VISUAL IMPACT ASSESSMENT
FOR THE
PROPOSED UPGRADE
OF THE SANI PASS
(PHASE TWO)

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REPORT ON SPECIALIST IMPACT ASSESSMENT

THE POTENTIAL IMPACT ON THE AFFECTED VISUAL ENVIRONMENT FOR THE PROPOSED PHASE TWO UPGRADE OF THE SANI PASS PROJECT

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EXECUTIVE SUMMARY

INTRODUCTION

Arcus Gibb, as the lead consultants for the Environmental Impact Assessment, have commissioned Cave Klapwijk and Associates to undertake the visual assessment investigation of the proposed upgrade of the existing Sani Pass from km 14 to the summit from a gravel to a hardened surface.

Main Road P318 provides access to and passes through the Ukhahlamba Drakensberg Park, which is a proclaimed World Heritage Site. Sustainable access to the Park needs to be developed and carefully managed and Main Road P318 forms an integral part of this initiative.

This project constitutes Phase 2a and 2b of the project, namely the upgrading of the remainder of the P318 from km 14 to the summit at the Lesotho border (km 33), a distance of 19 km. Phase 2a consists of the section from the Good Hope Trading Store ruins to the current RSA border post – a distance of 11.2 km. Phase 2b consists of the steeper section from the border post to the summit, a distance of 7.8 km. The proposed upgrade involves the complete grading and resurfacing of the P318 including some road realignment and widening, construction of new bridges, stormwater control and attenuation systems, bank and slope stabilisation measures and road servitude rehabilitation. In addition, a separate application for the relocation of the border post to the Good Hope site, at km 14 is currently underway.

The purpose of this specialist study is to determine the impact of the proposed project on the visual and aesthetic character of the study area. The rationale for this study is that the upgrade of the road may fundamentally alter the landscape character and sense of place of the local environment.

METHODS

In order to address the objectives of the study, the following methods have been used:

- Determined the setting, visual character and land use of the area surrounding the area, and the Genius Loci (sense of place). An initial site visit took place on 13 April 2008;

- Evaluate the landscape characteristics against which impact criteria ratings were applied;
• The viewshed, the area within which the proposed project can be visible, was
determined using digital topographic maps analyzed by the Geographic
Information System (GIS), algorithms available in the ArcView Software Suite.
The viewshed maps were ground-truthed on 12 June 2009.

The visual impact assessment statements in this report are based on the expert
opinion of the authors and attitudes that are generally accepted worldwide.

ASSUMPTIONS

The following limitations, constraints and assumptions are applicable to this study:

• The study area has been limited to a 10 km radius of the site because the visual
  impact of the road beyond this distance is of such a reduced scale that it can be
  considered of no significance, even if there is a direct line of the sight;

• The basis for this assessment is that scenic wilderness areas form the core of
  eco-tourism due to the high positive aesthetic appeal;

• The assessment is based on assumed demographic data. No detailed study
  was done to determine accurate data on potential viewers of the project
  components. If necessary, these studies could be undertaken during the design
  phase of the project;

• Determining a visual resource in absolute terms is not achievable. Evaluating a
  landscape’s visual quality is both complex and problematic. Various
  approaches have been developed, but they all have one problem in common:
  unlike noise or air pollution which can be measured in a relatively simple way,
  for the visual landscape mainly qualitative standards apply. Therefore
  subjectivity cannot be excluded in the assessment procedure. Individually there
  is a great variation in the evaluation of the visual landscape based on different
  experiences, social level and cultural background. Exacerbating the situation is
  the inherent variability in natural features. Climate, season, atmospheric
  conditions, region, sub-region all affect the attributes that comprise the
  landscape. What is considered scenic to one person may not be to another;

• The purpose of this visual impact assessment study is to identify the visual
  impact of the project in relation to the existing landscape setting. However,
  while an effort is made to be rigorous and logical in the assessment process,
  the element of subjectivity does influence the ratings. It has nevertheless been
  reported in McCool, S.F. et al (1986) that the professional visual assessor is
  more critical than the general public;
• Generally motorists’ and passengers’ view field is predominantly focused forward and therefore vistas beyond the 30° cone of view are not noticed as much as those within the view cone. However, at the current slow travelling speeds along the pass, it can be assumed that the cone of view will be greater than 30°.

• Localised visual perceptions of the economically depressed communities have not been tested as these may be influenced rather by the economic and job opportunities that would exist rather than the direct visual perception of the project;

• The assessment does not consider the ancillary project infrastructure and components such as borrow pits, spoil dumps, construction camp sites, etc. These components will be assessed in detail during the design phase should the project be implemented;

• The ‘No Go’ alternative was not specifically addressed as it is likely that the existing landscape will remain in its existing condition.

If the study, however, determined that the negative visual impact is of such a magnitude and significance that it will seriously influence the decision on whether or not to build, it may then be necessary to test and determine the visual perceptions of neighbouring communities. Such a study is involved, costly and time consuming.

• A relative visual quality sensitively scale has been established for the entire route ranging from high, medium and low visual quality. This scale is simply based on visual quality evaluated relative to each other and not in absolute scale.

**STUDY FINDINGS**

The study areas were assessed in terms of their inherent characteristics and the implications for the project for each of the project components under the following headings:

• Topography
• Vegetation cover
• Land use
• Landscape diversity
• Landscape character
• Visibility.
Based on the field observations and the studies reported herein, from a visual point of view, and with the implementation of the mitigation measures, the following observations and conclusions are made:

**DISCUSSION AND CONCLUSIONS**

It is clear that the Sani Pass road travels through a landscape with an inherently very high visual quality. Although the existing road has a negative impact on the visual quality of the valley the visual quality of the valley is still regarded as high. This is largely due to the colour and texture of the road surface material and retaining walls matching closely the colour and textures of the surrounding geological landscape especially during autumn and winter. During spring and summer the landscape changes more from the brown and tan hues to greener tones which contrast with the colour of the road making it much more visible in the landscape. However, the organic alignment of the road as it follows the natural lay, flow and contour of the landscape is not jarring on the eye. Certain areas when viewed close up such as where erosion and slumping has occurred and where cut slopes remain unrehabilitated, impart a higher negative visual impact. The only intrusive element within the study area is the current RSA Border Post which is to be relocated.

Intimate points of interest such as stream crossings, waterfalls, geological features and colourful flowering plants during parts of the year are experienced more fully due to the slow laboured speed that the existing road allows road users to travel.

It is these experiences along the road and the moderate to low-intrusive visual impact of the existing road that promotes the travel experience.

It is therefore imperative that any new structure introduced in this environment must match in colour, form and texture that of the existing road while at the same time still allowing the traveller to experience the more intimate point of interest.

Views from the road are extensive and continuously changing and opportunities for viewpoints need to be considered.

The upgrade of the Sani Pass Road from the Good Hope Trading Store site to the summit will exert a negative influence on the visual and aesthetic environment. This is largely due to:

- the alterations to the current aesthetic experience;
- the higher travel speeds allowed which detracts from the current slow, laboured travel speed which allows for a close appreciation of interesting detail alongside the road;
- the potential increase in vehicular traffic that will alter the current situation in terms of noise and activity;
• the need to cut into the existing landform to accommodate the vertical alignment and the width of the new servitude;
• The increased scale of the road in this rural / natural setting.

The significance of the impact for both Phase 2a and 2b is regarded as medium to high (a rating 3.5 on a scale of 1-5) after the implementation of mitigation measures. The significance is due to the high disruption to the visual and aesthetic amenities along the road during construction and the change to the landscape in terms of road widening, cuts and fills, rock face stabilization etc. that will intensify the visual contrast of the road with the landscape. Furthermore, the impacts are on a regional scale and of a long term duration.

Based on the field observations and the studies reported herein, and with the implementation of the mitigation measures the following conclusions are made from a visual point of view.

The upgrade of the Sani Pass Road (Phases 2a and 2b) will exert a medium intensity and medium high significance negative impact on the affected environment.
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ACRONYMS AND ABBREVIATIONS

CKA  Cave Klapwijk and Associates
DTM  Digital Terrain Model
ECO  Environmental Control Officer
EMP  Environmental Management Plan
VAC  Visual Absorption Capacity
VIA  Visual Impact Assessment
DoT  Department of Transport

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The KwaZulu-Natal Department of Transport in association with the Department of Transport (DoT) are the project proponent.

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SPECIALIST SCOPING STUDY ON THE POTENTIAL IMPACT OF THE AFFECTED VISUAL ENVIRONMENT FOR THE PROPOSED PHASE TWO UPGRADE OF THE SANI PASS PROJECT

VISUAL IMPACT ASSESSMENT

1 SCOPE AND PURPOSE

1.1 Introduction

Arcus Gibb, as the lead consultants for the Environmental Impact Assessment, have commissioned Cave Klapwijk and Associates to undertake the visual assessment investigation of the proposed upgrade of the existing Sani Pass from km 14 to the summit from a gravel to a hardened surface.

1.2 Background and Brief

1.2.1 Background

Main Road P318 provides access to and passes through the Ukhahlamba Drakensberg Park, which is a proclaimed World Heritage Site (Figure 1, Locality Plan). Sustainable access to the Park needs to be developed and carefully managed and Main Road P318 forms an integral part of this initiative.

Furthermore a co-operation agreement was signed in 2005 between Lesotho and South Africa to improve access between the two countries via Sani Pass. This is part of an initiative to improve accessibility between SADC countries.

This project constitutes Phase 2a and 2b of the project, namely the upgrading of the remainder of the P318 from km 14 to the summit at the Lesotho border (km 33), a distance of 19 km. Phase 2a consists of the section from the Good Hope Trading Store ruins to the current RSA border post – a distance of 11.2 km (Figure 2, Elevated view of Phase 2a). Phase 2b consists of the steeper section from the border post to the summit, a distance of 7.8 km (Figure 3, Elevated view of Phase 2b). The proposed upgrade involves the complete grading and resurfacing of the P318 including some road realignment and widening, construction of new bridges, stormwater control and attenuation systems, bank and slope stabilisation measures and road servitude rehabilitation. In addition, a separate application for the relocation of the border post to the Good Hope site, at km 14 is currently underway.
The reason for proposing that the pass be upgraded and surfaced is attributable to the following:

- The existing road drainage is unable to handle the high intensity runoffs on the steep gradients, resulting in excessive scour and gravel loss. Steep gradients generally result in maintenance difficulties on gravel roads with frequent closures as a result.

