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ROSSING URANIUM MINE
PROPOSED EXPANSION PROJECTS PHASE 1

LANDSCAPE CHARACTERISATION
AND VISUAL IMPACT ASSESSMENT

DECEMBER 2007

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1 INTRODUCTION

Visual impact is described in the Guideline for involving visual and aesthetic specialists in EIA processes as "the effect of an aspect of the development on a specified component of the visual, aesthetic or scenic environment within a defined time and space." [1] As identified in this definition, "landscapes are considerably more than just the visual perception of a combination of landform, vegetation cover and buildings as they embody the history, landuse, human culture, wildlife and seasonal changes to an area." [2] These elements combine to produce distinctive local character that will affect the way in which the landscape is valued and perceived.

Within the mining context, the size and scale of landscape modifications often lead to conflict as a result of the different social perceptions of change to a landscape heritage. This interrelationship is commented on in a U.S. Department of the Interior Geological Survey circular:[3] "The public needs to understand the economic value of the aggregate industry and the industry needs to recognise the ecological, cultural and aesthetic value of an area....The scientist's perception of the landscape should not exclude the public viewpoint.... Landscape itself needs to be viewed as one natural and human process: it is not the case of one ruling over the other." *(U.S. Geological Survey circular; 1191, Page 26)*

The above point is not in conflict with the Rössing mine management policies as indicated by the following extracts from the Rössing Sustainable Development Policy *(www.rossing.com)*:

- "Development can be sustainable if it is socially acceptable, environmentally responsible, economically viable, and satisfies the needs of the present generation without hindering future generations in the satisfaction of their needs." This does require a paradigm shift with regard to sustainable mining activities.
- "Rössing requires a shift in thinking from a purely economically driven planning and decision-making process, to one that in addition considers social, economic and environmental aspects that Rössing influences externally or indirectly."

Further motivation for this required shift in thinking is expressed in the following extract with regard to landuse decisions based only scientific factors. "No matter how scientifically sound a mining operation may be, it is the visual impact that can generate immediate and vocal opposition. ...It is in the visual perspective and understanding of landscape that individual heritage and life experience impacts us....If the community perceives the site as messy and complains the project has failed in the sense that viewers are responding with a preferential judgment..." *(U.S. Geological Survey circular; 1191, Page 12)*

In this regard, the following factors highlight the ideal procedural strategy with regard to visual impacts, and comprise a point of departure for the Rössing Expansion Projects (REP) VIA:

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

[2] Guidelines for Landscape and Visual Impact Assessment. 2002. U.K Institute of Environmental Management and Assessment (IEMA). Spon Press. Pg 9

[3] The Human Factor in Mining Reclamation. Belinda F. Arbogast, Daniel H. Knepper, Jr., and William H. Langer. U.S. Geological Survey circular ; 1191. U.S. Department of the Interior.

- "The ideal strategy for each identifiable negative effect is one of avoidance. If this is not possible, alternative strategies of reduction, remediation and compensation may be explored. [4]
- In order to retain the visual quality and landscape character, management actions must become an essential part of the guidelines throughout construction, and operation.... *Guideline for involving visual and aesthetic specialists in EIA processes. Ch 10*
- Proper management actions ensure that the lowest possible impact is created by the project. Management not only depends on mitigation and efforts to 'fix' what has been broken but a continual effort to educate, and to regulate land use and future modification... Lack of management actions will result in greater and more consequential visual impact and often results in increased mitigation costs, because early opportunities for avoidance of negative visual effects are missed." [5]
- On-going monitoring programmes with regard to the control of aesthetic aspects for all stages of the mine are a vital component ensuring that the long term visual management objectives defined by Rössing management will be met and that reputational loss at RUL will not occur.

The specific objectives of this study are to inform and educate decision makers in the Namibian Government and at Rössing Uranium Limited (RUL) with regard to the visual implications of mining operations to the surrounding sense of place. To ensure that this objective is met, the visual ***advantages*** and ***disadvantages*** of the existing and proposed landscape modifications associated with the Rössing mine will be defined in order that:

- Specific management actions can be formulated and implemented to achieve the objectives set out in the Rössing Closure Plan with regard to reducing the long term Visual Impacts from the mining activities.
- Decision makers are more informed with regard to the visual implications of future landscape modifications proposed by RUL to the aesthetic value of the *surrounding areas*.
- Decision makers are more informed with regard to an understanding of the accumulative visual implications of mining activities taking place at a *regional level* in an area which has a significant landscape character and a significant tourist related economy.

[4] Guidelines for Landscape and Visual Impact Assessment. 2002. U.K Institute of Environmental Management and Assessment (IEMA). Spon Press. Pg 44

[5] Oberholzer, B. 2005. Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town. *Ch 10*

2 TERMS OF REFERENCE

VRM Africa CC was commissioned by Ninham Shand to undertake a Landscape Characterisation (Visual Inventory) and the Impacts Assessment (Contrast Rating) for Rössing Uranium Limited (RUL). The purpose of the Visual Inventory is to 'bench mark' the existing landscape character of a large scale mining operation that began construction in 1973. The Contrast Rating study assesses the visual impacts of the proposed Rössing Expansion Projects which include the Acid Plant, the Radiometric Ore Sorter and the SK4 Pit. These proposed landscape modifications will be assessed in the context of the existing landscape character as defined in the Visual Inventory.

VRM Africa uses the ***VRM methodology*** developed by the ***Bureau of Land Management (BLM) from the United States Department of Internal Affairs*** [6] to measure contrast in order to analyse potential visual impacts associated with projects and activities. The basic philosophy underlying the system is: The degree to which a management activity affects the visual quality of a landscape depends on the visual contrast created between a project and the existing landscape.

The criteria for the assessment of the visual impacts of the proposed projects are based on the Western Cape DEA&DP Visual and Aesthetic Guideline.[7] Impacts will be defined for all the proposed landscape modifications and the defined alternatives based on the following criteria:

- **Distribution of Impacts:** Advantages and disadvantages
- **Extent**: The spatial or geographic area of influence of the visual impact
- **Duration:** The predicted life-span of the visual impact.
- **Intensity:** The magnitude of the impact on views, scenic or cultural resources.
- **Probability:** The degree of possibility of the landscape modification occurring.
- **Significance:** A synthesis of the above.

Specific management actions will be defined to avoid or reduce the levels visual impacts based on the following DEA&DP Visual and Aesthetic Guideline definitions:[8]

- **Avoidance:** "Consideration should be given to avoiding potential impacts altogether…"
- **Mitigation:** "These may include adjustments to the siting and design of the project, the careful selection of finishes and colours, the use of earthworks (such as berms) and planting to provide visual screening, as well as dust control where required.."
- **Compensation and offsets:** "Where avoidance and mitigation cannot achieve the desired effect, various forms of compensation could be considered
- **Rehabilitation and restoration:** "Both on-site and off-site landscape rehabilitation of areas affected by the project should be considered…This may include re-instating landforms and natural vegetation, provision of landscaped open space, or other agreed upon facilities."
- **Enhancement:** "Where the proposed project is located in run-down areas, or degraded landscapes, the improvement of these areas could form part of the visual management actions for the project."

[6] Bureau of Land Management, U.S. Department of Interior. 2004. Visual Resource Management Manual 8400

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

[8] ibid

3 PLANNING POLICY RESEARCH SUMMARY

In order to comply with the Visual Resource Management requirements it is necessary to clarify which planning policies govern the property area to ensure that the scale, density and nature of activities or developments are harmonious and in keeping with the sense of place and character of the area. The proposed landscape modifications must be viewed in the context of the planning policies from the following organizations:

- Namibian Environmental Management Act
- Namibia Minerals Policy
- Rio Tinto policies
- Rössing Uranium Limited (RUL) policies

3.1 NAMIBIA'S ENVIRONMENTAL MANAGEMENT ACT (EMA)

The purpose of Namibia's Environmental Management Act (EMA) is to "give effect to Article 95(l) and 91(c) of the Namibian Constitution:

- by establishing general principles for the management of the environment and natural resources;
- to promote the co-ordinated and integrated management of the environment;
- to give statutory effect to Namibia's Environmental Assessment Policy;
- to enable the Minister of Environment and Tourism to give effect to Namibia's obligations under international environmental conventions;
- to establish certain institutions in particular to provide for a Sustainable Development Commission and Environmental Commissioner".

3.2 NAMIBIA MINERALS POLICY, NAMIBIAN MINISTRY OF MINES AND ENERGY

- Government must ensure that short to medium-term projects such as mining do not jeopardize the potential for long-term sustainable development in tourism. *(Minerals Policy of Namibia, Pg 13)*
- However, mining is also important to the national economy and this policy envisages controlled and justified prospecting and mining in these areas under conditions that will satisfy the protection of the environment. *(Minerals Policy of Namibia, Pg 13)*
- In order to reconcile the objectives of mineral exploitation and environmental protection, it is essential that the negative impacts of prospecting or mining activities on the environment be avoided, minimised and mitigated in accordance with national policy and legislation, and international best practice. *(Minerals Policy of Namibia, Pg 13)*
- While mining forms a very important part of the Namibian economy, it also has contributed to major environmental degradation. With respect to current and future operations, there is a need for appropriate legislation to regulate the environment in mining. *(Minerals Policy of Namibia, Pg 26)*

3.3 RIO TINTO ENVIRONMENTAL AND SUSTAINABILITY POLICIES

- Wherever possible we prevent, or otherwise minimise, mitigate and remediate, harmful effects of the Group's operations on the environment. *(Rio Tinto Environmental Policy)*

- Excellence in environmental performance is essential to our business success. Compliance with all environmental laws and regulations is the foundation on which we build our environmental performance. *(Rio Tinto Environmental Policy)*
- Rio Tinto develops Group wide standards and builds systems to identify, assess and manage environmental risk... to achieve continuous improvement in environmental performance. *(Rio Tinto Environmental Policy)*
- Rio Tinto businesses, projects, operations and products should contribute constructively to the global transition to sustainable development.
- Rio Tinto contributes to sustainable development by helping to satisfy global and community needs and aspirations, whether economic, social or environmental. This means making sustainable development considerations an integral part of our business plans and decision making processes. *(Rio Tinto Sustainability Policy)*

3.4 ROSSING URANIUM LIMITED (RUL) POLICIES

In order to accomplish Rössing's vision and commitment to ... social responsibility and sustainability, Rössing will:

- commit to operate our business with respect and care for both the local and global environment in order to prevent and mitigate residual pollution
- be in full compliance with all applicable legislation, standards and requirements
- provide adequate training and resources to employees, contractors and visitors
- enhance biodiversity protection by assessing and considering ecological values and land-use aspects in investment, operational and closure activities *(Rössing Policy document www.rossing.com)*

In the RUL Closure Management Plan compiled in 2005 a number of aesthetic limitations were identified.

- Waste and low grade stockpiles:
  - The visual aesthetics are recognised as a constraint *(Pg 87)*
  - Dumps will be evaluated... to ensure no adverse visual impact
  - In order to reduce visual impacts, suitably coloured construction materials and rock waste could be used to cover dump site *(Pg 92)*
  - Visual Impact not aligned with RUL objectives results in reputational loss at RUL. Selective material placement for final cover to ensure visual impact is reduced to a minimum *(Pg 252)*
- Waste rock dumps:
  - The waste rock dumps within Dome and Pinnacle Gorges are not easily seen from points outside the mine property. However they are visible from the hills on the south bank of the Khan River and the Dome Gorge dump is visible from the Dome Gorge - Khan River junction. The dumps are made more visible due to the contrasting colour of the freshly broken rock with the surrounding country rock *(Pg 91)*
  - Seepage precipitates in gorges results in... unsightly environment with visual impact *(Pg 256)*
- Processing Plant:
  - Constraints: Visual aspects of fine dust plumes *(Pg 97)*
  - Rehabilitation to Natural Habitat: The whole area would be landscaped to produce a stable landform equivalent in terms of erosion and visual perspective terms to adjacent un-impacted land. *(Pg 99)*

    - Completion Criteria:
        - Ensuring that the plant area is left visually in tune with the surrounding landscape *(Pg 102)*
        - Ensuring that no residual plant structures remain visible. *(Pg 102)*
- Tailings Dam:
    - The flat nature of the tailings dam means that it visually fits into the surrounding desert landscape. *(Pg 112)*
    - The operational site will be invisible from nearby roads; however, the tailings facility will be visible to people travelling on the main road between Swakopmund and Usakos. Observed from the main road the tailings facility should not appear as a foreign feature in the desert landform
    - Dust Plumes: Visual assessments will be used to determine the completion of the removal operation. No accumulations should be visible from a distance of 20 m.
    - The final height of Rössing's tailings repository will rise to form a plateau at 645m above sea level and will extend about 100 m above the ground surface of the Pinnacle gorge area. The coloration of tailings sands ... will change when the final cover has been placed. The typical colour of crushed rock is light gray and is expected to show a stark colour contrast to the surroundings when tailings capping is completed. In order to fulfil the objective of leaving a landform that fits in with its surrounding country site, landform and colour need to be harmonized. ... Further work needs to be carried out... from observation points to assess the visual impact. *(Pg 142)*
    - Ensure that enough approximately coloured rock is stockpiled to cover the eastern side of the tailings facility to minimize visual impact *(Pg 15)*
- Remaining Disturbed area Footprint:
    - These areas should blend into the surrounding habitat
    - After further clean up and reshaping operations, a visual inspection from distances greater than 100m... should not reveal foreign objects and abrupt landforms. *(Pg 148)*

4 METHODOLOGY

4.1 VISUAL RESOURCE MANAGEMENT (VRM) METHODOLOGY

The ***VRM methodology***[9] is a systematic process ***developed by the Bureau of Land Management (BLM) from the United States Department of Internal Affairs*** to measure contrast in order to analyse potential visual impact of proposed projects and activities. The BLM has defined four Classes that represent the relative value of the visual resources of an area.

i. **Classes I and II** being the most valued
ii. **Class III** representing a moderate value
iii. **Class IV** being of least value

Evaluation of the suitability of a proposed landscape modification is undertaken by means of assessing the proposed landscape modification against a predefined Management Objective assigned to each class. The VRM Class Objectives are:

- The **Class I** objective is to preserve the existing character of the landscape where the level of change to the characteristic landscape should be very low and must not attract attention.
- The **Class II** objective is to retain the existing character of the landscape and the level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer and should repeat the basic elements of form, line, colour and texture found in the predominant natural features of the characteristic landscape.
- The **Class III** objective is to partially retain the existing character of the landscape where the level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer and changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
- The **Class IV** objective is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the landscape can be high and these management activities may dominate the view and be the major focus of the viewer attention.

The method for defining these classes consists of two stages:

- **Inventory** (Viewshed and Visual Resource Inventory)
- **Analysis** (Visual Resource Contrast Rating)

4.1.1 VISUAL INVENTORY

The **inventory stage** involves the identification of the visual resources of the area, assigning them to inventory classes. The process involves rating the visual appeal of the property, measuring public concern for scenic quality through public scoping meetings, and determining whether the tract of land is visible from travel routes or observation points. Through the inventory process Objective Classes are assigned to each defined land parcel or Physiographic Rating Units. The physiographic rating units consist of:

- Like physiographic characteristics such as landform, vegetation etc.
- Similar visual patterns, texture, colour, variety etc.

[9] Bureau of Land Management, U.S. Department of Interior. 2004. Visual Resource Management Manual 8400

- Areas which have a similar impact from cultural modifications i.e. roads, historical and other structures, mining operations or other surface disturbances.[10]

Class I is assigned to those areas where a ***management or specialist decision*** has been made to maintain a natural landscape. Class I is not rated in terms of Scenic Quality, Sensitivity and Distance questionnaires. *(See Appendix 4 for BLM Questionnaires)* The remaining Classes are defined making use of questionnaires developed by the BLM with regard to three aspects which influence aesthetic value. These are:

- Scenic quality of the landscape,
- Receptor sensitivity to the proposed landscape modification
- And distance from receptor to the proposed modification.

Each PRU is evaluated in terms of the above criteria and then the Inventory Classes are assigned by means of the matrix below.

			VISUAL SENSITIVITY LEVELS								
			HIGH			MEDIUM			LOW		
SCENIC QUALITY	19 or more	A	II	II	II	II	II	II	II	II	II
	12 - 18	B	II	III	III/IV *	III	IV	IV	IV	IV	IV
	11 or less	C	III	IV	IV	IV	IV	IV	IV	IV	IV
DISTANCE ZONES			fore/middle ground	background	seldom seen	fore/middle ground	background	seldom seen	fore/middle ground	background	seldom seen

- If adjacent areas are **Class III** or lower assign **Class III**, if higher assign **Class IV**

These Visual Inventory Classes are then modified into VRM Classes which take into consideration the sense of place and the planning which governs the use of the land (e.g. zoning restrictions). It must be noted that these Classes are not intended to be the only means of resolving these impacts but should rather be used as a guide, tempered by common sense, to ensure that every attempt is made to minimise potential visual impacts.

4.1.2 CONTRAST RATING

The **analysis stage** involves determining whether the potential visual impacts from proposed surface-disturbing activities or developments would meet the management objectives established for each area, or whether design adjustments will be required. A visual contrast rating process is used for this analysis, which involves comparing the proposed features with the major features in the existing landscape using the basic design elements of form, line, colour, and texture. Based on this analysis, mitigation measures are suggested which could be used as a **guide for resolving visual impacts**.

Steps in the Contrast Rating Process.

1. Obtain a detailed project description.

[10] Bureau of Land Management, U.S. Department of Interior. 2004. Visual Resource Management Manual 8400

2. Define the VRM Classes. This step involves adjusting the Inventory Classes in accordance with policy planning for the area.
3. Identify VRM Class Objectives.
4. Measure the Degree of Contrast that the proposed landscape modifications would create for each of the Physiographic Rating Units from each of the KOP's.

Assessing scenic values and determining visual impacts can be a subjective process. In order to ensure that objectivity and consistency are maintained, the basic design elements of **form, line, colour, and texture**, are used to describe and evaluate the proposed landscape modifications in terms of the following rating criteria:

Degree of Contrast	Criteria
None	The element contrast is not visible or perceived.
Weak	The element contrast can be seen but does not attract attention.
Moderate	The element contrast begins to attract attention and begins to dominate the characteristic landscape.
Strong	The element contrast demands attention, will not be overlooked, and is dominant in the landscape.

The suitability of the Degree of Contrast is assessed in conjunction with the VRM Classes for the defined area. Based on whether the VRM Objectives are met, mitigations if required are defined to avoid, reduce or mitigate the proposed landscape modifications so that the visual impact does not detract from the surround landscape sense of place.

4.1.2.1 ASSESSMENT OF IMPACTS

Impact as defined by the DEA&DP Visual & Aesthetic Guideline document is: "A description of the effect of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space …"[11] According to the DEA&DP Guideline for involving Visual and Aesthetic Specialists in EIA processes (2005) the impact assessment must be evaluated based on the following Criteria: [12]

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

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

Box 11: Specific criteria for visual impact assessments

Visibility of the project – the geographic area from which the project will be visible, or view catchment area. (The actual zone of visual influence of the project may be smaller because of screening by existing trees and buildings). This also relates to the number of receptors affected.

- *High visibility* – visible from a large area (e.g. several square kilometres).
- *Moderate visibility* – visible from an intermediate area (e.g. several hectares).
- *Low visibility* – visible from a small area around the project site.

Visual exposure – based on distance from the project to selected viewpoints. Exposure or visual impact tends to diminish exponentially with distance.

- *High exposure* – dominant or clearly noticeable;
- *Moderate exposure* – recognisable to the viewer;
- *Low exposure* – not particularly noticeable to the viewer;

Visual sensitivity of the area – the inherent visibility of the landscape, usually determined by a combination of topography, landform, vegetation cover and settlement pattern. This translates into visual sensitivity.

- *High visual sensitivity* – highly visible and potentially sensitive areas in the landscape.
- *Moderate visual sensitivity* – moderately visible areas in the landscape.
- *Low visual sensitivity* – minimally visible areas in the landscape.

Visual sensitivity of Receptors – The level of visual impact considered acceptable is dependent on the type of receptors.

- *High sensitivity* – e.g. residential areas, nature reserves and scenic routes or trails;
- *Moderate sensitivity* – e.g. sporting or recreational areas, or places of work;
- *Low sensitivity* – e.g. industrial, mining or degraded areas.

Visual absorption capacity (VAC) - the potential of the landscape to conceal the proposed project, i.e.

- *High VAC* – e.g. effective screening by topography and vegetation;
- *Moderate VAC* - e.g. partial screening by topography and vegetation;
- *Low VAC* - e.g. little screening by topography or vegetation.

Visual intrusion – the level of compatibility or congruence of the project with the particular qualities of the area, or its 'sense of place'. This is related to the idea of context and maintaining the integrity of the landscape or townscape.

- *High visual intrusion* – results in a noticeable change or is discordant with the surroundings;
- *Moderate visual intrusion* – partially fits into the surroundings, but clearly noticeable;
- *Low visual intrusion* – minimal change or blends in well with the surroundings.

Note 1: *These, as well as any additional criteria, may need to be customised for different project assessments.*
Note 2: *Numerical weighting of these criteria should be avoided because of their qualitative nature.*
Note 3: *Various components of the project, such as the structures, lighting or powerlines, may have to be rated separately, as one component may have fewer visual impacts than another. This could have implications when formulating alternatives and mitigations.*

As the impact assessment tables are formed from criteria listed above, the discussion in regards to each impact will centre on the broader aspects of impacts. See the table below for the criteria used for the assessment of impacts: [13]

Box 12: Criteria used for the assessment of impacts

The assessment of impacts is based on a synthesis of the following assessment criteria:

Nature of the impact - an appraisal of the visual effect the activity would have on the receiving environment. This description should include visual and scenic resources that are affected, and the manner in which they are affected, (both positive and negative effects).

Extent – the spatial or geographic area of influence of the visual impact, i.e.:
- *site-related:* extending only as far as the activity;
- *local:* limited to the immediate surroundings;
- *regional:* affecting a larger metropolitan or regional area;
- *national:* affecting large parts of the country;
- *international:* affecting areas across international boundaries.

Duration - the predicted life-span of the visual impact:
- *short term,* (e.g. duration of the construction phase);
- *medium term,* (e.g. duration for screening vegetation to mature);
- *long term,* (e.g. lifespan of the project);
- *permanent,* where time will not mitigate the visual impact.

Intensity – the magnitude of the impact on views, scenic or cultural resources.
- *low,* where visual and scenic resources are not affected;
- *medium,* where visual and scenic resources are affected to a limited extent;
- *high,* where scenic and cultural resources are significantly affected.

