TRONOX KZN Sands (Pty) LTD

INTEGRATED ENVIRONMENTAL AUTHORISATION FOR THE PORT DUNFORD MINE, KWAZULU-NATAL

Visual Impact Assessment

41106008-REP-0007
MARCH 2025

CONFIDENTIAL

TRONOX KZN Sands (Pty) LTD

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Visual Impact Assessment

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WSP

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

Phone: +27 11 254 4800

WSP.com

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Prepared by	Johan Bothma
Signature	johan.bothma@wsp.com Digitally signed by johan.bothma@wsp.com DN: cn=johan.bothma@wsp.com Date: 2025.03.26 08:36:01 +02'00'
Checked by	Brent Baxter
Signature	
Authorised by	Johan Bothma
Signature	johan.bothma@wsp.com Digitally signed by johan.bothma@wsp.com DN: cn=johan.bothma@wsp.com Date: 2025.03.26 08:36:27 +02'00'
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APPENDICES

APPENDIX A

CV OF SPECIALIST

ABBREVIATIONS

Abbreviations	
CPC	Central Processing Complex
DEDTEA	Department of Economic Development, Tourism and Environmental Affairs
DEM	Digital elevation model
DMRE	Department of Mineral Resources and Energy
DTMUs	Dozer trap mining units
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme Report
ha	Hectares
HMC	Heavy mineral concentrate
LTV	Level of theoretical visibility
m/ yr	m per year
MR	Mining Right
PWP	Primary Wet Plant
ROM	Run-of-mine
RSFs	Residue Storage Facilities
S&EIR	Scoping and Environmental Impact Reporting
PFC	Power factor correction
SP	Significance points
TiO_2	Titanium dioxide
VAC	Visual absorption capacity
VIA	Visual Impact Assessment
WSP	WSP Group Africa (Pty) Ltd

DETAILS OF THE SPECIALIST

Specialist Information	
Name:	Johan Bothma
Cell phone number:	+27 82 803 3882
Telephone number:	+27 11 254 4839
Email:	johan.bothma@wsp.com
Qualifications:	MLArch; PrLArch; SACLAP (20163) – See Appendix A for the specialist's full CV

DECLARATION OF INDEPENDENCE BY SPECIALIST

I, Johan Bothma declare that I –

- Act as the independent specialist for the undertaking of a Visual Impact Assessment specialist report for the proposed Port Durnford Mine Project;
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed;
- Do not have nor will have a vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity; and
- Undertake to disclose, to the competent authority, any information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan, or document.

EXECUTIVE SUMMARY

PROJECT CONTEXT

WSP Group Africa (Pty) Ltd. (WSP) was commissioned by Tronox KZN Sands (Pty) Ltd. (Tronox) to conduct a visual impact assessment (VIA) as part of the Environmental Authorisation (EA) process to obtain the mining rights to mine heavy mineral sands within the proposed Port Dunford study area. The proposed Port Dunford project site is situated in the KwaZulu-Natal province, approximately 16 km southwest of Richards Bay.

Tronox currently operates the Fairbreeze mine where heavy mineral sands are mined south-west of Mtunzini in the greater Richards Bay area. This is supported by a Tronox Mineral Separation Plant (MSP) and Smelter (collectively known as the Central Processing Complex (CPC)) in the Empangeni area. Tronox's previous mining operation, Hillendale is currently in the mine closure phase.

Tronox is applying for a mining right for the following tenements:

- A renewed prospecting right (KZN 30/5/1/1/2/10708 PR) covering the following farms: Remainder of the farm Richards 16802, Remainder of the farm Birkett 16832 and Ruth 16833 (known as the Port Durnford lease area),
- Waterloo prospecting right (DMRE Ref: KZN30/5/1/1/2/296 PR) located on the following farms: Portion 1,2 and Rem of Lot 131 uMlalazi 14098; Rem of Lot 103 uMlalazi 13880 and Rem of Lot 104 uMlalazi 13853, and
- Penarrow located on the following farms: Remainder of Lot 132 uMlalazi 13602 and Portion 1 of Lot 132 uMlalazi 13602

The VIA forms part of the environmental authorising processes required for the proposed Port Durnford Mine, and presents:

- A visual baseline description of the project site and surrounding landscape
- An evaluation of the expected visual resource value of the project site and receiving visual landscape
- An identification of potentially affected receptors and their perception of the visual landscape
- An impact assessment for proposed project activities, with recommended mitigation measures

This VIA has been developed as per the Provincial Government the Western Cape, Department of Environmental Affairs and Development Planning (DEA&DP) Guideline for Involving Visual and Aesthetic Specialists in the EIA Process (Oberholzer, 2005), as these are the only formal VIA guidelines that have been issued in South Africa. Further, in accordance with the Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes, promulgated in Government Notice No. 320 of 20 March 2020 and in Government Notice No. 1150 of 30 October 2020 (i.e. "the Protocols"), and Appendix 6 of the EIA Regulations.

PROJECT DESCRIPTION

The proposed Port Durnford Mine mining activities will be undertaken in two phases:

- Phase 1 (2025-2035) will be a low-rate mining operation at approximately 70 400 tpa (tons per annum) and an overall footprint of less than 10 ha. The run-of-mine (ROM) material will be mined by front end loader and hauled via trucks to the existing Fairbreeze mine as makeup ROM feed to the Fairbreeze PWP. The Phase 1 mining operation will only occur for five working days in the month, and will entail the development of minimal supporting infrastructure.

- The Phase 2 full scale mining footprint (which overlaps with the part of the Phase 1 development footprint) is 2 087 hectares which will be mined over a 33-year period (2036-2069) which will be conducted at a design production rate of 3 000 tonnes per hour, and will be continuous 24 hours per day, 365 days a year, and will operate until close of mine in 2070. The proposed Phase 2 mining operations will be similar to the current Tronox Fairbreeze operation; however, mobile skid mounted dozer trap mining units will be used within the active mining areas.

Once mined, the heavy mineral concentrate will be trucked off site to the existing Tronox MSP at the Empangeni CPC where it is further beneficiated to yield the target minerals, whereby the mineral products are separated from the concentrate. The non-product reject portion of the HMC (called MSP tailings) is returned to the mine site and disposed of together with coarse sand tailings. The fine sand tailings will be pumped to one of two residue storage facilities (RSF) for disposal. Coarse sand tailings will be used as backfill into mined out areas, to build the containment walls of the RSFs, as a RSF sand capping layer before final closure of each RSF or disposed of in sand dumps located outside the mining footprint.

VISUAL BASELINE AND RESOURCE VALUE

The visual resource value of the study area was assessed using widely accepted visual assessment industry standards, as function of prevailing topographical, hydrology, vegetation cover, and land use characteristics. Accordingly, the overall visual resource value of the study area is rated as moderate. Furthermore, the visual absorption capacity (an estimation of the capacity of the landscape to absorb development without creating a significant change in visual character or producing a reduction in scenic quality) was also determined to be moderate.

VISUAL RECEPTORS

Visual receptors in the study area include the residents of Mtunzini, Port Dunford, Esikhawini, Gobandlovu, KwaDlangezwa and other residential areas, numerous farmsteads, as well as travellers along the he N2 highway, R102 and other roads across the study area. Based on the high number of people expected to be visually affected by the project, and the overall perceived landscape value, visual receptor sensitivity towards the project is expected to be high.

IMPACT IDENTIFICATION

The following infrastructure and activities associated with the respective project phases are expected to result in a visual impact:

- Phase 1
  - The Phase 1 infrastructure and associated night-time lighting
  - Phase 1 small-scale mining
- Phase 2
  - Opencast mining activities (large-scale) and associated night-time lighting
  - The PWP complex and infrastructure and associated night-time lighting
  - Active coarse and fine tailings deposition areas (RSFs and sand tails)
  - Dust from mining and residue disposal areas

- Road haulage of concentrate, materials and wastes between the CPC and Port Durnford site
- Permanent alteration of site topography and land cover

IMPACT MAGNITUDE

The magnitude of the various visual impacts were evaluated as a function of the level of theoretical visibility, visual intrusion, and the distance of visual exposure to the source of the visual impact, summarised as follows

- Phase 1
  - Presence of visually intrusive site office and laydown yard and associated night-time light pollution - low
  - Opencast mining activities (small-scale) - low
- Phase 2
  - Opencast mining activities (large-scale) and associated night-time light pollution - moderate
  - Presence of visually intrusive PWP complex and infrastructure and associated night-time light pollution - low
  - Progressive increase in height and expansion of visually intrusive RSFs and sand tail dumps - moderate
  - Formation of dust plumes - low
  - Haulage by road of waste stream material to Port Durnford for disposal - low
  - Permanent alteration of site topography and land cover - low

VISUAL IMPACT SIGNIFICANCE

As required by the EIA Regulations (2014) as amended, the determination and assessment of the identified visual impacts was then based on the following criteria:

- Nature of the impact
- Magnitude of the impact (M)
- Duration of the impact (D)
- Extent of the impact (E)
- Reversibility which the impact (R)
- Probability of the impact occurring (P)

The results of the visual impact significance assessment are summarised below:

POTENTIAL VISUAL IMPACTS	VISUAL SIGNIFICANCE													
	Before mitigation							After mitigation						
	M	D	E	R	P	SP		M	D	E	R	P	SP	
Phase 1														
Presence of site office and laydown yard and associated night-time light pollution	2	3	2	1	4	**32**	**Mod**	1	3	2	1	4	**28**	**Low**

Opencast mining activities (small-scale)	2	3	3	1	5	**45**	**Mod**	1	3	3	1	5	**40**	**Mod**
Phase 2														
Opencast mining activities (large-scale) and associated night-time light pollution	3	4	2	1	5	**50**	**Mod**	2	4	2	1	5	**45**	**Mod**
Presence of visually intrusive PWP complex and infrastructure and associated night-time light pollution	2	4	2	1	5	**45**	**Mod**	1	4	2	1	5	**40**	**Mod**
Progressive increase in height and expansion of visually intrusive RSFs and sand tails dumpsites	3	4	2	1	5	**50**	**Mod**	2	4	2	1	5	**45**	**Mod**
Formation of dust plumes	2	4	2	1	4	**36**	**Mod**	1	4	2	1	4	**32**	**Mod**
Haulage by road of waste stream material to Port Durnford for disposal	2	4	3	1	4	**40**	**Mod**	1	4	3	1	4	**36**	**Mod**
Permanent alteration of site topography and land cover	2	5	2	5	5	**70**	**High**	1	5	2	5	4	**52**	**Mod**

An important point to consider is the fact that the mining process (both active mining and progressive backfilling of the mine workings, as well as construction and subsequent deposition of respective sand tails and RSF dumps) will be temporally and spatially dynamic, by which the sources of visual impact will change across the mine site over time. The typical mining sequence for a mining block will usually last approximately 7 years and will require a further 2 – 3 years to rehabilitate. Similarly, construction and deposition on the various sand dumps and RSFs will last for between 2 and 11 years, whereafter these landforms can be rehabilitated. Consequently, the nature and magnitude of the visual impact caused by different areas of the mine will change over time and will generally reduce once progressive rehabilitation of an area commences.

CUMULATIVE IMPACT

A cumulative impact evaluation considers the potential impacts and risks of proposed developments in the context of the effects of other similar existing and planned activities on the receiving environment. Cumulative impacts can therefore be seen as the total result of environmental impact from all existing and planned projects and activities in a defined area. The following current and historical mining activities already occur in the study area:

- The existing Fairbreeze mine is located roughly 4 km south-west of the proposed Port Durnford mine, immediately adjacent to Mtunzini
- The previous, historically rehabilitated Hillendale mine is located directly east of Port Dunford
- The proposed Zulti South mineral sands mine in the coastal dunes east of Port Durnford

The proposed Port Durnford opencast mining activities, and associated RSFs and sand tails, plant and infrastructure development, together with these existing mining operations, are expected to cumulatively impact the general visual aesthetics of the study area. The level of perceived impact will also vary depending on the degree of visibility of the proposed mining activities from different receptor locations and vantage points.

Operational rehabilitation of the RSFs and sand tails dumps if implemented where feasible, will contribute towards reducing the cumulative visual impact of the project during operations. The plant, infrastructure and facilities associated with the Port Durnford mine as well as that of other local mines will be removed during eventual decommissioning and closure and the associated footprints rehabilitated, which will significantly reverse the cumulative operational visual impact of these areas.

The mining dumps will remain permanent features of the landscape even following rehabilitation and revegetation and therefore result in a permanent, if reduced, cumulative visual impact. Notwithstanding, if the mining site is appropriately rehabilitated and returned to agricultural and timber uses, the long-term/permanent cumulative visual impact will be largely negligible, and thereby ensuring the pre-mining visual condition of the study area is maintained after closure.

VISUAL IMPACT MITIGATION RECOMMENDATIONS

The following visual mitigation measures are recommended to manage the identified impacts:

Component	Mitigation measures
Phase 1	
Presence of site office and laydown yard and associated night-time lighting	• Ensure all construction areas are appropriately maintained and kept in tidy order • Reduce the number and size of material laydown and waste storage areas to the extent feasible, and barricade these from view with shade netting/similar if needed • Remove accumulated waste material and unused equipment from site as frequently as is feasible • Repair unsightly and ecologically detrimental erosion damage to steep or bare slopes as soon as possible and re-vegetate these areas using a suitable mix of indigenous grass species • Utilise security lighting that is movement activated rather than permanently switched on, to prevent unnecessary constant illumination • Plan the lighting requirements of the facilities to ensure that lighting meets the need to keep the site secure and safe, without resulting in excessive illumination • Reduce the height and angle of illumination from which lights are fixed as much possible while still maintaining the required levels of illumination • Ensure all high-level light masts and poles are less than 25 m in height, and also less than the average height of surrounding plantation trees • Identify zones of high and low lighting requirements, focusing on only illuminating areas to the minimum extent possible to allow security surveillance • Avoid up-lighting of structures by rather directing lighting downwards and focussed on the area to be illuminated • Fit all security lighting with 'blinkers' or specifically designed fixtures, to ensure light is directed downwards while preventing side spill. Light fixtures of this description are commonly available for a variety of uses and should be used to the greatest extent possible
Opencast mining activities (small-scale)	• Maintain a visual screen of existing plantation trees, or otherwise plant where needed, of ideally 100 m wide but not less than 50 m wide around boundary of all opencast mining areas. This screen to be managed in x 3 linear rotational harvest

Component	Mitigation measures
	zones, to ensure three height cohorts at all times. Harvesting of existing plantation trees that are to serve as visual screens around mining areas and infrastructure is to cease 8 years or more before commencement of mining related activities in each area, from which point onwards these trees must be maintained as visual screens as described • Vegetate all topsoil berms as soon as stockpiled and ensure maximum height does not exceed 3 m wherever possible
Phase 2	
Opencast mining activities (large-scale) and associated night-time lighting	• Maintain a visual screen of existing plantation trees, or otherwise plant where needed, of ideally 100 m wide but not less than 50 m wide around boundary of all opencast mining areas. This screen to be managed in x 3 linear rotational harvest zones, to ensure three height cohorts at all times. Harvesting of existing plantation trees that are to serve as visual screens around mining areas and infrastructure is to cease 8 years or more before commencement of mining related activities in each area, from which point onwards these trees must be maintained as visual screens as described • Vegetate all topsoil berms as soon as stockpiled and ensure maximum height does not exceed 3 m wherever possible • Implement progressive backfilling and concurrent rehabilitation of mined-out opencast areas as part of standard roll-over mining operations
Presence of visually intrusive PWP complex and infrastructure and associated night-time light pollution	• Ensure all construction areas are appropriately maintained and kept in tidy order • Reduce the number and size of material laydown and waste storage areas to the extent feasible, and barricade these from view with shade netting/similar if needed • Remove accumulated construction waste and unused parts and equipment from site as frequently as is feasible • Repair unsightly and ecologically detrimental erosion damage to steep or bare slopes as soon as possible and re-vegetate these areas using a suitable mix of indigenous grass species • Utilise security lighting that is movement activated rather than permanently switched on, to prevent unnecessary constant illumination • Plan the lighting requirements of the facilities to ensure that lighting meets the need to keep the site secure and safe, without resulting in excessive illumination • Reduce the height and angle of illumination from which lights are fixed as much possible while still maintaining the required levels of illumination • Ensure all high-level light masts and poles are less than 25 m in height, and also less than the average height of surrounding plantation trees • Identify zones of high and low lighting requirements, focusing on only illuminating areas to the minimum extent possible to allow security surveillance • Avoid up-lighting of structures by rather directing lighting downwards and inwards focussed on the area to be illuminated and away from surrounding receptors • Fit all security lighting with 'blinkers' or specifically designed fixtures, to ensure light is directed downwards while preventing side spill. Light fixtures of this description are commonly available for a variety of uses and should be used to the greatest extent possible
Progressive increase in height and expansion of RSFs and sand tails	• Maintain a visual screen of existing plantation trees, or otherwise plant where needed, of ideally 100 m wide but not less than 50 m wide around boundary of all RSFs and sand tails dumps during operations. This screen to be managed in x 3 linear rotational harvest zones, to ensure three height cohorts at all times. Harvesting of existing plantation trees that are to serve as visual screens around mining areas and infrastructure is to cease 8 years or more before commencement

Component	Mitigation measures

	of mining related activities in each area, from which point onwards these trees must be maintained as visual screens as described
	• Ensure existing plantation trees to be retained as tree screens are structured into screening cohorts 6-8 years prior to commencement of mining activities or construction/deposition of sand dump/RSFs, to ensure adequate screening is provided. Similarly, additional timber screening trees to be planted 6-8 years prior to mining/dump construction that it is intended to screen
	• Tronox should engage with Mondi to include the relevant plantation tree screening management requirements in their commercial agreements, to ensure that Mondi maintain the required visual screens as specified for the duration of the mining operations
	• If possible, implement concurrent operational rehabilitation of the RSFs and sand tails side slopes to reduce the visual intrusion, including:
	  • Shape RSFs and sand tails side slopes and crest to pre-determined maximum gradient/s which will prevent erosion and allow for adequate vegetation growth
	  • Place growth medium to a suitable depth and re-vegetate using a suitable mix of indigenous grass species
	• Investigate potential RSF and sand dump layout, design and final rehabilitation optimisation, i.e. creating combined landform between RSF 9 and Sand Dump 8B, which would create additional deposition volume between the landforms and provide potential for creating a more natural appearing final landform

Formation of dust plumes	• Water down haul roads and large bare areas as frequently as is required to minimise airborne dust • Apply chemical dust suppressants if deemed necessary • Enforce a 40 km/h speed limit on-site for all vehicles • Continue to monitor dust fallout using the existing dust monitoring programme • Rehabilitate all exposed footprints, backfilled mining areas and where feasible residue facility side slopes as soon as possible
Haulage by road of waste stream material to Port Durnford for disposal	• No visual mitigation measures identified
Permanent alteration of site topography and land cover	• Shape the RSFs and sand tails to be as natural in appearance as possible • Distribute topsoil over the RSFs and sand tails and actively revegetate (using grasses) to establish a vigorous and self-sustaining vegetation cover • Conduct rehabilitation trials to establish the relinquishment criteria under which Mondi would again take over the respective rehabilitated sand dumps and RSFs. The suitability of these areas for the purposes of again establishing timber plantations will be a function of slope in combination with nature and depth of cover material, as well as other factors such as erosion prevention and control • Conduct on-going monitoring and maintenance of the rehabilitated areas to ensure that vegetation establishes successfully, and that erosion does not occur • Employ ongoing control measures to eradicate weedy and alien invader plant species • Implement all reasonable efforts to in the long run return the greater majority of the mine affected land, post closure, to viable and productive farmland, timber production, sugar cane plantation, and/or other similar agricultural uses

VISUAL IMPACT STATEMENT

It is concluded that, from a visual impact perspective, the proposed Port Durnford Mine project can proceed, provided that the recommended visual mitigation measures as detailed in this report are implemented. It is furthermore recommended that operational and closure phase rehabilitation and visual mitigation measures be revised and updated during operations, as mining progresses and additional information becomes available.

1 INTRODUCTION

Tronox KZN Sands (Pty) Ltd (Tronox) holds a prospecting right (PR) under the Department of Mineral Resources and Energy (DMRE) Reference: KZN 30/5/1/1/2/296 PR in respect of ilmenite, rutile and zirkon on the farms [Sub 1 and Remainder of Lot 102 uMlalazi No. 13860, Sub 1,2 and Remainder of Lot 131 uMlalazi No. 14098, Sub 1 and Remainder of Lot 103 uMlalazi No. 13880, Sub 2,3 and Remainder of Lot 104 uMlalazi No. 13853 and Sub 1 and Remainder of Lot Hibbert No. 15714] in the uMlalazi Municipality, KwaZulu-Natal Province (the "Waterloo PR"). This prospecting right was renewed by the DMRE pursuant to section 18 of the Mineral and Petroleum Resources Development Act, 2002 (MPRDA).

Historically, Tronox held the following two prospecting rights in terms of section 17 of the MPRDA:

- DMRE Ref: KZN 30/5/1/1/2/10708 PR (formerly 771 PR) in respect of ilmenite, rutile, zirkon and heavy minerals on the farms measuring 3 945.95 hectares in extent in the uMhlathuze Municipality, KwaZulu-Natal Province (the "Port Durnford PR"); and
- DMRE Ref: KZN 30/5/1/1/2/279 PR in respect of ilmenite, rutile, zirkon and heavy minerals on the farms measuring 258.27 hectares in extent in the uMlalazi Municipality, KwaZulu-Natal Province (the "Penarrow PR")

Tronox is now applying to convert these Prospecting Rights into a consolidated Mining Right and seeks environmental authorisation to mine for heavy minerals (general), garnet (abrasive), kyanite, leucoxene (heavy mineral), monazite (heavy mineral), rutile (heavy mineral), silica sand and zirconium ore. A Scoping and Environmental Impact Reporting (S&EIR) Process is required to support this Mining Right (MR) Application, to be known as the Port Durnford Mine.