- Gravel is a non-renewable resource and good quality gravels are particularly difficult to find in the Drakensberg areas of KwaZulu. The excessive loss of gravel is therefore of serious concern, particularly in areas where the opening of new borrow pits has a high visual impact and is out of the question in the Park. The haul distance for gravels is already within excess of the provincial average.

- The loss of gravel eventually lands up in the local streams and rivers resulting in sedimentation and a decline of condition in the lower reaches of the river when the velocities slow down. The silt carrying capacity of water is related to the square of the velocity. Thus, if the
flow velocity is reduced by a half, the silt carrying capacity is reduced fourfold. The very steep terrain therefore has an inordinate silt carrying capacity which aggravates the situation.

- It is therefore better to retain the existing gravel on the road by surfacing the road.
- Closures of the pass result in unnecessary hardship for the impoverished communities of the Mokhotlong District and in a loss of revenue to the tourism industry.

Figure 2: Elevated View of Phase 2a
Figure 3: Elevated View of Phase 2b

1.2.2 Visual Impact Assessment Terms of Reference

The purpose of this specialist study is to determine the impact of the proposed project on the visual and aesthetic character of the study area. The rationale for this study is that the upgrade of the road may fundamentally alter the landscape character and sense of place of the local environment.

The primary objective of this specialist study is therefore to describe the potential impact of these structures on the visual character and sense of place of the area. This specialist study will have the following objectives:

- Determine the visual character of the areas along the road by evaluating environmental components such as topography, current land use activities, surrounding land use activities, etc;

- Identify elements of particular visual quality that could be affected by the proposed project;

- Describe and evaluate the specific visual impacts of the road upgrade from critical viewpoints and view fields;
• Determine the extent of the visibility of the project from surrounding areas;

• Specific consideration should be given to the identification of requirements for further investigation;

• Recommend mitigation measures to reduce the potential visual impacts generated by the proposed project;

• The assessment should assess impacts according to the criteria and terminology as indicated by Arcus Gibb.

2 METHODS

In order to address the objectives of the study, the following methods have been used:

• Determine the setting, visual character and land use of the area surrounding the area, and the Genius Loci (sense of place). An initial site visit took place on 13 April 2008;

• Discussions and meetings with the specialist consultant team to identify specific aspects of the construction and development which would affect the visual quality of a setting;

• Define the extent of the affected visual environment, the viewing distance and the critical views;

• Evaluate the landscape characteristics against which impact criteria ratings were applied;

• The viewsshed, the area within which the proposed project can be visible, will be determined using digital topographic maps analyzed by the Geographic Information System (GIS), algorithms available in the ArcView Software Suite. The viewshed maps were ground-truthed on 12 June 2009.

The visual impact assessment statements in this report are based on the expert opinion of the authors and attitudes that are generally accepted worldwide.
3 ASSUMPTIONS AND UNCERTAINTIES

The following limitations, constraints and assumptions are applicable to this study:

- The study area has been limited to a 10 km radius of the site because the visual impact of the road beyond this distance is of such a reduced scale that it can be considered of no significance, even if there is a direct line of the sight;

- The basis for this assessment is that scenic wilderness areas form the core of eco-tourism due to the high positive aesthetic appeal;

- The assessment is based on assumed demographic data. No detailed study was done to determine accurate data on potential viewers of the project components. If necessary, these studies could be undertaken during the design phase of the project;

- Determining a visual resource in absolute terms is not achievable. Evaluating a landscape’s visual quality is both complex and problematic. Various approaches have been developed, but they all have one problem in common: unlike noise or air pollution which can be measured in a relatively simple way, for the visual landscape mainly qualitative standards apply. Therefore subjectivity cannot be excluded in the assessment procedure (Lange, 1994). Individually there is a great variation in the evaluation of the visual landscape based on different experiences, social level and cultural background. Exacerbating the situation is the inherent variability in natural features. Climate, season, atmospheric conditions, region, sub-region all affect the attributes that comprise the landscape. What is considered scenic to one person may not be to another (NLA, 1997);

- The purpose of this visual impact assessment study is to identify the visual impact of the project in relation to the existing landscape setting. However, while an effort is made to be rigorous and logical in the assessment process, the element of subjectivity does influence the ratings. It has nevertheless been reported in McCool, S.F. et al (1986) that the professional visual assessor is more critical than the general public;

- Generally motorists’ and passengers’ view field is predominantly focused forward and therefore vistas beyond the 30° cone of view are not noticed as much as those within the view cone. However, at the current slow travelling speeds along the pass, it can be assumed that the cone of view will be greater than 30°.
- Localised visual perceptions of the economically depressed communities have not been tested as these may be influenced rather by the economic and job opportunities that would exist rather than the direct visual perception of the project;

- The assessment does not consider the ancillary project infrastructure and components such as borrow pits, spoil dumps, construction camp sites, etc. These components will be assessed in detail during the design phase should the project be implemented;

- The ‘No Go’ alternative was not specifically addressed as it is likely that the existing landscape will remain in its existing condition.

  If the study, however, determined that the negative visual impact is of such a magnitude and significance that it will seriously influence the decision on whether or not to build, it may then be necessary to test and determine the visual perceptions of neighbouring communities. Such a study is involved, costly and time consuming.

- A relative visual quality sensitively scale (Figure 4, Relative Visual Quality Sensitivity) has been established for the entire route ranging from high, medium and low visual quality. This scale is simply based on visual quality evaluated relative to each other and not in absolute scale.

4 STUDY FINDINGS

The extent of the visual impact of the project will depend on the following characteristics of the receiving environment:

- Topography
- Vegetation cover
- Land use
- Landscape diversity
- Landscape character
- Visibility

The visual quality is the visual significance given to a landscape determined by cultural values and the landscape’s intrinsic physical properties (Smardon, et al, 1986). While many factors contribute to a landscape’s visual quality, they can ultimately be grouped under three headings: vividness, intactness and unity.
Figure 4: Relative Visual Quality Sensitivity
The visual quality can be categorised under relative headings such as high, medium and low visual quality for the study area. High refers to those areas that have a high aesthetic appeal such as river valleys, mountains, unspoilt coastal zones and wilderness areas. The medium areas are those that have high visual diversity, but which have already been modified by human activity comprising the aesthetic appeal such as roads, minor infrastructure and settlements. The low visual quality areas are those that are relatively highly populated and which have been heavily impacted on by human activity such as industrial and mining areas.

The study area focuses on a 10 km radius around the project.

4.1 Description of the Works

4.1.1 Lower Section Pavement Alternatives (Km 14 - Km 25)

- **Surfacings**

  Various surfacing are possible on this section of the pass. Due to the fact that a flexible pavement is being considered for this section (see Section Bases), a double seal, cape seal and asphalt surfacing can be considered. For the estimated traffic loading and remoteness of the site from asphalt plants, an asphalt surfacing is considered inappropriate from a cost point of view. A cape seal or double seal would be equally appropriate, but the preferred surfacing would be a double seal, consisting of a 19 mm aggregate and two 6.7 mm aggregate applications. This surfacing is considered to be constructible in the topography of the section under consideration and should provide for a durable surfacing for a considerable period of time.

- **Bases**

  Five different types of base layers were considered, namely:

  - Waterbound Macadam,
  - Emulsion Bound Macadam,
  - G1 or G2 granular base,
  - C3 or C4 lightly stabilized base or
  - Foam bitumen base.

  These are discussed separately below:
- **Waterbound Macadam**

Waterbound Macadam bases consist of a course, single-sized aggregate together with fine material which is added during construction by means of water to fill the voids.

WM pavements are known for the difficulty to obtain smooth surfaces during construction and for requiring an asphalt surfacing to rectify with the uneven surface of the base. WM base pavements are less sensitive to the influence of water and are therefore appropriate for pavements carrying heavy traffic in wet regions.

The benefit of using WM base pavements lies in the intensive use of manual labour for the construction of the base layer. This will benefit the community economically. Furthermore, since the area lies within a high rainfall region the WM base resistance to the influence of water, is a benefit.

Potential problems may lie in the sourcing and availability of water. The availability of suitable materials may also be a problem.

- **Emulsion Bound Macadam**

An emulsion bound penetration macadam is constructed by starting with a layer of rolled coarse aggregate followed by a pressure application of bitumen emulsion. The surface voids in the coarse aggregate layer are filled with fine aggregate to lock in the coarse aggregate followed by an additional application of bitumen binder which is then covered with fine aggregate and rolled. A minimum amount of equipment is required for construction, thus it is particularly adapted for jobs in remote localities involving small quantities.

- **Foam Bitumen**

Foam bitumen is a mixture of air, water and bitumen. It is typically 98 % bitumen, 1 % water and 1 % additive. It is produced by injecting the cold water onto the hot bitumen in a foaming chamber. The bitumen expands to about 5 to 10 times its original volume and forms a fine mist of foam, which is highly efficient in wetting and coating the surface of fine particles. As the foam collapses most of the water is loss in the form of steam, leaving residual bitumen with properties similar to the original bitumen.
A potential disadvantage is that a mixing and stockpile site is required that may be of considerable size which could lead to visual scarring. This could be problematic in or close to a World Heritage site.

- **Crushed Stone Bases (G1/G2)**

Granular bases consist of crushed or high quality natural gravel materials. Granular materials are usually susceptible to water. The ingress of water through surface cracks results in lowered bearing capacity and could result in excessive deformation. It is thus imperative to perform preventative maintenance to protect the inherent strength of the pavement.

It should be noted that the proposed upgrade of the road falls within a high rainfall area; this may lead to increased maintenance costs over the life of the pavement. Effective moisture management will be essential to ensure the longevity of the pavement structure.

Since no detours are allowed and the road is only 7m wide, construction will have to be done in half widths to allow the flow of traffic. Construction with granular base can lead to constructability challenges.

Furthermore the availability of suitable materials for the construction of the granular bases could be a problem. As the area lies within a World Heritage Site, it will definitely create problems with the development of borrow pits or rock quarries. Material will have to be imported at high costs and borrow pits will have to be located outside the Heritage site.