Probability – the degree of possibility of the visual impact occurring:
- *improbable,* where the possibility of the impact occurring is very low;
- *probable,* where there is a distinct possibility that the impact will occur;
- *highly probable,* where it is most likely that the impact will occur; or
- *definite,* where the impact will occur regardless of any prevention measures.

Significance – The significance of impacts can be determined through a synthesis of the aspects produced in terms of their nature, duration, intensity, extent and probability, and be described as:
- *low,* where it will not have an influence on the decision;
- *medium,* where it should have an influence on the decision unless it is mitigated; or
- *high,* where it would influence the decision regardless of any possible mitigation.

Note: These significance ratings may have limited usefulness unless they are described in terms of the broader context. The criteria given in Box 11 could assist in this regard.

Source: Adapted from the criteria provided by Department of Environmental Affairs and Tourism, 1998

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

4.1.2.2 MANAGEMENT ACTIONS

Proper management actions ensure that the lowest possible impact is created by the project. Management not only depends on mitigation but also a continual effort to educate, and to regulate land use and future modification.

In order to retain the visual quality and landscape character, management actions must become an essential part of the guidelines throughout construction, and operation. Although they are recommendations, lack of management actions will result in greater and more consequential visual impact.

Potential Management Actions as defined by the Western Cape DEA&DP Guideline for involving visual and aesthetic specialists in EIA processes include: [14]

- **Avoidance:** "Consideration should be given to avoiding potential impacts altogether…"

- **Mitigation:** "These may include adjustments to the siting and design of the project, the careful selection of finishes and colours, the use of earthworks (such as berms) and planting to provide visual screening, as well as dust control where required. Penalties for non-compliance should be considered."

- **Compensation and offsets:** "Where avoidance and mitigation cannot achieve the desired effect, various forms of compensation could be considered. These may include land swaps, appropriation or financial compensation."

- **Rehabilitation and restoration:** "Both on-site and off-site landscape rehabilitation of areas affected by the project should be considered…This may include re-instating landforms and natural vegetation, provision of landscaped open space, or other agreed upon facilities."

- **Enhancement:** "Where the proposed project is located in run-down areas, or degraded landscapes, the improvement of these areas could form part of the visual management actions for the project."

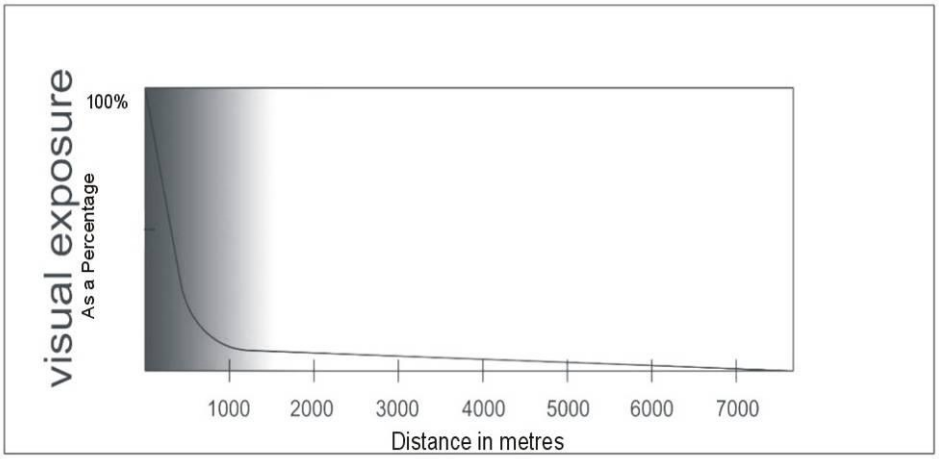
4.2 VISUAL ENVELOPE MAPPING (VEM) METHODOLOGY

According to the U.K Institute of Environmental Management and Assessment (IEMA) *Guidelines for Landscape and Visual Impact Assessment (VIA)*, DEM's are used as part of the VIA process to generate the visual envelope map (VEM) which outlines the area of land within which there is a view of any part of the proposed landscape modification. It must be recognised that VEM's are not an accurate indicator of the level of significance of the impact in the view, but are merely a statement of the fact of indivisibility. It is important to note that the level of accuracy of the output is as accurate as the data used to generate the DEM. The limitation of visibility mapping for the DEMs is that the computer generated viewshed does not take into consideration existing structures or vegetation which may screen or reduce the extent to which a modification is visible. However, in the desert environment in which the Rössing mine is located, vegetation is very limited and structures are located at lower elevations and as such the accuracy of the VEM would be higher.

Based on distance from a landscape modification to selected viewpoints, exposure or visual impact tends to diminish exponentially with distance. The inverse relationship of distance and

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

visual impact is well recognised in visual analysis literature (Hull and Bishop)[15]. This means that the impact of an object diminishes at an exponential rate as the distance between the observer and the object increases due to atmospheric conditions prevalent at the location which causes the air to appear greyer, diminishing detail. Thus, the impact at 1000 metres from the property would be 25% of the impact as viewed from 500 metres from the property. At 2000 metres it would be 10% of the impact at 500 metres. The relationship is indicated in the following graph generated by Hull and Bishop.



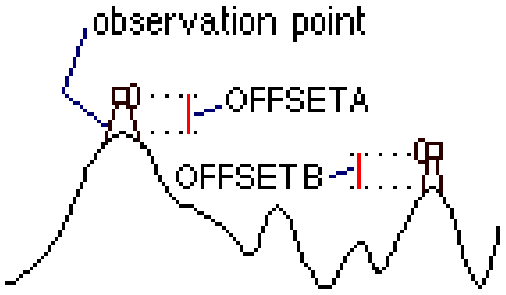
Within the Rössing Mine context the factors which influence visibility are the undulating and rugged terrain, the haze created by the desert and the mining activities, as well as the colour, texture and form of many of the modified landscapes. Some of these elements such as the dark browns of the Tailings Dam and the mountain scale type forms of the rock dumps create similarities to the surrounding desert landscape character. Taking this diminishing visibility concept into consideration, two zones of influence are introduced onto the Visual Envelope Mapping (VEM's). The more exposed areas, based on the Hull and Bishop findings which represent the areas where most landscape modifications would be visible and High levels of exposure would take place, are within the two kilometre buffer from the closest landscape modifications. The second distance rating is based on VRM literature defined by the Bureau of Land Management (U. S Dept of Interior), which subdivide the landscape into 3 distance zones based on the relative visibility from the source of impact. These are:

- Foreground (<6km), which is most specific in defining the areas sense of place,
- Background areas (6 – 15 km), where the influence is potentially noticed,
- Seldom Seen areas which as a result of isolation or rugged terrain are hardly ever seen.

In this study, only the Foreground (6km) distance was indicated as the nature of the terrain in association with the natural desert haze, limits the visual extent. The seldom seen areas have been defined as having a Class 1 status based on both the conservancy status and significant landscape character of the area.

Due to the size and scale of the Rössing area, VEMs for different landscape features were generated from point values selected from a 100m grid located within the feature area. To increase the accuracy of the VEM with regard to the height of the existing and proposed landscape modifications and Off-set Height was added for the proposed modifications. The following graphic indicates the Offset function.

[15] Hull, RB; Bishop, ID. Journal of Environmental Management. Vol 27, no. 1, pg 99-108.



- The vertical distance in surface units to be added to the z-value of the observation points (OffsetA)
- The vertical distance in surface units to add to the z-values of each cell as it is considered for visibility (OffsetB)

4.3 LANDUSE MAPPING

As part of the identification of visual elements within the Rössing area, a detailed mapping exercise was undertaken generated from the aerial photography provided by RUL. Specific landscape modifications were identified from the aerial photograph and digitised at a 1:5000 scale. In accordance with the Rössing Closure Plan, two categories were mapped:

- The major modified areas included the pit void, the rock dumps and haul routes, tailings dam and associated infrastructure as well as the processing plants and associated buildings and infrastructure. This would include the management buildings, the security buildings, the hospital and the power transformer areas.
- Other transformed areas which specifically looked at smaller modified areas surrounding and affiliated to the major modification areas. These included the National Road extent, the Airport Road, the Rössing Road, the borrow pits, and the sewerage works, E-camp, Dome quarry and other minor mining activities. These visual elements were smaller in context and scale but have visual implications which could potentially extend of the total Rössing visual envelope. Elements which were not digitised which have a potential visual impact are the power lines associated with NamPower and the fence lines.

4.4 DIGITAL ELEVATION MODEL (DEM)

In order for the VEMS to be established the existing and proposed landscape modifications, a Digital Elevation Model (DEM) was generated. A DEM is a data structure used to model surfaces such as elevation as a connected network of triangles. A Triangulated Irregular Network (TIN) is assembled from a series of data points with *X*, *Y*, and *Z* values and partitions geographic space into contiguous, non-overlapping triangles (called faces). The nodes of each triangle are the elevation or surface points.[16] The ESRI product ArcGIS with the 3D Analyst extension were utilised in the generation of the DEM. The ArcGIS 3D Analyst extension provides tools for three-dimensional (3D) visualisation, analysis, and surface generation.

The following points were extracted from the ESRI documentation regarding best practice in the generation of terrain models:[17]

- The data should be in a projected coordinate system. Unknown coordinate systems are not recommended. Geographic coordinates, such as decimal degrees, are not supported.

[16] ESRI. Getting Started with ArcGIS 3D Analyst. 2004
[17] ESRI. Getting Started with ArcGIS. 2004

- It will be more straightforward when using the terrain to have the z-values in the same unit of measure as x, y.
- The data involved should be continuous. There can be gaps in the sampling, as is typical over water bodies or obscured areas when building topographic models, but the collection should form a logical whole. Disparate collections are best represented as separate terrains. For example, building a terrain with measurements from two neighbouring counties is okay. Building a terrain with measurements from two counties on opposite sides of the state is not.
- When appending measurements to an existing terrain, they should be adjacent to measurements already in the terrain. It should grow as a unified area rather than in fragmented pieces.
- It's best to build a terrain from data gathered based on the same data collection specifications and accuracy requirements. Consistency on the data side will enable consistency, in terms of both performance and pyramid accuracy, on the terrain side.
- Use the fewest feature classes possible. This can improve build performance and, when break lines are involved, speed up runtime use of the terrain. Merge feature classes where appropriate.

4.4.1 RUL SOURCE DATA DESCRIPTION

Data provided by RUL was in an AutoCAD format and was divided into two different file types, SP and TP (See Figure 1 below).

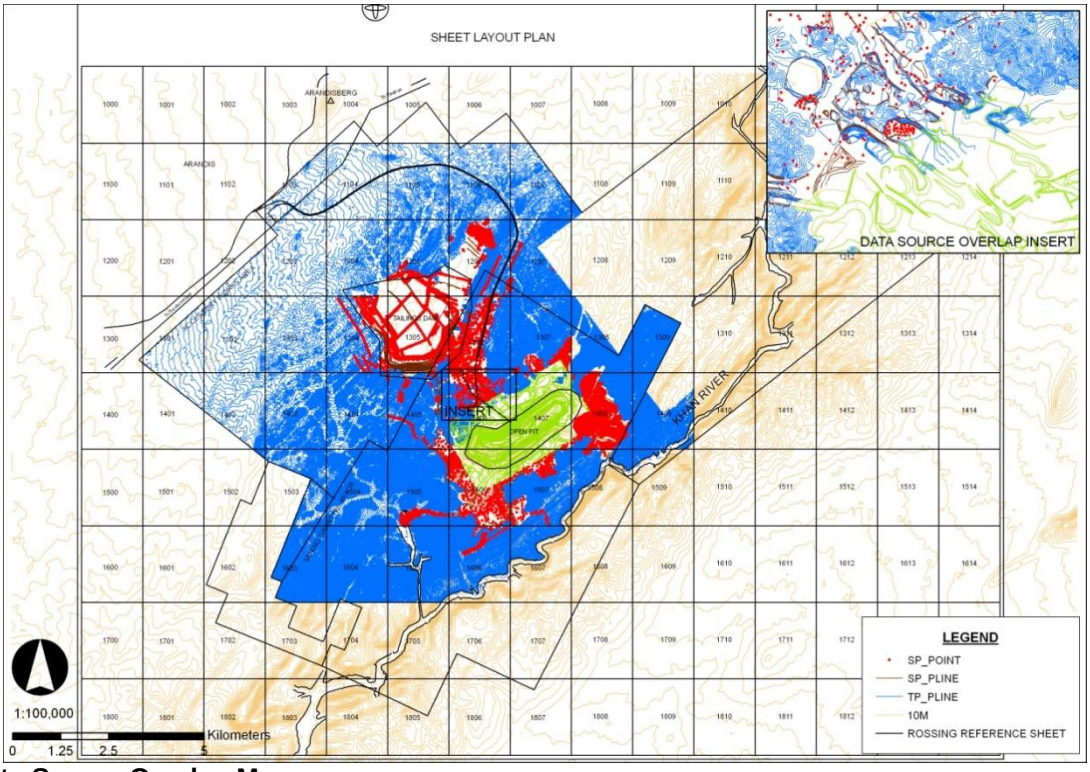


Figure 1: Data Source Overlap Map

The TP layer was generated from a historic aerial survey undertaken by Rössing (data unknown). The contours were generated at two metre intervals and as some mining landscape modifications had taken place, the data reflects these changes (See Figure 2 below).

Figure 2: TP Data reflecting modified forms over aerial photograph

The data was in AutoCAD file format and the height values were embedded in the vector elements. The SP AutoCAD data was originally based on the TP data but had been modified to reflect the landscape modifications as a result of the more recent mining activities. This data covered the rock dump and tailings dam areas as well as the area where the processing plants were located. The existing TP contour data in these areas had to be clipped out and replaced with surveyed data taken at the crest and toe of modified areas (for the rock dumps and tailings dam) and as a survey point for the processing plant. Elevation values from the SP data were available as two methods: vector lines with the height value embedded, and as text annotation corresponding to a surveyed spot height. For the SK Pit area, detailed survey AutoCAD drawings were provided with the benching and road modifications represented as vector data embedded with the corresponding height value.

4.4.1.1 RUL DATA LIMITATIONS

In the determination of the VEM of the proposed Rössing Phase One modifications, the DEM coverage needed to take into account the areas where significant receptors were located. In this regard, the Rössing data source reflected certain limitations:

- The northern areas where significant visual receptors are located (B2 National Road and Arandis town) were not available.
- The Khan River and Welwitschia flats to the south-east of the RUL area were not available.
- There was limited coverage in the south east in the vicinity of the proposed SK4.
- There was significant overlay between the different data sources (See Figure 1 above, Insert Map, Data Overlap).
- Small areas within the RUL coverage area had no data coverage (see Figure 3 below) with Areas 1, 2 in the vicinity of the Pit and Area 3 in the Tailings Dam area, being of a significant size. Areas 1 & 2 were of low prominence and not visually significant. On request RUL provided the missing data for the Tailings Dam area and this was incorporated into the SP Vector layer.

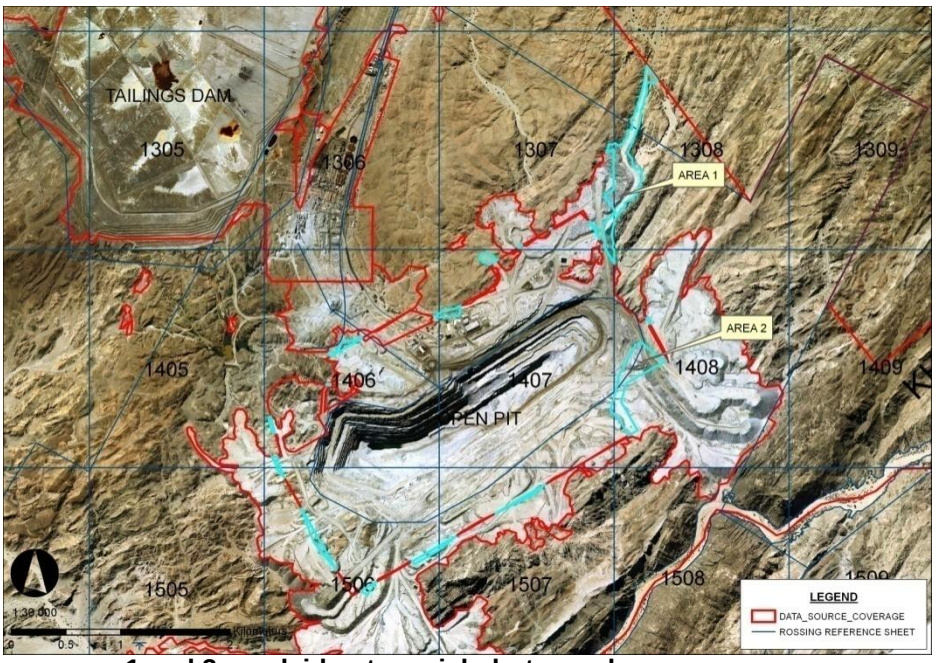


Figure 3: Non coverage areas 1 and 2 overlaid onto aerial photograph

4.4.2 OTHER DATA SOURCES

As a result of the limitations of the Rössing data coverage, other data sources were found. For the extended area, contour data was obtained from a surveying institution from Windhoek who provided the data (without cost) generated from an 80 metre DEM at a 10 metre contour interval and covered the greater extent of the RUL Mining area as well as the significant receptors areas of the National Road, Arandis and the Khan River and Welwitschia flats (See Figure 1, 10 Metre Coverage). The supplier estimated the contour accuracy as varying from 5 to 9 metres depending if the terrain was flat or hilly.

4.4.2.1 OTHER SOURCE DATA LIMITATIONS

The lack of accuracy of this data set is a limitation. To assess the accuracy of the data set the data was overlaid onto the other more accurate elevation data sources in the vicinity of the B2 Road and spot checks were undertaken. The difference in height value between the two data height values was averaged as four metres. In order to increase the significance of the visibility analysis in relation to the area covered by the 10 metre data source, site verifications would be necessary to verify the VE in relation to significant areas indentified in the viewshed analysis.

4.4.3 DATA PROCESSING

For the AutoCAD vector data sources (TP, SP and PIT0807), the contour data was extracted and converted to ESRI polyline shape files making use of the RUL Data Projection (Mercator Schwarzeck with a Central Meridian 15). These separate ESRI shape files were then merged into the respective TP, SP and Pit shape file coverage's. A further selection process was required to clean the data as some of the source data reflected zero values and in the TP data a river layer was also incorporated in the height selection that had to be excluded as the height values were incorrect (a river section was assigned a single height value which did not reflect that the river was decreasing in height as it flowed down stream). Making use of the selection function, the river data was removed making use of the 'River' attribute under the Layers column. The height data was then sorted incrementally and the erroneous elevation values (32500 etc...) were located and viewed. If, on viewing, these large values were not deemed significant (small size and not correlating with the other elevation data surrounding the element) they were deleted.

Height data for the SP coverage was also available as a point value data, as an AutoCAD annotation text value assigned to a spot height. The text values were converted to ESRI point

shape file format by converting each annotation layer into an ESRI geodatabase. This process converted the AutoCAD annotation into an ESRI point shape file which was then merged into a single GIS layer. The height data was then sorted incrementally and the erroneous elevation values were located. As there was no way of accurately verifying the authenticity of these point values (it was not a portion of a contour line), and the number of these point features was low, these elements were deleted. The ESRI union function was utilised to combine all the individual data coverage's into a single coverage. The coverage's for all data sources were mapped at a 1:5000 scale and then the ESRI union function was utilised to combine all the coverage areas into a single shape file from which a decision could be made to eliminate the potential conflicts. The following figure reflects which data sources overlapped.

UNI_ID	TP	PIT	SP	10M
1	1	0	0	0
2	0	1	0	0
3	0	0	1	0
4	0	0	1	0
5	0	0	1	0
6	0	0	1	0
7	0	0	0	1
8	0	1	1	0
9	0	1	1	0
10	0	1	1	0
11	1	1	0	0
12	1	0	1	0
13	1	0	1	0
14	1	1	1	0
15	1	1	0	0

Figure 4: Overlap between RUL Data Coverage Areas.

Making use of this layer, all the overlap areas were evaluated against the aerial photograph and a decision made based on which of the data sources was the most accurate and most recent and the coverage file updated accordingly (See Figure 4).

The different data sources were then clipped against the amended coverage file to ensure that only a single (most recent and accurate) data source reflect the elevation of a unique area (See Figure 5).