Table 1-1 provides the property information related to Port Durnford Mine.

Tronox mines mineral sands containing ilmenite, rutile, zircon, and other heavy minerals to produce titanium dioxide (TiO_2) and a variety of other secondary products. The TiO_2 product is sold for use by manufacturers of coatings, plastics, and décor paper. Heavy minerals that are not used as feedstock to produce TiO_2, are processed to produce secondary products such as pig iron, staurolite, activated carbon and zircon.

Tronox currently also operates the Fairbreeze mine where heavy mineral sands are mined south-west of Mtunzini in the greater Richards Bay area. This is supported by a Tronox Mineral Separation Plant (MSP) and Smelter (collectively known as the Central Processing Complex (CPC)) in the Empangeni area. Tronox's previous mining operation, Hillendale is currently in the mine closure phase.

WSP Group Africa (Pty) Ltd. (WSP) was commissioned to undertake this visual impact assessment (VIA) as part of the environmental authorising processes required for the proposed Port Durnford Mine, and presents:

- A visual baseline description of the project site and surrounding landscape
- An evaluation of the expected visual resource value of the project site and receiving visual landscape
- An identification of potentially affected receptors and their perception of the visual landscape
- An impact assessment for proposed project activities, with recommended mitigation measures

Table 1-1 - Description of the affected property

Farm Name	Port Durnford Mine
Application area	The original mining footprint presented in the scoping phase was 2 624.9 ha. The overall mining development footprint area has been reduced to 1 800 ha. Approximately 825 ha of "environmentally sensitive areas" has been excluded from the revised mine plan
Magisterial district	King Cetshwayo District Municipality
Distance and direction from the nearest town	The Port Durnford study project area is adjacent to the following towns at different points along the Mining Right (MR) application boundary: • 200 m North-East from Mtunzini; • 60 m North-North-West from Port Durnford; • 200 m North-West from Esikhawini; and • 200 m North-East from Gobandlovu The nearest proposed mining activity from Mtunzini will be sandtails stockpile 8 which is located roughly 1.8 km northeast from Mtunzini Town. The nearest mine pit will be located approximately 3 km north-northeast of Mtunzini Town. Sandtails dump A-2 will also be located approximately 200 m north of Nyembe Township. The Fairbreeze Mine is located immediately south of Mtunzini Town and extends southwards for approximately 12 km west of the N2 highway

1.1 LOCATION OF THE PROJECT SITE

The Prospecting Right area is situated in the uMlalazi and uMhlathuze Local Municipalities, under the King Cetshwayo District Municipality. It is located approximately 15 km south-west of Richards Bay and is adjacent to the following settlements/towns at different points along the boundaries; Mtunzini, Port Dunford, Esikhawini, Gobandlovu; and KwaDlangezwa (Figure 1-1) The N2 highway as well as the R102 traverse the length of the orebody; the R102 being located to the northwest and the N2 running through the centre. There is also a railway line just south of the N2 that also traverses the mining right area. The proposed mining right area is approximately 4 682 ha, however only 2 087 ha are earmarked for development.

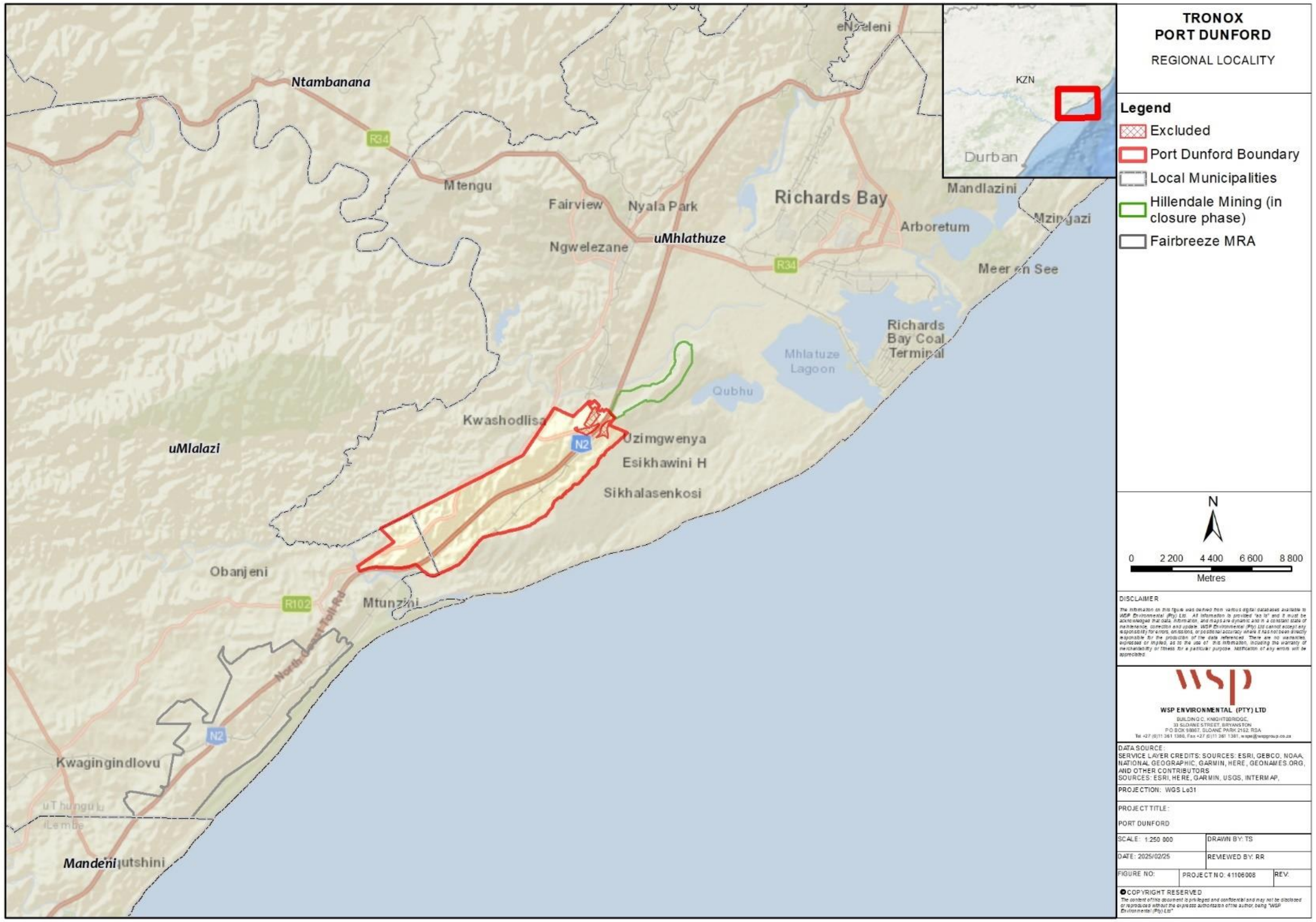

Figure 1-1 - Locality map of Port Durnford project site (WSP, 2024a)

1.2 DETAILS OF THE SPECIALISTS

The details of the professionals who contributed to the preparation of the VIA are provided in Table 1-3.

Table 1-2 – Specialist contact details

Team member	Contact number	Email address	Company / location
Johan Bothma	+27 11 254 4800	Johan.bothma@wsp.com	WSP South Africa / Midrand Offices
Dennis Komape	+27 11 254 4800	Dennis.komape@wsp.com	WSP South Africa / Midrand Offices

Table 1-3 - Details of specialist role and qualifications

Team member	Role / study discipline	Qualifications and experience
Johan Bothma	Project management and report reviewer	Director: Mine Closure PrLArch, ML(Prof) SACLAP 18 years' experience
Dennis Komape	Report compilation	MSc Environmental Sciences ~9 years mine closure, rehabilitation & environmental SACNASP – Member No. 119325

2 PROJECT DESCRIPTION

The proposed Port Durnford Mine mining activities will be undertaken in two phases. The following sections summarise Phase 1 (Section 2.1) and Phase 2 (Section 2.2) of the project, respectively. It is important to note that these descriptions focus on the expected visual impact aspects of the project and are therefore not meant to provide a comprehensive project overview. For more detail on specific aspects of the project, please refer to the Draft Scoping Report (WSP, 2024a).

2.1 PHASE 1

2.1.1 PHASE 1 DESCRIPTION

Phase 1 (2025-2035) will be a low-rate mining operation at approximately 70 400 tpa (tons per annum) and an overall footprint of less than 10 ha. The run-of-mine (ROM) material will be mined mechanically and hauled via trucks to the existing Fairbreeze mine as makeup ROM feed to the Fairbreeze PWP. The Phase 1 mining operation will only occur for five working days in the month (Figure 2-1), and will entail the development of minimal supporting infrastructure (Figure 2-1).

Figure 2-1 - Port Durnford project Phase 1 layout

Figure 2-2 - A 3D visualisation of the Phase 1 layout (WSP, 2024a)

2.1.2 PHASE 1 VISUAL IMPACT IDENTIFICATION

The following infrastructure and activities associated with Phase 1 are expected to result in a visual impact (Table 2-1). The respective magnitude and significance levels of each impact is further evaluated in Section 8.

Table 2-1 – Phase 1 project components that are expected to cause a visual impact

Source of visual impact	Description
Site office and laydown yard	• Introduction of visually intrusive infrastructure into the landscape which includes an office block and ablution facilities, guard house and access control facilities, various laydown areas, and storage infrastructure • The site office and laydown areas will be illuminated at night for operational and security reasons, which will result in a degree of light pollution
Opencast mining activities (small-scale)	• Removal of existing vegetation and land cover and alteration of the site topography and general appearance through progressive opencast mining activities, including associated intermittent airborne dust nuisance • The operational mining areas will be illuminated at night for security reasons, which will result in a degree of light pollution

2.2 PHASE 2

2.2.1 PHASE 2 DESCRIPTION

The Phase 2 full scale mining footprint is 2 087 hectares which will be mined over a 33-year period (2036-2069) which will be conducted at a design production rate of 3 000 tonnes per hour, and will be continuous 24 hours per day, 365 days a year, and will operate until close of mine in 2070. The proposed Phase 2 mining operations will be similar to the current Tronox Fairbreeze operation; however, the mining method will differ. At Port Durnford mobile skid mounted dozer trap mining units (DTMUs) will be used within the active mining areas.

Traps (similar to mobile sumps) will be positioned in the mining areas and material bulldozed to these points, where the run-of-mine (ROM) material will be washed into a trap using a water cannon and then pumped to a new PWP which will be constructed on the Port Durnford site. At the PWP the ROM material is separated into a heavy mineral concentrate (HMC), fine sand tailings (less than 45µm), and coarse sand tailings (greater than 45µm).

The HMC will then be trucked off site to the existing Tronox MSP at the Empangeni CPC where it is further beneficiated to yield the target minerals, whereby the mineral products are separated from the concentrate. The non-product reject portion of the HMC (called MSP tailings) is returned to the mine site and disposed of together with coarse sand tailings, as described further below.

The fine sand tailings will be pumped to one of two residue storage facilities (RSF) for disposal. The western RSF (RSF Site 9) will be constructed first and will provide storage space for the first 6 years (previously 3 years) of fine sand tailings. Thereafter, the eastern RSF (RSF C) will be developed sequentially as a series of four cells as mined out areas become available. RSF C will thus be developed on the pit floor, while RSF 9 will be developed on natural ground. Each RSF will have a return water dam and associated pipe and power infrastructure to take the pumped fine tailings feed to the RSF and recover water back to the PWP, including storm water that falls within the RSF managed area. Each of the RSFs will be provided with a return water dam/water control dam, from where collected water will be pumped back for process use.

Coarse sand tailings will be used as backfill into mined out areas, to build the containment walls of the RSFs, as a RSF sand capping layer before final closure of each RSF or disposed of in sand dumps located outside the mining footprint. With a high proportion of the mining voids at Port Durnford to be used for RSF development, areas within the mining rights boundary have been selected for sand tails final disposal.

Figure 2-3 diagrammatically illustrates the overall Phase 2 operations, which is summarised in sections 2.2.1.1 to 2.2.1.6.

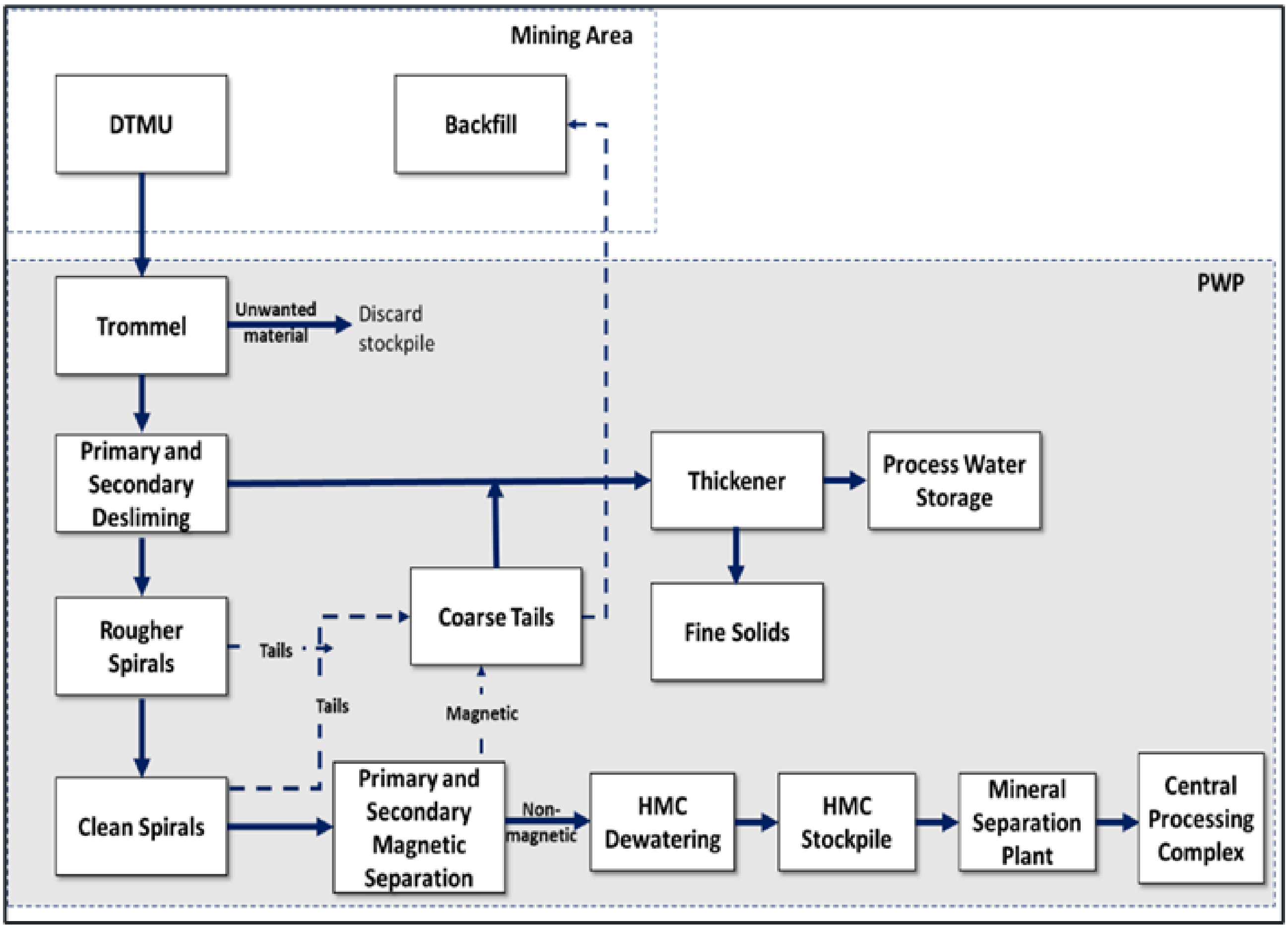

Figure 2-3 - Proposed Phase 2 summary process block diagram (WSP, 2024a)

2.2.1.1 Mining process

Before mining starts, a minimum of 0.3 m of topsoil will be stripped. This material will preferably be placed directly onto an area available for rehabilitation. If that is not possible, it will be placed on a stockpile for later use. Then, the in-situ sands are mined. In the Port Durnford mine the sands are mineralised from surface to the base of the economic mining limit within the pit. Consequently, there is mineralisation even in the topsoil that is set aside. After a pit has reached the economic limit for mining it becomes available to be backfilled, the material for which comprises the washed course tailings. Once the pit is backfilled to the design height, it becomes available for rehabilitation and topsoil is replaced, whereafter the topsoiled areas are revegetated.

The mining process itself entails dozing the sand material down to the DTMU's, each of which is anticipated to be fed by two D11 dozers and a CAT390 excavator. Each DTMU will be equipped with a vibrating screen to separate oversize material which will be routed to the discard dump. Each DTMU will be connected to a raw water feed pipeline, a ROM slurry delivery pipeline, and a power connection and accompanied by a primary pump. Here, the ROM is combined with water and pumped to the new PWP for on-site processing.

Figure 2-4 depicts a typical DTMU and the trap on the LHS into which material is dozed and an associated pump unit on the rod handling system (RHS).

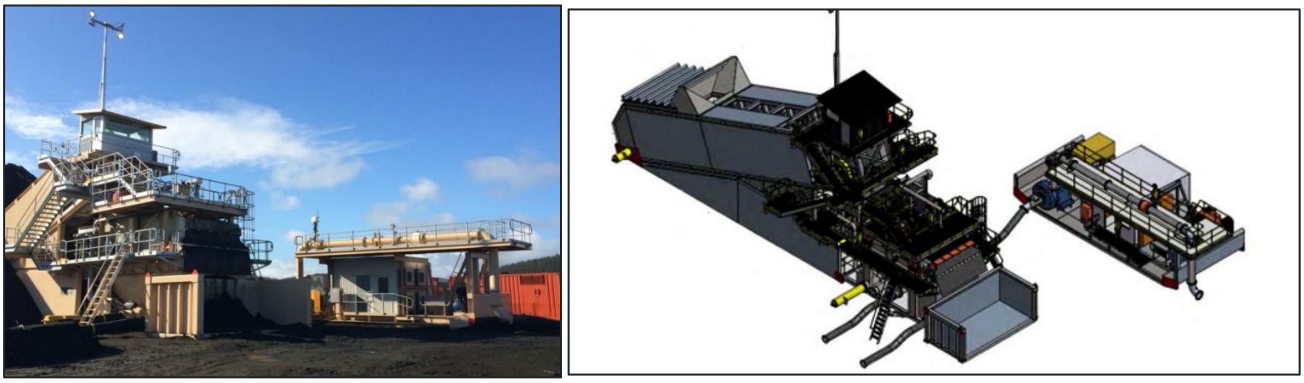

Figure 2-4 - A typical dozer trap mining unit (DTMU) showing the trap on the LHS into which material is dozed and an associated pump unit on the RHS (WSP, 2024a)

2.2.1.2 Scheduling

Phase 2 mining commences in 2035 and 2036 (WSP, 2024a), at the site of the Phase 1 pit, to complete mining that block. Thereafter, the active mining window moves to a position immediately east to the PWP and sequentially progresses in an easterly direction until the eastern extent of the mine is reached in 2061.

In 2051, mining is also initiated in the western extent of the proposed mining footprint and progresses in an easterly direction back towards the PWP, with the final block which lies immediately north of the PWP, being mined in 2069. Figure 2-5 illustrates the Phase 2 life of mine plan. Figure 2-6 presents the proposed Phase 2 mining block plan, showing 5-year mining windows, as well as the block plan layout for the PWP.

Figure 2-5 - Port Durnford project Phase 2 (life of mine) layout (WSP, 2024a)

Figure 2-6 - Proposed Phase 2 mining block plan showing 5-year mining windows (WSP, 2024a)

2.2.1.3 Topsoil stockpiles

- Topsoil within the "project footprint" which includes RSF Site 9, the mining footprint, sand tails dump areas, and the PWP plant site, will be removed to depth of 0.3 m and kept aside for rehabilitation
- Furthermore, wherever possible within the mining areas topsoil will be stripped and placed directly on areas available for rehabilitation
- The topsoil stockpiles will be afforded a 30 m buffer from the edge of the nearest wetland or delineated sensitive environmental area. Each topsoil stockpile area will be cleared of large trees or tree stumps prior to placement of soil. The height of stockpiles must not exceed the design parameters and stockpiles will be protected from stormwater erosion by use of diversion berms. The topsoil stockpiles will be grassed with a mix of indigenous grass seed
- When space has been depleted in the designated 44 ha of topsoil stockpile areas, topsoil will be stockpiled and used as stormwater runoff berms around the sand tail deposition areas

2.2.1.4 Minerals processing

The main PWP processes will include the following:

- Primary and secondary desliming to remove coarse and fine sand tailings
- Coarse tailings separation through rougher and cleaning spirals
- Primary and secondary magnetic separation of ore minerals to yield HMC
- HMC dewatering
- Transportation (trucking) of HMC to offsite stockpile areas

The PCP will comprise various plant infrastructure, buildings and operations areas, notably:

- ROM feed preparation and fines removal area
- Feed preparation and fines removal including gravity spiral circuit and magnetic separation circuit
- Fine tailings treatment thickener
- HMC storage and reclamation area
- 33 kV sub-station and power factor correction (PFC) yard
- Raw water storage
- Process water storage
- Residue containment dam
- Pollution control dam
- Compressed air plant
- Potable water treatment plant
- Sewage treatment plant
- Workshop and stores
- Gypsum plant
- Mine support complex including administration offices with parking, control room, change house, mess, security office, laboratory and sample room

Figure 2-7 illustrates the proposed Phase 2 PWP layout.