Major disadvantages include the accommodation of traffic as now bypasses are allowed and construction need to be carried out at half widths on a 7 m wide carriageway. The layer will need to be supported by a stabilised sub-base.

- **Cemented Bases (C3/C4)**

Lightly cemented based are usually constructed with marginal to better quality natural gravel and stabilized with cement. These pavements can either have uncemented or cemented sub-bases depending on the material quality and the life cycle strategy. Normally a cemented base pavement structure with an uncemented sub-base will result in a relatively shallow structural
balance, and with moisture ingress into the sub-base, it will be more sensitive to overloading.

As with granular bases, construction may be problematic if the road construction is undertaken in half-widths. Suitable natural material sources will have to be identified. Stabilization on steep grades may result in some construction difficulties.

Implications for the Project

From an aesthetic point of view exposed concrete that has been stained or pigmented would have been the preferred surface material. However, it has been recommended from an engineering point of view that the preferred surfacing for Phase 2a be a double seal bitumen surface which is normally black in colour. The black surface will significantly contrast with the natural tans and browns of the road shoulder and the greens / browns of the surrounding vegetation. It is recommended that the bitumen be tinted to that of a reddish-brown colour that would be more visually compatible with the surrounding landscape.

4.1.2 Upper Section Pavement Alternatives (Km 25 – Km 33)

Due to the very steep grades, the application of single, double or cape seals are considered to be not practical. Paving asphalt at grades between 12 and 25 % provides significant technical challenges and the final quality and durability of the surfacing will be questionable. The application of bitumen and aggregates are not recommended for grades exceeding 12 % as the bitumen will tend to flow before finally setting.

- Flexible Pavement Options

Flexible pavement options for the base layer includes granular bases, stabilised bases, and hot mix asphalt bases. All these alternatives require the use of large construction equipment that will not be possible to use in the limited space and steep grades on the upper sections of the pass. Due to construction limitations flexible pavement alternatives (granular layers, stabilised base layers and hot mix asphalt bases), are not considered.

- Continuously Reinforced Concrete Pavement (CRCP)

A Continuously Reinforced Concrete Pavement (CRCP) consists of concrete with steel reinforcement in the longitudinal direction and only nominal steel reinforcement ion the transverse direction. CRCP pavements do not have transverse joints and is designed to crack at a spacing of between 1 and 2,5 meters.
On of the major advantages of a CRCP is that it requires very little maintenance which is beneficial in the environment of the upper section of the pass.

Anchoring of the CRCP pavement may be required at sections with very steep grades, and that may be done by either anchor beams or dowels into rock.

A retarder may be applied on the surface of the concrete to provide an exposed aggregate finish. In addition, the cement may be stained to further enhance the appearance of the pavement on this section of the pass.

One of the advantages in using this pavement alternative includes options to satisfy aesthetic requirements.

- **Interlocking Paving Blocks**

Concrete Block Paving is a system of individually shaped interlocking blocks arranged to form a hard surface that can last decades with little or no maintenance. The blocks are placed on a layer of sand which in turn is placed on a granular or stabilised base layer. The gaps between the concrete blocks are filled in with sand.

In order to construct the pavement in half widths, an anchor beam will need to be introduced along the centre of the road. The pavement may therefore have a less acceptable aesthetic appearance that consists of concrete beams filled with concrete blocks.

One of the advantages of Concrete Block Paving is that the blocks can be stained in-situ or pigmented during manufacturing to be more aesthetically pleasing.

- **Hyson cells**

Hyson cells consist of a plastic form that is filled with concrete to provide a similar structure than concrete blocks. The mechanism of this pavement is similar to interlocking blocks and the same advantages and disadvantages apply.

Regular anchor beams will be required to anchor the pavement at steep grades in addition to the presence of an anchor beam in the centre of the road to allow half width construction.
One of the disadvantages of the Hyson cells is that once the concrete starts to wear, the hyson cells start to fray leaving an unsightly running surface.

- **Pre-cast Concrete Pavement**

  Pre-cast pavement consists of a series of individual pre-cast panels that are tied together in the longitudinal direction and doweled in the transverse direction after installation on site.

  The pre-cast panels are to be fabricated at pre-cast plant, preferably as close as possible to the installation site. Panels are normally removed from the forms the day following casting and cured and stored at the pre-cast plant.

  Delivery of the pre-cast panels to the site is a critical aspect of the installation process. Sufficient delivery trucks must be available to meet the required installation rate. This may be challenging given the topography of the upper section of the pass and the need for heavy lifting equipments to place the panels.

  As with the CRCP option the panels can be coloured by staining or pigmenting to be more aesthetically pleasing.

**Implications for the Project**

It has been recommended from an engineering point of view that a CRCP system be the preferred surfacing material. This material is also preferred from an aesthetic point of view due to the fact that the concrete, especially exposed concrete, can be coloured to complement the surrounding natural geological colours of the landscape.

Although several of the alternative pavements are essentially concrete they do not have the flexibility of design as does the CRCP system. Anchor beams that contrast with the pavements will have to be introduced.

**4.1.3 Structures and Cuttings**

It is envisaged that the cuttings will be rendered stable and not prone to erosion, by using soil nails and shotcrete, the latter being randomly shaped and weathered with a naturally occurring organic compound “Permeon” which may be sprayed on in various concentrations leading to various hues of brown, replicating the Tarkastad, Molteno, Elliot, Clarens and Drakensberg formation rocks which occur along the pass.
The installation of soil nails will necessitate that only limited height benches are excavated at a time. Removal will in all likelihood require blasting over most areas, but due to the small vertical drop each time, only small charges will be used. This in turn will limit the “throw” of the blast and practically eliminate the large rock-blast rubble which typically occurs on the down slope in these types of project.

The cross section of the road (Figure 5, Cross Section of Road Design) is designed so that nearly all flow would initially take place from the road towards the cutting side. After being intercepted by regularly-spaced drainage holes through the purpose-designed hand-labour constructed arrestor walls, the flow would be filtered in an arrestor bed, which is dual-purpose. Not only is it designed as the initial phase of the filter system, but it also acts as the rock arrestor layer for boulders which may come off the slope above. This arrestor area is designed such that it has sufficient width to facilitate both hand and machine clearing during the life of the structure; hand cleaning to provide a labour-input source for locals and machine clearing where the mass of material is too great for hand removal.

Structures envisaged along the route will require placement of concrete against the in-situ materials for the foundations. If the structure is located near a ground water source, the high pH of the initially wet concrete has a marked effect on the ground water pH although only for a limited period until the concrete achieves initial set. Be that as it may, this high pH has a marked effect on aquatic organisms and piscine life. It is thus recommended that this practice be eliminated by placing a membrane to effectively eliminate contact between concrete and ground water.

Drainage and bridge / culvert type structures can be rendered aesthetically pleasing by using naturally occurring stone in rubble-masonry construction. The larger catchments will require either a box culvert or a bridge. The proposal is to clad these structures with stone from the immediate area so as to blend in with the environment. This construction method also provides a large labour component for the works generating a source of income, training and possibly future careers for many people desperately in need of employment (Figure 6, Concept River Crossing Structure).

The client has requested that all the drainage be accommodated through varying sizes of conduits under the road.
Figure 5: Cross Section of Road Design
Figure 6: Concept River Crossing Structure
Implications for the Project

Structures such as bridges and culverts as well as cuttings by their very nature will produce a significant visual disturbance on the landscape as a result of the construction activities. The area of disturbance will undoubtedly be greater than that which currently exists. It is therefore imperative that the visual impact be reduced by blending these structures with the landscape. This can take the form of stone cladding, staining or tinting of the concrete and the creation of plant pockets in the shotcrete façades.

4.2 Description of the Affected Environment

The extent of the visual impact of the project will depend on the following characteristics of the receiving environment:

4.2.1 Topography

The route crosses the Ukhahlamba Drakensberg Mountains from south-east to north-west through a relatively narrow pass. The incline increases steadily to approximately km 28 where the angle of incline increases considerably to the summit at km 33.

The mountain range is majestic and dramatic with steep slopes, incised valleys and high rising peaks.

Several pristine streams cross the road as they come down steep narrow side valleys. These streams add to the scenic visitor experience.

The Southern Drakensberg receives high rainfall, exceeding 1 000 mm per year, usually in the form of thunderstorms. This high and sudden rainfall generates high runoff and accelerates erosion of the soft surface material resulting in the numerous erosion gulleys.

The lower sections of the pass consist of shallow soils derived from Karoo Sequence sediments and dolerite (Figure 2) while the upper steeper sections consists of shallow acidic litho soils derived from the massive Drakensberg basalts of the Stormberg Group (Low and Rebelo, 1996). These basalts give rise to the dramatic landscape (Figure 3).

Implications for the Project

The steep and diverse landscape through which the road passes, is one of the primary reasons for the aesthetic appeal of this section of the Drakensberg.
The winding and sinuous road is moulded to the landscape following its natural form. Views and experiences are constantly changing as one ascends or descends the pass. It is these intermediate experiences that will require retention along the route as these can easily be reduced or destroyed in the construction of a new road alignment.

The steep and rugged terrain ensures that travelling speed is slow and cautious. This allows travellers to focus on the natural detail close to the road verges. Faster speeds will tend to blur this detail.

The stream crossings are some of the most important scenic experiences along the route. It is important that these are still experienced in their pristine condition should the road upgrade go ahead.

The colour and texture of the existing road, retaining walls, cuttings and fills currently reflect the existing colours and textures of the surrounding landscape which assists in the road blending into the landscape.

4.2.2 Vegetation Cover

The vegetation along the route falls within two broad vegetation types within the Grassland Biome (Low and Rebelo, 1996). The lower section below the basalts consists of the Moist Upland Grassland vegetation type. This type consists of a dense sour grassland with trees and shrubs that occur on sheltered sites, rocky hills and ridges. The upper reaches of the pass consists of the Alti Mountain Grassland vegetation type that consists of mainly tussock grasses, dwarf shrubs and creeping or mat-forming plants.

Implications for the Project

The low vegetation leaves the road visually exposed. The uniformity of the grassland vegetation, especially the upper reaches, and the lack of vegetation diversity and height therefore do not readily assist in blending the road with the landscape or allowing the landscape to accept visual changes or intrusion during spring and summer. However, during the winter months the vegetation browns off, to a colour that readily matches the rock and soil of the road.