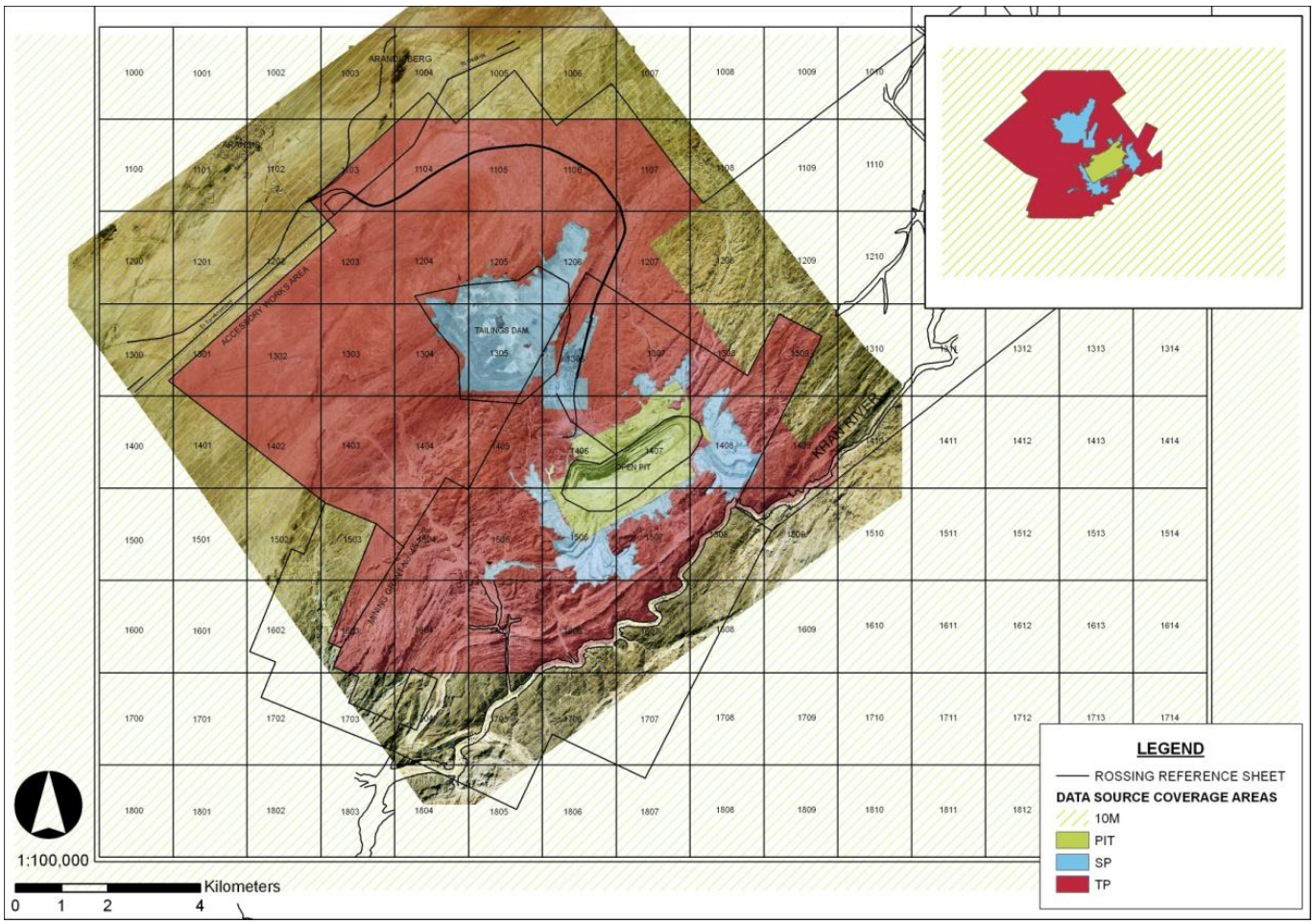


Figure 5: Data Source Coverage Areas

Subsequently five data sources were created and are reflected with comments in the following table and spatially on Figure 6 on the following page:

	DATA SOURCE	COMMENT
1	Selected RUL SP Points	For areas where no TP or SP contour data was available which covered the Processing Plant area and some portions of the Rock Dumps.
2	RUL SP Vector	For the RUL tenement area where major mining related landscape modifications had taken place. Specifically this coverage related to the Tailings Dam and Rock Dump areas.
3	RUL Pit Vectors	For the pit area and immediate surroundings
4	RUL TP Vector	For the RUL tenement area where major mining related landscape modifications had not taken place.
5	Sourced 10 metre Vector	Contour data generated from an 80 metre elevation model

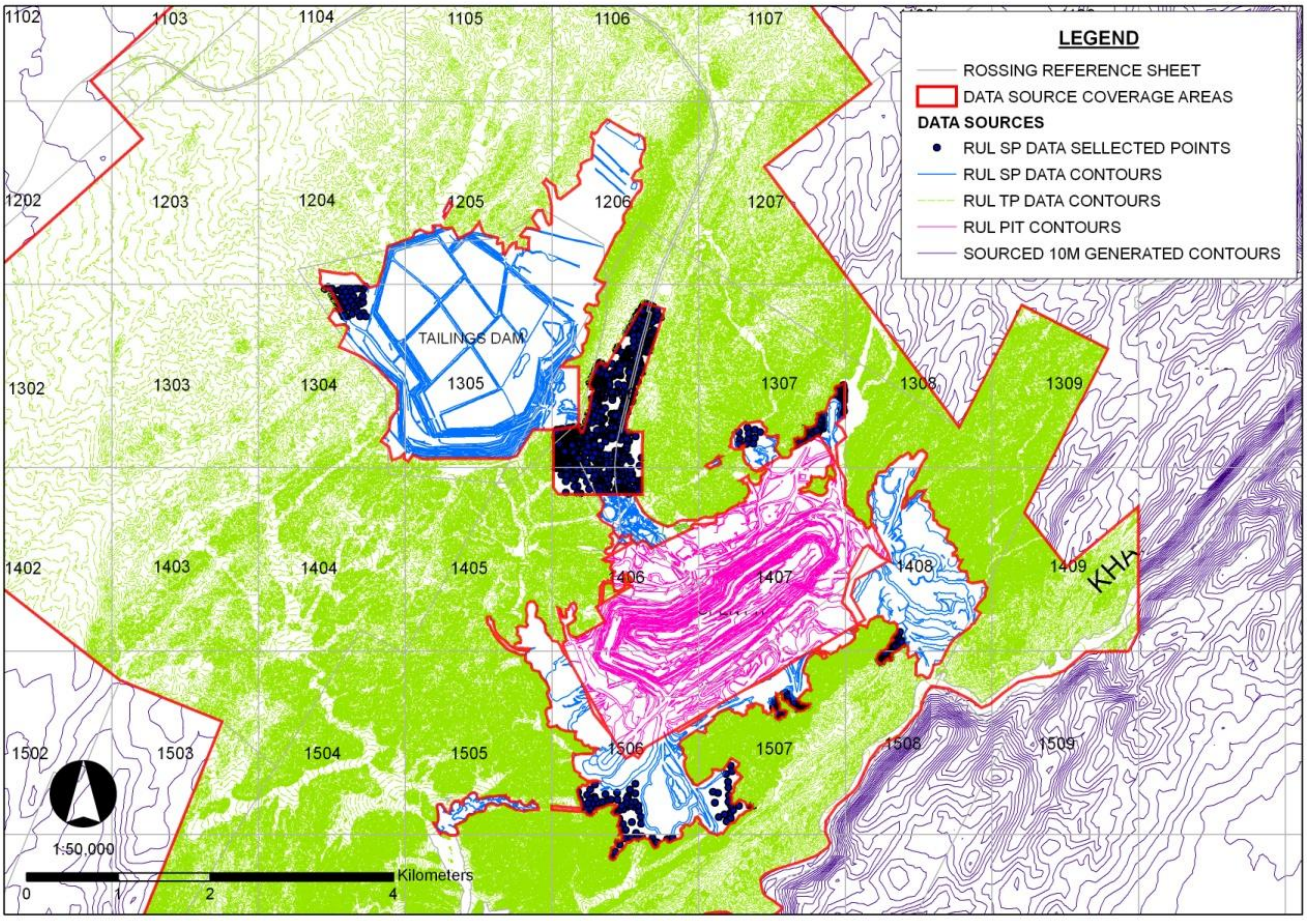


Figure 6: Data Sources Map

4.4.4 DEM METHODOLOGY

In order to evaluate the existing landscape character both in a qualitative and quantitative manner, two terrain models were generated. For the generation of VEMs, a single continuous terrain model was generated making use of all the different data sources. To depict the form and line character of specific mining landscape modifications, a separate DEM was generated making use of only SP and Pit data sources. To facilitate in this process, an amendment was made to the SP data layer. The area between the Pit and the processing plant which only reflected data from the TP data source was clipped from the TP layer and then pasted into the SP vector data source (see Figure 6 below). Due to the irregular shape of the SP data, anomalies would be reflected where the terrain stretches itself across large areas that have no measurement data. To rectify this, clipping and erase polygons were used to define the boundaries for the terrain surface to ensure that terrain only covered the area where measurements were collected.

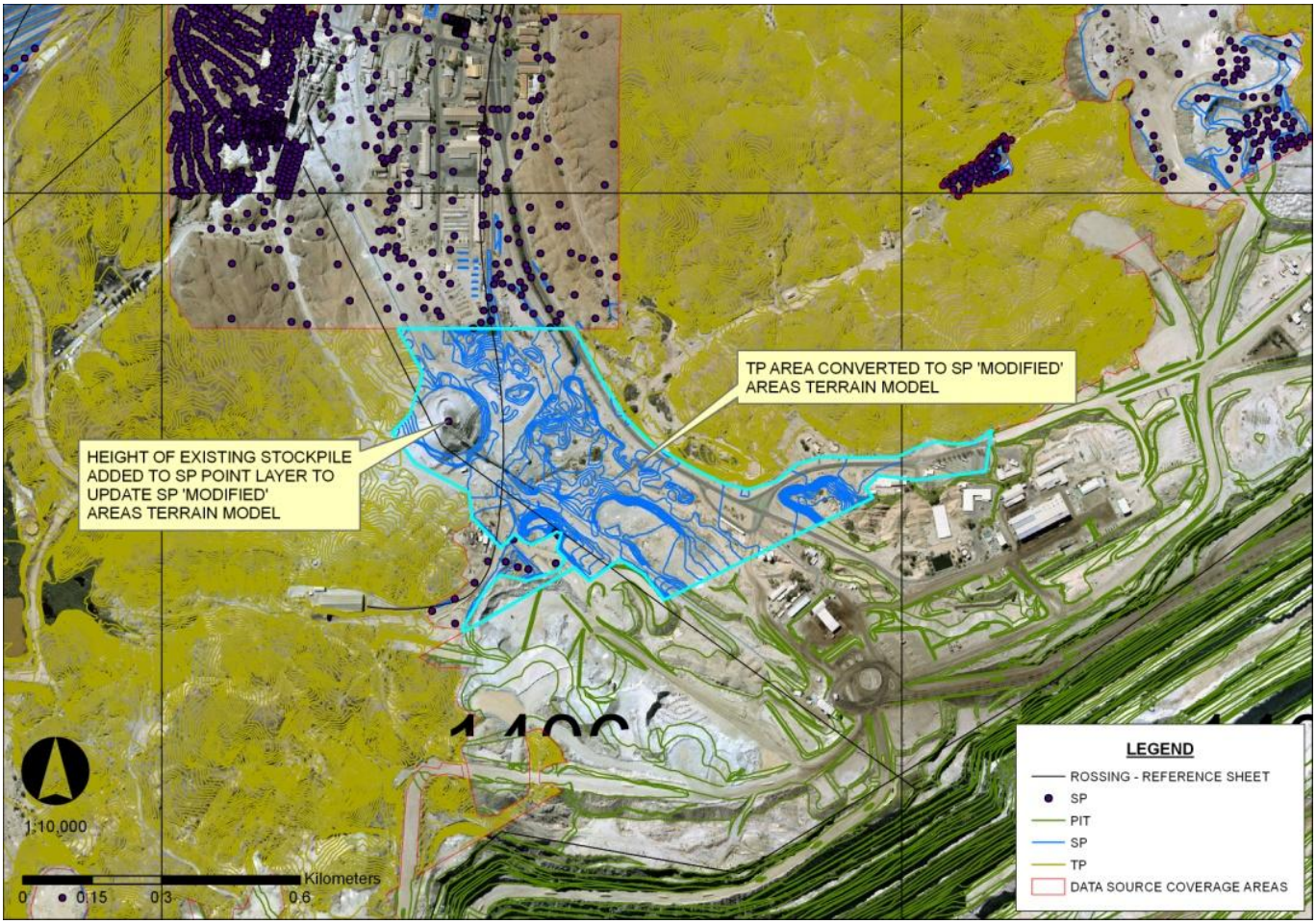


Figure 7: Data amendment to SP modified DEM

4.4.5 DEM VALIDITY

In chapter 4.1.1 it was stated that 'it is important to note that the level of accuracy of the output is as accurate as the data used to generate the DEM.' Due to the size and scale of the RUL area that is included in the landscape characterisation exercise, it will be necessary to extrapolate from landscape characterisation surveys undertaken at specific locations (see Photo listing) to the greater extent of the RUL area (which due to size of area and accessibility was not feasible). A major tool in this extrapolation process is the terrain model and as such the accuracy of the source data is fundamental to the validity of the findings. As part of the validity, specific data limitations must be noted in order to ensure that adequate measures are undertaken to reduce the inherent limitations. The following limitations pertain to the terrain model:

- As a result of the constant modification of the landscape due to the mining activities, the accuracy of the spatial data is accurate only to a point in time. The probability that more recent landscape modifications have taken place is very high.
- Some modifications to the data had to be undertaken which included selection of data source for specific coverage areas as well as the elimination of certain data that did not reflect the general elevation trend.
- The modifications were undertaken methodically and the process was documented.
- The greater majority of the mining landscape modifications are reflected in the terrain model.
- The areas not covered by the data and the data that was deleted, had relatively small coverage's and were not in significantly prominent locations.

The following actions are recommended to ensure that the limitations of the data do not undermine the validity of the findings:

- The VEM's for specific elements located in the coverage area of the sourced 10 metre data would need to be verified by means of photographs taken on site. If photographic records were not available and the outcomes and the associated visual impacts were defined as both High and Significant, a site specific investigation would be required to validate the findings on the ground.
- As a result of the extrapolated process utilised, the mapping of the landscape character is generalised and broad brush in nature. If, based on this mapping, the impacts associated with specific landscape modifications are defined as both High and Significant, a site specific investigation would be required to validate the findings on the ground.
- Should subsequent evaluations of visual impacts of future landscape modifications within the study area take place, a new landscape characterisation exercise would have to take place for the specific site which would inform the 2007 landscape characterisation mapping exercise.

Should these actions be implemented the validity of the findings based on the generated DEM would be Moderate to High and suitable for use in the visual impact study for the Rössing Landscape Characterisation study and the Rössing Expansion Projects.

5 LANDSCAPE CHARACTER

5.1 REGIONAL LANDSCAPE DESCRIPTION

Within the national context the property is located in Namibia. *(See Regional Locality Map on Plate 1 and Photographic Survey in Plate 4)* The countries most predominant features are the extreme arid nature of the coast line and surrounding Namib Desert, the oldest desert in the world. 'Namib' means open space and the Namib Desert gave its name to form Namibia – "***land of open spaces***". Namibia is known for its contrasting landscapes and its many-facetted grandeur and harsh splendour. These landscapes include the shifting sand dunes of the desolate Namib Desert with its high dunes and wilderness sense of space, the vast interior plateau, the awe-inspiring mountains and spectacular gorges which run along the coast where extremely slow growing lichen fields are dependent on coastal fog for survival. Etosha Pan, a dried-out saline lake to the north is surrounded by grasslands and bush which supports a large and varied wildlife.

The population density is one of the lowest in the world at less than 2 people per km² which has resulted in an unspoilt coast, vast untouched scenery and nature conservation areas. Namibia has 14 vegetation zones, ranging from several variations of desert vegetation to semi-desert, mopane, mountain, thorn bush, highland, dwarf shrub, camel thorn and mixed tree and shrub savannahs and the forest savannahs and woodlands of the north east. A desert plant that has caused much interest amongst botanists worldwide is the living fossil, Welwitschia mirabilis, endemic to the Namib Desert and one of the oldest plants known to man. (*www.namibiatourism.com.na)*

Namibia, with its excellent infrastructure is currently attracting a growing tourist industry. More specifically the open desertscapes in the Erongo region have very high levels of landscape character and a high visual aesthetic value. This sense of place is very significant in terms of sustaining the existing and promoting future tourism in the region which is a key component of the long term economy in the area. The open desert sense of place is created by very wide desert landscapes of a flat nature and similar colour and has a significant contribution to the existing and long term sustainability of the Erongo tourist industry; the significance of the visual impact of mining in the region is potentially high. Landscapes associated with the Erongo area are diverse; however there is no specific desert related form that is more significant than another. The significance of the landscape comes from the fact that it is a natural landscape, within which there are significant wilderness properties with limited man-made modifications. Significant features within this viewscape are the mountain ranges and ridges which protrude from the flat horizons and create focal points. Those elements are all raised and prominent and as such they add to the landscape character and increase the value of the several important tourist view corridors evident in the area.

The existing landscape character has been shaped historically by man's need to make use of the resources associated with this area in context with the limited water resources of this desert. Consequently, a component of the Erongo Regions' sense of place is created by the mining industry which plays an important role in employment, mineral production, total export earnings and social advancement in Namibia. Mining-related exports make up 40 percent of total export earnings from goods and services. (*www.sadcreview.com.)* The mining activities have to date been of a small to medium scale and located in isolated areas. This has resulted in the protection of the wide open spaces of the desert landscape in this region which have a very significant visual sense of place.

5.1.1 REGIONAL SIGNIFICANCE

Due to the inherent lack of available screening in context with the flatter, wide open vistas, there is a high potential for visual impact in desertscapes. The advantage of this environment is specifically related to isolation and rugged nature of many of the desert scapes which limit the number of receptors to the area and increase the VAC value respectively. Thus it is of critical importance that development is managed in such a way that it does not detract from the elements which define significant landscape character specifically relating to the tourist industry in the country. With regard to the Erongo Region, a number of key regional limitations were identified. Visual limitations are defined as landscape modifications which exceed the visual carrying capacity of the existing landscape and results in a radical change to the sense of place of an area or region. The key regional limitations in the area are:

- Accumulative visual impacts of existing and proposed large scale mining operations in areas of significant desert landscape character. This is especially related to the associated impacts of the infrastructure – the roads, the power lines, railway lines, pipelines and water reservoirs which are often inappropriately located in significant vistas.
- The lack of guidelines for Visual Resource Management for these very significant desert areas could result in uncontrolled development in significant desert vistas and tourist view corridors which have the potential to undermine the sustainability of the flourishing tourist economy in the region.

5.2 LOCAL LANDSCAPE CHARACTER

5.2.1 DESCRIPTION

(See Specific Locality Aerial Photograph in Plate 2 and Photographic Survey in Plate 4)

The Rössing mining area is bordered by the town of Arandis, near the western edge of the Central Namib Desert approximately 10km to the North West and by steep undulating slopes of the Khan River Valley and its tributaries, approximately 4.5 km to the south west. [18] As indicated on Plate 2, a number of visual feature comprise the area. The main features within this landscape are:

- The Rössing mine which is one of the largest open cast mines in the world which was started in 1973 and has resulted in a number of major mining related landscape modifications.
- The B2 National Road which is the main link road between the Namibian interior and the west coast. This route carries a lot of tourist traffic and as such is recognised as having a regional View Corridor status.
- The town of Arandis, a small town developed by Rössing to accommodate its employees.
- The Arandis airport, a small aerodrome currently being utilised by a Swakopmund based flight training school.
- The NamWater Reservoir
- The old Khan Mine
- The Khan River
- The Welwitschia Flats and Namib Naukluft areas.

Much of the land surrounding the Rössing mine area remains uninhabited and unproclaimed, apart from the designated National Parks and state controlled recreational areas further to the west. This sparse inhabitancy and land use pattern in the surrounding areas arises from the lack of

[18] Ninham Shand Proposed Rössing Expansion Project Phase 1: Final Scoping Report Pg 55

surface and ground water and associated low agricultural potential. Vehicle access to the site's main gate is via a single government owned road (D1991), also referred to as Rössing Road, off the highway that connects Swakopmund to Usakos. The Rössing mining area is bordered by the town of Arandis, near the western edge of the Central Namib Desert approximately 10km to the North West and by steep undulating slopes of the Khan River Valley and its tributaries, approximately 4.5 km to the south west. [19]

5.2.2 TOPOGRAPHY AND GEOLOGY

(See Specific Topography Map in Plate 3)

"Rössing is located on the generally south-west-facing, rough and undulating slopes at a mean elevation of 575 mamsl near the Western edge of the Central Namib Dessert. The topography is broken down into the following: [20]

- The southern reaches of the site are characterised by the several steeply incised and deep storm-wash gullies and gorges that run into the Khan River to the south, resulting in a rugged and hilly landscape.
- As one moves north from the Khan River, toward the town of Arandis the storm wash gullies become less pronounced and are interspersed with resilient rock ridges and occasional inselbergs, resembling a more typical Namibian desert plain.
- The landscape character to the north and west of the ridgeline is characterised by rolling hills,
- Areas to the east are more rugged, with crested and steep-sided hills.
- These hills and ridges continue to the south of the Khan River, where after they dissipate abruptly giving way the gravel plains of the Welwitschia Flats, which covers almost the entire area between the Khan and Swakop Rivers up to the confluence between them, an area forming part of the Namib-Naukluft Park.

The Rössing uranium deposit lies within the central zone of the late pre-Cambrian Damaran orogenic belt that occupies much of central and northern Namibia. Four distinctive habitat types can be identified and are briefly described as follows:"

(*Extract from the Rio Tinto Technical Handbook Series: 2002. Ninham Shand Proposed Rössing Expansion Project Phase 1: Draft Scoping Report. Pg 59 – 63)*

Undulating granite hills	The granite hills are characterised by gentle slopes with large areas of surface quartz gravel. Plant cover in this habitat is patchy, although most slopes support a few widely spaced individual shrubs. After rains, these hills become almost continuously covered with annual grasses. The habitat supports a relatively diverse arid plant community, with several species of conservation importance
Drainage lines and Gorges	The larger drainage lines running through the site are aligned and drain in a north east to south west direction. Larger drainage lines form wide, open valleys and floor lined with coarse, mostly granite derived sands. Although there is rarely surface water in the river systems there remains an appreciable sub-surface flow that is able to support riparian vegetation. Summer rainfalls on the interior plateau region provide a major source of water to the riverine vegetation and seasonal variations in vegetation are largely related to the frequency, intensity and duration of river flows.
Quartz outcrops *(See*	Small quartz outcrops occur throughout the site, usually emerging on hilltops. This habitat often supports a greater number of species than the surrounding

[19] Ninham Shand Proposed Rössing Expansion Project Phase 1: Final Scoping Report Pg 55
[20] Ninham Shand Proposed Rössing Expansion Project Phase 1: Draft Scoping Report. Pg 58

Map reference point A on Plate 3)	area, and often a species assemblage of great conservation importance.
Marble-quartzite ridges *(See Map reference point B on Plate 3)*	The marble-quartzite ridges, running predominantly in a north east to south west direction are comprised of dark, exposed quartzite rock and loose quartzite gravel on the surface. This habitat type, after good rains, has continuous annual grass cover and a widely spaced perennial shrub component, which has lower species diversity than the surrounding granite hills habitat type.
Alluvial sand	Alluvial sand deposits in the gorges vary in thickness up to about 8 m and up to 20 m in the Khan River bed. Alluvial sand is mined from the dry river beds to the north of the Khan River and used for various purposes at Rössing mine, including rehabilitation, building material and road material. The open pit requires large quantities of sand for the surfacing of haul roads, ramps and waste rock disposal areas. Currently and on average, RUL mines 133 000 tonnes of sand per year.