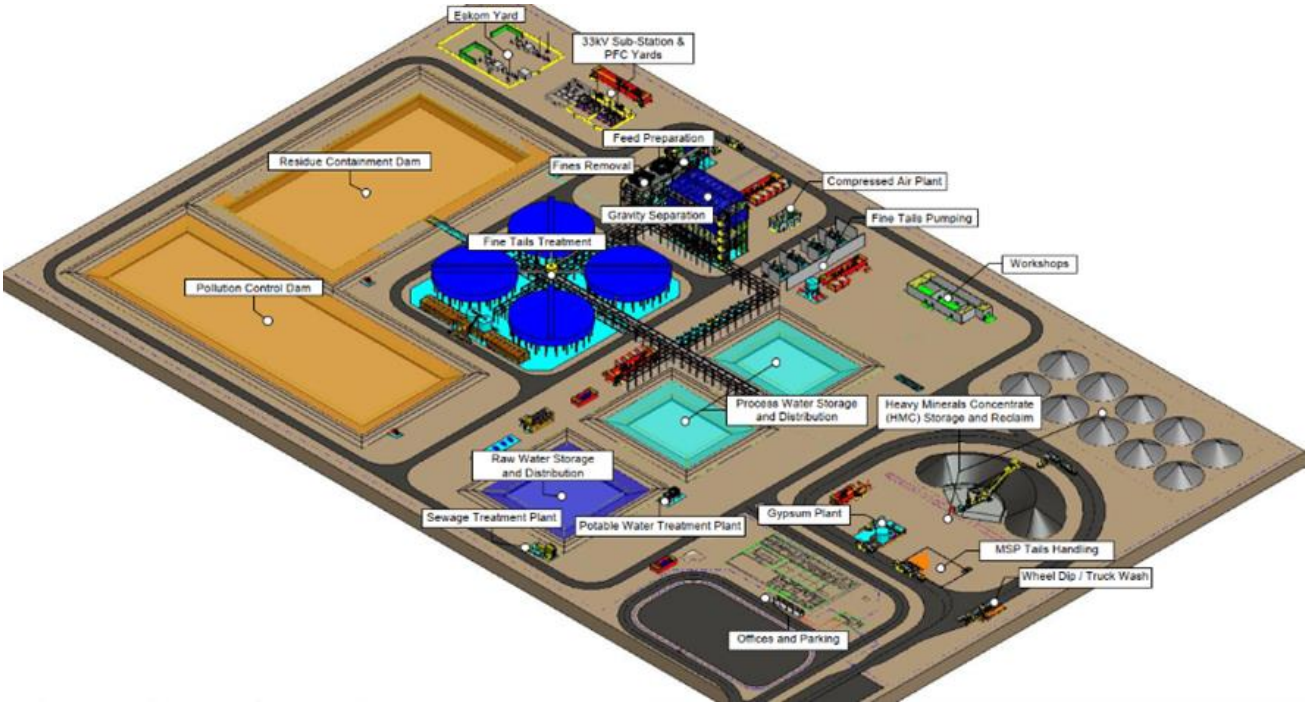

Figure 2-7 - Proposed Phase 2 PWP layout (WSP, 2024a)

2.2.1.5 Residue deposition

<u>RSFs</u>

- Two RSFs will be constructed for the fines material disposal:
- RSF 9:
    - Will be constructed first when the mining in Phase 2 begins and will provide storage space for the first 6 years, reaching full capacity in 2042
    - RSF 9 will have a maximum increase in height (rate of rise) of 3.3 m per year (m/ yr)
    - RSF Site 9 will be 268 ha in size and have a final height of approximately 55 m above average ground level
    - Thereafter, once dried out and stabilised sufficiently, capping of the RSF surface with coarse sand tailings will commence in 2046, and subsequently topsoiled and vegetated with an appropriate mixture of grasses, in 2048
    - The RSF will be returned to the landowner once Tronox is satisfied that the facility and the chosen vegetation cover has stabilised, which is anticipated to be upon issuance of a closure certificate by the DMRE
- RSF C
    - Four RSF cells are planned for RSF Site C which will utilise mined-out pits for additional storage capacity
    - The RSF dam walls will be constructed with coarse sand tails from the mining operation and be compacted. The dam walls will be erected to the designed heights to create a “holding shell” for the incoming fine residue

- Both fine residue and coarse sand tails will be disposed of above ground or in mined out pit areas, depending on disposal area availability. The different phases will have differing rates of rise as follows:
  - Phase 1 - 9.8 m/yr
  - Phase 2 - 5.1 m/yr
  - Phase 3 - 5 m/yr
  - Phase 4 - 3.5 m/yr
- The total footprint area of RSF Site C is expected to be 670 ha and will have a final height of approximately 50 m above the current average ground level against the N2 on the SE side of the facility. The NW side of RSF C will roughly key into pre-mining natural ground levels.
- It is anticipated that RSF Site C will be operational for 27.5 years and reach full capacity in 2064 before Phases 1- 4 are completed
- RSF capping and shaping of the sand tails dump sites with the remaining sand tails will take place between 2064 and 2069
- Thereafter, the site will be backfilled in 2069, affording the facility 4 years to dry out and stabilise, and subsequently topsoiled and vegetated with an appropriate mixture of grasses
- Once backfilled the site capped site will be rehabilitated with topsoil and returned to the landowner once the chosen vegetation cover has stabilised

Sand tailings dumps

- The sand tails material will be hydraulically transported from the PWP to the sand tails stockpile areas through feed pipelines running alongside roads on site. Sand will be deposited by cyclone at each stockpile area, and return water recycled back to the primary wet plant. The existing road infrastructure will be utilized for the pipeline routing as far as possible
- The sand tails stockpiles have been designed with a 1:3 vertical height. Each stockpile will have a 100 m buffer from the stockpile to the nearest public infrastructure (roads, railways and residential areas) and a 30 m buffer to the nearest environmental sensitive area
- Sand tailings stockpiles will vary in height from approximately 65 m (stockpile A1) to over 80 m (stockpile 8) above mean sea level
- Individual dumps will be rehabilitated after they have reached full capacity. Dumps will be shaped where required and possible given surrounding constraints, topsoiled and vegetated with an appropriate mixture of grasses or other cover
- These areas will then be returned to the landowner once the chosen vegetation cover has stabilised

2.2.1.6 Post-closure topography and land use

The topography of the permanent sand dumps and RSFs is expected to change substantially within the context of the broader mining rights area, whereas that of the mined-out areas that will only be backfilled to pre-mining levels will remain relatively unchanged in the long run. The RSF sites and sand tails deposition areas will leave permanent elevated features on the landscape, with more uniform side slopes and pronounced flatter crest areas.

It is anticipated that at least some land will be returned to forestation, where soil and slope conditions allow, with the remainder being used for crop production and as informal grazing land. In this regard, it would be required to determine the relinquishment criteria under which Mondi would again take over specifically the respective rehabilitated sand dumps and RSFs. The suitability of these areas for the purposes of again establishing timber plantations will be a function of slope in combination with nature and depth of cover material, as well as other factors such as erosion prevention and control.

The pre-mining and post mining topographic surface is presented in Figure 2-8. The natural valleys and peaks are depicted by green and red respectively.

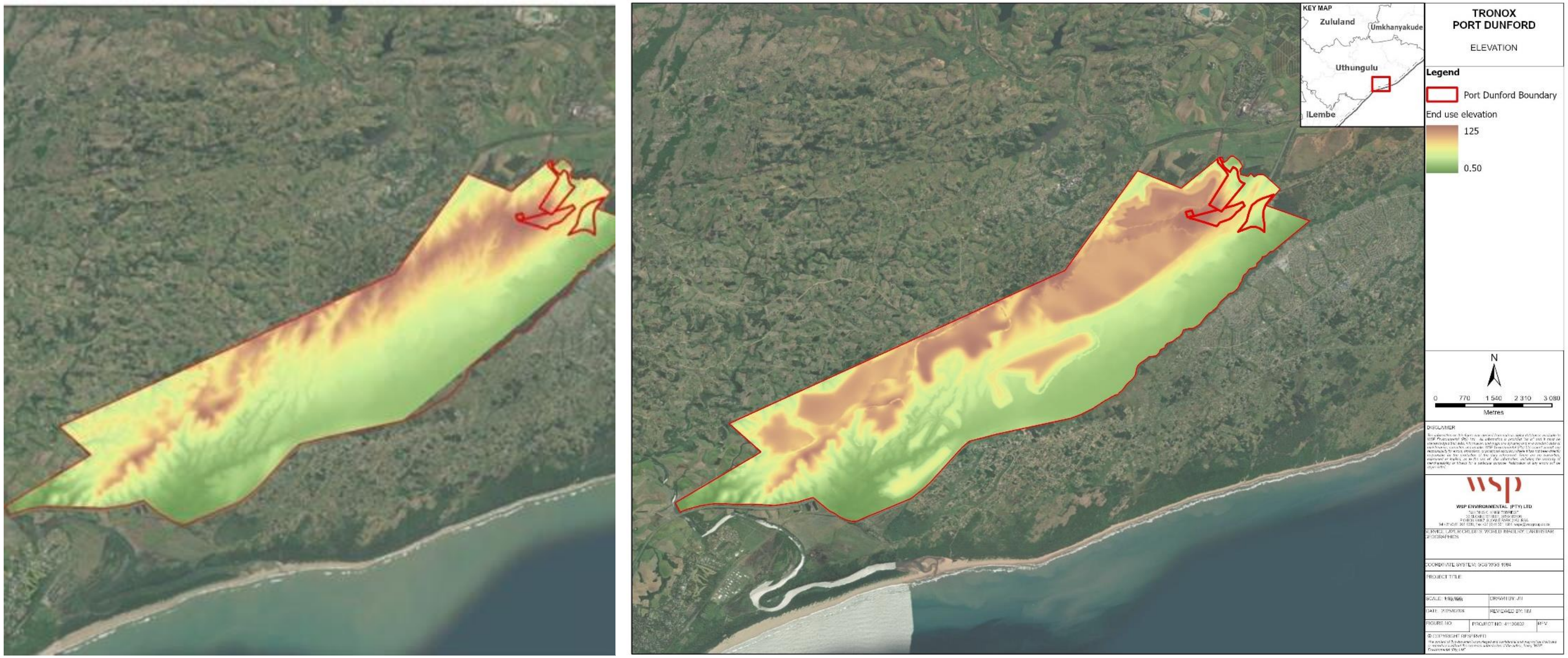

Figure 2-8: Pre mining and proposed post mining topography (WSP, 2024a)

2.2.2 PHASE 2 VISUAL IMPACT IDENTIFICATION

In summary, the following infrastructure and project components associated with the Port Durnford Phase 2 mining activities are expected to result in a visual impact, as indicated (Table 2-1). The respective magnitude and significance levels of each impact is further evaluated in Section 8. Several mitigation aspects are also touched on below but are further elaborated on in Section 9.

Table 2-2 - Phase 2 project components that are expected to cause a visual impact

Source of visual impact	Description
Opencast mining activities (large-scale)	• Removal of existing vegetation and land cover and alteration of the site topography and general appearance will occur through progressive opencast mining activities, including associated intermittent airborne dust nuisance • The site will be mined using opencast methods, whereby the respective pits are progressively cleared and then mined from one side, and subsequently backfilled, reprofiled and rehabilitated, the latter involving topsoiling and revegetation. This full sequence of events will play out over a roughly 7-year cycle, meaning that the opencast mining-related impacts in any one area will last approximately 7 years. The result is that, while the respective overall pit footprints may be expansive, the areas that will be mined and result in a visual impact at any point in time, will be reduced and limited to specific geographical locations at a time • The mining areas will be illuminated at night for operational and security reasons, which will result in a degree of light pollution. This can be expected to be more pronounced during the latter phases of material deposition on the RSFs and sand dumps
Presence of PWP complex and infrastructure	• The PWP complex will consist of various infrastructures, buildings, and operational areas that will be characterised by geometric elements and brighter colours that will likely contrast with and intrude on the existing site visual context • The PWP complex and other infrastructure areas will also be illuminated at night for operational and security reasons, which will result in a degree of light pollution
Progressive increase in height and expansion of visually intrusive RSF 9 and C, respectively	• The construction of the respective RSF containment starter and compartment walls and subsequent ongoing sand tails deposition will result in the vertical height increase and horizontal expansion of largely bare, geometric landforms that will contrast with the surrounding visual landscape • The degree of visual intrusion of these structures will be higher after initial construction and tails deposition, but will thereafter be partially reduced once the side walls are revegetated, which is expected to be achieved in approximately 3 years • Furthermore, a permanent band of plantation trees will be retained around all mining and dump areas and will be cultivated for screening purposes around 8 years before mining/deposition takes place in a specific area. Where plantations are currently not present (except for existing indigenous swamp and forest vegetation areas) supplementary timber screens will also be implemented accordingly • The visually intrusive character of the elevated RSF dam walls and sand tails deposition areas will largely be mitigated during final rehabilitation through the establishment of a suitable vegetative cover
RSF return water dams	• The RSF return water dams will be expansive and somewhat geometrically shaped, although these elements will be significantly less prominent than the surrounding RSFs and sand dumps

Source of visual impact	Description
Progressive increase in height and expansion of visually intrusive sand dumps	• Similar to the RSFs, the sand dumps will be tall, horizontally expansive, geometric landforms that will be largely bare while in use, and that will contrast with the surrounding visual landscape. However, it is noted that the various RSFs and sand dumps will typically have a combined construction and operational lifespan of between around 2 and 11 years during which concurrent operational rehabilitation will be done where possible, and whereafter final rehabilitation will take place • These features will be individually and progressively rehabilitated as they become available for this purpose, to prevent erosion, and thereby also reducing the resultant visual impact at a given point in time
Formation of dust plumes	• During construction and operations, and especially during dry and windy conditions, it is expected that opencast mining activities and expansion of the RSFs and sand tails will result in intermittent and short-lived airborne dust plumes, but which may be visible over notable distances
Haulage by road of waste stream material to Port Durnford for disposal	• MSP coarse tails and gypsum filter cake produced from the proposed mining operation are received by tip truck from the MSP in Empangeni, which will result in a secondary/indirect visual impact as a consequence of additional trucks and other mining fleet vehicles present on these roads
Permanent alteration of site topography and land cover	• Notwithstanding rehabilitation, the final RSF and sand dump landforms will become prominent, permanent features in the post mining landscape, and will likely be characterised by a mixture of different crops, pasture and some timber plantations, which will differ from the current land cover.

3 DELINEATION OF THE VISUAL STUDY AREA

A visual impact will be caused by the construction and operation of all visible infrastructural components and associated activities that will take place as part of the project, as well as all areas where the physical appearance of the landscape will be altered by earthworks and mining activities. The areas from which these features and landscape alterations are expected to be visible, are defined as the VIA study area, and therefore comprises the spatial extent of the project infrastructure and mining footprint, as well as an associated buffer area. The study area was defined as a 10 km radius around the physical footprint of the proposed mining area. Empirical data derived from studies on visibility and human perception indicates that most visual impacts become insignificant at a distance of between 7 and 10 km, depending on the nature of the source of the impact (Hull and Bishop, 1998).

- For the purposes of this VIA, the term 'project site' or 'site' refers to the proposed mining development footprint– shown in Figure 2-5
- The term "study area" refers to the area that will potentially be visually affected by the project, and represents the 500 m, 2 km, 5 km and 10 km radius buffers around the project footprint (shown in Figure 3-1, and further elaborated on in Section 8.2.3). Visual receptors occurring within the study area represented by the built-up areas are also indicated, and further considered during the impact assessment process (refer to Section 7)

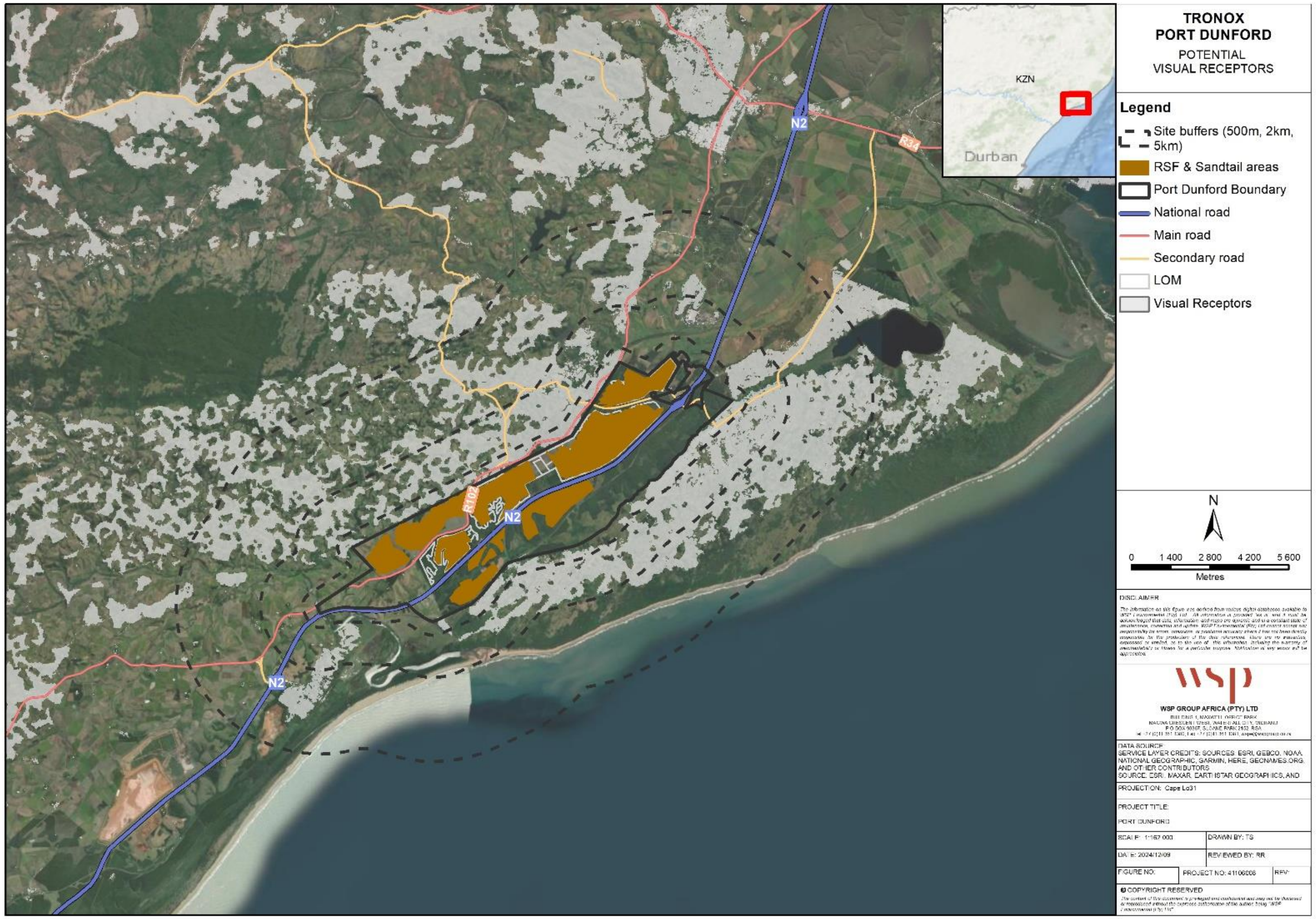

Figure 3-1 - The study area (500 m, 2 km, 5 km and 10 km buffers around the project site) for the Port Durnford visual impact assessment

4 STUDY METHODOLOGY

4.1 VIA METHODOLOGY

This VIA specialist study was conducted using the following methodology:

- Describing the landscape character or visual baseline based on:
  - Available aerial imagery, topographical maps, and proposed mining and infrastructure layout plans
  - Various specialist studies conducted to date as part of the project
  - Photos taken by specialists as part of their respective studies
- Determining the visual resource value of the landscape based on:
  - The topographical character of the study area and potential occurrence of landform features of interest
  - The presence and nature of water bodies within the study area
  - The general nature and level of disturbance to existing vegetation cover within the study area
  - The nature and level of anthropogenic activities and associated landscape disturbances and transformation
- Determining the visual absorption capacity of the receiving visual landscape
- Determining the receptor sensitivity to the proposed project
- Determining the magnitude of potential impacts within the existing visual context by considering the proposed project in terms of:
  - Visibility
  - Visual intrusion
  - Visual exposure
- Assessing the impact significance by relating the magnitude of the visual impact to:
  - Duration
  - Severity
  - Geographical extent
- Based on the outcomes of the impact assessment, mitigation measures to reduce the potential negative visual impacts of the project were recommended

4.2 LEGISLATIVE REQUIREMENTS AND INDUSTRY PRACTICE

For the purposes of conducting the VIA, guidance has been taken from the Provincial Government the Western Cape, Department of Environmental Affairs and Development Planning (DEA&DP) Guideline for Involving Visual and Aesthetic Specialists in the EIA Process (Oberholzer, 2005), as these are the only formal VIA guidelines that have been issued in South Africa. Additional guidance has also been taken from other reference works in the field of visual assessment, list in Section 12.