4.2.3 Landscape Diversity

Landscape diversity is a function of topography, vegetation and land use. The greater the diversity, the greater is the potential for the proposed development to blend with the surrounding landscape.

The diversity of this section of the Sani Pass is influenced by the topographical features rather than any land use pattern or vegetation cover.
The diversity is made up of the massive topographical features of the Drakensberg such as the steep slopes, incised valleys, craggy peaks and scarp faces. The great height of the mountains is sufficient to throw patterns of light and shadows across the face of the range which continuously changes throughout the day and the season. Changes in the vegetation create subtle colour and texture patterns.

Land uses are predominantly the road travellers for tourism and access to and from Lesotho. This part of the Drakensberg forms part of the Ukhahlamba Drakensberg Park World Heritage Site and land user activities are related to wilderness conservation and tourism. Previous stock grazing on the slopes is said to have ceased although a herder and a herd of goats were observed.

The landscape diversity at a macro scale is considered high. However, at a local scale the visual diversity is lower as vegetation height and pattern plays a larger role than does the effect of light and shadow.

Implications for the Project

At a macro scale the high diversity allows the road to be visually “absorbed” into the landscape. In other words, the road does not appear visually dominant or out of place or scale when viewed against the backdrop of the Drakensberg and the play of light and shadow.

However, at a local scale the low diversity does not readily accommodate any visual change to the landscape, especially during the summer months. The lack of visual screening in the form of tall vegetation and the uniformity of the low vegetation, especially when viewed against the mountain slopes, results in the road being highly visible with a high visual contrast. The road materials to be used for surfacing and for bridges, retaining walls and culvert structures will be required to match the surrounding landscape in colour and texture. Cut and fill slopes will need to be shaped, re-vegetated and rounded to blend in with the surrounding landscape form.

4.2.4 Landscape Character and Genius Loci

The spirit, or sense of place, is that quality imparted by the aspects of scale, colour, texture, landform, enclosure, and in particular, the land use. According to K. Lynch (1992) ‘it is the extent to which a person can recognise or recall a place as being distinct from other places as having a vivid, or unique, or at least a particular character of its own’.

The quality of Genius Loci is a function of attributes such as the scenic beauty or uniqueness and distinctive character of the built and cultural landscape.
The sense of place is defined by the backdrop of the massive and dominating Drakensberg Mountains and the partially enclosed valley through which the road passes together with the extensive views to the south and east across a vast picturesque landscape that extends to the distant horizon. The sense of place is further developed by the exquisite points of interest that unfold as one moves up the pass. These include the change in vegetation, the many stream crossings and minor waterfalls, the main stream channel at the valley bottom, the geological formation from cliff edges to large boulders between which the road passes. Many of these features are only observed and appreciated when viewed at very low travelling speeds. It is at the slower travel speed that the aesthetics of the pass are fully experienced and which lead to a heightened sense of place.

The visual quality is the visual significance given to a landscape determined by cultural values and the landscape’s intrinsic physical properties (Smardon, et al, 1986). While many factors contribute to a landscape’s visual quality, they can ultimately be grouped under three headings: vividness, intactness and unity.

The visual quality of the landscape through which the road passes, can be regarded as high due to the scale of the landscape, the relatively pristine visual state of the environment and the visual diversity that create a unified and vivid quality. The scenic quality of the valley, had it not been visually intruded by the existing road would probably have been regarded as very high. The entire section (Phase 2a and 2b) is still regarded as very scenic and picturesque with the exception of the visually intrusive Border Post. The general lack of human intrusion presents a relatively unspoilt, almost wilderness character.

Visual scale is the apparent size relationship between landscape components or features and their surroundings (Smardon, et al, 1986).

The vertical and horizontal scale can be regarded as broad, massive and expansive due to the great height of the Drakensberg and the extensive views over many kilometres to and from the mountain.

The enormous scale tends to dominate most man-made features reducing their perceived scale considerably due to the relative scale. The height of the mountains provides a visual backdrop that limits viewing the road and its associated structures in silhouette.

Implications for the Project

The pass is located within a landscape which has a strongly defined sense of place, an extensive, broad, massive and picturesque landscape and a high visual quality that is vivid and unified.
The existing road has been carved out of the landscape, generally along the geological contact zones as a thin gravel ribbon that follows the curves of the valley, utilising local materials that have helped blend it into the surrounding landscape, especially during winter. During spring and summer the road is far more visible due to the higher visual contrast of the road against the stronger greener shades of the landscape. Although the road is highly visible it does not significantly detract from the scenic quality of the valley.

An upgrade of the road will require new road structures such as bridges and retaining walls as well as cut and fill slopes to closely match that of the existing surrounding landscape. The minor natural features such as waterfalls, stream crossings and large boulder rocks will need protection as these contribute to the overall aesthetic experience and ambience of the pass. These points of interest will still need to be integrated with the road as they form an important component of the tourism experience. Many of the special points of interest may not be as readily appreciated at the higher design speeds of the upgraded road.

4.2.5 Visibility

Views from the road extend for many kilometres to the south and east. The viewing distance increases as the viewpoint increases in elevation.

Views of the pass are theoretically possible from the edges of the extended views. However, the road is only visible from 5 - 7.5 km away when the light is right. Often the pass is in shadow or is broken up by shadows thereby reducing the visibility of it. The road and its associated infrastructure is similar in colour to the surrounding area during autumn and winter and the visibility is further reduced. The break in the vegetation due to the cleared road reserve tends to focus attention to the road as the edge of the cleared reserve is in stark contrast to the surrounding landscape.

Critical views are those from the surrounding hill slopes and the higher elevations from where the road can be seen by road users and tourists within the World Heritage Site such as from the summit and the Sani Top Chalets, the road itself and the many tourism facilities lower down in the valley along the Phase 1 section.

Phase 2a of the pass is located within a valley flanked on either side by linear ridges. These ridges contain the visibility of the road to not much beyond 2.5 km (Figure 7, Phase 2a Viewshed Analysis). Visibility is generally to either side of the road with minor patches above and below the ends of this section.
Figure 7: Phase 2a Viewshed Analysis
Figure 8: Phase 2b Viewshed Analysis
Phase 2b of the pass consists of the higher elevated and steeper section for the RSA Border Post to the summit (Figure 8, Phase 2b Viewshed Analysis). The road begins to rise up out of the valley and onto the talus (scree) slopes of the escarpment thereby increasing and extending the visibility to distances beyond 15 km to the south-east down the valley. However, the visibility is generally contained north and south to within the valley. Visibility beyond 5 - 7.5 km is regards is being insignificant.

Implications for the Project

Extended views from beyond 5 - 7.5 km away can be regarded as insignificant due to the fact that the visual impact diminishes exponentially as the distance between the viewer and the object increases (Figure 9a and 9b, Reduction of Visibility over Distance).

Critical views affected are those from the surrounding areas within a 5 km radius towards the road and from the road itself viewed up and down the slope. As the existing low vegetation has no screening function, it is only the form, texture and colour of the road infrastructure that will assist in reducing the visibility and visual intrusion. Colour and forms that are in stark contrast to the surrounding landscape will be dominant. Colours and textures of structures that match the landscape will help blend in the road with the landscape.

4.3 Identification of Risk Sources

Various risk sources for the visual impact have been identified for the construction and operation phases and can be classified as both negative and positive. The following general risks are associated with the visual intrusion in the landscape.

4.3.1 Risk Sources

- **Construction Phase**

  It is anticipated that the major risk sources during construction would be:

  **Negative Risk Sources**

  - Excessive cleaning and stripping of topsoil for site offices, construction camps, servitudes and temporary access roads;
  - The relatively random and disorganised lay down of construction materials, vehicles and offices;
  - Cut and fill slopes become highly visible if not re-vegetated and shaped to blend in with the existing topography;
Figure 9a: Reduction of Visibility over Distance – View of Road
Figure 9b: Reduction of Visibility over Distance – View of Local Rural Village
- The extent and intensity of the security and construction lighting at night;
- Dust from construction activities;
- Open and unrehabilitated landscape scarring;
- Uncontrolled exploitation of borrow pits and quarries without compliance to environmental controls related to aesthetic rehabilitation. It is the intention that all such sites are to be located outside the World Heritage Site;
- Locations and layout of the construction workers camp if located in proximity of the works area; and
- High seed bank of alien species in the topsoil can lead to the uncontrolled spread of exotic invader plant species. This could create a vegetated area that is visually contrary to the surrounding landscape.

Positive Risk Sources

- Image of construction activity could lead to a perceived view of progress and benefit to the community.

Operational Phase

It is anticipated that the major risk source during operation would be:

Negative Risk Sources

- Areas and / or specific sites of high aesthetic value may be disfigured by the introduction of large scale infrastructure project components;
- The compromising of views from or the alteration of the ambience of natural areas;
- Site engineering such as cut and fills could remain aesthetically incompatible with the surrounding landscape. Edges may not blend in with the landscape or cut slopes may be too steep to be adequately re-vegetated;
- Need to keep road reserves clear of vegetation will result in visual scarring;
- New access roads leave permanent visual scarring;
- Cumulative impact of additional traffic will affect the sense of place.

Positive Risk Sources

- The upgraded road could be the visual affirmation of progress and prosperity for the region. Localised visual perceptions of the economically depressed communities of the population have not
been tested as these may be influenced rather by the economic and job opportunities that could exist rather than the direct visual perception of the project.

4.4 The Visual Assessment

4.4.1 The Visual Analysis

This section describes the aspects that have been considered in order to determine the intensity of the visual impact on the area. The criteria include the area from which the project can be seen (the viewshed), the viewing distance, the capacity of the landscape to visually absorb structures and forms placed upon it (the VAC), and the appearance of the project from important or critical viewpoints.

A broad scan was undertaken to obtain a quick impression of the relative visual quality and sensitivity of the entire study area (Figure 4) in order that the project components can be assessed relative to each other.

- The Viewshed

The viewshed is a topographically defined area that includes all possible observation sites from which the project will be visible. The boundary of the viewshed, which connects high points in the landscape, is the boundary of possible visual impact (Alonso et al., 1986). Local variations in topography and man-made structures would cause local obstruction of views. The viewshed, based on GIS assessment and fieldwork, extends for the main part within a 2.5 km zone either side of the road. There are some direct line of sight sections that extend at least 20 km to the south-east. (see Figures 7 and 8, Viewshed Analyses).

