ANNEXURE N11:
VISUAL STUDY BY
VISUAL RESOURCE MANAGEMENT AFRICA CC




RIO TINTO RÖSSING URANIUM LIMITED
PHASE 2 SOCIAL AND ENVIRONMENTAL IMPACT ASSESSMENT
FOR PROPOSED EXPANSION PROJECTS

DRAFT VISUAL IMPACT ASSESSMENT
REVISION 3

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TABLE OF CONTENTS

LIST OF PHOTOGRAPHS

COLOUR PLATES

(See attached document)

INTRODUCTION

PLATE 1: REGIONAL LOCALITY MAP
PLATE 2: SEA MINE SCENARIO 2 VIEWSHEDS
PLATE 3: PROPOSED SITE LAYOUT MAP
PLATE 4: PROPOSED SITE TOPOGRAPHIC MAP
PLATE 5: UPDATED VRM CLASS MAP
PLATE 6 SCENARIO 1: LOCALITY MAP BASE CASE
PLATE 7: SCENARIO 1: 3D VIEW SOUTH FROM NORTH
PLATE 8: SCENARIO 1: VRM ACTIVITIES OVERLAP MAP
PLATE 9 SCENARIO 2: LOCALITY MAP BASE CASE
PLATE 10: SCENARIO 2: 3D VIEW SOUTH FROM NORTH
PLATE 11: SCENARIO 2: VRM ACTIVITIES OVERLAP MAP
PLATE 12: SCENARIO 3: LOCALITY MAP BASE CASE
PLATE 13: SCENARIO 3: 3D VIEW SOUTH FROM NORTH
PLATE 14: SCENARIO 3: VRM ACTIVITIES OVERLAP MAP
PLATE 15: KEY OBSERVATION POINT MAP

KOP SENSE OF PLACE

PLATE 16: KOP ARANDIS
PLATE 17: KOP B2
PLATE 18: KOP KHAN RIVER
PLATE 19: KOP NAMIB NAUKLUFT PARK

PROJECT DESCRIPTION

PHOTO MONTAGES

MITIGATIONS

LIST OF ANNEXURES

(See attached document)

ANNEXURE A: GLOSSARY
ANNEXURE B: IMPACT ASSESSMENT CRITERIA
ANNEXURE C: BEST PRACTICABLE ENVIRONMENTAL OPTION
ANNEXURE D: KEY OBSERVATION POINT CONTRAST RATING

LIST OF ACRONYMS

BPEO Best Practicable Environmental Option
DEA&DP *Dep*artment of Environmental Affairs and Development Planning *(Western Cape, RSA)*
DTM Digital terrain model
EQO Environmental Quality Objective
ECO Environmental Control Officer
EIA Environmental impact assessment
EMA Environmental Management Act (Namibia)
EMP Environmental Management Plan
GIS Geographic information system
MET Ministry of Environmental and Tourism (Namibia)
NNP Namib Naukluft Park
NMME Namibia Ministry of Mines and Energy
SEIA Social and Environmental Impact Assessment
SAIEA Southern African Institute of Environmental Assessment
VAC Visual absorption capacity
VE Visual Envelope
VIA Visual impact assessment
VRM Visual resource management
ZVI Zone of visual influence

1 INTRODUCTION

Visual impact is defined 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, land use, 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 can often lead to conflict because of the different social perceptions of change to a landscape heritage. In order to minimize the negative effects of this potential conflict the following issues need to be assessed:

- '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.' [3]
- '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.' [4] This does require a paradigm shift with regard to sustainable mining activities.
- '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...' [5]

VRM Africa's point of departure is one of providing decision makers with sufficient information in order to take advantage of early opportunities for avoidance of negative visual effects. This is based on the U.K Institute of Environmental Management and Assessment's (IEMA) proposed strategy where the ideal strategy for each identifiable negative effect is one of avoidance.

The specific objectives of this study are to inform and educate decision makers in the Namibian Government and at Rio Tinto Rössing Uranium Limited (Rössing) of 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 components of the Rössing mine expansion, that are being assessed as part of the Phase 2 of SEIA for Rössing Expansion Project, 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 Rössing to the aesthetic value of the *surrounding areas*; and
- 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.

1.1 TERMS OF REFERENCE

VRM Africa CC was commissioned by Aurecon to undertake a Visual Impact Assessment (VIA) for Rio Tinto Rössing Limited (Rössing). The proposed mine expansion VIA is being dealt with in two phases for the SEIA.

The Rössing Social and Environmental Impact Assessment (SEIA) Phase I assessment has been completed and the Final SEIA Report [6] was submitted to the Ministry of Environment & Tourism: Directorate of Environmental Affairs (MET:DEA) for a decision. Their approval of the Phase 1 SEIA was issued on 7 April 2008, by means of an Environmental Clearance.

This study will assess the following proposed landscape modifications in terms of the Class Objectives defined for each VRM Class.

- The cumulative impacts of existing and future mines in the Erongo region
- Expansion of the SJ Pit
- New heap leach facility (Scenarios 2 and 3)
- Additional waste rock dumps
- New ripios disposal facility (Scenarios 2 and 3)
- Additional plants and structures
- Tailings storage facility (Scenarios 1, 2 and 3)
- Lights at night
- Increased blasting

Source: VRMA Terms of Reference

VRM Africa's aim is to provide decision makers with sufficient information to take advantage of "early opportunities for avoidance of negative visual effects." This is based on the U.K Institute of Environmental Management and Assessment's (IEMA) strategy:

- "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.
- If the consideration of mitigatory measures is left to the later stages of scheme design, this can result in increased mitigation costs, because early opportunities for avoidance of negative visual effects are missed." [7]
- "In order to retain the visual quality and landscape character, management actions must become an essential part of the guidelines throughout construction, and operation.... Proper management actions ensure that the lowest possible impact is created by the project...
- On-going monitoring programmes with regard to the control of aesthetic aspects for all stages of the project are a vital component in ensuring that the long term visual management objectives will be met.'[8]

1.2 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 extensive use of GIS and 3D modelling technology. Over the last 8 years VRM Africa has completed over seventy Visual Impact Studies of large scale landscape modifications throughout South Africa and Namibia. Other projects of relevance undertaken by VRM Africa are:

- VIA for Phase 1 SEIA of Rössing Expansion Project
- Trekkopje Desalination Plant
- Walvis Bay Power Station
- Bannerman Etango Uranium Mine
- Visual input into the SAIEA (2010). Strategic Environmental Assessment for the central Namib Uranium Rush. Ministry of Mines and Energy, Windhoek, Republic of Namibia.

VRM Africa is an independent company and in no way benefits from the final outcome of the project decision-making. Stephen Stead (BA Geog Hons, 1992) is the director of VRM Africa. He specialised in Geographic Information Systems and Human Geography at the University of Natal (Pietermaritzburg). For this project, Liesel Stokes of Brink, Stokes, Mhkize (BSM) was utilised as a consultant. BSM are registered with the Institute of Landscape Architects of South Africa (ILASA) *(Reg No. 125)* and the South African Council for the Landscape Architectural Profession (SACLAP) *(Reg No. 87004).* Stephen Stead is a member of IAIAsa South

Africa and is currently serving on the National Executive Committee (NEC). VRM Africa recognises and aspires to the IAIAsa code of ethics.

VRM Africa is indemnified from any damages that may result from publication. Any comments on the draft copy of the Visual Impact Report must be put in writing. This report, or electronic copies thereof, must not be altered or added to without the prior consent of the author. Any recommendations, statements or conclusions drawn from or based upon this report must make reference to it. Within the main report, this report must be included in its entirety as an appendix or separate section.

2 METHODOLOGY

The study made use of the Visual Resource Management (VRM) methodology[9]. This is a systematic process developed by the Bureau of Land Management (BLM) from the United States Department of Internal Affairs to evaluate potential visual impacts associated with landscape modifications. In the study, the suitability of modifications will be assessed in conjunction with the VRM Classes defined for areas in the previous Landscape Characterisation study undertaken for the Phase 1 of the SEIA for Rössing Expansion Project. 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 surrounding landscape sense of place and the Best Practicable Environmental Option (BPEO) is achieved.

A separate, high resolution A3 document has been compiled to be read in conjunction with this report in order that each step of the assessment is visually portrayed in sufficient resolution for decision makers and I&AP's.

During the course of the study, VRM Africa undertook the following actions:

Site Visits
During the study three site visits were undertaken. The routes followed during the site visits were combined into a track map.

Research into Planning and Guidelines which have Relevance to the Area.
Research was undertaken in order to understand the Best Practicable Environmental Option (BPEO) parameters for the area. BPEO recommendations were identified from researched information and in this regard the proposed landscape modification was assessed. The following documents were studied:

- Environmental Management Act of Namibia
- Minerals Policy of Namibia
- Rio Tinto policies
- Rössing policies
- U.K Institute of Environmental Management and Assessment (IEMA), '*Guidelines for Landscape and Visual Impact Assessment'*, Spon Press, 2002
- SAIEA (2010). Strategic Environmental Assessment for the central Namib Uranium Rush. Ministry of Mines and Energy, Windhoek, Republic of Namibia.

Assessment of Landscape Character
The general requirement for a Visual Impact Assessment is that it should include:

- 'A holistic description of the affected environment … including all aspects of the natural, cultural, historical, sacred and scenic landscape.
- Information from the biodiversity or vegetation, heritage, atmospheric and social specialists.'[10]

The VRM methodology measures 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.
- 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.
- 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.

Class I

Class I is assigned to those areas where a ***specialist decision*** has been made to maintain a natural landscape. Class I is not rated in terms of scenic quality, distance zones and sensitivity values.

Class II, III & IV Assessment

Classes II, III & IV are assigned to the physiographic regions by cross referencing scenic quality, distance zones and sensitivity values, making use of the table below developed by the Bureau of Land Affairs, USA. It must be noted that these classes are ***informative in nature*** and would have to be modified to take into consideration a management decision.

				VISUAL SENSITIVITY LEVELS								
				HIGH			**MEDIUM**			**LOW**		
19 or more	A		**A**	**II**	**II**	**II**	**II**	**II**	**II**	**II**	**II**	**II**
12 - 18	B	**SCENIC QUALITY**	**B**	**II**	**III**	**III / IV ***	**III**	**IV**	**IV**	**IV**	**IV**	**IV**
11 or less	C		**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**

VRM methodology identifies eight basic criteria which one would need to investigate in order to assess the visual resources of the landscape. These include:

- Landform
- Vegetation
- Water
- Colour
- Adjacent Scenery
- Scarcity
- Cultural Modifications

Regional Sense of Place

To define the BPEO for mining in this area, it is necessary to assess the potential cumulative impacts to the sense of place of the Erongo region, where the Rössing mine is located. The importance of this component of the study was introduced as a recommendation from the initial Landscape Characterisation Study, undertaken as part of Phase I of the SEIA for the Rössing Expansion Projects (March 2008), which stated that "it is vital for the long-term prosperity of the region that specific Visual Resource Management objectives are formulated and

implemented to reduce the accumulative visual impacts from mining activities potentially detracting from the significant wilderness sense of place." The following topics have been incorporated into this section of the study:

- Literature review
  - Socio-economic issues.
  - Landscape Heritage issues.
- Preliminary issues in relation to the SAIEA (2010). Strategic Environmental Assessment for the central Namib Uranium Rush. Ministry of Mines and Energy, Windhoek, Republic of Namibia. http://www.saiea.com/uranium/index.html
- A desktop study into the precedent for existing and proposed large scale mining landscape modifications within the Erongo Region.
- Significant visual issues / Potential Threats and Opportunities
- Implications of cumulative mining landscape transformation to the Erongo tourism economy

Update of the VRM Class Map

Based on more recent planning information made available as part of the Uranium Rush SEA, amendments have been made to the original VRM Classes as defined in the initial Phase I SEIA. The new VRM Class Map is depicted on Plate 5. The major modified areas remain the same Class IV with the following changes: (Refer to map)

A. The only Class I area is assigned to NNP as it is a formally protected area.
B. The areas previously defined as Class I due to biodiversity and landscape sensitivity were graded Class II. These include the areas south-east of the mine which fall within 6km NNP sense of place buffer which, although falling within the visual influence of the mine, are protected to a degree by visual screening from the waste rock dumps. This area also includes the chert quarry which is included in the long term post mine planning and as such requires visual protection.
C. The Khan River and the Khan mountain range, which currently screen the mine modifications, have high levels of landscape character, but are not formally protected. However protection measures have been suggested in the SEA and as such this area has retained its Class I status.
D. The area north-east of the mine is outside of the NNP buffer but is also outside of the mine zone of influence. The high levels of landscape character suggest Class II visual protection.
E. The landscape character of this area is strongly influenced by the modifications created by mine infrastructure, the development of the town of Arandis and the moderate visual impacts from the Tailings Facility (the Tailings Dam and the Berning Range screen this area from the high levels of visual contrast generated by the industrial Class IV landscapes associated with the plant and pit. Hence this area is defined as a Class III area.

Update of the Visual Envelope of the Project and Components

In order to describe the possible impact of the project components, the Visual Envelope of the proposed modifications was mapped. This determines the extent to which the proposed landscape modifications would be visible to the surrounding areas. Based on these individual viewsheds, a total visual envelope was generated depicting the probable extent to which the modifications would be visible to the surrounding areas over a period of time. This exercise will also allow the identification of new 'receptors' and Key Observation Points (KOPs) in the study area. As part of the study into the potential visual impacts associated with Blasting, an experiment was undertaken in association with the vibration and air quality specialists to assess the cumulative impacts associated with this impact type.

Update of Receptors and their Exposure to the Project

The degree of contrast that the proposed landscape modifications will make to the existing landscape is measured from locations surrounding the property. The selection criterion for these Receptors is their location within the defined viewshed where they would have a clear view of the property. View corridors within the

viewshed are also taken into account. View corridors are linear geographic areas that are visible to users of the route, usually situated along movement routes.[11]

Detailed Project Description

The visual characteristics of landscape modifications have been described and effectively represented in 3D modelling format, which form the basis of the photo-montages (photo-representations of the proposed landscapes).

Photo Montages from Key Observation Points

Detailed 3D modelling of the structures and the geometries of all the proposed landscape modifications was undertaken in order to gain a better understanding of their visual impact. For these receptors to effectively visualise the proposed landscape modifications, a photo-montage exercise was undertaken for all the new proposed landscape modifications as seen from the KOPs. The Photo Montages will be based on the Proposed Interim Code of Ethics for Landscape Visualisation (CALP, July 2003). [12]

Impact Assessment

The impact assessment phase involves determining whether the potential visual impacts from proposed surface-disturbing activities or developments would meet the management objectives established for each area as seen from the Key Observation Points (KOP), or whether design adjustments will be required. Impacts were defined for all the proposed landscape modifications and phases of the life of the mine based on the degree of contrast (DoC) rating. Specific management actions were recommended to avoid or reduce the levels visual impacts. A Contrast Rating will be undertaken from the all KOPs.

Impacts will be defined for all the proposed landscape modifications and the given 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. [13]

Recommendations and mitigations

Specific management actions have been defined to avoid or reduce the levels visual impacts for all the proposed landscape modifications. To fulfil the recommendations made with regard to achieving BPEO and VRM Class Objectives, it is vital that interaction between the Rössing authorities responsible for the mine management and VRMA is implemented, to ensure that mitigations are effective and manageable for implementation. This is also vital for the higher level of detail that is required as an output for the shaping of the existing and proposed permanent landscape modifications. The mitigations for all the proposed landscape modifications have taken the following Life of Mine phases into consideration.

- Construction
- Operation
- De-commissioning
- Closure

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 policies from the following parties:

- Government of the Republic of Namibia
- Ministry of Environment and Tourism
- Ministry of Mines and Energy

3.1 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; and
- to establish certain institutions in particular to provide for a Sustainable Development Commission and Environmental Commissioner". [14]

3.2 VISION 2030

- Natural environments are disappearing fast. Consequently the solitude, silence and natural beauty that many areas in Namibia provide are becoming sought after commodities and must be regarded as valuable natural assets. Preserving these assets is fundamental to developing our tourism as a sustainable economic sector ... Tourism has more potential as a sustainable industry than virtually any other form of economic development in Namibia. (Pg 29)
- Namibia's mineral resources are strategically exploited and optimally beneficiated. This serves to provide equitable opportunities for all Namibians to participate in the industry, while ensuring that environmental impacts are minimised. Investments resulting from mining are made to develop other sustainable industries and human capital for long-term national development. (Pg 43)
- Expansion of conservancy programme and wildlife habitats:
    - Scenario 1: Conservancies should cover many regions. As a consequence, wildlife (as an income generator and drawcard for tourism) will be more widely dispersed and supported throughout all of these regions.
    - Scenario 2: Conservancies would be established in all regions under this scenario. (Pg 78) [15]

3.3 MINERALS POLICY, 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. *(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. *(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. *(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. (*Pg 26)*[16]

3.4 MINISTRY OF ENVIRONMENT AND TOURISM (MET)

3.4.1 *SEA FOR COASTAL AREAS OF ERONGO AND KUNENE REGIONS*

- The Namibian coastal Strategic Environmental Assessment (SEA) for the Kunene and Erongo regions draws on international experience and is timely in relation to the mounting production sector pressures. Being an initiative of the Namibian Government through its Ministry of Environment and Tourism (MET) the SEA seeks to inform political and technical decision makers at local, regional and national levels .... A thriving economy cannot be built on a bankrupt environment and Namibia's biodiversity and unique "sense of place" should not be diminished by this transition. *(Pg i)*
- MME has issued a Policy specifically addressing mining and prospecting activities in environmentally sensitive areas. The areas of particular interest in relation to biodiversity are those that are gazetted as "Protected Areas" and exploitation of mineral resources is allowed under the Prospecting and Mining Act of 1992. Since approximately 13.6% of the land surface area of Namibia is "Protected Areas" and many of these areas have considerable mineral potential, prospecting in protected areas is and has been a common activity. The lack of concern for the environment most often shown by prospectors and mining companies in the past has led to a loss of key ecological characteristics and tourism potential of some protected areas. *(Pg 38)*
- 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 minimised in accordance with international best practice. Commitments, in respect of prospecting and mining activities, have to be made in line with strategies developed for the environmental protection. *(Pg 38)*[17]

3.4.2 *DRAFT MDP FOR NAMIB- SKELETON COAST NATIONAL PARK*

- The Draft Management & Development Plan (MDP) for the Central Area (CA) of the Namib-Skeleton Coast National Park (NSCNP) sets out the vision, objectives and guidelines for the management and development of the park. (The overall park is not yet proclaimed.) As such, it represents the policies and intentions of the MET, the Ministry of Fisheries and Marine Resources (MFMR) and their partners.*(Pg 8)*
- The NSCNP comprises four main management areas: the "Sperrgebiet" in the south, the Namib-Naukluft Park, the Central Area and the Skeleton Coast. *(Pg 5)*
- No prospecting and mining activities will take place in identified Key Biodiversity Areas of the four Management areas. All prospecting and mining activities in other areas are planned, managed and decommissioned using best practice, taking into account long term national benefits....so as to minimise negative environmental.. and socio-economic impacts. *(Pg 70)*
- Prospecting /Mining for strategic minerals will be permitted in the park and then only in areas where they will not unduly undermine conservation and/or public recreation and tourism. [18]

4 LANDSCAPE CHARACTERISATION

The landscape character is defined as 'The distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement.' It creates the specific sense of place or essential character and 'spirit of the place'. [19]

In both urban and rural contexts, the landscape is important because it is:

- an essential part of our natural resource base;
- a reservoir of architectural and historical evidence;
- an environment for plants and animals (including humans);
- a resource that evokes sensual, cultural and spiritual responses and contributes to our urban and rural quality of life; and
- a valuable recreation resource.

Landscapes are considerably more than just the visual perception of a combination of landform, vegetation cover and buildings – they embody the history, land use, human culture, wildlife and seasonal changes of an area. These elements combine to produce distinctive local character and continue to affect the way in which the landscape is experienced and valued. However the landscape is dynamic, continually evolving in response to natural or man induced processes. [20]

4.1 REGIONAL CONTEXT

As one of the oldest deserts in the world, the Namib has had both arid and semi-arid conditions for at least 55 million years. The word 'Namib' is of Nama origin and means open space, giving its name to form Namibia – "*land of open spaces*". 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 and forest savannahs and woodlands of the north east. A desert plant that has stirred 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. [21]

This wilderness sense of place is further enhanced by the very low population of Namibia. It is one of the lowest in the world with less than two people per km² and as such landscapes associated with manmade landscapes such as towns and infrastructure are limited. It is important to note that as a result of these large areas of 'untouched' scenery, Namibia has visual resources that are unique and have much potential for World Heritage status. Namibia's vibrant tourism industry is nearly entirely based on the promotion of its natural assets.

Photograph 1. Welwitschia Flats towards Spitzkop

The Geological Society of Namibia and the Geological Survey of Namibia are actively campaigning for sustainable development of the country's natural resources, both with regard to geo-tourism as well as to responsible mining development. [22]

As indicated in Plate 1 Figure 1, Rössing mine is located in the Erongo Region which is one of 13 regions within Namibia. At a broad brush level there are many differing types of landscapes in Namibia (as indicated in Figure 2). The predominant landscape in the area where Rössing is located is defined in the study as the Central-Western Plains which are mainly gravel plains interspersed with rocky outcrops and inselbergs. Thus the Erongo landscape is diverse and unique; 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 predominately natural landscape with significant wilderness properties and limited man-made modifications. The mountain ranges and ridges and Inselbergs protrude from the flat horizons creating focal points. The rugged river valleys associated with the Swakop, Kahn and Omaruru river systems create unique desert landscapes which enhance the wilderness sense of place. [23]

Some of these areas have unique world renowned character and vegetation. The Namibia National Commission for UNESCO has applied for the Welwitschia Flats area to be considered a World Heritage site and it is currently included on the tentative list of proposed new heritage sites. [24] This list 'provides a forecast of the properties that a State Party *may* decide to submit for inscription in the next five to ten years and which *may* be updated at any time'. [25] This is an indication of the recognition by the Namibian Government of the unique diversity of landscapes and environments associated with the Welwitschia Flats as an international tourist attraction. The Namibian Government Minerals Policy states that the Government must ensure that short to medium-term projects such as mining do not jeopardize the potential for long-term sustainable development in tourism.[26] The existing Namib Naukluft Park (NNP) is part of the proposed Namib–Skeleton Coast National Park (NSCNP) Central Area which, should it be proclaimed, will become the 8th largest protected area in the world and the largest park in Africa.[27]

'The vision of the proposed NSCNP is to protect and conserve the diversity of landscapes, habitats and biota of the Central Area in healthy and productive condition within the context of the Namib-Skeleton Coast National Park and the Greater Namib Area'. The emphasis is 'to rehabilitate landscapes and biodiversity, using best available practices, with emphasis on those areas of greatest ecological and aesthetic importance' and as to create a 'gateway to the Namib-Skeleton Coast National Park which is a highly accessible conservation area of international significance....working to become a World Heritage Site.' [28]

Photograph 2. Desert views of the Namib Naukluft Park and Welwitschia Plants

The importance of these unique landscapes is also recognised by the Namibian government. The Namibia Vision 2030 document, states that 'In today's overcrowded, rapidly developing world, natural environments are disappearing fast. Consequently the solitude, silence and natural beauty that many areas in Namibia provide are becoming sought after commodities and must be regarded as valuable natural assets. Preserving these assets is fundamental to developing our tourism as a sustainable economic sector ... Tourism has more

potential as a sustainable industry than virtually any other form of economic development in Namibia. It amounts to the same product – be it scenery, wildlife or open spaces (provided it remains unspoilt) – being sold repeatedly, without being depleted.' [29] See existing Google tourist map in Plate 1, Figure 3.

4.2 CUMULATIVE MINING LANDSCAPE CHARACTER

The U.K. IEMA guidelines define cumulative visual impacts as the 'summation of effects that result from changes caused by development in conjunction with other past, present and reasonably foreseeable actions.'[30] From a visual perspective, a cumulative impact is due to the inter-visibility of a range of developments and/or from combined effects of individual components of the proposed development occurring in different locations or over a period of time. The separate effects of such individual components or developments may not be significant, but together they may create an unacceptable visual impact.

Mining activities have been established in Erongo Region over the last century. The main uranium mines in the area are Rössing, which was established in 1976 and Langer Heinrich mine, where the deposit was discovered in 1973 and the mine was officially opened on March 15th, 2007. The mining industry plays an important role in total export earnings and employment as well as social advancement and mineral production in Namibia. Trekkopje Mine and the Valencia mine access roads are currently in the construction phase. The mining activities have up to the current time been located in isolated areas or in rugged terrain areas. This has protected the wide open spaces of the desert landscape in this region and only a small component of the current Erongo Region's sense of place is created by the mining industry.

As a result of the recent increase in demand for Uranium, the Ministry of Mines and Energy (MME), in co-operation with the German Federal Institute for Geosciences and Mineral Resources, commissioned the world's first Strategic Environmental Assessment (SEA) for a mining area (the so-called 'Central Namib Uranium Rush SEA') from the Southern African Institute for Environmental Assessment (SAIEA).[31] The following section focuses on the potential cumulative impacts based on the viewshed and the intervisibility of the existing and future mines and is extracted from the VRM Africa input into the above mentioned study. This study addresses the issue of the natural beauty of the desert. The document states that 'most Namib landscapes are wide, flat vistas, strongly horizontal in nature, where the potential for screening is very limited. The Visual Absorption Capacity (VAC) of these areas is low and large-scale mining will result in high levels of visual intrusion. People who value the natural beauty of the Namib will react negatively, especially when more than one mining landscape is visible from a single location. In this case, the uranium mines are not the only ones contributing to the impact, as dimension stone mining (especially marble and granite) also contributes significantly. From a visual perspective, there is a limit to how much one can manage or hide – there may be a case for 'sacrificing' certain areas (essentially zoning them for mining, even if in a National Park), but ensuring others are off-limits to mining, so that they remain undisturbed for public enjoyment and tourism. However, it remains to be seen whether the visual 'no-go' zones correspond to the heritage and biodiversity 'no-go' zones. [32] Without visual management of the natural and wilderness sense of place resource, it is possible that the long term economic benefits of the eco-tourist activities could be impacted as the combined cumulative impacts of the large scale and often alien mining landscape will alter the perceived natural sense of place required for eco-tourist activities.

All mines are limited by the finite nature of the resource. The high degree of modification to the resultant post closure landscapes have very little potential for rehabilitation or landscape reversal. This will forever represent an un-natural and transformed landscape. A suitably managed closure could allow the industrial landscape of the mine to be removed and some rehabilitation to take place. However should uranium prices drop due to a down turn in the world economy, the potential for forced and unplanned closure increases. This can result in a permanent landscape intrusion from the non removal of the industrial landscape if it is not catered for in the closure plan.

In order to assess the cumulative visual impacts of multiple mines in the area, the visual envelope (VE) of the mines was generated from a Digital Elevation Model (DEM) based on specified heights *(Plate 2, Figure 3*) in order to gain a better understanding of the mine Zone of Visual Intrusion (ZVI). The ZVI is defined as the 'area within which a proposed development may have an influence or effect on visual amenity.'[33] Distance buffers

were defined for each of the mine types to indicate possible visual intrusion areas with and without mitigation. Two height values were assessed for the two different types of mines with and without mitigation. For the Carnotite type mines which involve smaller surface disturbance, the 'without mitigation' heights of the mining activities was set at 30 m above ground level and the zone of visual intrusion (ZVI) at 15 km. For the large and deeper Alaskite mines (such as Rössing) the viewshed was generated from a mining activity height of 80 m above ground level. In order to represent how visual management actions can reduce the visual intrusion of the combined landscape modifications, the height of the Carnotite mines was reduced to 15 m and the Alaskite mines to 40 m above ground level. As a result of this reduction in height, the ZVI of the mines would be reduced to 8 km.

The SEA study addressed three scenarios: Mining Option 1 looks at the existing mines currently active or under construction (Rössing, Langer Heinrich, Valencia and Trekkopje). For the purposes of this document we will only be assessing Mining Option 2 which looks at the current six proposed mines that would be added to the existing mines. Mining Option 3 looks at the inclusion of a proposed four more mines (10 mines) added to this area. Refer to Plate 2 for maps of combined viewsheds of Mining Option 2, as well as the criteria that were used in assessing ***potential*** intervisibility and visual intrusion for the mitigated and unmitigated options. The proposed Rössing expansion project would form part of Mining Option 2 which is described below.

Without mitigation *(Plate 2, Figure 1)*
For Mining Option 2 there is a significant difference between the 'with' and 'without' mitigation scenarios. This is specifically due to the introduction of Rossing South and Etango which are both deep pit mines that would require large waste rock dumps. Both these mines have a viewshed and potential visual influence that overlaps with significant tourism resources. Without mitigation the intervisibility of Rössing, Rossing South and Etango would create an extensive overlap into the important tourist areas, predominantly in the Welwitschia Flats. In the more prominent areas of the Welwitschia Flats, it may be possible that all three of these mines would be visible from a single location, a factor which would significantly increase the potential to change the sense of place of the area.

With mitigation *(Plate 2, Figure 2)*
Mitigation would include landscape shaping of the waste rock dumps as well as a reduction in their height from 80 m to 40 m. This would significantly reduce the intervisibility in the Welwitschia Flats access areas. Areas previously associated with the visibility of two mines would be restricted to partial visibility of one mine at a time and with shaping the mining landscapes would be less dominating. The possibility of creating a new tourist route which is aligned through the Welwitschia Flats to the south east of the proposed Rossing South mine should be investigated. This would open up a new area within the NNP for conservation tourism.

The study also identified a number of key regional visual issues that were significant for the development in the Erongo Region:

- Cumulative visual impacts of existing and proposed large scale mining operations in areas of significant desert landscape character need to be addressed. 'It is no longer feasible to assess potential impacts on the basis of a single operation, nor can cumulative impacts be assessed on the basis on one operation's activity. A piece-meal and uncoordinated approach to sustainable development will not result in sustainable growth, effective protection of fragile ecosystems or the conservation of scarce water resources.'[34]
- The potential of the cumulative visual impact of mining in the region affecting the tourist industry is high. The region has high levels of landscape character which contribute to the sense of place of the Namib Desert. It is vital that the combined effects of the mining industry do not start to dominate the natural landscape features.
- The lack of guidelines for Visual Resource Management of desert areas with high landscape character could result in uncontrolled development in significant desert vistas and tourist view corridors. This has the potential to undermine the sustainability of the flourishing tourist economy in the region.
- It identifies significant visual issues / potential threats and opportunities as well as the implications of cumulative mining on the landscape and its effect on the Erongo Region tourism economy.
- Due to the inherent lack of available screening created by the flatter, wide open vistas associated with the desert landscape, there is a high potential for visual impact. In this regard 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 within the region and the country.' [35]

The achievement of the aim of continuing tourism in the area requires developers to ensure that they plan and implement their projects (whether mines or other) in as sensitive a way as possible, ensuring that they keep unwanted visual impacts to a minimum. The Namibia Ministry of Environment and Tourism's (MET) vision is 'a mature, sustainable and responsible tourism industry contributing significantly to the economic development of Namibia and the quality of life of all her people, primarily through job creation and economic growth' (MET, 2008). To achieve this vision, conditions conducive to recreation and tourism must be created. In many ways, sense of place encapsulates nearly all of the SEA Environmental Quality Objectives (EQO) and is therefore at the heart of the Uranium Rush SEA'.[36] The Draft SEA can be found on *http://www.saiea.com/ uranium /index.html* and the Rössing Expansion Project SEIA would need to take the final recommendations of the study into consideration.

4.3 LOCAL CONTEXT

As indicated in the visual landscape characterisation exercise for Phase 1 of the SEIA for Rössing Expansion Project, many of the areas within the mining tenement area have been highly modified. The mine has been in operation since 1976 and the original landscape has been radically modified by the excavation of the open pit, the dumping of waste rock and the processing of uranium rich ore. However, due to the high Visual Absorption Capacity (VAC) levels of the terrain and the similar colours and textures of the mining landforms, the Zone of Visual Influence (ZVI) of the existing mining activities is limited to approximately 10 km. Other landscape modifications in the area are the town of Arandis, the B2 national road, a small aerodrome, a railway line, water pipes, water reservoir, power line infrastructure and the old Khan mine to the west. The town of Arandis consists mainly of small dwellings. Shade trees planted along the roads in the town are well established and help to reduce the visual impact of the town. The Rössing Foundation structures located to the south of the town also do not create high levels of visual intrusion. However, the combined low visual intrusion of the town, the B2 road with the traffic, the railway line, the bridge crossing the railway line, the storage tanks on top of the tailings dam combined with the water and power line infrastructure do influence the landscape character of the area and the sense of place is more associated with a small town than of wilderness. Given the good railway and road infrastructure in close proximity to the town, it is very probable that the town of Arandis will grow. In keeping with the concept of locating landscape modifications in areas which are already modified, it makes sense to expand the visual footprint of this area to allow for economic growth. However, the growth must be managed to ensure that the important long term economy generating eco-tourism ventures associated with the wilderness areas of the Namib Naukluft Park (NNP) and Welwitschia Flats to the south of the mine are not compromised.

The main features or activities within the local landscape are:

- The Rössing mine, which is one of the largest open pit uranium mines in the world 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 coast. This route carries a large volume of tourist traffic and as such is recognised as having a regional View Corridor status.
- The town of Arandis, a small town originally developed by Rössing to accommodate its employees which will probably grow in size and scale due to it's central location to the Rössing and Trekkopje mines as well as close proximity to rail and road infrastructure.
- 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 Park areas.

5 RECEPTORS

Receptors are defined as individuals or communities visually influenced by a particular project. Key Observation Points (KOPs) are critical locations surrounding the property which require that the degree of contrast that the proposed landscape modifications will make to the existing landscape is assessed. KOPs can either be a single point of view that an observer/evaluator uses to rate an area or panorama, or a linear view along a roadway, trail, or river corridor. [37] The selection criterion for these KOPs is their location within the defined viewshed where they would have a clear view of the property. Also assessed are the view corridors which are 'linear geographic areas that are visible to users of the route, usually situated along movement routes.' [38] Visual sensitivity of receptors, defined as the level of visual impact considered acceptable, is dependent on the type of receptors. The following factors were taken into consideration:

1. angle of observation,
2. number of viewers,
3. length of time the project is in view,
4. relative project size,
5. season of use,
6. critical viewpoints, e.g. views from communities and road crossings, and
7. distance from property on which project is proposed.

5.1 VIEWSHED TO ASSESS KEY OBSERVATION POINTS

Making use of a regional Digital Elevation Model (DEM), a viewshed was generated taking into consideration the height of the most prominent of the proposed activities (Ripios at 680 m amsl). This area defines the project area for the Visual Resource Management study. The viewsheds for each scenario cover a large area and can be defined as high as they exceed several square kilometres. This is due to the height of the proposed activities, located in a prominent area in relation to the predominantly flat terrain of the surrounds. Taking the above criteria into consideration, the following receptors were identified having KOP status. (See Plate 15)

ID	KOP NAME	TYPE OF ACTIVITY
1	Arandis	Residential
2	B2 Eastbound	National Road
3	B2 Westbound 1	National Road
4	Khan River Valley	Nature / Wilderness recreation
5	Namib Naukluft Park	Wilderness/Conservation and recreation
6	Panner Gorge	Wilderness and recreation
7	Welwitschia Flats and Farmers	Wilderness/Conservation/agriculture

5.2 KOP 1: ARANDIS

The town of Arandis was originally developed by Rössing in the early 1970s as family accommodation for mine employees. In 1992, Arandis was handed over to the Namibian Government and is currently managed by the Arandis Town Council. It saw resurgence in economic growth in the 2000's. At the end of 2005, when the latest demographic survey was undertaken, Arandis had 4,500 residents.[39] The town layout is interesting with single storey houses and does not follow a grid pattern layout. Receptor sensitivity will be low due to the historic associations with the mining activities. 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 primarily when entering or leaving the town. As a result of this factor, the sensitivities of the residents to the proposed mining related landscape modifications would be **Low**. *See Plate 16.*

5.3 KOP 2: B2 EASTBOUND

The landscape character of this feature is typical of desert roads which follow a relatively straight line, undulating vertically with the rising and falling of the terrain the route crosses. The surrounding desertscapes are of wide open desert vistas within which prominent desert mountains create focal points *(Plate 16, Fig 4).* The significance of this route 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. However, the route is not in a protected area and there are many objects and activities along the road such as

the pipes, telephone lines and power lines which detract from the sense of place. This is more so in closer proximity to the town of Arandis. Due to this factor the visual sensitivity defined for receptors making use of the B2 is **Moderate**.

5.4 KOP 3: B2 WESTBOUND

As for KOP 2: B2 Eastbound. *See Plate 17.*

5.5 KOP 4: KHAN RIVER VALLEY

The Khan River is an area that has a unique landscape character with geology that has potential for heritage status. Due to the low elevation of the valley, surrounded by steep sided mountains, the visibility of large scale man made modifications is limited. The area is a popular tourist destination. For this reason the area is defined as having a High sensitivity and landscape modifications should not dominate the existing landscape as seen from this area. *See Plate 18.*

5.6 KOP 5: NAMIB NAUKLUFT PARK

Namib-Naukluft Park is the largest national park in Africa (40 000 sq. km), well known for its towering burnt orange sand dunes, high isolated red inselbergs *(an isolated hill or mountain rising abruptly from a plain)* and the Naukluft Mountains to the east of the park.[40] The NNP 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, their sensitivity levels towards man-made modifications would be high. *See Plate 19.*

5.7 KOP 6: WELWITSCHIA FLATS

'The Welwitschia Plains...form part of the hyper-arid gravel plains of the Namib Desert. The most notable feature of this area is the presence of the highest concentration of Welwitschia mirabilis plants in Namibia..... Some of the larger specimens (like those on the Plains) may be close to 2000 years old...The Plains and surrounding areas support a vast diversity of lichens endemic to the Namib Desert, ... The Welwitschia Plains lie within the Namib Naukluft Park, a proclaimed state controlled protected area in Namibia since 1907.'[41] 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. Therefore receptor sensitivity to landscape modifications would be high. *See Plate 21.*

The Welwitschia Flats are not yet a declared World Heritage Site, however the Namibian UNESCO office considers this area worthy of nomination and therefore conditions applicable to World Heritage Sites should inform how the area is managed. To be included on the World Heritage List, sites must be of outstanding universal value and meet at least one out of ten selection criteria, e.g. Criteria vii; "to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance".[42]
One of the recommendations of the Central Namib Uranium Rush SEA is that 'certain biodiversity, tourism and heritage hotspots should be set aside and thus be permanently unavailable for mining and prospecting. The purpose of highlighting these sensitive biodiversity and heritage areas is to make the individual mining and prospecting companies aware of those sites which fall within their EPL or ML areas and to make sure that they are avoided, protected and actively conserved. One of these areas is the Welwitschia Drive (to be defined in light of expected mining).' [43]

5.8 KOP 7: PANNER GORGE

This area is used as a recreation area although it is located within the Rössing tenement area. Due to the river valley and the surrounding low rugged mountains there are localised areas where the landscape character is high but these are more associated with the low lying areas which do not have high exposure levels to the existing waste rock dumps. The area is in the process of being fenced off and after closure will be made available to the public as part of the future tourism activities planned as part of the Khan Heritage Park. This includes the disbanded Khan mine and an important archaeological chert quarry (*sedimentary rock that may contain small fossils).* As a result of the long term tourism plans for the area, it would be important to maintain, as much as possible, the existing wilderness qualities associated with the area. In this regard the visual sensitivity of future receptors is rated as **High** and components of the area need to be visually protected. *See Plate 20.*

6 PROJECT DESCRIPTION

The proposed mine expansion VIA is being dealt with in two phases for the SEIA. The VIA for Phase 2 of the SEIA for the Rössing Expansion Project, which forms the subject of this report, deals with the potential impacts of the proposed expansion. [44]

Scenario 1: Base Case Option

The envisaged expansion *(Plate 6, 7 and 8)* would entail the establishment of various plants to deal with the processing of ore:

- Conveyors and pipelines
- Fine ore crusher
- Primary crusher
- Stockpile
- Concept 230 waste rock dump
- Comet case 69 pit
- Increased Tailings dam facility to 680 m amsl.

Scenario 2: Central Option (PREFERRED)

The envisaged expansion *(Plate 9, 10 and 11)* would entail the following activities:

- Conveyors and pipelines
- Fine ore crusher
- Primary crusher
- Stockpile
- Concept 230 waste rock dump
- Comet case 69 pit
- Increased Tailings dam facility to 680 m amsl.
- Agglomeration plant
- Agglomeration feedbin
- SX Plant
- Pre filtration and CIX
- Sulphuric acid storage
- Heap Leach and Structures
- Ripios and Overhead Rope Conveyor

Scenario 3: Permanent Option

The envisaged expansion *(Plate 12, 13 and 14)* would entail the following activities:

- Conveyors and pipelines
- Fine ore crusher
- Primary crusher
- Stockpile
- Concept 230 waste rock dump
- Comet case 69 pit
- Increased Tailings dam facility to 680 m amsl.
- Agglomeration plant
- Agglomeration feed bin
- SX Plant
- Pre filtration and CIX
- Sulphuric acid storage
- Permanent Heap Leach

6.1 AGGLOMERATION PLANT

As indicated on Figure 1 on Plate 22, the proposed Agglomeration Plant is located on the eastern extent of the existing tailings dam which, as depicted in Figure 3, is highly modified and was classified in the previous SEIA Landscape Characterisation study as a Class IV type. This allows for major modifications of the existing character of the landscape where the level of change to the landscape can be high. *(Refer to Methodology on Pg 9)* The photograph in Figure 2 depicts the close proximity to the highly modified industrial area associated with the existing processing plant. The viewshed was generated from the location as depicted on Plate 23 Figure 1 based on this 30m offset height. Due to the existing landscape modifications already present within the location, including storage tanks on top of the Tailings Dam, the visual intrusion of activity would be lowered.

6.2 COARSE ORE STOCKPILE

Plate 24 Figure 1 depicts the proposed site of the coarse ore stockpile. It is located adjacent to the existing coarse ore stockpile depicted in the photographs in Figure 2 and Figure 3. This area is already highly modified and was defined in the initial landscape characterisation study as a Class IV area. Plate 25 Figures 2 and 3 show the height and scale of the proposed stockpile in relation to the existing landscape. The height of the proposed stockpile is 68 m and a viewshed was generated from this point. The viewshed is depicted in Figure 1 and indicates that the zone of visual influence of this activity will be fragmented and localised.

6.3 DUST & LIGHTS AT NIGHT

Plate 26 depicts images of lights at night of the stacker on a Heap Leach and a processing plant as well as photographs of dust generated from drilling activities in the pit. The images of the lights at night (Figures 1 and 2) were not taken from existing Rössing mine scenarios but depict typical scenarios associated with processing plants as well as a heap leach stacker at night time. Lights at night have the potential to radically increase the zone of visual influence of a mine and as such need to be controlled and managed in such a way as to allow productivity without undermining safety.

Figures 3 and 4 show photographs taken of existing mining activities of drilling and resultant dust in the open pit after blasting. The lack of a point source for the dust reduces the visual intrusion of individual activities. The clarity of the general visibility of the areas surrounding the mine is hindered by the dust. This will affect any tourist activities which make use of these landscape views by reducing the clarity of these views. In this regard it is vital that dust retarding mitigations are implemented as part of the mining activities to ensure that dust is reduced.

6.4 FINE CRUSHING PLANT

The proposed fine crushing plant is to be located to the south of the existing fine crushing plant as depicted in Figure 1 Plate 27. The highly modified area is defined as a Class IV in the existing landscape characterisation exercise. The industrial nature of the proposed plant is depicted in Figure 2 on Plate 28, which is also in very close proximity to the existing fine crushing plant. The height of this plant is 36 m above ground and will extend over 384 m in length. The viewshed generated with the height offset of 36 m is shown in Figure 1 on Plate 28 and is very fragmented, with a localised zone of visual influence.

6.5 HEAP LEACH

Scenario 2: Central Option

Plate 29 Figure 1 indicates the location of this activity. The proposed heap leaching is to take place on the existing tailings dam. This area was indicated as having a Class IV landscape character due to the fact that the terrain has been highly modified. See Figure 3. The screening from the Berning Range as well as the elevated ground to the north, into which the heap leach facility is cut, would significantly reduce the visibility.