Further, in accordance with the Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes, which were promulgated in Government Notice No. 320 of 20 March 2020 and in Government Notice No. 1150 of 30 October 2020 (i.e. "the Protocols"), and

Appendix 6 of the EIA Regulations. The protocols used are the "*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been Prescribed",* which are referenced to the report content as indicated in Table 4-1:

Table 4-1 - Appendix 6 of the EIA Regulations specialist study checklist

Report content requirement	Reference
A specialist report prepared in terms of these Regulations must contain—	
(a) details of— (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Refer to Section 1.2
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Refer to declaration of independence by specialist after the table of contents
(c) an indication of the scope of, and the purpose for which, the report was prepared; (cA) an indication of the quality and age of base data used for the specialist report; (cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Refer to Sections 1 and 4.1 Refer to Sections 4.1 Refer to Section 6 for a description of existing impacts on site, Section 10 for cumulative impacts and Section 8 for impact assessment
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Refer to Section 4 for information regarding the date and season, and Sections, 5, 6.1.3 and 6.2 for relevance of seasonal influences on assessment outcome
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Refer to Section 4.1 for methodology, as well as Section 8
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Refer to Sections 4.1 and 6.
(g) an identification of any areas to be avoided, including buffers;	Refer to Section 6.3.
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Refer to Figure 6-6 which indicates the landcover, including drainage lines and associated remaining natural grassland areas to be avoided
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Refer to Section 5
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Refer to Sections 6 to 8 on findings and implications regarding visual resource value, receptor sensitivity, identified impacts
(k) any mitigation measures for inclusion in the EMPr;	Refer to Section 9

Report content requirement	Reference
(l) any conditions for inclusion in the environmental authorisation;	Refer to the mitigation measures listed in Section 9
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	None identified, other than ensuring implementation of the aforementioned mitigation
(n) a reasoned opinion— (i) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Refer to Section 11.
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	No consultation was conducted, however the study was performed using widely acknowledged principles of visual assessment as noted in Section 4.1 and elsewhere as relevant in the report
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Not applicable
(q) any other information requested by the competent authority	None received yet
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Not applicable

5 ASSUMPTIONS AND LIMITATIONS

The following qualification is relevant to the field of VIA and the findings of this study:

- This VIA including evaluation of the visual impacts and proposed mitigation measures is conducted on the project development plan that is put forward for permitting. Further refinement of locational and design aspects of individual plant, infrastructure and buildings, mining areas, and material dumps may still be required during the final project design/construction phase. However, these limited variations are not expected to have a material impact on the outcomes or recommendations of this VIA;
- Similarly, the selection of specific technologies and individual components may not be finalised in all instances. However, in most cases the specific choice of technologies is not expected to materially influence the findings of the impact assessment, as the heights and horizontal extents of individual dumps are expected to be the most determining factor in terms of the visual impact of the project;
- Artificial landforms and structures such as road embankments, bridges, buildings, and tall vegetation will all reduce the level of visibility of individual project components within the study area, in instances where these act as a physical obstruction between the viewer and the source of a visual impact. However, conversely, elevated positions such as bridge overpasses and raised sections of roadway will increase visibility of visual impacts where direct line of sight is visible over

landscape features that would otherwise have acted as visual obstruction or screening elements. The effect of these elements was addressed and incorporated in the viewshed analysis to the extent possible given the available spatial data and informed the positioning of vegetative screening berms. Accordingly, viewsheds for three individual scenarios were produced, i.e.:

- Existing site (pre-mining condition) without any existing vegetation – this scenario illustrates the control visibility scenario demonstrating the exaggerated level of visibility of the current site if no land cover were taken into consideration, and is therefore not a depiction of the actual expected level of visibility within the study area (refer to Section 8.2.1)
- Life-of-mine site (post-mining) with only remaining existing vegetation in place – this scenario demonstrates the normal practice of leaving a minimum band of existing plantation trees of a minimum of 100 m width (where feasible) around any planned mining activity (refer to Section 8.2.1)
- Life-of-mine site (post-mining) with remaining existing vegetation and additional proposed tree screening in place – this scenario illustrates the expected level of visibility within the study area with proposed visual mitigation measures in place (refer to Section 9)

- However, it is expected that the results of the respective viewshed analyses presented in Section 8.2.1 are overstated and present a worse-case scenario, as the full extent of existing visual screening cannot be reliably modelled;
- Determining the value and quality of a visual resource or the significance of the visual impact that any activity may have on it, in absolute terms, is not achievable. The value of a visual resource is partly determined by the viewer and is influenced by that person's socio-economic, cultural, and specific background and biases, and is even subject to fluctuating and intangible factors, such as emotional mood and appreciation of 'sense of place';
- This situation is compounded by the fact that the conditions under which the visual resource is viewed can change dramatically due to natural phenomena, such as weather, climatic conditions, and seasonal change. Visual impact cannot therefore be measured simply and reliably, as is for instance the case with water, noise or air pollution; and
- It is therefore not possible to conduct a visual assessment without relying to some extent on the expert opinion of a qualified consultant, which is inherently subjective. The subjective opinion of the visual consultant is however unlikely to materially influence the findings and recommendations of this study, as a wide body of scientific knowledge exists in the industry of visual evaluation and assessment, on which findings of this VIA is based.

6 VISUAL ENVIRONMENT BASELINE AND RESOURCE VALUE

This section provides a brief overview of the visual baseline environment and context in which the proposed project will take place and is predicated on available photographs as well as Google Earth imagery of the site and study area. The visual baseline presented in this section then serves as basis for evaluating the visual resource value of the site. The visual baseline is described in terms of the following general landscape characteristics (Section 6.1 and 6.2):

- General topography, including prominent natural and artificial landforms, and their spatial orientation relative to the project site;

- Location, physical extent, and appearance of water bodies;
- Nature of existing vegetation cover with respects to indigenous vs. exotic species, overall appearance, density and height, and level of disturbance;
- Nature and level of anthropogenic transformation or disturbance, and the perceived level of compatibility of the proposed project in terms of existing land uses; and
- Seasonal changes and atmospheric and weather conditions.

These aspects are subsequently evaluated against standard landscape aesthetics and visual assessment criteria, to determine the visual resource value of the site as a visual unit, as well as that of individual characteristic features (Section 6.3). The impact of landscape characteristic aspects such as topography and land cover on visual assessment factors such as visibility and visual exposure are evaluated at a later stage as part of the impact magnitude determination (Section 8.2).

6.1 GENERAL LANDSCAPE CHARACTERISTICS

The VIA study area is within the KwaZulu-Cape Coastal Forest Mosaic ecoregion distributed along the eastern coastline of South Africa. The region is characterised by closed hills, tropical and subtropical forests, as well as mixtures of estuaries, dunes, and woodlands (WWF & IUCN, 1994). Regional land uses are predominantly timber production, agriculture, urban development, and industries largely centred around the Port of Richards Bay (WSP, 2024a).

The site itself is characteristic of the region and lies on a roughly northeast-southwest slanted ridgeline. The highest point is approximately midway along the northern site boundary, and the terrain generally dips to the east and southeast, with the area immediately west of the site also dipping to a local low point along the Mlalazi River. The majority of the site is presently a productive commercial timber plantation unit under sustained use and specific management methods (WSP, 2023) that is between 25-30 m tall at maturity.

6.1.1 TOPOGRAPHY

The topography at study area is described as steep and rolling, forming deep ridges along rivers, although no prominent individual landforms are present (WSP, 2024a). The slope is steeper in the west where gradients of up to 35% occur. The central and eastern sections have shallower slopes with gradients of 1% to 10%. The slope aspect in the west is mostly western, whilst aspect in the east is eastern. Surface elevations range between 10 – 130 mamsl (WSP, 2024c).

There are no major rivers within the site area, and drainage in the southwest is via several shallow channels towards the Mlalazi River, whilst the remainder of the site drains to the Mhlatuze River in the northeast. Ephemeral channels also occur on steeper slopes, while channels on shallower gradients are generally perennial. The riparian habitats are associated with streams and numerous large wetlands occurring in the east (Snyman & Associates, 2003).

Figure 6-1 illustrates the different topographical elevations of the project area.

Figure 6-1 - Topography map of the project area

6.1.2 HYDROLOGY AND DRAINAGE FEATURES

The perennial Mhlathuze River flows past the northern site boundary and its tributaries drain the north-western areas. The perennial Mzingwenya River and its associated tributaries flow along the eastern site boundary from southwest to north-east where it drains into Lake Qhubu. The perennial Amanzamnyama and Ojinjini Rivers and their associated tributaries flow from north-east to south-west within the site boundary and confluences with the Mlalazi River. Another tributary of the Mlalazi River runs further south of this site boundary. The Mlalazi River runs along the southwestern site boundary and eventually drains into the Indian Ocean (WSP, 2024c).

From a visual perspective, the more pronounced channels are less common on sandy coastal aquifers and mostly occur where the terrain is steeper, forming more visible, incised channels/watercourses. Permanent wetland zones are relatively common, with seasonal and temporary wetland zones also occurring. The river channel areas are also frequently distinguished by associated riverine forest vegetation rather than visible water. Similarly, the wetland areas are often characterised by combinations of swamp forest and/or open grassland, rather than open water bodies. However, riparian species are absent in plantations or areas under sugar cane. The vegetation cover aspect of the study area is further described in Section 6.1.3.

The Indian Ocean and associated coastline are by far the most significant hydrological feature within the study area. However, the site topography and existing land cover mean that these features, which are some 3 km or more to the southeast, are not visible from the site.

6.1.3 VEGETATION CHARACTERISTICS

The study area is located in the Indian Ocean Coastal Belt Biome, with embedded elements of the Forest Biome. According to the 2018 SANBI mapping of South Africa's regional vegetation types, the study area comprises two vegetation types, namely Maputaland Coastal Belt and Swamp Forest. Similarly, the finer-scale provincial vegetation mapping for KwaZulu-Natal (Ezemvelo, 2011) also identifies Maputaland Coastal Belt and Swamp Forest: *Ficus trichopoda* Swamp Forest in the study area. Biodiversity sensitivities on site have been mapped and are described below according to SAAPAD 20201Q3 which delineates protected areas, the KZN Biodiversity Sector Plan of 2016 and National Wetland Mapping by SANBI, 2018. Figure 6-2 provides the different biodiversity sensitivities of the project site.

The broader region in which the study area is located is referred to as the Maputaland-Pondoland-Albany Hotspot on account its rich biodiversity attributes. However, most of the vegetation cover in the region have since been extensively transformed by monoculture activities including timber production (Figure 6-3), sugar cane plantations and grazing land (Figure 6-4), as well as through expansive urban development. The remaining natural vegetation biodiversity hotspots in the region are therefore largely confined to steep slopes and narrow ravines, as well as along the coastline. These areas essentially represent the remaining communities of natural vegetation within the site boundary and study area and are in strong visual contrast with the much taller, mono-species timber plantations (Figure 6-5).

The plantations of Port Durnford consists of a variety of eucalyptus and pine species, which over the years have been withdrawn back from the drainage lines which cross through the site. The species varieties, which are mostly clones, have been selected based on growth rates or pulp / wood type produced (Coastal and Environmental Services, 2008).

Figure 6-2 - Biodiversity sensitivity of the project area

Figure 6-3 - The plantations of Port Durnford consists of a variety of eucalyptus (pictured) and pine species

Figure 6-4 - Large parts of the region are used for livestock grazing or are under sugar cane, which contrast dramatically with the vertically prominent timber plantations

Figure 6-5 - The remaining communities of diverse natural vegetation contrast with the much taller, mono-species timber plantations

6.1.4 GENERAL LAND COVER AND LAND USES

The most prevalent primary industries in KZN are agriculture, forestry, and fishing, as well as mining and quarrying. Prominent secondary industries include manufacturing, electricity and water provision, and construction. These land uses have resulted in the extensive removal of the natural dune and forest vegetation communities, thereby greatly altering the appearance of the landscape and negatively impacting the ecological functioning of the region. Consequently, remaining natural habitat (forest land, shrubland, waterbodies, and wetlands) are typically restricted to smaller, often isolated patches across the study area. Figure 6-6 illustrates the land cover of the project study area.

From a visual perspective, urban built-up areas, timber plantations, and agricultural practices are the dominant land uses in the study area (Figure 6-7). Linear infrastructure such as roads and power lines often form prominent visual pathways in the landscape, as they cut through the vertically dominant timber plantations (Figure 6-8). The project site itself consists mainly of transformed land and the present land use is mainly forestry and to a lesser extent, sugar cane farming. Where achievable, this is also the preferred land use after mining.

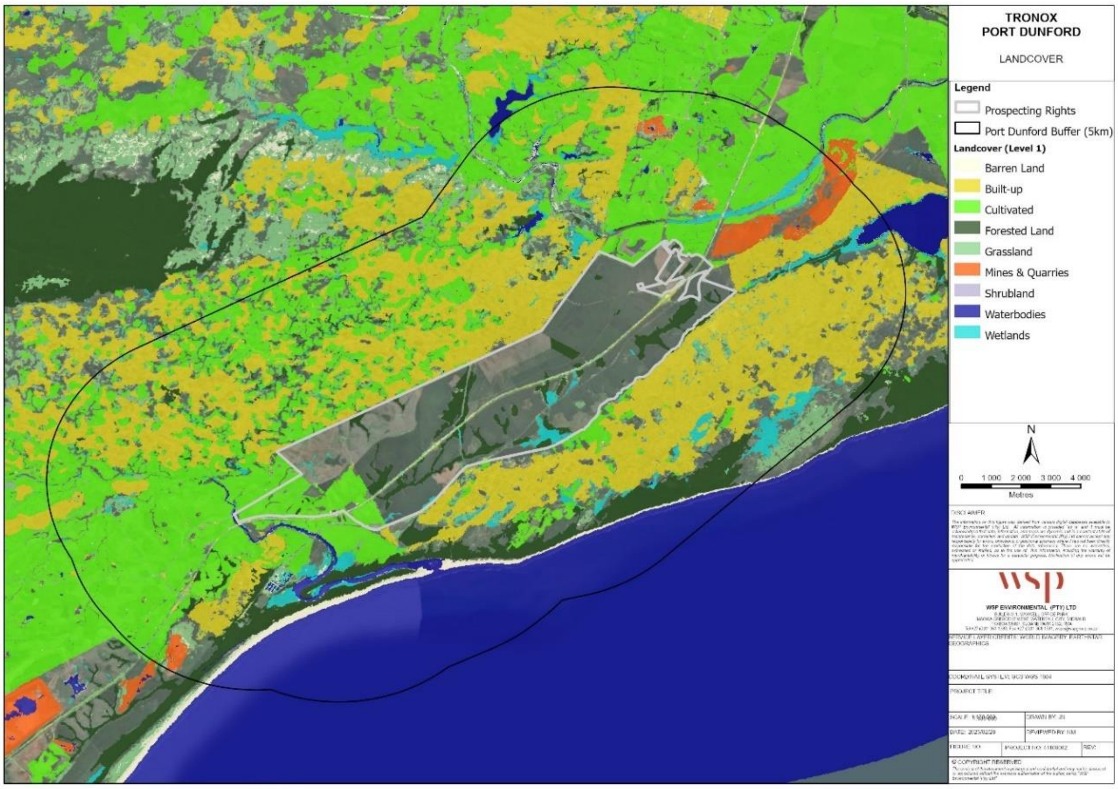

Figure 6-6 - Landcover map of the project area (WSP, 2024a)

Figure 6-7 - From a visual perspective, urban built-up areas, timber plantations and agricultural land cover are the dominant land uses in the study area

Figure 6-8 - Linear infrastructure such as roads and power lines (pictured) often form prominent visual pathways in the landscape

6.2 SEASONAL AND ATMOSPHERIC CONDITIONS

A further aspect of the visual baseline that needs to be considered is that of weather-related/ atmospheric conditions and seasonal variations. Prevailing atmospheric conditions can greatly influence how a landscape is perceived by viewers, as well as the range over which views are possible (SAWS, 2022.).

The climate experienced within the interior of South Africa is controlled predominantly by subtropical high pressure, with temporary disruptions by low pressure cells or fronts. This high-pressure zone is located along 33°S latitude and is associated with strong divergence at the surface and convergence in the upper atmosphere. Rain falls predominantly in winter and spring over the south-western sector of the country due to the influence of westerly waves (Tyson & Preston-Whyte, 2000).

Port Durnford consequently has a humid subtropical climate of warm wet summers and cool, dry winters. Along the coastline, sea and land breeze circulations influence the diurnal wind profile. During the day, the land heats up more rapidly than the ocean surface, which has a higher heat capacity. The warmer air over the land rises causing a low pressure to develop (WSP, 2024b). The climate of the study area has also been described by (Snyman & Associates, 2003) as moist coastal and subtropical tending to tropical.

Mist is common during large parts of the year, greatly reducing visibility when it is present. Airborne pollution in the region can also be high, often resulting in hazy atmospheric conditions. Fires can also significantly impact visual conditions, causing vast and highly visible smoke columns which greatly reduce the visibility in short-range views.

Furthermore, the timber plantation areas undergo dramatic changes in appearance as different areas are planted, and the trees grow and mature, and are subsequently felled. The visual character of these areas are dynamic, with areas that have restricted, short-range view depths when under timber (refer to Figure 6-3), changing to open, rolling landscapes with long-range vistas when the trees are cut down and the land cleared for future re-planting (Figure 6-9).

Figure 6-9 – Areas under dense timber change to open, rolling landscapes with long-range vistas when the trees are cut down (a view of the proposed footprint for the sand tails stockpile 8)

6.3 VISUAL RESOURCE VALUE OF THE STUDY AREA

Visual resource value refers to the visual quality of elements of an environment, as well as the way in which combinations of elements in an environment appeal to our senses. Studies in perceptual psychology have shown an affinity for landscapes with a higher visual complexity, rather than homogeneous ones (Young, 2004). Furthermore, based on research of human visual preference (Crawford, 1994), landscape quality increases when:

- Prominent topographical features and rugged horizon lines exist
- Water bodies such as streams or dams are present
- Untransformed indigenous vegetation cover dominates, and
- Limited presence of human activity, or land uses that are not visually intrusive or dominant prevail

Further to these factors, Table 6-1 indicates criteria used for visual resource assessment. The assessment combines visual quality attributes (views, sense of place and aesthetic appeal) with landscape character and gives the landscape a high, moderate or low visual resource value.

According to the uMhlathuze Spatial Development Framework (May 2020), the geomorphology of the landscape is generally described as a low-relief area that is bounded by a coastline and a high-relieve terrain on the landward side (WSP, 2024a).

The project area is located on a low-level coastal plain with a mix of afforestation and sugar cane farming. The project area of influence includes:

- Industrial
- Road infrastructure (including the N2 freeway)

- Residential / urban townships
- Tribal lands
- Other mining operations

These natural features will influence the visual impacts presented by the project and vice versa. (WSP, 2024a)

Table 6-1 - Visual resource value criteria

Visual resource value (sensitivity)	Criteria
Very high (4)	• Pristine or near-pristine natural landscape with no or very limited human intervention visible • Natural landscapes characterised by highly scenic or attractive features that are unique to the area or region • Areas that exhibit a strong positive character with valued features that combine to elicit a distinct experience of visual unity, richness, and harmony • Cultural heritage sites, architectural features, or built-up sites comprised completely or mostly consisting of elements of high historical or social value, and that are unique or otherwise characterised by high visual appeal • These landscapes are likely of particular importance to conserve, and are particularly sensitive to change
High (3)	• Predominantly natural landscapes that nevertheless have some human interventions visible • Natural landscapes characterised by scenic or attractive natural features, characteristic of the region in which it is located • Areas comprised of visual elements that mostly combine to create a sense of visual unity, richness, and harmony, with minor or isolated incongruent aspects of features • Cultural heritage sites, architectural features, or built-up sites largely characterised by features of high historical or social value, and that mostly have high visual appeal • These are landscapes may contain specific features or elements of conservation importance, and which may be sensitive to change
Moderate (2)	• Partially transformed or disturbed landscape in which human interventions are visible but do not dominate views • Natural landscapes but with noticeable presence of incongruous elements or degradation of some features • Areas that exhibit some positive visual appeal but that are not unique and are found elsewhere, or that include some disharmonious elements resulting in a more mixed character • Cultural heritage sites, architectural features, or built-up sites characterised by individual elements that have some socio-cultural or historic interest but not considered visually unique • These landscapes are less important to conserve but may still include certain areas or features worthy of conservation, and have some capacity to absorb visual change

Visual resource value (sensitivity)	Criteria
Low (1)	• Extensively transformed or disturbed landscape • Human intervention is of visually intrusive nature and dominates available views • Scenic appeal of landscape greatly compromised, and visual cohesion of individual elements is mostly non-existent • Built-up sites in which unappealing elements have visual prominence, or that consist of widely disparate or incongruous land uses and activities • Areas generally negative in character with few, if any, valued features. Scope for positive enhancement frequently occurs

An analysis of the visual resource value of the study area vis-á-vis the tabulated factors is discussed below:

- Topography: The topography at study area is generally rolling, forming deeper ridges between rivers, with steeper slopes in the west, while in the central and eastern sections shallower slope gradients are encountered. However, the natural landforms on site are mostly modest and do not form prominent visual landmarks. While the site topographical character is still mostly unaltered, it is also similar to that of the surrounding areas and therefore not distinct or unique
  - The topography of the study area is therefore rated as having a moderate (2) visual resource value
- Hydrology: Despite the presence of various streams and wetlands on site and these being of at least some visual appeal, none are particularly visually prominent and are rather distinguished by their associated vegetation cover, and are thus not highly significant features within the overall visual context
  - The visual resource value of the study area’s hydrology is therefore considered to be moderate (2)
- Vegetation cover: Natural habitat across most of the study area has been transformed or severely modified by timber production, suburban expansion, agriculture, industry, and mining. Notwithstanding, the patchwork of timber, sugar cane, farmland and remaining natural vegetation communities occurring within the project site and immediate surroundings provide visual variation and interest
  - The visual resource value of most of the study area’s vegetation cover is therefore considered to be moderate (2). However, the areas of remaining coastal forest and swamp vegetation located in the narrower valleys and along shallow, wide drainage lines, respectively are deemed to be of high resource value due to their unique appearance and visual contrast with the surrounding plantations
- Land use: Timber production, urban expansion and agriculture are the prevailing or most visually prominent land uses across most of the study area. Infrastructure associated with mining, informal urban expansion, and industrial development are optically intrusive and detract from the visual aesthetic of the landscape, however considerable parts of the study area and specifically the project site are still rural/agricultural in appearance

- The visual resource value of the study area's land use is therefore considered to be moderate (2)

In summary, on all metrics the visual resource value of the study area is expected to be moderate - Table 6-2, but with notable exceptions being the remaining areas of coastal forest and swamp vegetation, which are deemed to be of high (3) visual resource value.