- The Viewing Distance

The visual impact of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases (Hull and Bishop, 1988).

Thus, the visual impact at 1 km would be approximately a quarter of the impact as viewed from 500 m. Consequently, at 2 km, it would be one sixteenth of the impact at 500 m (Figures 9a and 9b). The view of the project components would appear so small from a distance of 5 km or more that the visual impact at this distance is insignificant. On the other hand the visual impact of the project components from a distance of 500 m or less would be at its maximum.
• **Critical Views**

Critical views can be regarded as continuous along the entire road. The views are continuously unfolding as one move up the pass through the landscape with a high scenic quality. Critical viewpoints are those along the route such as waterfalls, seep areas and stream crossings or areas where wild flowers provide spectacular shows. Critical viewpoints include establishments such as bed and breakfast facilities, lodges, hotels and chalets that rely on the surrounding scenic quality for their existence. Most of these are located lower down the pass in the Phase 1 area and the Sani Top Chalets at the pass summit.

• **The Visual Absorption Capacity (VAC)**

The VAC is a measure of the landscape’s ability to visually accept / accommodate or embrace a development. Areas that have a high VAC are able to accept objects easily and their visual impact is less noticeable. Conversely, areas with a low VAC will suffer a higher visual impact from structures imposed on them. In this case the VAC has been defined as a function of three factors (Table 1).

The VAC was determined, based on the author’s field experience, taking the following into account:

- Slope
- Visual pattern or diversity (landscape texture) with regard to vegetation and structures and land use
- Vegetation height.

**Table 1: Visual Absorption Factors and their Numerical Values**

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<tr>
<th>VAC Factor</th>
<th>Categories</th>
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<td>Slope</td>
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<td>Numerical Value VAC</td>
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<td>Vegetation</td>
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<td>height</td>
<td>Numerical Value VAC</td>
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<td>Visual Pattern</td>
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<td>Numerical Value VAC</td>
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<td>Low</td>
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It is therefore concluded that the VAC of Phase 2a can be regarded as moderate to high due to the moderate visual pattern, moderate vegetation height and the moderate to steep slopes of the adjacent topography. This implies that the landscape is inherently able to a moderately high degree to visually accommodate or accept the possible visual change made to it by the project upgrade.

Phase 2b exhibits a moderate VAC due to the steep and rising landform, the moderate visual pattern and the low vegetation height. This implies that the landscape is able, to a moderate extent, to accept the possible visual change made to it.

• **Visual Assessment**

The assessment of the impact of the road upgrade on the visual environment is based on the following methodology.

The visual impact assessment will be evaluated against the following standard criteria:

- **Nature of the impact**
  Description of the impact

- **Extent**
  Describe whether or not the impact would occur on a spatial scale that:
  - is limited to the immediate area(s) where construction is to take place (immediate, site-specific);
  - is confined to a small area with a radius of less than 5 km around the project site (local);
  - extends over a larger geographic area that would include a major portion of an area or province (regional);
  - covers an even wider area that would have national or international implications (national).

- **Duration**
  A prediction of whether the duration of the impact would be:
  - Short term (0 - 3 years) – or confined to the construction period;
  - Medium term (3 - 10 years);
  - Long term (> 10 years);
  - Should be considered as permanent (beyond the anticipated lifetime of the project).
- **Intensity**
  The intensity of an impact expresses the relative importance of consequences attributable to a change in an environmental component. The intensity of an impact is an integration of the component's Environmental Value with its Degree of Disturbance, which can be either positive or negative.

The environmental value of a component is the synthesis of its Ecosystem-based Value and its Social Value.

The Ecosystem-based Value expresses the relative importance of a component to the ecosystem, as measured by its function or role. It integrates notions such as patterns of use, diversity, or having rare and unique characteristics of the environmental component. The Ecosystem-based Value of a given component is considered to be:

- **High** - when the component is of major interest in terms of its ecosystem-based function, biodiversity, of exceptional qualities, and there is a consensus in the scientific community that it should be conserved or protected;
- **Medium** – when the component is of strong interest and has recognised qualities, and there is concern, although not consensus, for its conservation or protection;
- **Low** – when the component holds little interest, has few notable qualities and there is little concern for its conservation or protection.

However, visual quality is purely a social function and is used independently in determining the Environmental Value.

The social value of a component expresses the relative importance attributed to the component by the public, the various levels of government, or any other legislative or regulatory authority. The social value indicates the popular or political desire or will to conserve the integrity or the original character of a component. This will is expressed through the legal protection that the component is accorded, or by the concern of the local or regional public for the component. The social value evaluation is based on information gathered during various public consultations in the study zone.

The social value of the visual quality is considered:

- **High** – where the areas have a high aesthetic appeal such as river valleys, unspoilt coastal zones, mountain areas and
wilderness areas and where the quality is essential to human aesthetics. The value is high where the visual intrusion affects the natural, cultural or social environment in such a way that these views temporarily or permanently cease (negative) or change / improve (positive);

- Medium – where the areas are those of high visual diversity, but which have been modified by human activity such as roads, minor infrastructure and settlements that have compromised the aesthetic appeal. The value is medium where the visual intrusion affects the natural, cultural or social environment in such a way that these views continue in a modified positive or negative way;

- Low – where the areas are relatively highly populated and which have been heavily impacted on by human activity such as high residential or commercial uses, industrial and mining. Areas with minimal visual diversity or aesthetic appeal are also included. The value is low where the visual intrusion affects the natural, cultural or social environment in such a way that these views are not affected.

- **Frequency of occurrence**
  A description of any repetitive, continuous or time-like characteristics of the impact(s) as:
  - Continuous (i.e. without interruption);
  - Intermittent (occurring from time to time, without specific periodicity);
  - Periodic (occurring at more or less regular intervals);
  - Time-linked (i.e. occurring only or mostly at specific times of the day or week – e.g. impact only at night or during normal working hours).

- **Probability of occurrence**
  The likelihood of the visual intrusion actually occurring indicated as:
  - Improbable – very low possibility for the intrusion to occur due to design or historic experience;
  - Probable – good possibility for the intrusion to occur;
  - Highly probable – mostly likely for the intrusion to occur;
  - Definite – intrusion will occur regardless of any prevention or mitigation measures.

- **Legal requirements**
  An identification and list of specific legislation and permit requirements related to the visual specialist study that potentially could be infringed upon by the proposed project or which is required to enable the project to proceed.
Significance

The interaction between the intensity, extent and duration defines the significance of an impact on a given environmental component. Table 2 presents the grid for determining Significance and differentiates between five levels of significance, ranging from very high to very low.

Table 2: Grid for Determining Impact Significance

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<td>Very low</td>
</tr>
<tr>
<td></td>
<td>Site-specific</td>
<td>Long</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium</td>
<td>Very low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Short</td>
<td>Very low</td>
</tr>
</tbody>
</table>
- **Status of the impact**
  A statement of whether the impact is positive (a benefit), negative (a cost) or neutral. Indicate in each case who is likely to benefit and who is likely to bear the costs of each impact.

- **Degree of confidence in predictions**
  A statement of the degree of confidence in the predictions, based on the availability of information and the specialist’s knowledge and expertise.

The visual impact will, however, vary when evaluated against the criteria of intensity of visual impact and the significance of the impact.

An example is the situation where a project component such as a toll plaza or bridge is located within a fairly narrow undisturbed valley between two rising landforms. The visual impact’s intensity is low since it cannot be seen from surrounding areas. The component has the hillsides as a backdrop and therefore blends into the valley texture. The significance, however, is high within the context of the scenic value of the pristine valley because the sense of place and the character of the valley are severely compromised.

The converse is also true in that a high visual intensity impact can have a low significance. The visual impact assessment will therefore be based on the criteria of intensity and significance relative to land use and the nearness to important viewpoints.

### Table 3: Visual Assessment Criteria – Intensity Rating

<table>
<thead>
<tr>
<th>Visual Assessment Criteria</th>
<th>Intensity Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
</tr>
<tr>
<td>Visibility from critical viewpoints</td>
<td>Highly visible within 1 km</td>
</tr>
<tr>
<td>Visibility from general surrounding landscape</td>
<td>Not obscured by natural landform</td>
</tr>
<tr>
<td>Visual intrusion on landscape character and sense of place</td>
<td>Dominates sense of place</td>
</tr>
</tbody>
</table>
### Visual Assessment Criteria – Intensity Rating

<table>
<thead>
<tr>
<th>Visual Assessment Criteria</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual association with existing infrastructure development</td>
<td>Existing development is easily visible from proposed development (within 2 km)</td>
<td>Existing development is partially visible from proposed development (&gt; 2 km &lt; 5 km)</td>
<td>Existing development is barely noticeable (&gt; 6 km) from the proposed development</td>
</tr>
<tr>
<td>Visibility from homesteads, conservation areas, local communities, villages and towns</td>
<td>Highly visible. Dominates view within 500 m - 1 km</td>
<td>Visible, but does not dominate view within range of 1 km – 2.5 km</td>
<td>Visible, but are not obviously noticeable in the view &gt; 2.5 km</td>
</tr>
</tbody>
</table>

### Table 4: Visual Assessment Criteria – Significance Rating

<table>
<thead>
<tr>
<th>Visual Assessment Criteria</th>
<th>Significance Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visibility from existing viewpoints</td>
<td>High: Particularly interferes with scenic views from viewpoints</td>
</tr>
<tr>
<td></td>
<td>Medium: Partially interferes with scenic views from viewpoints</td>
</tr>
<tr>
<td></td>
<td>Low: Components are too far from the viewpoints to interfere with scenic views</td>
</tr>
<tr>
<td>Visibility from general surrounding landscape</td>
<td>High: Compromises particularly scenic distant views of the landscapes</td>
</tr>
<tr>
<td></td>
<td>Medium: Particularly noticeable in scenic landscapes</td>
</tr>
<tr>
<td></td>
<td>Low: Hardly noticeable in scenic landscapes</td>
</tr>
<tr>
<td>Visual intrusion on landscape character and sense of place</td>
<td>High: Compromises proclaimed conservation nature reserves and wilderness areas is within 500 m - 1 km of a natural feature (e.g. pans, mountains)</td>
</tr>
<tr>
<td></td>
<td>Medium: Compromises particularly scenic landscape features e.g. coastal edge, undisturbed valleys within 1 km – 2.5 km</td>
</tr>
<tr>
<td></td>
<td>Low: Compromises built up areas which exhibit an industrial character; is less visible, homestead &gt; 2.5 km away</td>
</tr>
</tbody>
</table>
### Visual Assessment Criteria