5.3 RECEPTORS

Within the surrounding Rössing area, making use of the landscape in which the mine is a component, are seven receptors. Receptors are defined as 'Individuals, groups or communities who will be subject to the visual influence of a particular project.' [21] The receptors within the Rössing context are:

- B2
- Khan River Valley
- Namib Naukluft
- Welwitschia Flats
- Arandis Airport
- Arandis
- Rössing Road

5.3.1 B2 NATIONAL ROAD

Ref: PLATE 5	COMMENT
Description *(See Aerial Photograph Map and Photographic Survey)*	The storm wash gullies are less pronounced and are interspersed with resilient rock ridges and occasional inselbergs, resembling a more typical Namibian desert plain. The landscape character of this feature is typical of desert roads which follow a relatively straight line which undulates vertically with the rising and falling of the desert terrain the route crosses. The surrounding desertscapes are of wide open desert vistas within which prominent desert mountains create focal points.
Visual Envelope *(See Visual Envelope Map)*	As a result of the flat terrain the VE is large and linear as it follows the route of the road and located predominantly within the 2km buffer. Within the 2km buffer visible landscape modifications associated with Rössing Mine are the NamWater pipe which supplies water to Rössing and the power lines. Also within this context is the NamWater reservoir which dominates and attracts attention, creating high levels of contrast as a result of its prominence and the reflective nature of its

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

	colour. The hanger associated with the airport is very dominating and the box form and the reflective nature of the materials attracts a lot of attention. Within the 6km buffer, the only major landscape modification is the southern, more elevated section of the Tailings Dam. Visual impacts associated with this feature are more related to the large block forms located on prominent skyline which creates high levels of visual contrast and draws the attention of the casual observer
Significance	The significance of this feature relates to the high number of tourist receptors making use of the view corridor and who wish to experience the open desertscapes and wilderness sense of place that surround the B2. Due to this factor the visual sensitivity defined for receptors making use of the B2 is High.

5.3.2 KHAN RIVER VALLEY

Ref: PLATE 6	COMMENT
Description *(See Aerial Photograph Map and Photographic Survey)*	The Khan River Valley is a significant desert landscape which recedes to the horizon. The landscape is characterised by rugged mountain features which create a very steep sided valley. The flat alluvial sands in the river bed contrast with the broken and undulating mountain surrounds. Included in this area is the old Khan copper mine. The old structures and mining infrastructure is a significant heritage feature.
Visual Envelope *(See Visual Envelope Map)*	As a result of the lower elevation of the Khan River Valley and the elevated mountain features directly adjacent the VE of this feature is contained to an extent. This route is highly exposed to a number of major mining modifications which are addressed in the site specific landscape character.
Significance	The significance of this feature relates to the very high levels of landscape aesthetic of the rugged mountain and the isolated desert wilderness sense of place that makes this area a tourist destination. The number of receptors is limited by the remoteness of the terrain, but tourist receptors include hikers as well as 4x4 tourist excursions. A factor which increases the significance of this area is the Khan copper mine. The history of this feature is a tourist attraction and receptors can access this area via the Khan River. This area also needs to be protected against misuse by tourists.

5.3.3 NAMIB-NAUKLUFT NATIONAL PARK / WELWITSCHIA FLATS

Ref: PLATE 6	COMMENT
Description *(See Aerial Photograph Map and Photographic Survey)*	The Welwitschia Flats are a barren, open expanse of gravel and sand that has a significant open desert vista and is home to the Namib's most celebrated plant, one of the largest known endemic Welwitschia Mirabilis – estimated at over 1,500 years old. Namib-Naukluft National Park is the largest game park in Africa, well known for it's towering burnt orange sand dunes, high isolated red inselbergs and the Naukluft Mountains to the east of the park. (*www.namibiatourism.com.na)* Namib-Naukluft area is excluded from receptor analysis as a result of the very rugged terrain which would reduce the number of receptors in that area. However, the nature reserve status of this area requires that the potential visual impacts are investigated. As the Namib-Naukluft abuts onto the Welwitschia Flats, issues related to receptor visibility in this area will be addressed under the Welwitschia Flats receptors.

Visual Envelope *(See Visual Envelope Map)*	As a result of the flat and elevated terrain, the viewshed is extensive but fragmented. Landscape modifications associated with Rössing falls mainly within the 6km and greater buffer. Significant within the 6km buffer are the rock dumps which, as a result of their alien forms, have the potential to create high levels of contrast.
Significance	The significance of this area relates to the status of this area as an international tourist destination as a result of the endemic vegetation and significant desert landscape character. ▪ A site visit was not undertaken to this area and as such no photographs were taken which is a limitation.

5.3.4 ARANDIS AIRPORT

Ref: PLATE 7	COMMENT
Description *(See Aerial Photograph Map and Photographic Survey)*	Arandis Airport is a small aerodrome which is not utilised by Rössing. It is currently being utilised by a Swakopmund based flight training school.
Visual Envelope *(See Visual Envelope Map)*	The terrain is typically more Namibian desert plain and is flat. The VE for this feature is linear in direction and regionally contained. This feature is located in the VE of the B2, evident from the photograph taken from the B2. There are no major Rössing landforms that fall within the 2km buffer. The Tailings Dam falls within the viewshed of the 6km buffer and the south western elevated sector of the Tailings Dam is visible from the airport as indicated in the photographs. The more intrusive landscape modifications associated with the processing plant are not visible as they are screened by the Tailings Dam.
Significance	Receptor sensitivity will be Moderate to Low due to distance from the proposed landscape modifications and the lack of exposure to the Processing Plant and the Waste Rock Dumps. The number of receptors is limited. Potential does exist for tourist related activities which would increase the significance.

5.3.5 ARANDIS

Ref: PLATE 5	COMMENT
Description	This small town was developed by Rössing to accommodate its employees in the seventies. The town layout is interesting and does not conform to the usual grid patterns associated with labour accommodation. The houses are single storey with numerous trees. Arandis has "... by African standards, an enviable infrastructure, including paved roads, a soccer stadium, a library, streetlights and steady sources of electricity and clean water. Two small clothing factories and a technical college provide some jobs not directly affiliated with the mine. *(Craig Timberg, Washington Post Foreign Service, December 6, 2006)*
Visual Envelope	The terrain is typically of the Namibian desert plain interspersed with resilient rock ridges and inselbergs. As a result of the slightly raised terrain to the south, the VE excludes the major mining modifications as a result of topographic screening. This is in combination with the built nature of the town and the number of trees restricts visibility of the mine.
Significance	Receptor sensitivity will be low due to the visibility of the mine being reduced by the atmospheric haze and the distance from the mine. The area is also built up

	and has numerous trees which restrict visibility towards the south. The residents of Arandis would be exposed to the mining activities when entering or leaving the town. As a result of this factor, the visual impacts associated with the REP will be assessed as part of the B2 National Road study.

5.3.6 RÖSSING ROAD

Ref: PLATE 8	COMMENT
Description *(See Aerial Photograph Map and Photographic Survey)*	The private road built by Rössing at the commence of mining is unique from a terrain perspective as it takes the receptor from the typical Namibian desert plain with flat open vistas towards the southern reaches of the site. This is characterised by several steeply incised and deep storm-wash gullies and gorges that run into the Khan River to the south, resulting in a rugged and hilly landscape.
Visual Envelope *(See Visual Envelope Map)*	Visibility of the visual envelope is linear as it follows the length of the road and is mainly located within the 2km buffer due to the undulating desert terrain and lower elevations. Falling with the 6km VE are the modifications associated with the Tailings Dam which do attract attention of the causal observer.
Significance	▪ The visual sensitivities of the receptors making use of this route are defined as Moderate to Low as a result of the private road status of this route which leads only to the Rössing mine. Receptors making use of this route would mainly be related to Rössing mine in terms of employees or tourists specifically intent on visiting the mine. Thus perceptions of the receptors would have expectations of mining related activities. ▪ The significance of this route lies in its value as a transition route offering receptors with an expectation of mining landscapes, views of expansive and open desert across the Khan River valley to the Welwitschia Flats. The lack of close exposure to the major mining modifications adds to the receptor perceptions that visual impacts associated with Rössing mine are contained.

5.3.7 LOCAL CHARACTER SIGNIFICANCE

The variation in geological features creates a rugged and harsh beauty which adds to the significant desert sense of place but also increase the VAC for the area. These mountain features, as a result of their prominence, are visually very significant and mitigations need to be set in place to ensure that visual degradation of these natural features is avoided. The key local limitations in the area are:

- The area is surrounded by pristine nature areas which includes the mountains north of the Khan River valley, the Khan River and the significant open desert vista of the Welwitschia flats.
- The low lying valleys and prominent ridges within the Rössing mine context also have significant wilderness qualities and a high aesthetic value.
- The B2 National Road is a major link road along the Namibian coast and as such carries a lot of traffic and has a regional tourist View Corridor status.

6 VISUAL INVENTORY

Within the Rössing Tenement area, three main landscapes are apparent. The first landscape, defined as **Major Disturbed Areas**, is a completely transformed environment associated with mining activities. *(See Significant Landscape Features Map on Plate 9)*
These include:

- Open Cut Pit
- Waste and Low Grade Stockpiles
- Processing Plant and Structures
- Tailings Dam and Associated Infrastructure

The second landscape is that of the **Remaining Disturbed Areas** which includes:

- Borrow Pits
- Quarry
- NamWater Reservoir
- Sewerage Plant
- General Mining

The third landscape character relates to the **Nature Related Areas** where significant landscapes are created by natural forms where limited or no man-made activities or landforms are found. These areas specifically relate to the desert areas to the north and south, the river valley areas outside of the mining visual envelope and the Khan River valley areas. Within this category there are three sub-categories which define the transitional zone between the transformed landscapes and the completely natural landscapes where the sense of place of the natural landscape is modified by the proximity or exposure to the major mining landscape modifications.
These are:

- Those areas which have a high level of exposure to the existing landscape modifications.
- Those areas which have moderate to low exposure
- Areas not exposed

Assessing scenic values and determining visual impacts can be a subjective process. In order to ensure that objectivity and consistency are maintained, the basic design elements of **form, line, colour, and texture**, are used to describe and evaluate landscapes, as well as to describe the proposed project. Evaluation is completed by means of the VRM Questionnaires below:

- A scenic quality evaluation
- A sensitivity level analysis
- A delineation of distance zones

(See Methodology for further details)

6.1 MAJOR DISTURBED AREAS

The approximate 2,165ha physical mining footprint includes the major disturbed areas of the open pit, uranium extraction plant, tailings dam, waste rock dumps and associated infrastructure.

6.1.1 OPEN CUT PIT

Description

The Rössing mining sequence is a conventional drill, blast, load and haul operation. The open pit has been developed in a series of “benches” or levels interconnected by a system of haul roads. The Rössing open pit had reached 345 m in depth by 2003 and comprised of 23 benches of 15 m

in height. Future pit expansion from the present mined area will take the form of mining push-backs on all walls of the present pit so that the final pit will be considerably extended in area and a pit depth of approximately 500 m will be achieved eventually *(See Aerial Photograph and Photographic Survey in Plate 10)* *(Rössing Uranium Limited Closure Management Plan 2005. Page 75)*

Infrastructure in the pit consists of a trolley assist including power cables, transformers and pipelines and radiometric scanners used to measure the truck load material grade for allocation to the crusher or low grade/waste dumps. *(Rössing Uranium Limited Closure Management Plan 2005. Page 75)*

Visual Envelope

As a result of the nature of the open pit which is a void, as opposed to an extrusion, the physical VE is limited and localised to the specific area where the landscape modification has been undertaken. The exception relates to the associated impact of the dust as a result of the mining activities which include blasting, digging and hauling. *(See 3D View in Plate 10)*

Significance Rating

SCENIC QUALITY	RATING	MOTIVATION
Landform	0	Void
Vegetation	0	None
Water	0	None
Colour	1	Mono-colour
Adjacent scenery	2	Modified
Scarcity	0	None
Cultural Modifications	-5	Highly modified

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

VISUAL SENSITIVITY	RATING	MOTIVATION
Type of Users	L	Workers or mine visitors (no exposure to significant receptors) have a choice in exposure to views.
Amount of use	L	The void nature of the landscape modification limits the amount of usage.
Public interest	L	The lack of visibility and the high level of existing modification reduce the level of public interest.
Adjacent land Users	L	The area adjacent the site is all highly modified and as such would have similar rating in terms of sensitivities.
Special Areas	L	Both the size and scale make this an interesting highly modified landscape and as such it does have special areas value but only in the context of the mining landscape.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

DISTANCE ZONE	MOTIVATION
Seldom Seen	Void is not seen beyond extent

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

6.1.2 WASTE AND LOW GRADE STOCKPILES

Description

Waste rock is hauled and disposed of at one of seven designated sites, the farthest being 2km from the open pit, mostly infilling the dry river gorges running parallel to the Khan River. Low grade and high-grade stockpiles are located around the open pit, where they remain accessible. *(See Aerial Photograph and Photographic Survey in Plate 11)* *(Rössing Uranium Limited Closure Management Plan 2005. Page 84)*

Visual Envelope

The total extent of the viewshed is not indicated on the map due to the fact that the viewshed is limited by the extent of the data provided. Within this preliminary viewshed is the B2, a significant view corridor. Receptors travelling on the B2 would probably be exposed to the rock dumps although they will be at a distant (8-9km). However due to the colouration and the flat and alien forms of these features in relation to the very large scale, the probability that they would be visible is quite good.

Significance Rating

SCENIC QUALITY	RATING	MOTIVATION
Landform	3	Interesting in terms of size and scale, highly modified.
Vegetation	0	None remaining
Water	0	NA
Colour	2	Monotone or related to shadow
Adjacent scenery	5	Prominent mountain relief features have very high landscape character.
Scarcity	0	Extensive
Cultural Modifications	-3	Highly modified landscape

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

VISUAL SENSITIVITY	RATING	MOTIVATION
Type of Users	H	High levels of exposure in Khan River Gorge and western Welwitschia Flats to tourist related receptors.
Amount of use	L	Isolation of the area reduces the number of receptors into these areas.
Public interest	H	The exposure into areas of high landscape character has increased the levels of public interest.
Adjacent land Users	H	Close proximity to the Namib Naukluft area increases sensitivity
Special Areas	L	Within the modified area there are no specific visual special areas.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

DISTANCE ZONE	MOTIVATION
Foreground	Receptors in the Khan River area and the western Welwitschia Flats area are highly exposed.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

6.1.3 PROCESSING PLANT AND STRUCTURES

Description

The eastern boundary of the processing plant is the main mine road and railway line. The Berning Range escarpment and the plant boundary fence make up the western boundary. The northern limit is defined by the edge of the dumping zone from the escarpment across to the main gate. The area is approximately 150ha in size. *(See Aerial Photograph and Photographic Survey in Plate 12)*

The area encompasses the process plant from the primary crusher to final product recovery. This includes the primary crusher, the coarse ore stockpile and conveyer system, the secondary crushing plant, the fine crushing plant, the uranium extraction section, tails handling systems, continuous ion exchange, solvent extraction and final product recovery, as well as the engineering

workshops and offices. It also includes the disused acid plant, pyrite stockpile, the acid unloading facilities, acid pipeline and acid storage tanks. Buildings are mostly made of concrete and concrete block construction. There are underground tanks for storage of diesel and process solvent and above ground tanks for acid and ammonia. *(Rössing Uranium Limited Closure Management Plan 2005. Page 93)*

Visual Envelope

The viewshed of the Tailings Dam and Processing Plant and associated structures is limited primarily to the east and within the 2km buffer zone. It does not cover the area of the B2 National Road due to topographic screening from the Berning range and Tailings Dams to the north. *(See Visual Envelope Map in Plate 12)*

Significance Rating

SCENIC QUALITY	RATING	MOTIVATION
Landform	0	Highly modified
Vegetation	0	None apparent other than a row of exotic trees
Water	0	None apparent
Colour	0	Varied colours
Adjacent scenery	5	Berning Range and the northern section of the Dome lie adjacent to the site. These areas do have high levels of landscape character.
Scarcity	0	None
Cultural Modifications	-5	Highly modified.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

VISUAL SENSITIVITY	RATING	MOTIVATION
Type of Users	L	Workers or mine visitors (no exposure to significant receptors) have a choice in exposure to views.
Amount of use	L	The views are very contained.
Public interest	L	The lack of visibility and the high level of existing modification reduce the level of public interest.
Adjacent land Users	L	The adjacent land users are limited and the areas adjacent the site are all highly modified and as such would have similar rating in terms of sensitivities.
Special Areas	L	Both the size and scale make this an interesting highly modified landscape but the special areas value is only within the mining context.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

DISTANCE ZONE	MOTIVATION
Foreground	There is no restricted access along the Rössing Road and as such receptors can come into close proximity to the site.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

6.1.4 TAILINGS DAMS AND ASSOCIATED INFRASTRUCTURE

Description

All tailings from the uranium extraction process are conveyed and pumped to a large tailings impoundment situated to the north-west of the plant and separated from it by a north-east trending ridge. Due to the low uranium content of the ore, the tailings consist of virtually the entire mass of input ore plus waste process liquids. The tailings material is coarse, by industry standards. The

tailings impoundment is anchored on its eastern end against a ridge of hills *(See Aerial Photograph and Photographic Survey in Plate 13)*

Surface seepage from the tailings impoundment occurs through the filter drain in the embankment and the foundation materials. An extensive seepage control program and monitoring system has been established to contain sub-surface seepage in Pinnacle and Panner Gorges. Windblown tailings have been accumulated to the south-west of the impoundment over the years. *(Rössing Uranium Limited Closure Management Plan 2005. Page 54)*

The tailings facility is the largest feature on the Rössing site covering a footprint of about 730ha and is raised to an elevation of about 80m above surface. *(Rössing Uranium Limited Closure Management Plan 2005. Page 110)*

Visual Envelope
As for Processing Plant *(See Visual Envelope Map and 3D View in Plate 13)*

Significance Rating

SCENIC QUALITY	RATING	MOTIVATION
Landform	3	The colour and form as seen from significant receptors reduces the level of contrast created from this landscape modification and do blend to a certain extent with the desert landscape.
Vegetation	0	None apparent
Water	0	The top of the Tailing Dam does have some water but the colour and visual environment would not increase the landscape character.
Colour	2	The oxidisation process does result in a browning of the sand particles which is similar in colour and texture to the surrounding desert landscape as seen from significant receptors. The mono-colour reduces the value.
Adjacent scenery	5	The site is in close proximity to the Berning Range which is regionally prominent and adds significantly to the landscape character.
Scarcity	0	NA
Cultural Modifications	-4	The modifications are extensive and site related and as such creates an alien landscape character.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

VISUAL SENSITIVITY	RATING	MOTIVATION
Type of Users	H	The Tailing Dam is visible from the B2 which is a significant receptor. The reservoirs and structures on top of the Tailings Dam draw attention to the landscape modification and as such increase the level of use.
Amount of use	H	The B2 is a major link road along the Namibian coast and therefore carries a lot of traffic.
Public interest	H	The B2 is a significant view corridor and the wilderness and open desert views related to receptors making use of this road are important.
Adjacent land Users	L	Adjacent land users are limited.

Special Areas	H	The Namib desert has a significant landscape character

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

DISTANCE ZONE	MOTIVATION
Foreground	The B2 falls within the foreground area.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

6.2 REMAINING DISTURBED AREAS

This includes additional smaller infrastructure within the surrounding areas of the Rössing mine. These are smaller in context and scale but have visual implications which could influence the extent of the total Rössing visual envelope. A general list of structures with a potential impact was complied however only the infrastructures with a significant influence have been assessed.

- Power lines, which are a NamPower infrastructure form part of the Processing Plant. These features are also located in wilderness which is a visual limitation and addressed in the Specific Visual Limitation section
- Borrow Pits
- NamWater Reservoir
- E.Camp
- Arandis Airport
- Sewerage Works
- A portion of the B2 National Road,
- Rössing Road.

6.2.1 BORROW PITS

Description

Exploration drilling completed at promising sites has left concreted drilling platforms and mud sumps as well as scrap and litter found in the vicinity. Many of these drill sites are only accessible by foot. *(See Aerial Photograph Map and Photographic Survey in Plate 14) (Rössing Uranium Limited Closure Management Plan 2005. Page 147)*

Visual Envelope

For the majority of the seven borrow pits the VE is localised to the specific area where the landscape modification has been undertaken. This is as a result of the landscape character of the borrow pit which is a void as opposed to an extrusion which limits the visibility. Also the borrow pits are located in areas which have low prominence and as they are used to mine sand they are usually located at the bottom of a riverbed where the sand is found. The northern pits are all closely associated with existing landscape modifications and would fall into the major landscape modifications VE's. The southern two pits are located outside the major mine VE and as such extend the overall visual envelope of the mine into the valleys in the south. The small scale of the landscape modification also lends itself towards mitigations where these impacts could be significantly reduced. This would reduce the viewshed of these landscape modifications and subsequently contain further visual expansion of the Rössing mine total VE to meet future mine objectives. *(See Visual Envelope Map and 3D View in Plate 14)*

Significance Rating

SCENIC QUALITY	RATING	MOTIVATION
Landform	2	
Vegetation	0	The majority are highly modified sites within a desert

		environment which reduces the probability of significant vegetation found on site. *(See Limitations)*
Water	0	The sites are all river valleys but due to the dry desert environment, the flowing of the rivers is only associated with flooding.
Colour	3	The areas are mined for sand and as such the bulk of the modifications are related to the removal or repositioning of sand. In this regard the probable change in colour would be limited and shadow related.
Adjacent scenery	5	The sites are all in river valleys and as such would have lower exposure to major mine modifications and the desert sense of place would still be apparent.
Scarcity	5	The valley areas in the Rössing area are all visually significant.
Cultural Modifications	-1	The close proximity of the sites to major mine modifications does reduce the landscape character but the remoteness of most of these modifications and the high potential for visual repair increases the scarcity of these features.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

VISUAL SENSITIVITY	RATING	MOTIVATION
Type of Users	L	Work related
Amount of use	L	Limited access
Public interest	H	The close proximity of this site to desert environments increases the level of public interest.
Adjacent land Users	H	Limited access
Special Areas	L	The valley areas have significant landscape character.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

DISTANCE ZONE	MOTIVATION
Seldom Seen	Due to the location of these sites in valley areas, they have low levels of exposure.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

6.2.2 QUARRY

Description

The quarry is found in sandy locations, predominantly in river beds, and is of a void nature. *(See Aerial Photograph Map in Plate 15)*

Topography and Visual Envelope

The visual envelope is mainly contained within the valley and within the 2km buffer. The receptor within this viewshed is Rössing Road and as a result of this the significance is heightened. The proximity of the landscape modifications to the high levels of modification and contrast created by the Rössing Processing Plant reduces the significance of the landscape modifications as this area falls mainly within the Processing Plant visual envelope. *(See Visual Envelope Map in Plate 15)*

Significance

SCENIC QUALITY	RATING	MOTIVATION
Landform	2	Small scale modifications
Vegetation	0	NA

Water	0	NA
Colour	2	NA
Adjacent scenery	5	Views of Rössing Dome are significant as seen from Rössing Road as they have few landscape modifications.
Scarcity	3	The prominence of the locations and exposure increases the significance of the site
Cultural Modifications	-3	The void nature of the quarry reduces most of the impact and the scale of the modification is limited.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

VISUAL SENSITIVITY	RATING	MOTIVATION
Type of Users	M	Rössing Employees and visitors
Amount of use	M	The Rössing Road carries a moderate amount of traffic
Public interest	L	The processing plant demands attention
Adjacent land Users	L	There are no adjacent land users in this context
Special Areas	H	The Dome is a unique geological feature in a regionally significant desert landscape.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

DISTANCE ZONE	MOTIVATION
Foreground	The Rössing Road falls within the two kilometre buffer and has high levels of exposure.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

6.2.3 NAMWATER RESERVOIR

Description

Water supply pipelines and storage reservoirs *(See Aerial Photograph Map and Photographic Survey in Plate 16)*

Topography and Visual Envelope

This is not specifically Rössing related however it is an associated impact as the NamWater Reservoir provides Rössing with water. The viewshed of this is localised and linear. The significance of this viewshed is directly related to the B2 National Road where the potential visibility of these structures extends over a long distance, approximately 10km away. This visibility is verified by photographs and there are high levels of contrast as a result of it's the reservoirs prominent location at a high elevation for gravity feeding. The contrast is also affected by the high levels of reflectivity of the material used. This structure dominates and by association draws the casual observer's attention towards the mining related activities of Rössing. It would be identified as a leader feature. Recommendations are to mitigate by means of berming and change the colour of the paint to reduce the reflectivity of the structure. *(See Visual Envelope Map in Plate 16)*

Significance

SCENIC QUALITY	RATING	MOTIVATION
Landform	0	The terrain has been modified and is cut into a cut and fill bench.
Vegetation	0	None apparent
Water	0	None apparent
Colour	0	The highly reflective light nature of the colour of the reservoirs does not blend with the surrounding desert environment.
Adjacent scenery	4	The undulating open desertscape is significant
Scarcity	3	The site is highly modified
Cultural Modifications	-5	The highly reflective colour, texture and form of the reservoir create high levels of contrast in the open desert landscape.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

VISUAL SENSITIVITY	RATING	MOTIVATION
Type of Users	H	The B2 is a significant tourist view corridor
Amount of use	H	High levels of traffic are carried on the road.
Public interest	H	Open desert views would be important for tourist related traffic.
Adjacent land Users	M	The local residents of Arandis
Special Areas	L	Due to the scale of the landscape modifications in relation to the small site, there are no special areas on the site.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

DISTANCE ZONE	MOTIVATION
Foreground	The B2 National Road falls within the two kilometre buffer and has high levels of exposure.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

6.2.4 E. CAMP

Description

To the north of the Tailings Dam and alongside the Rössing Road is an old factory premises known as E. Camp

Topography and Visual Envelope

The visual envelope is contained and fragmented. It does extend quite far but only into very isolated areas. Within the 2km buffer the significant receptor is the Rössing Road which takes a major amount of traffic into and out of Rössing. As such the significance of this particular landscape modification is heightened. The fragmented and localised nature of this viewshed does lend itself to mitigation, in terms of reducing the colour contrast created by these structures which would significantly reduce the overall visual contrast and the impact associated with this structure.