Table 6-2 - Visual resource value determination

Visual baseline attribute	Topography	Water bodies	Vegetation	Land uses
Visual resource value score	Moderate (2)	Moderate (2)	Moderate (2) to high (3)	Moderate (2)
Total				8 (moderate)

Where the above score is adjusted as follows:

- 4 – 6 = low (1)
- 7 – 9 = moderate (2)
- 10 – 13 = high (3)
- 14-16 = very high (4)

Based on the above score ranges, the overall visual resource value of the study area is rated as moderate (2).

6.4 VISUAL ABSORPTION CAPACITY

Visual absorption capacity (VAC) can be defined as an "estimation of the capacity of the landscape to absorb development without creating a significant change in visual character or producing a reduction in scenic quality" (Oberholzer, 2008). The ability of a landscape to absorb development or additional human intervention is primarily determined by the nature and occurrence of vegetation cover, topographical character, and human structures.

A further major factor is the degree of visual contrast between the proposed new project and the existing elements in the landscape. If, for example, a visually prominent industrial development already exists in an area, the capacity of that section of landscape to visually "absorb" additional industrial structures is higher than that of a similar section of landscape that is still in its natural state. VAC is therefore primarily a function of the existing land use and cover, in combination with the topographical ruggedness of the study area and immediate surroundings.

Based on the varying degrees of landscape transformation and undulating topography within the surrounding landscape, in combination with the largely uniform land cover of the project site itself, the VAC of the receiving environment is rated as moderate.

To account for the fact that visual impacts are expected to be more intrusive in landscapes with a lower VAC than in those with a higher VAC (regardless of the visual quality of the landscape), a weighting factor is incorporated into the impact magnitude determination, as indicated in Table 6-3.

Table 6-3 - VAC weighting factor table

Visual resource value of receiving landscape	Low VAC	Medium VAC	High VAC
Very high/high resource value	High (1.2)	High (1.2)	Moderate (1.0)
Moderate resource value	High (1.2)	Moderate (1.0)	Low (0.8)
Low resource value	Moderate (1.0)	Low (0.8)	Low (0.8)

The visual resource value of the study area has been determined to be moderate (refer to Section 6.3), while the VAC of the study area has been rated as moderate (see above). Hence, a moderate (1.0) weighting factor in terms of VAC is applied during the impact assessment.

7 VISUAL RECEPTOR SENSITIVITY

7.1 RECEPTOR GROUPS

Visual impact is primarily an impact concerned with human interest. Potential viewers, or visual receptors, thus constitute people that might see the proposed development.

Receptor sensitivity refers to the degree to which an activity will actually impact on receptors and depends on how many people see the project, how frequently they are exposed to it and their perceptions regarding aesthetics. Receptors of the proposed mining development can be broadly categorised into two main groups, namely:

- People who live or work in the area, and who will be frequently exposed to the project components (resident receptors), and
- People who travel through the area and are only temporarily exposed to the project components (transient receptors)

Receptors in the study area include the residents of Mtunzini, Port Dunford, Esikhawini, Gobandlovu, KwaDlangezwa and other settlements, as well as the numerous farmsteads that are abundant and scattered throughout the landscape . The locations of receptors are shown in Figure 3-1.

The N2 highway as well as the R102 traverse the length of the orebody; the R102 being located to the northwest and the N2 running through its centre. There is also a railway line just south of the N2 that also traverses the mining right area. These roads will convey large numbers of transient receptors across the study area.

7.2 RECEPTOR SENSITIVITY AND INCIDENCE

The visual receptor sensitivity and incidence can be classified as high, moderate or low, as indicated in Table 7-1.

Table 7-1 - Visual receptor sensitivity criteria

Number of people that will see the project (incidence factor)	
Large	Towns and cities, along major national roads (e.g. thousands of people)
Moderate	Villages, typically less than 1 000 people
Small	Less than 100 people (e.g. a few households)
Receptor perceived landscape value (sensitivity factor)	
High	People attach a high value to aesthetics, such as in or around a game reserve or conservation area, and the project is perceived to impact significantly on this value of the landscape.
Moderate	People attach a moderate value to aesthetics, such as smaller towns, where natural character is still plentiful and in close range of residency.
Low	People attach a low value to aesthetics, when compared to employment opportunities, for instance. Environments have already been transformed, such as cities and towns.

The following ratings have therefore been applied to the identified visual receptor groups:

- Resident receptors: Resident receptors comprise a large number of people (incidence factor) living in the study area. We advance that considering the existing levels of development and transformation in the landscape, people living in urban areas further removed from the site, as well as those living in nearby informal settings, will probably attach a lower to moderate value (sensitivity factor) to the project. In essence, we anticipate that these people are probably desensitised to additional modifications to sites that are already highly transformed. Conversely, the residents of the private estates, tourist establishments and adjacent farmsteads will attach a higher value to the visual landscape
- Transient receptors: People travelling through the study area will include local residents, itinerant workers, and regional tourists. They will constitute a high number of people (incidence factor), and it is expected that they will attach a lower degree of value to the currently transformed visual setting of the proposed project site (sensitivity factor). This receptor group has thus been given a low sensitivity rating.

Based on the above, a high number of people (incidence factor) are expected to be visually affected by the project, and the overall perceived landscape value (sensitivity factor) is expected to be moderate (2).

7.3 RECEPTOR SENSITIVITY WEIGHTING FACTOR

To determine the magnitude of a visual impact, a weighting factor that accounts for receptor sensitivity is determined (Table 7-2), based on the number of people that are likely to be exposed to a visual impact (incidence factor) and their expected perception of the value of the visual landscape and project impact (sensitivity factor).

Table 7-2 - Weighting factor for receptor sensitivity criteria

		Number of people that will see the project		
		Large	**Moderate**	**Small**
Receptor perceived landscape value (Sensitivity factor)	High	High (1.2)	High (1.2)	Moderate (1.0)
	Moderate	High (1.2)	Moderate (1.0)	Low (0.8)
	Low	Moderate (1.0)	Low (0.8)	Low (0.8)

Based on the receptor sensitivity assessment and the above criteria, a high weighting factor (1.2) in terms of this aspect is applied during the impact magnitude determination.

8 IMPACT ASSESSMENT

8.1 IMPACT IDENTIFICATION

The following activities and elements associated with the mine are expected to result in visual impacts occurring during the construction, operational and decommissioning/closure phases of the project. For the purposes of this assessment, potential impacts during the construction and operational phases have been grouped together, as they are expected to be largely similar in nature, although potentially of varying magnitude.

8.1.1 PHASE 1

- The Phase 1 infrastructure and associated night-time lighting
- Phase 1 small-scale mining

8.1.2 PHASE 2

- Opencast mining activities (large-scale) and associated night-time lighting
- The PWP complex and infrastructure and associated night-time lighting
- Active coarse and fine tailings deposition areas (RSFs and sand tails)
- Dust from mining and residue disposal areas
- Road haulage of concentrate, materials and wastes between the CPC and Port Durnford site
- Permanent alteration of site topography and land cover

8.2 IMPACT MAGNITUDE CRITERIA

The magnitude of a visual impact is determined by considering the visual resource value and VAC of the landscape in which the project will take place, the receptors potentially affected by it, together with the level of visibility of the project components, their degree of visual intrusion and the potential visual exposure of receptors to the project, as further elaborated on below:

8.2.1 THEORETICAL VISIBILITY

The level of theoretical visibility (LTV) is defined as the sections of the study area from which the proposed the RSFs and sand tails may be visible. This was determined by conducting a viewshed analysis and using Geographic Information System software with three-dimensional topographical modelling capabilities. The basis of a viewshed analysis is a digital elevation model (DEM). The DEM for this viewshed analysis was derived from 5 m contour lines. The 500 m, 2 km, 5 km and 10 km study area boundaries surrounding the site were used for the analysis. The following viewshed analyses were subsequently produced (see further explanation below):

- The existing site (pre-mining condition) of the current site without incorporating existing or planned vegetation screening (Figure 8-1). This scenario illustrates the exaggerated level of visibility of the current site if no land cover were taken into consideration to serve as control case, and is therefore not a depiction of the actual expected level of visibility within the study area
- The life-of-mine site (post-mining) with existing vegetation that will remain after mining (Figure 8-2). This scenario demonstrates the normal practice of leaving a minimum band of existing plantation trees of a minimum of 100 m width (where present and feasible) around any planned mining activity, but does not include any additional vegetation to be planned as further screening
- Life-of-mine site (post-mining) with remaining existing vegetation and additional proposed tree screening in place (refer to Section 9, which deals with proposed mitigation). This scenario illustrates the expected level of visibility of the mining landforms within the study area, after additional proposed visual screening has been implemented

The viewshed was modelled for the proposed RSFs and sand tails using Esri ArcGIS for Desktop software, 3D Analysist Extension, by integrating the life-of-mine landform contour models into the above-mentioned DEM, with observer points set around and on top of the RSFs and sand tails. The LTV based on the results of the viewshed analysis was then rated according to Table 8-1.

However, we highlight that human activities within the study area have and continue to cause modification to land cover and local-scale topography that will influence the actual levels of visibility of the site, when viewed from different locations withing the study area. Artificial landforms, such as elevated berms and embankments, buildings and infrastructure, and indeed tall vegetation (particularly tall trees windrows and plantations) are not comprehensively reflected in pre-existing contour databases, or the resultant DEM of the study area, but will visually screen the proposed project infrastructure and mining activities to varying degrees. To account for this, the screening effects of existing vegetation (Figure 8-2) and with proposed additional vegetation screening in place (refer to Section 9) was modelled into the viewshed analysis as follows:

- Observer points set around and on top of the RSFs and sand tails were spaced at 10 m intervals as well as at a 10 m grid over the top surfaces of all infrastructure
- The height of existing timber plantations including of those trees to be retained as primary visual screens around all mine workings was modelled at 25 m
- Proposed additional timber plantation screens were modelled around the edges of all opencast mining areas, RSFs, and sand tails dumps, at a minimum width of 50 m and height of 25 m
- The height of indigenous forest vegetation was conservatively modelled at 10 m.

It should be noted that the viewshed analysis results as per Figure 8-1 and Figure 8-2 illustrate the cumulative modelled visibility of the various mining landforms from within the entire study area. In reality, the site and any of the individual mining landforms will be far less visible from any given viewpoint within the study area, due to localised screening by local topography, vegetation, buildings, and other landcover.

A further point to consider is the fact that the mining process (both active mining and progressive backfilling of the mine workings, as well as construction and subsequent deposition of respective sand tails and RSF dumps) will be temporally and spatially dynamic. Accordingly, the sources of visual impact will change across the mine site over time, and can be summarised as follows:

- Initially, opencast mining will commence just west of the centre of the site in 2036, and will systematically progress to the northeast, in a continuation of "S" curves, followed by concurrent backfilling operations, with mining terminating at the eastern end of the main mining block in 2054. As mentioned earlier, the total duration of the consecutive site clearance, mining, and backfilling activities in each parcel/mining block will last approximately 7 years on average, after which rehabilitation measures will be implemented
- Construction of the respective RSF C phases 1-4 and deposition will then follow in this area in the same sequence from 2041 until 2051
- Construction of RSF9 near the southwest corner of the mining area will follow from 2038-39, with sand dumps A-1, A-2 and A-3 being created along the southernmost half of the site from 2036 to 2047. Sand Dump 8B will subsequently be created in the westernmost part of the site, from 2048-2053
- Mining and subsequent concurrent backfilling of the westernmost block will commence from 2054 to 2057 with subsequent RSF side wall construction from 2054-2059 and deposition occurring from 2056 to 2059
- Mining and subsequent concurrent backfilling of the easternmost block will commence from 2058 to 2061 with subsequent RSF side wall construction from 2059-2064 and deposition occurring from 2060 to 2063
- Mining and subsequent concurrent backfilling of the western half of the main mining block will occur from 2061, starting in the west, also following an "S" curve pattern to the west ending in 2069, at the point where mining initially started in 2037
- Construction of RSF 3 will occur from 2064-2067, with backfilling occurring here until 2069
- Final backfilling of the eastern part of the remaining main mining block covering RSF C as well as the last section of mining will occur from 2069 to 2071

The visual impacts as observed from the Zini Riverview Estate and other establishments west and southwest of the mine will largely be caused by RSF 9 (roughly 3-6 km from these locations) which would progressively become visible from 2036 to 2038 as it progressively increases to its final height and will thereafter be rehabilitated. Some years later from 2048 to 2053, RSF 9 will progressively be obstructed by the initial construction and subsequent deposition and increase in height of Sand Dump 8B (located around 2 km from, and between the estate and RSF 9), whereafter Sand Dump 8B will be rehabilitated. The other structures that are expected to be partially visible from these locations are the western and southern slopes and tops of sand dumps A-2, A-3, and A-1, which will be created from 2036 to 2047 whereafter they will be rehabilitated and will be located between 3.5-8 km from this location. The visibility of these structures and proposed mitigation is further addressed in Section 9

Consequently, the areas of the mine resulting in a visual impact will be limited to certain parts of the site at any given point in time. The opencast mining blocks will typically be backfilled between one to two years after they have been mined, with the various RSF dumps being constructed over backfilled areas once they become available for this purpose. The individual RSF side walls will typically continue to be built up for between two to six years, whereafter the side walls can be progressively rehabilitated. Similarly, deposition on the various sand dumps will last for between six and eleven years, whereafter these landforms can be rehabilitated.

The results of the viewshed analysis are thus considered to be conservative (presenting a "worst-case" scenario) within the context of the study area and demonstrates the cumulative visual impact of the project over the entire lifespan of the mine.

Table 8-1 - Level of visibility rating

Level of theoretical visibility of project element	Visibility rating
Less than a quarter of the total project study area	Low (1)
Between a quarter and half of the study area	Moderate (2)
More than half of the study area	High (3)

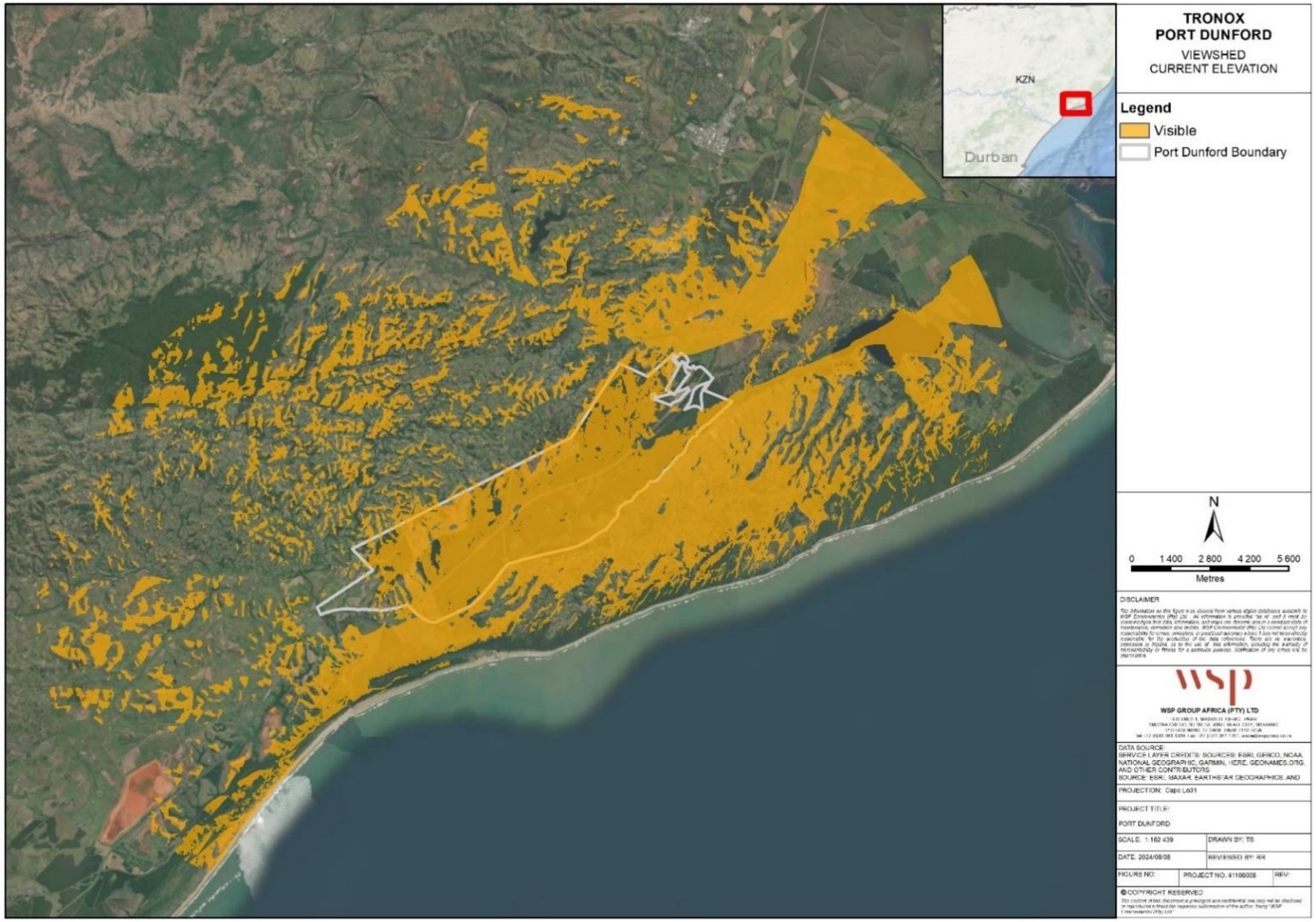

Figure 8-1 - Cumulative maximum viewshed of existing site (pre-mining condition) without existing or planned vegetation screening

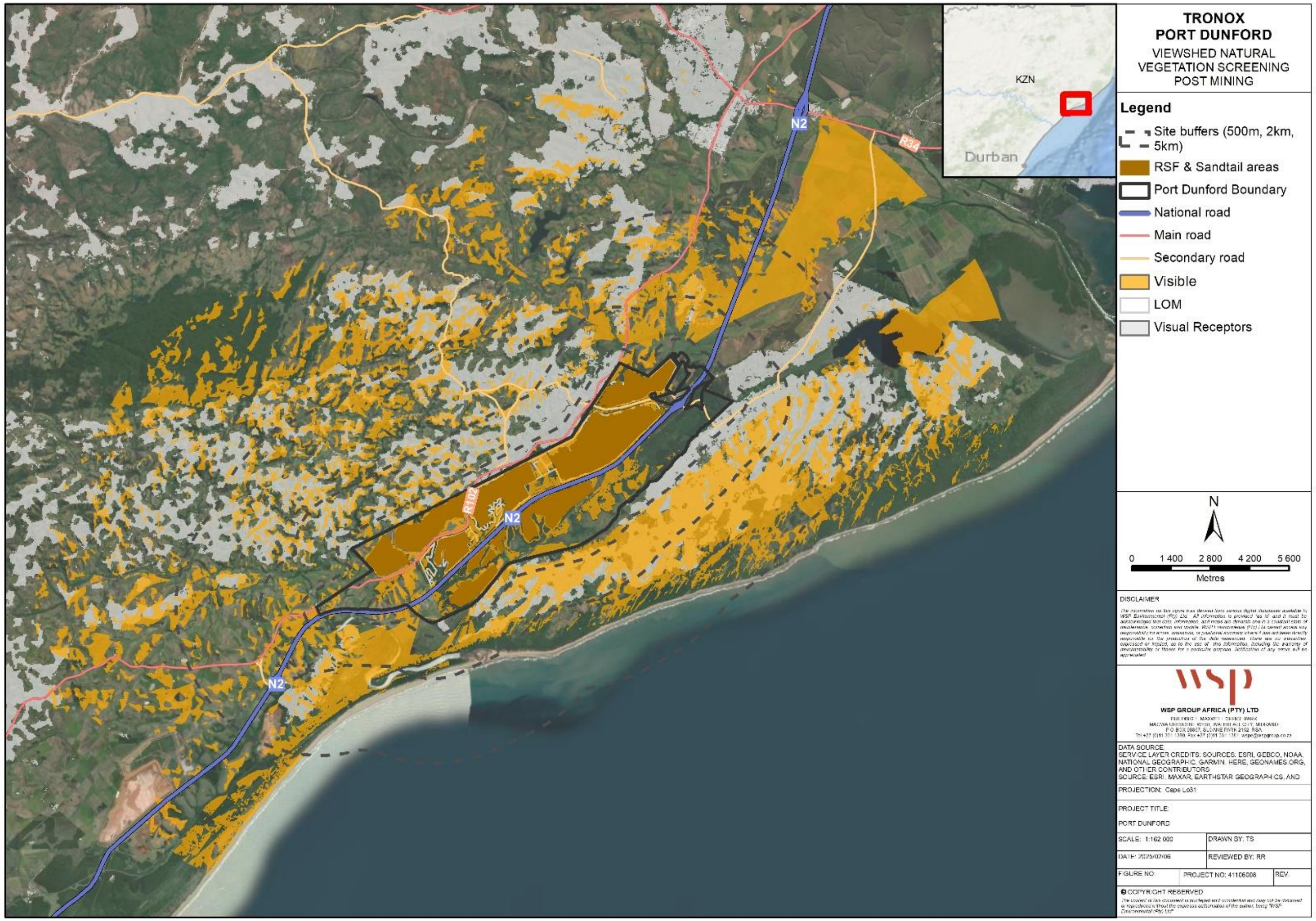

Figure 8-2 - Cumulative maximum viewshed of life-of-mine site (post-mining) with remaining existing vegetation and no additional screening