Scenario 3: Permanent Option

Scenario 3 has a permanent heap leach combined with a ripios situated on the existing tailings dam which was indicated as having a Class IV landscape character. (See Plates 31 and 32). However the height will exceed

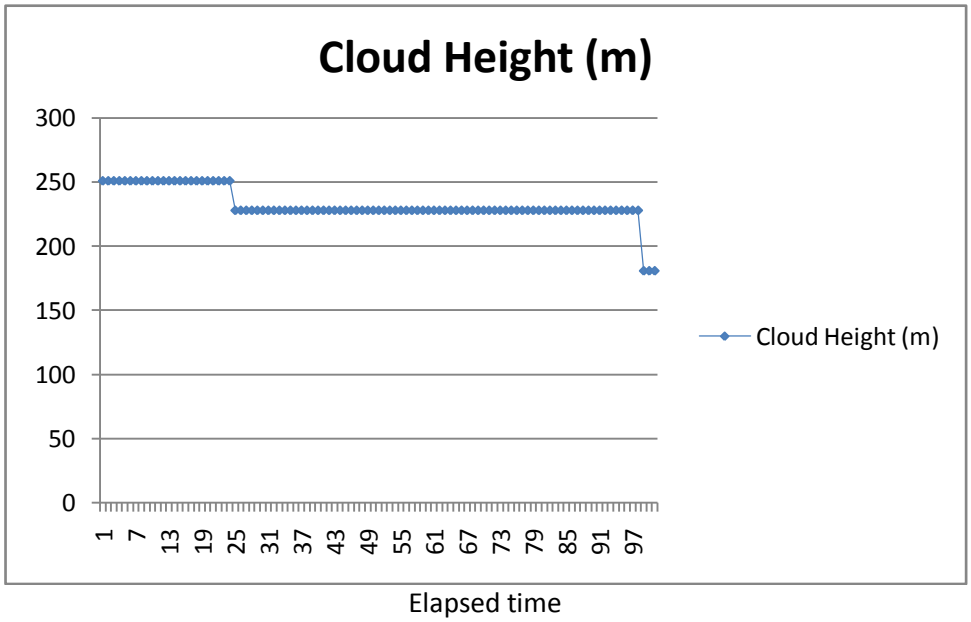
the height of the Berning range which is located to the SE and create potentially high levels of visual intrusion due to its size and sale.

6.6 SX PLANT

As indicated in Figure 1 on Plate 33, the proposed Pre-filtration, CIX and SX plants are located to the north-west of the processing plant. This plant lies to the west of the ridge line which runs in a north south direction and forms part of the Berning Range. The proposed plants are to be located on the eastern extent of the existing tailings dam which, as depicted in Figure 3, is a highly modified landscape. It was classified in the previous SEIA Landscape Characterisation study as a Class IV type, which allows for major modifications of the existing character of the landscape where the level of change to the landscape can be high. The photograph in Figure 2 depicts the close proximity to the highly modified industrial area associated with the existing processing plant. However smaller outcrops associated with the ridge to the east of the proposed plant would help to reduce the visual exposure of the activity. Figure 3 Plate 33 and Figure 2 Plate 34 show the 3D views of the plants. The viewshed was generated from the location as depicted in Figure 1 Plate 34 based on this 30m offset height. Due to the elevation of the site the main zone of visual influence would be to the north in the direction of B2. Due to the existing landscape modifications already present within the location, including storage tanks on top of the Tailings Dam, the expected visual intrusion of the plant would be low.

6.7 SJ OPEN PIT EXTENSION AND BLASTING

The existing open pit facility in its current state is one of the largest open pit uranium mines in the world approximately 2800 m x 800 m x 330 m deep. The proposed expansion scenario [45] will be executed with four push back areas, which are situated to the south and west of the existing pit. Due to the highly modified landscape associated with this area, the landscape characterisation exercise undertaken during the Phase 1 SEIA for Rössing Expansion Project defined the area as a Class IV landscape, as can be seen in Plate 34 Figures 2 and 3. Due to the void nature of the pit the visibility is limited to the immediately surrounding areas. The significant potential impacts associated with the pit would be dust generated from blasting, drilling, loading and hauling of the ore bearing rock. Figure 1 on Plate 36 indicates the viewshed of the blast plume. In order to more fully understand the cumulative impacts associated with blasting and the blast plume, a study was undertaken in order to assess the extent to which the blast plume would affect the surrounding areas. An example of a dust plume is shown in Figure 2 Plate 36. Time series photographs were taken from point A (Figure 1, Plate 36). The plume was seen to be visible for a distance of 7 km for approximately 15 minutes after the blast, after which the dust cloud dissipates. The blast specialist, Danie Zeeman of Blast Management and Consulting was able to determine that the blast plume rose to a height of 250 m. *(See table below)*



Source: Blast Management and Consulting

As a result of the height of the plume in relation to the surrounding areas, the viewshed is very large and the zone of visual influence, although for a short period of time, would extend to an area of 16 km from the source. For the proposed Rössing expansion the number of blasts will increase from one a week to the maximum average of 2.3 per week. The size of the blast will be large and similar in size and scale to the study blast as reflected in the table below, which records the ore tonnages to be mined in the second phase of mining, the required increase in blasting frequency and average blast size per different phases of the mine expansion:

Phase 2 Mining:

Blasting Frequency	80	Time per annum
Blasting Frequency	1.5	Time per week
Average Blast	500,000	Tonnes

Phase 3 Mining:

Blasting Frequency	120	Time per annum
Blasting Frequency	2.3	Timer per week
Average Blast	500,000	Tonnes

Phase 4 Mining:

Blasting Frequency	112	Time per annum
Blasting Frequency	2.2	Timer per week
Average Blast	500,000	Tonnes

Source: Rössing Limited

The implications of this, from a cumulative perspective, are high as the potential for intervisibility between multiple mines relatively close to each other increases. This intervisibility has the potential to alter the surrounding sense of place and lessen the tourist economic potential of an area. The 3D perspective view on Figure 3 Plate 36 depicts the expansion phase of the pit in relation to the existing pit.

6.8 PRIMARY CRUSHER

The proposed Primary Crushing Plant is located approximately 200 metres to the south west of the existing primary crushing plant which is depicted in Figures 2 and 3 on Plate 38. As can be seen in Figure 3 on Plate 39 the proposed structure will be similar in nature to the existing crushing plant although probably larger in height. As indicated in Figure 2, the visual absorption capacity in the area is high, as a number of large scale mining activities are currently taking place in close proximity to the proposed site. The viewshed generated, from an offset height of 15 m, (indicated in Plate 38 Figure 1) generates a very small visual envelope and consequently the zone of visual influence is also small.

6.9 RIPIOS AND OVERHEAD ROPE CONVEYOR

Scenario 2: Central Option

The ripios is situated on the dome as seen in Figure 1 on Plate 40. A photograph showing the view south from the dome is indicated in Figure 1 and Figure 3 shows the fan shaped form is as a result of a radial stacker/conveyor pivoting on a single point to the south east of the activity. A radial stacker, similar to that indicated in Figure 3 Plate 41, will be used for stacking of the spent ore processed in the heap leaching. As indicated in Plate 40 Figure 2, the uniform and curved nature of the front and side faces create smooth textured and alien type landscape modification in contrast to the rugged and broken terrain of the surrounding areas. There is also a rope conveyor taking the ripios from the Tailings Facility to the dome. This will run across the access road to the mine (Plate 40, Figure 4).

Scenario 3: Permanent Option
See comment from heap leach (Plates 30 and 31)

6.10 TAILINGS DAM

Scenario 1: Base Case Option
The proposed Tailings facility is located on the existing highly transformed landscape of the existing tailings dam. Due to the elevation of the site the class rating as defined in the initial landscape study was Class III which allows for landscape modification without being excessive. See Plate 41 Figure 2 for photograph of existing landscape character. In Scenario 1 the proposed tailings dam has an increased expansion to the north east as can be seen in Plate 42 Figure 1. Figure 1 depicts a 3D diagram of the proposed tailings dam with an increase in height to 680 m amsl.

Scenario 2 and Scenario 3:
The proposed Tailings facility is located on the existing highly transformed landscape of the existing Tailings Dam as discussion in Scenario 1 above. As depicted in Plate 423Figure 3 the proposed landscape modification in Scenarios 2 and 3 is increased in height to 680 m amsl and therefore a potentially significant visual impact is expected. The viewshed analysis in Figure 1 Plate 43 shows the visual envelope and zone of visual influence of all 3 scenarios to be extensive. This is because the tailings facility would be greater in size and scale than the surrounding mountains where the elevated sections are 640 m amsl. Currently these surrounding mountains have absorbed most of the mine's visual impact. Thus because of the scale of the activity and the height in relation to the surrounding mountains the tailings facility will generate high levels of visual impact as seen from proximate KOPs.

6.11 WASTE ROCK DUMP FACILITY

The proposed additional waste rock dumps are located primarily on the existing waste rock dumps as indicated in Figure 1 on Plate 44. These areas, as depicted in Figures 2 and 3 have been highly transformed by years of dumping of waste rock. The initial landscape characterisation study of these areas indicated them as Class IV type landscapes and suitable for high levels of modification. Figure 1 on Plate 44 shows that due to the large volume of waste rock to be generated in the process of mining uranium ore from the pit (230 MT), the height of the waste rock dumps could start to protrude above the surrounding mountains. As indicated in Figure 1 the viewshed, generated from an offset height of 120 m, would result in a very large visual envelope that potentially has a very large zone of visual influence. In order to reduce the zone of visual influence Rössing requested that a visually sensitive design for the proposed waste rock dumps be generated in order to ensure that the visual intrusion of this basic construction is limited.

Specific detail design in terms of benching and the layering of benches is required to generate a sense of depth and to break up the uniform lines so they resemble the fragmented and broken landscape of the surrounding areas. The design process revolved around creating a typical mountain form with a large and stable base, narrowing as it gets higher. It is important that the raised areas should not try to emulate the surrounding natural mountain peaks as these features would look false and generate higher levels of visual contrast. The maximum height of the waste rock dumps for the raised elevated sections should be 615 m amsl to ensure that it does not detract from the surrounding natural peaks, where the elevated sections are 640 m amsl. In terms of heights, the bulk of the waste rock dumps needs to be located below the 550 m amsl, ensuring that it is well contained by the surrounding landscape and therefore not be noticeable to the casual observer. The more elevated sections have not been shaped into peaks but reflect a more rounded shape from a distance, representing a low lying mountainous form so that they do not become dominant features.

Breaking up the horizontal lines and forms
Figure 2 on Plate 45 refers to the benching and undulations of the waste rock dumps which have been designed to relate to the preferred 30 metre intervals. However, the nature of the bench feature is that it creates a strong horizontal line and form which is alien to the surrounding landscape and generates higher levels of contrast. To remedy this, the following criteria were incorporated into the design:

- Benching has been broken up into different heights.
- The benches follow very undulating lines.

- The distances between benches are not uniform.

The shadows created by the undulating curves of the benches achieve a perception of depth and fragmentation. This is seen from the side as the forms and lines appear broken. As indicated by the red lines on Figure 2, the forms created relate to the hard fragmented terrain of the surroundings.

To create the mountainous landscape, it is recommended that the lower benches are large (60 m in height) and smaller with more fragmented benches at the top (10 – 15 m in height), with the standard 30 m bench height utilised in the central elevations. The large benching created at the base of the waste rock dumps also ensures that unauthorized access is restricted from the western areas. Unfortunately these large walls do lead to higher levels of contrast. However the areas where these landscape features would be visible from are very limited and very remote. Located to the west of the waste rock dumps is an archaeologically significant chert quarry which was found in the course of exploration work. The site was occupied approximately 120,000 years ago, when relatively moist conditions prevailed. This has the potential to be utilised as a future tourist activity during the post closure phase of the mine (see Plate 45 Figure 1). The site will be subjected to high levels of exposure to the waste rock dumps and it is important that they are designed so as to limit the level of visual intrusion as seen from this location.

Potentially high levels of visual intrusion associated with Basil Read Waste Rock Dumps

The waste rock dump site in question is indicated in the Plate 45 Figure 3 and Plate 46 Figure 2. The reason for the increased visual intrusion is that a strong horizontal line is created, which is dissimilar to the surrounding landscape character. Increased levels of contrast are also generated by the forms created by the 'scree' slopes. Although similarities in texture and colour do assist in reducing contrast, the large scale of the modification results in the perception of the landform as manmade and alien to the sense of place.

The area where dumping is taking place is elevated and prominent. This results in a large visual envelope which extends into the Welwitschia Flats and Namib Naukluft Park (NNP). The Welwitschia Flats and NNP areas have high levels of landscape character which significantly add to the appeal of the area as a wilderness tourist destination.

In conclusion, the visual envelope of the Rössing mine is being extended and a precedent is being created for the generation of alien mine landforms in close visual proximity to visually sensitive locations. In this regard, it is VRM Africa's recommendation that the Basil Read dumping strategy is reviewed and alternative sites are utilised to ensure further visual intrusion is not generated. It is recommended that dumping is moved to the smaller waste rock dumps to the east of the open pit, which have greater capacity to absorb the landscape modification due to the areas highly modified landscape character. It must be noted that a detailed design is required for the area where dumping has taken place in close proximity to the Khan River. [46]

7 CONTRAST RATING

The analysis stage involves determining whether the potential visual impacts from proposed activities 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. In the study, the suitability of modifications will be assessed in conjunction with the VRM Classes defined for areas in the previous Landscape Characterisation study undertaken for Phase 1 of SEIA for Rössing Expansion Project *(See Plates 8, 11 and 14).*

Steps in the Contrast Rating Process.

1. Obtain a detailed project description.
2. Define the VRM Classes and associated management objectives for each of the landscape areas which was undertaken as part of the Phase 1 of the SEIA for Rössing Expansion Project.
3. Undertake an assessment of the degree of contrast that is generated by the proposed landscape modification in relation to the visual management objectives that are defined for each landscape area.

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 surrounding landscapes sense of place. Analysis tables from the Key Observation Points can be found in the Annexure. *(See Plate 15 KOP Map)*

7.1 PHOTO MONTAGES FROM KOP'S

In order to provide more information about the potential landscape modifications, and to allow for the potential visual impacts to be assessed in relation to the surrounding KOPs, 3D model views per KOP were generated for all scenarios based on the information provided by the client. Detailed photo montages were generated for the preferred option (Scenario 2). These have been collated in the attached Colour Plates for a high resolution depiction of each photomontage in order to increase the accuracy and validity of the Photo montages. VRM Africa has attempted to achieve the objectives defined by the Collaborative for Advanced Landscape Planning (CALP) Proposed Interim Code of Ethics for Landscape Visualisation (July 2003) which states that professional presenters of realistic landscape visualisations are responsible for promoting full understanding of proposed landscape changes; providing an honest and neutral visual representation of the expected landscape, by seeking to avoid bias in responses and demonstrating the legitimacy of the visualisation process. [47]

In some cases, due to the scale of the proposed landscape modifications and the uniformity of the landscape which limits reference points, the accuracy of the model proof is approximate and must be referenced as ***FOR ILLUSTRATIVE PURPOSES ONLY.***

8 DESCRIPTION OF IMPACTS

8.1 IMPACT SUMMARY TABLE FOR KEY OBSERVATION POINTS

Evaluation of the suitability of proposed landscape modifications is assessed by comparing the proposed landscape modification against a Class Objective assigned to each area, which has an associated preferred level of contrast as described in the Degree of Contrast table below.

KOP	VRM		DEGREE OF CONTRAST					
	CLASS	*PREFERRED* DEGREE OF CONTRAST	SCENARIO	CONSTRUCTION	OPERATION	CLOSURE	POST CLOSURE	VRM OBJECTIVE MET
Arandis	III	M	1	W	M	M	M	Y(M)
			2	W	M	M	M	Y(M)
			3	W	S	S	S	N
B2 Eastbound	III	M	1	W	M	M	M	Y(M)
			2	W	M	M	M	Y(M)
			3	W	S	S	S	N
B2 Westbound	III	M	1	W	M	M	M	Y(M)
			2	W	M	M	M	Y(M)
			3	W	S	S	S	N
Khan River	II	W	*	W	M	M	M	Y(M)
Panner Gorge	II	W	*	W	M	M	M	Y(M)
Welwitschia Flats / NNP	II	W	1	W	W	W	W	Y
			2	W	W	W	W	Y
			3	W	M	M	M	Y

Y = Yes, N = No, Y(M) = Yes with Mitigation, S = Strong, M = Moderate, W = Weak

8.1.1 *ARANDIS*

Scenario 1: Base Case

For the Arandis area the VRM Class III objective was defined due to the areas existing moderate development and proximity to the mine and infrastructure. Moderate levels of visual impact would be suitable for proposed landscape modifications in order to retain the existing sense of place. In terms of visual impacts assessment in

Phase 2 of the SEIA for the Rössing expansion, only the tailings storage facility would be visible during the later stages of construction. Due to the distance to the tailings storage facility and the localised topographic and vegetation screening, the visual impact of this activity would be moderate and fit in with the VRM Objectives defined for this Key Observation Point with mitigation.

Scenario 2: Central Option

In the construction phase the tailings storage facility would not dominate the landscape. However gradually over time the tailings storage facility would begin to dominate due to the size and scale and proximity to the skyline. The sense of place already contains views of the existing tailings storage facility activities and the resultant level of change to the characteristic landscape would be moderate and will not dominate. This would adhere to the Class III visual objectives defined for this area.

Scenario 3: Permanent Option

In the operational phase the activity will irreversibly change the character of the landscape due to the size and scale of the landscape modifications. The broad, wide forms will dominate the view as they are unlike the surrounding landscape. Management objectives will not be met.

8.1.2 *B2 ROUTE*

Scenario 1: Base Case

The proximity of the B2 route to the mine zone of visual influence allows for a greater perceived acceptance of mine related landscape modifications. However, due to the importance of this route as the main tourist corridor from the interior through the central Namib Desert areas to the western coastline there is a necessity for greater control of visual impact management. Consequently the VRM Class III objectives were defined which allow for moderate modifications. The only expansion activity that creates excessive contrast from this Key Observation Point is the tailings storage facility which is large in scale in relation to the surrounding landscape, and in close proximity to the B2. The oxidised brown colour of the tailings storage facility is very similar to the surrounding landscape as is the strong horizontal line created by the shape. Together these features help to reduce the degree of contrast generated by the landscape modification and allow for the VRM Class III visual objectives defined for this area to be met with mitigation.

Scenario 2: Central Option

In the construction phase the existing activity is similar to proposed site activity. The distance reduces the visibility and detail. The oxidised brown colour of the tailings storage facility is very similar to the surrounding landscape as is the strong horizontal line created by the shape. Together these features help to reduce the degree of contrast generated by the landscape modification and allow for the VRM Class III visual objectives defined for this area to be met. This would adhere to the Class III visual objectives defined for this area with mitigation.

Scenario 3: Permanent Option

In the construction phase the landscape and its sense of place will be irreversibility changed as the broad, wide and uniform features of the Permanent Heap begin to dominate the landscape and the skyline blocking out views of the Berning Range which is an integral component of the vista. Due to the method of construction, mitigation by means of shaping is limited. The rounding of the edges as seen from the B2 eastbound would be required to help reduce some of the degree of contrast as seen from this location. Management objectives will not be met.

8.1.3 *KHAN RIVER*

Due to the high levels of landscape character associated with the Khan River and its importance as a tourist view corridor, this area was assigned Class II VRM status. This area should not be subject to landscape modifications. However, the existing vista does include close views of the existing waste rock dumps. Two rehabilitation scenarios can be undertaken, the first is to clean up the smaller elements which generate contrast and then re-evaluate *(Plates 53 Figure 2).* The second scenario is to increase the dumping of waste rock in specific areas *(Plates 53 Figure 3)* which would help to break up the very strong alien horizontal line which dominates the view in relation to the rugged and broken lines of the surrounding mountainous

landscape. In terms of the current Waste Rock Dump requirements, this area is not required for additional dumping capacity. Should this area be required for future dumping of waste rock, the second scenario would be required and detailed design for the Waste Rock Dump in this area would be necessary.

8.1.4 *NAMIB NAUKLUFT PARK*

The Namib Naukluft Park is an important wilderness reserve where the lack of manmade activities is vital to benchmark the Namibian 'place of open spaces', sense of place and heritage. A VRM Class I would be required for landscape modification within this area. The Rössing tenement licence area does overlap with the park but the mining footprint area is not within the Namib Naukluft Park area. Due to the distance (+5 km) from the park to the waste rock dumps and the ripios landscape modifications, the broken lines and variable benches of the visually preferred design would reduce the degree of contrast to suitable weak levels. Much of the Phase II activities would be screened by the waste rock dump. With the distance, the rough texture and grey colour of the ripios and the waste rock dump would help to reduce the degree of contrast to acceptable moderate levels.

8.1.5 *PANNER GORGE*

Panner Gorge has high levels of landscape character associated with the river and surrounding mountain features. It is also important due to the long term tourism Khan Heritage Area plans located in this area which includes a significant archaeological chert quarry. Taking this into account, the area was defined as a Visual Resource Management Class II area to ensure that post life of mine the area would still offer tourism activities in conjunction with the Khan Heritage Area. During Operation Phase the activities associated with disposal at the waste rock dump (which is the only activity visible from this area) would exceed the moderate levels of contrast required for this area. However, at closure stage and beyond, moderate levels of contrast will be generated as the broken lines of design of the waste rock dump would be similar to the surrounding landscape and with careful design and shaping of the final protruding 'peak' features, contrast would be limited.

8.1.6 *WELWITSCHIA FLATS*

Scenario 1: Existing Option

The Welwitschia Flats is an area similar in landscape character to the Namib Naukluft Park but this area is not protected as a National Park. Due to the importance of reducing the zone of visual influence of each mine in the area, the comments for the Namib Naukluft Park Key Observation Point hold true for this area. This area is highlighted as a sensitive hotspot area which needs to be avoided, protected and actively conserved e.g. Welwitschia Drive.[48] Due to the similar colours and lines of the tailings storage facility to the existing landscape as seen from this location, the degree of contrast would be weak and the Class II VRM objectives proposed to protect the scenic resources of this area would be met.

Scenario 2: Central Option

As with Scenario 1, the colour and line of the tailings storage facility is very similar to the existing landscape, although in this scenario the tailings storage facility is higher. Mitigation would be required to round off the edges of the tailings storage facility as seen from this location. A new visual footprint would be created by the development of the Ripios on the dome which is in clear view of the Welwitschia Flats. The ripios would not dominate the view as it fits below the skyline and is located in an area which has a higher VAC levels due to the rugged terrain. With the distance the grey colour of the ripios would further assist to reduce the degree of contrast and the VRM Class II objectives defined for the site would be met.

Scenario 3: Permanent Option

Comment as for Scenario 2. The combination of the combined views of the tailings dam and the permanent heap does increase the visual intrusion as both landscape modifications are located on the skyline as seen from this location. Some visual absorption is created by the Berning Range in front of the permanent heap and over the distance, the grey colour of the permanent heap would help to reduce the degree of contrast to moderate levels.

8.2 IMPACTS SUMMARY TABLE OF INDIVIDUAL LANDSCAPE MODIFICATIONS

8.2.1 *SCENARIO 1: BASE CASE OPTION*

The impacts from all the mining activities were compiled into a single summary table.

DESCRIPTION	CLASS		IMPACT CRITERIA				
	VRM CLASS	VRM OBJECTIVE	VISIBILITY	EXPOSURE	LANDSCAPE CHARACTER	DEGREE OF CONTRAST	VRM OBJECTIVES MET
Blast Plume & Dust	III	M	M	M	M	M	Y(M)
Coarse Ore Stockpile	IV	S	L	L	L	W	Y
Fine Crushing Plant	IV	S	L	L	L	M	Y
Pit Extension	IV	S	L	L	L	W	Y
Primary Crusher	IV	S	L	L	L	W	Y
Tailings Storage Facility	III	M	S	S	L	H	N
Waste Rock Dumps	IV	S	M	M	M	M	Y(M)

H = High, L = Low, Y = Yes, N = No, Y(M) = Yes with Mitigation,
S = Strong, M = Moderate, W = Weak

8.2.2 *SCENARIO 2: CENTRAL OPTION*

DESCRIPTION	CLASS		IMPACT CRITERIA				
	VRM CLASS	VRM OBJECTIVE	VISIBILITY	EXPOSURE	LANDSCAPE CHARACTER	DEGREE OF CONTRAST	VRM OBJECTIVES MET
Agglomeration Plant	IV	S	L	L	L	M	Y(M)
Blast Plume & Dust	III	M	M	M	M	M	Y(M)
Coarse Ore Stockpile	IV	S	L	L	L	W	Y
Fine Crushing Plant	IV	S	L	L	L	M	Y (M)
Heap Leach	IV	S	L	M	L	M	Y(M)
Pre-Filtration/SX Plant	III	M	M	M	M	M	Y(M)

Pit Extension	IV	S	L	L	L	W	Y
Primary Crusher	IV	S	L	L	L	W	Y
Ripios and Overhead Conveyor	II	M	M	L	M	M	Y*
Tailings Storage Facility	III	M	H	H	L	M	Y(M)
Waste Rock Dumps	IV	S	M	M	M	M	Y(M)

** In context of the close proximity to Class IV mine sense of place*
H = High, L = Low, Y = Yes, N = No, Y(M) = Yes with Mitigation,
S = Strong, M = Moderate, W = Weak

8.2.3 *SCENARIO 3: PERMANENT OPTION*

DESCRIPTION	CLASS		IMPACT CRITERIA				
	VRM CLASS	VRM OBJECTIVE	VISIBILITY	EXPOSURE	LANDSCAPE CHARACTER	DEGREE OF CONTRAST	VRM OBJECTIVES MET
Agglomeration Plant	IV	S	L	M	L	M	Y(M)
Blast Plume & Dust	III	M	M	M	M	M	Y(M)
Coarse Ore Stockpile	IV	S	L	L	L	W	Y(M)
Fine Crushing Plant	IV	S	L	L	L	W	Y(M)
Permanent Heap Leach	IV	S	H	H	M	S	N
Pre-Filtration/SX Plant	IV	M	L	M	L	M	Y(M)
Pit Extension	IV	S	L	L	L	W	Y(M)
Primary Crusher	IV	S	L	L	L	W	Y(M)
Tailings Storage Facility	III	M	H	H	L	M	Y(M)
Waste Rock Dumps	IV	S	M	M	M	M	Y(M)

H = High, L = Low, Y = Yes, N = No, Y(M) = Yes with Mitigation,
S = Strong, M = Moderate, W = Weak

<u>Agglomeration Plant</u>

In Scenario 2 and Scenario 3 the agglomeration plant is sited in an area where the landscape character has already been highly modified. The location is well developed and has higher VAC levels. This is due to other existing tanks etc. Being located on the current tailings storage facility and as such the visual intrusion would be moderate. This modification is well within the required Class IV classification defined for the area. In order to reduce the zone of visual influence for the mine in context with the cumulative impacts identified in the Uranium Rush SEA, mitigation regarding colour is required during the life of the mine. All the structures

associated with the activity need to be removed completely during closure phase and the site landscape returned to an uncluttered and neutral form.

Blast Plume & Dust

As indicated by the blast study, the zone of visual influence for dust and blasting is high although the duration of the visual impact is very limited. The area where the blasting takes place is hazy due to the other existing mining activities that are currently taking place. This does increase the visual absorption capacity levels and reduces the visual intrusion to moderate levels. During the life of the mine blasting and dust has the potential to increase the cumulative visual risks to the surrounding areas which may also be mined. However, after closure this activity will cease.

Coarse Ore Stockpile

The area where this activity is proposed is already highly transformed and has other mining activities including the existing stockpile, which create high visual absorption capacity levels. Another stockpile would generate low levels of visual intrusion and the Class IV Visual Resource Management (VRM) objectives defined for the area will be achieved during life of the mine. This additional stockpile will need to be removed during closure.

Fine Crushing Plant

The area where this plant is proposed is already highly transformed and has other mining structures including the existing stockpile which creates high visual absorption capacity levels. The plant would generate low levels of visual intrusion and the Class IV VRM objectives defined for the area will be achieved during life of the mine. It will need to be removed during closure.

SX Plant

In Scenario 2 and Scenario 3, these structures are sited in an area where the landscape character has already been highly modified. The location is well developed and has higher VAC levels due to the other existing tanks etc. located on the current tailings storage facility. This modification is well within the required Class III classification defined for the area and in the long term would be effectively screened to northern receptors by the TSF. In order to reduce the zone of visual influence for the mine, mitigation regarding colour is required during the life of the mine. All the structures associated with the activity need to be removed completely during closure phase and the site landscape returned to an uncluttered and neutral form.

SJ Open Pit

Due to the void nature of this activity the viewshed is localised. The pit is already in existence which generates high visual absorption capacity levels and the visual intrusion will be low. With dust suppression measures in place, the Class IV visual objectives for the site will be achieved.

Primary Crusher

The area where this activity is proposed is already highly transformed and has other mining activities including the existing crushing plant and structures which create high visual absorption capacity levels. Another crushing plant would generate low levels of visual intrusion and the Class IV VRM objectives defined for the area will be achieved during life of mine. The proposed crusher will need to be removed during closure.

Heap Leach

In Scenario 2: Central Option the area where the heap leach facility is proposed is already highly transformed and has other mining activities including the existing tailings storage facility The Berning range located directly to the east screens views to the south. Due to the low profile of the activity in relation to the higher visual absorption capacity levels of the site, low levels of visual intrusion would be generated and the Class IV VRM objectives defined for the area will be achieved during the life of the mine. All of this activity must be removed during closure and the area shaped to an uncluttered landscape.

Ripios and Overhead Conveyor

In Scenario 2 the ripios is situated on the dome with a radial stacker used for stacking of the spent ore processed in the heap leaching. The uniform and curved nature of the front and side faces create smooth textured and alien type landscape modification in contrast to the rugged and broken terrain of the surrounding

areas. The Ripios would also require an overhead rope conveyor taking the leached material from the Heap leach to the Ripios. This will run across the access road to the mine

Permanent Heap

In the permanent option the ripios, situated on top of the permanent heap, will grow to a height of 710 m which will be above the ridge of Berning Range. The Berning Range is a significant visual feature of the landscape as it features very prominently in the B2 and Arandis receptor views. The uniform colour and cone like shape of the geometry will create high levels of contrast to the browns and predominantly horizontal lines of the surrounding landscape. This landscape modification will also intrude into the skyline as seen from all receptors and would significantly increase the potential for indivisibility between mines.

Tailings Storage Facility Scenario 1: Base Case

As seen in Plate 42 the tailings storage facility is the only expansion activity assessed in the Phase 2 SEIA for Rössing Expansion Project that generates high levels of visual intrusion in this scenario. This scenario increases the height of the existing TSF to 680 m amsl and covers a much greater footprint which is banked up against the Berning Range. Due to the size and scale of the landscape modification which would effectively block views of the Berning Range, higher levels of contrast would be generated and the Class III VRM objectives would not be met.

Tailings Storage Facility Scenario 2 & 3: Central Option & Permanent Options

The central tailings facility constitutes a major change to the design with the top of the tailings reaching 680mamsl. Although this landscape modification is the same height as the TSF in Scenario 1, the massing is less and the views of the Berning Range are not compromised. *See Plate 43.*

Waste Rock Dumps

Specific designs need to be negotiated. Mitigations include dust suppression and removal of structures during the mine Closure Phase. Final shapes of prominent crests need to be designed and shaped in consultation with VRM Africa to ensure that they do not become visually intrusive. *See Plates 44 – 46.*

9 NATURE OF THE VISUAL IMPACT

Specific impact criteria to assess impacts were defined by Aurecon South Africa. *(See Annexure for further details)*

1. EXTENT: Spatial scale
2. DURATION: Time scale
3. MAGNITUDE: Size or degree scale
4. SIGNIFICANCE: The significance of impacts as determined through a synthesis of ... their nature, duration, intensity, extent and probability. Assessed in the case of no mitigation and with the most effective mitigation measure(s) in place.
5. PROBABILITY Degree of possible visual impact
6. CONFIDENCE Key uncertainties and risks in the VIA process, which may influence the accuracy of, and confidence in, the VIA process.
7. REVERSIBILITY Ability to be changed or undone

'The mitigation described in the SEIA Report will represent the full range of plausible and pragmatic measures but does not necessarily imply that they should, or will, all be implemented. The decision as to which combination of alternatives and mitigation measures to apply will lie with Rössing as the proponent, and their acceptance and approval ultimately with MET:DEA and MME. The SEIA Report will explicitly describe Rössing commitments in this regard.' [49]

9.1 SCENARIO 1: BASE CASE OPTION

NATURE OF VISUAL IMPACT (NO MITIGATION OPTION)		
CRITERIA	**RATING WITHOUT MITIGATION**	**MOTIVATION**
Extent	*LOCAL*	The visual impacts will be confined to the existing mine zone of visual influence.
Magnitude	*MEDIUM*	Landscape integrity and receptors are *moderately* altered as the alien landform of the tailings facility will be intrusive and dominate the landscape character of the area of Arandis and the B2. Although the Class III objectives set for the tailings facility would be exceeded, this scenario would not generate excessive levels of visual contrast and screening from the Berning Range would limit intervisibility to the south and the SEA recommendation of reducing the intervisibility of mining landscapes would be achieved.
Duration	*LONG TERM*	The visual impact associated with the expansion of the pit and tailings facility would be permanent.
Significance	*MEDIUM*	Medium magnitude with a local extent and long term duration.
Probability	*PROBABLE*	Estimated 5 to 95% chance of the impact occurring.
Confidence	*CERTAIN*	Wealth of information and sound understanding of the environmental factors potentially influencing the impact.
Reversibility	*IRREVERSIBLE*	The activity will lead to an impact that is permanent.

9.2 SCENARIO 2: CENTRAL OPTION

NATURE OF VISUAL IMPACT			
CRITERIA	**RATING WITHOUT MITIGATION**	**RATING WITH MITIGATION**	**MOTIVATION**
Extent	*LOCAL*	*LOCAL*	The landscape modifications will marginally increase the existing mine zone of visual influence which due to the terrain and mine planning, has been contained at a local level.
Magnitude	*MEDIUM*	*LOW*	Without mitigation, the visual intrusion of the edges of the tailings facility would generate moderate levels of visual intrusion due to the distance from the southern receptors. With mitigation, landscape integrity and receptors are *slightly* altered as the alien landform of the tailings facility will be marginally intrusive as seen from the NNP and Welwitschia Flats. This is more in line with meeting the SEA recommendations of reducing the intervisibility of mining landscapes.
Duration	*LONG TERM*	*LONG TERM*	The visual impact associated with the Central Option will be permanent.
Significance	*HIGH*	*MEDIUM*	Without mitigation the significance would be high. With mitigation it would be medium as there is a low magnitude with a local extent and long term duration.
Probability	*PROBABLE*	*PROBABLE*	Estimated 5 to 95% chance of the impact occurring.
Confidence	*CERTAIN*	*CERTAIN*	Wealth of information and sound understanding of the environmental factors potentially influencing the impact.
Reversibility	*IRREVERSIBLE*	*IRREVERSIBLE*	The activity will lead to an impact that is permanent.

9.3 SCENARIO 3: PERMANENT OPTION

NATURE OF VISUAL IMPACT WITH AND WITHOUT MITIGATION		
CRITERIA	**RATING**	**MOTIVATION**
Extent	*REGIONAL*	The visual impacts will be confined to the Erongo Region.
Magnitude	*MEDIUM*	The magnitude of the visual impact will be medium
Duration	*LONG TERM*	The visual impact associated with this option will be permanent.
Significance	*HIGH*	Medium magnitude with a regional extent and long term duration which specifically relate to the Permanent Heap which could set a precedent in the Erongo Regions for large scale, alien shaped landforms which would significantly detract from the sense of place. The location of the Permanent Heap on the skyline as seen from the NNP and Welwitschia Flats increases the significance of the visual impact.
Probability	*PROBABLE*	Estimated 5 to 95% chance of the impact occurring.
Confidence	*CERTAIN*	Wealth of information and sound understanding of the environmental factors potentially influencing the impact.
Reversibility	*IRREVERSIBLE*	The activity will lead to an impact that is permanent.

10 CONCLUSION

Due to the long period of time that the Rössing mine has been operating, the sense of place of the site has already been significantly impacted. Rössing Uranium Limited management has in the recent past been well aware of containing the visual influence of the mining activities as much as possible and this, in conjunction with the higher VAC levels of the surrounding terrain, have significantly helped to reduce the visual envelope of the mine to the greater surrounds. As a result of this reduced visual envelope, the landscape character of surrounding areas such as the Khan River and Welwitschia Flats which are incorporated into the NNP, remain intact. In this light, modifications associated with the further expansion of the mine have a lower significance rating. However, it must be noted that due to the current demand for uranium, other uranium mines are proposed in the Erongo Region as well as within the NNP. In order to more fully understand the implication of the demand for uranium mining in the central Namib, the Uranium Rush Strategic Environmental Assessment (SEA) has been undertaken. The SEA identifies the importance of each mine reducing the zone of visual influence as this, in turn, would reduce the potential intervisibility of the mines. If not effectively managed this combined visual impact has the potential to generate high cumulative visual impacts and significantly detract from the high levels of landscape character that define and sustain the eco-tourism in the region. With this in mind it is necessary to ensure that all mines make every effort to reduce the levels of visual intrusion to ensure that the area does not develop into a sterile landscape that is dominated by mining landscapes. As such it is important that all mines moderate their large scale landscape modifications so as to ensure that the intervisibility effect is limited.

In Scenario 1 the only mining expansion activity that does not meet the VRM Class Objectives is the tailings facility which situated on top of the existing tailings dam *(Plates 42 and 43, Figures 1 - 4)*. This scenario increases the height of the existing tailings facility to 680 m amsl and covers a much greater footprint area and banks up against the Berning Range. Due to the size and scale of this landscape modification, which would effectively block views of the Berning Range as seen from northern receptors which include the B2, higher levels of contrast would be generated.

In Scenario 2 the only mining expansion activity that could potentially generate higher levels of visual intrusion are the tailings facility which is located on the existing tailings facility and the ripios which is located on the dome. Due to the increased height of the tailings to 680 m amsl this would result in higher levels of contrast created by massing and scale. Although this landscape modification is the same height as the tailings facility in Scenario 1, the massing is less and the views of the Berning Range are not compromised. The geometry is also organic which allows a more effective blending with the forms, lines and textures of the existing landscape. The Ripios is also a large landscape modification but is effectively located in a natural depression and surrounded by rugged terrain. This increases the VAC levels and visual intrusion as seen from the Welwitschia Flats and NNP would be limited. Views by northern receptors such as the B2 are limited and reflect strong horizontal lines which mimic the existing landscape. Scenario 2 is the visually preferred option as the existing zone of visual influence would only marginally be increased. This would mainly would be to the north towards Arandis which already associated with higher levels of visual contrast and would increase as this areas grows.

In Scenario 3 the mining expansion activity that generates high levels of visual intrusion is a combination of the visual intrusion of the very large landscape modifications of the permanent heap and the tailings facility. The uniform colour and cone like shape of the geometry is alien to the surrounding landscape which would result in high levels of contrast being be generated. This effect is further accentuated by the prominence of the location and proximity to the Berning Range which is an import visual reference in the landscape. These proposed landscape modifications would increase the visual envelope of the area and visual intrusion along the B2 and Arandis areas would be high.

Based on the detailed study which included 3D modelling of all scenarios, it is the recommendation of this study that Scenario 2 is the visually preferred option as the existing zone of visual influence would only marginally be increased. This would mainly be to the north towards Arandis which is already associated with higher levels of visual contrast and would increase as this area grows. Mitigation measures have been made and it would be important to implement a follow up procedure to ensure that the recommendations made by

this study are adequately implemented. It is also vital that a properly managed trust fund is set up to ensure that sufficient funds are available to implement a progressive rehabilitation programme required for closure and for the removal of the processing plant structures after the life of the mine.

11 MITIGATIONS FOR THE PREFERRED OPTION (SCENARIO 2)

11.1 WASTE ROCK DISPOSAL FACILITY

Operation

- Dust suppression needs to be strictly implemented.
- Within the parameters of safety, lights at night need to be strictly controlled during the operational phase.
- A detailed height envelope study for the Waste Rock Dump has been undertaken. Rössing needs to ensure that the final WRD design is located as close as possible to the defined visual preference height specifications and design.

Closure

- All components of the processing plant used during operation must be removed at mine closure. The site must be visually 'cleaned up' so as to portray an uncluttered landscape.
- The elevated and prominent angular shapes of the Waste Rock Dump need to be rounded so as to reduce the level of contrast generated by the corners and straight line created by the benching.
- The final shaping of the Waste Rock Dump crests must be undertaken in consultation with a suitably qualified landscape practitioner to ensure that these prominent features appear natural in relation to the surrounding landscape, as seen from the surrounding Key Observation Points.

11.2 COARSE ORE STOCKPILE

Closure

- All the remaining ore stockpile and structures associated with the stockpile must be removed at mine closure. The site must be shaped to a natural land form.

11.3 PLANTS & STRUCTURES

Construction

- Within the limits of engineering feasibility structures should be as low as possible to the ground.
- Natural desert colours, as close as possible to a medium grey-brown, should be utilised for all structures.

Operation

- Within safety limits, lights at night need to be strictly controlled and lighting should be downward directed and the point source shielded.

Closure

- All components of the infrastructure used during operation must be removed at mine closure and the site must be landscaped to natural forms.
- It is vital that a properly managed and externally controlled trust fund/funding plan is set up during operation phase to ensure that sufficient funds are available to implement the rehabilitation and mitigations required for closure. A visual survey of the site needs to be undertaken prior to closure and recommendations (if any) implemented as part of the closure plan.

11.4 FINISHES AND TEXTURES

- All painted surfaces should blend into the surroundings using subdued earth tones. For larger surfaces, e.g. roofs and storage tanks, medium brown-grey should be tested and then used if suitable for its ability to blend into the desert surrounds. Bright colours such as reds, greens, whites and blue colours should be avoided except for required industry safety markings.
- The surface pipelines are to be painted grey unless required for safety reasons to be colour coded.
- Glass surfaces should be shielded to avoid glare and reflections.

11.5 HEAP LEACH FACILITY

Construction

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

Operation

- Large machinery needs to be painted a grey-brown desert colour to help reduce the degree of contrast generated.

Closure

- All machinery, structures, remaining ore and linings associated with the Heap Leach need to be removed and the ground decontaminated.
- The area needs to be covered with a layer of waste rock to reduce wind erosion and dust.
- A visual survey of the site needs to be undertaken prior to closure and recommendations (if any) implemented as part of the closure plant.

11.6 THE PIT

Construction and Operation

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

11.7 BLAST PLUME

Operation

- Blasting should take place in the afternoon when the atmospheric haze is more intense as well as on preset days so that tourist ventures can plan to use the surrounding areas when no blasting is taking place.
- It is recommended that blasting times are co-ordinated with other mines to ensure that the cumulative impacts of blasting are reduced.

11.8 RIPIOS

Construction

- Machinery and structures must be painted in grey-brown desert colours to reduce the degree of contrast.
- Dust control measures must be implemented during construction to ensure that excessive levels of dust are not generated.

Operation

- Strict dust control measures must be implemented to ensure that dust generated during the stacking process is limited.
- The outer edges of the Ripios need to be smoothed off so as to reduce the edging angle which increases visual intrusion and create a more rounded shape.

Closure

- A visual survey of the site must be undertaken prior to closure and recommendations (if any) implemented as part of the closure plan.
- All machinery and equipment must be removed from the site.

11.9 TAILINGS STORAGE FACILITY

Construction

- If possible a vegetation/ plant rescue should be undertaken for all plant species defined by the botanical specialist as significant. This should not come from the visual specialist
- The areas that are to be covered by the tailings must be mined of all its resources, such as sand, which can reduce the need to be acquired elsewhere, thereby reducing the visible footprint.

Operation

- A wet dust suppression process must be implemented to ensure that excessive dust is not generated.

- During operation the outer edges of the TSF need to be rounded off as seen from the WF and NNP (see Mitigation Plate 57)

Closure

- A visual survey of the site must be undertaken prior to closure and the recommendations (if any) implemented as part of the closure plan.