Significance

SCENIC QUALITY	RATING	MOTIVATION
Landform	3	Landscape modifications have been limited to the building footprints and road and the general landform has been retained.
Vegetation	1	NA
Water	0	NA

Colour	2	The spacing between the structures reduces the colour massing but the highly reflective colour of the paint reduces the scenic quality of the E.Camp
Adjacent scenery	5	The desertscape surrounding the site are visually significant.
Scarcity	4	The site is in close proximity to the major Rössing Mine modification and as such the scarcity is reduced.
Cultural Modifications	2	The fragmentation of the building layout does not detract from the overall landscape but the level of colour contrast created by the paint is very high and draws attention to a modified environment from an area which has significant desert mountain views.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

VISUAL SENSITIVITY	RATING	MOTIVATION
Type of Users	M	Rössing Employees and visitors
Amount of use	M	The Rössing Road carries a moderate amount of traffic
Public interest	H	The area has significant desert mountain views.
Adjacent land Users	L	There are no adjacent land users in this context.
Special Areas	H	The undulating topography and the prominence of the ridge to the north increase the landscape value and sensitivity.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

DISTANCE ZONE	MOTIVATION
Foreground	The Rössing Road falls within the two kilometre buffer and has high levels of exposure.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

6.2.5 ARANDIS AIRPORT

Description

Arandis Airport is a small aerodrome servicing primarily Rössing. *(See Aerial Photograph Map and Photographic Survey in Plate 7)*

Topography and Visual Envelope

See Receptors *(See Visual Envelope Map in Plate 7)*

Significance

SCENIC QUALITY	RATING	MOTIVATION
Landform	0	Flat
Vegetation	0	NA
Water	0	NA
Colour	1	Visible colour of the hanger is greyish and reflective
Adjacent scenery	5	Desertscape
Scarcity	1	Fairly common in the region
Cultural Modifications	-3	The hanger dominates the view and attracts attention.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

VISUAL SENSITIVITY	RATING	MOTIVATION
Type of Users	H	The B2 is a significant tourist view corridor
Amount of use	H	High levels of traffic are carried on the road.
Public interest	H	Open desert views would be important for tourist related traffic.

Adjacent land Users	L	NA
Special Areas	L	Due to the scale of the landscape modifications in relation to the small site, there are no special areas on the site.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

DISTANCE ZONE	MOTIVATION
Foreground	The B2 National Road falls within the two kilometre buffer and has high levels of exposure.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

6.2.6 SEWERAGE WORKS

Description

The Sewerage works, in close proximity to mine modifications, is a small transformed site alongside Rössing Road. *(See Aerial Photograph Map in Plate 17)*

Topography and Visual Envelope

As for quarry *(See Visual Envelope Map in Plate17)*

Significance

SCENIC QUALITY	RATING	MOTIVATION
Landform	2	Gently undulating.
Vegetation	2	Some small bushes visible.
Water	0	NA
Colour	2	Colours do not create high levels of contrast to surrounds.
Adjacent scenery	3	Surrounding landscape is desert but is in close proximity to major mine modifications.
Scarcity	2	Small scale of site in relation to surrounding landscape is not scarce.
Cultural Modifications	0	Small scale of the modification.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

VISUAL SENSITIVITY	RATING	MOTIVATION
Type of Users	M	Rössing Employees and visitors.
Amount of use	M	The Rössing Road carries a moderate amount of traffic.
Public interest	H	The area is associated with significant desert mountain views.
Adjacent land Users	L	There are no adjacent land users in this context.
Special Areas	L	The small site is transformed.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

DISTANCE ZONE	MOTIVATION
Foreground	The site does fall within the visual envelope of major mining modifications.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

6.2.7 NATIONAL ROAD

Description

The B2 is a significant view corridor; it is the main transport route through the area and carries a high level of tourist related traffic. *(See Aerial Photograph Map and Photographic Survey in Plate 5)*

Topography and Visual Envelope
See Receptors (See Visual Envelope Map in Plate 5)

Significance

SCENIC QUALITY	RATING	MOTIVATION
Landform	1	Gently undulating
Vegetation	0	NA
Water	0	NA
Colour	3	The colour of the road does not detract from the surrounding desertscape
Adjacent scenery	5	Significant desert views
Scarcity	2	Similar landscape in region
Cultural Modifications	0	The road does not detract from the landscape

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

VISUAL SENSITIVITY	RATING	MOTIVATION
Type of Users	H	Tourist related traffic
Amount of use	H	The B2 carries a high amount of traffic
Public interest	H	The area has significant desert mountain views.
Adjacent land Users	L	There are no adjacent land users in this context.
Special Areas	H	The road has a high view corridor status

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

DISTANCE ZONE	MOTIVATION
Foreground	The road does fall within the visual envelope of major mining modifications.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

6.2.8 ROSSING ROAD

Description
Rössing Road has a moderate view corridor status; it is the access road through to Rössing and has the potential to have an increased amount of tourist related traffic. *(See Aerial Photograph Map and Photographic Survey in Plate 8)*

Topography and Visual Envelope
See Receptors (See Visual Envelope Map in Plate 8)

Significance

SCENIC QUALITY	RATING	MOTIVATION
Landform	3	Gently undulating
Vegetation	0	NA
Water	0	NA
Colour	4	The colour of the road does not detract from the surrounding desertscape
Adjacent scenery	5	Significant desert views
Scarcity	2	Similar landscape in region
Cultural Modifications	0	The road does not detract from the landscape

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

VISUAL SENSITIVITY	RATING	MOTIVATION
Type of Users	M	Rössing Employees and visitors
Amount of use	M	The Rössing Road carries a moderate amount of traffic
Public interest	H	The area has significant desert mountain views.
Adjacent land Users	L	There are no adjacent land users in this context.
Special Areas	M	The road has a moderate view corridor status

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

DISTANCE ZONE	MOTIVATION
Foreground	The road does fall within the visual envelope of major mining modifications.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

6.2.9 GENERAL MINING RELATED

Description

These can be found mainly south of the tailings dam. *(See Aerial Photograph Map in Plate 18)*

Topography and Visual Envelope

These are located in areas of low prominence and as such the viewshed is contained mainly within the 2km buffer. Within the 6km buffer it is more related to the more elevated, mountainous region to the south of the pit. *(See Visual Envelope Map and 3D View in Plate 18)*

Significance

SCENIC QUALITY	RATING	MOTIVATION
Landform	2	Undulating
Vegetation	0	NA
Water	1	Small dam is visible, water colouration is probably coloured by leaching from the Tailing Dam
Colour	0	Highly modified
Adjacent scenery	3	Close visual proximity to the major mine modifications
Scarcity	0	Not scarce
Cultural Modifications	-2	Modifications have been severe

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

VISUAL SENSITIVITY	RATING	MOTIVATION
Type of Users	L	Rössing Employees
Amount of use	L	Very limited access
Public interest	L	Association with major modifications
Adjacent land Users	L	NA
Special Areas	L	The majority of the area is transformed.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

DISTANCE ZONE	MOTIVATION
Seldom Seen	The restricted access and undulating nature of the area results in very little visibility.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

6.3 REMAINING UNDISTURBED AREAS

6.3.1 OUTSIDE ROSSING VISUAL ENVELOPE

Description

The remaining undisturbed areas outside of the Rössing mine context have been isolated as having visual implications in terms of their pristine nature sense of place and tourist receptors. Specific areas highlighted are the Namib-Naukluft Park desert context, the Welwitschia flats and the Khan River Valley. These areas create contrasting landscapes of shifting high sand dunes of the desolate Namib Desert, awe-inspiring mountains, spectacular gorges and flat gravel plains. The region has very high levels of landscape character and a high visual aesthetic value. This sense of place is very significant in terms of sustaining existing and promoting future tourism in the region which is a key component in the long term economy in the area.

The mine area falls within the Central Namib Desert vegetation zone. All plant species found here are drought tolerant, drought resistant or succulent. The larger mammal species found in the area are considered to be nomadic, moving widely in search of food sources and have been seen around the Khan River gorges as well as in Panner and Pinnacle Gorges. *(See Aerial Photograph Map and Photographic Survey in Plate 19)* *(Rössing Uranium Limited Draft Scoping Report 2007. Page 51)*

Topography and Visual Envelope

See Receptors (See Visual Envelope Map in Plate 19)

Significance

SCENIC QUALITY	RATING	MOTIVATION
Landform		NA as it is a pristine nature area *(see Visual Resource Management Pg 36 for more details)*
Vegetation		NA
Water		NA
Colour		NA
Adjacent scenery		NA
Scarcity		NA
Cultural Modifications		NA

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

VISUAL SENSITIVITY	RATING	MOTIVATION
Type of Users		NA
Amount of use		NA
Public interest		NA
Adjacent land Users		NA
Special Areas		NA

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

DISTANCE ZONE	MOTIVATION
	NA

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

6.3.2 WITHIN ROSSING VISUAL ENVELOPE

Description

The remaining undisturbed areas within the Rössing mine context have been isolated as having visual implications in terms of their nature sense of place and tourist receptors. Specific areas highlighted are those falling within the two kilometre visual envelope of the major mining

modifications and those located within the six kilometre visual envelope of the major mining modifications. *(See Aerial Photograph Map and Photographic Survey in Plate 19)*

Topography and Visual Envelope
See Receptors (See Visual Envelope Map in Plate 19)

Significance

SCENIC QUALITY	RATING	MOTIVATION
Landform	5	High levels of landscape character which add to the desert landscape sense of place
Vegetation	0	
Water	0	
Colour	5	As above
Adjacent scenery	5	As above
Scarcity	5	As above
Cultural Modifications	0	

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

VISUAL SENSITIVITY	RATING	MOTIVATION
Type of Users	L	Rössing employees
Amount of use	L	Limited access
Public interest	H	Desert environments and proximity to the Welwitschia Flats / Namib Naukluft
Adjacent land Users	H	Desert environments and proximity to the Welwitschia Flats / Namib Naukluft
Special Areas	H	Desert environments and proximity to the Welwitschia Flats / Namib Naukluft

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

DISTANCE ZONE	MOTIVATION
Foreground	The Welwitschia flats are located within the 6km buffer area.

(Source: Visual Resource Management. Bureau of Land Management, Dept of Interior, USA)

7 VISUAL RESOURCE MANAGEMENT

7.1 PHYSIOGRAPHIC RATING UNITS (PRU) METHODOLOGY

The purpose of the PRU's is to identify the nature of the landscape and receptor sensitivity for each footprint of each separate visual area. The following PRU's were defined. *(See Physiographic Rating Units Map in Plate 20)*

ID	PHYSIOGRAPHIC AREA	METHODOLOGY
1	AIRPORT	Defined boundary
2	BORROW PITS	Defined boundary
3	BORROW PITS HIGH EXPOSURE	Areas falling within the two kilometre visual envelope of the major mining modifications.
4	E-CAMP	Defined boundary
5	MINING RELATED	NA Defined boundary
6	NAMWATER	Defined boundary
7	NATIONAL ROAD	Defined boundary
8	PIT	Defined boundary
9	PROCESSING	Defined boundary
10	QUARRY	Defined boundary
11	ROCK DUMPS	Defined boundary
12	ROSSING ROAD	Defined boundary
13	ROSSING ROAD HIGH EXPOSURE	Areas falling within the two kilometre visual envelope of the major mining modifications.
14	SEWAGE PLANT	Defined boundary
15	TAILINGS DAM	Defined boundary
16	TAILINGS DAM HIGH EXPOSURE	Defined boundary
17	UNDISTURBED	The remaining undisturbed areas not falling within the visual envelope of the major mining modifications. This unit also included the regionally prominent mountain features, the Khan River Valley, the Welwitschia Flats, all the areas to the south of the Khan River and the Namib Naukluft area which were located within the VE of the major mining modifications.
18	UNDISTURBED FOREGROUND	The remaining undisturbed areas not falling within the two kilometre visual envelope of the major mining modifications but located within the six kilometre visual envelope of the major mining modifications.
19	UNDISTURBED HIGH EXPOSURE	The remaining undisturbed areas falling within the two kilometre visual envelope of the major mining modifications, excluding areas located within the six kilometre visual envelope of the major mining modifications.

7.2 CLASS I

Class I is assigned to those areas where a ***management or specialist decision*** has been made to maintain a natural landscape. As a result of the significance of the landscape character and its current and potential tourist destination status, the Khan River, the area south of the River and the Khan River mountains are all classified as Class 1 and will not be modified with regard to the visual envelope of the Rössing landscape modifications. With reference to the regional landscape characterisation, the desert and the features of the desert have very high landscape character and

are significant. As such all desert related areas must be treated as a Class 1. *(See Physiographic Rating Units Map in Plate 21)*

ID	PHYSIOGRAPHIC AREA	MOTIVATION
17	UNDISTURBED	The features included in this category are all regionally significant in terms of defining the sense of place of the region and create a high level of landscape character which is vital for the sustainability of the Erongo tourism economy.

7.3 CLASS II, III & IV ASSIGNMENT TABLE

PHYSIOGRAPHIC AREA			LANDFORM	VEGETATION	WATER	COLOUR	ADJ SCENERY	SCARCITY	CULT MOD.	TOTAL	SCENIC	TYPE OF USER	AMOUNT OF USE	PUBLIC INT	ADJ LANDUSERS	SPECIAL AREAS	SENSITIVITY		VISUAL INVENTORY	VRM MANAGEMENT
T1	AIRPORT		0	0	0	1	5	1	-3	4	C	H	H	H	L	L	M	FG	IV	
2	BORROW PITS		2	0	0	3	5	5	-1	14	B	L	L	H	H	L	M	SS	IV	
3	BORROW PITS	HIGH EXPOSURE	2	0	0	3	5	5	-1	14	B	L	L	L	M	L	L	SS	IV	
4	E-CAMP	HIGH EXPOSURE	3	1	0	2	5	4	2	17	B	M	M	H	L	H	H	FG	II	
5	MINING RELATED	HIGH EXPOSURE	2	0	1	0	3	0	-2	4	C	L	L	L	L	L	L	SS	IV	
6	NAMWATER		0	0	0	0	4	3	-5	2	C	H	H	H	M	L	H	FG	III	
7	NATIONAL ROAD		1	0	0	3	5	2	0	11	C	H	H	H	L	H	H	FG	III	
8	PIT		0	0	0	1	2	0	-5	-2	C	L	L	L	L	L	L	SS	IV	
9	PROCESSING		0	0	0	0	5	0	-5	0	C	L	L	L	L	L	L	FG	IV	
10	QUARRY	HIGH EXPOSURE	2	0	0	2	5	3	-3	9	C	M	M	L	L	H	M	FG	IV	
11	ROCK DUMPS		3	0	0	2	5	0	-3	7	C	H	L	H	H	L	M	FG	IV	
12	ROSSING ROAD		3	0	0	4	5	2	0	14	B	M	M	H	L	M	M	FG	III	
13	ROSSING ROAD	HIGH EXPOSURE	3	0	0	4	5	2	0	14	B	M	M	L	L	M	M	FG	III	
14	SEWAGE PLANT	HIGH EXPOSURE	2	2	0	2	3	2	0	11	C	M	M	H	L	L	M	FG	IV	
15	TAILINGS DAM	HIGH EXPOSURE	3	0	0	2	5	0	-4	6	C	H	H	H	L	H	H	FG	III	
16	TAILINGS DAM		3	0	0	2	5	0	-4	6	C	L	L	L	L	L	L	FG	IV	
17	UNDISTURBED									0									I	
18	UNDISTURBED	FOREGROUND	5	0	0	5	5	5	0	20	A	L	L	H	H	H	H	FG	II	I
19	UNDISTURBED	HIGH EXPOSURE	5	0	0	5	5	5	-2	18	B	L	L	M	H	M	M	FG	III	IV / I

(See Physiographic Rating Units Map in Plate 21)

7.4 VRM CLASSES

As a result of the significant sense of place in these areas nine changes were made to areas in PRU 18 and 19. The motivations for the changes are indicated on the table below per map reference. *(See Visual Resource Management Map in Plate 22)*

MAP REFERENCE	PHYSIOGRAPHIC RATING UNIT	VISUAL INVENTORY CLASS	VISUAL RESOURCE MANAGEMENT CLASS	MOTIVATION
1	18	II	I	Potential for significant desert sense of place due to the remoteness and the fact that it falls within the outer extremities of the major mine modifications.
2	18	II	I	As for 1
3	18	II	I	As for 1
4	19	III	IV	Its location is within the Rössing defined 'highly disturbed' areas where there are very high levels of exposure to the major mining modifications.
5	19	III	IV	As for 4
6	19	III	I	As for 1
7	19	III	IV	As for 4
8	19	III	IV	As for 4
9	19	III	I	As for 1

7.5 SITE SENSE OF LIMITS

The site sense of limits assesses each physiographic rating unit in terms its VRM Class limitations.

ITEM	RECOMMENDATIONS	
Regional sense of place *(See Plate 4)*	*Advantages and Limitations*	The accumulative impacts of uncontrolled mining in the Erongo region have the potential to radically alter the desert sense of place which is a significant component in maintaining a sustainable tourist economy in the region. The advantages are that to date, due to the isolation and contained VE's of the existing mining activities, the exposure to significant receptors has been limited and the desert sense of place stills remains.
	Recommendations	• In order to reduce the accumulative impacts of the mines in the Erongo region and changing the perceived desert sense of place in terms of the tourist market, every effort needs to be undertaken to portray to the outside observers that proactive action is being undertaken to contain the resultant visual impacts and localise the mine Visual Envelope (VE). • A regional VRM plan needs to be compiled for the Namibian desert areas identifying heritage landscapes that define the

		significant sense of place, so necessary to the Namibian tourist industry which is based on the 'Namibia' concept - "***land of open spaces***".
Open Pit *(See Plate 10)*	*Advantages and Limitations*	As a component of the Closure Plan, it is recommended that a berm is constructed to restrict access to the Pit. The advantage is that receptor exposure is limited and the area near the Pit is highly transformed. However, if located in unmodified areas this feature will create high levels of contrast and detract from the sense of place.
	Recommendations	• The berm should meander in a natural manner in both a horizontal and vertical form. • It is recommended that a suitably qualified landscape architect is incorporated to assist in the design of the landform to ensure that levels of contrast are limited.
Waste and Low Grade Rock Dumps *(See Plate 11)*	*Advantages and Limitations*	The linear and colour elements of the rock dumps create high levels of contrast and the size and scale generate a very large VE. If not adequately managed and designed, taking the potential visual limitations into consideration as seen from significant receptors, these landscape modifications have the potential to radically transform the local sense of place. The similar form and texture of these elements to the surrounding mountainous features is an advantage. As such, potential exists to create long term landforms that will blend with the surrounding mountain landscapes. A further limitation is that the rock dumps have become very large in size and scale and are currently encroaching into the Marelite Khan Mountain features. These significant regional landscape features are an important component of the desert sense of place.
	Recommendations	• It is recommended that no further dumping take place in close proximity to mountain features indicated on the map due to the prominence and exposure. • It is recommended that a study is undertaken to create and model design strategies that can be incorporated into the existing dumping strategy to start working towards a final rock dump landform that replicates the surrounding mountain forms thus creating the potential that over a long period of time these features will weather into natural looking mountain forms, lines and colours.
Processing Plant and Structures *(See Plate 12)*	*Advantages and Limitations*	The Processing Plant and Structures are of a very industrial nature. The current advantage associated with this feature is that it has a contained VE, due to the Berning Range and the Tailings Dam, with regard to significant receptors to the north. Should future modifications protrude above the screening features mentioned the potential exists for high levels of contrast to be created which could radically alter the desert sense of place at a local level.