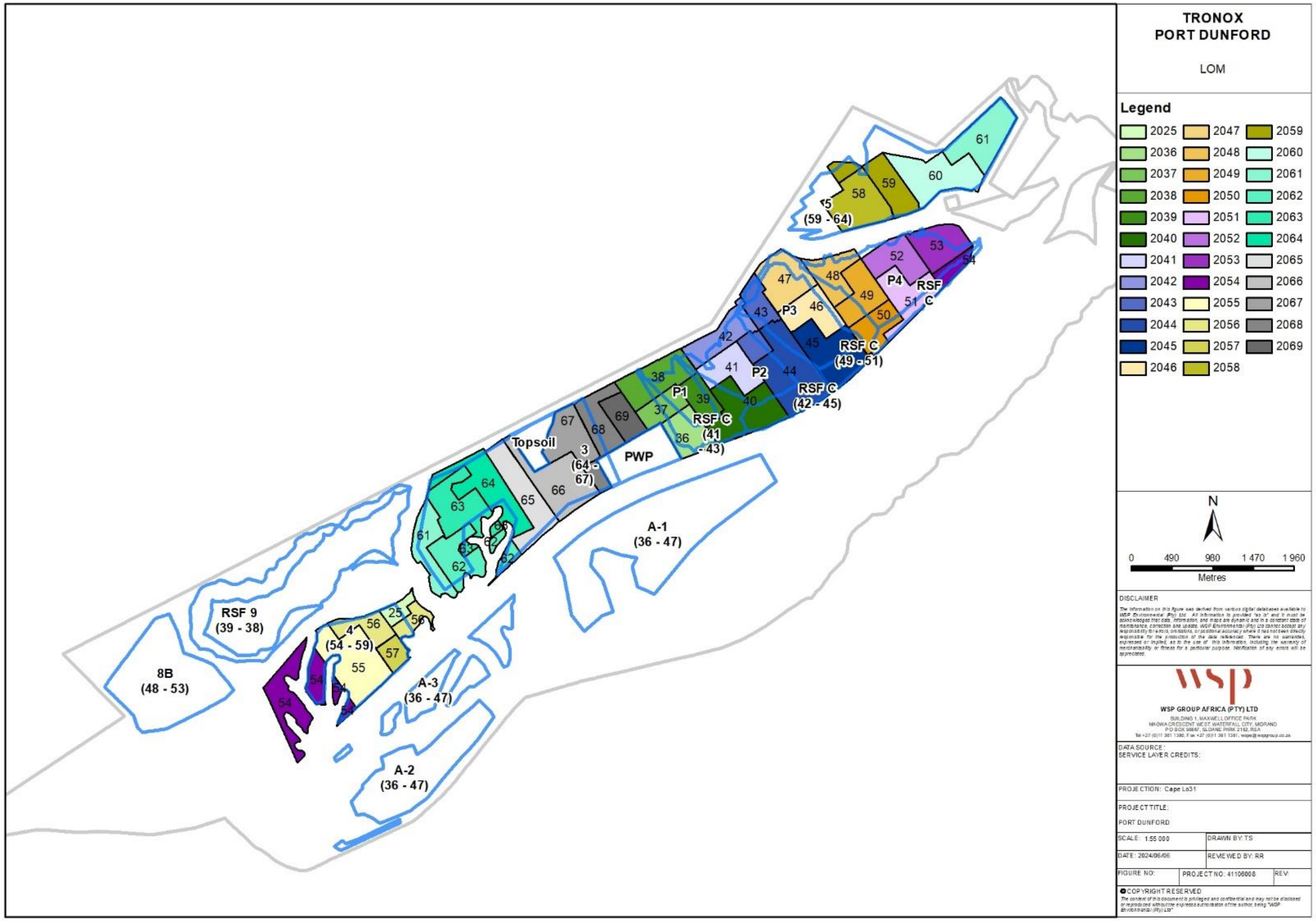

Figure 8-3 - Life-of-mine open pit mining, and sand tails and RSF deposition sequencing per year

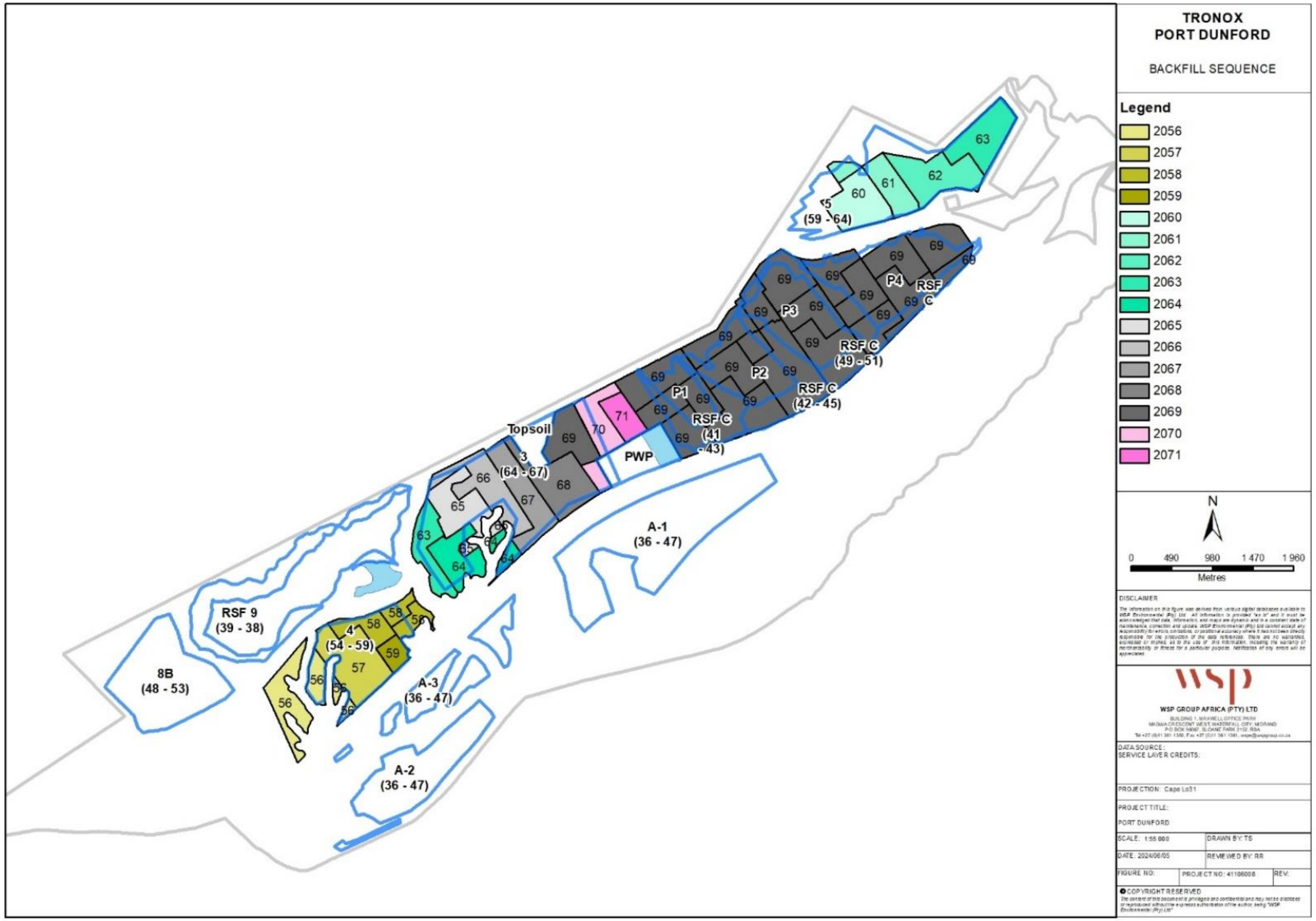

Figure 8-4 – Life-of-mine backfilling, and sand tails and RSF deposition sequencing per year

8.2.1.1 Phase 1

- Presence of visually intrusive site offices and laydown yard and associated night-time light pollution – given the limited geographic footprint and relatively low heights of these elements, compounded by the degree of screening that will be afforded by existing vegetation cover, the degree of visibility within the study area is expected to be low (1)
- Opencast mining activities (small-scale) – same as above

8.2.1.2 Phase 2

- Opencast mining activities (large-scale) and associated night-time light pollution – the degree of visibility of the opencast mining activities is expected to be somewhat less than that of the RSFs and sand tails, as mining will occur below the existing ground level, and will therefore be screened by some extent by the RSFs and sand tails dumps, as well as existing plantations. Accordingly, the visibility of the opencast mining activities has been rated as moderate (2)
- Presence of visually intrusive PWP complex and infrastructure and associated night-time light pollution – given the limited geographic footprint and relatively low heights of these elements, compounded by the degree of screening that will be afforded by existing vegetation cover, the degree of visibility within the study area is expected to be low (1)
- Progressive increase in height and expansion of visually intrusive RSFs and sand tails - the final height of the proposed RSFs and sand tails will vary between 50 m to 100 m above mean sea level, respectively. The post-mining viewshed without mitigation (Figure 8-2) indicates collectively these facilities will be visible from roughly half of the study area, including several settlements and towns, such as *inter alia*, Mtunzini, Port Dunford, Esikhawini, and Gobandlovu. As reflected by Figure 8-3 and Figure 8-4, the various dumps will be constructed and be in use during different periods of the overall lifespan of the mine, ranging from around 2-11 years, and will thereafter be rehabilitated. During these periods, highly variable localised screening of these elements by local topography and timber plantations will also occur from positions east, north, west, and southwest of the mine, with the degree of screening expected to be highly locality specific. Based on the viewshed and the above considerations, the LTV of the RSFs and sand tails is rated as moderate (2), in line with the criteria set out in Table 6-1
- Formation of dust plumes - during construction and operations, and especially during dry and windy conditions, it is expected that opencast mining activities and expansion of the RSFs and sand tails will result in intermittent airborne dust plumes, which may be visible for some distance. However, given the generally wetter climate and smaller mining blocks compared to i.e. opencast coal mining operations, the level of visibility of dust plumes associated with mining construction and operations is expected to be moderate (2) and generally of a short duration
- Haulage by road of waste stream material to Port Durnford for disposal – the mine vehicles will be utilising existing national and other public roads and will therefore only be nominally increasing an existing impact within the study area. Additionally, the degree to which mining fleet passing through the study area will be visible will vary, but has been conservatively rated as moderate (2)
- Permanent alteration of site topography and land cover - at final closure, the RSFs and sandtail dump sites will remain in place, but it will be shaped and revegetated. They will still however, be visible across those areas of the landscape where it was visible during operations. The LTV thus remains moderate (2) after closure

8.2.2 VISUAL INTRUSION

Visual intrusion deals with how well the project components fit into the ecological and cultural aesthetic of the landscape as a whole. An object will have a greater negative impact on scenes considered to have a high visual quality than on scenes of low quality because the most scenic areas have the "most to lose".

The visual impact of a proposed landscape alteration also decreases as the complexity of the context within which it takes place, increases. If the existing visual context of the site is relatively simple and uniform any alterations or the addition of human-made elements tend to be very noticeable, whereas the same alterations in a visually complex and varied context do not attract as much attention. Especially as distance increases, the object becomes less of a focal point because there is more visual distraction, and the observer's attention is diverted by the complexity of the scene (Hull and Bishop, 1998). The expected level of visual intrusion of each of the project components is assessed below.

8.2.2.1 Phase 1

- Presence of visually intrusive site office and laydown yard and associated night-time light pollution – the proposed mine offices and other associated infrastructure will result in the removal of, and visual contrast with, the existing timber plantations and other vegetation cover on site. However, existing smallholdings, farming, urban and industrial infrastructure within the study area is similar in appearance to that of the proposed Phase 1 mining activity, and frequently more expansive. The visual intrusiveness of this impact is therefore rates as low (1)
- Opencast mining activities (small-scale) – the proposed Phase 1 opencast mining activities will result in the sequential removal of existing vegetation cover and result in exposed areas of bare, red earth that will notably contrast with the visual surroundings. However, the extent of areas will be reduced due to concurrent backfilling and rehabilitation activities and be similar in extent to that of other existing mining activities in the study area, and is therefore rated as moderately (2) intrusive

8.2.2.2 Phase 2

- Opencast mining activities (large-scale) and associated night-time light pollution – as for Phase 1 the proposed Phase 2 opencast mining activities will result in the sequential removal of existing vegetation cover over the progressively mined parcels/mining blocks, which during mining activities will result in exposed bare areas which will contrast dramatically with the visual surroundings. Once a parcel has been completely mined out, it will thereafter be backfilled and profiled, followed by topsoiling and revegetation activities. The entire mining sequence as described will last approximately 7 years, with rehabilitation requiring a further two to three years. However, given the scale of the mining operations, the visual intrusion of the operational mining areas and associated activities is rated as high (3)
- Presence of visually intrusive PWP complex and infrastructure and associated night-time light pollution – the mining plant and associated support infrastructure will be considerably more expansive and visually complex than that of Phase 1 and will be similar in appearance to that of existing large-scale industrial operations in the study area, but less expansive. The remaining timber bands adjacent to large roads and along most sections of the mining site boundary will also serve to screen the PWP complex from most directly adjacent locations. The PWP complex is also expected to be moderately visible from the eastern part of Zini Riverview Estate but will be

located around 8 km away and will therefore reduce the visual intrusion considerably. Consequently, the visual intrusion has been rated as moderate (2)

- Progressive increase in height and expansion of visually intrusive RSFs and sand tails – these artificial landforms will be tall and occupy large areas of the site, will be largely geometric in shape and/or characterised by mono-gradient slopes, and will be wholly or largely unvegetated while in use (Figure 8-5), for a duration of several years (ranging on around 2-11 years, depending on the facility). Consequently, the visual intrusion of these elements has been rated as high (3)
- Formation of dust plumes – dust plumes are often one of the more socially objectionable impacts associated with opencast mining, due to the associated potential health risks, nuisance factor and degradation of the visual amenity value of the surrounding landscape. By contrast, agricultural activities and other developments surrounding most mining operations do not generate large volumes of dust. However, the formation of dust plumes is likely to be of low significance and frequency within the semi-tropical context of the Port Durnford Project (WSP, 2024), compared with what would be expected in seasonally dryer environments, such as the Highveld, and has therefore been rated at most as moderately (2) intrusive, although this is likely a conservative rating
- Haulage by road of waste stream material to Port Durnford for disposal – as for Phase 1, the visual intrusion of road transport related activities of Phase 2 has been rated as low (1)
- Permanent alteration of site topography and land cover - the RSFs and permanent sand tail dumps will remain in place, but it will be shaped and revegetated. It will thus have a low intrusive value (1) after final rehabilitation and closure. Figure 8-6 shows a naturally revegetated topsoil stockpile at Fairbreeze, illustrating how plant cover significantly reduces the visual prominence of artificial mining landforms in the landscape, noting that the final Port Durnford RSFs and sand tails dumps will be less geometric in appearance than the topsoil dump depicted

Figure 8-5 - Temporary operational sand tails backfill material at the adjacent Fairbreeze Pit C extension illustrating the vertical prominence, geometric nature, and visually intrusive nature of the larger operational dumps typically associated with sand mining in shorter-range views

Figure 8-6 - Example of a naturally revegetated topsoil stockpile at the adjacent Fairbreeze mine

8.2.3 VISUAL EXPOSURE

The visual exposure of a development is a function of the distance between a receptor and the source of the visual impact, and diminishes at an exponential rate as the distance between the observer and the object increases – refer to Figure 8-7. Relative humidity and fog in the area directly influence the effect. Increased humidity causes the air to appear greyer, diminishing detail. Thus, the visual exposure impact at 1 000 m would be 25% of the impact as viewed from 500 m. At 2 000 m it would be 10% of the impact at 500 m. The inverse relationship of distance and visual impact is well recognised in visual analysis literature (Hull and Bishop, 1998) and was used as important criteria for this study.

Thus, visual exposure is an expression of how close receptors are expected to get to the proposed interventions on a regular basis. For the purposes of this assessment, close range views (equating to a high level of visual exposure) are views over a distance of 500 m or less, medium-range views (equating to a moderate/medium level of visual exposure) are views of 500 m to 2 km, and long-range views are over distances greater than 2 km (low levels of visual exposure).

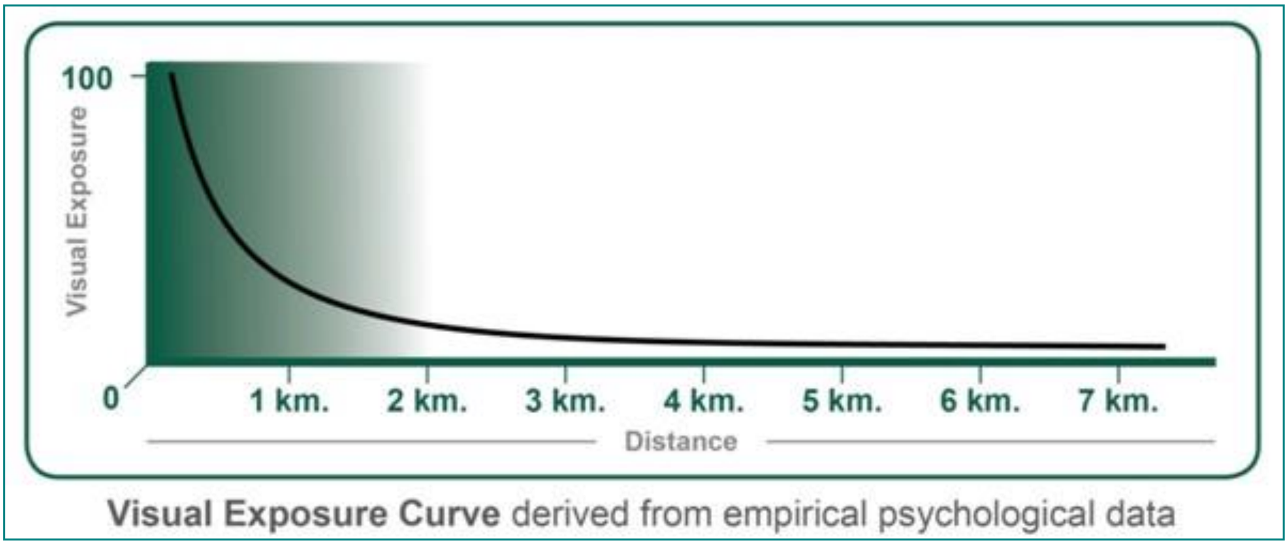

Figure 8-7 - Visual exposure graph

8.2.3.1 Phase 1

- All identified impacts: few receptors are located in close proximity (i.e. within 2 km) to the proposed Phase 1 project site and activities. Accordingly, the degree of visual exposure during this phase is rated as medium (2).

8.2.3.2 Phase 2

- All identified impacts: a large number of resident receptors are located along the northern and southwestern site boundary and in close proximity to the proposed mining activities (i.e. within 500 m), with much larger numbers of people living 2 – 5 km and further away. Views of the proposed RSFs, PWP, sand tails and associated impacts will therefore occur from short-to medium range positions, and thus have high (3) levels of visual exposure.

8.3 IMPACT MAGNITUDE METHODOLOGY

The expected impact magnitude of the proposed project was rated, based on the above assessment of the visual resource value of the site, as well as level of visibility, visual intrusion, visual exposure and receptor sensitivity as visual impact criteria. The process is summarised below.

- *Magnitude = [(Visual quality of the site x VAC factor) x (Visibility + Visual Intrusion + Visual Exposure)] x Receptor sensitivity factor.*

Thus: [(*1 x Factor 1.0*) *x* (*1 + 1 + 1*)] *x Factor 1 = 3.*

From the above equation the maximum magnitude point (MP) score is 51.8 points. The possible range of MP scores is then categorised as indicated in Table 8-2.

Table 8-2 - Impact magnitude point score range

MP score	Magnitude rating
>34.5	Very high: Permanent cessation of processes
26 - 34.5	High: Processes temporarily cease
17.5 – 25.9	Moderate: Processes continue but in a modified way
9 – 17.4	Low: Slight impact on processes
<8.9	Minor: No impact on processes

8.4 IMPACT MAGNITUDE DETERMINATION

Based on the visual resource, VAC, receptor sensitivity and impact assessment criteria assessed in the preceding sections, the magnitude of the various impacts identified was determined for each phase of the project. Consequently, the impact magnitude determination for the construction and operational phases and for the closure phase is presented in Table 8-3.

Table 8-3 - Determination of impact magnitude

Visual impact [(Visual quality of the site x VAC factor) x (Visibility + Visual Intrusion + Visual Exposure)] x Receptor sensitivity factor	Visual resource value	VAC weighting factor	Level of visibility	Visual intrusion	Visual exposure	Receptor sensitivity factor	Impact magnitude point score
Phase 1							
Presence of visually intrusive site office and laydown yard and associated night-time light pollution	2	1	1	1	2	1.2	9.6 (low)
Opencast mining activities (small-scale)	2	1	1	2	2	1.2	12 (low)
Phase 2							
Opencast mining activities (large-scale) and associated night-time light pollution	2	1	2	3	3	1.2	19.2 (moderate)
Presence of visually intrusive PWP complex and infrastructure and associated night-time light pollution	2	1	1	2	3	1.2	14.4 (low)
Progressive increase in height and expansion of visually intrusive RSFs and sand tail dumps	2	1	2	3	3	1.2	19.2 (moderate)
Formation of dust plumes	2	1	2	2	3	1.2	16.8 (low)
Haulage by road of waste stream material to Port Durnford for disposal	2	1	2	1	3	1.2	14.4 (low)
Permanent alteration of site topography and land cover	2	1	2	1	3	1.2	14.4 (low)

Where for:

- visual resource value: very high = 4; high=3; moderate=2; low=1
- visual absorption capacity weighting factor: high = factor 0.8; moderate = factor 1; low = factor 1.2
- visibility, visual intrusion, and visual exposure: high=3; moderate=2; low=1
- receptor sensitivity factor: high = factor 1.2; moderate = factor 1; low = factor 0.8

8.5 IMPACT ASSESSMENT RATING METHODOLOGY

As required by the EIA Regulations (2014) as amended, the determination and assessment of the significance of the visual impacts was based on the following criteria:

8.5.1 THE IMPACT NATURE

A description of what causes the effect, what will be affected and how it will be affected.