<table>
<thead>
<tr>
<th>Visual Assessment Criteria</th>
<th>Significance Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High</strong></td>
<td><strong>Medium</strong></td>
</tr>
<tr>
<td>Visual association with existing infrastructure development</td>
<td>Where the development is within 200 m from existing infrastructure development</td>
</tr>
<tr>
<td>Visibility from homesteads, lodges, tourism accommodation, conservation areas, local communities, villages and towns</td>
<td>Where the visibility of the development interferes with the way of life such as a tourism enterprise and/or obstructs scenic distant views by being within 500 m – 1 km of the community</td>
</tr>
</tbody>
</table>

### Table 5: Visual Impact Assessment Criteria Ratings
(These are the criteria against which the impact is assessed and are not the impact assessment)

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>HIGH</th>
<th>MEDIUM</th>
<th>LOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visibility</td>
<td>Very visible from many places within and beyond the 5 km zone</td>
<td>Visible from within the 5 km zone, but partially obscured by intervening objects</td>
<td>Only partly visible within the 5 km zone and beyond due to screening by intervening objects</td>
</tr>
<tr>
<td>Genius Loci</td>
<td>A particularly definite place with an almost tangible dominant ambience or theme</td>
<td>A place which projects a loosely defined theme or ambience</td>
<td>A place having little or no ambience with which it can be associated</td>
</tr>
<tr>
<td>CRITERIA</td>
<td>HIGH</td>
<td>MEDIUM</td>
<td>LOW</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Visual quality</td>
<td>A very attractive setting with great variation and interest, but no clutter</td>
<td>A setting which has some aesthetic and visual merit</td>
<td>A setting which has little aesthetic value</td>
</tr>
<tr>
<td>Visible social structures</td>
<td>Housing and/or other structures as a dominant visual element</td>
<td>Housing and/or other structures as a partial visual element</td>
<td>Housing and/or other structures as a minor visual element</td>
</tr>
<tr>
<td>Surrounding landscape compatibility</td>
<td>Ideally suits or matches the proposed development</td>
<td>Can accommodate the proposed development without appearing totally out of place</td>
<td>Cannot accommodate proposed development without it appearing totally out of place visually</td>
</tr>
<tr>
<td>Character</td>
<td>The site or surrounding area exhibits a definite character</td>
<td>The site or surrounding area exhibits some character</td>
<td>The site or surrounding area exhibits little or no character</td>
</tr>
<tr>
<td>Scale</td>
<td>A landscape which has horizontal and vertical elements in high contrast to the human scale</td>
<td>A landscape with some horizontal and vertical elements in some contrast to the human scale</td>
<td>Where vertical variation is limited and most elements are related to the human and horizontal scale</td>
</tr>
<tr>
<td>Visual Absorption Capacity (VAC)</td>
<td>The ability of the landscape to easily accept visually a particular development because of its diverse landform, vegetation and texture</td>
<td>The ability of the landscape to less easily accepts visually a particular development because of a less diverse landform, texture and vegetation</td>
<td>The ability of the landscape not to visually accept a proposed development because of a uniform texture, flat slope and limited vegetation cover</td>
</tr>
</tbody>
</table>
CRITERIA | HIGH | MEDIUM | LOW
--- | --- | --- | ---
Viewing distance | If uninterrupted view distances to the site are > 5 km | If uninterrupted view distances are > 5 km < 2.5 km | If uninterrupted view distances are > 500 m < 2.5 km
Critical views | Views of the project are to be seen by many people passing on main roads and from prominent areas, i.e. towns, urban areas, settlements, game farms, guest farms / lodges, hiking corridors, conservation areas, naturally scenic area | Some views of the project from surrounding towns, urban areas, settlements, main roads and game farms / lodges, conservation areas, naturally scenic areas | Limited views to the project from towns, urban areas, settlements, main roads and game farms / lodges, conservation areas, naturally scenic areas

- **Cumulative Impacts**

Visual impacts have been assessed in terms of the impact the road upgrade will have on the visual environment. Visual assessment is a component of the human aesthetics and is considered part of a suite of social impacts such as noise and sense of place which together may result in a higher cumulative impact than if they were each in isolation. This study assesses only the visual impacts.

Upgrading of the road will result in a wider road width which will be more readily visible than is currently the case. It is assumed that with the upgraded road will come an increase in vehicle traffic which will have an impact on the *Genius Loci* (Sense of Place) of the pass.

4.4.2 *The Visual Impact*

The visual impact of the project in the landscape is a function of many factors or criteria (*Table 5*). The value ratings assigned to *Table 4* refer to the impact a development could have on the visual elements that have been assessed. The impact ratings in *Table 4* are assessed in terms of visual attributes and are represented in *Tables 5 and 6*. Some of the factors are measurable such as viewing distance, the VAC of the surrounding landscape and the scale of the surrounding environment and landform. Other factors are subjective viewpoints which are extremely difficult to consistently
categorise the opinion of the community. Studies in the USA have shown that professionals and environmental groups view modification of the natural landscape more negatively than other groups (McCool, et al., 1986).

The critical appraisal of the visual impact of the project and associated works on the landscape is presented from the viewpoint of the informed citizen and professional. To the more economically depressed communities surrounding the proposed project, it may well be that they do not, or will not, object to the visual intrusion in their immediate environment. It may be that they welcome it since they could perceive it as a symbol of prosperity and personal advancement opportunity.

- **The View Distance**

The visual impact of the project and associated structures will reduce exponentially (Figures 9a and 9b) as the viewer moves further away from the proposed structures (Hull and Bishop, 1988).

The project components will exert a high visual impact within the 1 km zone. The viewshed analyses have indicated that some components of the proposed development will be visible beyond the 10 km zone. However, due to topography, visibility for the most part is restricted to 2.5 km.

- **Phase 2a**

The Phase 2a section is generally visible for not much more beyond 2.5 km either side of the road. This is due to the screening effect of the ridges either side of the valley. The visibility extends up the valley where views are possible from the edge of the escarpment near the summit and some views down the valley into the current Phase 1 area.

The critical zone is within 500 m of the road.

- **Phase 2b**

The Phase 2b section is far more visible than the Phase 2a section due to its higher elevation which allows for direct line of sight for distances beyond 20 km to the south-east. The viewing distance either side of the road is limited by the valley ridges and do not extend much beyond 2.5 km. It is the switchback section that is visible for extended distances.
### Table 6: The Visual Quality Ecosystem-based Values

<table>
<thead>
<tr>
<th>Project Aspect</th>
<th>Ecosystem Based Value (Visual Quality)</th>
<th>Motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 2a</td>
<td>Medium</td>
<td>The sense of place of this section is the narrow road flanked on the north-east by a mountain stream and flanked either side by rising hills with panoramic views of the Drakensberg escarpment enclosing the upper reaches of the valley. The vertical scale of the landscape is well defined by the rising landforms either side of the valley and the dominant escarpment at the head of the valley. The horizontal scale is defined by the long linear valley carved up the side of the mountain. The high diversity and high visual of this section is attractive and aesthetically pleasing. This attractiveness and high scenic quality of the area is what draws tourism to the area.</td>
</tr>
<tr>
<td>Phase 2b</td>
<td>Medium</td>
<td>The Phase 2b section of the road begins to rise up from the valley bottom and along the higher slopes moving through a rapidly changing landscape in terms of vegetation, geology, landform and scenic vistas. The sense of place is a function of the massive escarpment and vistas down the valley into the southern foothills. This is defined by the visual diversity of the steep slopes, incised valleys, craggy peaks and scarp faces, the pattern of light and shadows across the face of the mountain range and the continuous change in vegetation patterns. The vertical scale of the landscape is defined predominantly by the massive scarp face created by the basalt cover</td>
</tr>
</tbody>
</table>
Critical Viewpoints

Critical views were determined during the field trips and from the 1:50 000 topographical maps and are discussed in Section 4.2, Visibility (see also Section 4.4.2 The View Distance).

Critical viewpoints are those areas from where most viewers would be exposed to the impact such as from the P318 Road, farmsteads and facilities or areas that rely on the aesthetic environment such as guest lodges, guest farms, game farms and the Ukhahlamba Drakensberg Park.

Areas with high scenic value were regarded as critical view zones against which the visual impact would be assessed. The scenic areas consist of the entire Phase 2a and 2b sections.

Extent

The visual impact for construction and operation of all project components will occur on a regional scale due to the extent of the length of the road (19 km) even though the impact adjacent to the road is localised in extent. However, the visual impact for the operational phase will extend as far as can be seen, which can be up to 5 – 7.5 km. Due to the diminishing visibility, as a result of distance, the project components will exert an impact on a regional rather than local scale (Figures 9a and 9b) when viewed at distances.

The viewshed analyses suggest that, theoretically, the project components can at times be seen for over 10 km. Due to the exponential decrease in visibility, the visibility of these components should be insignificant beyond 5 - 7.5 km.

Duration

The duration of the impact during construction will be short term due to the relatively short construction period and the rehabilitation of the disturbed areas.
The duration of the impact during the operational phase will be permanent, in other words greater than 10 years and greater than the anticipated lifespan of the road with the impact terminating only after a possible decommissioning of the road and rehabilitation of the affected area. However, the change to the landscape can never be reversed even after decommissioning and rehabilitation.

- **Intensity or Severity**

  The intensity of the impacts has been determined in terms of the social value of the visual quality.

  It is important to note that intensity is a function of distance.

  The intensity for both Phase 2a and 2b during construction will be high within the 1 – 500 m zone. This is due to the fact that a great deal of the aesthetic appeal of the road is the point of high interest at the road edges such as waterfalls, stream crossings and flora. During construction in a very confined space these points will either not be accessible or lose their aesthetic appeal among the construction activity. The intensity diminishes as one moves away from the activity zone to where the road begins to blend in visually with the landscape over distance.