	Recommendations	• It is recommended that future modifications at the processing plant are designed so that they do not protrude above the existing screening provided by the Berning Range and the Tailings Dam (see Tailings Dam limitations with this regard).
Tailings Dam and Associated infrastructure *(See Plate 13)*	*Advantages and Limitations*	The Tailings Dam is a major man made feature and falls within the VE of the B2 National Road. The B2 has been identified in this study as a significant view corridor due to the tourist related traffic that makes use of this access route between the interior and coastal areas. The advantage is that to date visual impacts associated with the Tailings Dam are limited as a result of: • the gentle undulations of the road, • the slightly elevated ground to the south which partially screens the Tailings Dam, • the desert related colouration of the Tailings particles which have been exposed to an oxidisation process that changes the colour of the particles • the horizontal form of the Tailings Dam which has similar lines to the horizon line as seen from the B2 • the Tailings Dam does not protrude much above this horizon line. There are several limitations associated with this feature. The first relates to the associated infrastructure positioned on top of the Dam which as a result of their large, vertical and rectangular forms break the skyline and create high levels of contrast as seen from the B2. These features draw attention to the Tailings Dam which changes the sense of place. The other limitation is the diagonal line created by the benching process. Strong diagonal lines as a result of a series of benches adjacent to each other create high levels of contrast to the dominant horizontal lines of the horizon as seen from the B2. The final limitation relates to the closure plan which states that the Tailings Dam must be covered by a rock layer. The colour of the rock is dissimilar to that of the surrounding desert and will create high levels of contrast and will change the local sense of place.
	Recommendations	• It is recommended that the height of the Tailings Dam does not exceed its current height as any further expansion in height will result in the Tailings Dam protruding above the skyline as seen from the B2 and creating higher levels of contrast. • It is recommended that further expansion be laterally and in a southerly direction outside of the B2 Visual Envelope. • The Benching at the north-west corner of the Tailings Dam creates strong diagonal lines as seen from the B2 receptors travelling west. It is recommended that benching is implemented so as to break up the strong diagonal line. The benches in this area should not be uniformly spaced.

		• To reduce the contrast created by the lighter and more reflective rock fragments that will cover the Tailings Dam at closure, it is recommended that the rock coverings in the VE of the B2 be coloured a darker brown (refer to Khan River recommendations for more detail).
Borrow Pits *(See Plate 14)*	Limitation	The southern Borrow Pits are very close to a main drainage gorge. The advantage of these areas is that they have very low levels of receptor exposure and the nature of the impact is such that they can be rehabilitated. As a limitation these areas do not have high levels of exposure due to their low elevation and as such have a significant desert sense of place. The mining of alluvial sands in these areas increases the mine VE and footprint.
	Recommendations	• It is recommended that mining of alluvial sands takes place in areas away from major gorges in close proximity to the Khan River as these areas, after closure, have the potential to retain a significant sense of place.
NamWater Reservoir and pipes. *(See Plate 16)*	Limitation	The NamWater Reservoir falls in close proximity to the B2 National Road and as a result of the highly reflective colour and rectangular forms, the reservoir creates high levels of contrast which draws attention to the mining activities to the south and significantly alters the open desert sense of place. Although this reservoir does not fall under Rössing management, it is Rössing related in that it supplies water to the mine. It is also important to notice that the perception from B2 receptors is that it is Rössing related and the resultant high levels of contrast created by this feature are attributed to the Rössing mine. In this light it is to the advantage of RUL to undertake mitigations, which if undertaken would suitability reduce the level of contrast to the advantage of the mine.
	Recommendations	• It is recommended that the reservoir is painted a desert related colour making use of an earthcote type paint which is not reflective. • It is also recommended that a screening berm is created around the structure to break up the massing of the reservoir. • In order to ensure that the berm is natural looking in its surrounding, it is recommended that a suitably qualified landscape architect is utilised to assist in the design of this feature.
E.Camp	Limitation	The E-Camp is in close proximity to the Rössing Road and the white colour of the structures creates high levels of contrast in vistas which have significant landscape character. The advantage would be that the bulk of the structures are screened due to the undulating terrain. By changing the colour of the structures, the desert sense of place will remain undisturbed and add to the perception that Rössing is placing emphasis on containing the visual envelope of the mining and related activities.
	Recommen	• It is recommended that the structures are painted in brown

	dations	desert colours that are non-reflective in texture.
Khan River *(See Plates 6 & 19)*	Limitation	The dumping of waste rock into the Dome gorge in close proximity to the Khan River is a limitation in that public access up the Khan River is not restricted and as such tourist related receptors are highly exposed to the man made forms, colour and lines of the rock dumps in an area that has very high levels of landscape character. The areas in the river where receptors are exposed do significantly alter the sense of place. The significance of the visual impact is heightened in that there is a perception to north travelling receptors that the river has been completely blocked up by the rock dump. The advantages relate to the isolation of the Khan River in that low numbers of receptors currently make use of the area. In terms of visual elements, the alluvial form and texture are similar to natural scree slopes found in the Khan River. Another limitation in terms of prospecting is the accumulative damage to the wilderness sense of place.
	Recommendations	• It is recommended that a study be undertaken to identify management actions that can be implemented to reduce the levels of contrast created by the artificial landscape modifications that intrude into this nature related wilderness area. The study must specifically address: o the reshaping of the flat horizontal line at the crest of the dump into a more natural line and form, o the uniformity of the rock dump texture in relation to the variation in natural scree slope texture found in the valley, o the mono-colour of the dumped rock in relation to the variation in the colour of the desert rock surrounding the site. In this regard it is vital to recognise that the desert colours do not comprise of a single colour but a range of brown colours all with the same hue. • It is recommended that once the study is completed, the defined management actions must then be tested in a pilot study to ensure successful outcomes which are adequately documented. The adequate implementation of the management actions will inform the colouring strategy of rocks on the Tailings Dam. • The reservoir at the base of the rock dump needs to be screened with dry packed rocks found at the source. • The old road cutting to the side of the rock needs to be rehabilitated to reduce the levels of contrast created by the cutting. It is recommended that the rehabilitation of this feature is used as a pilot study. • The pump houses located in the river need to be dry packed with rock found at source. • The old dam walls in the river valley need to be reshaped into natural forms.

		• The successful implementation of these management actions would increase the perception of Rössing Mine's emphasis on containing the VE of the mine.
Berning Range and other mountain features	Limitation	The Berning Range and other prominent mountain features have significant landscape character at a regional level and are a major component of the surrounding desert sense of place. The advantage is that to date limited landscape modifications have taken place on these features.
	Recommendations	• The Berning Range in particular is very close to the Rössing Road and is a major feature in the perception by receptors that the Rössing Mine is containing the VE. In this regard it is recommended that no further modifications take place on or adjacent to the southern side of the mountain.
Infrastructure in significant Desert scapes	Limitation	The location of power lines and aerial masts create high levels of contrast in the desertscape and have the potential to significantly alter the wilderness sense of place.
	Recommendations	• New infrastructure is located in close proximity to existing infrastructure so as to contain the modification VE.

8 CONTRAST RATING

VRM Africa was tasked with undertaking a Visual Impact Assessment of the Rössing Expansion Projects which includes the following components:

- Acid plant and related handling, storage and transport of sulphur feedstock,
- Radiometric ore sorter plant,
- SK4 ore body

The following steps will be carried out for each of the above in the Contrast Rating Process.

1. Obtain a detailed project description.
2. Define the site landscape character
3. Identify the VE for the proposed landscape modification and significant receptors that fall within this area.
4. Define the VRM Classes for the site and identify VRM Class Objectives. This would involve the measuring of the Degree of Contrast that the proposed landscape modifications would create to the existing landscape and would include a motivation. (See Methodology for further details)
5. Identify whether or not the VRM Objectives were met.
6. Describe the Impacts and the Nature of the impacts.
7. Make recommendations and mitigations.

8.1 ACID PLANT

8.1.1 SCOPING REPORT

The following project components of the Acid Plant were identified in the Scoping stage which needs to be addressed in the VIA:

- A sulphur burning acid plant to be built at the Rössing mine site;
- The onsite acid storage facilities will be upgraded and utilised to store acid imported and produced;
- Bulk sulphur storage and handling facility will be built at Walvis Bay Harbour as well as at Rössing mine.[22]

In terms of alternatives, the only variation from a visual perspective is a difference in height of the stack. Two stack heights of acid plant were identified:

- Alternative 1, Acid Plant with a 50 metre height stack,
- Alternative 2, Acid Plant with a 75 metre height stack[23]

8.1.2 PROJECT DESCRIPTION

As indicated on *Plate 26*, the nature of the project is industrial and of a large scale. The Acid Plant comprises of:

- The onsite acid storage facilities to store acid,
- acid offloading and rail loading facilities as well as the tank farm at the harbour *(See Plate 26)*
- transport of acid by rail to the Rössing mine site will continue as required;
- The acid offloading facilities at Rössing mine;

[22] *Ninham Shand Proposed Rössing Expansion Project Phase 1: Final Scoping Report. Pg 20*
[23] *Ninham Shand Proposed Rössing Expansion Project Phase 1: Final Scoping Report. Pg x*

- Bulk sulphur storage and handling facility will be built at Walvis Bay Harbour as well as at Rössing mine. There will be a need for specialised rail cars for the transport of sulphur.[24]
- A stack which will either be at 50m or 75m above the ground. Emissions from the stack will be transparent in nature and as such will not create high levels of visual impact. However, it must be noted that for short periods of time, during start-up after the plant has been closed for an annual maintenance program, that dark coloured gas would be emitted from the stack which would increase the potential visual impact during this period.

ELEMENTS	PROJECT DESCRIPTION
FORM	Bold, dominant, 3D, ordered, structured
LINE	Geometric, crisp, straight, complex (verticals, horizontals and diagonals)
COLOUR	Monotone, light, reflective
TEXTURE	Smooth, metallic

- The following terms are defined in Appendix 2 to help define Form, Line, Colour, and Texture.

8.1.3 SITE SPECIFIC LANDSCAPE CHARACTERISATION

The only site proposed for the Acid Plant is located to the north of the existing Processing Plant adjacent to the old Acid Plant. Topographically the site is contained in a shallow valley running in a north-south direction between the Berning Range to the north and the Dome area to the south *(See Locality Map on Plate 23 & Topographical Map on Plate 24).* The valley drains to the south. The current land use for the site is a storage depo for the mine and has been significantly modified *(See Aerial Photograph Map in Plate 26).* The scoping report describes the site as "the severely changed nature of the area, within the transformed, brownfield mine processing precinct, means that there is no lost opportunity from an environmental perspective".[25] The VRM class rating undertaken in the landscape characterisation study classified the area as Class IV which is suitable for high levels of modification *(See VRM Classes Map on Plate 25).*

ELEMENTS	SITE DESCRIPTION
FORM	Simple, horizontal, flat and undulating
LINE	Horizontal predominating, wavy line of horizon, many indistinct verticals of poles
COLOUR	Monochromatic ochres and greys
TEXTURE	Mostly smooth, some sporadic mottling in the background

- The following terms are defined in Appendix 2 to help define Form, Line, Colour, and Texture.

8.1.4 RECEPTORS

To determine the receptors which will potentially view the proposed landscape modifications and evaluate the level of exposure to the site, a VE was generated for the project alternatives. As indicated on the VEM for Alternative 1, the VE covers several kilometres and is described as High. *(See Visual Envelope of Alternatives 1 in Plate 26).* The B2 National Road, the Rössing Road and the Welwitschia Flats / Namib Naukluft areas fall, to a small extent, within the VE for this alternative. The B2 and the Welwitschia Flats / Namib Naukluft areas have been identified in the landscape characterisation study as significant view corridors with significant landscape character and as such the visual sensitivities of the receptors are defined as High. The Rössing Road is a private road which only leads to the mine and as such the sensitivities of receptors making use of the road would be low due to their expectation of mine related landscapes. The employees of the mine will also be exposed to the proposed plant. As a result of the close proximity and similar visual sensitivities of the Rössing Road receptors and the Rössing employees, the two receptors are rated as a single entity and mitigations take both points of view into consideration.

[24] *Ninham Shand Proposed Rössing Expansion Project Phase 1: Final Scoping Report. Pg 20*
[25] *Ninham Shand Proposed Rössing Expansion Project Phase 1: Final Scoping Report. Pg 42*

The VEM for Alternative 2 is much greater as a result of the increase in height of the stack by 25 metres which protrudes above the surrounding topographic features. *(See Visual Envelope Map of Alternative 2 in Plate 26).* The VE covers several square kilometres and is described as High. The B2 National Road, the Rössing Road and the Welwitschia Flats / Namib Naukluft areas fall, to a small extent, within the VE for this alternative. As with Alternative 1, the specific visual sensitivities would be the same and Rössing Road and Rössing employees will be assessed as a single entity.

8.1.5 SULPHUR HANDLING AND STORAGE FACILITIES IN THE PORT OF WALVIS BAY

As a component of the project, sulphur storage facilities will be constructed at Walvis Bay harbour. The location within the harbour complex has been indicated by NamPort as the area landwards of the Grindrod. *(See Aerial Photograph Map on Plate 27).* Limited bulk handling facility and the storage housing will be enclosed. Dry sulphur will be stockpiled in this storage area in preparation for railing to the mine.[26]

A site visit was undertaken and photographs taken from residential receptors located in close proximity to the proposed storage site *(See Photograph Survey in Plate 27).* During the site visit it was determined that although the receptors would have high levels of visual exposure to the proposed site, the significance of the visual impact would be low due to the existing harbour infrastructure surrounding the site which are typically Class IV in nature and create high VAC levels *(See Aerial Photograph Map on Plate 27).* Should the proposed structure be of a similar scale, form, colour and line to the surrounding warehouse type structures, the level of visual impact would be low and no further investigation into visual impact would need to take place.

8.1.6 ACID PLANT – ALTERNATIVE 1 CONTRAST RATING

8.1.6.1 KEY OBSERVATION POINT – B2 NATIONAL ROAD

TYPE OF OBSERVATION POINT	*National Road and View Corridor*
SITE CLASS	*Class IV*
MANAGEMENT OBJECTIVE LEVEL OF CONTRAST	*Weak*
RECEPTOR SENSITIVITY	*High*
Motivation The B2 has been identified as a significant tourist view corridor and as such receptor sensitivities will be High. Although the distance from the receptor to the proposed landscape modification is just within the Foreground distance, the alien vertical line breaking the skyline has the potential to create high levels of contrast. Although no dark smoke will be emitted during operations, there are periods (at start-up, after shut-down for maintenance) where darker plumes of smoke would be visible for a short period of time. In this regard it is important that the point source of the smoke is screened as the two factors in conjunction would create high levels of contrast for that period of time. The height of the stack would require that an aircraft warning light be displayed at night. It is recommended that this point source of light be screened from significant receptors.	

[26] Ninham Shand Proposed Rössing Expansion Project Phase 1: Final Scoping Report. Pg 42

DEGREE OF CONTRAST		LAND/WATER				VEGETATION				STRUCTURES			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				✓				✓				✓
	LINE				✓				✓			✓	
	COLOUR				✓				✓			✓	
	TEXTURE				✓				✓				✓

PREDICTED LEVEL OF CONTRAST	*Weak*
CONFIDENCE LEVEL	*The confidence level for the VE is High. The confidence for the impact is Moderate as no specific design was supplied for the study and the visual impacts were based on assumptions made from images provided of similar Acid Plants. (See Photograph examples Plate 26)*
MANAGEMENT OBJECTIVES MET?	*Yes with mitigation*

Motivation

As a result of the distance from the B2, the limited extent to which the stack would protrude above the topographic screening elements, and the limited extent to which the B2 receptors are exposed to the stack, the predicted visual impact would be weak. Specific mitigations would be required with regard to the colour, lighting.

8.1.6.2 KEY OBSERVATION POINT – ROSSING ROAD

TYPE OF OBSERVATION POINT	*Private Road*
SITE CLASS	*Class IV*
MANAGEMENT OBJECTIVE LEVEL OF CONTRAST	*Strong*
RECEPTOR SENSITIVITY	*Moderate to Low*

Motivation

The Rössing Road is a private road which only goes to the Rössing Mine and as such traffic is predominately related to Rössing personnel or tourists who are going specifically to visit the mine. In both cases the perception of the receptors is related to the expectation of a highly modified environment.

DEGREE OF CONTRAST		LAND/WATER				VEGETATION				STRUCTURES			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				✓				✓		✓		
	LINE				✓				✓	✓			
	COLOUR				✓				✓		✓		
	TEXTURE				✓				✓		✓		

PREDICTED LEVEL OF CONTRAST	*Moderate to Strong*
CONFIDENCE LEVEL	*As for the B2*
MANAGEMENT OBJECTIVES MET?	*Yes with mitigation*

Motivation
The Acid Plant will be viewed with the existing, highly modified environment of the Processing Plant as a backdrop. This is a typical of Class IV environment, and as such the VAC is high. As a result of the topographic screening by the Berning Range, views of the Acid Plant would be limited to the high exposure areas. General mitigations would be required with regard to the colour.

8.1.6.3 KEY OBSERVATION POINT – NAMIB NAUKLUFT / WELWITSCHIA FLATS

TYPE OF OBSERVATION POINT	*National Park and desert wilderness area*
SITE CLASS	*Class IV*
MANAGEMENT OBJECTIVE LEVEL OF CONTRAST	*Weak*
RECEPTOR SENSITIVITY	*High*

Motivation
The Namib Naukluft and Welwitschia Flat areas are wilderness areas which have very high levels of landscape character and significant desert sense of place. Although the isolation of these areas does limit the number of receptors entering the area, those that do visit are tourist related and as such the sensitivity levels would be High. In this regard, levels of contrast to the existing landscape should be Weak.

DEGREE OF CONTRAST		LAND/WATER				VEGETATION				STRUCTURES			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				✓				✓				✓
	LINE				✓				✓			✓	
	COLOUR				✓				✓			✓	
	TEXTURE				✓				✓				✓

PREDICTED LEVEL OF CONTRAST	*Weak*
CONFIDENCE LEVEL	*Low – A site visit to this area was not undertaken*
MANAGEMENT OBJECTIVES MET?	*Yes with Mitigation*

Motivation
As a result of the distance from the proposed landscape modification, the limited extent to which the stack would protrude above the topographic screening of the Dome area the management objectives would be met. Increased VAC would be created by the existing landscape modifications (e.g. existing lights at night). Specific mitigations would be required with regard to the colour and lighting.

8.1.7 ACID PLANT – ALTERNATIVE 2 CONTRAST RATING

8.1.7.1 KEY OBSERVATION POINT – B2 NATIONAL ROAD

TYPE OF OBSERVATION POINT	*National Road and View Corridor*
SITE CLASS	*Class IV*
MANAGEMENT OBJECTIVE LEVEL OF CONTRAST	*Weak*
RECEPTOR SENSITIVITY	*High*
Motivation As for Alternative 1	

DEGREE OF CONTRAST		LAND/WATER				VEGETATION				STRUCTURES			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				✓				✓				✓
	LINE				✓				✓	✓			
	COLOUR				✓				✓		✓		
	TEXTURE				✓				✓				✓

PREDICTED LEVEL OF CONTRAST	*Moderate to Strong*
CONFIDENCE LEVEL	*The confidence level for the VE is High even though the distance from the B2 to the site reduces the accuracy of the VE generated from the terrain model, the level of coverage indicates that it is highly probable that the B2 will be included in the VE generated from the 75 metre stack. The confidence for the impact is Moderate as no specific design was supplied for the study and the visual impacts were based on assumptions made from images provided of similar Acid Plants.*
MANAGEMENT OBJECTIVES MET?	*No*
Motivation The protrusion of the strong vertical line above the horizon line created by the stack would generate high levels of contrast. This would be further exacerbated during the periods where darker smoke would be emitted re-emphasising the focal point. These factors are associated with an industrial site and are alien to the surrounding desert sense of place.	

8.1.7.2 KEY OBSERVATION POINT – ROSSING ROAD

TYPE OF OBSERVATION POINT	*Private Road*
SITE CLASS	*Class IV*
MANAGEMENT OBJECTIVE LEVEL OF CONTRAST	*Strong*
RECEPTOR SENSITIVITY	*Moderate to Low*
Motivation As for Alternative 1	

DEGREE OF CONTRAST		LAND/WATER				VEGETATION				STRUCTURES			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				✓				✓		✓		
	LINE				✓				✓	✓			
	COLOUR				✓				✓		✓		
	TEXTURE				✓				✓		✓		

PREDICTED LEVEL OF CONTRAST	*Moderate to Strong*
CONFIDENCE LEVEL	*As for B2*
MANAGEMENT OBJECTIVES MET?	*Yes with mitigation*
Motivation As for Alternative 1	

8.1.7.3 KEY OBSERVATION POINT – NAMIB NAUKLUFT / WELWITSCHIA FLATS

TYPE OF OBSERVATION POINT	*National Park and desert wilderness area*
SITE CLASS	*Class IV*
MANAGEMENT OBJECTIVE LEVEL OF CONTRAST	*Weak*
RECEPTOR SENSITIVITY	*High*
Motivation The Namib Naukluft and Welwitschia Flats are wilderness areas which have very high levels of landscape character and a significant desert sense of place. Although the isolation of these areas does limit the number of receptors entering the area, those that do enter are tourist related and as such the sensitivity levels would be High. In this regard, levels of contrast to the existing landscape should be Weak.	

DEGREE OF CONTRAST		LAND/WATER				VEGETATION				STRUCTURES			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				✓				✓				✓
	LINE				✓				✓		✓		
	COLOUR				✓				✓			✓	
	TEXTURE				✓				✓				✓

PREDICTED LEVEL OF CONTRAST	*Weak*
CONFIDENCE LEVEL	*Low – A site visit to this area was not undertaken*
MANAGEMENT OBJECTIVES MET?	*No*
Motivation The 75 metre stack would probably protrude above the skyline and the vertical line would create moderate levels of contrast and draw attention of the receptors.	