Table 8-4 - Nature or type of impact

Nature or type of impact	Definition
Beneficial / Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Adverse / Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct	Impacts that arise directly from activities that form an integral part of the Project (e.g. new infrastructure).
Indirect	Impacts that arise indirectly from activities not explicitly forming part of the Project (e.g. noise changes due to changes in road or rail traffic resulting from the operation of Project).
Secondary	Secondary or induced impacts caused by a change in the Project environment (e.g. employment opportunities created by the supply chain requirements).
Cumulative	Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.

8.5.2 PHYSICAL EXTENT

Physical extent: The geographical scale or reach of the identified impacts:

Table 8-5 - Physical extent rating of impact

Score	Description
1	the impact will be limited to the site;
2	the impact will be limited to the local area (local study area);
3	the impact will be limited to the region;
4	the impact will be national; or
5	the impact will be international;

8.5.3 DURATION

The duration: Wherein it is indicated what the lifetime of the impact will be:

Table 8-6 - Duration rating of impact

Score	Description
1	of a very short duration (0 to 1 years)
2	of a short duration (2 to 5 years)
3	medium term (5–15 years)
4	long term (> 15 years)
5	permanent (this is considered permanent if the impact will be experienced post mine closure)

8.5.4 REVERSIBILITY

Reversibility: An impact is either reversible or irreversible. How long before impacts on receptors cease to be evident.

Table 8-7 - Reversibility of impact

Score	Description
1	The impact is immediately reversible.
3	The impact is reversible within 2 years after the cause or stress is removed; or
5	The activity will lead to an impact that is in all practical terms permanent.

8.5.5 MAGNITUDE

Magnitude: Determination of the extent to which environmental resources are going to be affected as a function of industry-specific parameters and criteria:

Table 8-8 - Magnitude rating of impact

Score	Description
0	small and will have no effect on the environment.
1	minor and will not result in an impact on processes (to be defined by individual specialist fields).
2	low and will cause a slight impact on processes.
3	moderate and will result in processes continuing but in a modified way.
4	high (processes are altered to the extent that they temporarily cease).

Score	Description
5	very high and results in complete destruction of patterns and permanent cessation of processes.

8.5.6 PROBABILITY

The probability of occurrence, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale where:

Table 8-9 - Probability rating of impact

Score	Description
1	very improbable (probably will not happen).
2	improbable (some possibility, but low likelihood).
3	probable (distinct possibility).
4	highly probable (most likely).
5	definite (impact will occur regardless of any prevention measures).

The significance, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;

- The status, which is described as either positive, negative or neutral;
- The degree to which the impact can be reversed;
- The degree to which the impact may cause irreplaceable loss of resources; and
- The degree to which the impact can be mitigated.

The significance is determined by combining the above criteria in the following formula:

Significance = (Extent + Duration + Reversibility + Magnitude) x Probability

$[S = (E+D+R+M) \times P]$

The significance weightings for each potential impact are as follows:

Table 8-10 – Impact significance weighting

Overall Score	Significance Rating (Negative)	Significance Rating (Positive)	Description
< 30 points	Low	Low	where this impact would not have a direct influence on the decision to develop in the area
31 - 60 points	Medium	Medium	where the impact could influence the decision to develop in the area unless it is effectively mitigated

Overall Score	Significance Rating (Negative)	Significance Rating (Positive)	Description
> 60 points	High	High	where the impact must have an influence on the decision process to develop in the area

8.6 DETERMINATION OF IMPACT SIGNIFICANCE

The impact significance criteria presented above was accordingly used to rank the Phase 1 and 2 impacts respectively, as follows:

8.6.1 MAGNITUDE

Based on the impact magnitude ranking as per Table 8-3, the magnitude of the respective impacts has been adjusted in line with Table 8-2 as follows:

- Very high - 5
- High - 4
- Moderate - 3
- Low - 2
- Minor - 1

8.6.1.1 Phase 1

- Presence of visually intrusive site office and laydown yard and associated night-time light pollution – low (2)
- Opencast mining activities (small-scale) – low (2)

8.6.1.2 Phase 2

- Opencast mining activities (large-scale) and associated night-time light pollution – moderate (3)
- Presence of visually intrusive PWP complex and infrastructure and associated night-time light pollution – low (2)
- Progressive increase in height and expansion of visually intrusive RSFs and sand tails – moderate (3)
- Formation of dust plumes – low (2)
- Haulage by road of waste stream material to Port Durnford for disposal – low (2)
- Permanent alteration of site topography and land cover – low (2)

8.6.2 DURATION

Visual impacts will be caused for the duration of the presence/existence of the respective project activities and development, and have accordingly been ranked as follows:

8.6.2.1 Phase 1

- All identified impacts - the duration has been ranked as medium-term (3) as a function of the expected 10-year lifespan of Phase 1

8.6.2.2 Phase 2

- All operational impacts - the duration has been ranked as long-term (4) as a function of the expected 33-year lifespan of Phase 2
- Permanent alteration of site topography and land cover – this impact will persist likely into perpetuity after mine closure has been implemented and was therefore ranked as permanent (5)

8.6.3 PHYSICAL EXTENT

8.6.3.1 Phase 1

- Site-based activities – the scale of the visual impact caused by the site office and opencast mining has been rated as local (2) given the comparatively small footprint of the infrastructure and these activities, respectively
- Haulage by road of ROM material to Fairbreeze Mine for processing – as this activity will take place over a larger geographical area and extend to some distance beyond that of the visual impacts of the mine itself, the scale of this impact has been rated as regional (3)

8.6.3.2 Phase 2

- All identified impacts – given the expansive footprint areas of the mining activities, PWP complex, RSFs and sand tails, respectively, and the high likelihood that these will be visible from a significant percentage of the 10-km radius study area, the scale of these impacts has been rated as local (2)

8.6.4 PROBABILITY

The probability of a visual impact occurring is a function of whether a proposed activity or development will take place. The various project facets of Port Durnford Phases 1 and 2 will take place or be implemented if approved and is therefore ranked as having a definite (5) probability. The only exceptions were deemed to be the visual impact caused by the formation of dust clouds, and of haul trucks on public roads, respectively. While these activities are certain to occur, they are of short-lived or frequent but intermittent occurrence, and therefore rated as having a high (4) probability of visual impact.

8.6.5 REVERSIBILITY

8.6.5.1 Phase 1

- All identified impacts – the impacts are deemed to be immediately reversible (1), as the visual impact will cease as soon as the mining activity is ended, or the infrastructure is removed

8.6.5.2 Phase 2

- All operational impacts - the impacts are deemed to be immediately reversible (1), as the visual impact will cease as soon as the mining activity is ended, or the infrastructure is removed
- Permanent alteration of site topography and land cover – this impact will persist likely into perpetuity after mine closure has been implemented and was therefore ranked as permanent (5)

Using the above ratings, the results of the impact significance assessment before and after mitigation, for the Phase 1 and 2 impacts respectively, are presented in Table 8-11. Recommended mitigation measures are discussed in Section 9.

Table 8-11 - Rating of impact significance

POTENTIAL VISUAL IMPACTS	VISUAL SIGNIFICANCE													
	Before mitigation							After mitigation						
	M	D	E	R	P	SP		M	D	E	R	P	SP	
Phase 1														
Presence of site office and laydown yard and associated night-time light pollution	2	3	2	1	4	**32**	**Mod**	1	3	2	1	4	**28**	**Low**
Opencast mining activities (small-scale)	2	3	3	1	5	**45**	**Mod**	1	3	3	1	5	**40**	**Mod**
Phase 2														
Opencast mining activities (large-scale) and associated night-time light pollution	3	4	2	1	5	**50**	**Mod**	2	4	2	1	5	**45**	**Mod**
Presence of visually intrusive PWP complex and infrastructure and associated night-time light pollution	2	4	2	1	5	**45**	**Mod**	1	4	2	1	5	**40**	**Mod**
Progressive increase in height and expansion of RSFs and sand tails dumpsites	3	4	2	1	5	**50**	**Mod**	2	4	2	1	5	**45**	**Mod**
Formation of dust plumes	2	4	2	1	4	**36**	**Mod**	1	4	2	1	4	**32**	**Mod**
Haulage by road of waste stream material to Port Durnford for disposal	2	4	3	1	4	**40**	**Mod**	1	4	3	1	4	**36**	**Mod**
Permanent alteration of site topography and land cover	2	5	2	5	5	**70**	**High**	1	5	2	5	4	**52**	**Mod**

9 RECOMMENDED MITIGATION MEASURES

Visual mitigation of a mine can be approached in two ways, and usually a combination of the two methodologies is most effective. The first option is to implement measures that attempt to reduce the visibility of the sources of a visual impact. Thus, an attempt is made to "hide" the source of the visual impact from view, by placing visually appealing or screening elements between the viewer and the source of the visual impact.

The second option aims to minimise the degree or severity of the visual impact itself, and usually involves altering the source of the impact in such a way that it is smaller in physical extent and/or less intrusive in appearance. This can be done by decreasing the size of disturbances, or by choices in design, shaping, positioning, colouring and/or covering them in such a way that they blend in with the surrounding scenery to a certain degree. For instance, the visual impact of an artificial landform can be reduced somewhat by shaping it in an appropriate fashion, covering it with topsoil, re-seeding it with indigenous grasses, etc.

Visual mitigation possibilities can however be limited for mining and other large-scale industrial projects, because of the scale and location of the project, as well as various technical, functional, operational and logistical requirements. Visual mitigation efforts should therefore be focussed on implementing operational rehabilitation where feasible, as well as reducing the long-term post-closure impacts caused by the mine, through effective post-operational rehabilitation.

The proposed visual mitigation measures for the Phase 1 and 2 visual impacts, respectively, are presented in Table 9-1.

Table 9-1 - Recommended mitigation measures for visual impacts

Component	Mitigation measures
Phase 1	
Presence of visually intrusive site office and laydown yard and associated night-time light pollution	• Ensure all construction areas are appropriately maintained and kept in tidy order • Reduce the number and size of material laydown and waste storage areas to the extent feasible, and barricade these from view with shade netting/similar if needed • Remove accumulated waste material and unused equipment from site as frequently as is feasible • Repair unsightly and ecologically detrimental erosion damage to steep or bare slopes as soon as possible and re-vegetate these areas using a suitable mix of indigenous grass species • Utilise security lighting that is movement activated rather than permanently switched on, to prevent unnecessary constant illumination • Plan the lighting requirements of the facilities to ensure that lighting meets the need to keep the site secure and safe, without resulting in excessive illumination • Reduce the height and angle of illumination from which lights are fixed as much possible while still maintaining the required levels of illumination • Ensure all high-level light masts and poles are less than 25 m in height, and also less than the average height of surrounding plantation trees • Identify zones of high and low lighting requirements, focusing on only illuminating areas to the minimum extent possible to allow security surveillance • Avoid up-lighting of structures by rather directing lighting downwards and focussed on the area to be illuminated

Component	Mitigation measures
	• Fit all security lighting with 'blinkers' or specifically designed fixtures, to ensure light is directed downwards while preventing side spill. Light fixtures of this description are commonly available for a variety of uses and should be used to the greatest extent possible
Opencast mining activities (small-scale)	• Maintain a visual screen of existing plantation trees, or otherwise plant where needed, of ideally 100 m wide but not less than 50 m wide around boundary of all opencast mining areas. This screen to be managed in x 3 linear rotational harvest zones, to ensure three height cohorts at all times. Harvesting of existing plantation trees that are to serve as visual screens around mining areas and infrastructure is to cease 8 years or more before commencement of mining related activities in a given area, from which point onwards these trees must be maintained as visual screens as described • Vegetate all topsoil berms as soon as stockpiled and ensure maximum height does not exceed 3 m wherever possible
Phase 2	
Opencast mining activities (large-scale) and associated night-time light pollution	• Maintain a visual screen of existing plantation trees, or otherwise plant where needed, of ideally 100 m wide but not less than 50 m wide around boundary of all opencast mining areas. This screen to be managed in x 3 linear rotational harvest zones, to ensure three height cohorts at all times. Harvesting of existing plantation trees that are to serve as visual screens around mining areas and infrastructure is to cease 8 years or more before commencement of mining related activities in a given area, from which point onwards these trees must be maintained as visual screens as described • Vegetate all topsoil berms as soon as stockpiled and ensure maximum height does not exceed 3 m wherever possible • Implement progressive backfilling and concurrent rehabilitation of mined-out opencast areas as part of standard roll-over mining operations
Presence of visually intrusive PWP complex and infrastructure and associated night-time light pollution	• Ensure all construction areas are appropriately maintained and kept in tidy order • Reduce the number and size of material laydown and waste storage areas to the extent feasible, and barricade these from view with shade netting/similar if needed • Remove accumulated construction waste and unused parts and equipment from site as frequently as is feasible • Repair unsightly and ecologically detrimental erosion damage to steep or bare slopes as soon as possible and re-vegetate these areas using a suitable mix of indigenous grass species • Utilise security lighting that is movement activated rather than permanently switched on, to prevent unnecessary constant illumination • Plan the lighting requirements of the facilities to ensure that lighting meets the need to keep the site secure and safe, without resulting in excessive illumination • Reduce the height and angle of illumination from which lights are fixed as much possible while still maintaining the required levels of illumination • Ensure all high-level light masts and poles are less than 25 m in height, and also less than the average height of surrounding plantation trees • Identify zones of high and low lighting requirements, focusing on only illuminating areas to the minimum extent possible to allow security surveillance • Avoid up-lighting of structures by rather directing lighting downwards and inwards focussed on the area to be illuminated and away from surrounding receptors • Fit all security lighting with 'blinkers' or specifically designed fixtures, to ensure light is directed downwards while preventing side spill. Light fixtures of this description are commonly available for a variety of uses and should be used to the greatest extent possible

Component	Mitigation measures

Progressive increase in height and expansion of visually intrusive RSFs and sand tails	• Maintain a visual screen of existing plantation trees, or otherwise plant where needed, of ideally 100 m wide but not less than 50 m wide around boundary of all RSFs and sand tails dumps during operations. This screen to be managed in x 3 linear rotational harvest zones, to ensure three height cohorts at all times (Figure 9-1). Harvesting of existing plantation trees that are to serve as visual screens around mining areas and infrastructure is to cease 8 years or more before commencement of mining related activities in each area, from which point onwards these trees must be maintained as visual screens as described
	• Ensure existing plantation trees to be retained as tree screens are structured into screening cohorts 6-8 years prior to commencement of mining activities or construction/deposition of sand dump/RSFs, to ensure adequate screening is provided. Similarly, additional timber screening trees to be planted 6-8 years prior to mining/dump construction that it is intended to screen
	• Tronox should engage with Mondi to include the relevant plantation tree screening management requirements in their commercial agreements, to ensure that Mondi maintain the required visual screens as specified for the duration of the mining operations
	• If possible, implement concurrent operational rehabilitation of the RSFs and sand tails side slopes to reduce the visual intrusion, including:
	  ◦ Shape RSFs and sand tails side slopes and crest to pre-determined maximum gradient/s which will prevent erosion and allow for adequate vegetation growth
	  ◦ Place growth medium to a suitable depth and re-vegetate using a suitable mix of indigenous grass species
	• Investigate potential RSF and sand dump layout, design and final rehabilitation optimisation, i.e. creating combined landform between RSF 9 and Sand Dump 8B, which would create additional deposition volume between the landforms and provide potential for creating a more natural appearing final landform

Formation of dust plumes	• Water down haul roads and large bare areas as frequently as is required to minimise airborne dust • Apply chemical dust suppressants if deemed necessary • Enforce a 40 km/h speed limit on-site for all vehicles • Continue to monitor dust fallout using the existing dust monitoring programme • Rehabilitate all exposed footprints, backfilled mining areas and where feasible residue facility side slopes as soon as possible
Haulage by road of waste stream material to Port Durnford for disposal	• No visual mitigation measures identified
Permanent alteration of site topography and land cover	• Shape the RSFs and sand tails to be as natural in appearance as possible • Distribute topsoil over the RSFs and sand tails and actively revegetate (using grasses) to establish a vigorous and self-sustaining vegetation cover • Conduct rehabilitation trials to establish the relinquishment criteria under which Mondi would again take over the respective rehabilitated sand dumps and RSFs. The suitability of these areas for the purposes of again establishing timber plantations will be a function of slope in combination with nature and depth of cover material, as well as other factors such as erosion prevention and control • Conduct on-going monitoring and maintenance of the rehabilitated areas to ensure that vegetation establishes successfully, and that erosion does not occur • Employ ongoing control measures to eradicate weedy and alien invader plant species

Component	Mitigation measures
	• Implement all reasonable efforts to in the long run return the greater majority of the mine affected land, post closure, to viable and productive farmland, timber production, sugar cane plantation, and/or other similar agricultural uses

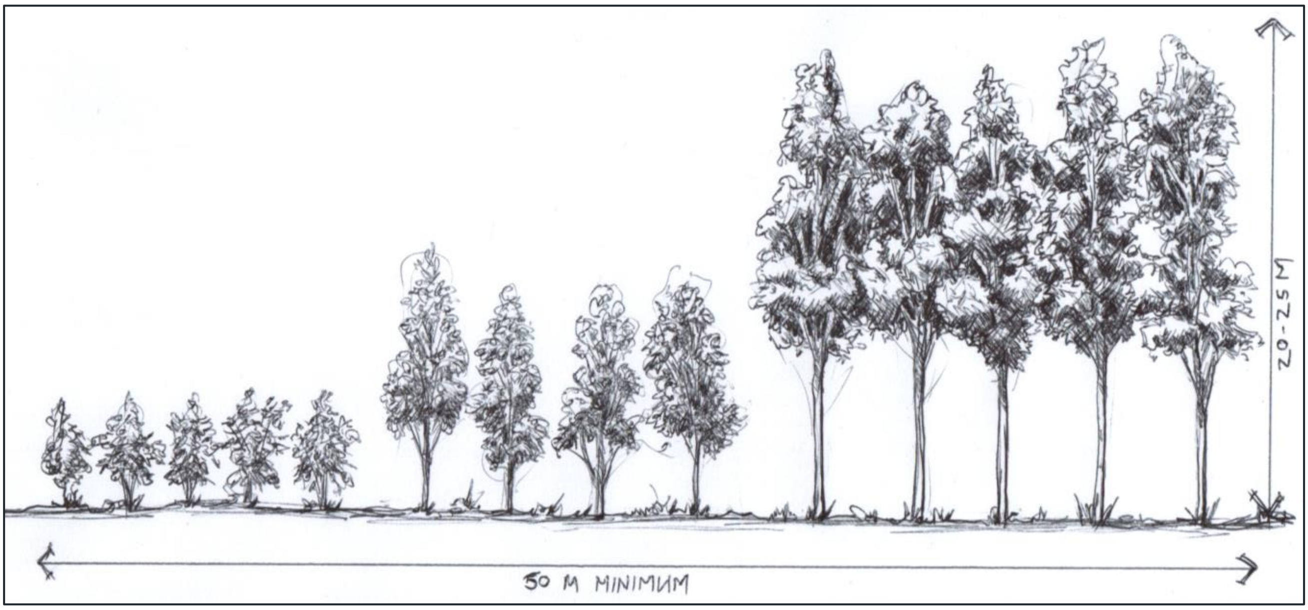

Figure 9-1 – Tree screens to be managed in linear rotational harvest zones, to ensure three height cohorts at all times

Figure 9-2 shows the positions of the recommended additional timber screens around the mine perimeter, in instances where plantations are not currently present. Most of the proposed screens are indicated at a width of 100 m, however due to site constraints in certain locations the width of the screens may need to be restricted to no less than 50 m (at a height of 25 m).

Figure 9-3 presents the results of the viewshed analysis with the existing timber bands of 100 m width to be retained around the mining areas, other plantation areas (all at an assumed height of 25 m) and natural forest vegetation (assumed height of 10 m), as well as the recommended additional timber screens as described above.

Note that no additional timber plantations are recommended where natural forest/swamp vegetation currently occurs, to protect the remaining habitat within the study area. The proposed tree screens should therefore be planted along the following areas (noting that no indigenous forest or wetland vegetation is to be removed in the process):

- Directly north of the N2 highway, along the "S" curve section of the highway between Zini Riverview Estate and the mine
- Along the southwest-most section of the mine boundary, south of the N2 highway
- Along the southern and western boundaries of Sand Dump 8, i.e. north of the R102 road and northwest section of the mine boundary
- Sections of the southern mine boundary where gaps/breaks in the existing timber plantations occur
- Sections of the northern mine boundary where gaps/breaks in the existing timber plantations occur

- Sections on either side of the N2 where prominent gaps/breaks in the existing timber plantations occur

The results indicate the effectiveness of these screening measures over short-range views close to the respective mining features/areas, while they are expected to remain somewhat more visible from longer-range views and elevated locations in relation to the site.