11.10 LIGHTS AT NIGHT

- The visual impact of lighting will be significant because it can give a project a far greater zone of visual influence at night than the structures have during the day.
- All lighting is to be kept to a minimum within the requirements of safety and efficiency.
- Where such lighting is deemed necessary, low-level lighting, which is shielded to reduce light spillage and pollution, should be used.
- No external up-lighting of any parts of the structures, including the stacks, must be allowed.
- External lighting must use down-lighters shielded in such a way as to minimise light spillage and pollution beyond the extent of the area that needs to be lit.
- Namibia is renowned for spectacular stargazing as it is generally dry, with a very high percentage of clear nights and no sources of light interference. This is a growing tourist industry for which light pollution must be controlled. To reduce the light impact of the Ripios Stacker as seen from the NNP, without compromising safety, lighting reduction design and technologies should be assessed. The aim should be to reduce the source light generated by the Stacker operating at night from any prominent location.
- Security and perimeter lighting must also be shielded so that no light falls outside the area needing to be lit. Overly tall light poles are to be avoided.
- No naked light sources are to be directly visible from a distance, (except for the aircraft warning lights.) Only reflected light should be visible from outside the site.
- All necessary aircraft warning lights are to be installed as per the relevant authority requirements.

11.11 MONITORING

A suitably qualified Visual Practitioner must be incorporated into a scheduled monitoring program to ensure that the visual recommendations have been adequately addressed.

Operation Phase

- Quarterly during life of mine.

Closure Phase

- One year later.
- Active Closure Phase (after approximately 2 years).
- Passive Closure with institution of Control Phase (approximately five years after commencement of closure).

11.12 FUTURE MODIFICATIONS

Any future changes, improvements, additions or enlargements during the operational phase, which have the potential to generate high levels of visual impact, must be subject to a separate visual impact assessment.

12 REFERENCES

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

[3] Belinda F. Arbogast, Daniel H. Knepper, Jr., and William H. Langer. The Human Factor in Mining Reclamation. U.S. Geological Survey circular ; 1191. U.S. Department of the Interior. Pg 26.

[4] Rössing Sustainable Development Policy *(www.rössing .com)*.

[5] U.S. Geological Survey circular; 1191, Pg 12.

[6] Phase I of Rössing Social and Environmental Impact Assessment (SEIA) *Ninham Shand Report No. 4492/402239. www.aurecon.webfoundryza.com.*

[7] Guidelines for Landscape and Visual Impact Assessment. 2002. IEMA. Spon Press. Pg 44.

[8] 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.*

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

[10] 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.

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

[12] Sheppard, S.R.J. 2005. Validity, reliability, and ethics in visualization. In: Bishop, I. & Lange, E. (Eds.) Visualization in Landscape and Environmental Planning: Technology and Applications. Taylor and Francis, London. Chapter 5, pp. 79-97. http://www.calp.forestry.ubc.ca/CodeOfEthics_July03.pdf.

[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.

[14] Environmental Management Act, 2007 (Act No. 7 of 2007), of the Parliament. Namibia Government Gazette No. 3966.

[15] Government of the Republic of Namibia, '*Namibia Vision 2030: Policy Framework for Long term Development'*, 2004, Pg 29, 43. 78.

[16] Government of the Republic of Namibia, *Minerals Policy of Namibia*, 2006, pg 13.

[17] Strategic Environmental Assessment (SEA) for Coastal areas of Erongo and Kunene Regions. Ministry of Environment and Tourism Study Report Namibian Coast Conservation & Management Project – NACOMA. January 2008.

[18] Management & Development Plan for the Central Area of the Namib-Skeleton Coast National Park for the Period of 2009-2013. Third draft: 28 January 2009. (Pg105).

[19] U.K Institute of Environmental Management and Assessment (IEMA), 'Guidelines for Landscape and Visual Impact Assessment' Second Edition, Spon Press, 2002. Pg 120/121. Latin *genius locī* : genius, spirit + locī, genitive sing. of *locus*, place.

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

[21] www.namibiatourism.com.na.

[22] Geotourism, David Newsome. Edited by Ross Lingston Dowling. June 2005. Pg 46.

[23] SAIEA (2010). Strategic Environmental Assessment for the central Namib Uranium Rush. Ministry of Mines and Energy, Windhoek, Republic of Namibia. Appendix: VRM Africa. Visual Impact Assessment *http://www.saiea.com/uranium/index.html.*

[24] Namibia National Commission for UNESCO submission http://whc.unesco.org/en/tentativelists/1747/.

[25] http://whc.unesco.org/en/nominations/.

[26] Government of the Republic of Namibia, Minerals Policy of Namibia, 2006.

[27] Management & Development Plan for the Central Area of the Namib-Skeleton Coast National Park for the Period of 2009-2013. Third draft: 28 January 2009. Pg 5.

[28] MDP for the Central Area of the NSCNP, 2009. As above. Pg 54; 90; 19.

[29] Government of the Republic of Namibia, '*Namibia Vision 2030: Framework for Long term Development'*, 2004.

[30] U.K Institute of Environmental Management and Assessment (IEMA), ' Guidelines for Landscape and Visual Impact Assessment' Second Edition, Spon Press, 2002. Pg 119.

[31] Mining Journal. March 2010. Mining Journal special publication – Namibia. Pg 6. *www.mining-journal.com/__data/assets/supplement.../Namibia_scr.pdf.*

[32] SAIEA (2010). Strategic Environmental Assessment for the central Namib Uranium Rush. Ministry of Mines and Energy, Windhoek, Republic of Namibia. Appendix: VRM Africa. Visual Impact Assessment *http://www.saiea.com/uranium/index.html.*

[33] U.K Institute of Environmental Management and Assessment (IEMA). 'Guidelines for Landscape and Visual Impact Assessment' Second Edition, Spon Press, 2002. Pg 121.

[34] Marie Hoadley & Daniel Limpitlaw, *'Uranium Mining in Namibia – Focus Erongo'*, InfoMine (2007) Uranium Prices, retrieved from <*http://www.infomine.com/investment/metalschart.asp>.*

[35] SAIEA (2010). Strategic Environmental Assessment for the central Namib Uranium Rush. Ministry of Mines and Energy, Windhoek, Republic of Namibia. Appendix: VRM Africa. Visual Impact Assessment *http://www.saiea.com/uranium/index.html.*

[36] SAIEA (2010). Strategic Environmental Assessment for the central Namib Uranium Rush. Ministry of Mines and Energy, Windhoek, Republic of Namibia. Ch 7.6.4: Recreation and Tourism. *http://www.saiea.com/uranium/index.html.*

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

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

[39] http://www.rossing.com/rossing_foundation.htm.

[40] www.namibiatourism.com.na.

[41] Namibia National Commission for UNESCO, 'World Heritage UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage' WHC-09/33.COM/8A, Submission retrieved from http:// *whc.unesco.org/document/101975, June 2009.*

[42] United Nations - Copyright © 1992-2009 UNESCO World Heritage Centre, All Rights Reserved | v3.0, Updated 27 Oct 2009. http://whc.unesco.org/en/criteria/.

[43] SAIEA (2010). Strategic Environmental Assessment for the central Namib Uranium Rush. Ministry of Mines and Energy, Windhoek, Republic of Namibia. Chapter 7.6.5: Recreation and Tourism. *http://www.saiea.com/uranium/index.html.*

[44] Aurecon. 2009. Expansion Scenario as per Comet Case 89.

[45] Aurecon South Africa. 2009. Expansion Scenario as per Comet Case 89.

[46] Rio Tinto Rössing Uranium Mine Proposed Expansion Projects Phase II. Draft waste Rock Dumps 2026 Recommendations. VRM Africa January 2009.

[47] Sheppard, S.R.J. 2005. Validity, reliability, and ethics in visualization. In: Bishop, I. & Lange, E. (Eds.) *Visualization in Landscape and Environmental Planning: Technology and Applications*. Taylor and Francis, London. Chapter 5, pp. 79-97. http://www.calp.forestry.ubc.ca/CodeOfEthics_July03.pdf.

[48] SAIEA (2010). Strategic Environmental Assessment for the central Namib Uranium Rush. Ministry of Mines and Energy, Windhoek, Republic of Namibia. Chapter 7.6.5: Recreation and Tourism. *http://www.saiea.com/uranium/index.html*

[49] Rössing SEIA: Phase 2: Final Scoping Report © Ninham Shand (2008) Pg 13.

ANNEXURE A: GLOSSARY

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.

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 trails.

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

Visual sensitivity of receptors
The level of visual impact considered acceptable which is dependent on the type of receptors. [1]

[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. Appendix A

ANNEXURE B: IMPACT ASSESSMENT CRITERIA

IMPACT CRITERIA

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 …"[2] 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:[3]

Landscape Character / Sensitivity

Area sensitivity is 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 Envelope / 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

Exposure is 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.

Receptor Sensitivity

The level of visual impact considered acceptable is dependent on the type of receptors.

- High – residential areas, nature reserves and scenic routes
- Moderate – Sporting or recreational areas or places of work
- Low – industrial, mining or degraded areas

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.
- *high,* where it would influence the decision regardless of any possible mitigation.

[2] 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.

[3] 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.

CRITERIA	CATEGORY	DESCRIPTION
Extent or spatial influence of impact	**National**	Within Namibia
	Regional	Within the Erongo Region
	Local	Within existing mine zone of visual influence
*** Magnitude of impact (at the indicated spatial scale)**	**High**	Landscape integrity and receptors are *severely* altered
	Medium	Landscape integrity and receptors are *notably* altered
	Low	Landscape integrity and receptors are *slightly* altered
	Very Low	Landscape integrity and receptors are *negligibly* altered
	Zero	Landscape integrity and receptors remain *unaltered*
Duration of impact	**Short term**	(construction period) Up to 3 years
	Medium Term	Between 3 and 10 years
	Long Term	More than 10 years after construction

SIGNIFICANCE RATINGS	LEVEL OF CRITERIA REQUIRED
High	• High magnitude with either a regional extent and medium term duration or a local extent and long term duration. • Medium magnitude with a regional extent and long term duration.
Medium	• High magnitude with a local extent and medium term duration • High magnitude with a regional extent and construction period or a site specific extent and long term duration • High magnitude with either a local extent and construction period duration or a site specific extent and medium term duration • Medium magnitude with any combination of extent and duration except site specific and construction period or regional and long term • Low magnitude with a regional extent and long term duration
Low	• High magnitude with a site specific extent and construction period duration • Medium magnitude with a site specific extent and construction period duration • Low magnitude with any combination of extent and duration except site specific and construction period or regional and long term • Very low magnitude with a regional extent and long term duration
Very low	• Low magnitude with a site specific extent and construction period duration • Very low magnitude with any combination of extent and duration except regional and long term
Neutral	• Zero magnitude with any combination of extent and duration

PROBABILITY RATINGS	CRITERIA
Definite	Estimated greater than 95% chance of the impact occurring.
Probable	Estimated 5 to 95% chance of the impact occurring.
Unlikely	Estimated less than 5% chance of the impact occurring.

CONFIDENCE RATINGS	CRITERIA
Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.
Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.
Unsure	Limited useful information

REVERSIBILITY RATINGS	CRITERIA
Irreversible	The activity will lead to an impact that is permanent.
Reversible	The impact is reversible, within a period of 10 years.

ANNEXURE C: BEST PRACTICABLE ENVIRONMENTAL OPTION

1. BEST PRACTICABLE ENVIRONMENTAL OPTION (BPEO)

The Best Practicable Environmental Option (BPEO) procedure 'establishes for a given set of objectives, the option that provides the most benefits or the least damage to the environment.'[1]
In order to determine the BPEO the following specialist reports and guidelines, which make relevant reference to visual impact, were taken into account:

- **U.K IEMA: *Guidelines for Landscape and Visual Impact Assessment***

'The principal aim of these guidelines is to encourage high standards for the scope and content of landscape and visual impact assessments, based on the collegiate opinion and practice of members of the Landscape Institute and the Institute of Environmental Management and Assessment (UK). The guidelines also seek to establish certain principles that will help achieve consistency, credibility and effectiveness in landscape and visual impact assessment, when carried out as part of an EIA.'

General principles for best practice in visual impact assessment include:

- Clearly describing the methodology
- Use clearly defined and agreed terminology
- Avoid generalisations
- Be as impartial as possible
- Draw on the advice and opinions of others
- Carry out consultations
- Organise and structure the assessment
- Openly acknowledge any deficiencies
- Consider the 'worst case situation'[1]

- The **Western Cape *DEA&DP Guideline for involving visual and aesthetic specialists in EIA Processes*** states that the BPEO should address the following:
  - 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 BPEO must also ensure that development must be located to prevent structures from being a visual intrusion (i.e. to retain open views and vistas).
  - 'Long term protection of important scenic resources and heritage sites;
  - Minimisation of visual intrusion in scenic areas;
  - Retention of wilderness or special areas intact as far as possible;
  - Responsiveness to the area's uniqueness, or sense of place.'[1]

2. PUBLIC COMMENT

A scoping process was undertaken by Aurecon South Africa as part of the EIA process. The main concerns pertaining to visual impacts raised by I&AP's were as follows:

- "The mine is going to be extended….What is going to be the effect of the visual impact on tourism" *Participant Arandis 24 January 2008*
- "Avoiding the extension of he mine's footprint would also fit in better with the Rio Tinto environmental standards, for instance
  - Best Practice for mineral waste disposal is reuse of waste or backfilling of existing pit.
  - The biodiversity guidelines call for avoidance of impacts as the first choice, then minimisation, then mitigation" *S Muller, I&AP (6 February 2008, written submission)*

ANNEXURE D: KEY OBSERVATION POINT CONTRAST RATING

1. ARANDIS – SCENARIO 1

CONSTRUCTION PHASE

VRM CLASS III	**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 .

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

MANAGEMENT OBJECTIVES MET?	*Yes*
Motivation Activities will not be visible due to topographic and vegetation screening.	
CONFIDENCE LEVEL	*High/Certain*

OPERATION PHASE

VRM CLASS III	As above

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

MANAGEMENT OBJECTIVES MET?	*Yes*
Motivation Limited visibility of landscape modifications as sense of place already dominated by residential dwellings, structures and existing mining activities.	
CONFIDENCE LEVEL	*High/Certain*

CLOSURE PHASE
As for Operation Phase

POST CLOSURE PHASE
As for Operation Phase

2. ARANDIS – SCENARIO 2

CONSTRUCTION PHASE

VRM CLASS III	As above

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

MANAGEMENT OBJECTIVES MET?	*Yes*
Motivation Activities will only gradually over time become visible due to topographic screening.	
CONFIDENCE LEVEL	*High/Certain*

OPERATION PHASE

VRM CLASS III	As above

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

MANAGEMENT OBJECTIVES MET?	*Yes*
Motivation The sense of place is already dominated by the existing mining activities, so the level of change to the characteristic landscape is moderate. The view will not be dominated.	
CONFIDENCE LEVEL	*High/Certain*

CLOSURE PHASE

As for Operation Phase

POST CLOSURE PHASE

As for Operation Phase

3. ARANDIS – SCENARIO 3

CONSTRUCTION PHASE

VRM CLASS III	As above

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

MANAGEMENT OBJECTIVES MET?	*Yes*
Motivation Activities will only be gradually visible over an extended period of time	
CONFIDENCE LEVEL	*High/Certain*

OPERATION PHASE

VRM CLASS III	As above

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

MANAGEMENT OBJECTIVES MET?	*No*
Motivation The activity will irreversibly change the character of the landscape. The broad, wide forms will dominate the view as they are unlike the surrounding landscape.	
CONFIDENCE LEVEL	*Certain*

CLOSURE PHASE
As for Operation Phase

POST CLOSURE PHASE
As for Operation Phase

4. B2 EASTBOUND – SCENARIO 1

CONSTRUCTION PHASE

VRM CLASS III	**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.

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

MANAGEMENT OBJECTIVES MET?	*Yes*
Motivation Existing mining activities, which include storages tanks and machinery, will be very similar to proposed construction activities. Colour mitigation required. The distance reduces the visibility and detail.	
CONFIDENCE LEVEL	*High/Certain*

OPERATION PHASE

VRM CLASS III	As above

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

MANAGEMENT OBJECTIVES MET?	*No – with Mitigation Yes*
Motivation Due to the size and scale and uniformity of the Ripios, the proposed landscape modification will dominate the landscape. Mitigation to reduce the height of the Ripios and break up the uniformity of the front face needs to be undertaken.	
CONFIDENCE LEVEL	*High/Certain*

CLOSURE PHASE

As for Operation Phase

POST CLOSURE PHASE

As for Operation Phase

5. B2 EASTBOUND – SCENARIO 2

CONSTRUCTION PHASE

VRM CLASS III	As above

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

MANAGEMENT OBJECTIVES MET?	*Yes*
Motivation Existing activity is similar to proposed site activity. Colour mitigation of structures and machinery required.	
CONFIDENCE LEVEL	*Certain*

OPERATION PHASE

VRM CLASS III	As above

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

MANAGEMENT OBJECTIVES MET?	*Yes*
Motivation Tailings and Ripios will, over time and a period of weathering, blend with the existing landscape. The level of change will be moderate and the view will not be dominated. Mitigation to break up the uniformity of the front face of the tailings is required.	
CONFIDENCE LEVEL	*Certain*

CLOSURE PHASE
As for Operation Phase

POST CLOSURE PHASE
As for Operation Phase

6. B2 EASTBOUND – SCENARIO 3

CONSTRUCTION PHASE

VRM CLASS III	As above

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

MANAGEMENT OBJECTIVES MET?	*Yes*
Motivation The permanent heap leach and tailings will only reach maximum height over a period of time.	
CONFIDENCE LEVEL	*Certain*

OPERATION PHASE

VRM CLASS III	As above

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

MANAGEMENT OBJECTIVES MET?	*No*
Motivation The landscape and its sense of place will be irreversibility changed. The broad, wide forms will dominate the landscape.	
CONFIDENCE LEVEL	*Certain*

CLOSURE PHASE
As for Operation Phase

POST CLOSURE PHASE
As for Operation Phase

7. B2 WESTBOUND 1 – SCENARIO 1

CONSTRUCTION PHASE

VRM CLASS III	**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.

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

MANAGEMENT OBJECTIVES MET?	*Yes*
Motivation Existing mining activities, which include storage tanks and machinery, will be very similar to proposed construction activities. Colour mitigation required.	
CONFIDENCE LEVEL	*Certain*

OPERATION PHASE

VRM CLASS III	As above

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

MANAGEMENT OBJECTIVES MET?	*NO – with Mitigation Yes*
Motivation Due to the size and scale and uniformity of the Tailings, the proposed landscape modification will dominate the landscape. Mitigation to reduce the height of the Ripios and break up the uniformity of the side face needs to be undertaken.	
CONFIDENCE LEVEL	*Certain*

CLOSURE PHASE

As for Operation Phase

POST CLOSURE PHASE

As for Operation Phase

8. B2 WESTBOUND 1 – SCENARIO 2

CONSTRUCTION PHASE

VRM CLASS III	As above

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

MANAGEMENT OBJECTIVES MET?	*Yes*
Motivation Existing mining activities, which include storage tanks and machinery, will be very similar to proposed construction activities. Colour mitigation required.	
CONFIDENCE LEVEL	*Certain*

OPERATION PHASE

VRM CLASS III	As above

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

MANAGEMENT OBJECTIVES MET?	*No – with mitigation Yes*
Motivation The tailings and the Ripios dominate this view. Their broad, smooth, regular forms are unlike the natural landscape and will change its existing character. Mitigations to change these qualities must be undertaken.	
CONFIDENCE LEVEL	*Certain*

CLOSURE PHASE
As for Operation Phase

POST CLOSURE PHASE
As for Operation Phase

9. B2 WESTBOUND 1 – SCENARIO 3

CONSTRUCTION PHASE

VRM CLASS III	As for previous.

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

MANAGEMENT OBJECTIVES MET?	*Yes*
Motivation As for previous.	
CONFIDENCE LEVEL	*Certain*

OPERATION PHASE

VRM CLASS III	As above

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

MANAGEMENT OBJECTIVES MET?	*No*
Motivation The nature of the horizon line is being irreversibly altered dominating the view.	
CONFIDENCE LEVEL	*Certain*

CLOSURE PHASE
As for Operation Phase

POST CLOSURE PHASE
As for Operation Phase

10. B2 WESTBOUND 2 – SCENARIO 1

CONSTRUCTION PHASE

VRM CLASS III	**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.

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

MANAGEMENT OBJECTIVES MET?	*NO – with Mitigation YES*
Motivation A clear and strong horizontal line is created by the existing TSF activities. The location of stacker machinery and conveyors will draw attention to the area. However, the sense of place in this area is already dominated by the existing mining activities associated with the roads, rail and TSF as well as the contrast generated by Arandis (and rail bridge).	
CONFIDENCE LEVEL	*HIGH*

OPERATION PHASE

VRM CLASS III	As above

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

MANAGEMENT OBJECTIVES MET?	*NO – with Mitigation YES*
Motivation Due to the size and scale of the Ripios, the proposed landscape modification will dominate the landscape. Mitigation to reduce the height of the Ripios and break up the uniformity of the side face needs to be undertaken.	
CONFIDENCE LEVEL	*HIGH*

CLOSURE PHASE

As for Operation Phase

POST CLOSURE PHASE

As for Operation Phase

11. KHAN RIVER VALLEY – SCENARIO 1

CONSTRUCTION PHASE

VRM CLASS I	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

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

MANAGEMENT OBJECTIVES MET?	*YES*
Motivation The proposed landscape modifications will generate the same levels of contrast as the existing WRD activities.	
CONFIDENCE LEVEL	*HIGH*

OPERATION PHASE
As for Construction Phase

CLOSURE PHASE
As for Construction Phase

POST CLOSURE PHASE
As for Construction Phase

12. NAMIB NAUKLUFT PARK

CONSTRUCTION PHASE

VRM CLASS I	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

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

MANAGEMENT OBJECTIVES MET?	*YES*
Motivation Due to the distance of the KOP to the proposed activity, which would include machinery and conveyors on to of the existing TSF, the size of the proposed activities at this phase will generate weak levels of contrast in relation to the existing levels of contrast.	
CONFIDENCE LEVEL	*HIGH*

OPERATION PHASE

VRM CLASS I	As above

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

MANAGEMENT OBJECTIVES MET?	*NO – with Mitigation YES*
Motivation The NNP is a protected area and as such the views from the area need to be protected. Although not dominating, the preference for landscape modifications as seen from this area have a weak degree of contrast. Mitigation which reduces the height of the Ripios should be investigated.	
CONFIDENCE LEVEL	*HIGH*

CLOSURE PHASE
As for Operation Phase

POST CLOSURE PHASE
As for Operation Phase

13. PANNER GORGE

CONSTRUCTION PHASE

VRM CLASS II	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.

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

MANAGEMENT OBJECTIVES MET?	*YES*
Motivation The existing views of WRD and dumping activities would reduce the visual exposure of increased dumping in the area as seen from this KOP.	
CONFIDENCE LEVEL	*HIGH*

OPERATION PHASE

VRM CLASS II	As above

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

MANAGEMENT OBJECTIVES MET?	*NO*
Motivation The dumping activities and flat tops of the benches will exceed the Class II VRM objectives defined for the area.	
CONFIDENCE LEVEL	*HIGH*

CLOSURE PHASE

VRM CLASS II	As above

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

MANAGEMENT OBJECTIVES MET?	*YES with Mitigation*
Motivation With the rounding of the dominating edges created by the benches, the natural forms created with similar textures to the surroundings will reduce the levels of contrast generated to that suited to Class II objectives.	
CONFIDENCE LEVEL	*LOW – Specific design still required.*

POST CLOSURE PHASE

VRM CLASS II	As above

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

MANAGEMENT OBJECTIVES MET?	*YES*
Motivation Specific design still required.	
CONFIDENCE LEVEL	*LOW – Specific design still required.*

14. WELWITCHIA FLATS – SCENARIO 1

CONSTRUCTION PHASE

VRM CLASS II	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

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

MANAGEMENT OBJECTIVES MET?	*Yes*
Motivation Due to the distance from the KOP to the proposed activity, which would include machinery and conveyors on to of the existing Tailings storage facility, the size of the proposed activities at this phase will generate weak levels of contrast in relation to the existing levels of contrast.	
CONFIDENCE LEVEL	*High/Certain*

OPERATION PHASE

VRM CLASS II	As above

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

MANAGEMENT OBJECTIVES MET?	*Yes with Mitigation*
Motivation The NNP is a protected area and as such the views from the area need to be protected. Although not dominating due to the distance, the contrast rating preference for landscape modifications as seen from this area should be weak. Mitigation to reduce the height of the Ripios should be investigated.	
CONFIDENCE LEVEL	*Certain*

CLOSURE PHASE

As for Operation Phase

POST CLOSURE PHASE

As for Operation Phase

15. WELWITCHIA FLATS – SCENARIO 2

CONSTRUCTION PHASE

VRM CLASS II	As for previous.

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

MANAGEMENT OBJECTIVES MET?	*Yes*
Motivation As for previous.	
CONFIDENCE LEVEL	*Certain*

OPERATION PHASE

VRM CLASS II	As above

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

MANAGEMENT OBJECTIVES MET?	*Yes with mitigation*
Motivation The level of change to the characteristic landscape is low. In order not to attract the attention of the casual observer, it is recommended that the slopes of the Ripios and tailings are made irregular to conform with the characteristic landscape.	
CONFIDENCE LEVEL	

CLOSURE PHASE

As for Operation Phase

POST CLOSURE PHASE

As for Operation Phase

16. WELWITCHIA FLATS – SCENARIO 3

CONSTRUCTION PHASE

VRM CLASS II	As for previous.

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

MANAGEMENT OBJECTIVES MET?	*Yes*
Motivation As for previous.	
CONFIDENCE LEVEL	*Certain*

OPERATION PHASE

VRM CLASS II	As above

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

MANAGEMENT OBJECTIVES MET?	*Yes with mitigation*
Motivation The level of change to the characteristic landscape is low. In order not to attract the attention of the casual observer, it is recommended that the slopes of the Ripios and tailings are made irregular to conform with the characteristic landscape.	
CONFIDENCE LEVEL	*Certain*

CLOSURE PHASE
As for Operation Phase

POST CLOSURE PHASE
As for Operation Phase

RIO TINTO RÖSSING URANIUM LIMITED
PHASE 2 SOCIAL AND ENVIRONMENTAL IMPACT ASSESSMENT
FOR PROPOSED EXPANSION PROJECTS

DRAFT VISUAL IMPACT ASSESSMENT
COLOUR PLATES

REVISION 3

Document completed in behalf of:
Aurecon South Africa
Bloemhof Building
65 York Street
George

vrm AFRICA

TABLE OF COLOUR PLATES

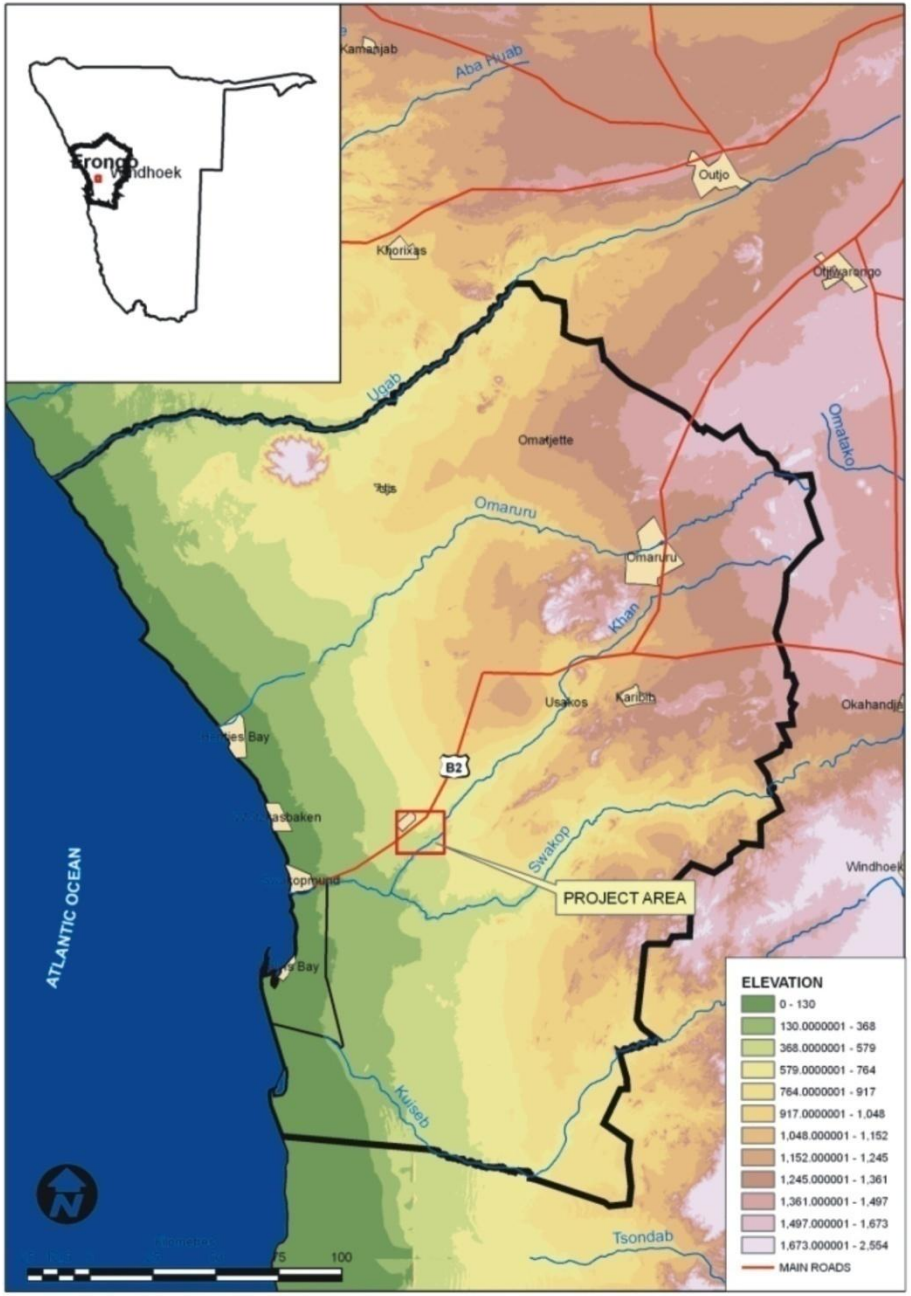


Figure 1: Regional Locality Map

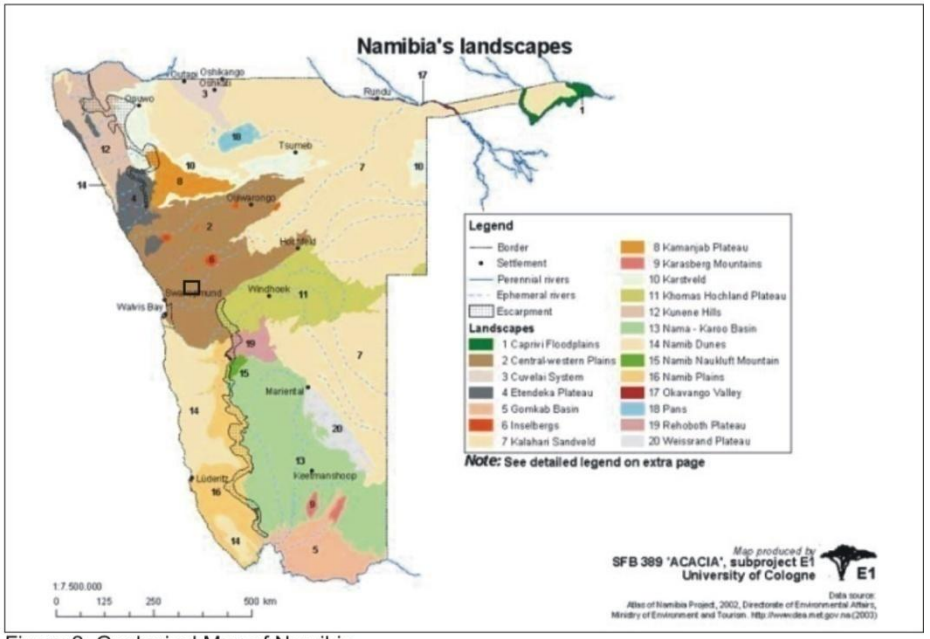


Figure 2: Geological Map of Namibia

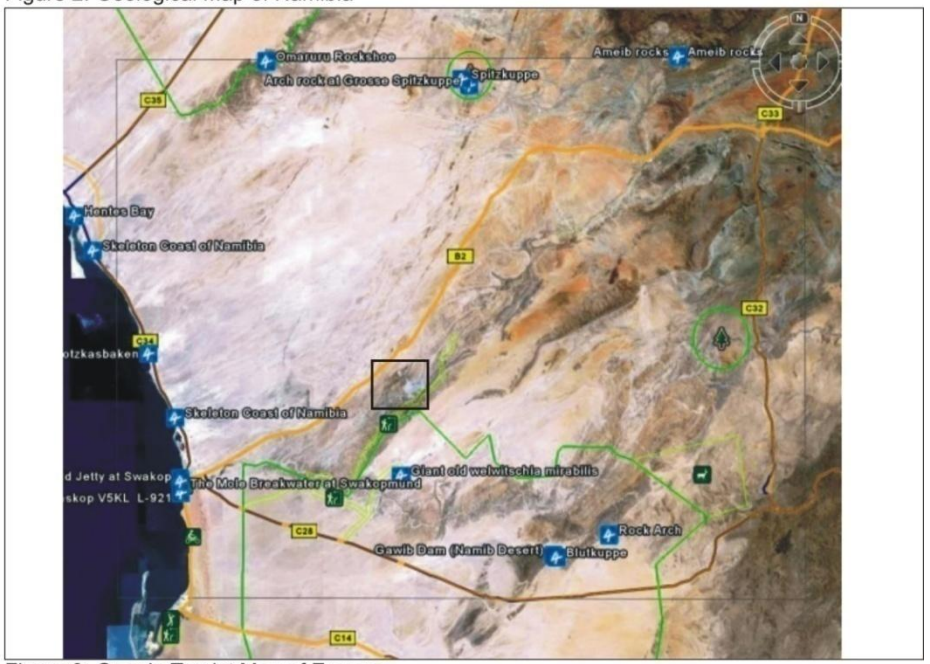


Figure 3: Google Tourist Map of Erongo

PLATE 1: REGIONAL LOCALITY MAPS

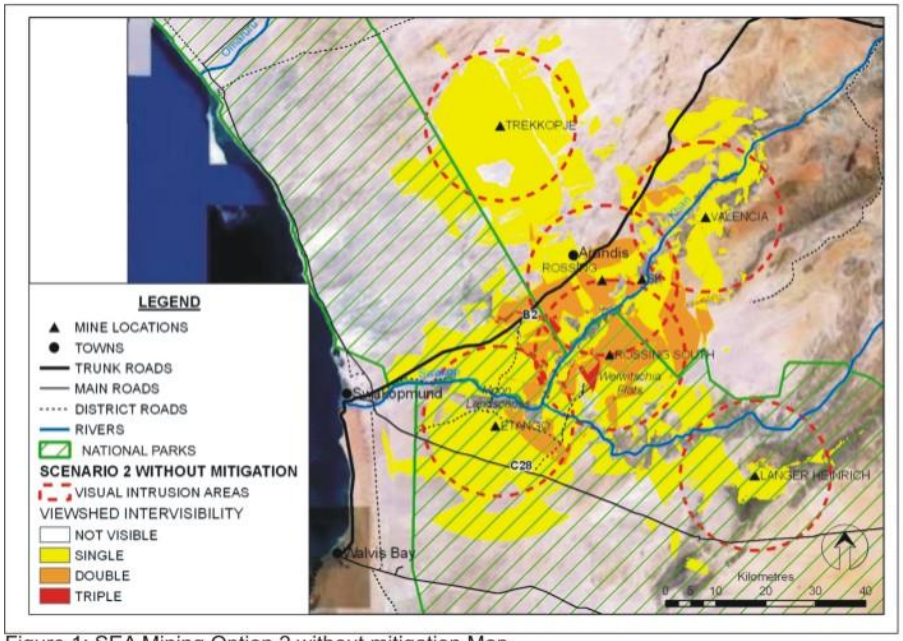


Figure 1: SEA Mining Option 2 without mitigation Map

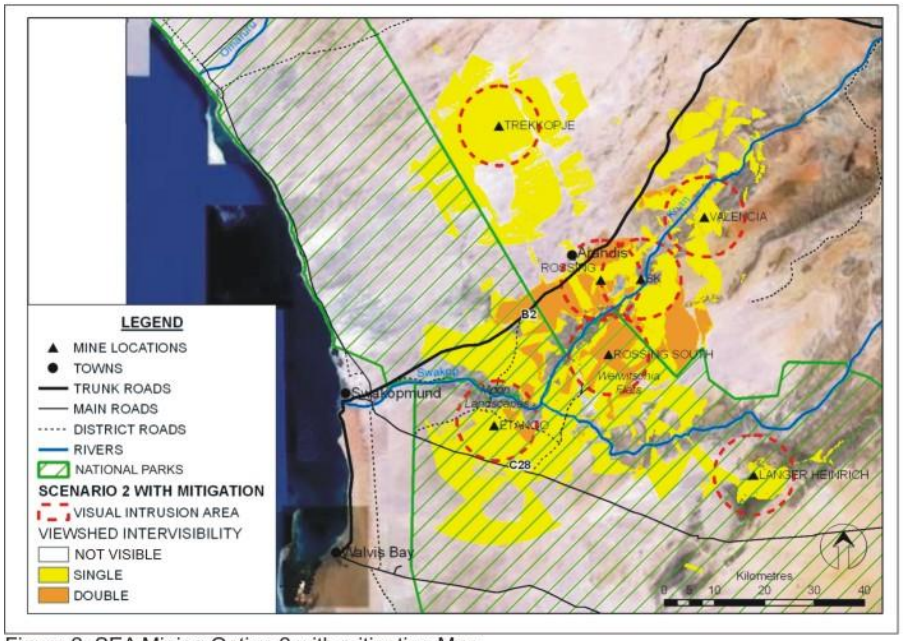


Figure 2: SEA Mining Option 2 with mitigation Map

MINE	DEPOSIT TYPE	POSSIBLE VISUAL INTRUSION ZONE		POTENTIAL ACTIVITY HEIGHT	REDUCED ACTIVITY HEIGHT
		Without mitigation	With mitigation		
Langer Heinrich	Carnotite	15km	8km	30m	15m
Trekkopje	Carnotite	15km	8km	30m	15m
Valencia	Alaskite	15km	8km	80m	40m
Rössing/ SK pit extension	Alaskite	15km	8km	80m	40m
Rössing South (Husab Project)	Alaskite	15km	8km	80m	40m
Etango project	Alaskite	15km	8km	80m	40m

Figure 3: SEA Mining Option 2 Table

Presently there are about 200 prospecting licenses in the Namib Naukluft Park (NNP) alone. In order to address the potential impacts, a Uranium Rush strategic Environmental assessment (SEA) is currently being undertaken for the Ministry of Mines and Energy by the Southern African Institute of Environmental Assessment (SAIEA)

The figures in this Plate refer to the SEA Proposed Mine Mining Option 2 as put forward by the SAIEA: 'Environmental Quality Objective 26 – Maintaining the Natural Beauty and Sense of Place of the Central Namib', 2009.

