyed with a vehicle while sensitive spots were surveyed on foot.

4.2 Databases, literature survey and maps

Databases kept and maintained at institutions such as the Provincial Heritage Resources Agency and the Archaeological Data Recording Centre at the National Flagship Institute (Museum Africa) in Pretoria were consulted to determine whether any heritage resources of significance has been identified during earlier heritage surveys in or near the Project Area.

Literature relating to the pre-historical and the historical unfolding of the Project Area where the proposed mining development project will take place was reviewed (see Part 5, 'Contextualing the Project Area'). It is important to contextualise the pre-historical and historical background of the region in order to comprehend the identity, meaning and significance of heritage resources that may occur in and near the Project Area (see Parts 5 & 8).

In addition, the Project Area was studied by means of maps on which it appears (Rustenburg East [2527CB]: 1: 50 000 topographical map) (Figures 1-3).

4.3 Spokespersons consulted

Spokespersons living or working in the Project Area are usually intimately acquainted with the area, particularly if they were born there. Consequently, some spokespersons were therefore consulted with regard to the possible presence of graveyards and other possible heritage resources which may occur in the Project Area (see Part 9, 'Spokespersons consulted').

4.4 Assumptions and limitations

It must be pointed out that heritage resources can be found in the most unexpected places. It must also be borne in mind that surveys may not detect all the heritage resources in a given project area. While some remains may simply be missed during surveys (observations), others may occur below the surface of the earth and may only be exposed once mining development commences.

If any heritage resources of significance are exposed during the Impala Project the South African Heritage Resources Authority (SAHRA) should be notified immediately, all development activities must be stopped and an archaeologist accredited with the Association for Southern African Professional Archaeologist (ASAPA) should be notified in order to determine appropriate mitigation measures for the discovered finds. This may include obtaining the necessary authorisation (permits) from SAHRA to conduct the mitigation measures.

4.5 Some remarks on terminology

Terms that may be used in this report are briefly outlined below:

- Conservation: The act of maintaining all or part of a resource (whether renewable or non-renewable) in its present condition in order to provide for its continued or future use. Conservation includes sustainable use, protection,

maintenance, rehabilitation, restoration and enhancement of the natural and cultural environment.

- Cultural resource management: A process that consists of a range of interventions and provides a framework for informed and value-based decision-making. It integrates professional, technical and administrative functions and interventions that impact on cultural resources. Activities include planning, policy development, monitoring and assessment, auditing, implementation, maintenance, communication, and many others. All these activities are (or will be) based on sound research.

- Cultural resources: A broad, generic term covering any physical, natural and spiritual properties and features adapted, used and created by humans in the past and present. Cultural resources are the result of continuing human cultural activity and embody a range of community values and meanings. These resources are non-renewable and finite. Cultural resources include traditional systems of cultural practice, belief or social interaction. They can be, but are not necessarily identified with defined locations.

- Heritage resources: The various natural and cultural assets that collectively form the heritage. These assets are also known as cultural and natural resources. Heritage resources (cultural resources) include all human-made phenomena and intangible products that are the result of the human mind. Natural, technological or industrial features may also be part of heritage resources, as places that have made an outstanding contribution to the cultures, traditions and lifestyles of the people or groups of people of South Africa.

- In-Situ Conservation: The conservation and maintenance of ecosystems, natural habitats and cultural resources in their natural and original surroundings.

- Iron Age: Refers to the last two millennia and 'Early Iron Age' to the first thousand years AD. 'Late Iron Age' refers to the period between the 16th century and the 19th century and can therefore include the Historical Period.

- Maintenance: Keeping something in good health or repair.

- Pre-historical: Refers to the time before any historical documents were written or any written language developed in a particular area or region of the world. The historical period_and historical remains refer, for the Project Area, to the first appearance or use of 'modern' Western writing brought to the Eastern Highveld by the first Colonists who settled here from the 1840's onwards.

- Preservation: Conservation activities that consolidate and maintain the existing form, material and integrity of a cultural resource.

- Recent past: Refers to the 20th century. Remains from this period are not necessarily older than sixty years and therefore may not qualify as archaeological or historical remains. Some of these remains, however, may be close to sixty years of age and may, in the near future, qualify as heritage resources.

- Protected area: A geographically defined area designated and managed to achieve specific conservation objectives. Protected areas are dedicated primarily to the protection and enjoyment of natural or cultural heritage, to the maintenance of biodiversity, and to the maintenance of life-support systems. Various types of protected areas occur in South Africa.

- Reconstruction: Re-erecting a structure on its original site using original components.

- Replication: The act or process of reproducing by new construction the exact form and detail of a vanished building, structure, object, or a part thereof, as it appeared at a specific period.

- Restoration: Returning the existing fabric of a place to a known earlier state by removing additions or by reassembling existing components.

- Stone Age: Refers to the prehistoric past, although Late Stone Age peoples lived in South Africa well into the Historical Period. The Stone Age is divided into

an Earlier Stone Age (3 million years to 150 000 thousand years ago) the Middle Stone Age (150 000 years to 40 000 years ago) and the Late Stone Age (40 000 years to 200 years ago).

- Sustainability: The ability of an activity to continue indefinitely, at current and projected levels, without depleting social, financial, physical and other resources required to produce the expected benefits.

- Translocation: Dismantling a structure and re-erecting it on a new site using original components.

- Project Area: refers to the area (footprint) where the developer wants to focus its development activities (refer to Figure 3).

- Phase I studies refer to surveys using various sources of data in order to establish the presence of all possible types and ranges of heritage resources in any given Project Area (excluding paleontological remains as these studies are done by registered and accredited palaeontologists).

- Phase II studies include in-depth cultural heritage studies such as archaeological mapping, excavating and sometimes laboratory work. Phase II work may include the documenting of rock art, engraving or historical sites and dwellings; the sampling of archaeological sites or shipwrecks; extended excavations of archaeological sites; the exhumation of human remains and the relocation of graveyards, etc. Phase II work involve permitting processes, require the input of different specialists and the co-operation and approval of SAHRA.

5 CONTEXTUALISING THE PROJECT AREA

5.1 The Central Bankeveld

The Project Area is located in the Central Bankeveld of the North-West Province of South Africa. The Bankeveld is a narrow strip of land between the northern bushveld savannah and the centrally situated Highveld. The Central Bankeveld with its numerous centuries-old remains of ancient Tswana spheres of influence is important to this report.

The Central Bankeveld is covered by older grabbo penetrated by younger volcanic magma which formed the series and chains of pyramid-shaped norite hills from the Pilanesberg in the north-west to Brits in the east. These hills, as part of the Magaliesberg valley, represent a unique ecozone characterised by grassveld, savannah veld and near wooded valleys. The region has abundant surface water supplies. The Pienaar, the Moretele, the Hex and the Apies Rivers all drain their waters into the Crocodile River.

5.2 Pre-historical context

The Project Area is located between the Magaliesberg in the west and the series of norite kopjes running from Thekwane in the south to near the Pilanesberg in the north. This area is known for its rich and diverse range of heritage resources. Stone Age sites are scattered along the Magaliesberg and are also found in caves and rock shelters in the mountain. Rock engravings are located further towards Maanhaarrand and Rustenburg in the west. The most abundant heritage, however, are those that date from the Late Iron Age and which are associated with the numerous Tswana chiefdoms who occupied this region during the last four centuries.

The interaction between the climate, geology, topography, and the fauna and flora of the Central Bankeveld established a milieu in which the first Tswana found a suitable living environment in order to practise herding, agriculture, metal working and trading. It was here that their chiefdoms flourished during AD1600 to 1840.