8.1.8 DESCRIPTION OF IMPACTS

(See detailed tables on page 12 for detailed definitions of Visual Impact Criteria)

Visibility of the project	*(ALT 1) Mod.- Low*	The geographic area from which the project will be visible, or view catchment area is limited to the existing Processing Plant VE and exposure to receptors is limited.
	(ALT 2) High	The geographic area from which the project will be visible, or view catchment area extends the Processing Plant VE and increases exposure to the B2 receptors.
Visual exposure	*(ALT 1) Low*	As a result of topographic screening to the north, exposure to significant receptors is limited.
	(ALT 2) Mod.- High	As a result of the stack protruding above the topographic screening to the north, exposure to significant receptors is Moderate to High.
Visual sensitivity of the area	*Moderate - High*	The desert areas outside the VE of the major mining modifications have high levels of landscape character. The rating is moderated by the highly modified landscape of the mining activities.
Visual sensitivity of Receptors	*High*	The B2 was defined in the study as a significant tourist view corridor.
Visual absorption capacity (VAC)	*Moderate*	The rugged terrain and the high levels of modifications that have taken place increase the VAC. However, the stark desert landscapes with strong horizontal lines reduces the VAC.
Visual intrusion	*(ALT 1) Mod.- Low*	The visual intrusion of Alternative 1 is low due to the contained VE and the high VAC of the Processing Plant.
	(ALT 2) High	The visual intrusion of Alternative 2 is high due to the VE exposed to significant receptors where the VAC is low. Due to the height of the proposed landscape modification, the potential to mitigate is limited.

Source: Oberholzer, B. 2005. Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town. Pg 27

(See detailed tables on page 12 for detailed definitions of Visual Impact Criteria)

DEFINITION	RATING	MOTIVATION
Nature of the impact	*POSITIVE*	• The Rössing Mine is currently a significant contributor to the regional economy and the expansion projects would increase the life of the mine. • Both short and long term employment opportunities would be created by the REP which would benefit the local and regional economy.
	NEGATIVE	• The B2 and Welwitschia Flats both have significant landscape character and are tourist related. • The protrusion of the 75 metre stack does detract from the local sense of place.
Extent	*NATIONAL*	As a result of the storage facilities located at Walvis Bay, the spatial or geographic area of influence of the visual impact relates to a national context.
Duration	*MEDIUM TERM*	The predicted life-span of the visual impact is medium term
Intensity	*(ALT 1) MODERATE*	The significance of visual impacts associated with this landscape modification would be Low as a result of distance from the B2, the limited extent to which the stack would protrude above the

		topographic screening elements, the limited extent to which the B2 receptors are exposed to the stack and the high VAC created by the highly transformed Processing Plant landscape character. The visual impact of the 50 metre stack would also influence the sense of place at the Processing Plant as to date the landscape modifications are low in form and mainly horizontal in line. With the removal of all associated structures at closure, the intensity of the long term visual will be Low.
	(ALT 2) HIGH	The protrusion of the stack above the skyline which creates a vertical line in a strong horizontal desert landscape, coupled with an extensive VE which includes significant receptors are factors which increase the significance of the visual impact. The distance from the tourist related receptors to the source of impact (the top 25 metres of the stack) do reduce the level of significance. The visual impact of the 75 metre stack would also influence the sense of place at the Processing Plant as to date the landscape modifications are low in form and mainly horizontal in line. With the removal of all associated structures at closure, the intensity of the long term visual will be Low.
Probability	*DEFINITE*	The probability of the visual impact occurring is definite as the impact will occur regardless of any prevention measures.
Significance	*(ALT 1) LOW*	The visual impacts associated with the Acid Plant should not influence the decision.
	(ALT 2) HIGH	The visual impacts associated with the Acid Plant should influence the decision regardless of any possible mitigation.
Confidence Levels	*Moderate*	*The confidence for the definition of impact is reduced as no specific design was supplied for the study and the visual impacts were based on assumptions made from images provided of similar Acid Plants.*

Source: Oberholzer, B. 2005. Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town. Pg 28

8.1.9 MITIGATIONS

AVOIDENCE

It is recommended that the 75 metre stack be avoided as the introduction of this element will create high levels of contrast to the surrounding significant receptors as well as to the mining area. The current perception of Rössing is that the visual impacts associated with the mining activities have and are being contained. The height of the stack will protrude above the surrounding screening topography and will potentially alter the sense of place and exceed the regional sense of limits.

CONSTRUCTION AND OPERATION PHASE

Vegetation

- The site must be evaluated by a suitably qualified botanist for any seeds that may be carried by endemic indigenous plant life on the site for use in generating a seed bank for rehabilitation in post-closure.

Earthworks

- Topsoil, if any not contaminated, should be removed from the site and used for rehabilitation of areas impacted by mining and requiring rehabilitation in terms of the Rössing Closure Document.

Finishes and Textures

- The examples given of the Acid Plant are of highly reflective materials. It is recommended that the plant is painted in colours more suited to the surrounding desert landscape so as to create the perception that Rössing is emphasising the contained VE policy. The highly reflective material of the plant would also create a high level of reflectivity and increase the glare factor. It is recommended that the stack is painted a light grey colour.

Lighting

- The stack as a result of its height will need to take aircraft warning lighting into consideration. All other lighting must be kept to an efficient minimum while still keeping within the safety norms described by Rössing. It is recommended that lighting be used for aircraft warning as opposed to painting the stack in a bright colour.

Other

- Dust control measures must be implemented during construction to ensure that excessive levels of dust are not generated.
- Litter is to be strictly controlled.

CLOSURE

- All components of the plant must be removed in accordance with the Rössing Closure recommendations.
- The ground where the plant was located must be decontaminated and then landscaped into a natural form in alignment with the natural hydrological patterns.
- It is vital that an endemic indigenous seed bank be introduced to protect the topsoil from wind erosion and facilitate long term rehabilitation of local vegetation. In this regard, topsoil must be sourced and located over the site and a vegetation rehabilitation programme implemented.
- Adequate measures must be set in place to ensure that erosion from storm water run-off does not take place.
- A monitoring program must be implemented to ensure that the landscaping and rehabilitation mitigations defined for closure are adequately implemented.

POST CLOSURE

- A monitoring program must be implemented to ensure that the landscaping and rehabilitation mitigations defined for closure have been adequately implemented and if not, that they are suitability adjusted to ensure successful post closure visual objectives.

8.2 ORE SORTER

8.2.1 PROJECT DESCRIPTION

The following alternatives have been identified during the Scoping stage of the SEIA process, to be taken forward to the next stage for detailed assessment: *(See Plate 28)*

- Radiometric ore sorter plant:
  - Vertical or horizontal arrangement of pre-screening units (vertical arrangement subsequently rejected)
  - Suitable disposal site for reject rock [27]

As indicated in the Scoping document, RUL has in the past undertaken various studies to identify possible sites for the disposal of the reject ore from the proposed radiometric sorting process. The most recent of these studies (Rössing Uranium Ltd, 2005) addressed seven possible locations, as follows:

• Location A ~ The tailings dam;
• Location B ~ Below the southern toe of the tailings dam;
• Location C ~ The valley and areas adjacent to the grit-blasting yard;
• Location D ~ The mine waste dump designated *Waste 5*;
• Location E ~ The upper area of Dome Gorge;
• Location F ~ Northwest of the salvage yard on the slopes of the Berning Range; and
• Location G ~ South of the Seepage Dam access road.

However, certain of these locations are inherently flawed or have significant constraints. This is due to their impacting on the management of the tailings dam and its seepage (Locations A and B), intrude into the exploitation of the SH ore body (areas within Locations D and G), foreclose on possible sites for heap leaching (Location E), or pose infrastructural and visual impacts (Location F). An engineering cost study is underway to determine the most beneficial means of transporting the reject ore, i.e. whether by truck or conveyor. Initial indications are that trucking may be preferable within a distance of 3 kms. The possibility of utilising existing, designated waste rock disposal areas is also being kept as an option. *(Ninham Shand Proposed Rössing Expansion Project Phase 1: Draft Scoping Report).*

With regard to the VIA of this plant, no alternatives in terms of waste rock dumps will be evaluated in this study It is important to note that in the landscape characterisation, the Waste Rock Dumps were identified as a limitation which needs to be addressed holistically. This sentiment is also indicated in the Rössing Closure document. In this regard it is recommended that a specific study be undertaken to address the potentially high visual impact issues that are associated with this landform.

ELEMENTS	DESCRIPTION
FORM	Regular, repetitive, structured, diagonal and horizontal
LINE	Many repetitive, mostly diagonals of conveyors
COLOUR	No reference information provided, possible similarities to the Acid Plant
TEXTURE	No reference information provided, possible similarities to the Acid Plant

- The following terms are defined in Appendix 2 to help define Form, Line, Colour, and Texture.

[27] *Ninham Shand Proposed Rössing Expansion Project Phase 1: Final Scoping Report. Pg x*

8.2.2 SITE SPECIFIC LANDSCAPE CHARACTERISATION

A site for the proposed radiometric ore sorter plant has been identified in the area west of the conveyor running between the existing coarse ore stockpile and the series of crushers and screens where the present pilot ore sorter plant is located. Since the area is within a largely transformed space between the mining operations and the processing plant, and contains various linear utilities, the technical and engineering criteria that informed the choice of site are unlikely to be influenced by environmental concerns. [28] *(See Aerial Photograph Map on Plate 28)*

ELEMENTS	DESCRIPTION
FORM	Flat. Wide. Dominant in foreground. Some small surface undulations. Middle ground variety of structures of geometric forms. Ridgeline in foreground undulating organic.
LINE	Predominantly horizontal due to vast open space in foreground. Middle ground shallow verticals, horizontals and verticals
COLOUR	Monochrome grey ochres. Light chroma, broken by shadows of forms in middle ground.
TEXTURE	Coarse, uneven predominantly in foreground. Smooth surfaces of buildings

- The following terms are defined in Appendix 2 to help define Form, Line, Colour, and Texture.

8.2.3 RECEPTORS

To determine the receptors that will potentially view the proposed landscape modifications and evaluate the level of exposure to the site, a VE was generated for the project. *(See Visual Envelope Map in Plate 28)* The VE for the Ore Sorter was generated at an Offset height of 19.5 metres above ground level which covers several square kilometres and is described as High. Falling within the VE for this alternative are, to the Rössing Road, the Rössing Mine and the Welwitschia Flats / Namib Naukluft areas. The VE does not take into account the height of the Processing Plant and associated structures as such the probability that the receptor making use of the road would view the Ore Sorter as the Processing Plant lies between. The Welwitschia Flats / Namib Naukluft areas have been identified in the landscape characterisation study as significant view corridors with significant landscape character and as such the visual sensitivities of the receptors are defined as High. The Rössing Road is a private road which only leads to the mine. As such sensitivities of receptors making use of the road would be Low due to their expectation of mine related landscapes. The only receptors that will be highly exposed to the proposed landscape modification are the employees of the mine. As a result of their employment status they will have an expectation with regard to viewing major mining activities and landforms and as such their visual sensitivities are defined as Low. *(See Photograph Survey in Plate 28).*

8.2.4 ORE SORTER PLANT – CONTRAST RATING

8.2.4.1 KEY OBSERVATION POINT – ROSSING EMPLOYEES

TYPE OF OBSERVATION POINT	*Private Road*
SITE CLASS	*Class IV*
MANAGEMENT OBJECTIVE LEVEL OF CONTRAST	*Strong*
RECEPTOR SENSITIVITY	*Low*
Motivation The Rössing road is a private road which only goes to the Rössing Mine with receptors predominately related to Rössing personnel or tourists who are specifically going to visit the mine. In both cases the perception of the receptors is related to an expectation of a highly modified environment.	

[28] *Ninham Shand Proposed Rössing Expansion Project Phase 1: Final Scoping Report. Pg 44*

DEGREE OF CONTRAST		LAND/WATER				VEGETATION				STRUCTURES			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM			✓					✓		✓		
	LINE				✓				✓		✓		
	COLOUR				✓				✓	✓			
	TEXTURE				✓				✓	✓			

PREDICTED LEVEL OF CONTRAST	*Moderate to Strong*
CONFIDENCE LEVEL	*High*
MANAGEMENT OBJECTIVES MET?	*Yes with mitigation*

Motivation
The Ore Sorter Plant will be viewed as a visual component of the existing highly modified environment of the Processing Plant as a backdrop typical of a Class IV environment and as such the VAC is high and as the profile of the plant is similar to the other structures and plants at the mine would be readily absorbed. General mitigations would be required with regard to the colour.

8.2.4.2 KEY OBSERVATION POINT – NAMIB NAUKLUFT / WELWITSCHIA FLATS

TYPE OF OBSERVATION POINT	*National Park and desert wilderness area*
SITE CLASS	*Class IV*
MANAGEMENT OBJECTIVE LEVEL OF CONTRAST	*Weak*
RECEPTOR SENSITIVITY	*High*

Motivation
The Namib Naukluft and Welwitschia Flats are wilderness areas which have very high levels of landscape character and significant desert sense of place. Although the isolation of these areas does limit the number of receptors entering the area, those that do enter are tourist related and as such the sensitivity levels would be High. In this regard, levels of contrast to the existing landscape should be Weak.

DEGREE OF CONTRAST		LAND/WATER				VEGETATION				STRUCTURES			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				✓				✓				✓
	LINE				✓				✓			✓	
	COLOUR				✓				✓			✓	
	TEXTURE				✓				✓				✓

PREDICTED LEVEL OF CONTRAST	*Weak*
CONFIDENCE LEVEL	*Low – A site visit to this area was not undertaken*
MANAGEMENT OBJECTIVES MET?	*Yes with Mitigation*

Motivation
The objectives would be met as a result of the distance from the proposed landscape modification, the limited extent to which the plant would protrude above the surrounding topographic screening with the

Tailings Dam as a backdrop as well as the increased VAC created by the existing landscape modifications. Specific mitigations would be required with regard to the colour and lighting.

8.2.5 DESCRIPTION OF IMPACTS
8.2.5.1 ALTERNATIVE 1

(See detailed tables on page 12 for detailed definitions of Visual Impact Criteria)

DEFINITION	RATING	MOTIVATION
Visibility of the project	*Low*	The geographic area from which the project will be visible, or view catchment area is limited to the existing Processing Plant VE and exposure to significant receptors is limited.
Visual exposure	*Low*	As a result of topographic screening to the north, exposure to significant receptors is limited.
Visual sensitivity of the area	*Low*	As a result of the highly transformed environment of the Rössing Mine, the visual sensitivity of the area where the plant is to be located is Low.
Visual sensitivity of Receptors	*High*	The visual impact is limited to Rössing employees and as such the visual sensitivities with regard to the proposed plant would be Low.
Visual absorption capacity (VAC)	*High*	The rugged terrain and the high levels of modifications that have taken place create a high VAC.
Visual intrusion	*Low*	The visual intrusion is low due to the contained VE and the high VAC of the Processing Plant.

Source: Oberholzer, B. 2005. Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town. Pg 27

(See detailed tables on page 12 for detailed definitions of Visual Impact Criteria)

DEFINITION	RATING	MOTIVATION
Nature of the impact	*POSITIVE*	• The Rössing Mine is currently a significant contributor to the regional economy and the expansion projects would increase the life of the mine. • Both short and long term employment opportunities would be created by the REP which would benefit the local and regional economy.
	NEGATIVE	• According to the Rössing Closure Document, the mine has almost reached its capacity for the dumping of waste rock *(Refer to Waste Rock Dumps Limitations).*
Extent	*Local*	The visual impact will be contained to a local level.
Duration	*Medium Term*	The predicted life-span of the visual impact is Medium Term
Intensity	*Low*	The scenic resources of the surrounding area will not be more affected as the existing VE of the mine will not be enlarged. With the removal of all associated structures at closure, the intensity of the long term visual will be further reduced.
Probability	*Definite*	The probability of the visual impact occurring is definite as the impact will occur regardless of any prevention measures.
Significance	*Low*	The visual impacts associated with the Ore Sorter should not influence the decision.
Confidence Levels	*Moderate to Low*	*As a result of a site visit not being undertaken to this area, the confidence levels of the impact definition are reduced.*

Source: Oberholzer, B. 2005. Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town. Pg 28

8.2.6 MITIGATIONS

AVOIDENCE

- Not applicable

CONSTRUCTION AND OPERATION PHASE

Siting and Earthworks

- Topsoil, if any and not contaminated, should be removed from the site and used for rehabilitation of areas impacted by mining and requiring rehabilitation in terms of the Rössing Closure Document.

Finishes and Textures

- It is recommended that the plant is painted in colours more suited to the surrounding desert landscape so as to create the perception that Rössing is emphasising the contained VE policy. If the plant was constructed of a highly reflective material, the high level of reflectivity and increased the glare factor would increase the visual impact.

Lighting

- All other lighting must be kept to an efficient minimum while still keeping within the safety norms described by Rössing.

Other

- Dust control measure must be implemented during construction to ensure that excessive levels of dust are not generated.
- Litter is to be strictly controlled.

CLOSURE

- All components of the plant must be removed in accordance with the Rössing Closure recommendations.
- The ground where the plant was located must be decontaminated and then landscaped into a natural form in alignment with the natural hydrological patterns.
- It is vital that an endemic indigenous seed bank be introduced to site to ensure long term rehabilitation objectives and reduce the further loss of the topsoil from wind erosion. In this regard, topsoil must be sourced and located over the site and a vegetation rehabilitation programme implemented.
- Adequate measures must be set in place to ensure that erosion from storm water run-off does not take place.
- A monitoring program must be implemented to ensure that the landscaping and rehabilitation for closure are adequately implemented.

POST CLOSURE

- A monitoring program must be implemented to ensure that the landscaping and rehabilitation mitigations defined for closure have been adequately implemented and if not, that they are suitability adjusted to ensure successful post closure visual objectives.

8.3 SK4 PIT

8.3.1 PROJECT DESCRIPTION

"The pioneering work required to allow access to the SK4 site would comprise drilling, some minor blasting and the use of heavy earth moving plant. Once suitable road access has been created, excavation will be undertaken to provide a drilling platform. The drilling platform will then allow the initial excavation of two 15 m deep benches and access by loading equipment. The typical open-cast mining sequence of drilling, blasting, loading and haulage will be applied. Various heavy equipment will be put to use on the site, including an excavator and dump trucks, supported by a bulldozer and front-end loader. A water cart for dust suppression and a diesel bowser for refuelling will also be available. Until a safe working area has been established, mining will only occur during daylight. It is envisaged that the SK4 pit will eventually comprise about 10 benches, in an excavation of 600 m in length, 300 m in width and 150 m in depth. In the order of 27 Mt of material is likely to be excavated, of which 75 % is likely to comprise waste. The life of the SK4 ore body mine is anticipated to be approximately three years.

A single haulage road of some 35 m in width is envisaged, accessing the SK4 pit in the southwest corner. This dedicated haulage road will continue to the existing primary crusher which is situated 3,5 km's to the northwest of the SK4 pit. Figure 9 provides a nominal indication of the route of the haul road and it should be noted that the infilling of a drainage line will be necessary to accommodate the road alignment. Although this infilling will result in an intrusion into the landscape, its low elevation and the already transformed nature of the surrounding biophysical environment will be such that the impact of this section of the haul road will not be significant. The material from the SK4 pit will then continue in the ore stream, to be processed in the normal fashion through the existing metallurgical plant.

The waste rock (±20 Mt) derived from the SK4 pit will be accommodated within existing waste dump sites and an area designated as *Waste 7* has been earmarked for this purpose. Although this waste dump site offers sufficient capacity to hold the waste ore from the SK4 pit, the longer term implications of visual intrusion on elevated horizontal lines in the landscape will be considered." *(Ninham Shand Proposed Rössing Expansion Project Phase 1: Final Scoping Report. Pg 33)*

8.3.1.1 ALTERNATIVES

The following alternatives have been identified during the Scoping stage of the SEIA process, to be taken forward to the next stage for detailed assessment: (See *Plate 29).* From a visual perspective they alternatives will not be evaluated based on the following reasons: [29]

- SK4 ore body: The void nature of the Pit which limit visibility, the site specific location of the ore, and the engineer specific methodology required to mine the ore body, dictate that such these factor should not be subject to alternative evaluation. The only relevant visual alternative with regard to the pit is avoidance.
- Haul road design and alignment: As for SK4 Pit.
- Waste disposal: The lack of specific design for the dumping of the waste, and the lack of specific information with regard to the nature of the impact as seen from the Welwitschia Flats, which is the only significant receptor from which to evaluate waste dump alternatives.

ELEMENTS	DESCRIPTION
FORM	Concave, stepped, regular. Strong, dominant, steep
LINE	Regular parallel horizontal
COLOUR	Grey-browns in alternating horizontal strips of light and dark
TEXTURE	Regular, even, medium textures

[29] Ninham Shand Proposed Rössing Expansion Project Phase 1: Final Scoping Report. Pg x

- The following terms are defined in Appendix 2 to help define Form, Line, Colour, and Texture.

8.3.2 SITE SPECIFIC LANDSCAPE CHARACTERISATION

ELEMENTS	DESCRIPTION
FORM	Rugged, strong, undulating, complex. Organic, various sizes from small rocks to large hills.
LINE	Broken, organic, mostly convex.
COLOUR	Grey, browns, middle to dark tones.
TEXTURE	Rough, coarse, uneven.

- The following terms are defined in Appendix 2 to help define Form, Line, Colour, and Texture.

8.3.3 RECEPTORS

To determine the receptors that will potentially view the proposed landscape modifications and evaluate the level of exposure to the site, a VE was generated for the project alternatives *(See Visual Envelope Map in Plate 29).* This is specifically related to the short term views as the nature of the landscape modification is a void and as such the VE would be contained to an extent. Falling within the VE for this alternative are the Rössing Mine and the Welwitschia Flats / Namib Naukluft areas. The Welwitschia Flats / Namib Naukluft areas have been identified in the landscape characterisation study as significant view corridors with significant landscape character and as such the visual sensitivities of the receptors are defined as High. The only receptors that will be highly exposed to the proposed landscape modification are the employees of the mine. As a result of their employment status they will have an expectation with regard to viewing major mining activities and landforms and as such their visual sensitivities are defined as Low. *(See Aerial Photograph Map and Photograph Survey in Plate 29).*

8.3.4 SK4 PIT AND HAUL ROAD RAMP – CONTRAST RATING

8.3.4.1 KEY OBSERVATION POINT – ROSSING EMPLOYEES

TYPE OF OBSERVATION POINT	*Private Road*
SITE CLASS	*Class III*
MANAGEMENT OBJECTIVE LEVEL OF CONTRAST	*Moderate - Strong*
RECEPTOR SENSITIVITY	*Low*
Motivation The perception of the receptors is related to an expectation of a highly modified environment.	

	DEGREE OF CONTRAST	LAND/WATER				VEGETATION				STRUCTURES			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM	✓							✓				✓
	LINE	✓							✓				✓
	COLOUR	✓							✓				✓
	TEXTURE	✓							✓				✓

PREDICTED LEVEL OF	*Strong*

CONTRAST	
CONFIDENCE LEVEL	*High*
MANAGEMENT OBJECTIVES MET?	*Yes with Mitigation*
Motivation Mining landscape expectation by Rössing employees and the isolation of the proposed landscape modifications which limits the exposure to the majority mining employees at the Processing Plant.	