Mining Option 2
Rössing Uranium(existing)/ Rössing Uranium SK Pit extension
Trekkopje (existing)
Valencia (existing)
Langer Heinrich(existing)
Rossing South
Etango Project

Figure 1: SEA Mining Option 2 Viewshed and visual intrusion without mitigation

Figure 2: SEA Mining Option 2 Viewshed and visual intrusion with mitigation

Figure 3: Viewshed and visual intrusion generation of height and distance criteria

PLATE 2: SEA MINE OPTION 2 VIEWSHEDS

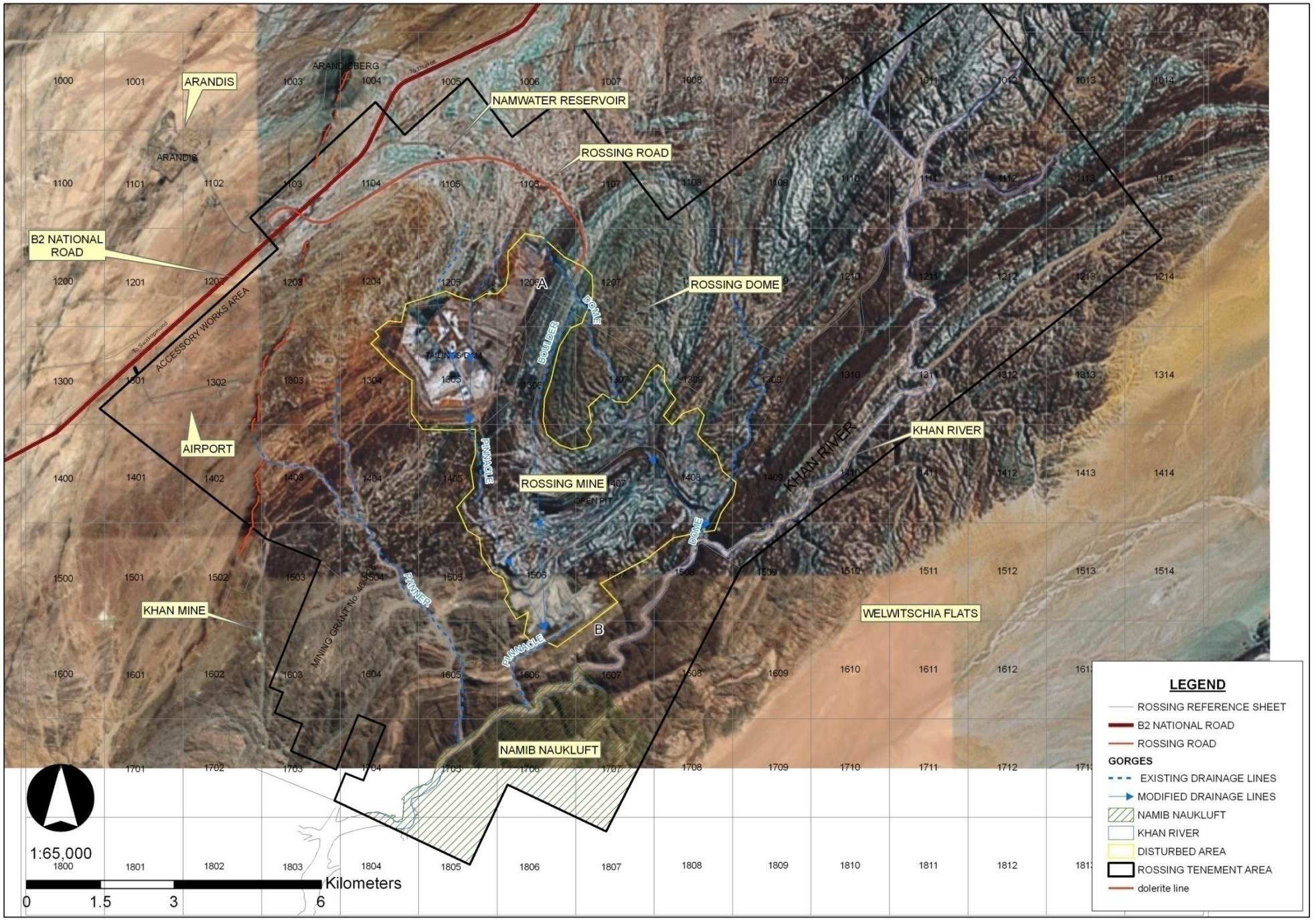


PLATE 3: PROPOSED SITE LOCALITY MAP

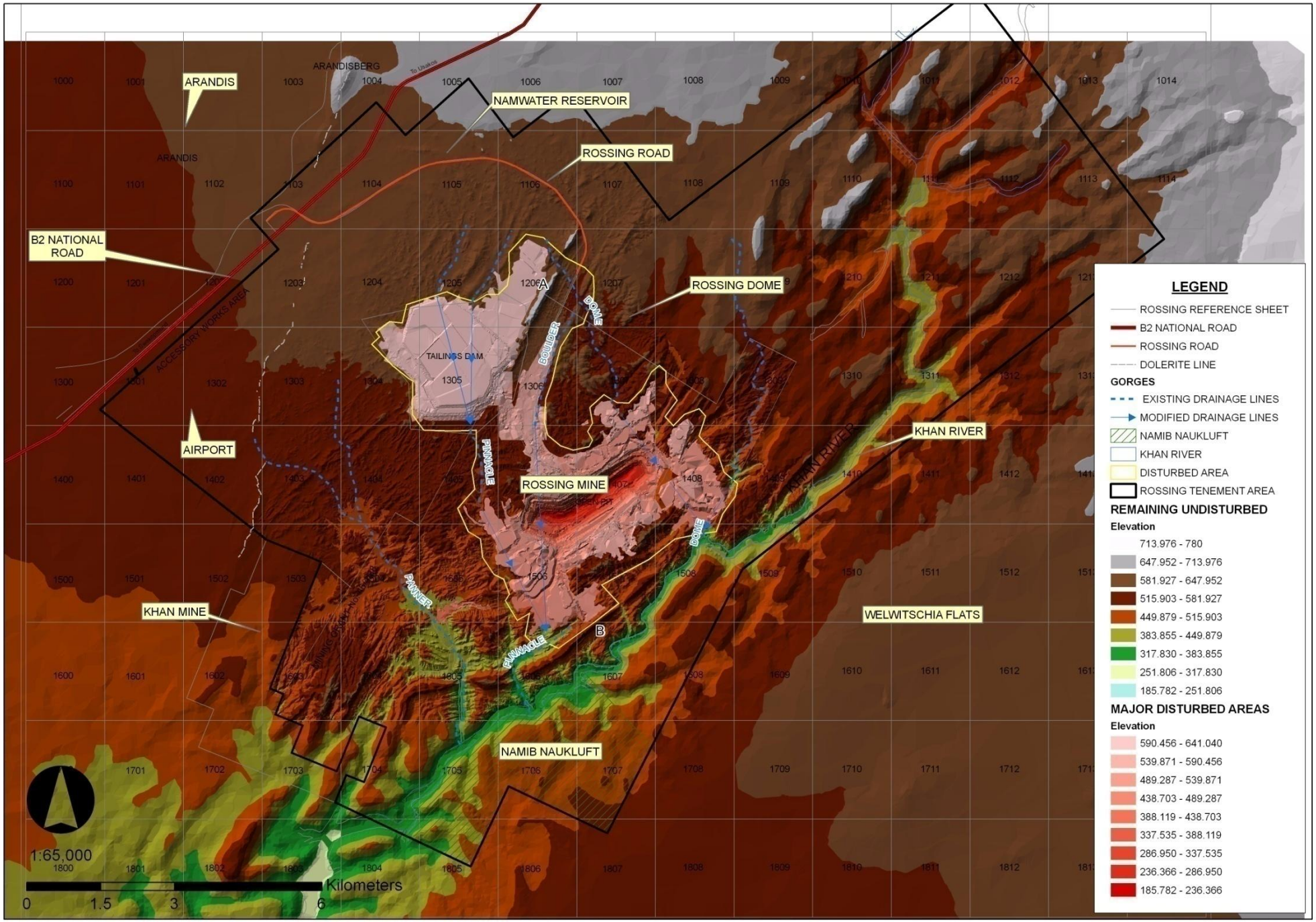


PLATE 4: PROPOSED SITE TOPOGRAPHIC MAP

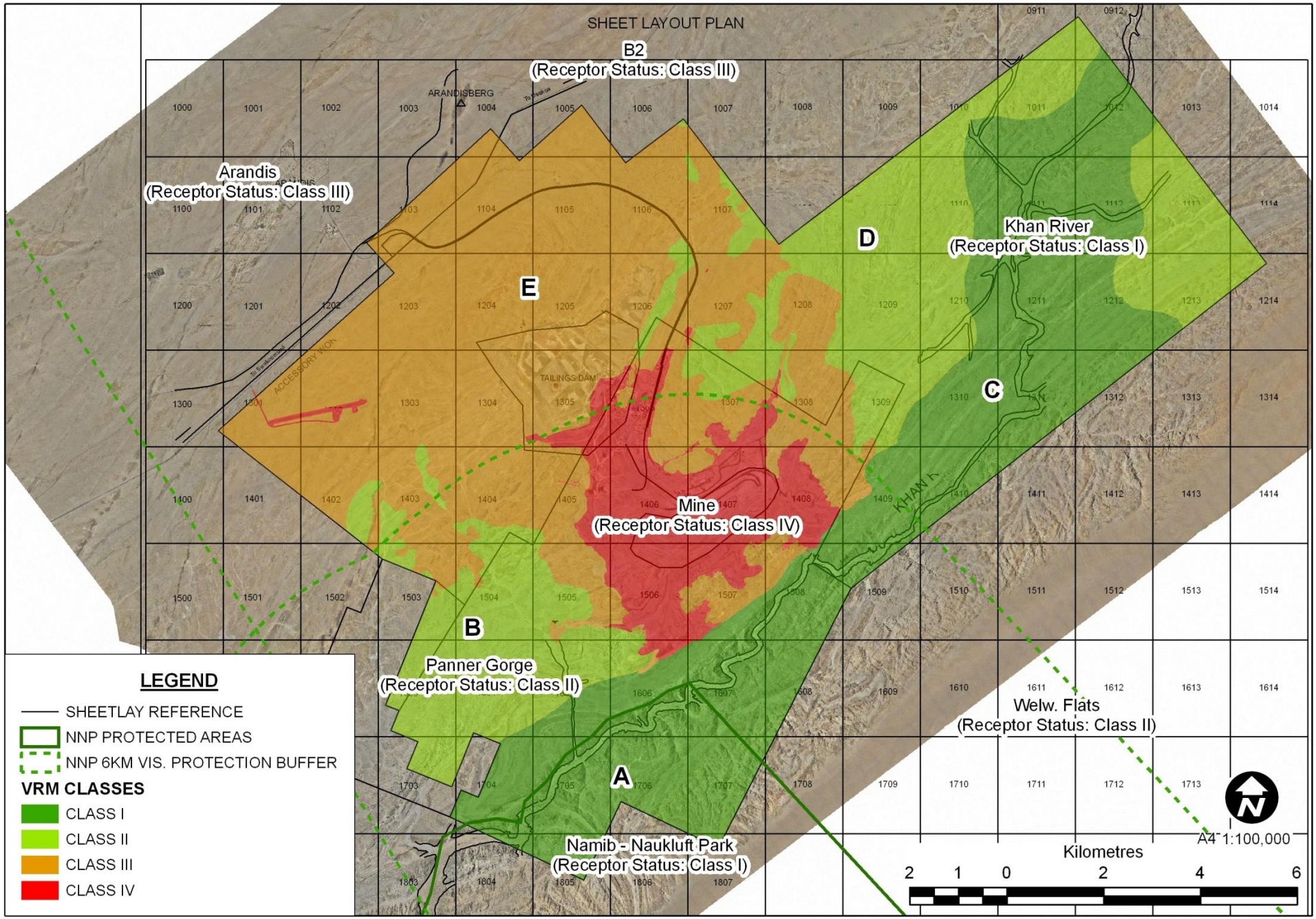


PLATE 5: UPDATED VRM CLASS MAP

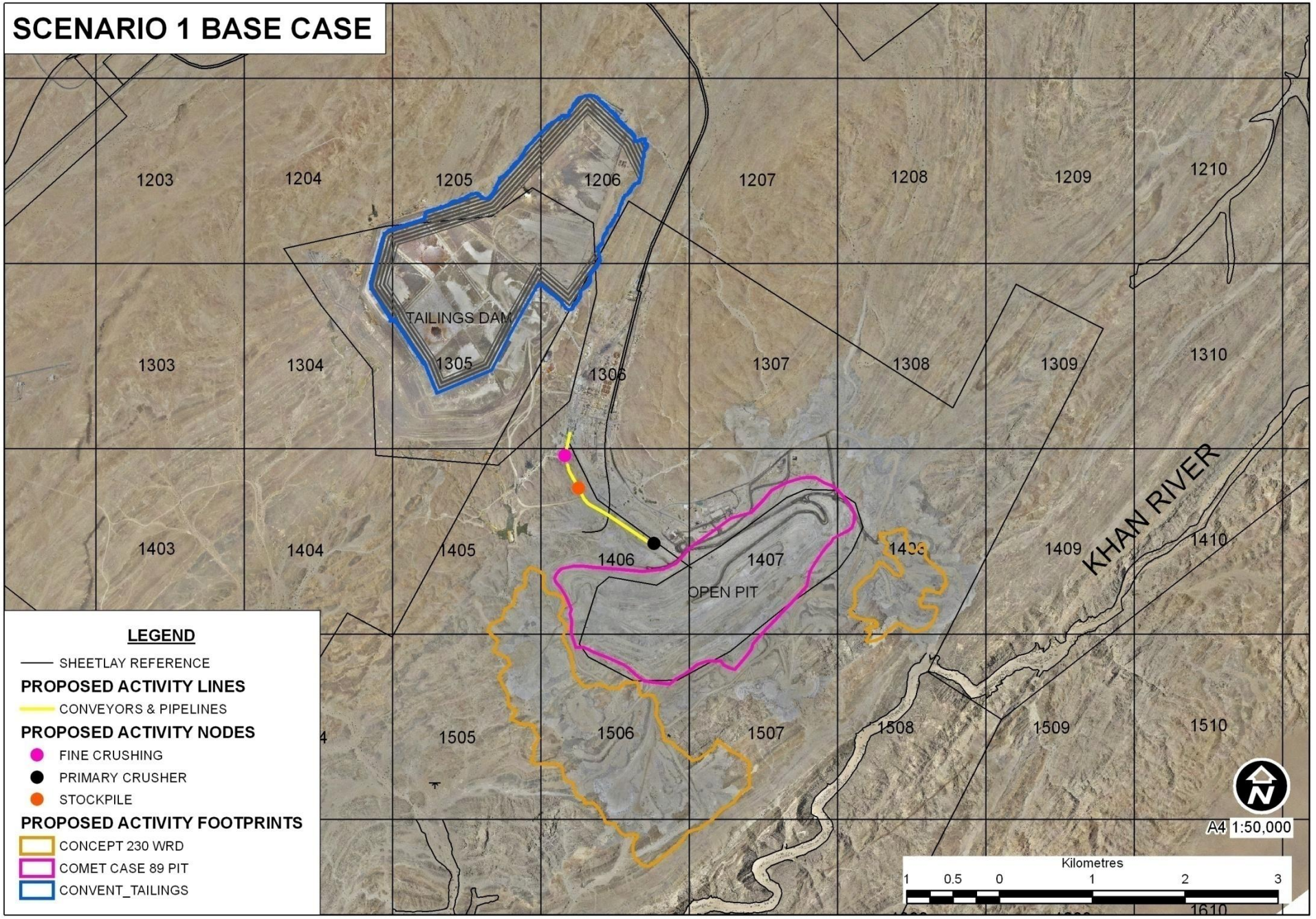


PLATE 6: SCENARIO 1: LOCALITY MAP BASE CASE

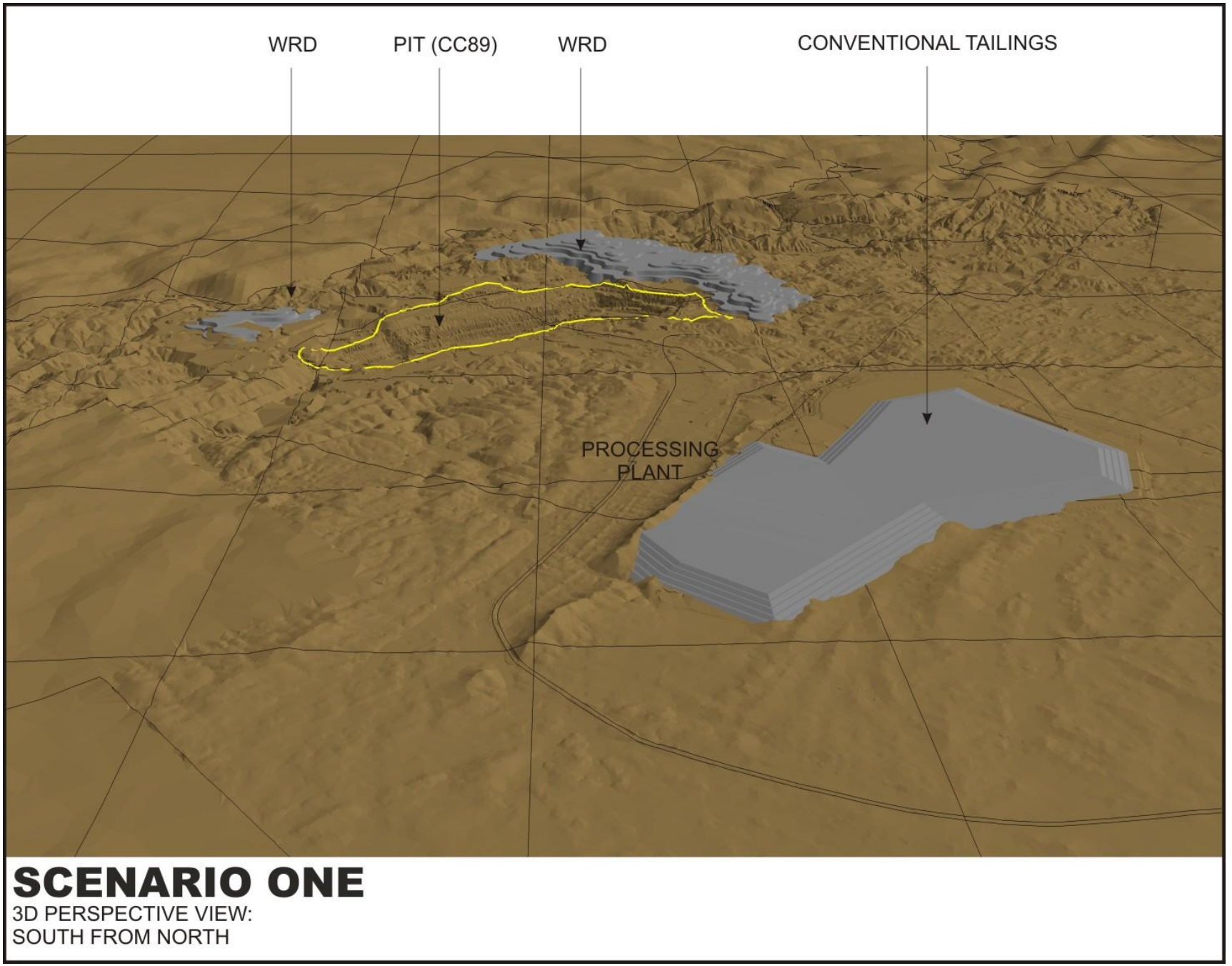


PLATE 7: SCENARIO 1: 3D VIEW SOUTH FROM NORTH

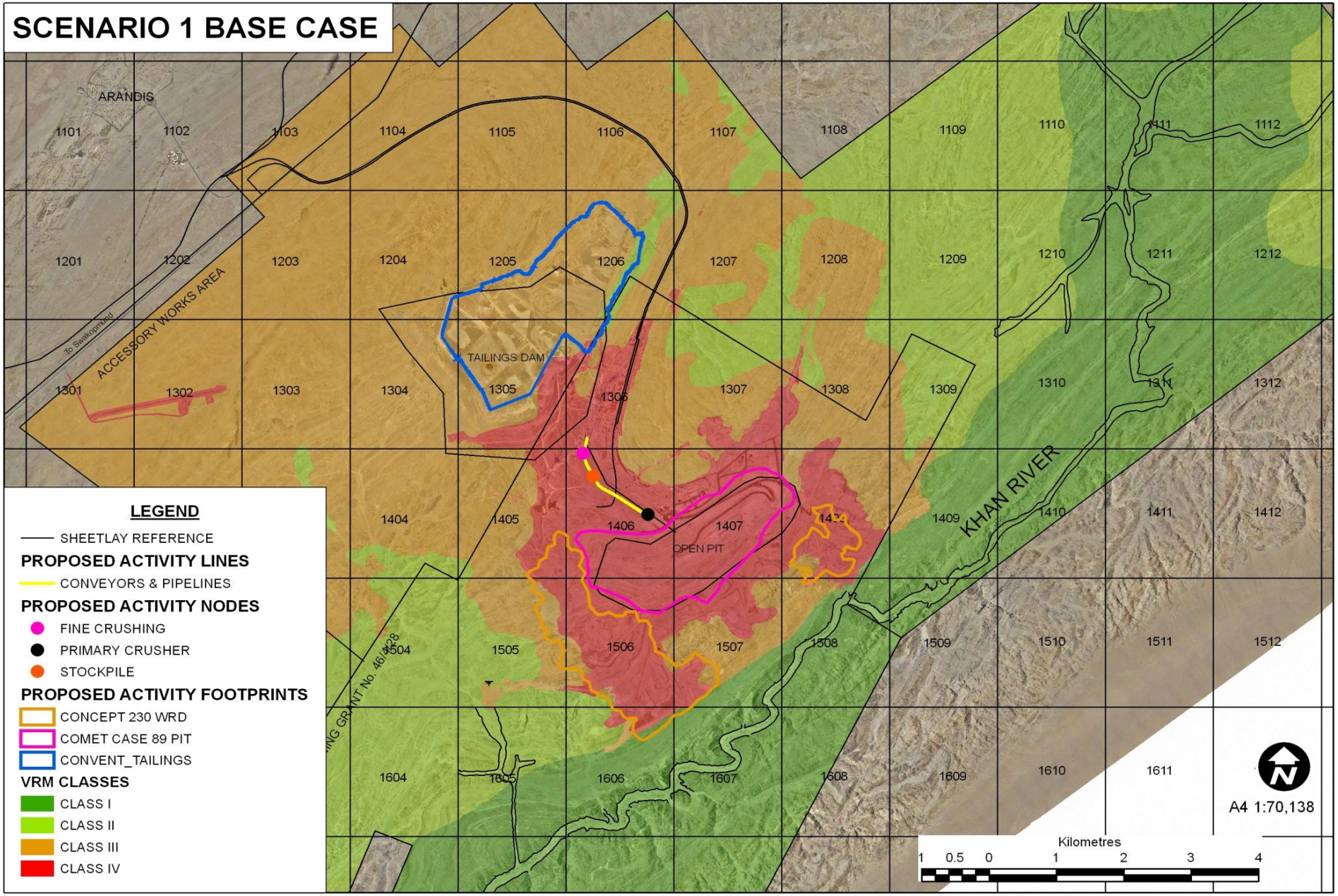


PLATE 8: SCENARIO 1: VRM ACTIVITIES OVERLAP MAP

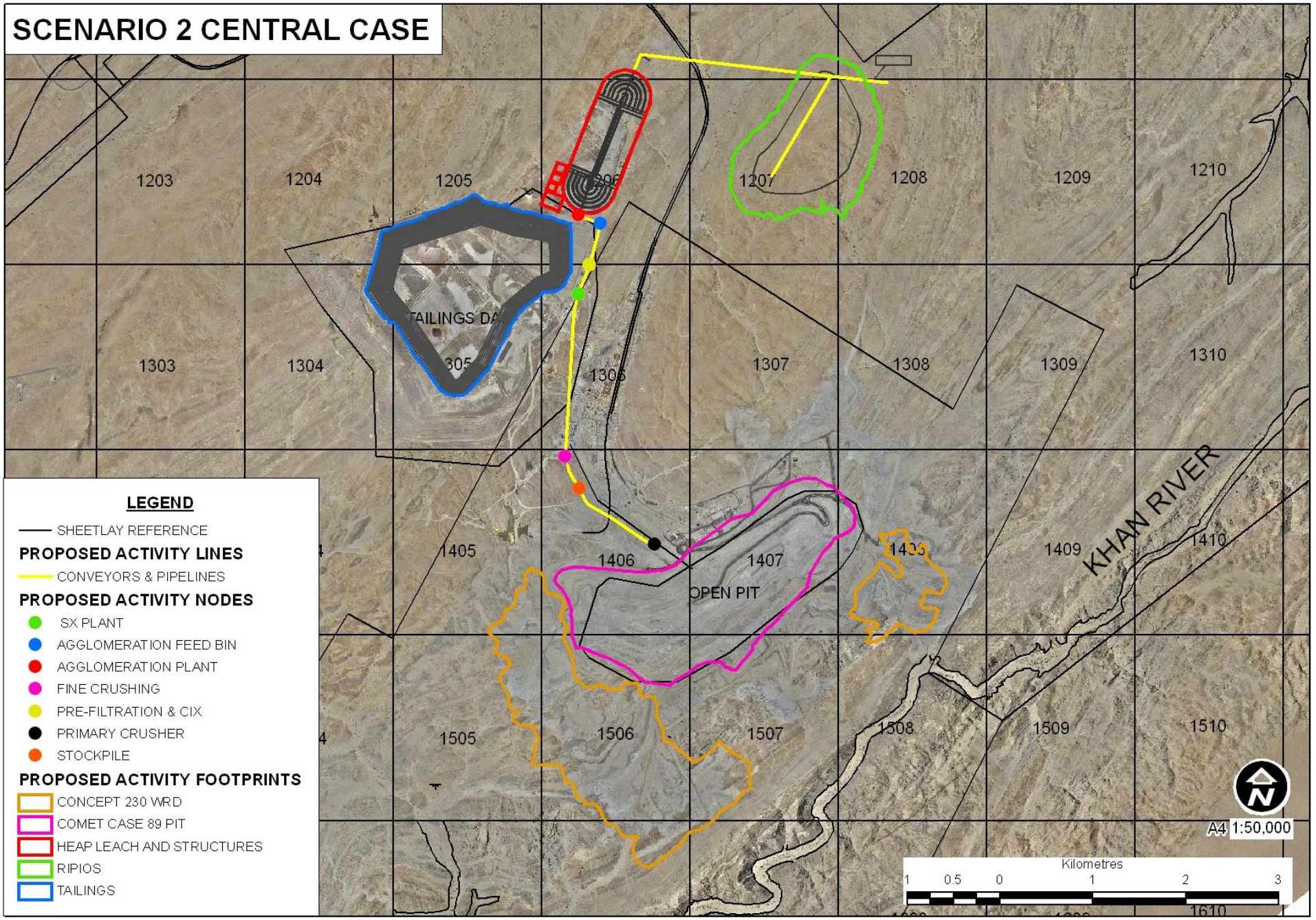


PLATE 9: SCENARIO 2: LOCALITY MAP

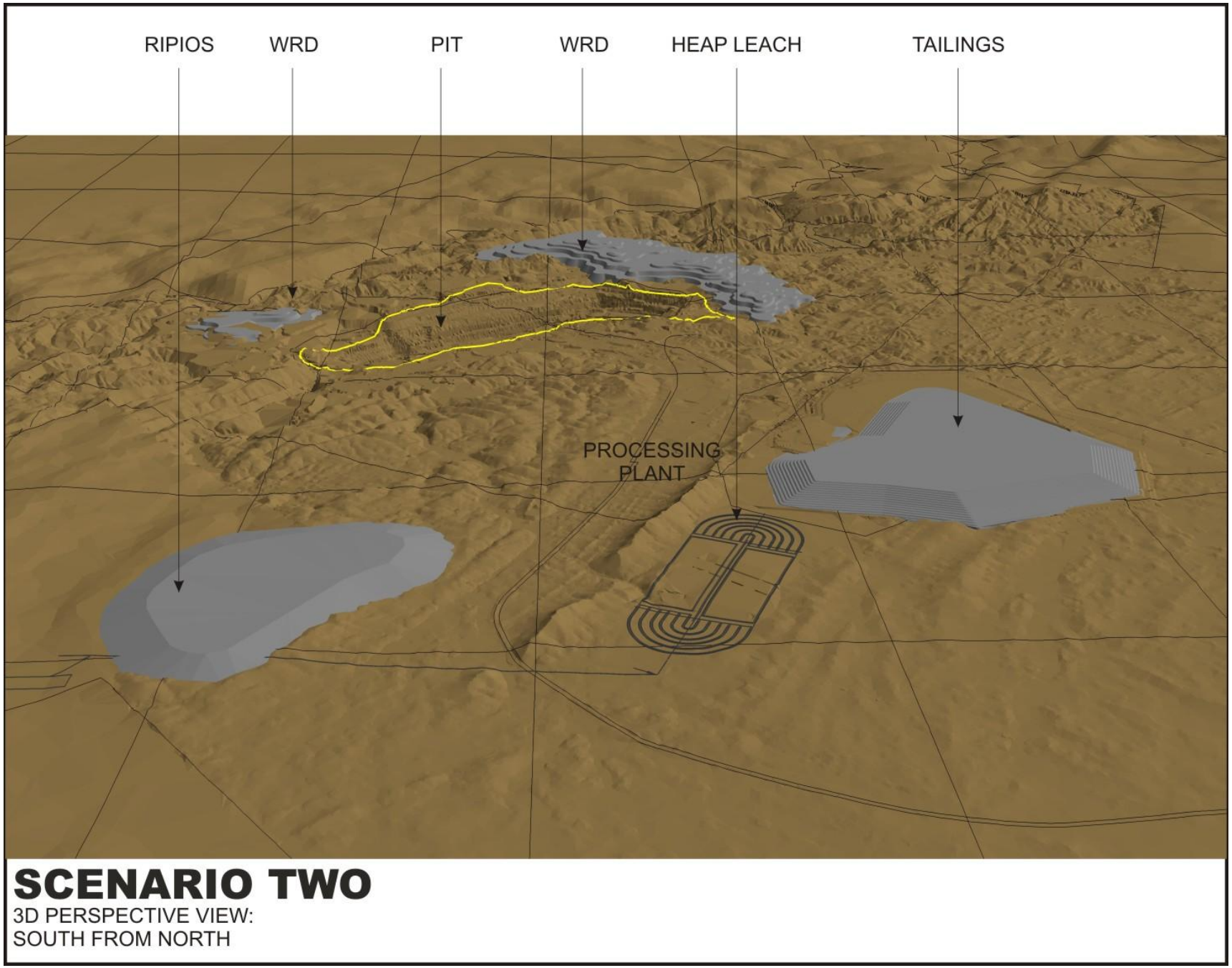


PLATE 10: SCENARIO2: 3D VIEW SOUTH FROM NORTH

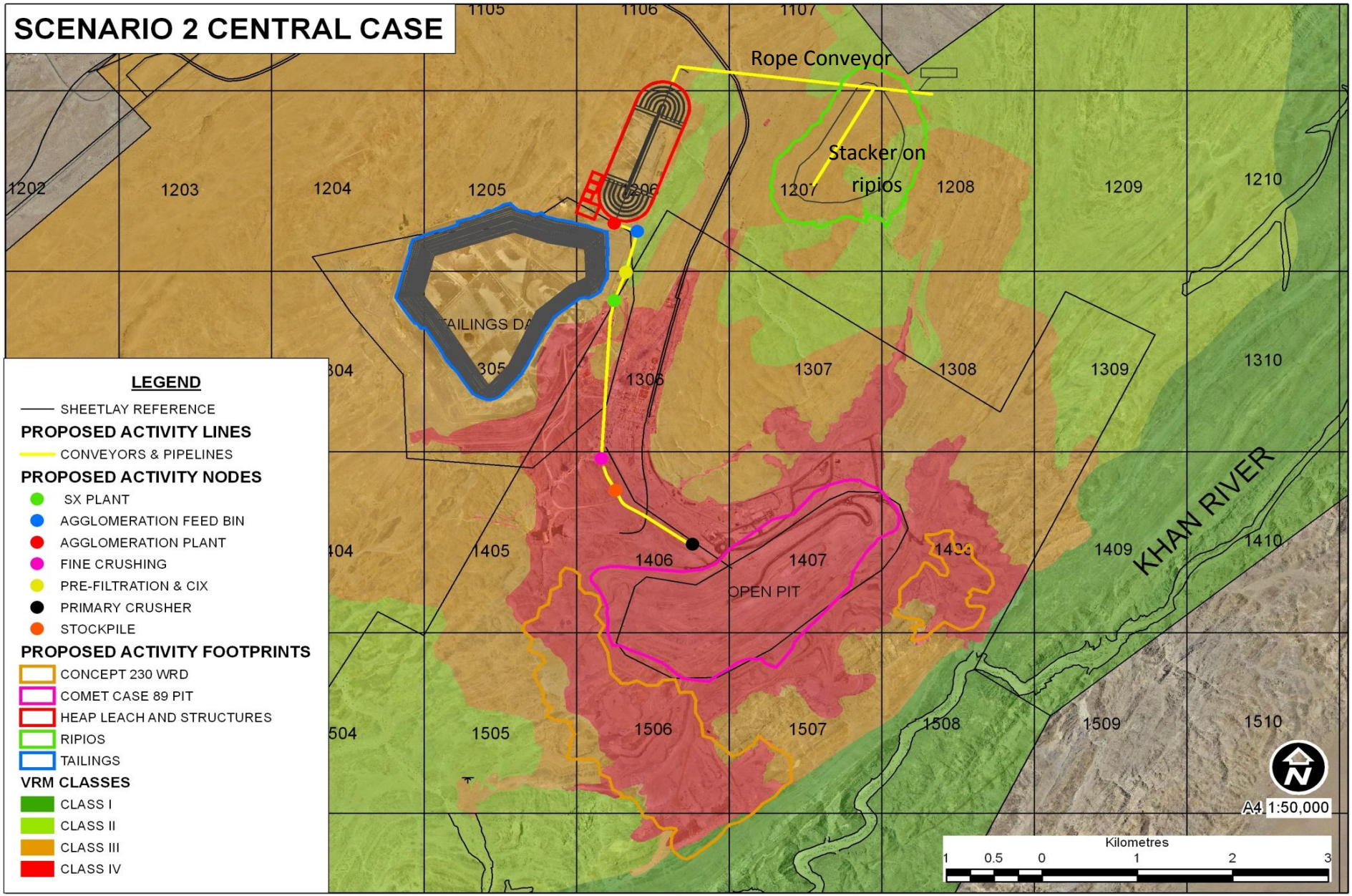


PLATE 11: SCENARIO 2: VRM ACTIVITIES OVERLAP MAP

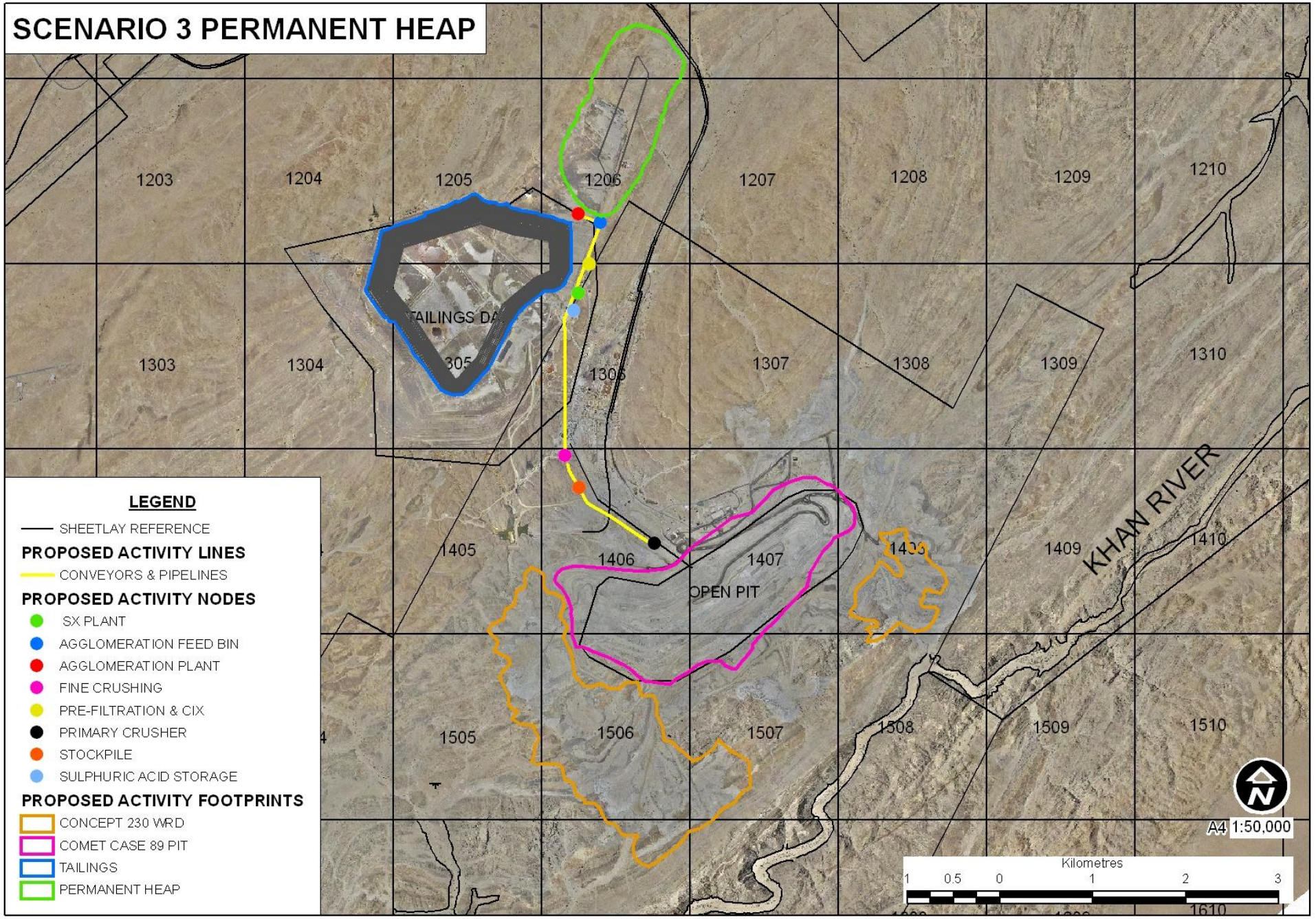


PLATE 12: SCENARIO 3: LOCALITY MAP

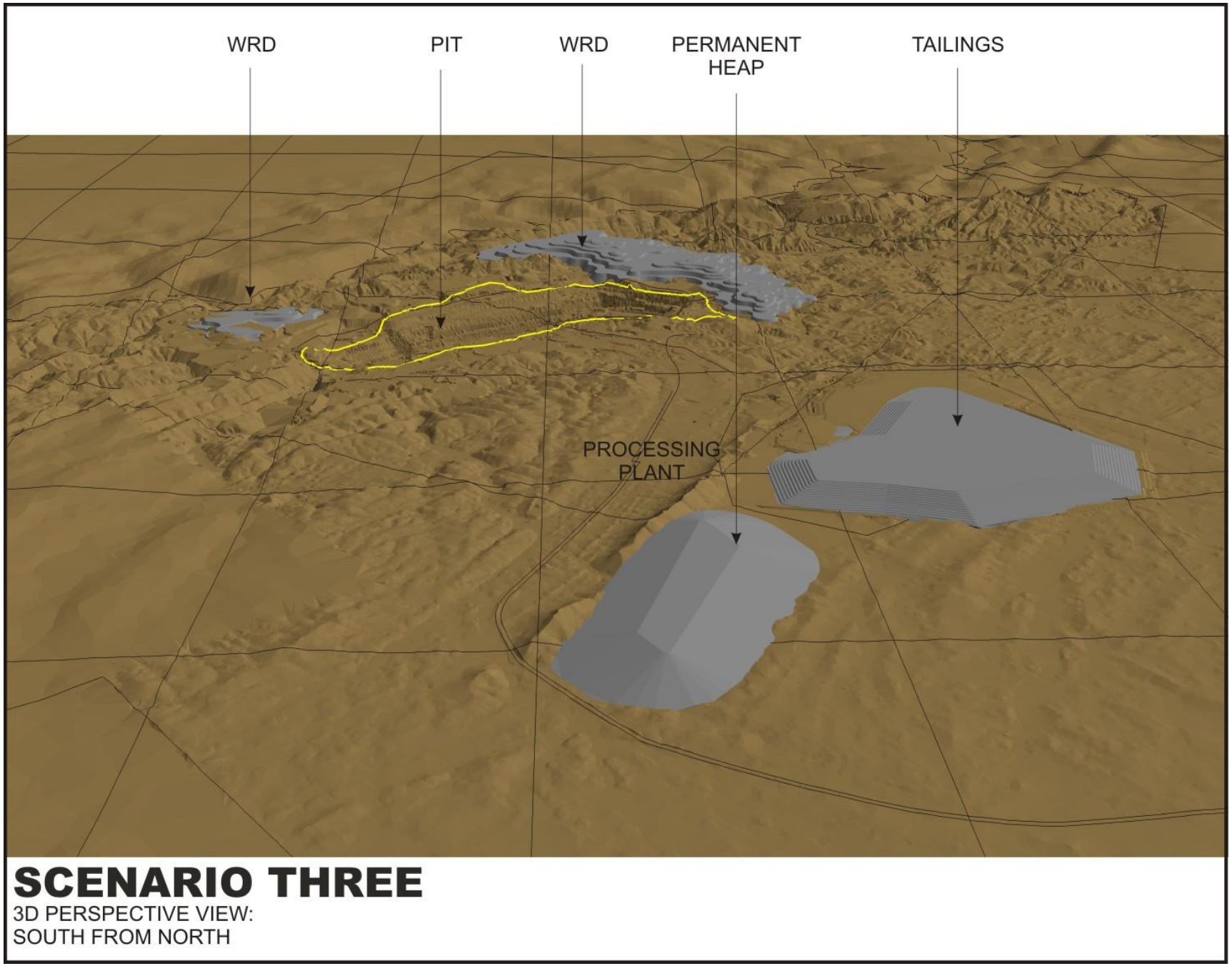


PLATE 13: SCENARIO3: 3D VIEW SOUTH FROM NORTH

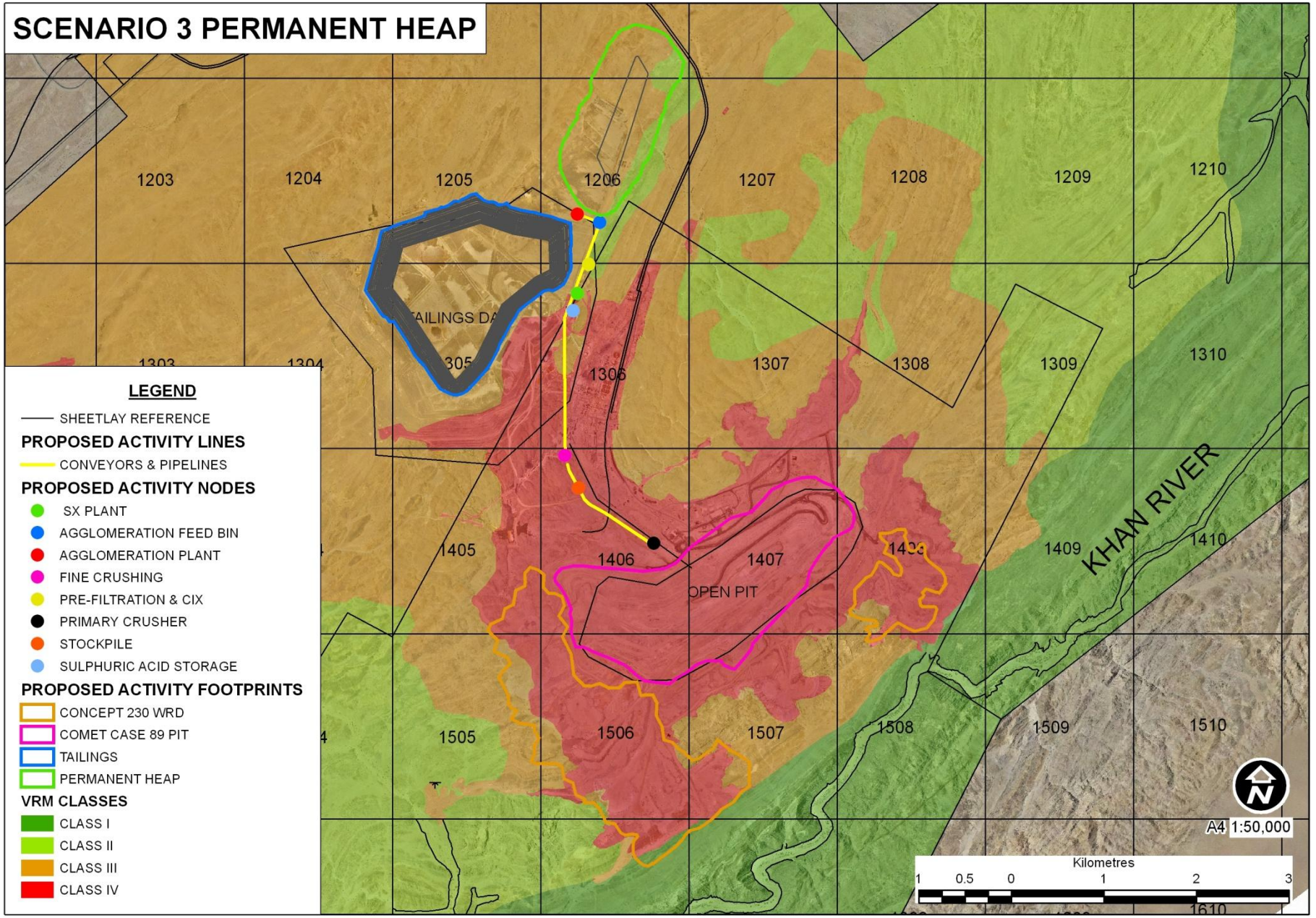


PLATE 14: SCENARIO 3: VRM ACTIVITIES OVERLAP MAP

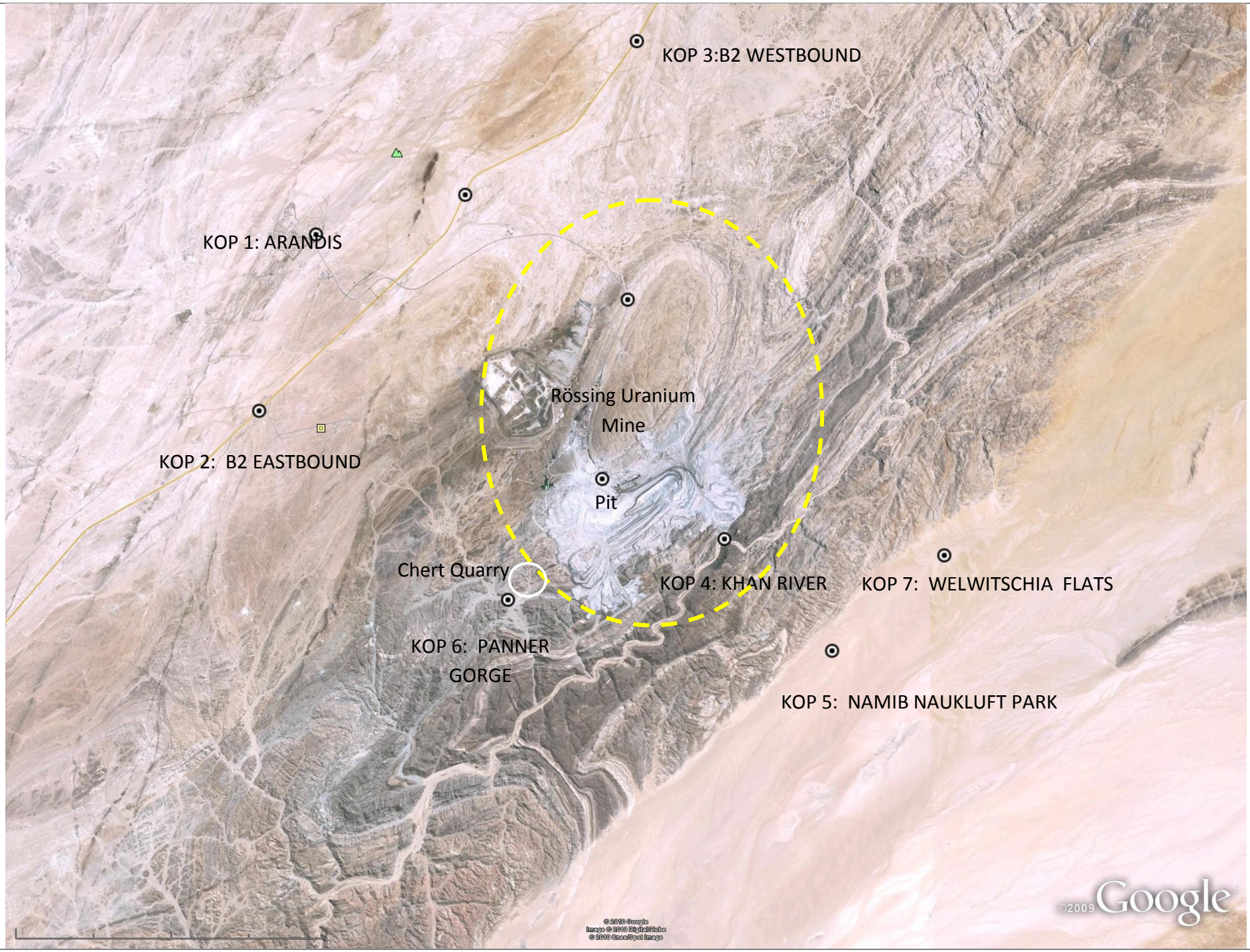


PLATE 15: KEY OBSERVATION POINT MAP

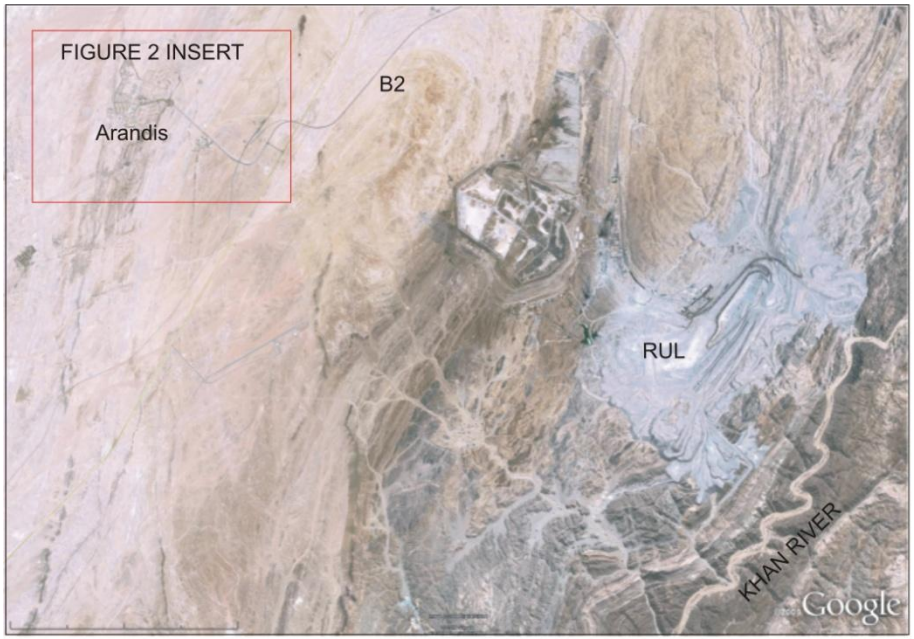


Figure 1:

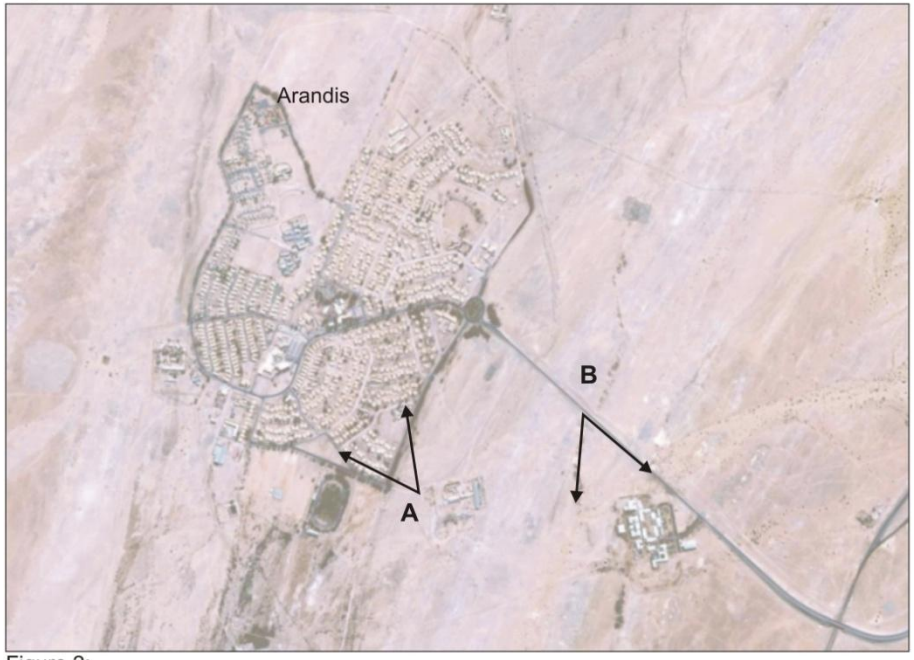


Figure 2:

Figure 3: Photograph from Point A

Figure 4: Photograph from Point B

Figure 1:	Google regional Locality Map
Figure 2:	Google map of Arandis
Figure 3:	The town of Arandis is low in profile and consists of medium to high density small dwellings constructed to house Rössing Uranium employees.
Figure 4:	Rössing Uranium Educational facility, Arandis

PLATE 16: KOP ARANDIS

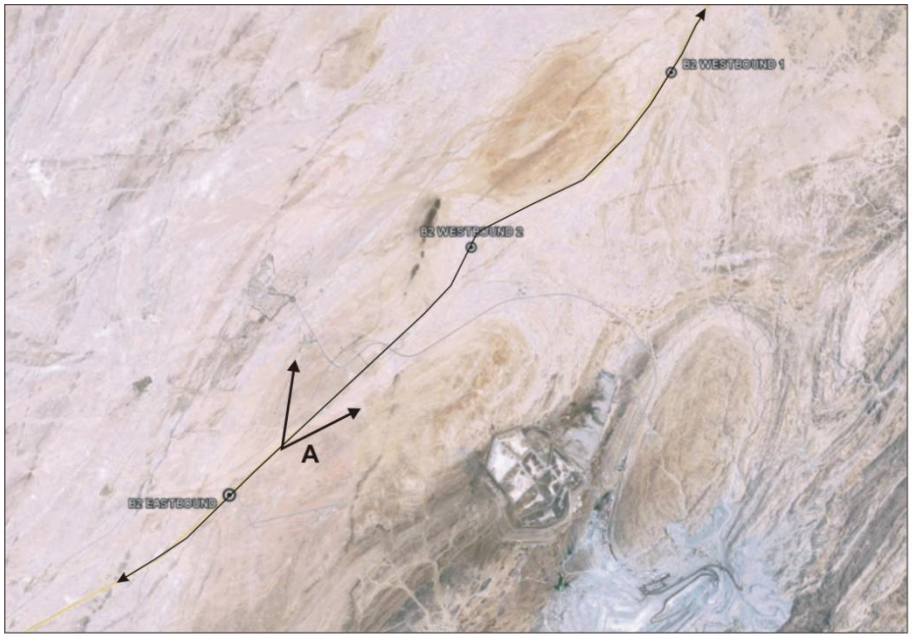


Figure 1:

Figure 2:

Figure 3: Photograph from Point A

Figure 4: Photograph from Point B

Figure 1:	B2 localised map
Figure 2:	B2 regional map overlayed onto Google tourist attractions.
Figure 3:	View along B2 travelling in a easterly direction just before Arandis. Services infrastructure alongside the road, which includes telephone lines, power lines and water pipes, does detract from the landscape character.
Figure 4:	View of the Spitzkoppe mountain as seen from the B2 which reinforces the importance of the route as a scenic corridor. The road is the main access route from the interior to the west coast and carries a high volume of tourist traffic.

PLATE 17: KOP B2

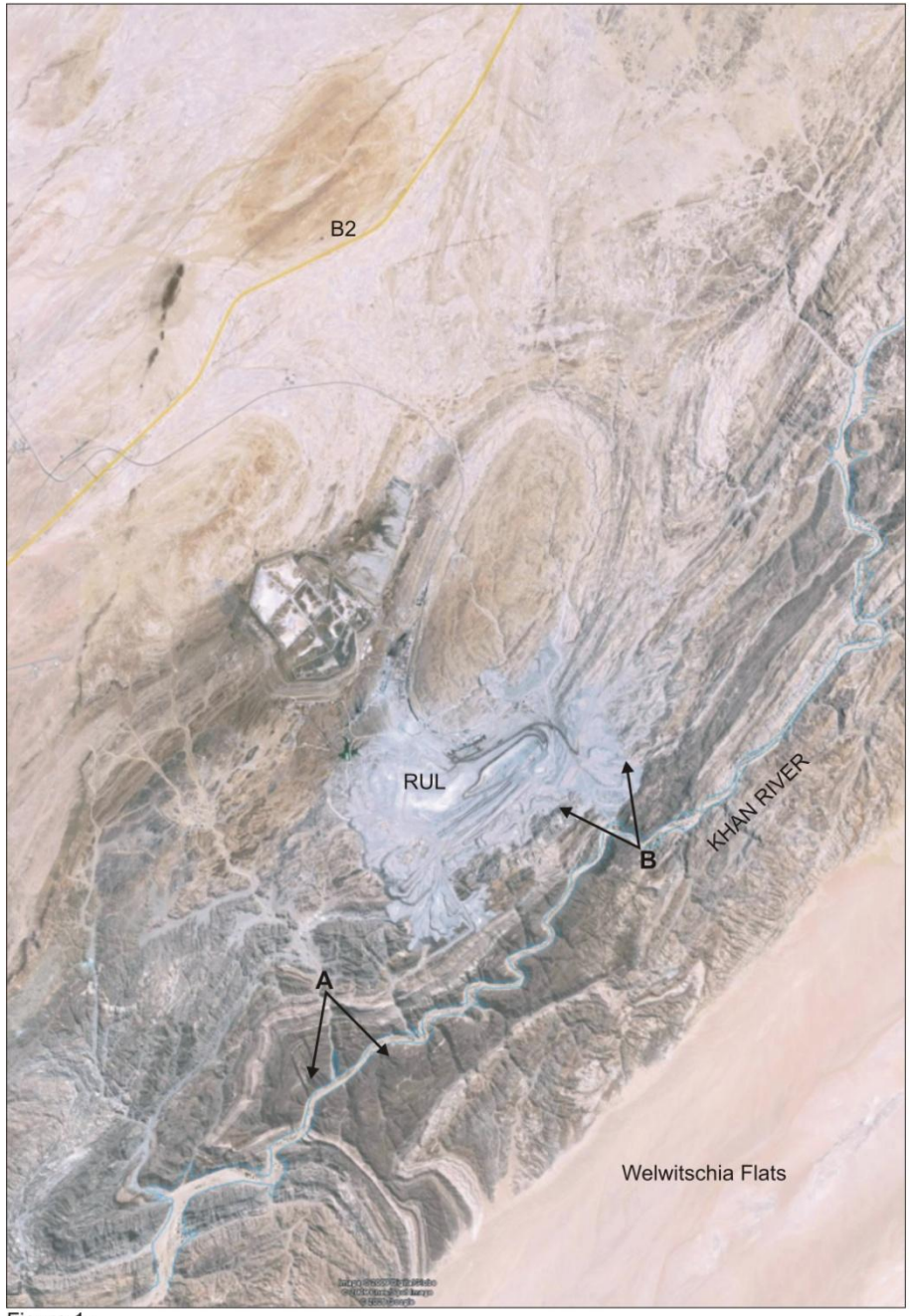


Figure 1:

Figure 2: Photograph from Point A

Figure 3: Photograph from Point B

Figure 1:	Locality map
Figure 2:	The geological formations along the Khan River have the potential to become geological heritage sites.
Figure 3:	Photograph of old dams wall to be rehabilitated.

PLATE 18: KOP KHAN RIVER

Figure 1:

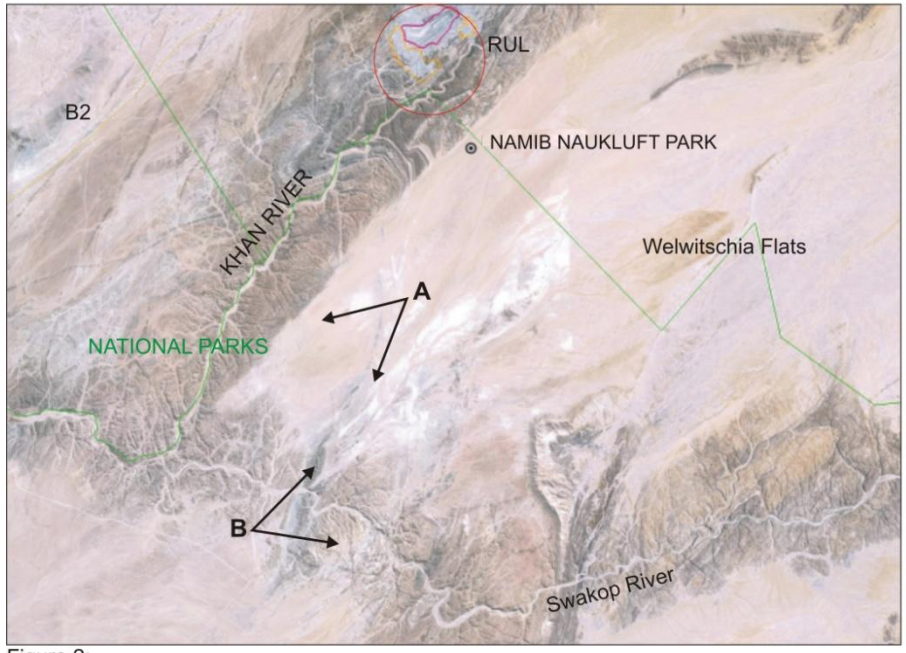


Figure 2:

Figure 3: Photograph from Point A

Figure 4: Photograph from Point B

Figure 1:	Regional National Parks locality map
Figure 2:	Local National Parks locality map
Figure 3:	Tourist facilities within the Namib Naukluft Park (NNP) to the south of the mine.
Figure 4:	Camping facilities within the NNP in the Swakop River.

PLATE 19: KOP NAMIB NAUKLUFT PARK

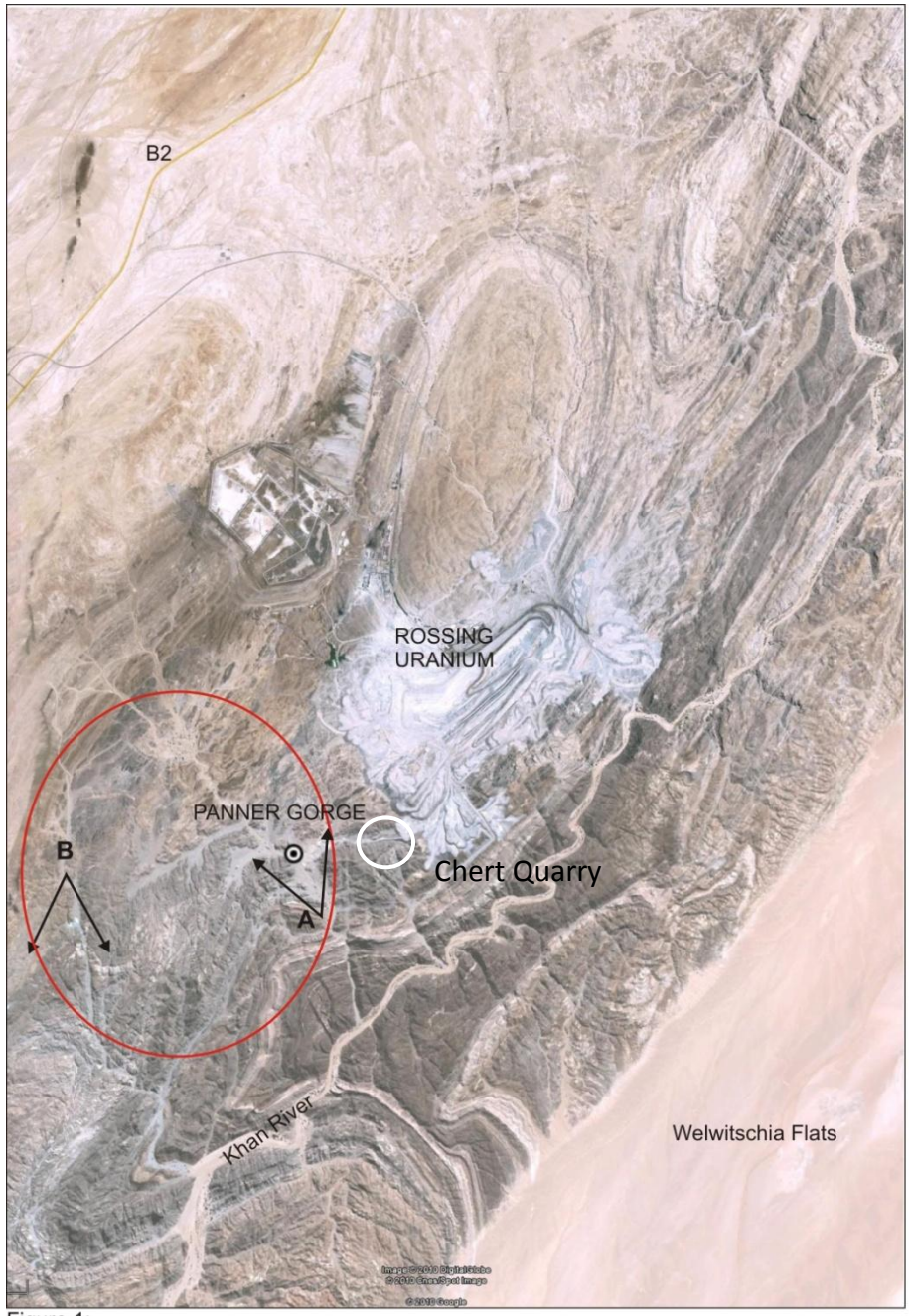


Figure 1:

Figure 2: Photograph from Point A

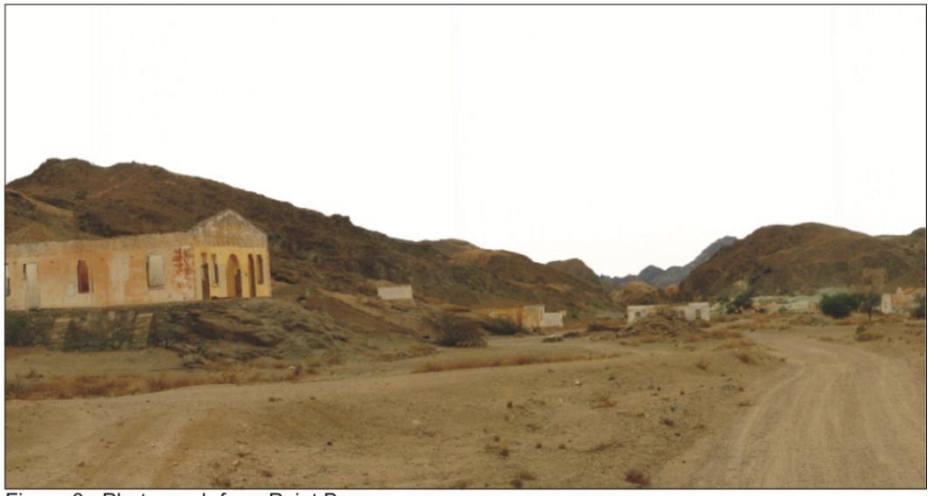


Figure 3: Photograph from Point B

Figure 1:	Panner Gorge and Khan Mine area
Figure 2:	View from Panner Gorge indicating the sand river bed surrounded by rocky outcrops. Along the route there are areas which have been used for camping or recreation.
Figure 3:	Interesting ruins related to the Khan Mine located in the vicinity of Panner Gorge, which has potential as a tourist destination to attract visitors to the area.

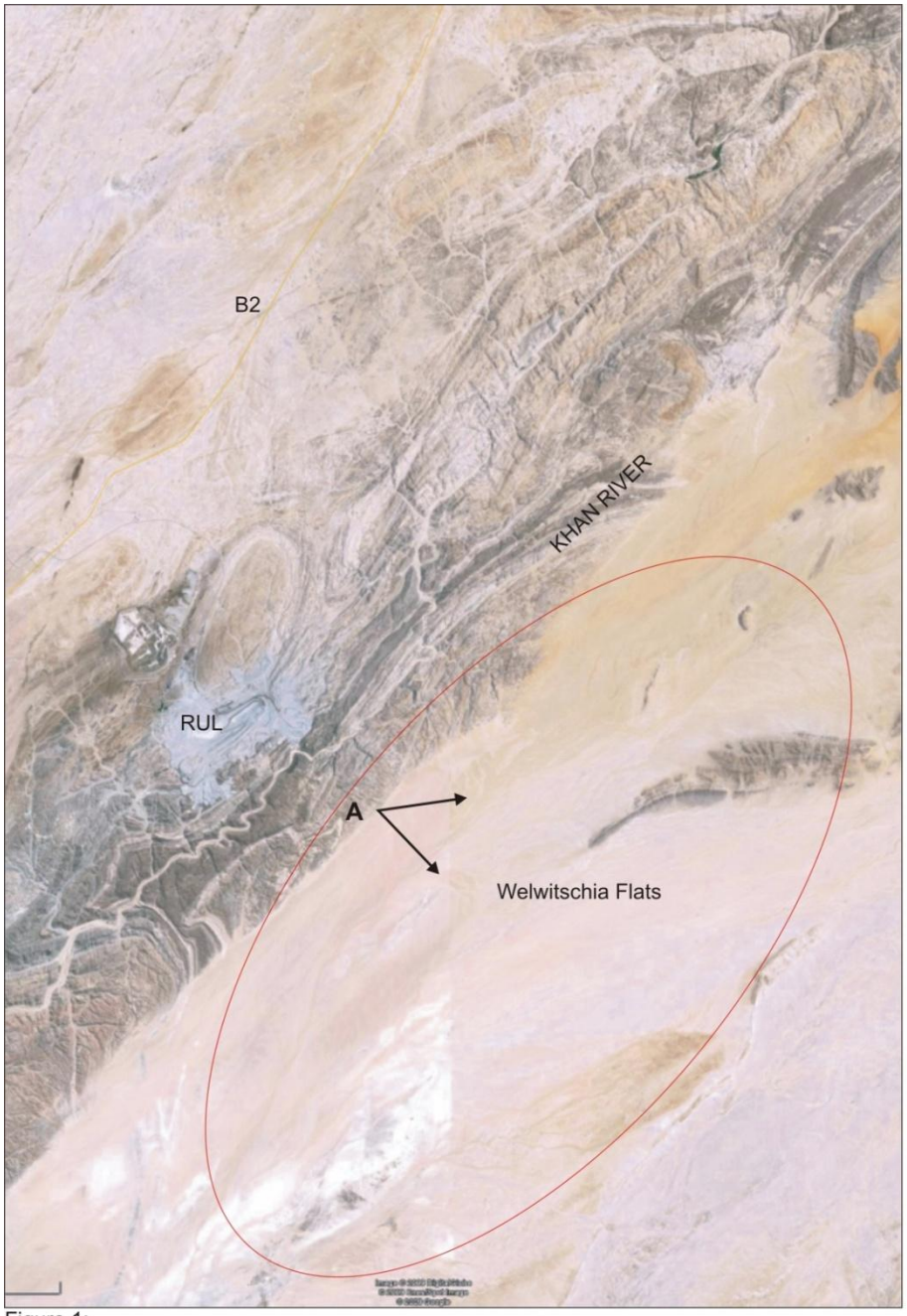


Figure 1:

Figure 2:

Figure 3: Photograph from Point A

Figure 1:	Welwitschia Flats locality map
Figure 2:	The *Welwitschia Mirabilis* plant is considered a living fossil and is found only in the Namib desert. They can grow to about 2 - 4 m in length and can live 1000 years or more.
Figure 3:	Gravel plains of the Welwitschia Flats, interspersed with mountains, create high levels of landscape character with a strong wilderness sense of place. There are currently very few dominating manmade modifications in the area.

PLATE 21: KOP WELWITSCHIA FLATS

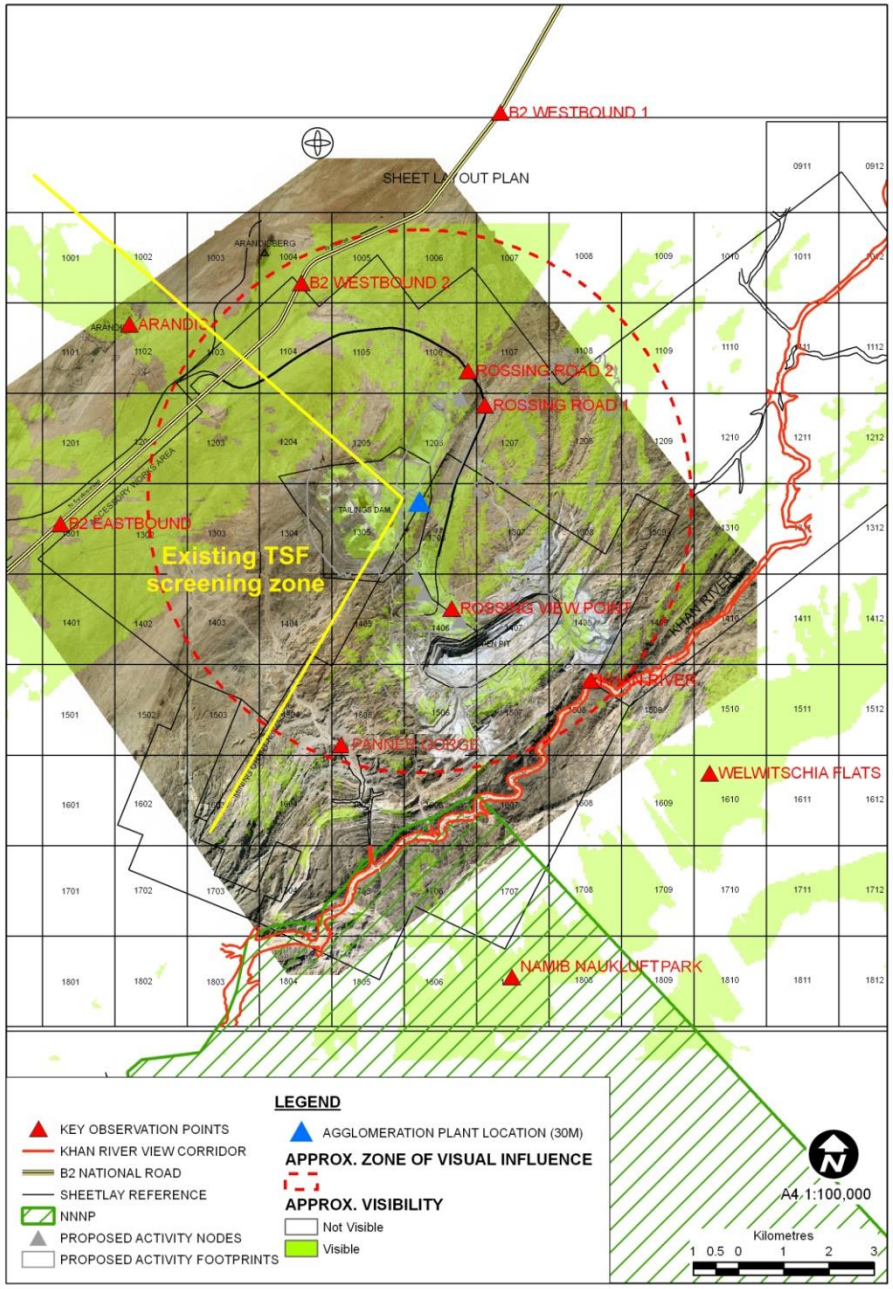
Figure 1:

Figure 2: View from Point A

Figure 3: View from Point B

Figure 1:	The aerial locality map shows the location of the agglomeration plant near the existing tailing facility and alongside the proposed heap leach and ripios.
Figure 2:	Photograph in close proximity to site taken in a southerly direction. The site is very transformed and in close proximity to the industrial visual context of the processing plant.
Figure 3:	Photograph of the existing Tailings Facility landscape character taken in a SE direction, location of the proposed agglomeration plant.

PLATE 22: AGGLOMERATION PLANT - A



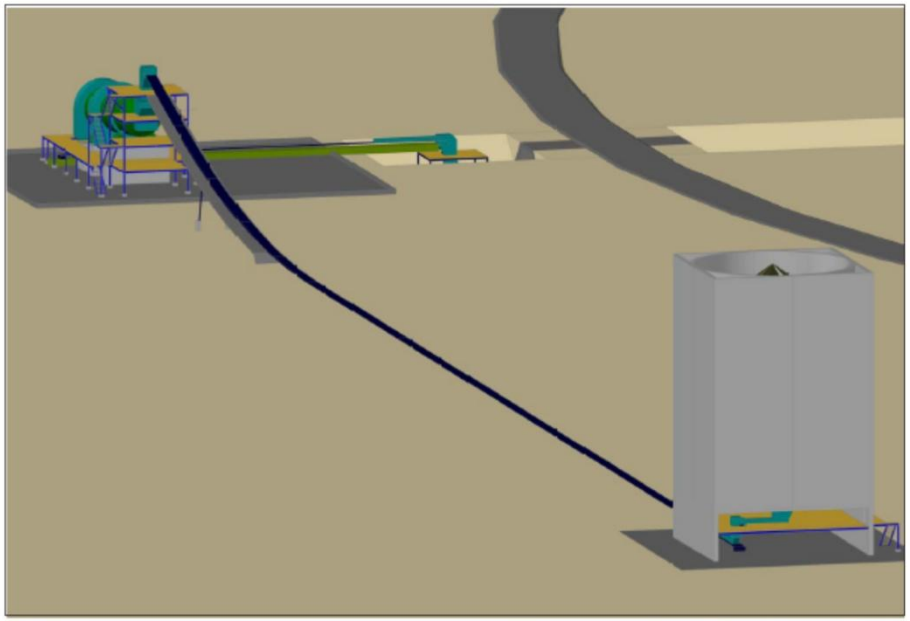


Figure 2: Modelling provided by Aker Solutions.UK

Figure 1: The viewshed shows that there is no visibility from the Panner Gorge and Rossing Road. Long term screening from the ripios will decrease the visibility of the B2 Eastbound and Arandis. The other KOP's are all visible and within the zone of influence.

Figure 2: Figure 2 shows the proposed 3D model of the plant

PLATE 23: AGGLOMERATION PLANT - B

Figure 1:

Figure 2: Photograph from Point A

Figure 3: Photograph from Point B

Figure 1:	The aerial locality map shows the site of the proposed new coarse ore stockpile.
Figures 2/3:	Photographs depicting the existing stock pile. It is proposed that the new stock pile is located next to the existing stock pile.

PLATE 24: COARSE ORE STOCKPILE - A

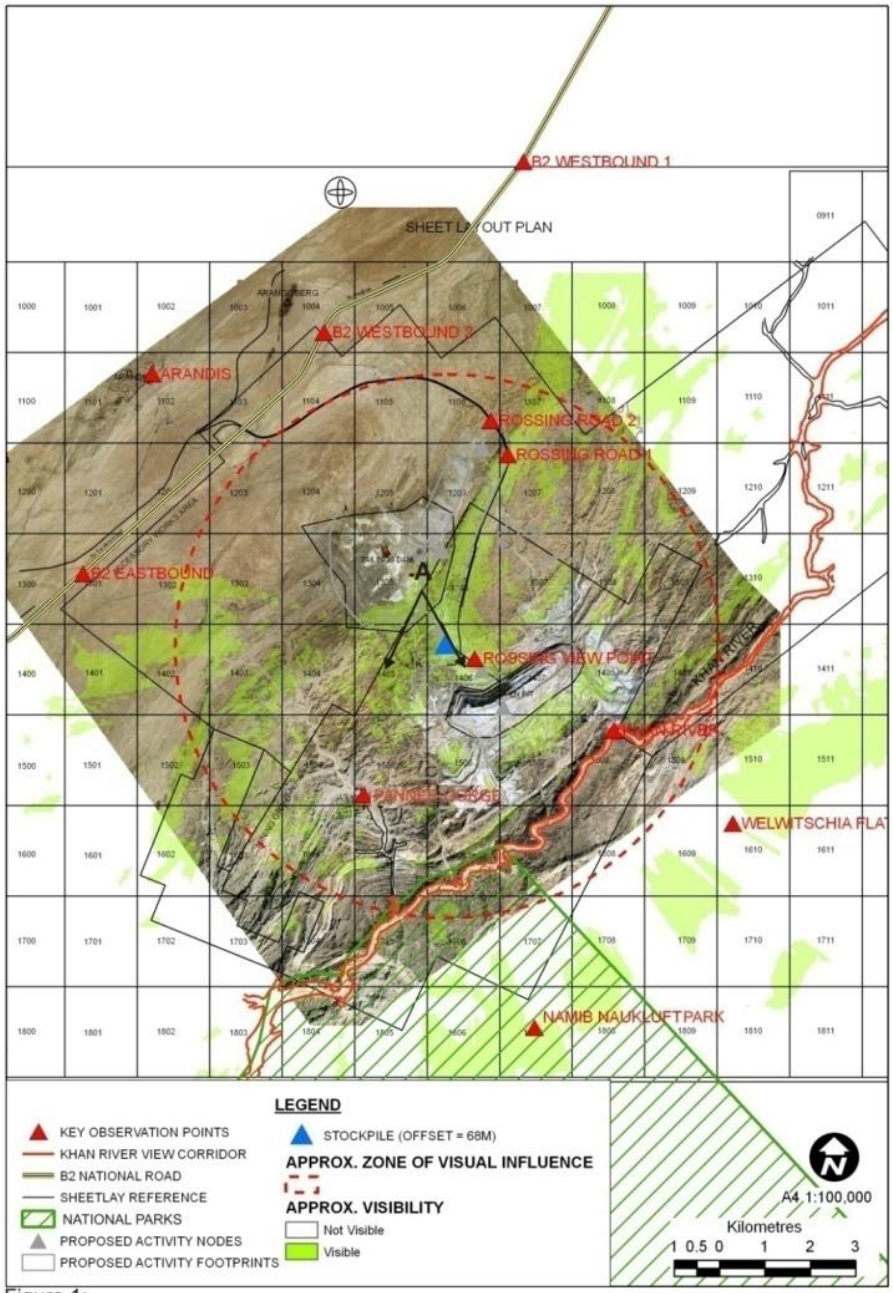


Figure 1:

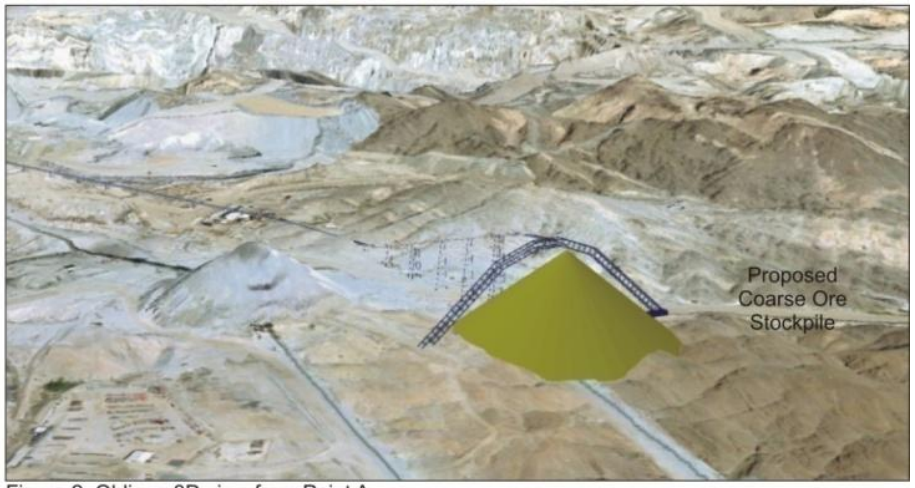


Figure 2: Oblique 3D view from Point A

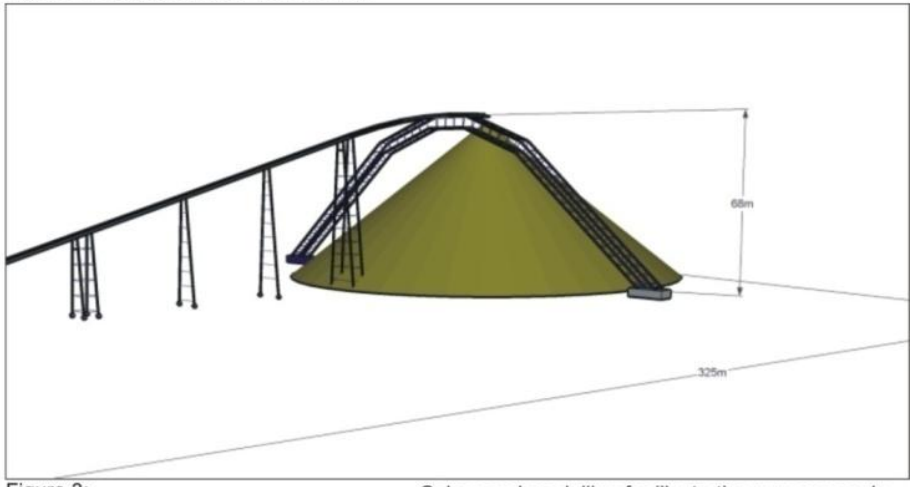


Figure 3: Colour and modelling for illustrative purposes only

Figure 1: The viewshed shows that only the Rössing Road and Rössing viewpoint would be visible. The Namib Naukluft is visible. However, it is outside the zone of influence.

Figure 2: 3D model of the proposed stockpile as seen in the context of the surroundings.

Figure 3: Detailed model of the stockpile. It would have a height of 68 m and overall footprint of 325 m.

PLATE 25: COARSE ORE STOCKPILE - B

PLATE 26: DUST AND LIGHTS AT NIGHT

Figure 1:

Figure 2:

Figure 1: Photograph of Lumwana processing plant at night. Source: www.miningmagazine.com

Figure 2: Photograph of heap leach stacker lights at night. Source: http://www.dtsmining.com.au

Figure 3:

Figure 4:

Figure 3: Photograph depicting the dust generated from drilling activities within the pit.

Figure 4: Photograph depicting the dust generated from mining activities in the pit.

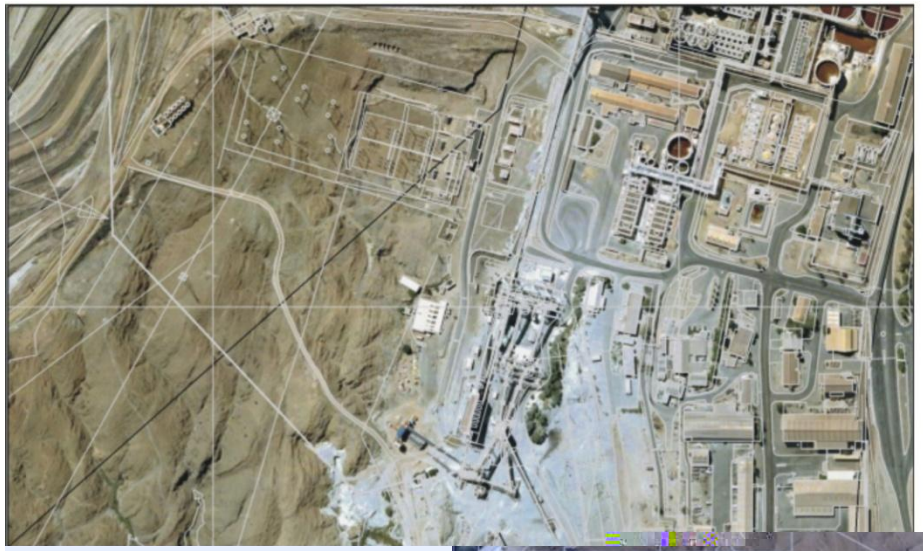


Figure 2: Photograph from Point A

y to the proposed site indicating the
site is also in close context to the existing fine
t which have strong industrial characters.

Figure 1:

Figure 1: Locality map

Figure 2: Photograph taken in close proximit
transformed nature of the site. The
crushing plant and processing plan

PLATE 27: FINE CRUSHING PLANT - A

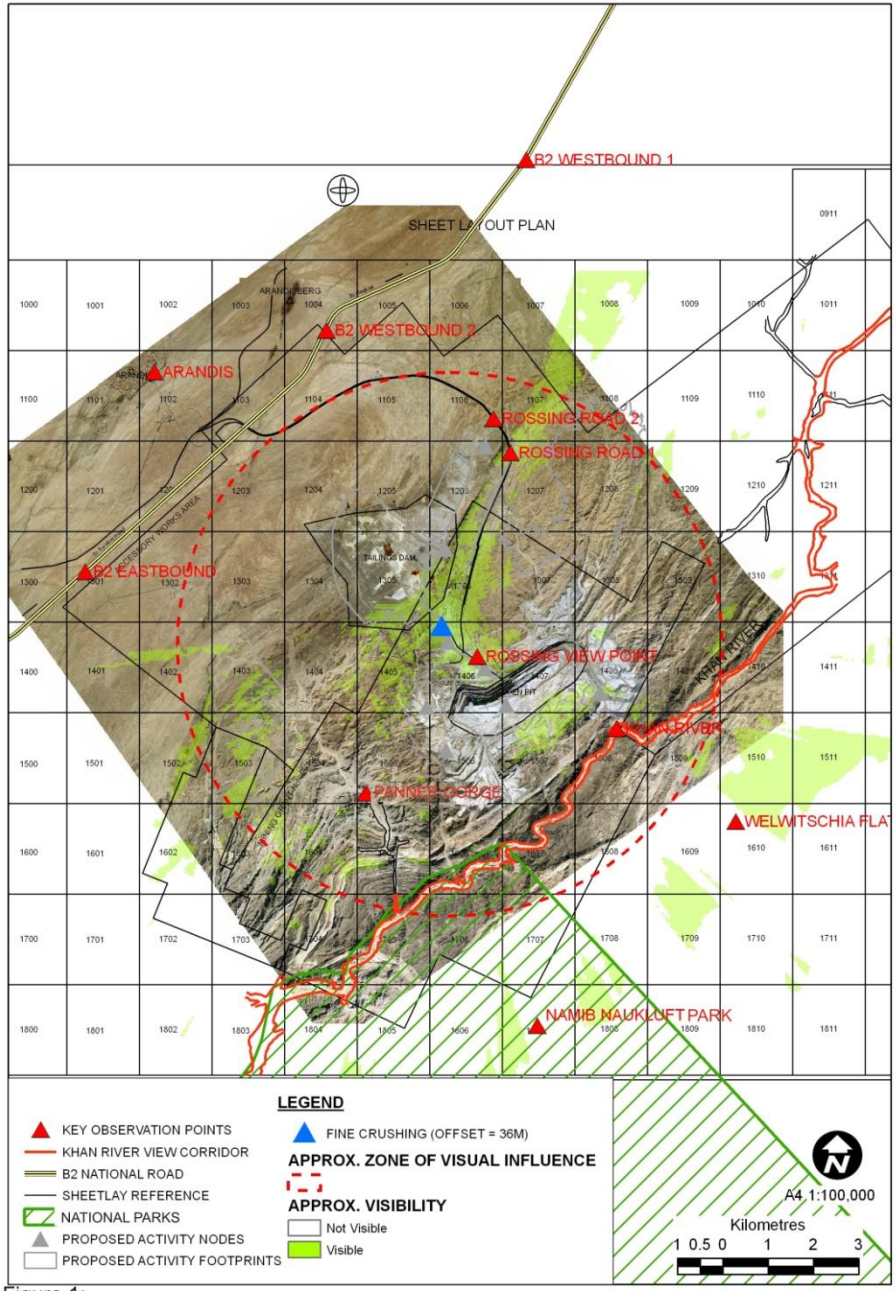


Figure 1:

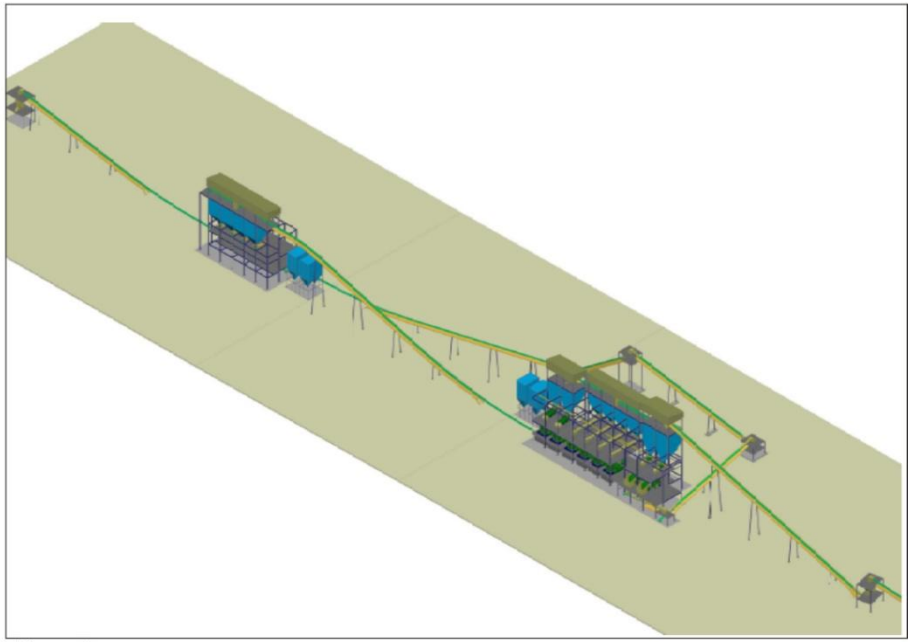


Figure 2: Modelling provided by Aker Solutions.UK

Figure 1: The figure shows that the only Key Observation Points that would be visible, and within the zone of influence, would be Rössing Road 2 and Rössing view point.