  During operation of the road the intensity is reduced to a moderate level as many of the natural features along the road edge will become accessible, but not to the degree that they were prior to the upgrade as a result of increased travel speeds and a re-defined road alignment. Furthermore, the implementation of recommended mitigation measures will reduce the high intensity during operation.

- **Frequency of Occurrence**

  The frequency of occurrence is regarded as time linked as the visual quality of the area is only visible during the day.

- **Probability of Occurrence**

  The construction and operational impact described is probable and can be regarded as highly probable. It must be recognised, however, that much of this assessment is subjective and that it is not possible to empirically state that the impact will or will not occur.
• **Significance**

The significance of the visual impact is considered high during construction and medium to high during operation after the implementation of mitigation measures. This is due to the high disruption to the visual and aesthetic amenities along the road during construction and the change to the landscape in terms of road widening, cuts and fills, rock face stabilization etc. that will intensify the visual contrast of the road with the landscape. Furthermore, the impacts are on a regional scale and of a long term duration.

• **Nature of the Impact**

The impact status is considered negative for the construction and operational phases.

• **Degree of Confidence in Predictions**

The confidence is considered to be medium as the level of judgement is based generally on common sense, general knowledge, the author’s field experience and the inherently subjective nature of this type of assessment.

• **Legislation**

There are no specific legal requirements. General legislation pertaining to the environment is contained in the National Environmental Management Act of 1998.
Table 7.1: Assessment of potential visual impacts associated with the proposed upgrade of Phase 2a

<table>
<thead>
<tr>
<th>ISSUE / IMPACT</th>
<th>PHASE</th>
<th>EXTENT</th>
<th>DURATION</th>
<th>INTENSITY</th>
<th>FREQUENCY OF OCCURRENCE</th>
<th>PROBABILITY OF OCCURRENCE</th>
<th>SIGNIFICANCE</th>
<th>STATUS</th>
<th>CONFIDENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>WITHOUT MITIGATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aesthetics</td>
<td>Construction</td>
<td>Regional</td>
<td>Short term</td>
<td>High</td>
<td>Time linked</td>
<td>Highly probable</td>
<td>Very high</td>
<td>Negative</td>
<td>Medium</td>
</tr>
<tr>
<td>Operation</td>
<td>Regional</td>
<td>Permanent</td>
<td>High</td>
<td>Time linked</td>
<td>Highly probable</td>
<td>High</td>
<td>Negative</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>WITH MITIGATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aesthetics</td>
<td>Construction</td>
<td>Regional</td>
<td>Short term</td>
<td>High</td>
<td>Time linked</td>
<td>Highly probable</td>
<td>Very high</td>
<td>Negative</td>
<td>Medium</td>
</tr>
<tr>
<td>Operation</td>
<td>Regional</td>
<td>Permanent</td>
<td>Medium</td>
<td>Time linked</td>
<td>Highly probable</td>
<td>Medium - High</td>
<td>Negative</td>
<td>Medium</td>
<td></td>
</tr>
</tbody>
</table>

Discussion:
The visual impact extends from 1 m – 2.5 km away. Beyond this distance the road is out of sight due to the parallel flanking ridges. Where visibility is continuous such as above the border post within the valley and below the Good Hope Trading Store the visibility becomes insignificant beyond 5 – 7.5 km. The moderate to high VAC of the landscape is moderate to high and allows the landscape to partially absorb the visual intrusion of the road.

Although the intensity of the development is high within 1 km, the significance after mitigation is considered medium to high (rating of 3.5 on a scale of 1 - 5) due to the significant change to the sense of place and aesthetic experience even after mitigation measures over a lengthy distance.

The existing RSA border post buildings are intrusive and visually incompatible with the high scenic quality of the valley.

Mitigation measures:
Mitigation is discussed under Section 5. The main focus is on blending the colour, form and textures with the existing conditions to avoid there being a visual contrast. Relocate the border post to where recommended at the Good Hope Trading Store site.
Table 7.2: Assessment of potential visual impacts associated with the proposed upgrade of Phase 2b

<table>
<thead>
<tr>
<th>ISSUE / IMPACT</th>
<th>PHASE</th>
<th>EXTENT</th>
<th>DURATION</th>
<th>INTENSITY</th>
<th>FREQUENCY OF OCCURRENCE</th>
<th>PROBABILITY OF OCCURRENCE</th>
<th>SIGNIFICANCE</th>
<th>STATUS</th>
<th>CONFIDENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetics</td>
<td>Construction</td>
<td>Regional</td>
<td>Short term</td>
<td>High</td>
<td>Time linked</td>
<td>Highly probable</td>
<td>Very high</td>
<td>Negative</td>
<td>Medium</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>Operation</td>
<td>Regional</td>
<td>Permanent</td>
<td>High</td>
<td>Time linked</td>
<td>Highly probable</td>
<td>high</td>
<td>Negative</td>
<td>Medium</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>Construction</td>
<td>Regional</td>
<td>Short term</td>
<td>High</td>
<td>Time linked</td>
<td>Highly probable</td>
<td>Very high</td>
<td>Negative</td>
<td>Medium</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>Operation</td>
<td>Regional</td>
<td>Permanent</td>
<td>Medium</td>
<td>Time linked</td>
<td>Highly probable</td>
<td>Medium - High</td>
<td>Negative</td>
<td>Medium</td>
</tr>
</tbody>
</table>

Discussion:
The visual impact extends from 1 m → 20 km away. Beyond this distance the road is out of sight due to the parallel flanking ridges. Where visibility is continuous such as from the summit area and below the border post within the valley the visibility becomes insignificant beyond 5 – 7.5 km. The moderate to high VAC of the landscape allows the landscape to partially absorb the visual intrusion of the road.

Although the intensity of the development is medium within 1 km, the significance after mitigation is considered high (rating of 3.5 on a scale of 1 - 5) due to the significant change to the sense of place and aesthetic experience even after mitigation measures over a lengthy distance.

The visual distance either side of Phase 2b is limited to 2.5 km. However, as the road rises out of the valley bottom, the visibility increases and extends theoretically to distances beyond 15 km to the south-east. At distances beyond 5 - 7.5 km the impact becomes insignificant. The VAC of the landscape is moderate and allows, from a distance, the landscape to partially absorb visually the road.

Mitigation measures:
Mitigation is discussed under Section 5. The main focus is on blending the colour, form and textures with the existing conditions to avoid there being a visual contrast.
Table 7.3: Site Evaluation: Phase 2a

<table>
<thead>
<tr>
<th>CHARACTERISTICS</th>
<th>VISUAL CRITERIA RATING (Table 5)</th>
<th>VISUAL IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Visibility</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>2. Genius Loci</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>3. Visual Quality</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>4. Social Structures</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>5. Surrounding landscape compatibility</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>6. Character</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>7. Scale</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>8. VAC</td>
<td>Moderate-High</td>
<td>Medium</td>
</tr>
<tr>
<td>9. View Distance</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>10. Critical Views</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

Table 7.4: Site Evaluation: Phase 2b

<table>
<thead>
<tr>
<th>CHARACTERISTICS</th>
<th>VISUAL CRITERIA RATING (Table 5)</th>
<th>VISUAL IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Visibility</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>2. Genius Loci</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>3. Visual Quality</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>4. Social Structures</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>5. Surrounding landscape compatibility</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>6. Character</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>7. Scale</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>8. VAC</td>
<td>Moderate</td>
<td>Medium</td>
</tr>
<tr>
<td>9. View Distance</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>10. Critical Views</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>
5 RECOMMENDED GENERAL MITIGATION / MANAGEMENT MEASURES