8.3.4.2 KEY OBSERVATION POINT – NAMIB NAUKLUFT / WELWITSCHIA FLATS

TYPE OF OBSERVATION POINT	*National Park and desert wilderness area*
SITE CLASS	*Class IV*
MANAGEMENT OBJECTIVE LEVEL OF CONTRAST	*Weak*
RECEPTOR SENSITIVITY	*High*
Motivation The Namib Naukluft and Welwitschia Flats are wilderness areas which have very high levels of landscape character and significant desert sense of place. Although the isolation of these areas does limit the number of receptors entering the area, those that do enter are tourist related and as such the sensitivity levels would be High. In this regard, levels of contrast to the existing landscape should be Weak.	

DEGREE OF CONTRAST		LAND/WATER				VEGETATION				STRUCTURES			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM		✓						✓				✓
	LINE		✓						✓				✓
	COLOUR			✓					✓				✓
	TEXTURE			✓					✓				✓

PREDICTED LEVEL OF CONTRAST	*Moderate*
CONFIDENCE LEVEL	*Low – A site visit to this area was not undertaken*
MANAGEMENT OBJECTIVES MET?	*Yes with Mitigation*
Motivation As a result of the very limited extent to which the SK4 Pit and the haul road ramp would be visible in the short and long term. However, specific mitigation would require a study into the mining carrying capacity in significant landscape character areas in the Erongo region.	

8.3.5 ROCK DUMPS – CONTRAST RATING

8.3.5.1 KEY OBSERVATION POINT – ROSSING EMPLOYEES

TYPE OF OBSERVATION POINT	*Private Road*
SITE CLASS	*Class IV*
MANAGEMENT OBJECTIVE LEVEL OF CONTRAST	*Strong*
RECEPTOR SENSITIVITY	*Low*
Motivation The perception of the receptors is related to an expectation of a highly modified environment.	

DEGREE OF CONTRAST		LAND/WATER				VEGETATION				STRUCTURES			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM		✓						✓				✓
	LINE			✓					✓				✓
	COLOUR				✓				✓				✓
	TEXTURE				✓				✓				✓

PREDICTED LEVEL OF CONTRAST	*Moderate*
CONFIDENCE LEVEL	*Moderate to Low as a result of the lack of specific design criteria associated for the dumping strategy.*
MANAGEMENT OBJECTIVES MET?	*Yes with mitigation*
Motivation	

8.3.5.2 KEY OBSERVATION POINT – NAMIB NAUKLUFT / WELWITSCHIA FLATS

TYPE OF OBSERVATION POINT	*National Park and desert wilderness area*
SITE CLASS	*Class IV*
MANAGEMENT OBJECTIVE LEVEL OF CONTRAST	*Weak*
RECEPTOR SENSITIVITY	*High*

Motivation

The Namib Naukluft and Welwitschia Flats are wilderness areas which have very high levels of high levels of landscape character and significant desert sense of place. Although the isolation of these areas does limit the number of receptors entering the area, those that do enter are tourist related and as such the sensitivity levels would be High. In this regard, levels of contrast to the existing landscape should be Weak.

DEGREE OF CONTRAST		LAND/WATER				VEGETATION				STRUCTURES			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM		✓						✓				✓
	LINE		✓						✓			✓	
	COLOUR		✓						✓			✓	
	TEXTURE			✓					✓				✓

PREDICTED LEVEL OF CONTRAST	*Moderate*
CONFIDENCE LEVEL	*Low – A site visit to this area was not undertaken*
MANAGEMENT OBJECTIVES MET?	*Yes with Mitigation*

Motivation

Specific mitigations need to be incorporated into the design of the dumping of the waste rock to ensure that the resultant forms and lines do not create high levels of contrast and dominate the landscape as seen from the significant tourist receptors in the west sector of the Welwitschia Flats. Further motivation for this mitigation strategy meeting the management objectives lies in the distance between the landscape modifications and the receptors and the limited number of receptors making use of this area.

8.3.6 DESCRIPTION OF IMPACTS

(See detailed tables on page 12 for detailed definitions of Visual Impact Criteria)

DEFINITION	RATING	MOTIVATION
Visibility of the project	(SK4 Pit and Haul Road) *Low*	The geographic area or view catchment area from which the project will be visible is limited for the SK4 Pit and the Haul Road as a result of the void native of the pit and the location of the haul road across a valley.
	(W7) *High*	The significant factor with regard to this component of the REP is the waste stock pile on W7 which has a VE which covers several square kilometres and as such is defined as High.
Visual exposure	*Moderate to High*	As a result of the isolation of the project, the only significant receptors are located in the western sector of the Welwitschia Flats.
Visual sensitivity of the area	*Moderate to Low*	The SK4 Pit and Haul road are located in areas which are not physically modified but are however highly exposed to the major mine modifications associated with the Rock Dumps and as such the visual sensitivity of the area is reduced. Subsequently the visual sensitivity is reduced to Moderate. The W7 is already a highly modified site and the sensitivity is Low.
Visual sensitivity of Receptors	(SK4 Pit and Haul Road) *Low*	The visual impact is limited to Rössing employees and as such the visual sensitivities with regard to the proposed plant would be Low.
	(W7) *High*	The tourist receptors located in the Welwitschia area would be highly sensitive.
Visual absorption capacity (VAC)	(SK4 Pit and Haul Road) *High*	The rugged terrain and the high levels of modifications that have taken place create a high VAC and reduce the visibility of the Pit and Haul Roads.
	(W7) *Low*	The higher elevation and prominence of the W7 lowers the VAC.
Visual intrusion	(SK4 Pit and Haul Road) *Low*	As a result of the high levels of exposure to the major mining modifications and the isolation of the projects, the proposed landforms, although very large in scale, would result in a Moderate change to the landscape.
	(W7) *Moderate to High*	The significance of the landscape character of the Welwitschia Flats, in combination with the potentially high levels of contrast that could be created by the prominent rock dumps, results in a High level of visual intrusion for this feature.

Source: Oberholzer, B. 2005. Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town. Pg 27

(See detailed tables on page 12 for detailed definitions of Visual Impact Criteria)

DEFINITION	RATING	MOTIVATION
Nature of the impact	*POSITIVE*	• The Rössing Mine is currently a significant contributor to the regional economy and the expansion projects would increase the life of the mine. • Both short and long term employment opportunities would be created by the REP which would benefit the local and regional economy.
	NEGATIVE	• According to the Rössing Closure Document, the mine has almost reached its capacity for the dumping of waste rock

		(refer to Waster Rock Dumps Limitations).
Extent	*Local*	The visual impact will be contained to a local level.
Duration	*Permanent*	The predicted life-span of all the SK4 landscape modifications is permanent.
Intensity	*Moderate to High*	As a result of the low VE of the SK4 Pit and Haul Road the intensity of the impact will be Low. The modifications to W7 do have the potential to impact the surrounding views and scenic resources but are tempered by the isolation of the site and the existing modifications of the site.
Probability	*Definite*	The probability of the visual impact occurring is definite as the impact will occur regardless of any prevention measures.
Significance	*Medium*	Unless mitigated, the impacts associated with the W7 should influence the decision.
Confidence Levels	*Moderate to Low*	*As a result of the lack of specific design criteria associated for the dumping strategy in W7, the confidence level of the impacts is Moderate to Low.*

Source: Oberholzer, B. 2005. Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town. Pg 28

8.3.7 MITIGATIONS – SK4 PIT

AVOIDENCE

- Not applicable

RECOMMENDATIONS

- The recommendations that the proposed landscape modifications associated with the SK4 Pit are suitable must be viewed at a regional context and should ***not*** set a precedent for further large scale mining operations in desert areas of significant landscape character. In this regard, it is recommended that a study into the mining carrying capacity in significant landscape character areas in the Erongo region is undertaken in order to identify criteria for defining which areas are suited to the large scale mining modifications ***without*** threatening the long term tourism industry in the area.

CONSTRUCTION PHASE

Siting and Earthworks

- If available, topsoil should be removed from the site and used for rehabilitation of areas impacted by mining and requiring rehabilitation in terms of the Rössing Closure Document.
- If available, any alluvial sands must be mined from the valley areas in the impact sites prior to construction as this would reduce the necessity of further mining for this resource in more sensitive areas.

Lighting

- All other lighting must be kept to an efficient minimum while still keeping within the safety norms described by Rössing.

Other

- Dust control measure must be implemented during construction to ensure that excessive levels of dust are not generated.
- Litter is to be strictly controlled.

OPERATION

- Dust control measures must be implemented during operation to ensure that excessive levels of dust are not generated.

CLOSURE

- Dust control measures must be implemented during construction to ensure that excessive levels of dust are not generated.
- All components of the infrastructure used during operation must be removed in accordance with the Rössing Closure recommendations.
- A dark sky policy must be maintained.
- It is vital that topsoil and endemic indigenous seed banks be introduced to selected sites in the impact areas to increase the potential of long term re-vegetation.
- A monitoring program must be implemented to ensure that the landscaping and rehabilitation for closure are adequately implemented.

POST CLOSURE

- A monitoring program must be implemented to ensure that the landscaping and rehabilitation mitigations for closure have been adequately implemented.

8.3.8 MITIGATIONS – W7 AND HAUL ROAD

AVOIDENCE

- It is recommended that no further dumping on elevated areas in the W7 take place until the impacts of this landscape modification are assessed as seen from the Welwitschia Flats. The findings of the study need to be taken into account with regard to the long term forms and lines of the dumps as of closure.

RECOMMENDATIONS

- The alignment of the forms and lines of the Rock Dumps to those of the natural geological patterns surrounding the modified areas, has the potential to reduce the long term visual impacts that these features will potentially have on the surrounding landscape character. This visual impact could, as described in the Rössing Closure Plan with regard to waste rock dumping, "result in reputational loss at RUL." *(Pg 252)* In this regard, a study needs to be implemented to determine the most suitable and attainable shape for the dumps to ensure that the permanent impacts of these potentially alien visual elements do not create permanent high levels of contrast and detract from the significant views associated with the Welwitschia Flats area.
- In accordance with the Rössing Closure Plan, selective material must be sourced for final cover placement to ensure visual impact is reduced to a minimum *(Pg 252)*

CONSTRUCTION PHASE

Siting and Earthworks

- Topsoil should be removed from the site and used for rehabilitation of areas impacted by mining and requiring rehabilitation in terms of the Rössing Closure Document.
- If applicable, any alluvial sands must be mined from the valley areas in the impact sites prior to construction as this would reduce the necessity of further mining for this resource in more sensitive areas.

- Dust control measure must be implemented during construction to ensure that excessive levels of dust are not generated.
- All other lighting must be kept to an efficient minimum while still keeping within the safety norms described by Rössing.

Other

- Litter is to be strictly controlled.

OPERATION

- Dust control measures must be implemented during operation to ensure that excessive levels of dust are not generated.
- All other lighting must be kept to an efficient minimum while still keeping within the safety norms described by Rössing.
- Dumping should by preference take place in lower lying already impacted areas outside of the view of significant receptors.
- An annual monitoring program must be implemented to evaluate the implementation of the recommended dumping strategy and, if necessary, to make adjustments to design ensuring that the long term closure objectives for the SK4 Pit are be implemented.

CLOSURE

- Ongoing dust control measures must be implemented to ensure that excessive levels of dust are not generated.
- All components of the infrastructure used during operation must be removed in accordance with the Rössing Closure recommendations.
- A dark sky policy must be maintained.
- It is vital that topsoil and endemic indigenous seed banks be introduced to selected sites in the impact areas to increase the potential of long term re-vegetation.
- All smaller borrow pits or dumps on site must be visually ‘cleaned up’ so as to portray an uncluttered landscape.
- A monitoring program must be implemented to ensure that the landscaping and rehabilitation mitigations have been adequately implemented.

POST CLOSURE

- A monitoring program must be implemented to ensure that the landscaping and rehabilitation mitigations for closure have been adequately implemented.

9 APPENDIX 1 - VISUAL RESOURCE MANAGEMENT (VRM) METHODOLOGY

9.1.1 SCENIC QUALITY RATING QUESTIONNAIRE[30]

KEY FACTORS	RATING CRITERIA AND SCORE		
SCORE	**5**	**3**	**1**
Landform	High vertical relief as expressed in prominent cliffs, spires or massive rock outcrops, or severe surface variation or highly eroded formations including or dune systems: or detail features dominating and exceptionally striking and intriguing.	Steep sided river valleys, or interesting erosion patterns or variety in size and shape of landforms; or detail features that are interesting though not dominant or exceptional.	Low rolling hills, foothills or flat valley bottoms; few or no interesting landscape features.
Vegetation	A variety of vegetative types as expressed in interesting forms, textures and patterns.	Some variety of vegetation, but only one or two major types.	Little or no variety or contrast in vegetation.
Water	Clear and clean appearing, still or cascading white water, any of which are a dominant factor in the landscape.	Flowing, or still, but not dominant in the landscape.	Absent, or present, but not noticeable.
Colour	Rich colour combinations, variety or vivid colour: or pleasing contrasts in the soil, rock, vegetation, water.	Some intensity or variety in colours and contrast of the soil, rock and vegetation, but not a dominant scenic element.	Subtle colour variations contrast or interest: generally mute tones.
Adjacent Scenery	Adjacent scenery greatly enhances visual quality.	Adjacent scenery moderately enhances overall visual quality.	Adjacent scenery has little or no influence on overall visual quality.
Scarcity	One of a kind: unusually memorable, or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing etc…	Distinctive, though somewhat similar to others within the region.	Interesting within its setting, but fairly common within the region.
SCORE	**2**	**0**	**-4**
Cultural Modification	Modifications add favourably to visual variety while promoting visual harmony.	Modifications add little or no visual variety to the area, and introduce no discordant elements.	Modifications add variety but are very discordant and promote strong disharmony.

[30] Bureau of Land Management, U.S. Department of Interior. 2004. Visual Resource Management Manual 8400

9.1.2 SENSITIVITY LEVEL RATING QUESTIONNAIRE

The following VRM questionnaire was completed.

FACTORS	QUESTIONS	
Type of Users	**Maintenance of visual quality is:**	
	A major concern for most users	High
	A moderate concern for most users	Moderate
	A low concern for most users	Low
Amount of use	**Maintenance of visual quality becomes more important as the level of use increases:**	
	A high level of use	High
	Moderately level of use	Moderate
	Low level of use	Low
Public interest	**Maintenance of visual quality:**	
	A major concern for most users	High
	A moderate concern for most users	Moderate
	A low concern for most users	Low
Adjacent land Users	**Maintenance of visual quality to sustain adjacent land use objectives is:**	
	Very important	High
	Moderately important	Moderate
	Slightly important	Low
Special Areas	**Maintenance of visual quality to sustain Special Area management objectives:**	
	Very important	High
	Moderately important	Moderate
	Slightly important	Low

9.1.3 DISTANCE ZONES

Landscapes are subdivided into 4 distance zones based on relative visibility from travel routes or observation points. The 4 zones are:

DISTANCE ZONES	DISTANCE ZONES DEFINITION
Foreground	The foreground (fig) zone includes areas seen from highways, rivers, or other viewing locations that are less than 1 kilometres away.
Middle ground	The middle ground (mg) zone includes areas seen from highways, rivers, or other viewing locations that are greater than 1 kilometre but less than 2 kilometres away.
Background	Seen areas beyond the foreground-middle ground zone greater than 2 kilometres away are in the background (big) zone.
Seldom seen	Areas not seen as foreground-middle ground or background (i.e. hidden from view) are in the seldom-seen (sis) zone

10 APPENDIX 2 - DEFINITIONS AND ACRONYMS [31]

10.1.1 DEFINITIONS

Alternatives
A possible course of action, in place of another, that would meet the same purpose and need defined by the development proposal. Alternatives considered in the EIA process can include location and/or routing alternatives, layout alternatives, process and/or design alternatives, scheduling alternatives or input alternatives.

Best practicable environmental option
This is the option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term.

Environmental impact assessment
A public process that is used to identify, predict and assess the potential positive and negative social, economic and biophysical impacts of a proposed development. EIA includes an evaluation of alternatives, appropriate management actions and monitoring programmes.

Impact (visual)
A description of the effect of an aspect of the development on a specified component of the visual, aesthetic or scenic environment within a defined time and space

Issue (visual)
Issues are concerns related to the proposed development, generally phrased as questions, taking the form “what will the impact of some activity be on some element of the visual, aesthetic or scenic environment?”

Key issue
An issue raised during the scoping process that has not received an adequate response and which requires further investigation before it can be resolved.

Landscape integrity
The relative intactness of the existing landscape or townscape, whether natural, rural or urban, and with an absence of intrusions or discordant structures.

Management actions
Actions that enhance benefits of a proposed development, or avoid, mitigate, restore or compensate for negative impacts.

Mitigation measures See 'management actions'

Pre-application planning
The process of identifying environmental opportunities and constraints, potential fatal flaws and negative impacts, as well as alternatives and management actions in the early stage of the project design, prior to application for environmental authorization.

Receptors
Individuals, groups or communities who will be subject to the visual influence of a particular project.

[31] Oberholzer, B. 2005. Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town. Appendix A

Scenarios
A description of plausible future environmental states that could influence the nature, extent, duration, magnitude/intensity, probability and significance of the impact occurring.

Sense of place
The unique quality or character of a place, whether natural, rural or urban.

Scenic corridor
A linear geographic area that contains scenic resources, usually, but not necessarily, defined by a route. See also *view corridor.*

Scenic route
A linear movement route, usually in the form of a scenic drive, but which could also be a railway, hiking trail, horse-riding trail or 4x4 trail.

Scoping
The process of determining the key issues, and the space and time boundaries to be addressed in an environmental assessment.

10.1.2 ACRONYMS

BPEO Best Practicable Environmental Option
DEA&DP Department of Environmental Affairs and Development Planning
DEAT Department of Environmental Affairs and Tourism
DWAF Department of Water Affairs and Forestry
DTM Digital terrain model
ECO Environmental Control Officer
EIA Environmental impact assessment
EMP Environmental Management Plan
GIS Geographic information system
VAC Visual absorption capacity
VIA Visual impact assessment
VRM Visual resource management
ZVI Zone of visual influence

10.1.3 VRM TERMINOLOGY

The following terms were used in the Contrast Rating Tables to help define Form, Line, Colour, and Texture. The definitions were a combination of Microsoft Word Dictionary and simple description.

FORM	LINE	COLOUR	TEXTURE
Simple	Horizontal		Smooth
Weak	Vertical		Rough
Strong	Geometric		Fine
Dominant	Angular		Coarse
Flat	Acute		Patchy
Rolling	Parallel		Even
Undulating	Curved	Dark	Uneven
Complex	Wavy	Light	Complex
Plateau	Strong	Mottled	Simple
Ridge	Weak		Stark
Valley	Crisp		Clustered
Plain	Feathered		Diffuse
Steep	Indistinct		Dense
Shallow	Clean		Scattered
Organic	Prominent		Sporadic
Structured	Solid		Consistent

Simple	basic, composed of few elements	**Organic**	derived from nature; occurring or developing gradually and naturally
Complex	complicated; made up of many interrelated parts	**Structure**	organised; planned and controlled; with definite shape, form, or pattern
Weak	lacking strength of character	**Regular**	repeatedly occurring in an ordered fashion
Strong	bold, definite, having prominence	**Horizontal**	Parallel to the horizon
Dominant	controlling, influencing the surrounding environment	**Vertical**	Perpendicular to the horizon; upright
Flat	level and horizontal without any slope; even and smooth without any bumps or hollows	**Geometric**	Consisting of straight lines and simple shapes
Rolling	progressive and consistent in form, usually rounded	**Angular**	Sharply defined; used to describe an object identified by angles
Undulating	moving sinuously like waves; wavy in appearance	**Acute**	Less than 90°; used to describe a sharp angle
Plateau	uniformly elevated flat to gently undulating land bounded on one or more sides by steep slopes	**Parallel**	Relating to or being lines, planes, or curved surfaces that are always the same distance apart and therefore never meet
Ridge	a narrow landform typical of a highpoint or apex; a long narrow hilltop or range of hills	**Curved**	Rounded or bending in shape
Valley	low-lying area; a long low area of land, often with a river or stream running through it, that is surrounded by higher ground	**Wavy**	Repeatedly curving forming a series of smooth curves that go in one direction and then another
Terrace	Area of natural ground along the coast; a flat raised strip of beach or ground that has been formed naturally along the coast	**Crisp**	Smooth, firm, and clean with a stiff, uncreased, or unspoilt surface
Plain	A flat expanse of land; fairly flat dry land, usually with few trees	**Feathered**	Layered; consisting of many fine parallel strands
Steep	Sloping sharply often to the extent of being almost vertical	**Indistinct**	Vague; lacking clarity or form
Shallow	Lacking in depth; little space between the bottom and the surface or top	**Clean**	Smooth-edged without rough or jagged features
Prominent	Noticeable; distinguished, eminent, or well-known	**Patchy**	Irregular and inconsistent;
Solid	Unadulterated or unmixed; made of the same material throughout; uninterrupted	**Even**	Consistent and equal; lacking slope, roughness, and irregularity
Broken	Lacking continuity; having an uneven surface	**Uneven**	Inconsistent and unequal in measurement irregular
Smooth	Consistent in line and form; even textured	**Stark**	bare and plain; lacking ornament or relieving features
Rough	Bumpy; knobbly; or uneven, coarse in texture	**Clustered**	Densely grouped
Fine	Intricate and refined in nature	**Diffuse**	Spread through; scattered over an area
Coarse	Harsh or rough to the touch; lacking detail	**Diffuse**	To make something less bright or intense

11 APPENDIX 3 - VRM AFRICA DETAILS

This document was completed by Silver Solutions 887 cc trading as VRM Africa, a Visual Impact Study and Mapping organisation located in George, Western Cape. We make use of the well-documented visual impact analysis methodology developed by the Bureau of Land Management in the USA in order to accurately and objectively quantify visual impact. This methodology involves the sequential mapping of visual resources of the site in relation to the surrounding areas. For this purpose we make extensive use of GIS and 3D modelling technology. Over the last 5 years VRM Africa has completed over 60 Visual Impact Studies throughout South Africa and Namibia. The majority have been based in the Western Cape ensuring we have extensive practical experience assessing projects in terms of the planning policies stipulated by the DEA&DP Guidelines and the Western Cape PSDF.

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