Figure 2: 2010 3D technical model

PLATE 28: FINE CRUSHING PLANT - B

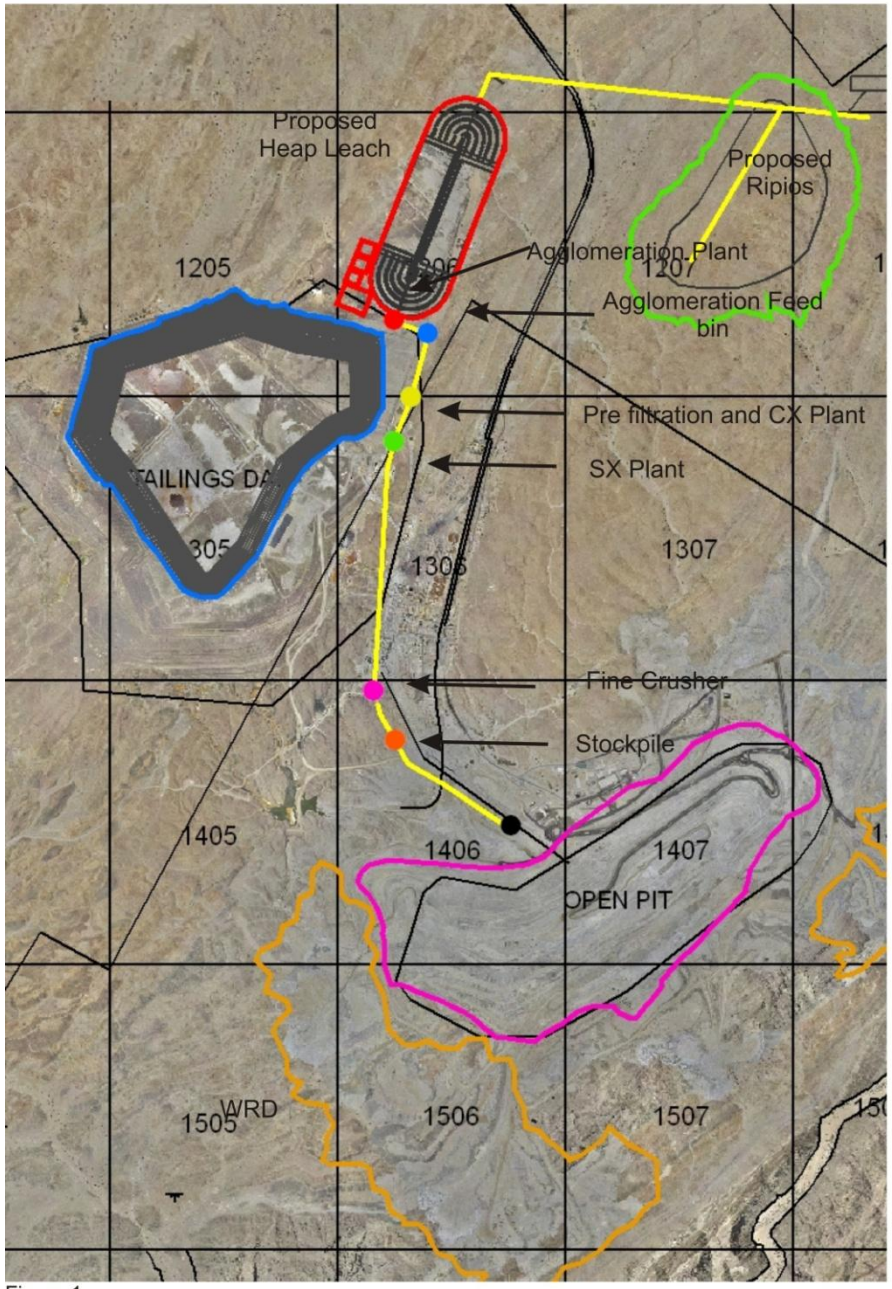


Figure 1:

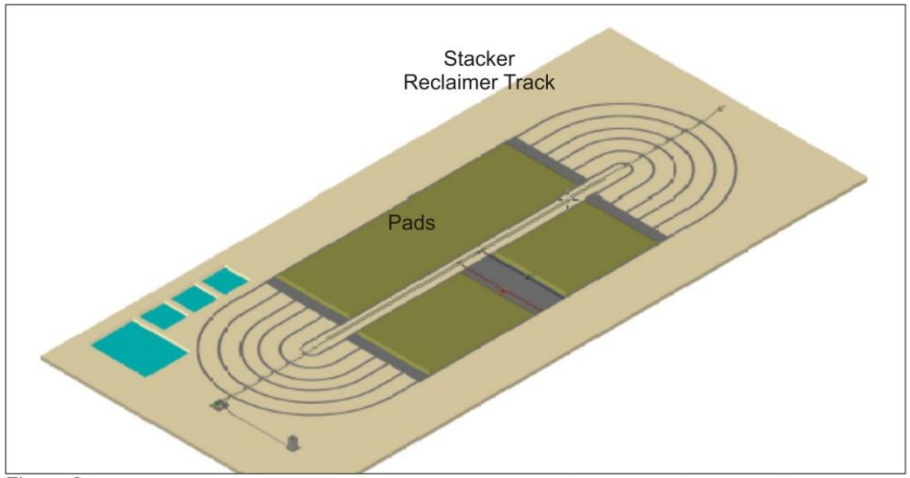


Figure 2: Modelling provided by Aker Solutions.UK

Figure 3:

Figure 1:	Locality map
Figure 2:	3D model of dynamic racetrack for the heap leach facility
Figure 3:	Photographs depicting the highly modified landscape of the existing Tailings Facility where the heap leach is proposed. The site has limited exposure and is well screened next to the Berning Range.

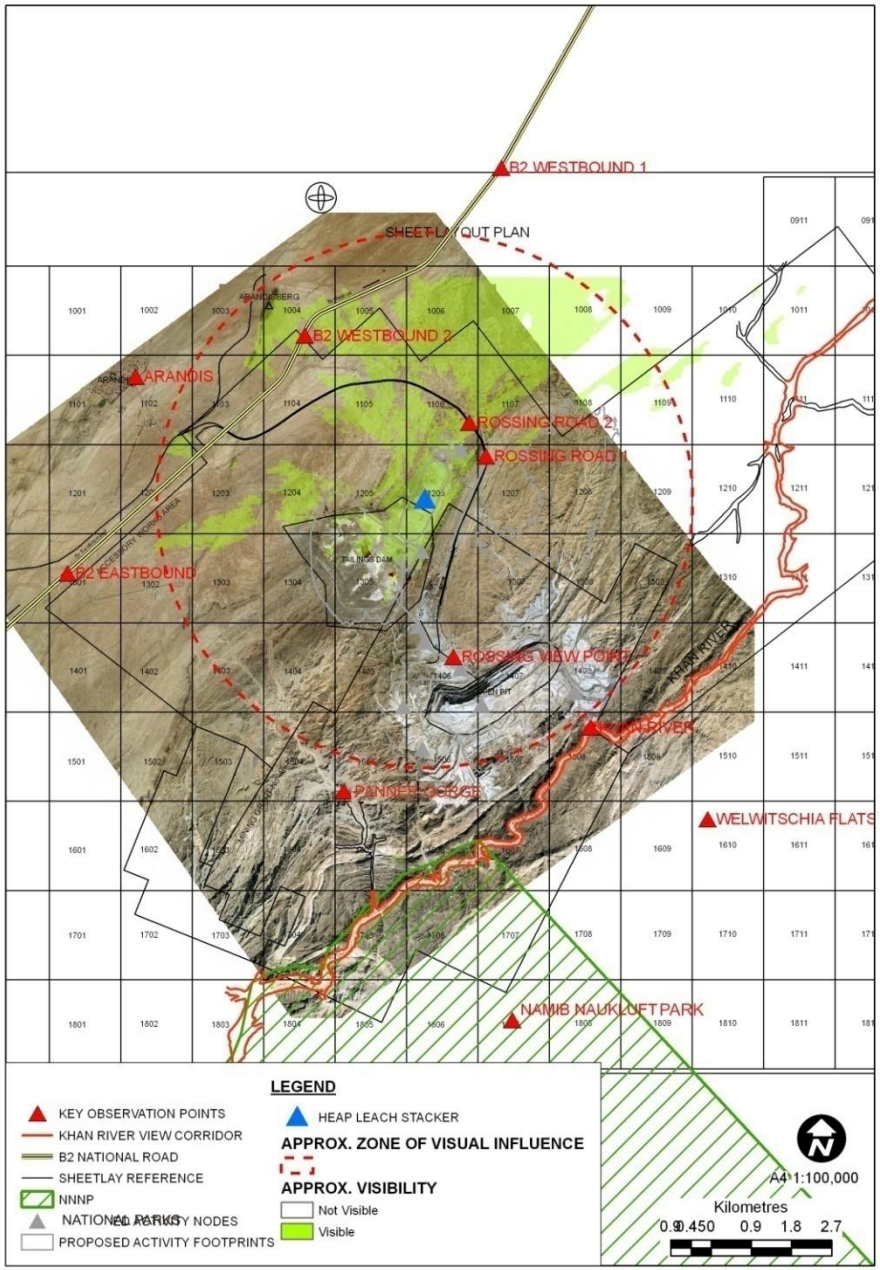


Figure 1:

Figure 2:

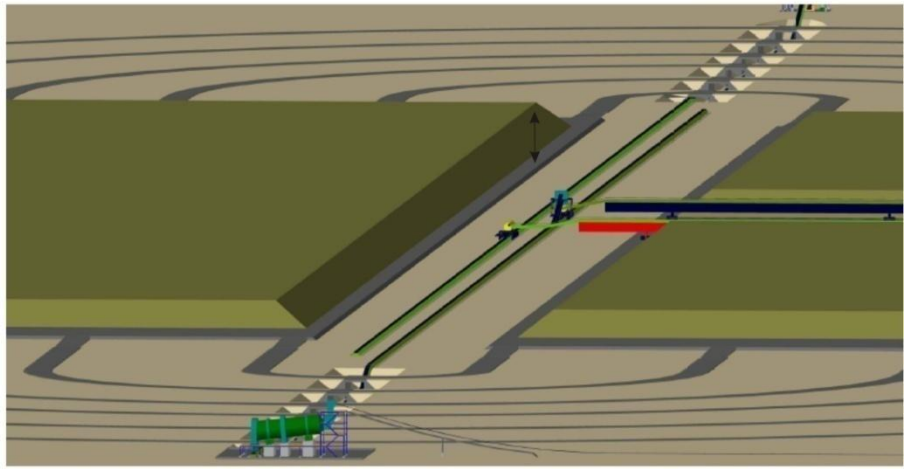


Figure 3: Modelling provided by Aker Solutions.UK

Figure 1: The viewshed shows that the only Key Observation Points that would be both visible and within the zone of influence, are the B2 Westbound 2 and Rössing Road 1 and 2.

Figure 2: Google aerial photograph of existing heap leach in Chile.

Figure 3: 3D detail of proposed dynamic heap leach racetrack.

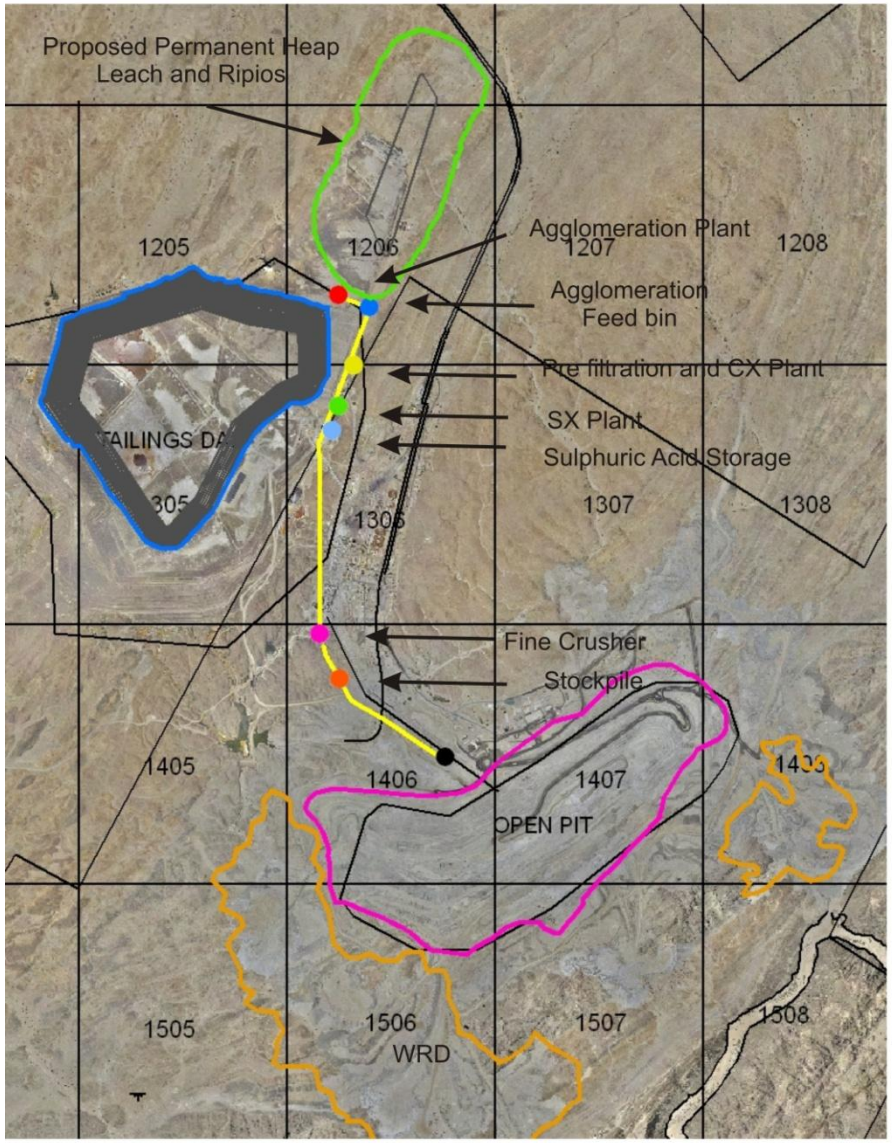


Figure 1:

Figure 2:

Figure 3:

Figure 1:	Locality map
Figure 2:	Permanent heap leach facility would be located in this area. Receptors would be tourists mainly related to Rössing Uranium.
Figure 3:	Photographs depicting the highly modified landscape of the existing Tailings Facility where the permanent heap leach is proposed.

PLATE 31: PERMANENT HEAP LEACH AND RIPIOS SCENARIO 3 - A

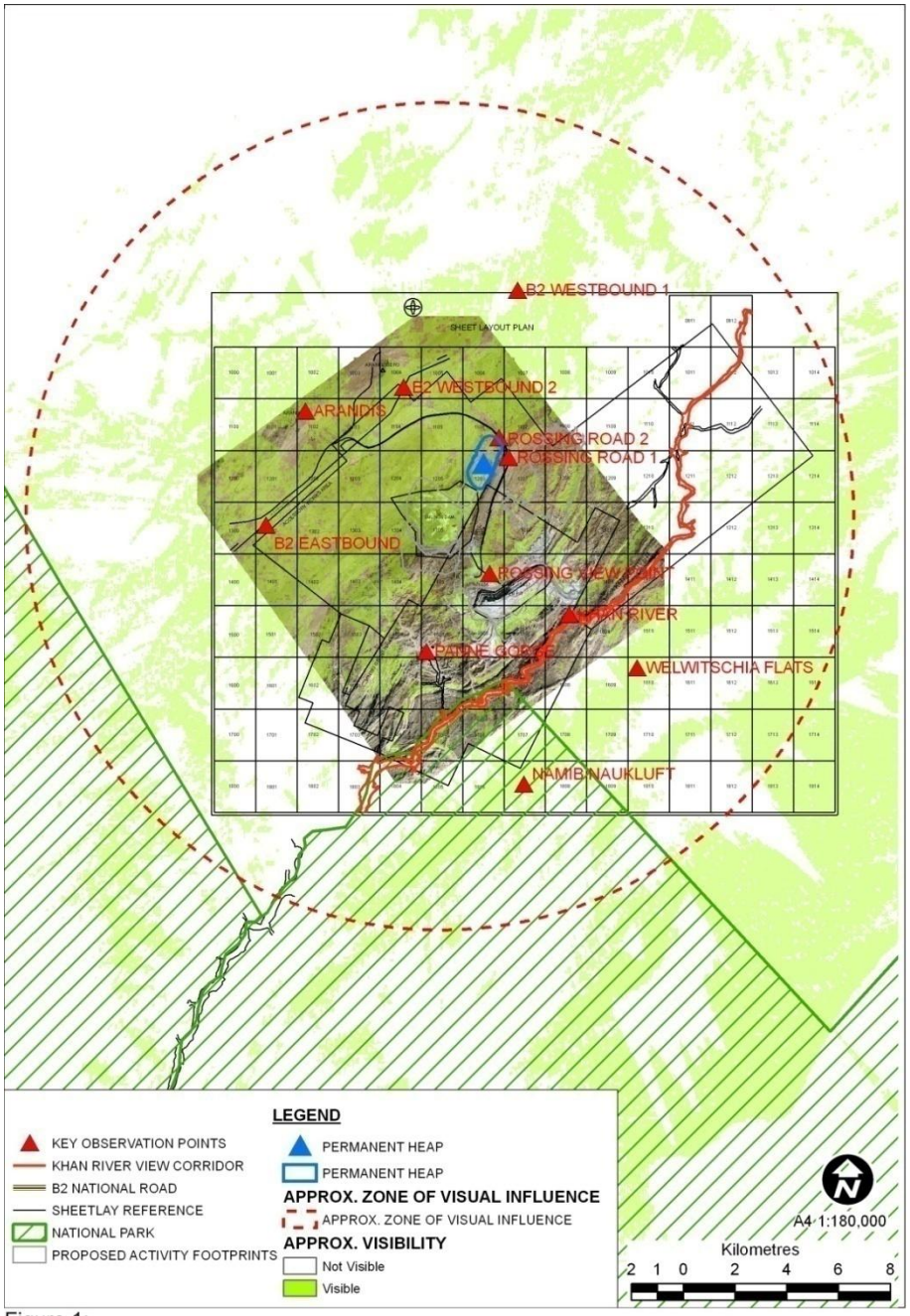


Figure 1:

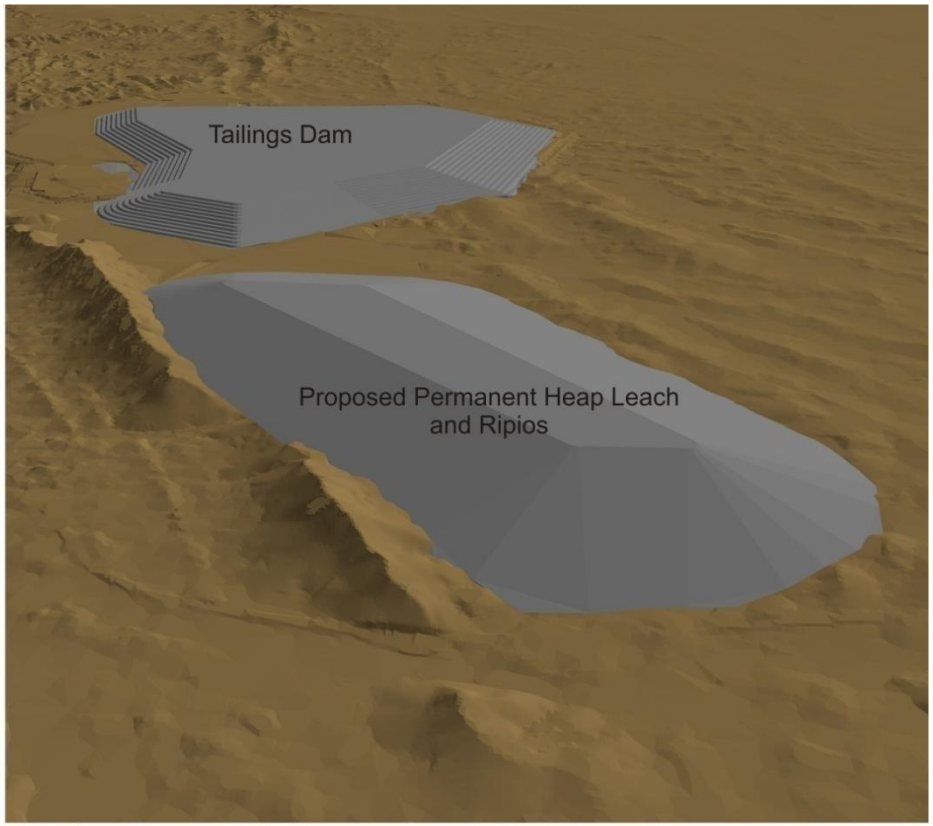


Figure 2: Colour and modelling for illustrative purposes only

Figure 1: The viewshed shows that the only Key Observation Points that would be both visible and within the zone of influence, are the B2 Westbound 2

Figure 2: 3D detail of proposed permanent heap leach.

PLATE 32: PERMANENT HEAP LEACH AND RIPIOS SCENARIO 3 - B

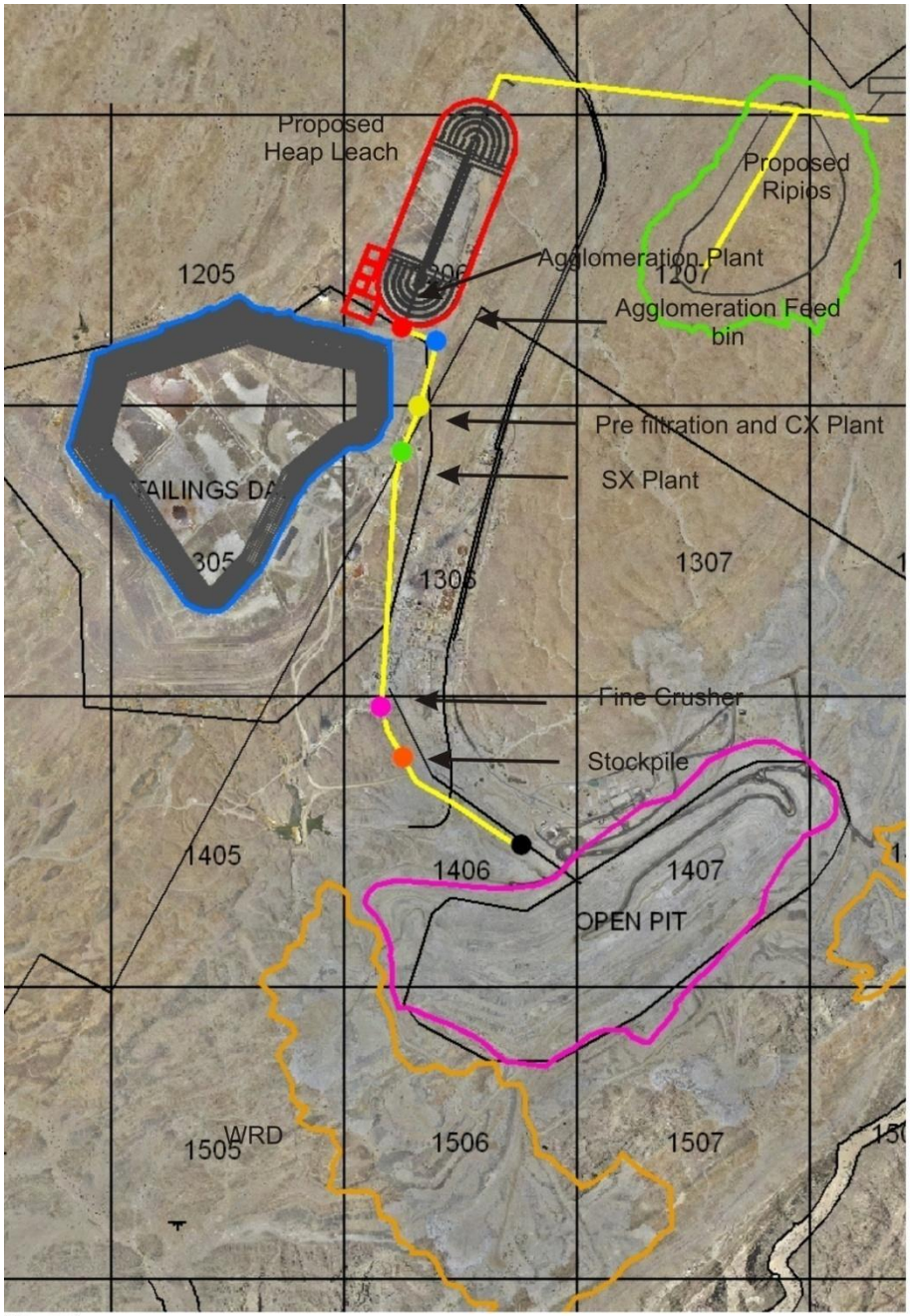


Figure 1:

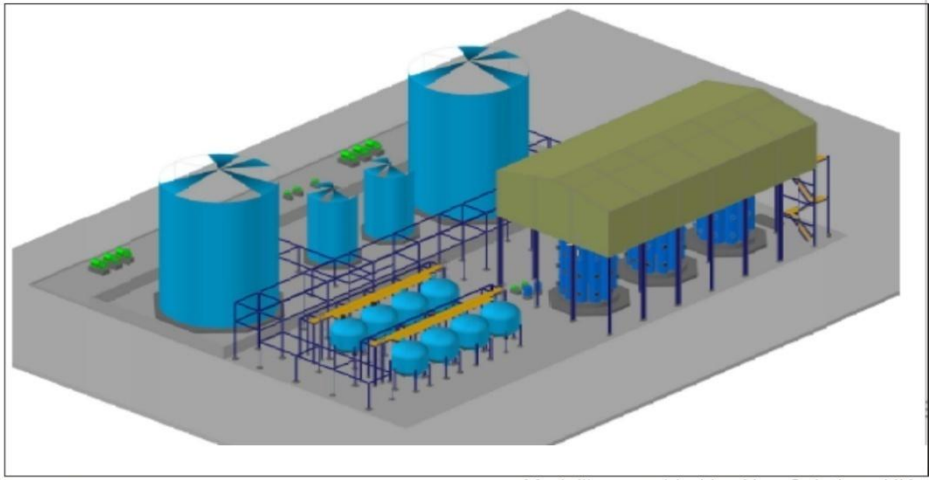
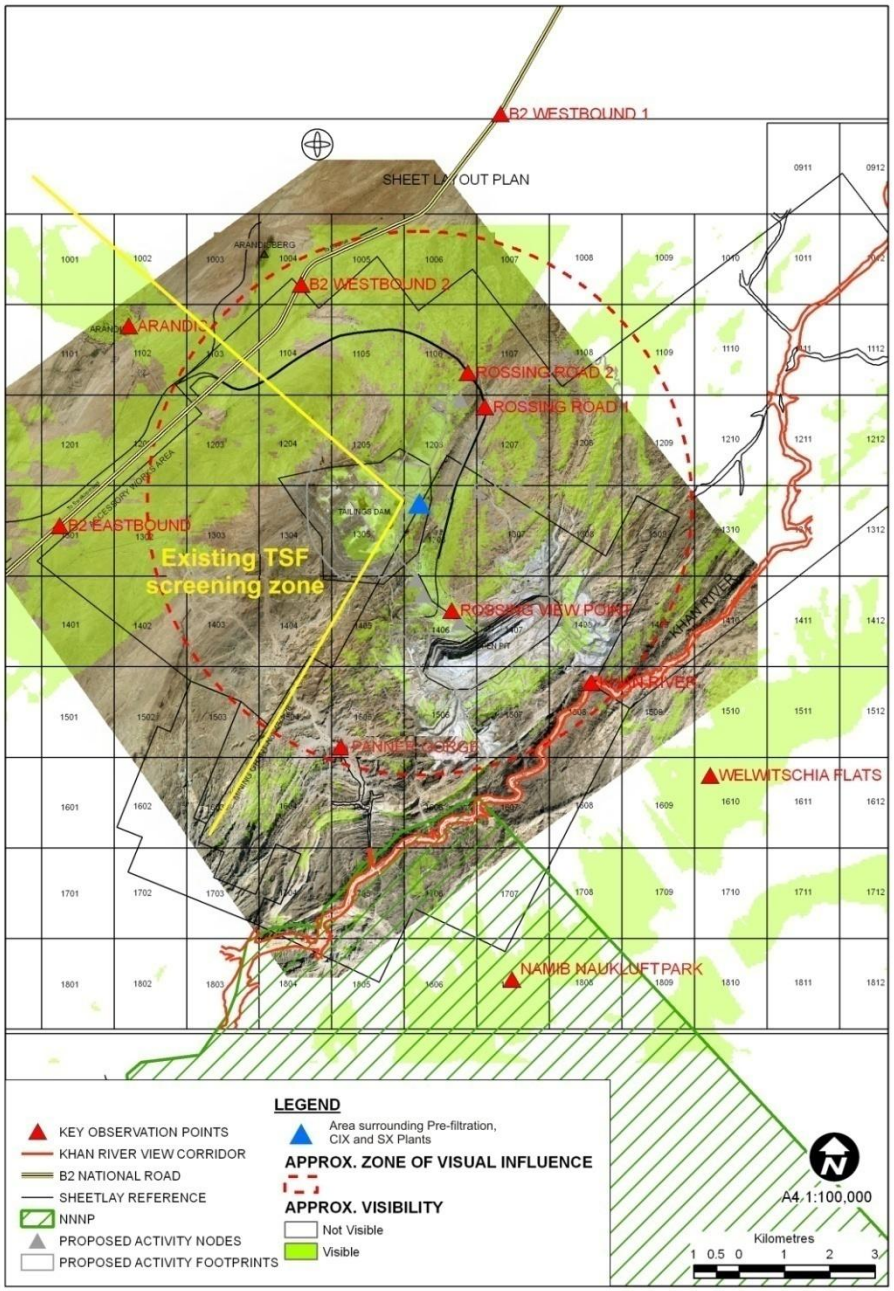
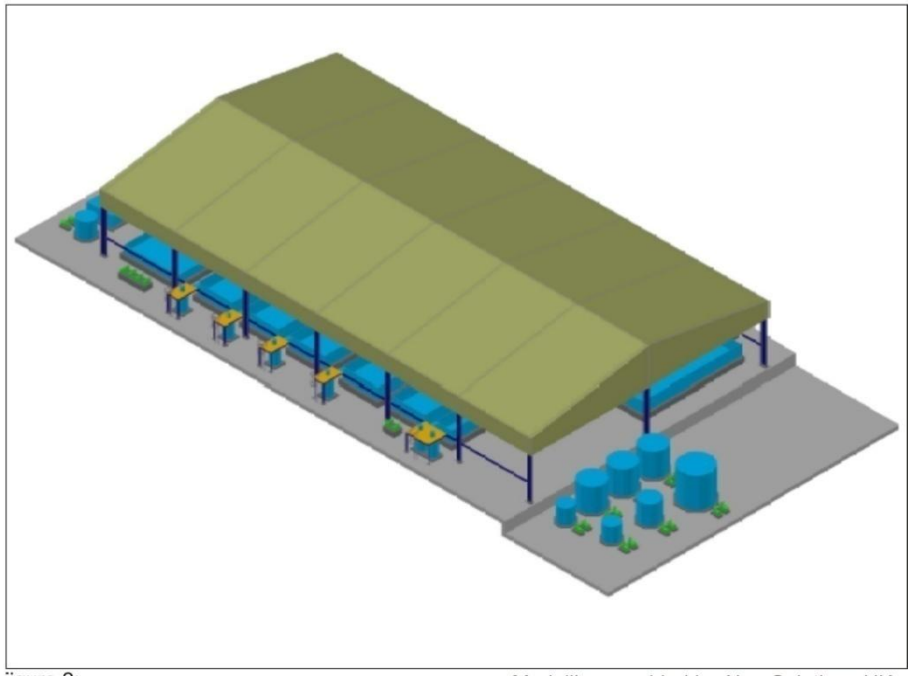


Figure 2: Modelling provided by Aker Solutions.UK

Figure 1: Locality map

Figure 2: Preliminary 3D Modelling of Pre-Filtration and CIX Plant





igure 2: Modelling provided by Aker Solutions.UK

Figure 1: The viewshed of the Pre-Filtration and SX Plants shows that only Rössing Road 1 and 2 would be visible and within the zone of visual influence.

Figure 2: Detailed 3D showing the Solvent Extraction (SX) Plant

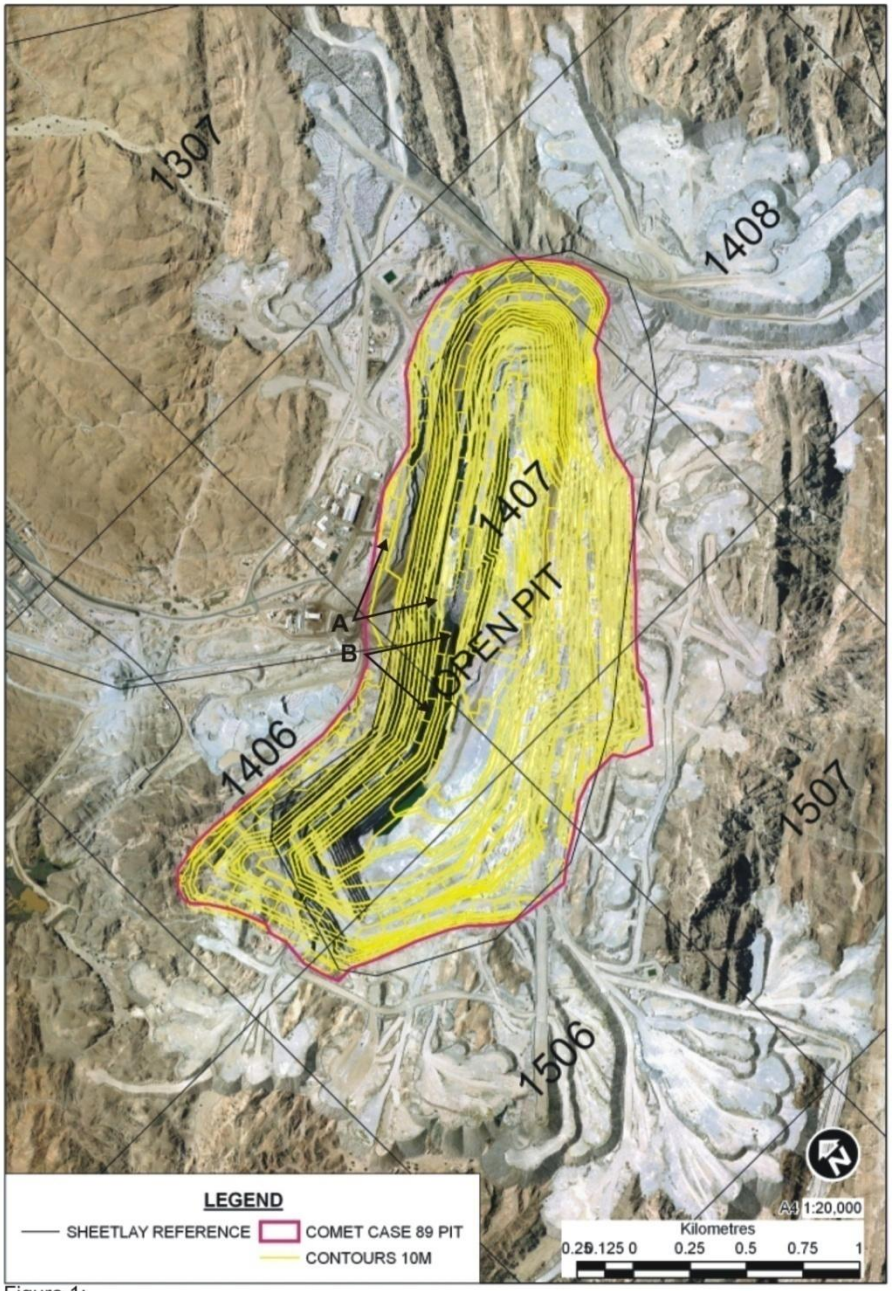


Figure 1:

Figure 2:

Figure 3:

Figure 1:	Aerial locality map of pit expansion. Photograph from Point A
Figure 2:	View north east into the existing pit. Photograph from Point B
Figure 3:	Zoomed in photograph of dust generated from drilling activities.

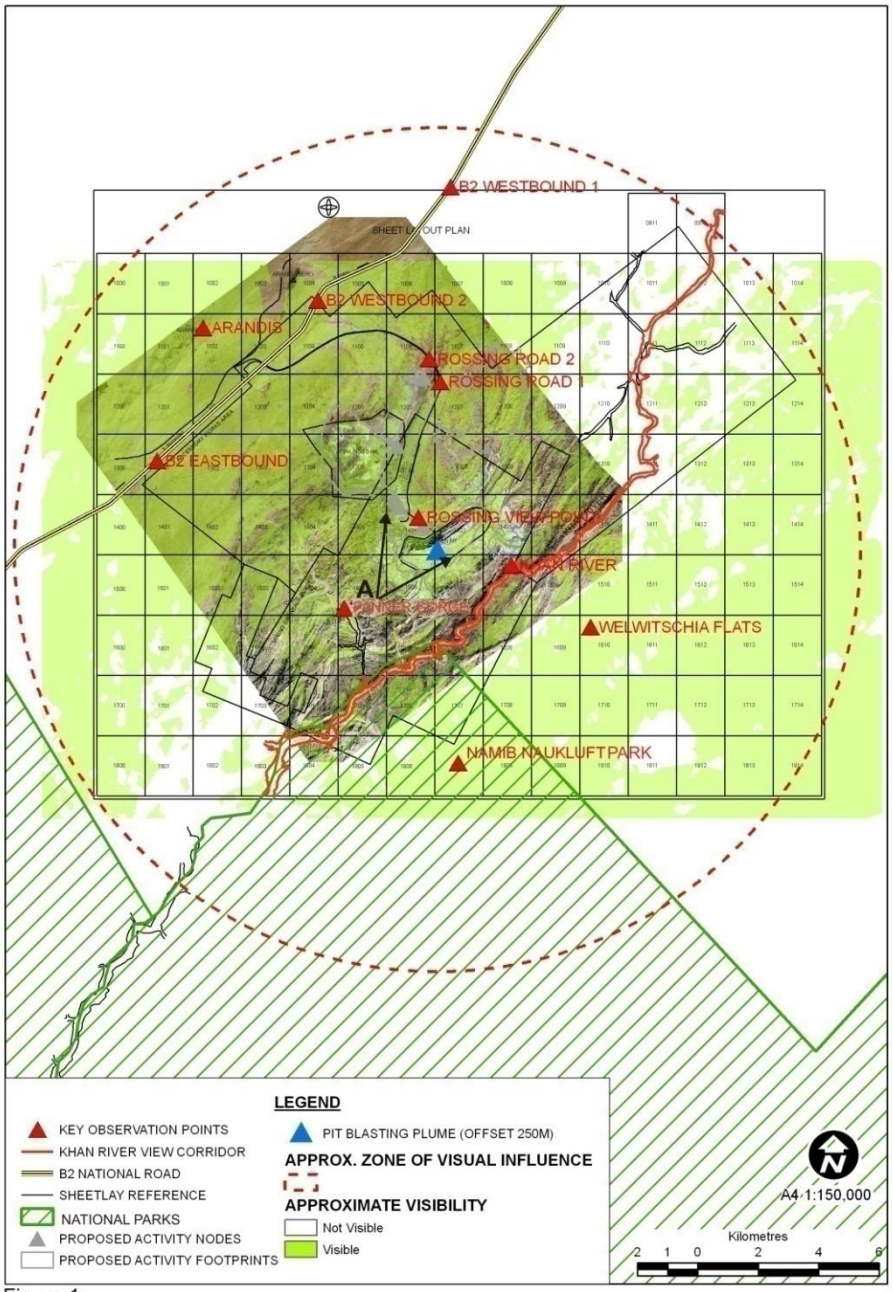


Figure 1:

Figure 2:

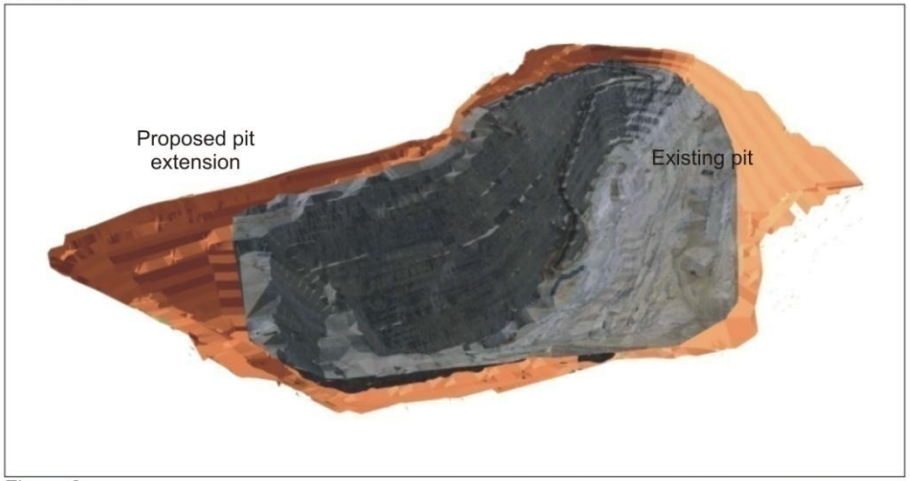


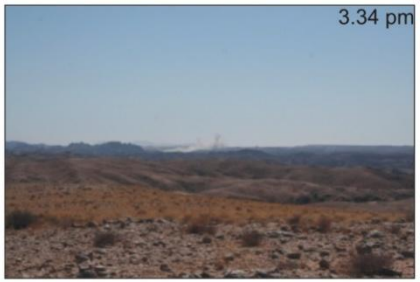
Figure 3: Colour and modelling for illustrative purposes only

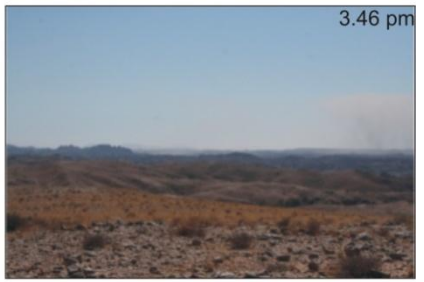
Figure 1: Viewshed map of pit shows that all Key Observation Points are within the zone of influence (red circle) and all, except the B2 Westbound, are situated within the approximate visibility of any blasting related to the pit (shown in green).

Figure 2: Photograph from Hill Jim Viewpoint showing dust plume created by blasting in north western side of the pit. *(source: http://www.rossing.com/asset_use.htm)*

Figure 3: The 3D technical drawing shows the extent of the proposed widening of the pit.