5.1 Road and Structures

Table 8: General Mitigation and Management Measures

<table>
<thead>
<tr>
<th>KM REF</th>
<th>ENVIRONMENTAL ASPECT</th>
<th>POTENTIAL IMPACT</th>
<th>MITIGATION MEASURES</th>
<th>RESPONSIBLE PARTY</th>
<th>PENALTY</th>
<th>METHOD STATEMENT REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction area</td>
<td>Highly significant visual impact</td>
<td>• Little can be done about reducing the effect since the works can neither be screened nor moved.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
|        | Surrounding landscape | Visually prominent project components | • Appoint Landscape Architect during the design phase to integrate the project components with the surrounding landscape to ensure that the project blends in physically and aesthetically with environment.  
• All existing large trees that fall outside the construction area must be retained. These will assist in softening the forms of the structures and obscure views to them.  
• All bridges, stream crossings, culverts and road side protection barriers should be constructed of materials that reflect the texture and colours of the surrounding landscape. It is recommended that they are built or at least cladded with stone and then stained with manganese and iron oxide products. | Landscape Architect / Engineer | R15 000 | ✓ |
|        | Surrounding Landscape | Visually obtrusive roads / access roads and road reserves | • For access / service roads and servitudes, avoid straight edges and corridors. These lines should complement the landscape through which they pass.  
• Road surface materials should not contrast in colour with the surrounding landscape. The existing road and landscape colours and hues are a suite of brown shades which would contrast with black and grey. Consideration should be made to pigment bitumen (if it is to be used) to a red / brown colour. Exposed concrete that has been coloured would be a preferred surface material. | Road Engineer | ✓ | ✓ |
<table>
<thead>
<tr>
<th>KM REF</th>
<th>ENVIRONMENTAL ASPECT</th>
<th>POTENTIAL IMPACT</th>
<th>MITIGATION MEASURES</th>
<th>RESPONSIBLE PARTY</th>
<th>PENALTY</th>
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<td>is recommended that the concrete be coloured after installation to allow for an uneven brown / tan colour to be applied. Adding a tint to the concrete mix would result in a too uniform colour.</td>
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<td>• Special attention should be focused on the width of servitude actually required for the construction and operational phases. There is a tendency to make these servitudes wider than necessary and access roads built to a higher engineering specification than required resulting in excessive visual scarring that can be difficult to rehabilitate.</td>
<td></td>
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<td></td>
<td>Surrounding landscape</td>
<td>Visually obtrusive concrete, supports retaining walls and rock cuttings</td>
<td>• All exposed rock cuttings and concrete support panels need to be coloured and ‘aged’ to match the surrounding landscape colours. This can be achieved by applying staining compounds that contain manganese and iron oxides and then applying organic matter, such as yoghurt and kraal manure, high in yeast and protein to develop mosses and algae on the exposed faces. • Plant pockets need to be designed into the concrete retaining walls to allow for natural vegetation to become established. It is recommended that a low planter be built in front and at the base of any vertical retaining wall to soften the edges.</td>
<td>Civil Engineer</td>
<td>✓</td>
<td>✓</td>
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<td></td>
<td>Surrounding landscape</td>
<td>Visually obtrusive grading</td>
<td>• Sculpturing or shaping the cut and fill slopes to angles and forms that are reflected in the adjacent landscape can reduce the visual impact. By blending the edges with the existing landforms, the visual impression made is that the project component has followed the natural shape of the landscape, rather than having been ‘engineered’ through the landscape.</td>
<td>Civil Engineer</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Surrounding landscape</td>
<td>Visually obtrusive vegetation stripping</td>
<td>• Vegetation stripping should be undertaken in a manner where the edges are organic (non-geometric) or curvilinear rather than straight or sharp-edged. When disturbances in the landscape are viewed from a distance, those with</td>
<td>Contractor</td>
<td>✓</td>
<td>✓</td>
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<td>irregular lines, rather than straight lines, appear to blend in with the natural configuration and lines in the landscape.</td>
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|        |                      | Construction area and road reserve Degradation and soil erosion | • A detailed landscape and rehabilitation plan should be developed by the landscape architect together with the flora specialist and the Ezemvelo KZN Wildlife. The general roadside landscaping shall reflect the existing surrounding landscape.  
• Effective rehabilitation of the construction area and road reserves. These specifications must be explicit and detailed and included in the contract documentation (Environmental Management Plan) so that the tasks can be costed and monitored for compliance and result.  
• It is essential that all cut and fill slopes, as well as all areas disturbed or affected by construction activity, are suitably topsoiled and vegetated as soon as is possible after final shaping. The progressive rehabilitation measures will allow the maximum growth period before the completion of the project.  
• All areas beyond the works area must also be rehabilitated. This includes areas such as temporary access roads, construction campsites, workers campsites, borrow pits, lay down areas, etc.  
• The rehabilitation and stabilisation of vegetation of all, buffer strips and new landforms must be completed as soon as the landforms are complete.  
• The vegetation programme should be monitored and managed to ensure that problems (e.g. erosion, die back and lack of grass cover) are identified early so that corrective measures can be taken. | Landscape Architect / Ezemvelo KZN Wildlife  
Civil Engineer / Landscape Architect  
Civil Engineer  
Civil Engineer / Landscape Architect  
Contractor  
Landscape Architect / Environmental Control Officer | ✓ | ✓ | ✓ |
<p>|        |                      | Road user Scenic views not utilised | • Attention must be given to provide the road user and tourist the opportunity to optimise the visual attributes of the scenic landscape. This can be achieved by opening up vistas where cuttings may have blocked the views and by providing stop over | Landscape Architect / Design Engineer | ✓ | ✓ |</p>
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<td></td>
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<td>- Points for travellers to appreciate and experience the views or landscape features.</td>
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<td>- All aesthetic amenities such as existing stream crossings, waterfalls, flora features, look out points, hikers' drop off points, etc. currently available to the pass users must remain visible and accessible.</td>
<td>Landscape Architect / Design Engineer</td>
<td></td>
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<td></td>
<td>Topsoil</td>
<td>Loss of natural topsoil</td>
<td>- The special conditions of contract must include the stripping and stockpiling of topsoil from the construction areas for later re-use. Topsoil is considered to be at least the top 300 mm of the natural soil surface and includes grass, roots and organic matter. The areas to be cleared of topsoil should all be areas that will be covered by roads and construction camps. The presence of degraded and disused areas left over after development that are not rehabilitated, could present a high perceptual visual impact. These areas should be topsoiled and re-vegetated.</td>
<td>Contractor</td>
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<td>Construction areas</td>
<td>Visual impact from dust</td>
<td>- All areas that will be affected by construction activities and where dust will be generated will require dust suppression by regular wetting, possibly by means of a water bowser or by means of a soil binding compound. The importance of suppressing the visual aspects of dust cannot be overstressed since the visibility will generate the impression of a polluting industry.</td>
<td>Contractor</td>
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<td>✔</td>
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<td>Overall visual impact</td>
<td>Visual mitigation measures not complied with</td>
<td>- During construction the detailed requirements that would have been set during the design phase and incorporated in the contract documentation, must be monitored for compliance.</td>
<td>Independent Environmental Control Officer / Landscape Architect</td>
<td></td>
<td>✔</td>
</tr>
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</table>
5.2 Monitoring and Review Programme

The rehabilitation and stabilisation by vegetation of all new landforms (e.g. platform side slopes, road fill, cut slopes) should be completed as soon as the landforms are complete. The monitoring and management of the vegetation programme is important to ensure that problems (e.g. erosion, dieback and lack of grass cover) are identified early so that corrective measures can be taken.

During construction the detailed requirements that would have been set during the design phase and incorporated in the contract documentation, must be monitored for compliance.

6 DISCUSSION AND CONCLUSIONS

This specialist study was undertaken for only the main components of the project such as the road itself, the associated bridge structures and the cut and fill slopes. The study excluded ancillary components such as borrow pits, laydown areas, quarries, construction camps and temporary access roads.

It is clear that the Sani Pass road travels through a landscape with an inherently very high visual quality. Although the existing road has a negative impact on the visual quality of the valley the visual quality of the valley is still regarded as high. This is largely due to the colour and texture of the road surface material and retaining walls matching closely the colour and textures of the surrounding geological landscape especially during autumn and winter. During spring and summer the landscape changes more from the brown and tan hues to greener tones which contrast with the colour of the road making it much more visible in the landscape. However, the organic alignment of the road as it follows the natural lay, flow and contour of the landscape is not jarring on the eye. Certain areas when viewed close up such as where erosion and slumping has occurred and where cut slopes remain unrehabilitated, impart a higher negative visual impact. The only intrusive element within the study area is the current RSA Border Post which is to be relocated.

Intimate points of interest such as stream crossings, waterfalls, geological features and colourful flowering plants during parts of the year are experienced more fully due to the slow laboured speed that the existing road allows road users to travel.

It is these experiences along the road and the moderate to low-intrusive visual impact of the existing road that promotes the travel experience.
It is therefore imperative that any new structure introduced in this environment must match in colour, form and texture that of the existing road while at the same time still allowing the traveller to experience the more intimate point of interest.

Views from the road are extensive and continuously changing and opportunities for viewpoints should need to be considered.

6.1 Evaluation of the Project

Tables 2, 3 and 4 Determining Impact Significance and Visual Assessment Intensity and Significance Criteria Ratings, rate each criterion from high, through medium to low according to the specific characteristics of that criteria. Tables 7.3 and 7.4 Site Evaluation, list for each criterion the visual criteria rating and the visual impact of the component on these criteria. Tables 7.1 and 7.2 Impacts on the Visual Environment, summarise the impacts for the construction, operation and decommissioning phases.

The upgrade of the Sani Pass Road from the Good Hope Trading Store site to the summit will exert a negative influence on the visual and aesthetic environment. This is largely due to:

- the alterations to the current aesthetic experience;
- the higher travel speeds allowed which detracts from the current slow, laboured travel speed which allows for a close appreciation of interesting detail alongside the road;
- the potential increase in vehicular traffic that will alter the current situation in terms of noise and activity;
- the need to cut into the existing landform to accommodate the vertical alignment and the width of the new servitude;
- The increased scale of the road in this rural / natural setting.

The significance of the impact for both Phase 2a and 2b is regarded as medium to high (a rating 3.5 on a scale of 1-5) after the implementation of mitigation measures. The high significance is due to the high disruption to the visual and aesthetic amenities along the road during construction and the change to the landscape in terms of road widening, cuts and fills, rock face stabilization etc. that will intensify the visual contrast of the road with the landscape. Furthermore, the impacts are on a regional scale and of a long term duration.
6.2 Conclusions

Based on the field observations and the studies reported herein, and with the implementation of the mitigation measures the following conclusions are made from a visual point of view.

The upgrade of the Sani Pass Road (Phases 2 and 2b) will exert a medium intensity and medium to high significance negative impact of the affected environment.
7 REFERENCES


PHOTOGRAPHS
Photo 1: View towards pass from base of pass

Photo 2: Good Hope Trading Store Potential Future Border Post area
Photo 3: View north-west up the valley

Photo 4: View up towards pass from lower section
Photo 5: View up towards pass from near Goedehoop (Good Hope) Trading Store section

Photo 6: View up valley from look-out point on sharp bend
Photo 7: View up valley from look-out point

Photo 8: View down valley from look-out point
Photo 9: Existing RSA Border Post looking north-west

Photo 10: Existing Border Post looking south-east
Photo 11: Road between large boulders

Photo 12: An important scenic stream crossing
Photo 13: Waterfall feature at road drift crossing

Photo 14: Taller vegetation edging the road lower down the pass
Photo 15: A scenic stream crossing that will require protection and access

Photo 16: View down valley at stream crossing near RSA Border Post
Photo 17: Dry stream crossing difficult to cross in wet weather

Photo 18: View south east from midway. Note change in colour and texture of vegetation from the upper alpine areas
Photo 19: Typical scenery experiences along the route

Photo 20: Extensive view down valley
Photo 21: Stream crossings are always a point of interest

Photo 22: Low retaining walls to hold back loose talus slope rock
Photo 23: Soft erodible cut slopes

Photo 24: One of the many stream crossings
Photo 25: Stream crossing below start of switchbacks

Photo 26: Seep areas with low retaining walls
Photo 27: A point of interest at one of the switchbacks – alpine vegetation, iced waterfall, geology, frozen road surface etc. that will require protection and access

Photo 28: Ice waterfall
Photo 29: Narrow road width and loose surface material

Photo 30: Hairpin bends near summit through soft material
Photo 31: Sharp steep curves of top section of pass

Photo 32: View south east from top of pass
Photo 33: Sani Pass summit

Photo 34: Sani Top Chalets at the top of the pass
Photo 35: View down pass from Sani Top Chalets - note how the road and the landscape blend in with each other visually

Photo 36: Local rural village at the top of the pass
Photo 37: Rural village near Lesotho Border