Figure 1: Blast study timed series





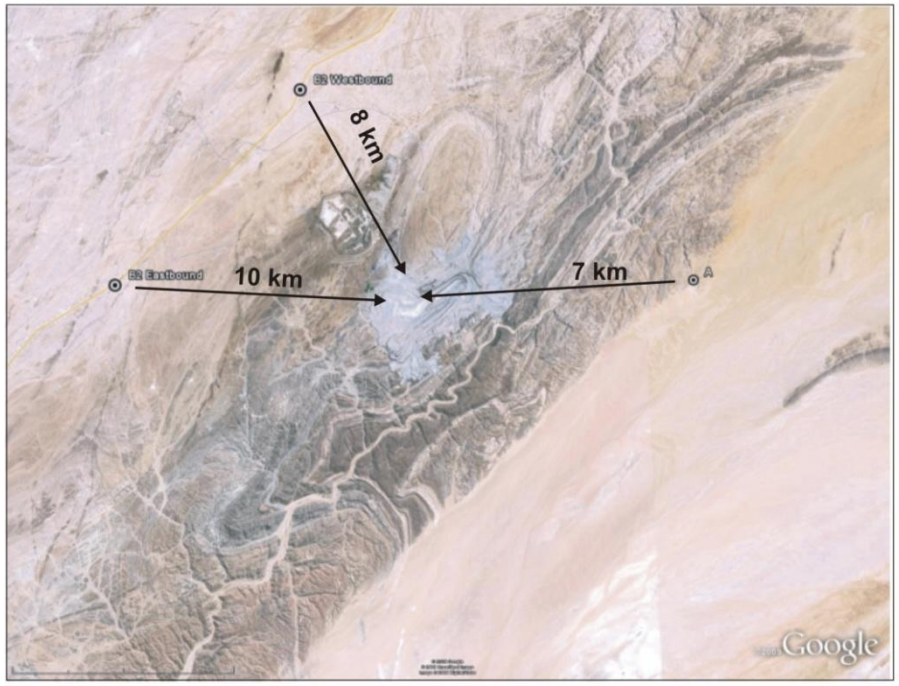


Figure 2:

Figure 3:

Figure 4:

Figure 1:	Blast study from Point A on Locality map over period of 13 minutes.
Figure 2:	Locality map
Figure 3:	View from B2 Eastbound
Figure 4:	View from B2 Westbound

PLATE 37: BLAST PLUME STUDY

Figure 1:


Figure 2:


Figure 3:

Figure 1:	Locality map
Figure 2:	Photograph depicting the existing primary crushing plant.
Figure 3:	Photograph depicting dust generated during the dumping of the ore into the primary crusher.

PLATE 38: PRIMARY CRUSHER - A

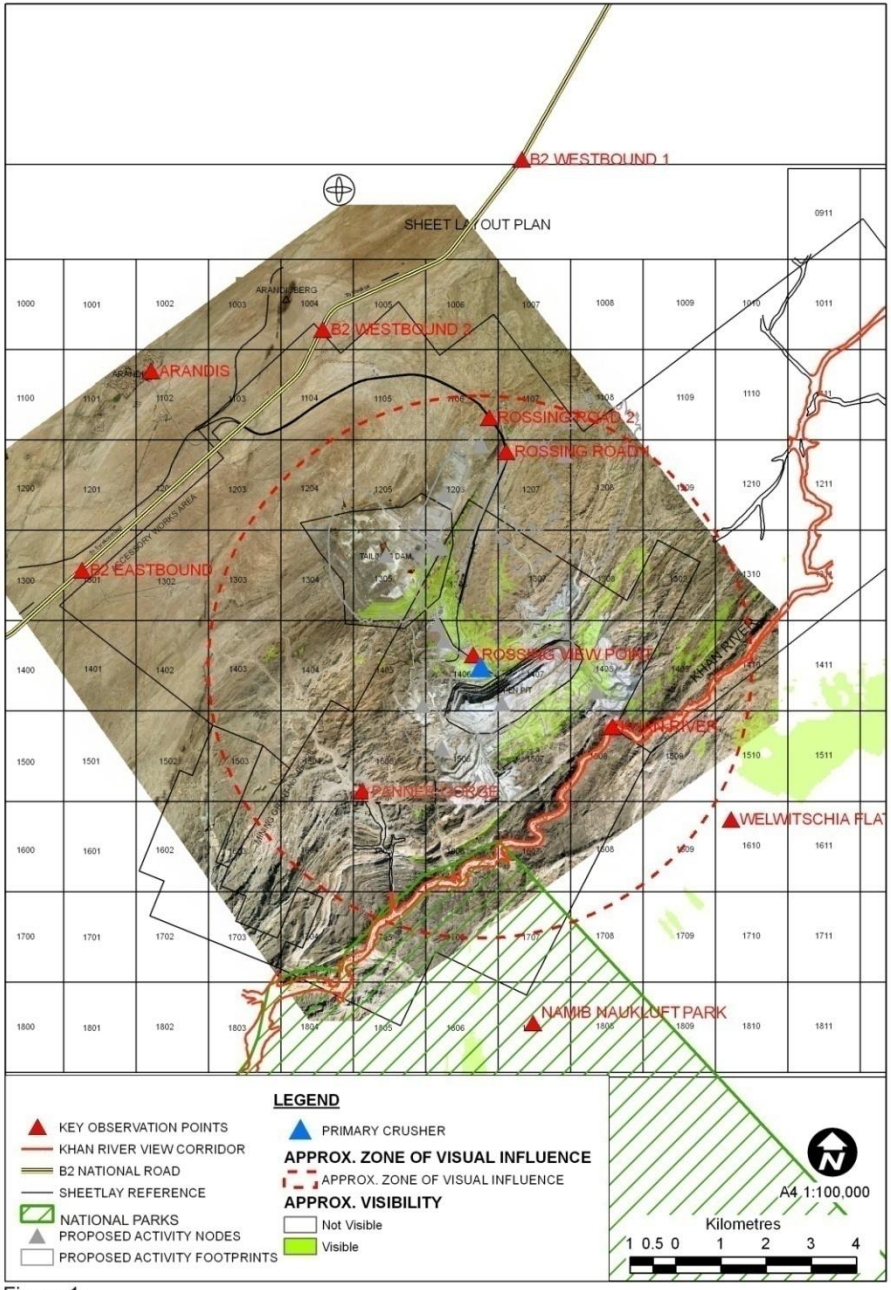


Figure 1:

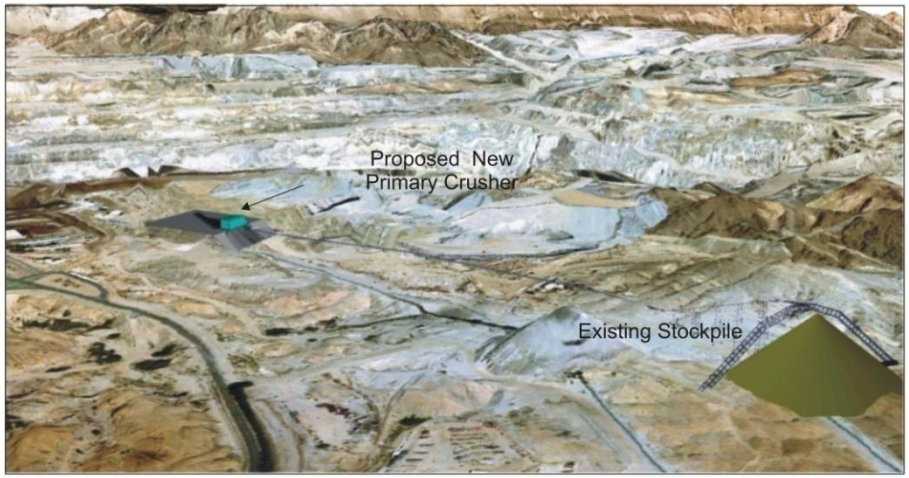


Figure 2:

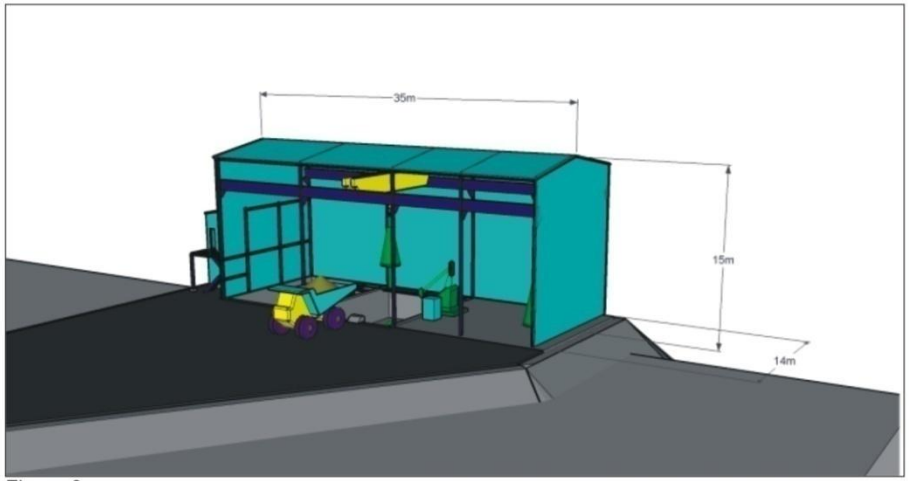


Figure 3: Colour and modelling for illustrative purposes only

Figure 1: Viewshed map shows that only the Rössing Uranium viewpoint receptor would be visible. This, however, is not a KOP as it is within the Rössing Uranium mining area.

Figure 2: 3D Context model

Figure 3: 3D technical model

PLATE 39: PRIMARY CRUSHER - B

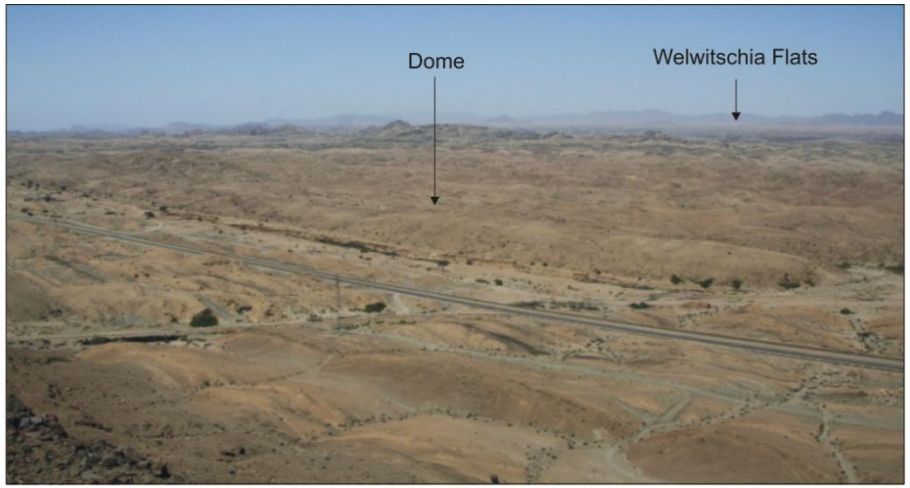


Figure 2:

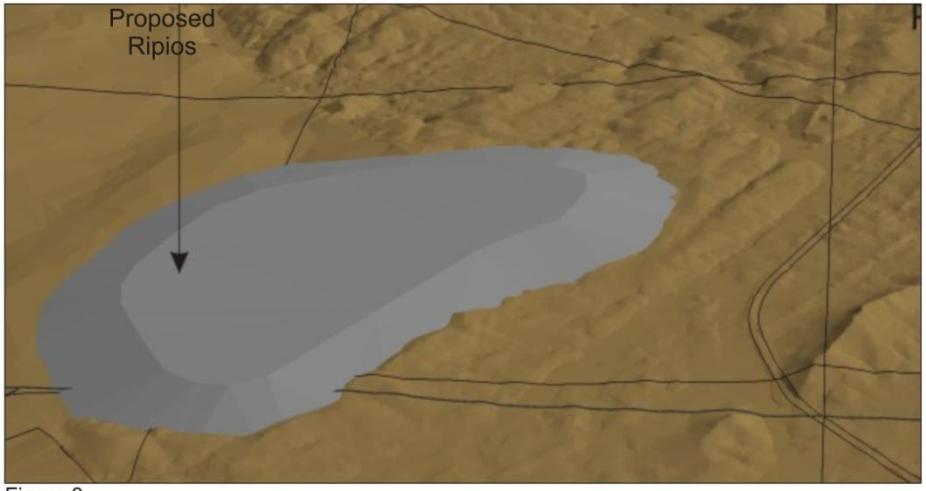


Figure 3:

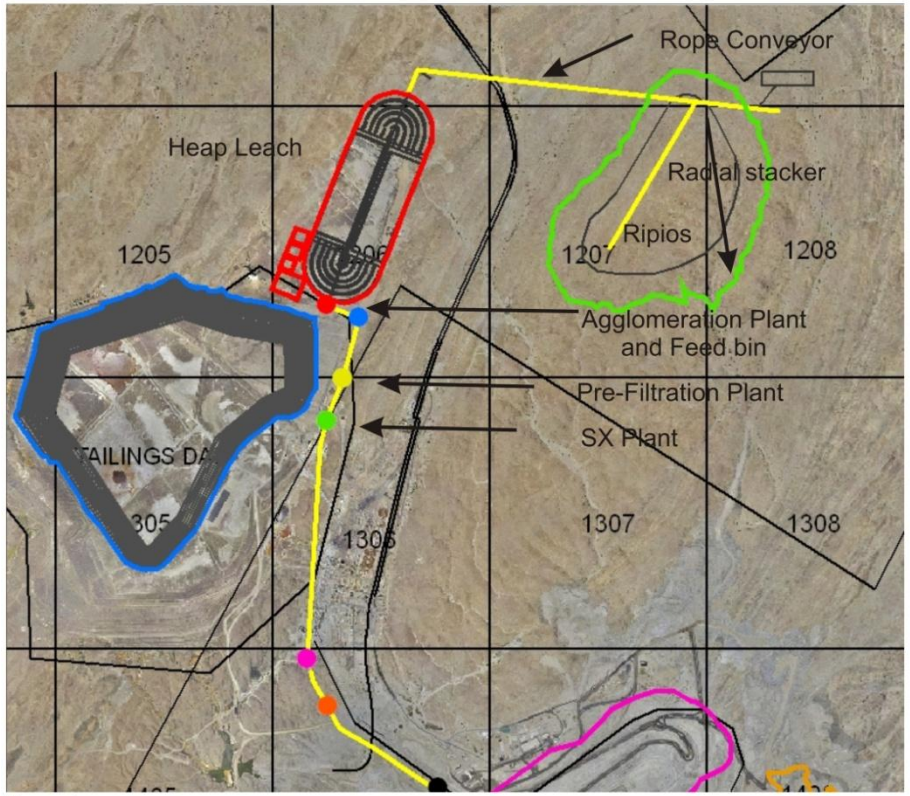


Figure 1:

Figure 4:

Figure 1:	The locality map of the proposed ripios.
Figure 2:	Photograph depicting the view to the south of the Dome area as seen from the Berning Range. Although the visual disturbance to the surrounds will be very limited, the location of the proposed ripios on the dome will transform the landscape character.
Figure 3:	Preliminary 3D model of ripios
Figure 4:	Example of 3D model of Rope conveyor system

PLATE 40: RIPIOS - A

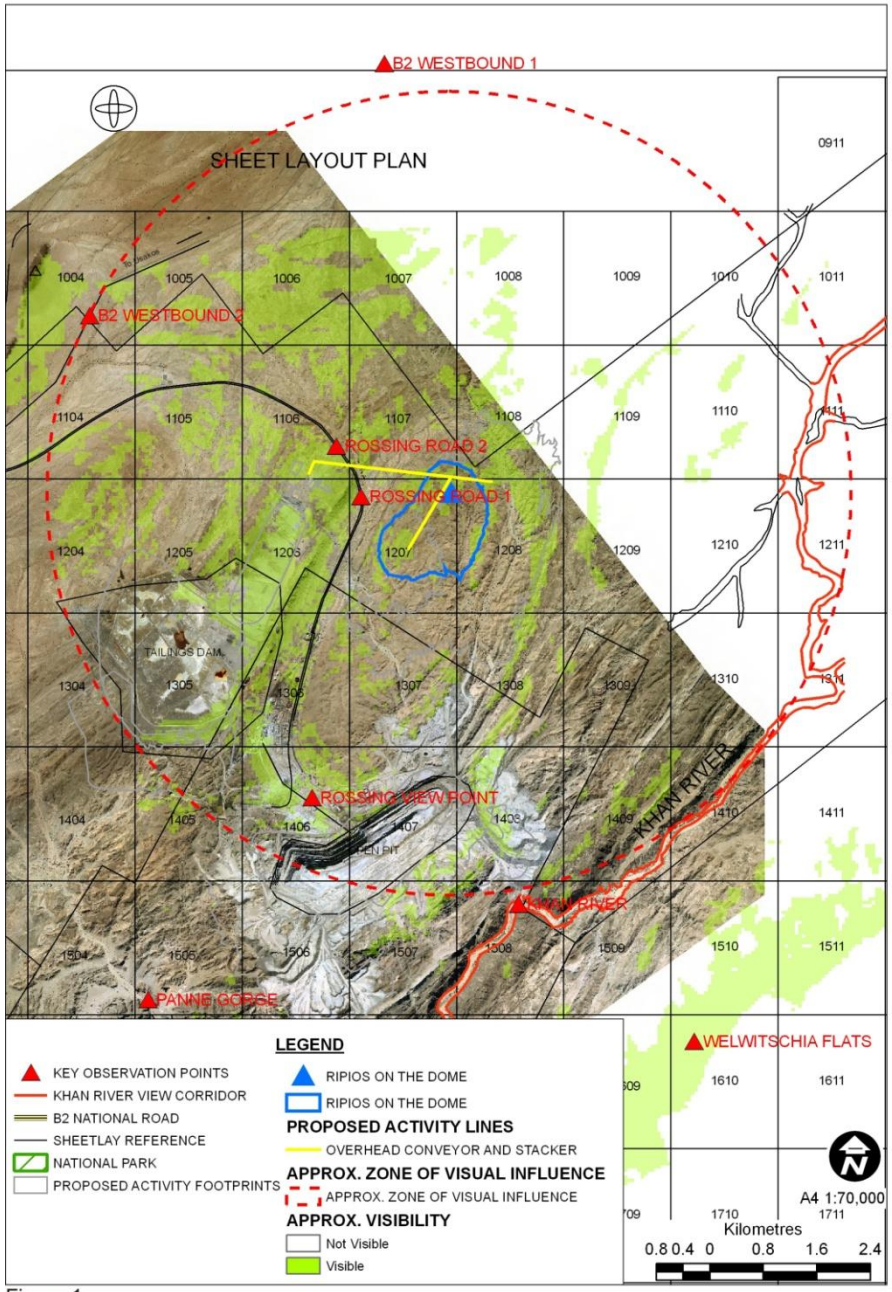


Figure 1:

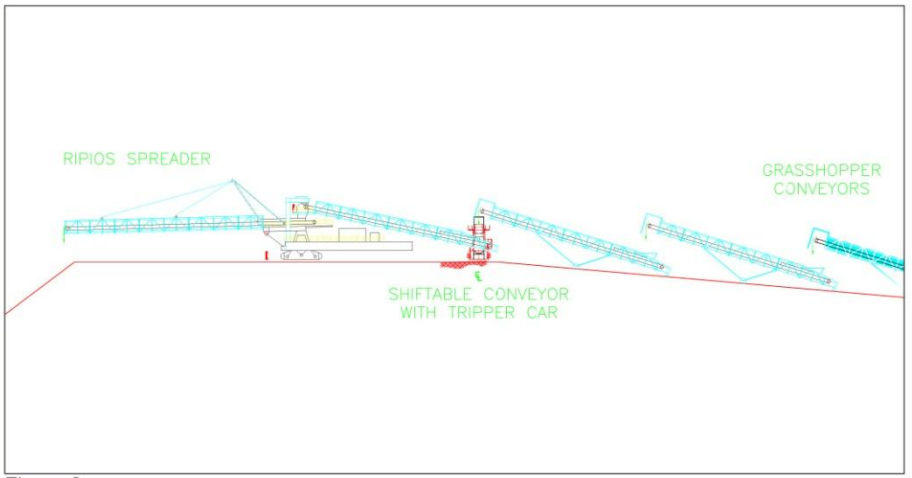


Figure 2:

Figure 3: Colour and modelling for illustrative purposes only

Figure 1: Ripios Viewshed Map shows that the visual influence zone is very fragmented.

Figure 2: Preliminary model of ripios spreader and conveyor system.

Figure 3: Example of radial stacker (www.flickr.com)

PLATE 41: RIPIOS - B

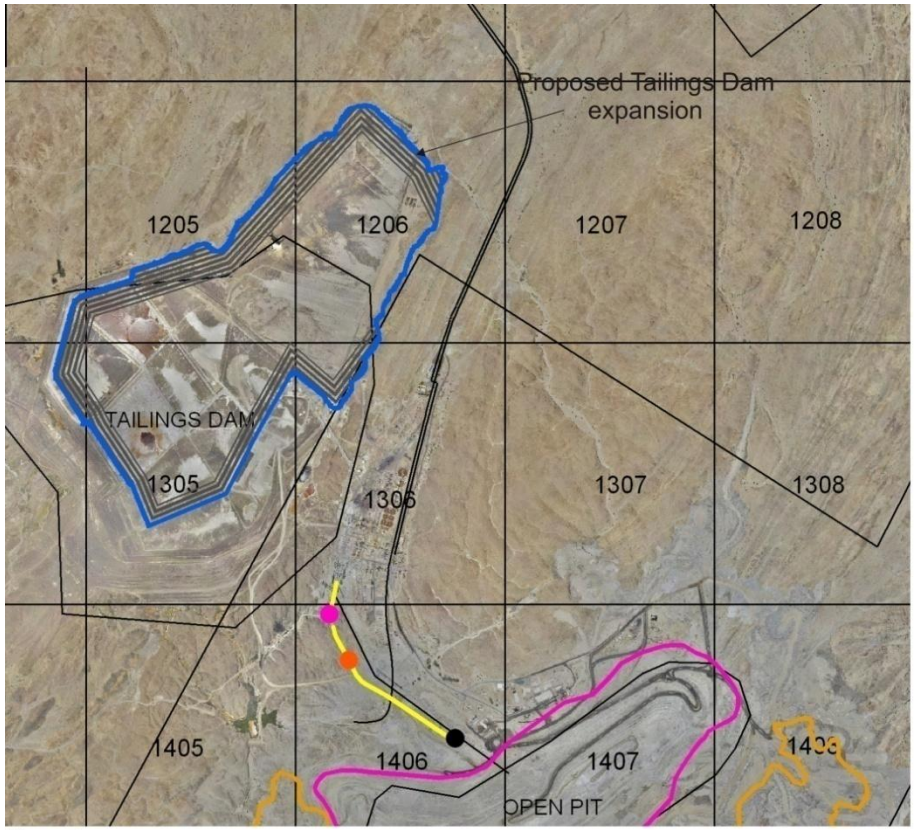


Figure 2:

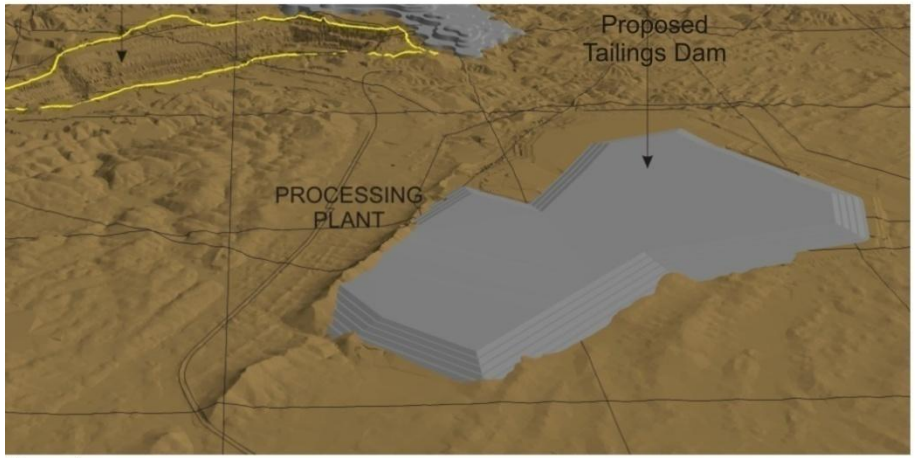


Figure 1:

Figure 3:

Figure 4:

Figure 1:	The aerial locality map shows the position of the proposed new tailings facility to the north of the pit.
Figure 2:	3D Modelling
Figure 3:	Photograph depicting the proposed site for the extended Tailings Dam which is on top of the existing tailings facility. The landscape is highly transformed but is quite elevated and prominent to the surroundings.
Figure 4:	Photograph depicting the view south east from the bridge outside Arandis of the existing tailings dam.

PLATE 42: TAILINGS STORAGE FACILITY SCENARIO 1

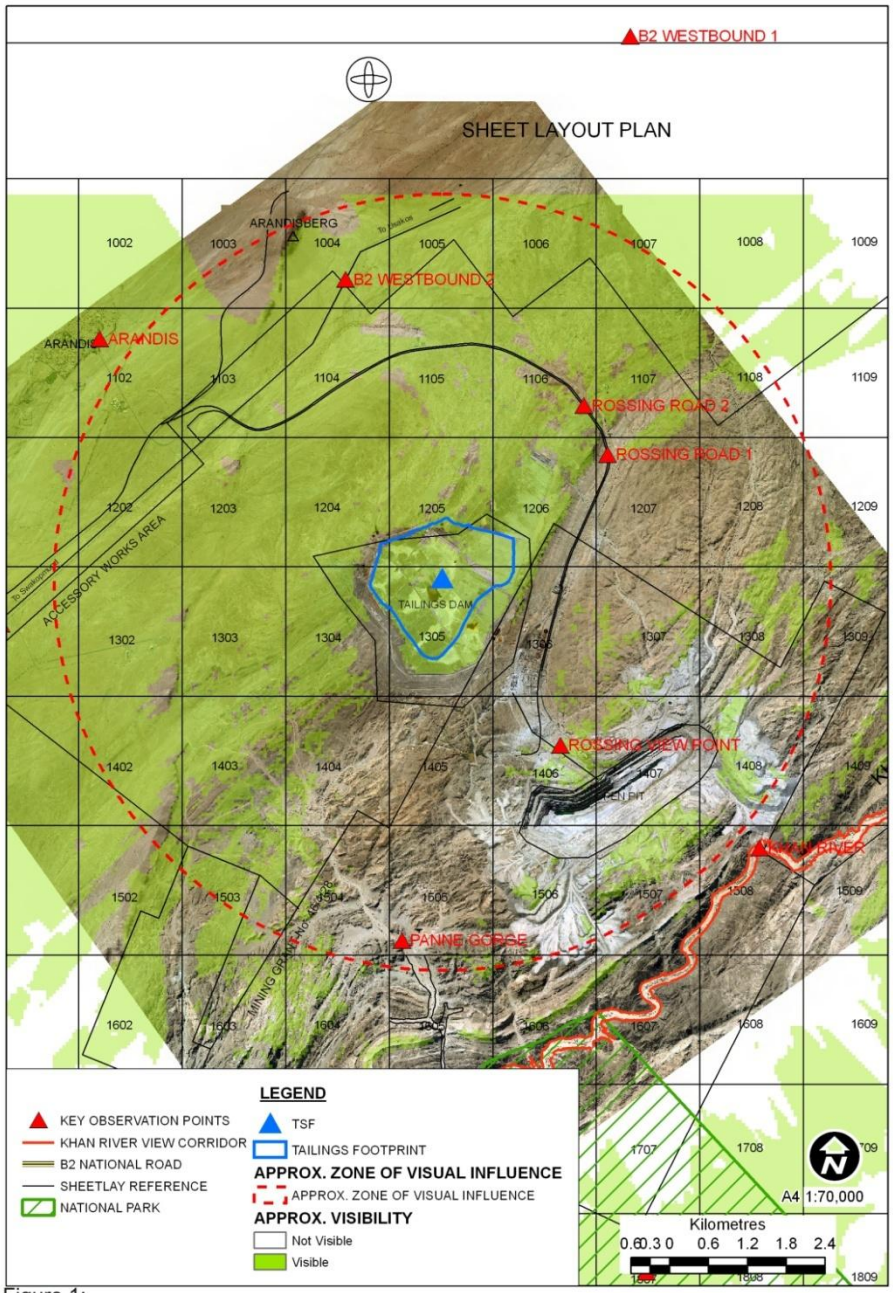


Figure 1:

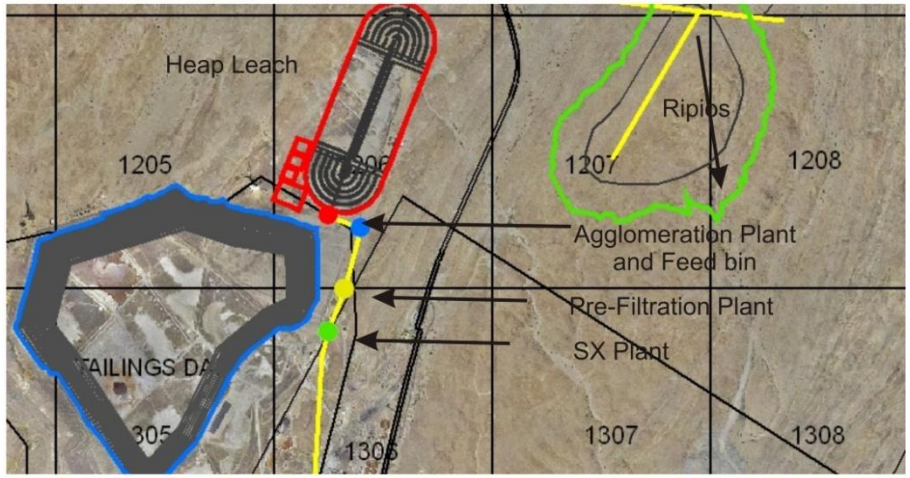


Figure 2:

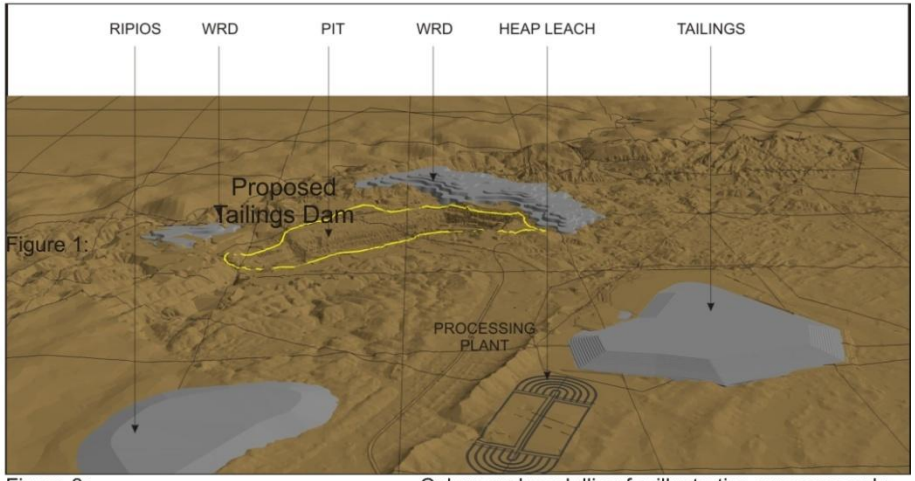


Figure 3: Colour and modelling for illustrative purposes only

Figure 1:	The viewshed map shows that the visual envelope and zone of visual influence in all 3 scenarios would be extensive as the Tailings facility would be greater in size and scale than the surrounding mountains where the elevated sections are 640 m amsl.
Figure 2:	Locality of tailings facility for Scenario 2 and 3
Figure 3:	3D context of tailings facility

Figure 1:

Figure 2: Photograph from Point A

Figure 3: Photograph from Point B

Figure 1:	The proposed waste rock dumps (WRD) can be seen in the aerial locality map marked by an orange line. They will be situated on the existing WRD.
Figure 2:	Existing WRD. Areas that are being considered for dumping have potentially high levels of exposure which need to be assessed. Strategies need to be investigated to ensure that intrusion is reduced.
Figure 3:	Photograph depicting the intensity and scale of the existing WRD to the south of the open pit.

PLATE 44: WASTE ROCK DUMPS 230 MT - A

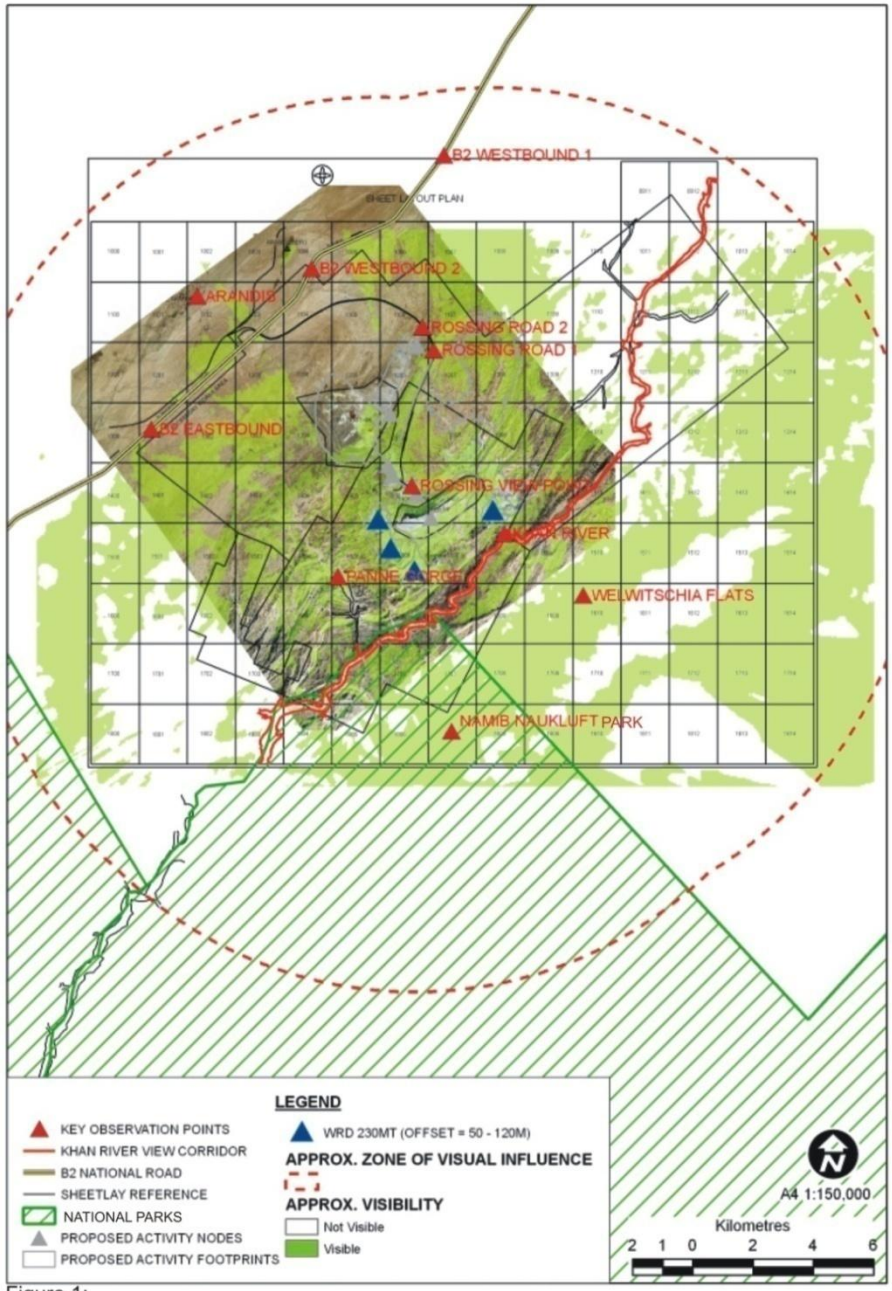


Figure 1:

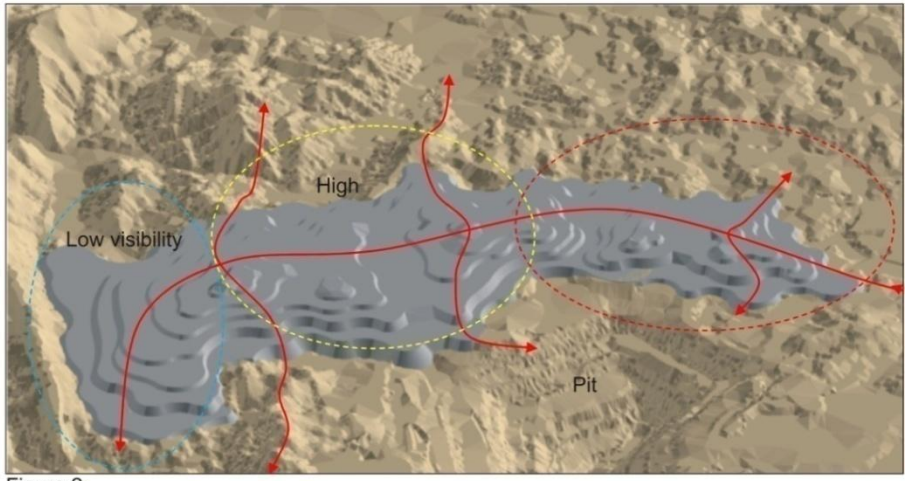


Figure 2:

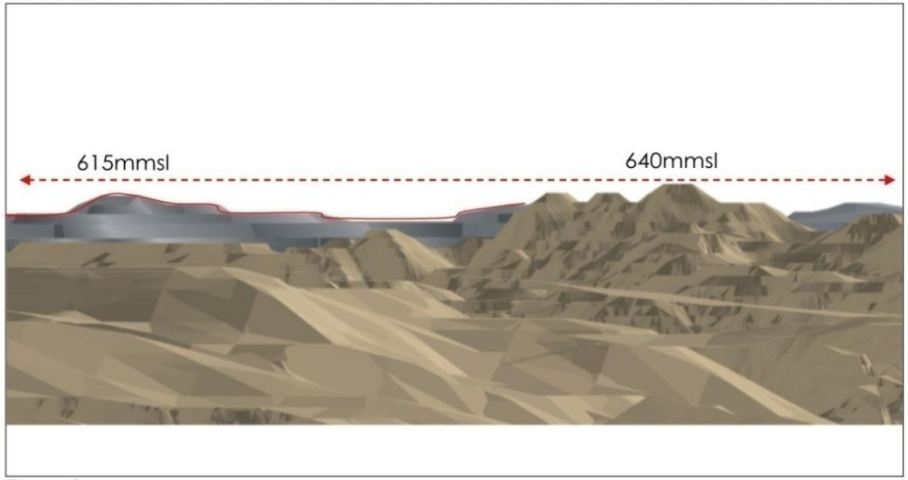


Figure 3:

Figure 1:	The viewshed shows that the KOP visible would be the Rössing viewpoint, Panner Gorge, the Welwitschia Flats, Namib Naukluft Park and the Khan River. All Key Observation Points would be within the zone of influence.
Figure 2:	Oblique view south
Figure 3:	Receptor view Welwitschia Flats/Namib Naukluft Park

PLATE 45: WASTE ROCK DUMPS 230 MT - B

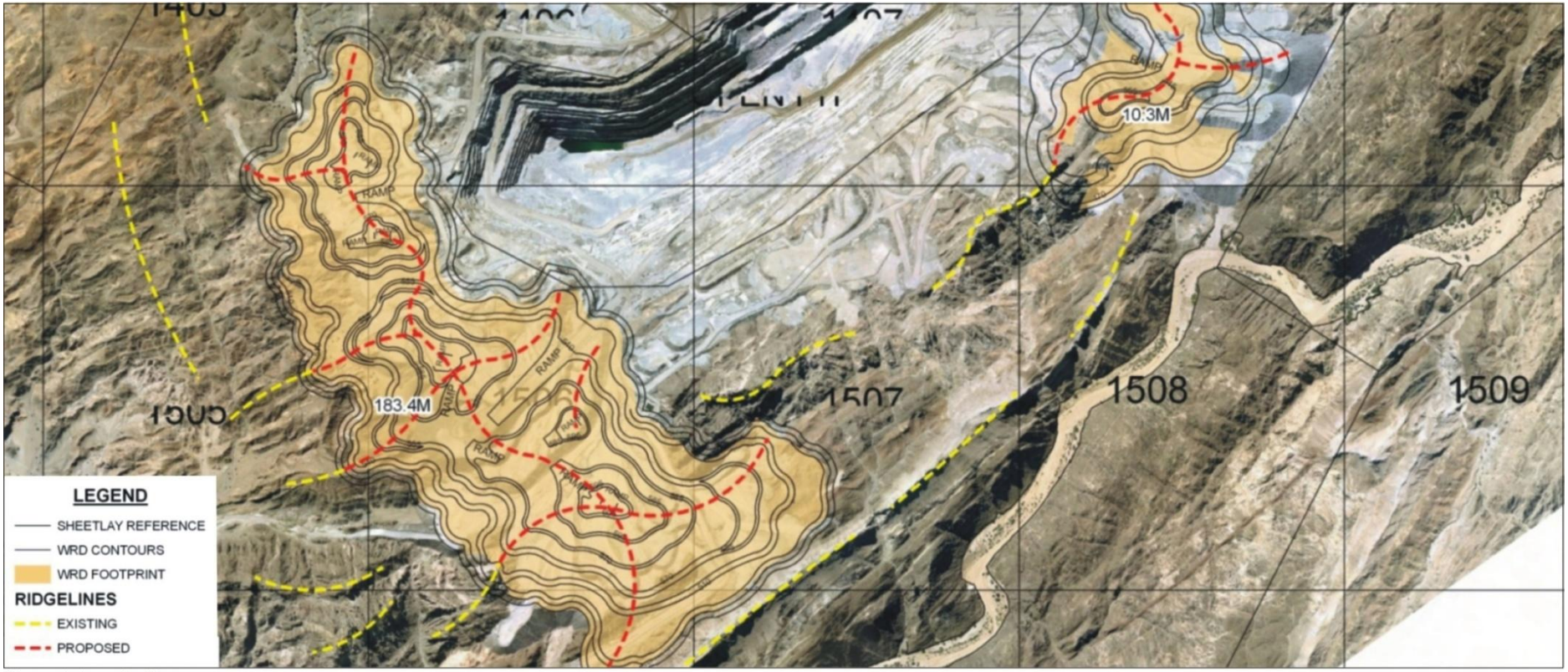


Figure 1: Locality Map

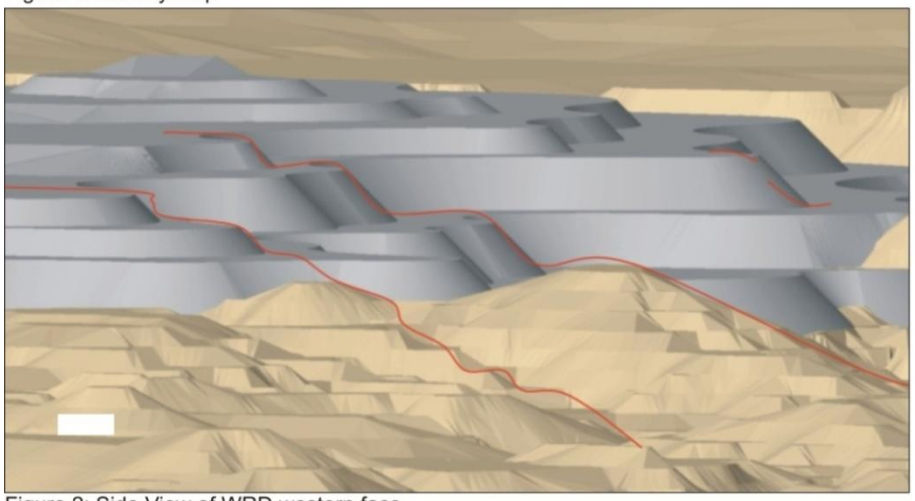


Figure 2: Side View of WRD western face

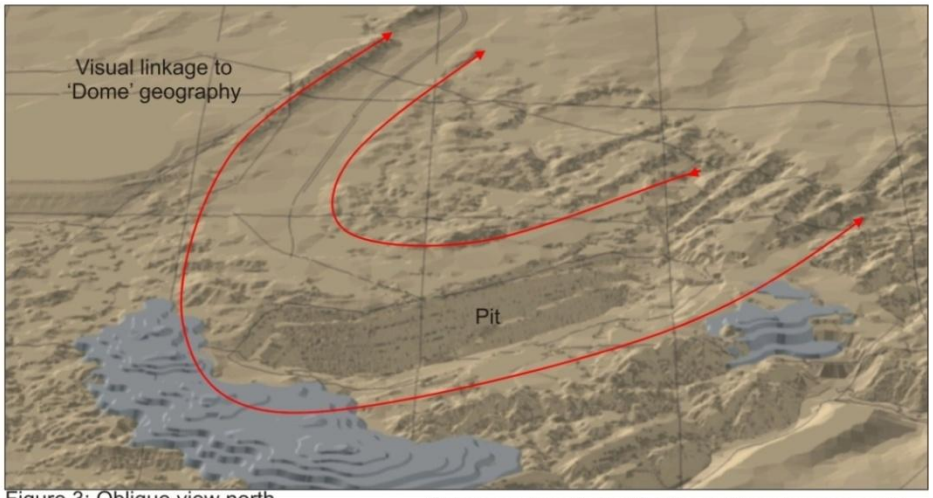


Figure 3: Oblique view north

Colour and modelling for illustrative purposes only

PLATE 46: WASTE ROCK DUMPS 230 MT - C

Figure 1:

Figure 2:

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

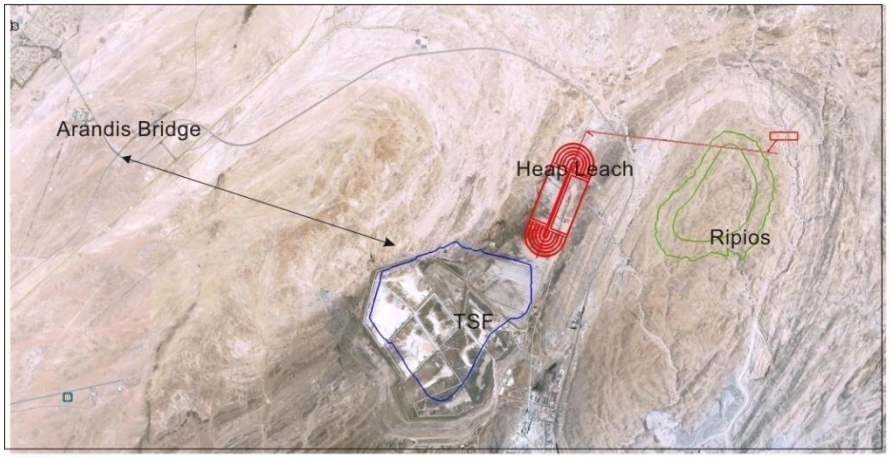


Figure 3:

Figure 1: Existing Landscape

Figure 2: Proposed Landscape

Figure 3: Arandis Bridge Viewpoint Locality Map

For the **Arandis** area the VRM Class III objective was defined due to the areas existing moderate development and proximity to the mine and infrastructure. Moderate levels of visual impact would be suitable for proposed landscape modifications. In terms of visual impacts of the Phase II expansion, the only activity that would be visible is the Ripios during the later stages of construction. Due to the distance to the Ripios and the localised topographic and vegetation screening, the visual impact of this activity would be moderate and fit in with the VRM Objectives defined for this KOP.

PLATE 47: ARANDIS BRIDGE PHOTO MONTAGE SCENARIO 2

Figure 1: Existing view

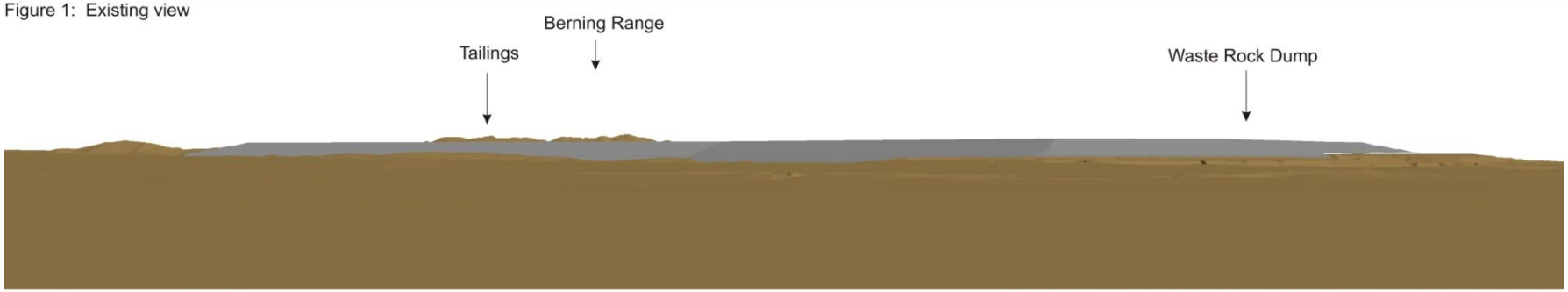


Figure 2: Scenario 1 - Base Case

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

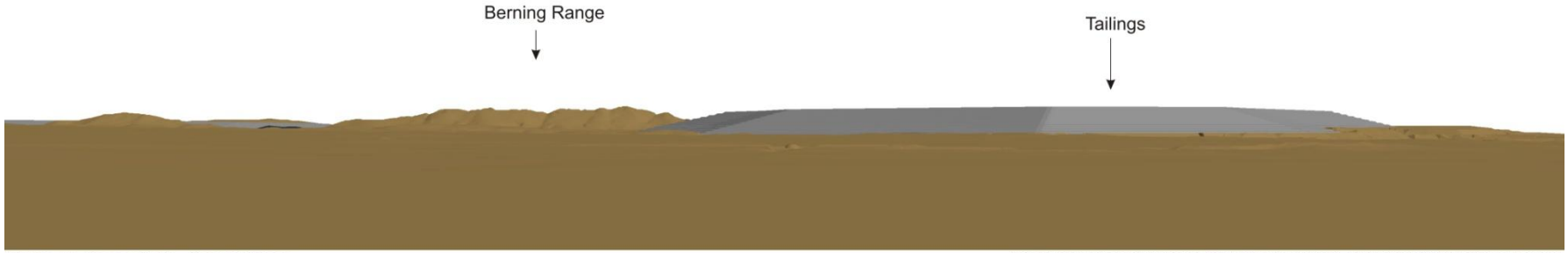


Figure 3: Scenario 2 - Central Case

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

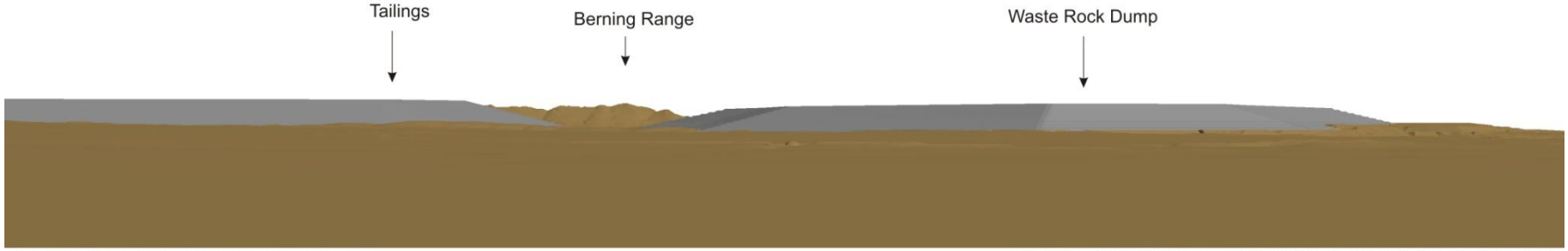


Figure 3: Scenario 3 - Permanent Heap Leach

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

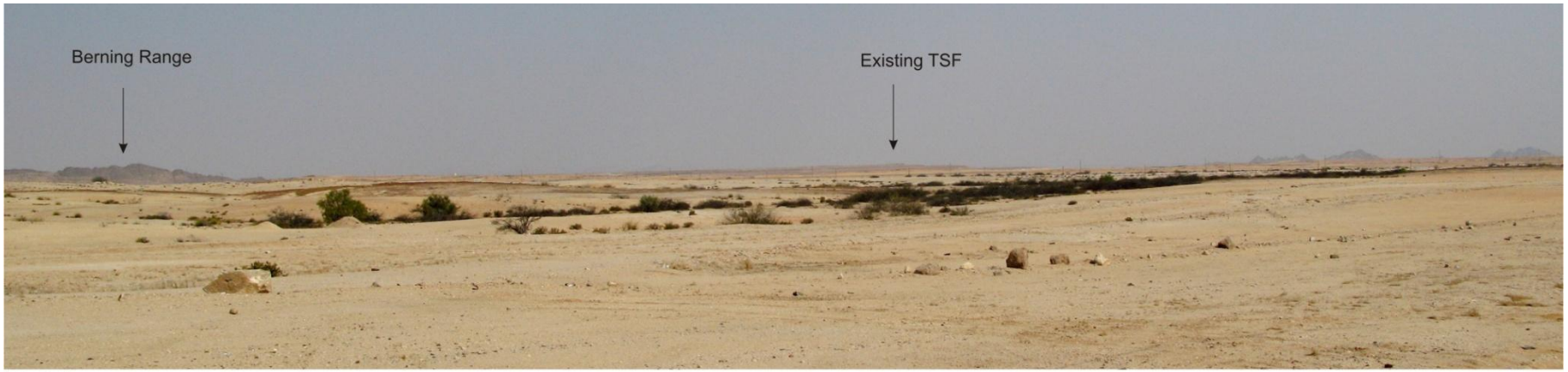


Figure 1:

Figure 2:

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

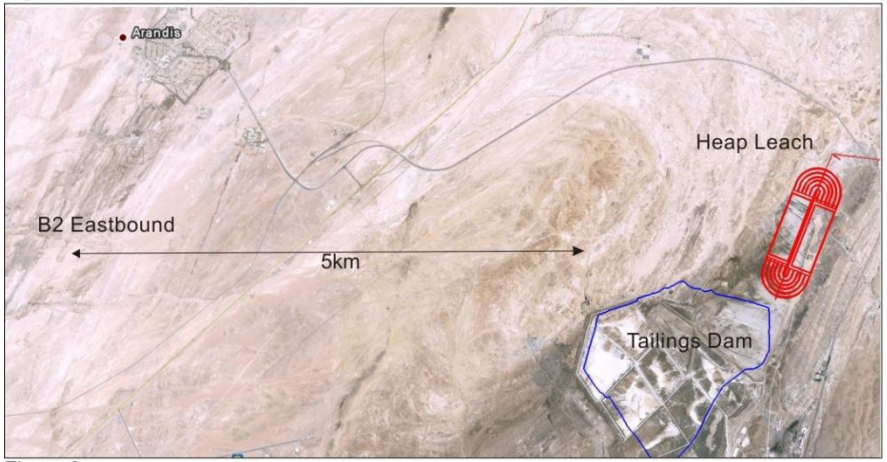


Figure 3:

Figure 1: Existing Landscape

Figure 2: Proposed Landscape

Figure 3: Viewpoint Locality Map

The proximity of the **B2 route** to the mine zone of visual influence allows for a greater perceived acceptance of mine related landscape modifications. However, due to the importance of this route as the main tourist corridor from the interior through the central Namib Desert areas to the western coastline there is a necessity for greater control of visual management. Consequently the VRM Class III objectives were defined which allow for moderate modifications. With a change in design that breaks up the uniformity of the faces the contrast generated from this landform would be reduced to moderate. This would adhere to the Class III visual objectives defined for this area.

PLATE 49: B2 EASTBOUND PHOTO MONTAGE SCENARIO 2

PLATE 50: B2 EASTBOUND 3D MODEL VIEW COMPARISON PER SCENARIO

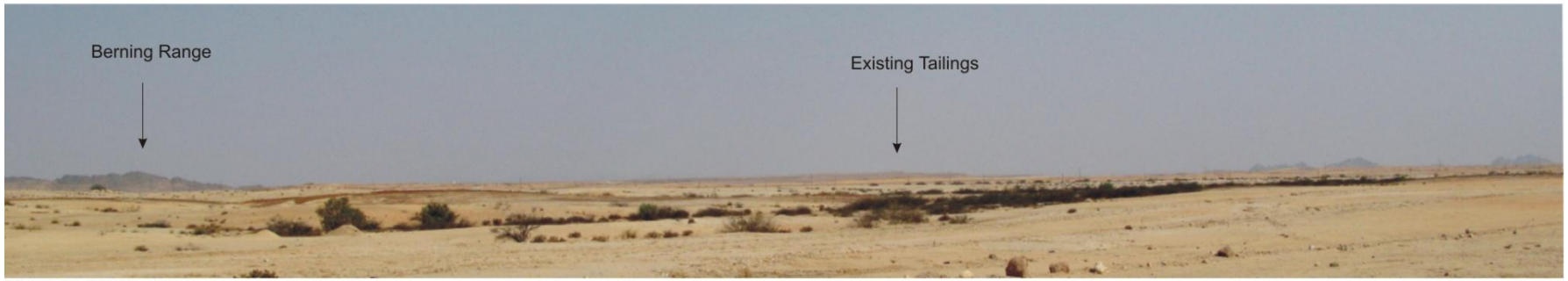


Figure 1: Existing view

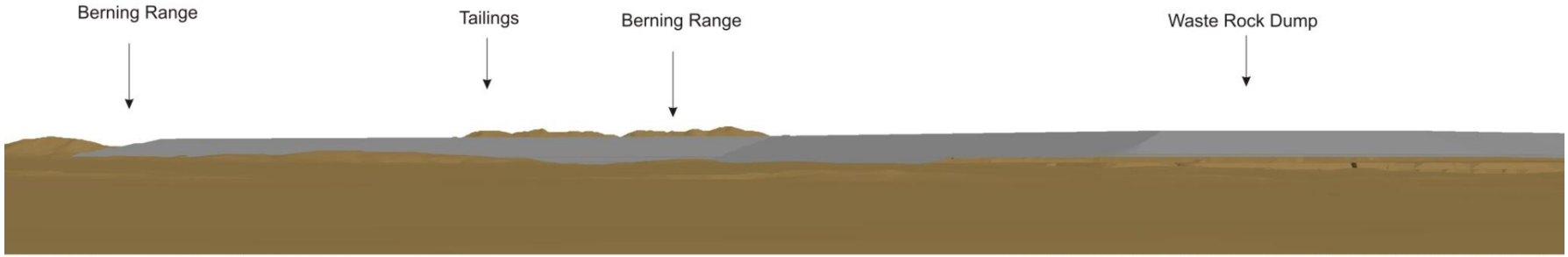


Figure 2: Scenario 1 - Base Case

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

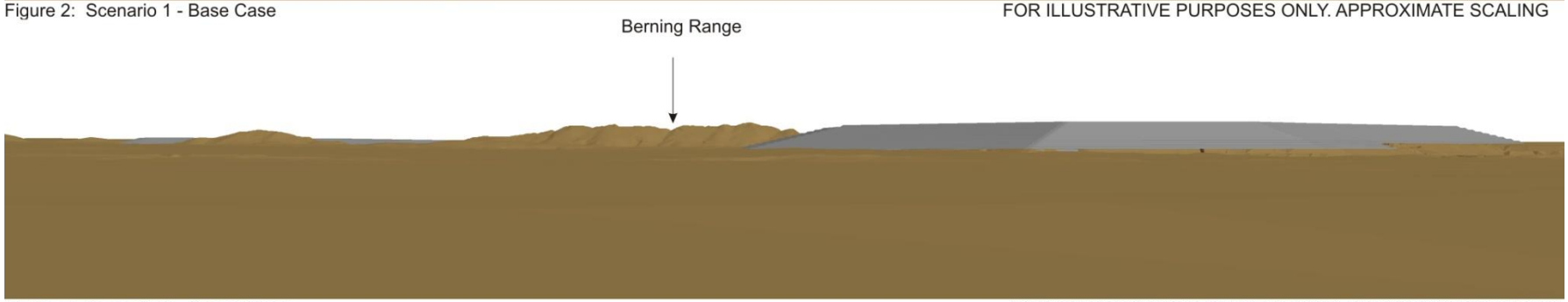


Figure 3: Scenario 2 - Central Case

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

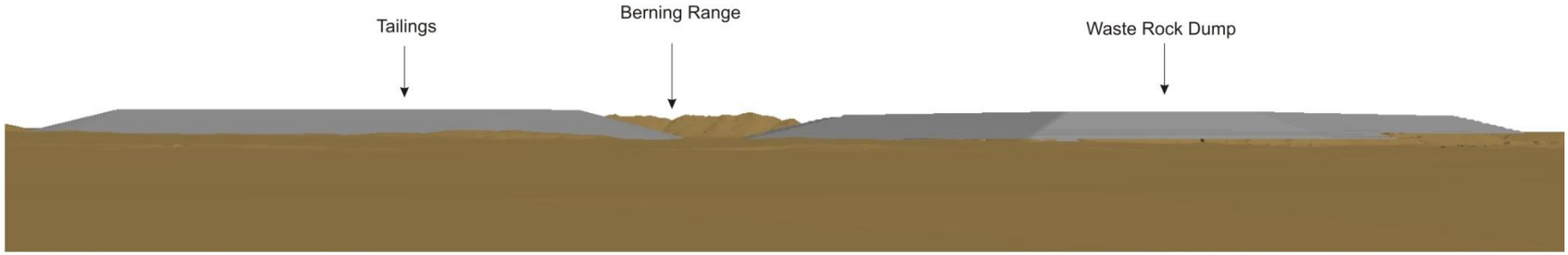


Figure 3: Scenario 3 - Permanent Heap Leach

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

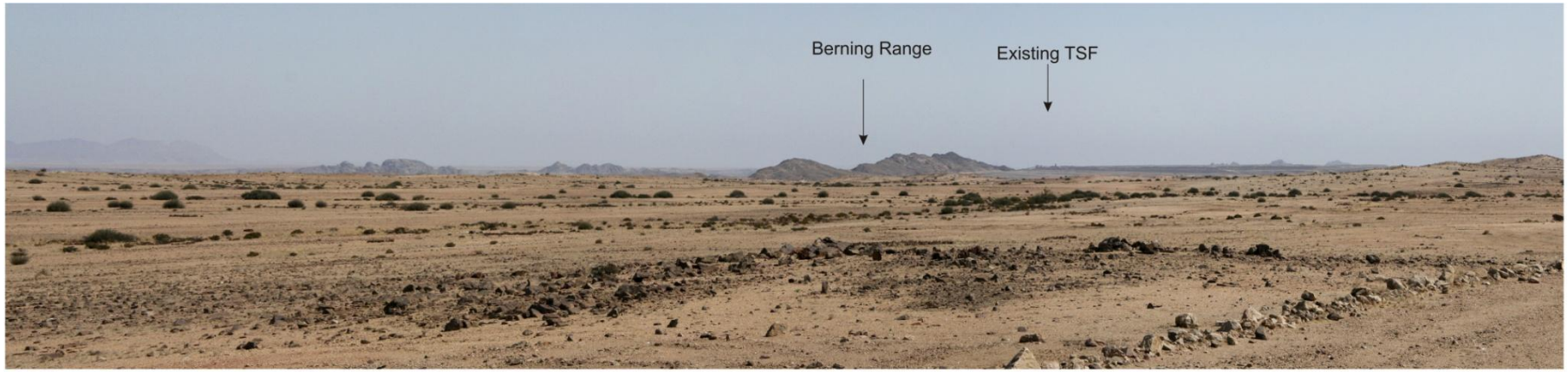


Figure 1:

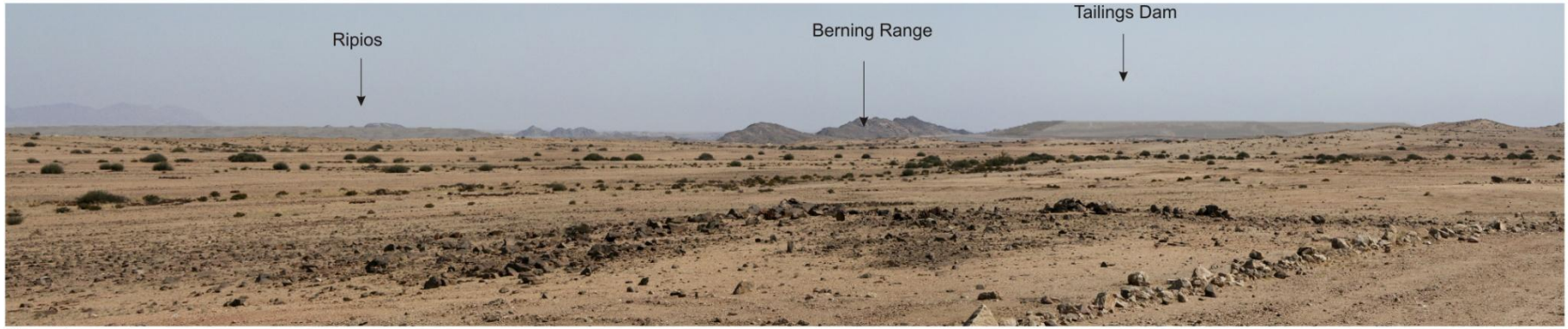


Figure 2:

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

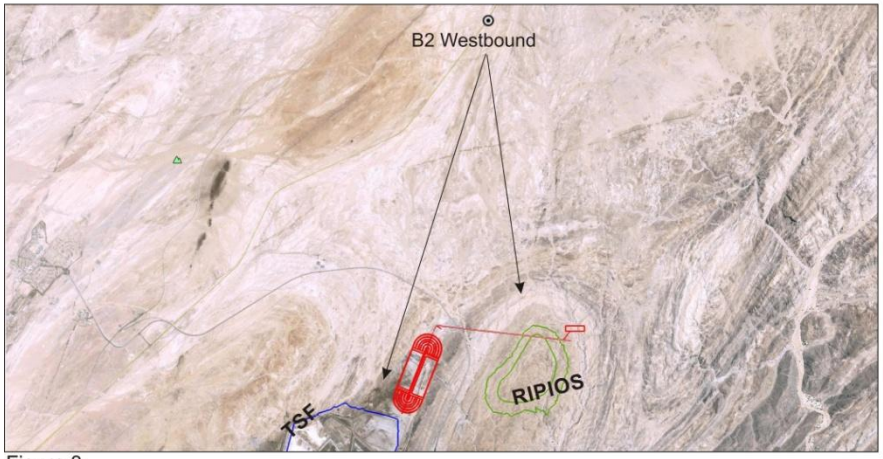


Figure 3:

Figure 1: Existing Landscape

Figure 2: Proposed Landscape

Figure 3: Viewpoint Locality Map

The proximity of the **B2 route** to the mine zone of visual influence allows for a greater perceived acceptance of mine related landscape modifications. However, due to the importance of this route as the main tourist corridor from the interior through the central Namib Desert areas to the western coastline there is a necessity for greater control of visual management. Consequently the VRM Class III objectives were defined which allow for moderate modifications. With a change in design that breaks up the uniformity of the faces the contrast generated from this landform would be reduced to moderate. This would adhere to the Class III visual objectives defined for this area.

PLATE 51: B2 WESTBOUND PHOTO MONTAGE SCENARIO 2

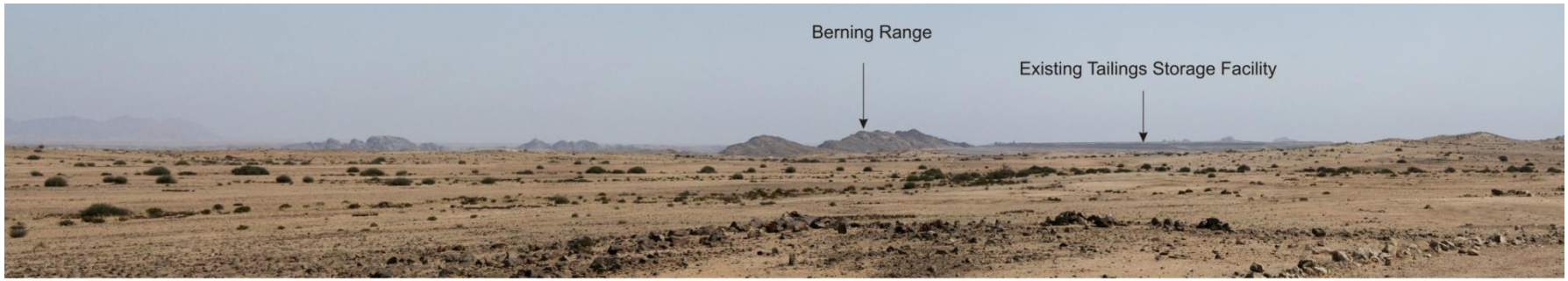


Figure 1: Existing view

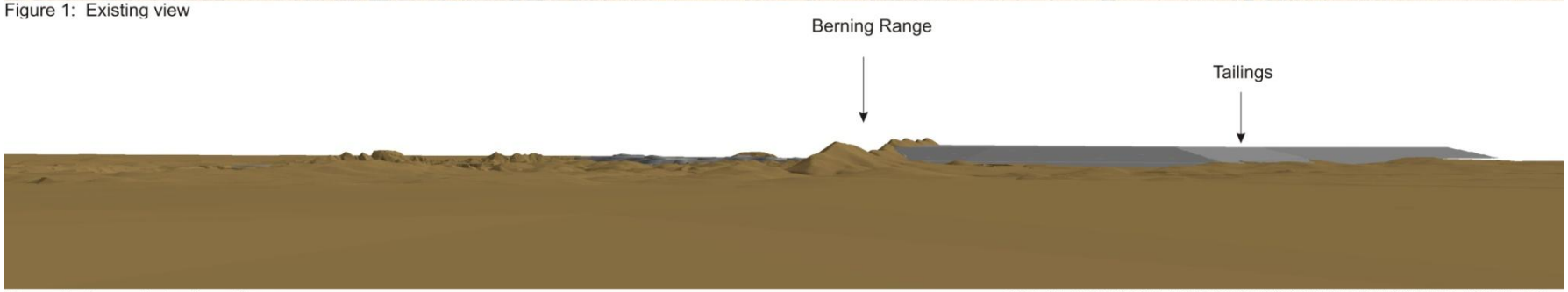


Figure 2: Scenario 1 - Base Case

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

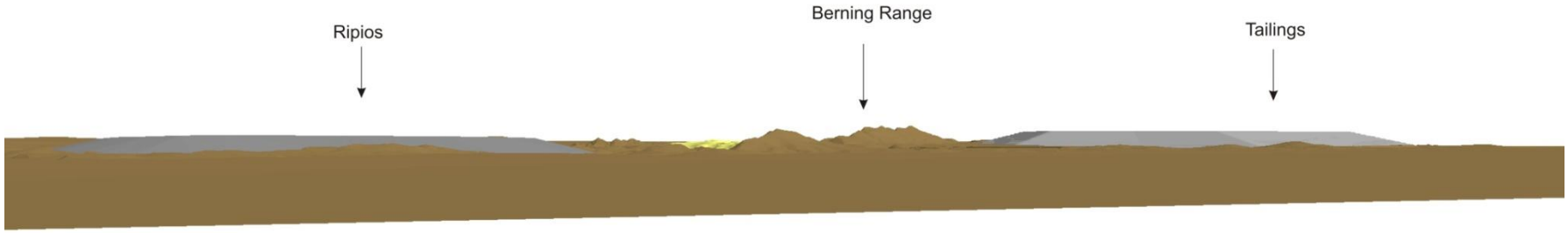


Figure 3: Scenario 2 - Central Case

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

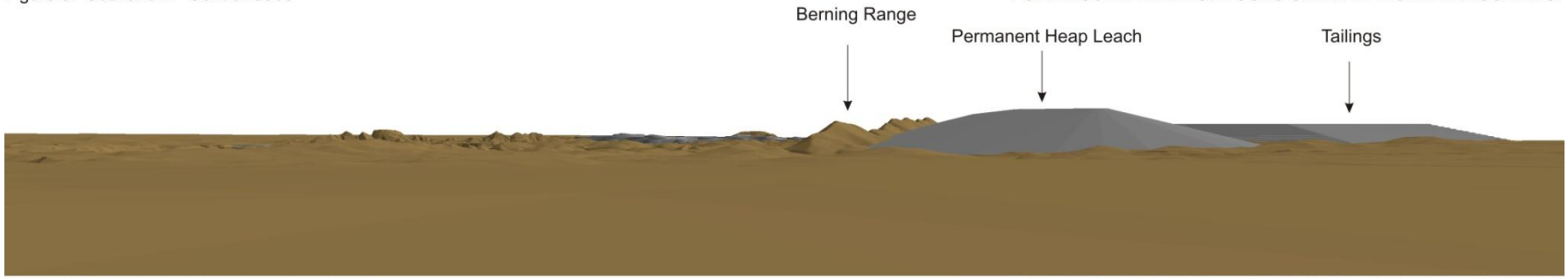


Figure 3: Scenario 3 - Permanent Heap Leach

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

PLATE 52: B2 WESTBOUND 3D MODEL VIEW COMPARISON PER SCENARIO

Figure 1:

Figure 2:

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

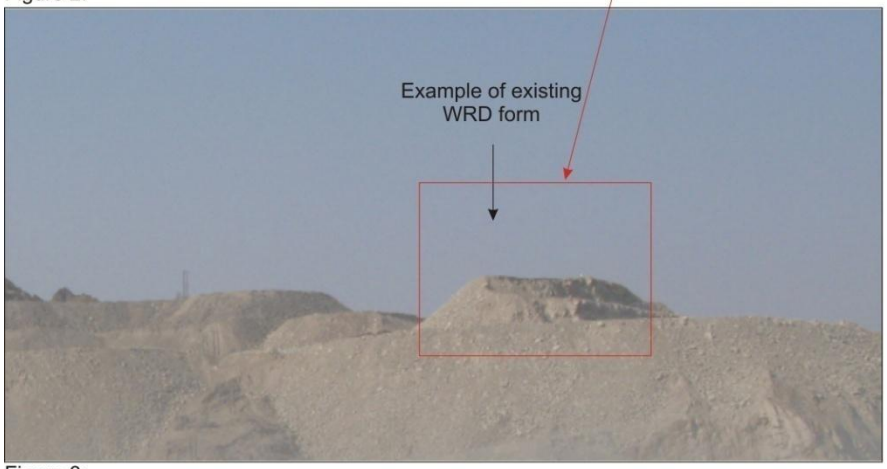


Figure 3:

Figure 1: Existing landscape

Figure 2: Proposed WRD with mitigation

Figure 3: Scenario 2 Waste Rock Dump Context image

The second scenario is to increase the dumping of waste rock in specific areas as can be seen above, which would help to break up the very strong alien horizontal line which dominates the view in relation to the rugged and broken lines of the surrounding mountainous landscape. Given the cost implications of the second scenario and the lack of certainty of the final outcome, the first scenario would be preferred. In terms of the current WRD requirements, this area does not need to be dumped. Should this area be required for future dumping of waste rock, the second scenario would be feasible and detailed design for the WRD in this area would be required.

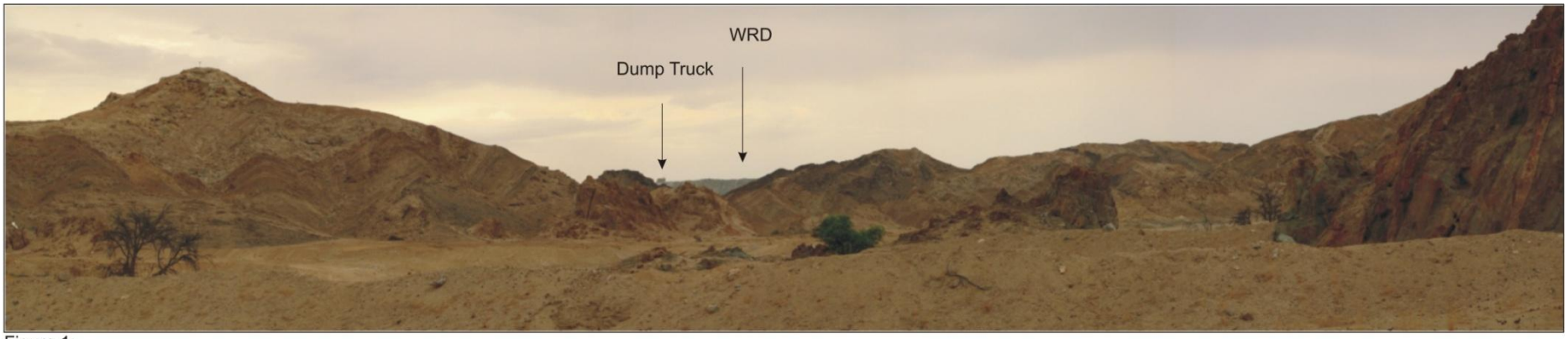


Figure 1:

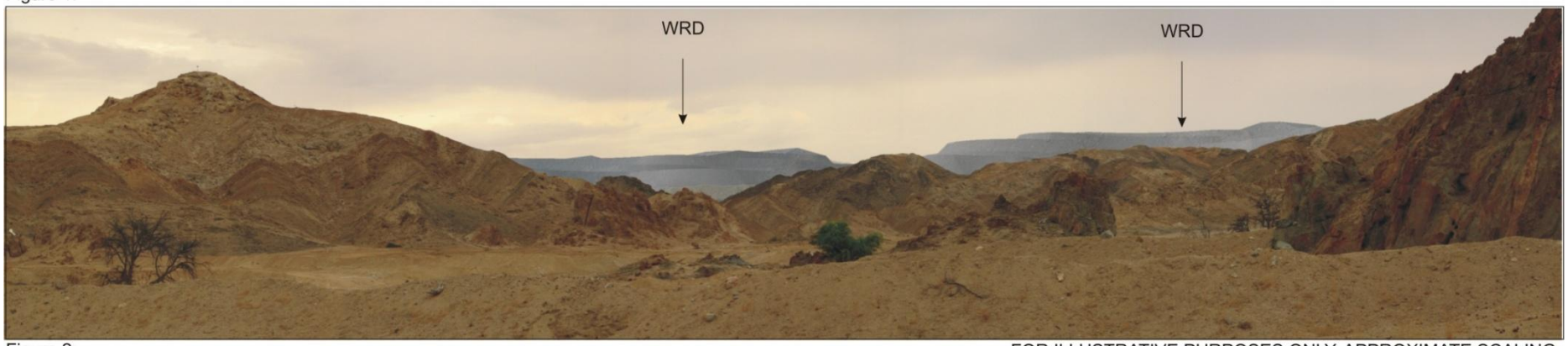


Figure 2:

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

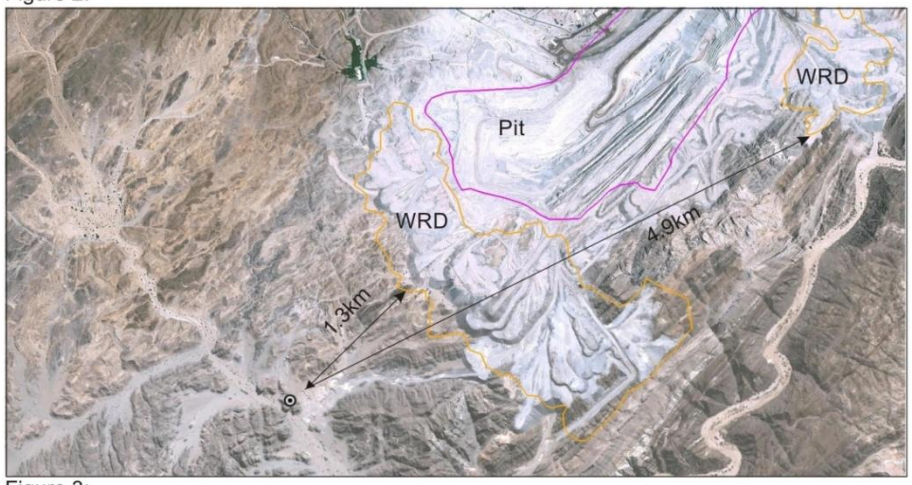


Figure 3:

Figure 1: Existing Landscape

Figure 2: Proposed Landscape

Figure 3: Viewpoint Locality Map

Panner Gorge has high levels of landscape character associated with the river and surrounding mountain features. However, it is in close proximity to the mine and WRD activities can already been seen from this area. Taking this into account, the area was defined as a VRM Class III area to ensure that post life of mine, the area would still offer tourism activities in conjunction with the deserted Khan Mine. During Operation Phase the activities associated with dumping of the Waste Rock Dump (WRD) (which is the only activity visible from this area) would exceed the moderate levels of contrast required for this area. However, at closure stage and beyond, moderate levels of contrast will be generated as the broken lines of design of the WRD would be similar to the surrounding landscape and with careful design and shaping of the final protruding 'peak' features, contrast would be limited.

PLATE 54: PANNER GORGE PHOTO MONTAGE

Figure 1:

Figure 2:

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

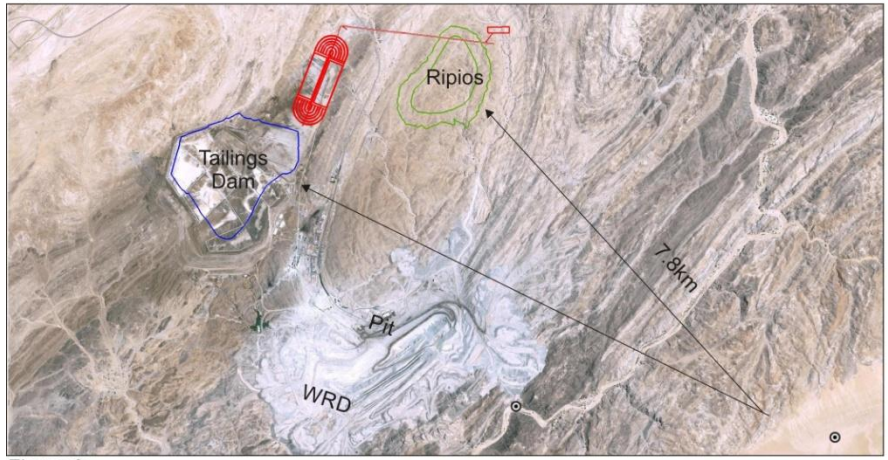


Figure 3:

Figure 1: Existing Landscape

Figure 2: Proposed Landscape

Figure 3: Viewpoint Locality Map

The **Welwitschia Flats** is an area similar in landscape character to the NNP but this area is not protected as a National Park. Is it recommended that some modification in height is made, as depicted in Plate 53, to ensure that the proposed moderate levels of contrast are reduced to weak. Visual Resources of this area will therefore be able to continue to generate economic benefits from long term eco-tourism.

Figure 1: Existing view

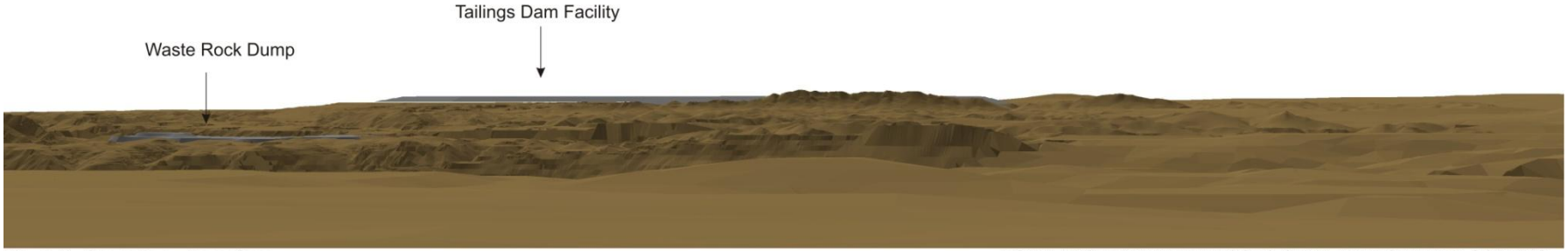


Figure 2: Scenario 1 - Base Case

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

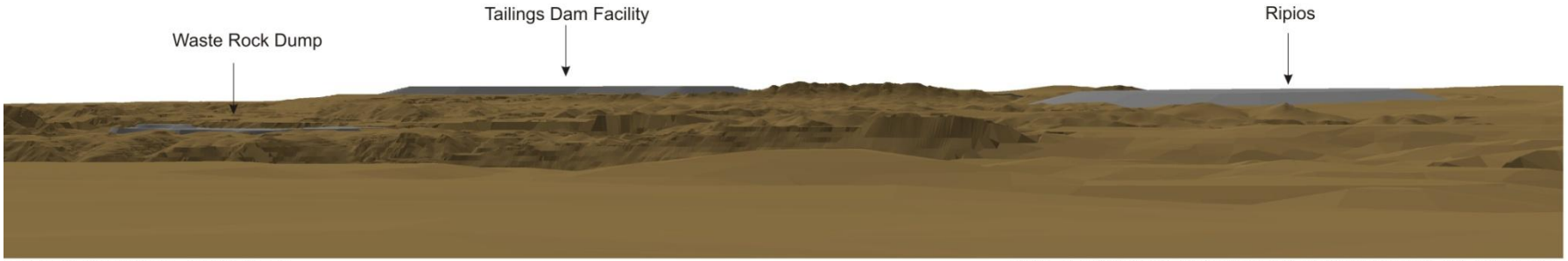


Figure 3: Scenario 2 - Central Case

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

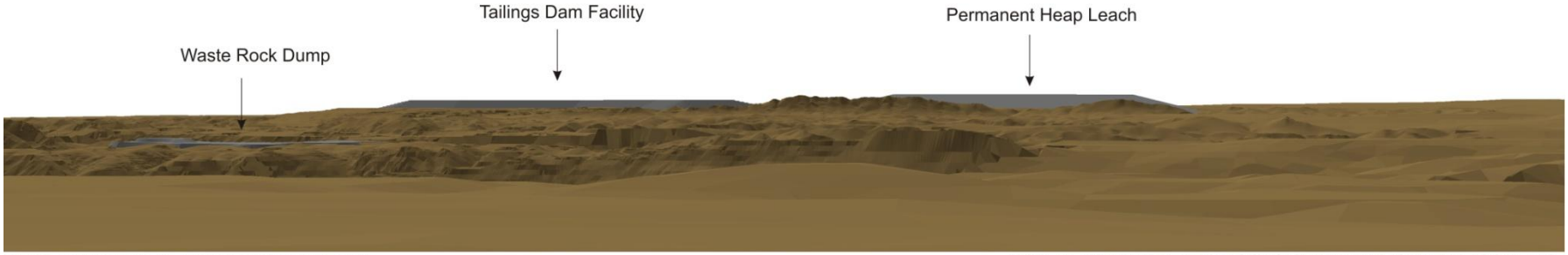


Figure 3: Scenario 3 - Permanent Heap Leach

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

Figure 1:

Figure 2:

FOR ILLUSTRATIVE PURPOSES ONLY. APPROXIMATE SCALING

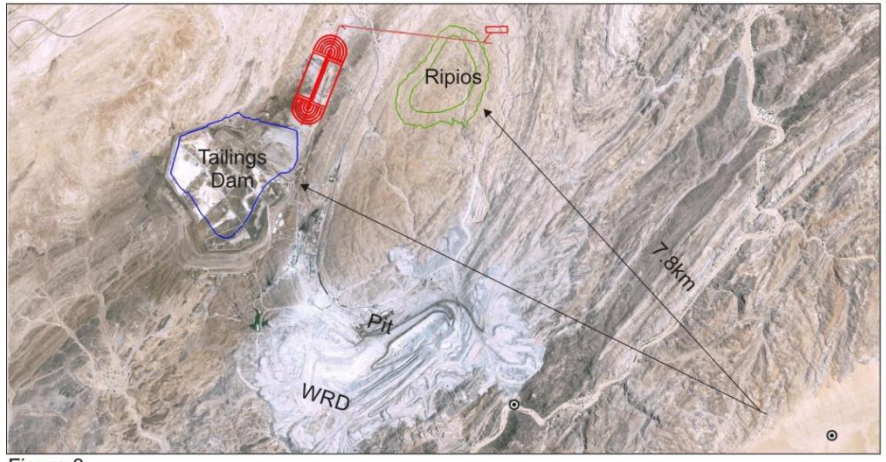


Figure 3:

Figure 1: Photo montage of proposed view from Welwitschia Flats.
Figure 2: Proposed mitigation from Welwitschia Flats. The area in red highlights the proposed mitigation of lowering the height of the edge of the Tailings Dam in this section in order to create a more natural line.
Figure 3: Viewpoint Locality Map

MOTIVATION

The only mining activity associated with Scenario 2 Phase II expansion that has high levels of visual intrusion is the Tailings due to the very large size and scale of this activity. The mitigation scenario reduces the visual intrusion as seen from the Welwitschia Flats and NNP to the south-west of the mine. The mitigation requires some adjustment in height to the SW section of the Tailingswhich allows the activity to be more readily absorbed by the surrounding mountain features and is more in line with the horizon line, which drops off gradually from east to west as seen from these KOPs. This mitigation would reduce the visual intrusion as seen from these areas from High to Moderate. The visual impact to the B2, the other important tourist related KOP, would be remain High.