However, an important point to consider as explained in Section 8.2.1, is that this viewshed illustrates the cumulative maximum visibility of the mine site and various mining landforms within the entire study area, over the total life of mine. In actuality, the effective level of visibility of the mine site from any one location will be significantly reduced, due to local topography, buildings, existing and additional vegetation screening (refer to Figure 9-4). The following observations are made in this regard:

- The visual impacts as observed from the eastern end of Zini Riverview Estate (viewpoint 1) will largely be caused by RSF 9 (roughly 3 - 6 km from this location) which would be visible from 2036 to 2038, whereafter it will progressively be obstructed by the construction of Sand Dump 8B (located around 2 km from this location) from 2048 to 2053, whereafter the latter will be rehabilitated. The only other structures that will be partially visible are the western slopes and tops of sand dumps A-2, A-3, and A-1, which will be created from 2036 to 2047 whereafter they will be rehabilitated, and that will be located between 3.5 - 8 km from this location
- From the centre of Zini Riverview Estate (viewpoint 2) the results are somewhat similar, however the level of visibility of all the aforementioned mining landforms will be significantly reduced, due to topographical occlusion and the presence of existing buildings and vegetation, and will also be approximately 1 - 1.5 km further away
- The visibility of most of the mining landforms is expected to be very limited to almost zero from much of the areas immediately south of the mine (represented by viewpoint 3), mostly due to topographical occlusion and screening by the remaining plantations south of the N2. However, direct line-of-sight of the taller sand dumps or RSFs is expected where breaks in the vegetation occur and no further screening will be implemented, such as sparser areas of swampland vegetation
- Similarly, visibility of the mining landforms from directly to the east (viewpoint 4) is expected to be very limited, due to the substantial areas of plantations between the town/residential areas and the mine
- Visibility of the mine landforms from the north (viewpoint 5) is expected to be the most variable, due to the more hilly and contoured topography, somewhat higher general elevation in relation to the mine, lack of timber plantations between the mine and surrounding housing areas, and generally sparser vegetation cover. However, the addition of the proposed tree screen along the northern boundary of the mine will generally reduce the visibility of these structures to their upper slopes and tops

Further, while the cumulative viewshed indicates that the whole PWP plant site is expected to be visible from within the study area, this would largely be limited to vehicles driving past this site immediately to the south along the N2, as well as potentially from some of the highest locations north and further from the site. Limited to no visibility of the PWP plant is also expected from Zini Riverview Estate and other establishments west of the mine. The visual impact from directly visible light sources associated with the plant, which is expected to be the main source of potential light pollution associated with the mine, is therefore also expected to be limited.

Figure 9-5 shows two representative line-of-sight section lines through the life-of-mine site with the cumulative maximum viewshed of the existing and planned vegetation screening in place. Figure 9-6 shows the +-1:1 vertical vs. horizontal line-of-sight of section 1, a location west of the mine indicating that the low existing natural vegetation between the mine and receptors located in Zini Estate will not screen Sand Dump 8B from view from this location. However, the addition of tree screens north of the N2 highway and along the mine boundary south of the sand dump, which will be planted approximately 6-8 years before construction of the dump, will largely screen the dump from view. As the dump progressively increase in height, the upper sections of Sand Dump 8B and a section of the top of RSF 9 will be visible for the duration of mining operations, highlighting the need for operational and post-closure rehabilitation.

The section indicates the importance of planting the additional tree screens 6 - 8 years before construction of the dump it is intended to screen commences, and that the 3 screening zones be established, to provide the maximum period of screening during operations. This is especially true as areas of the dump illuminated for night-time operations would not be screened during approximately the latter half of its use, highlighting the need for additional lighting mitigation measures, as indicated in Table 9-1.

Similarly, Figure 9-7 shows the line-of-sight through the northern half of the main mining block, across RSF C. The vast area of timber plantation located between Esikhawini residential area and the N2, will effectively screen RSF 9 from view. However, the top of this structure may be visible from locations north of the mine such as Vulindlela. The introduction of additional timber screening along the northern mine boundary is expected to assist in greatly reducing the visibility of this and other mining structures and areas from the north.

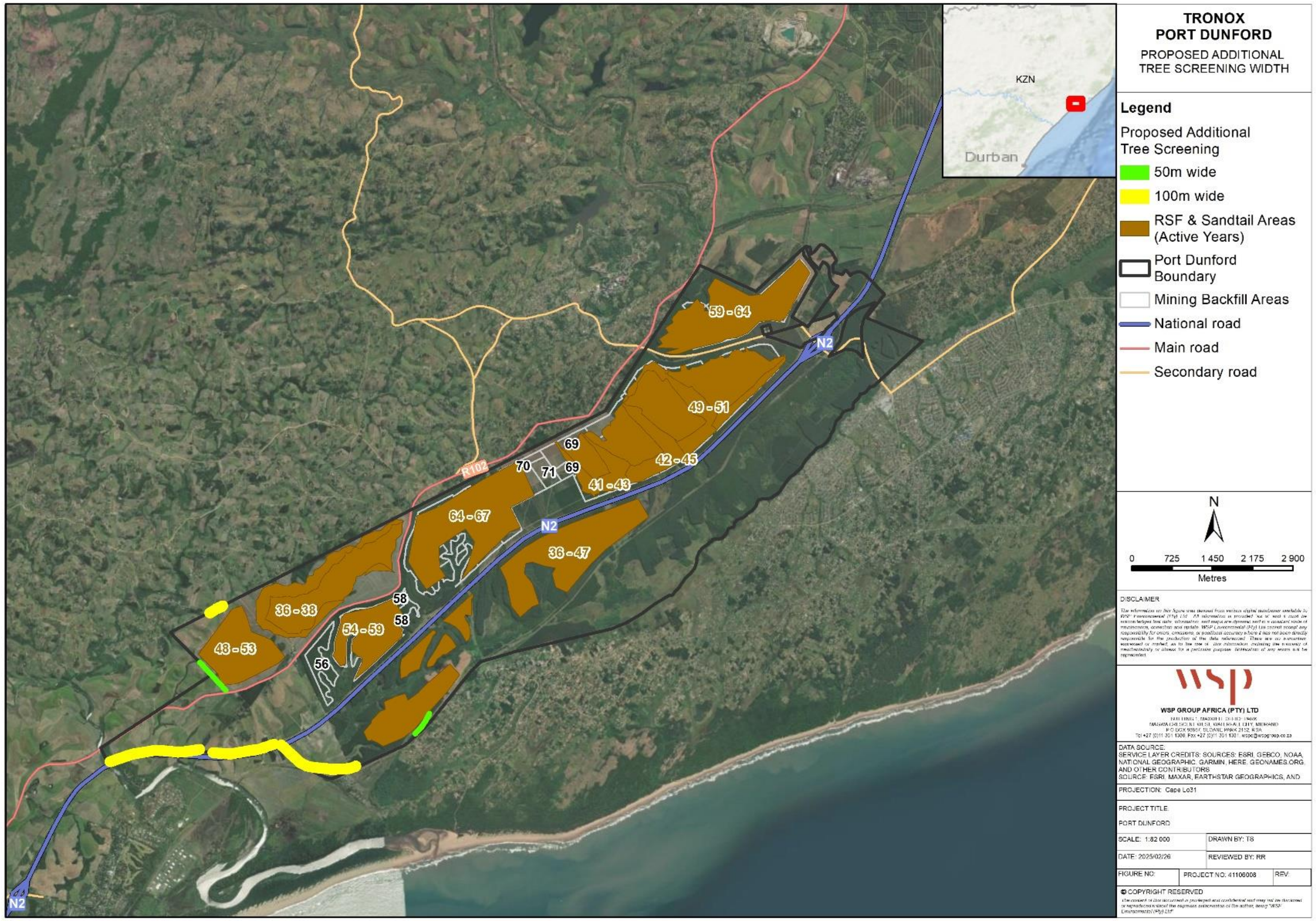

Figure 9-2 - Positions of recommended additional tree screens

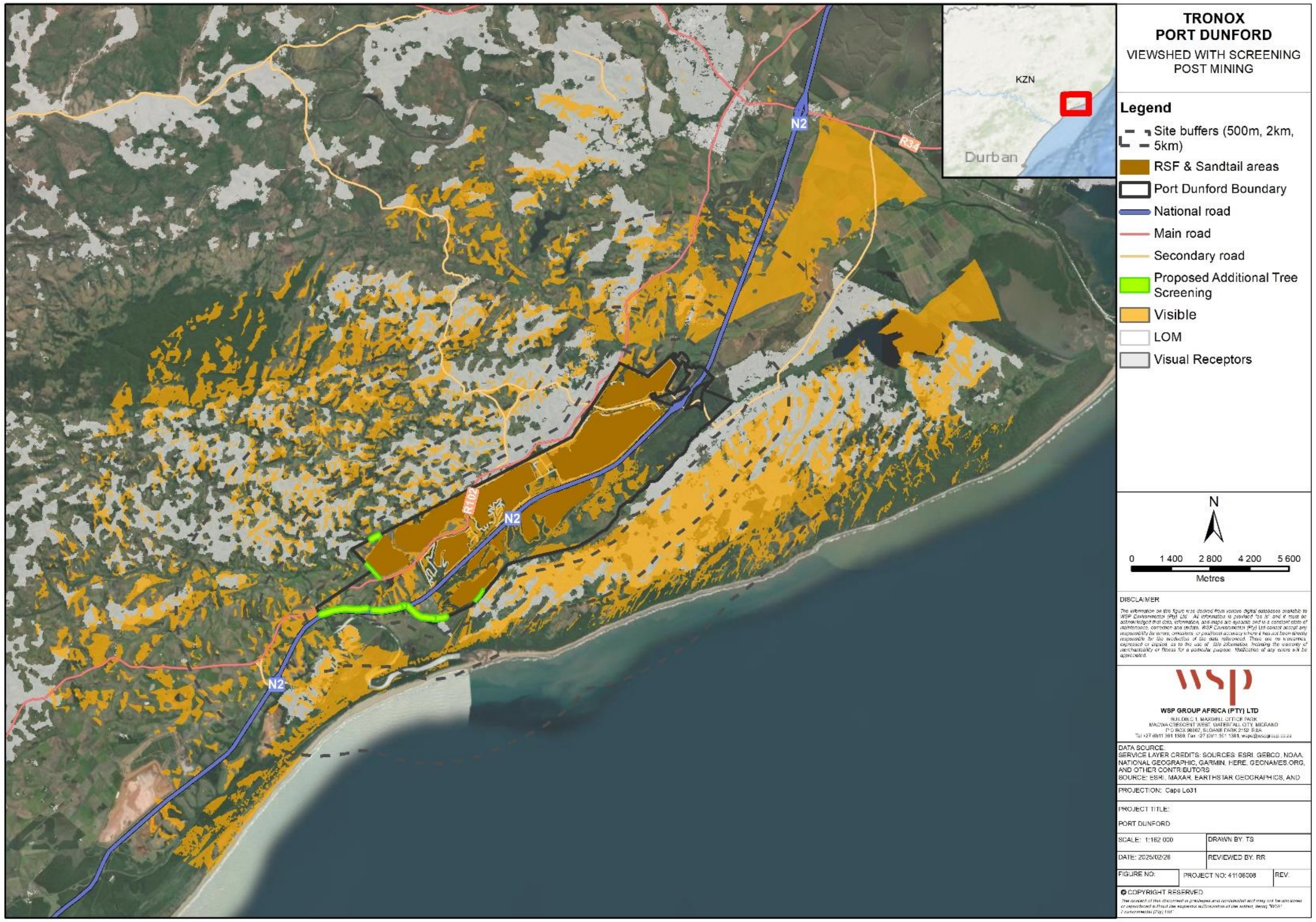

Figure 9-3 - Cumulative maximum viewshed of the proposed RSFs and sand tails (post mining) with additional vegetation screening

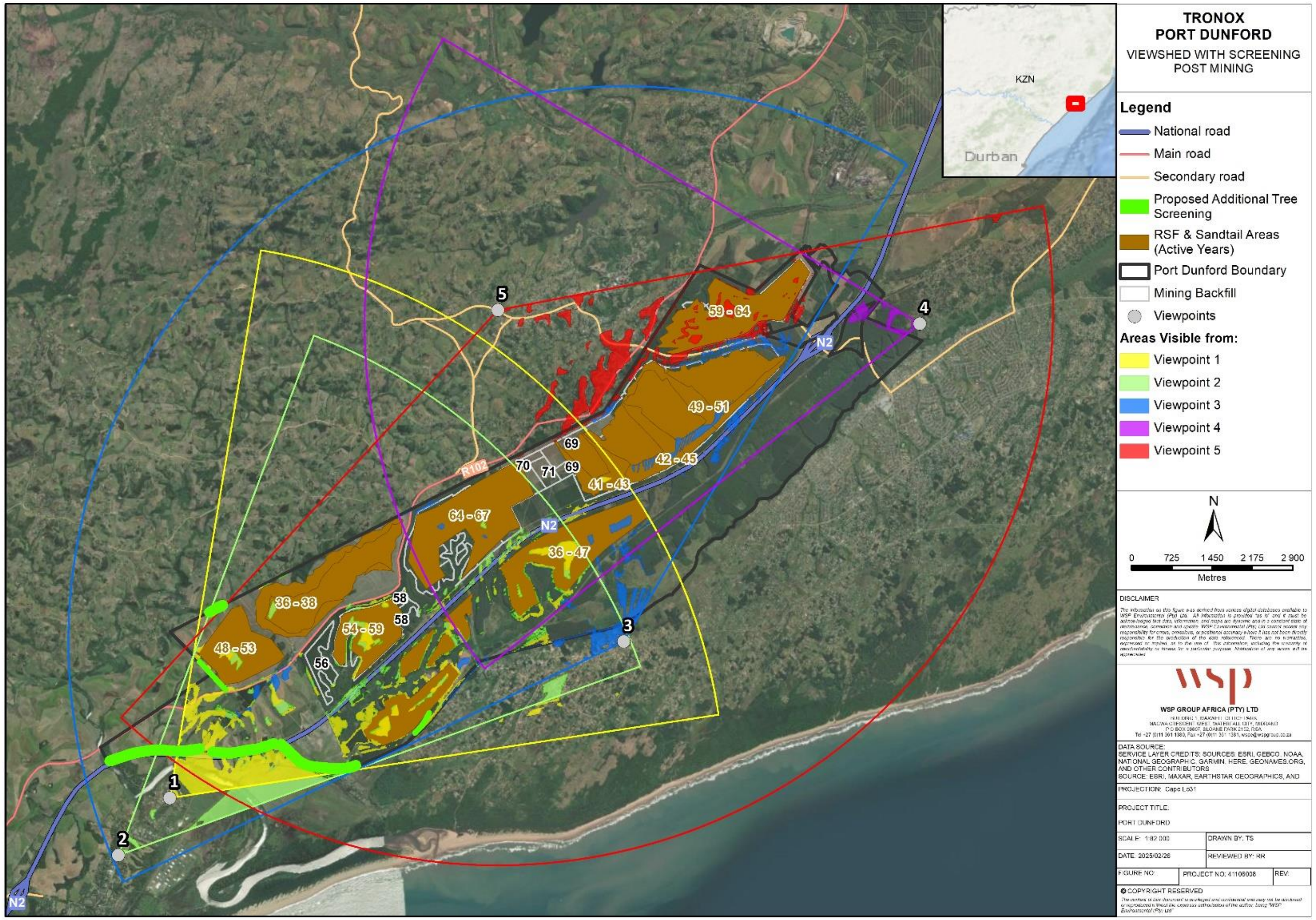

Figure 9-4 - Viewshed (post mining) with vegetation screening from five representative viewpoints within study area

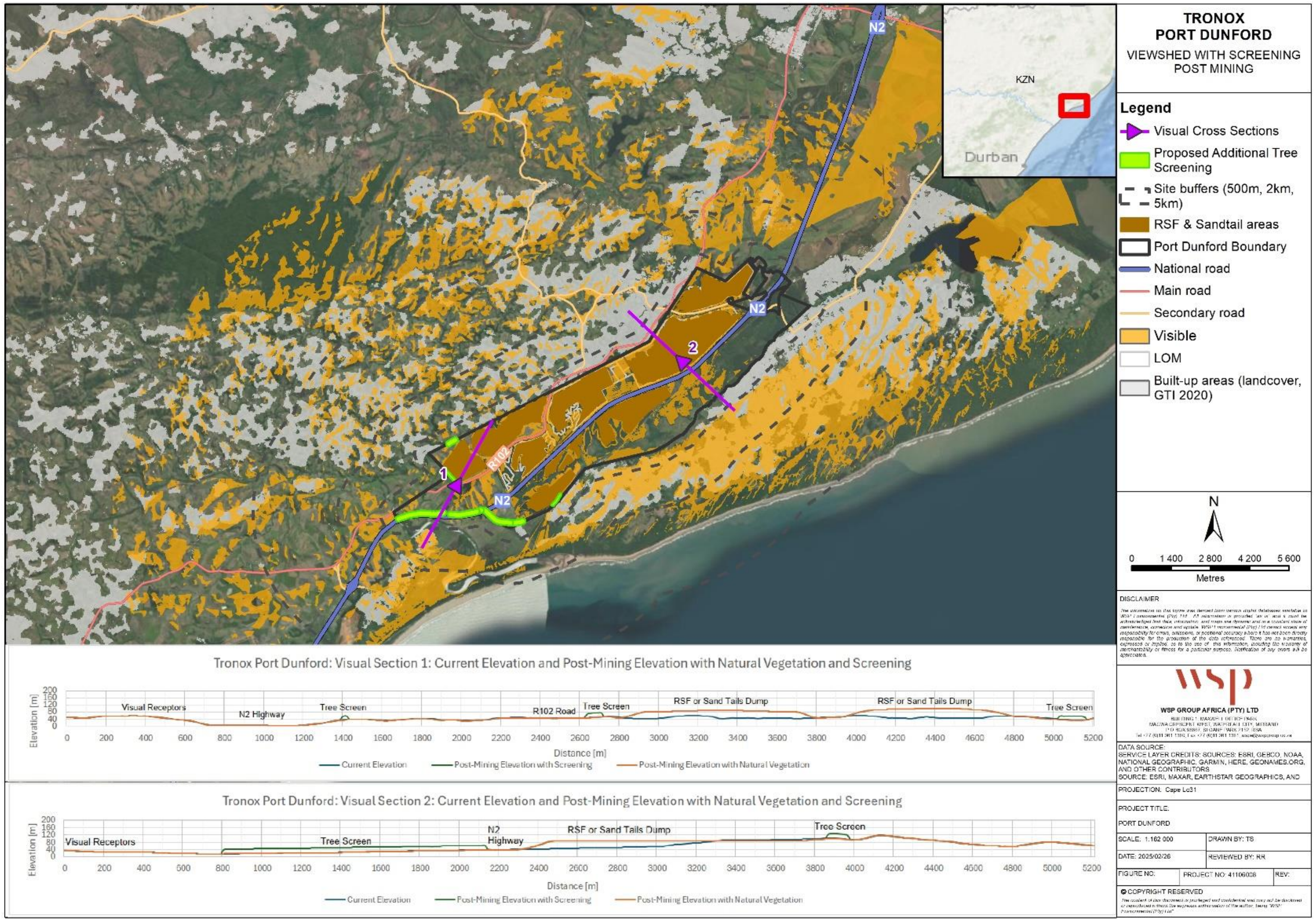

Figure 9-5 - Line-of-sight sections (1V:1) through the project site (post mining) with vegetation screening

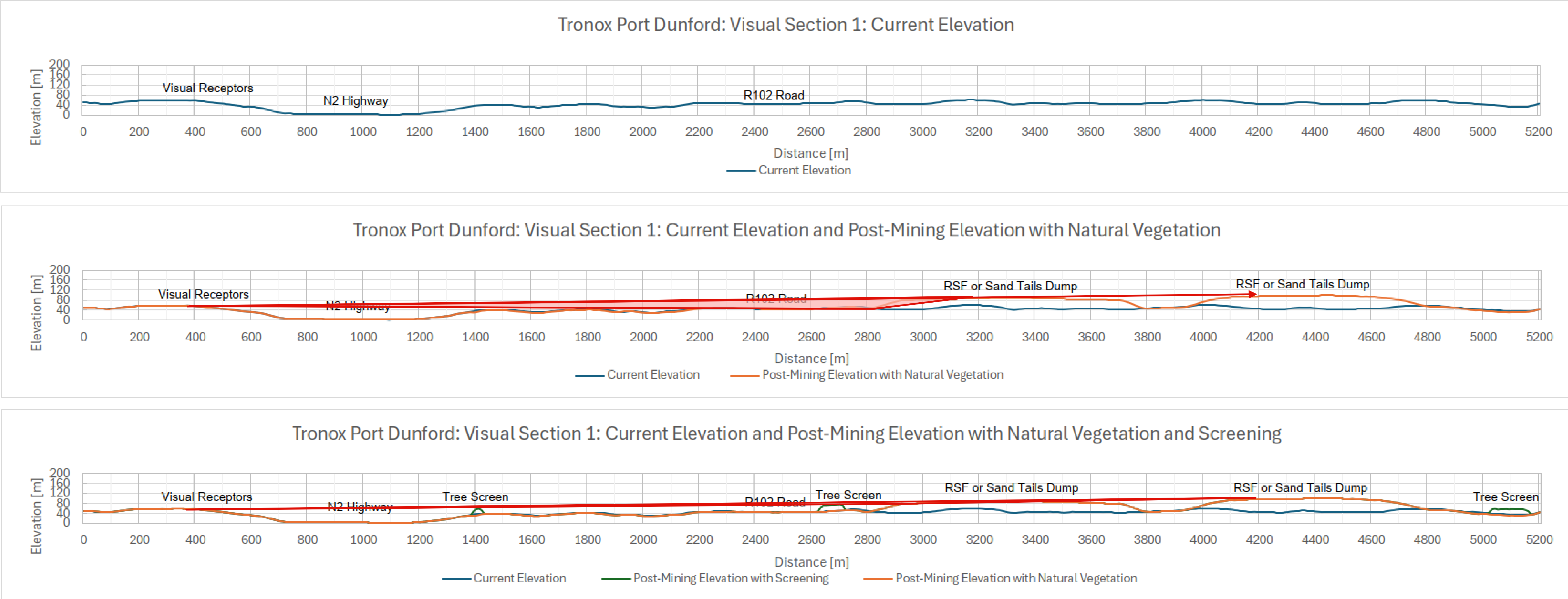

Figure 9-6 – Line-of-sight (+-1:1 vertical vs. horizontal) of section 1 (as per Figure 9-5) through the current project site (top), and post-mining site without (middle) and with additional vegetation screening (bottom) indicating reduced visibility of Sand Dump 8B (red cones)

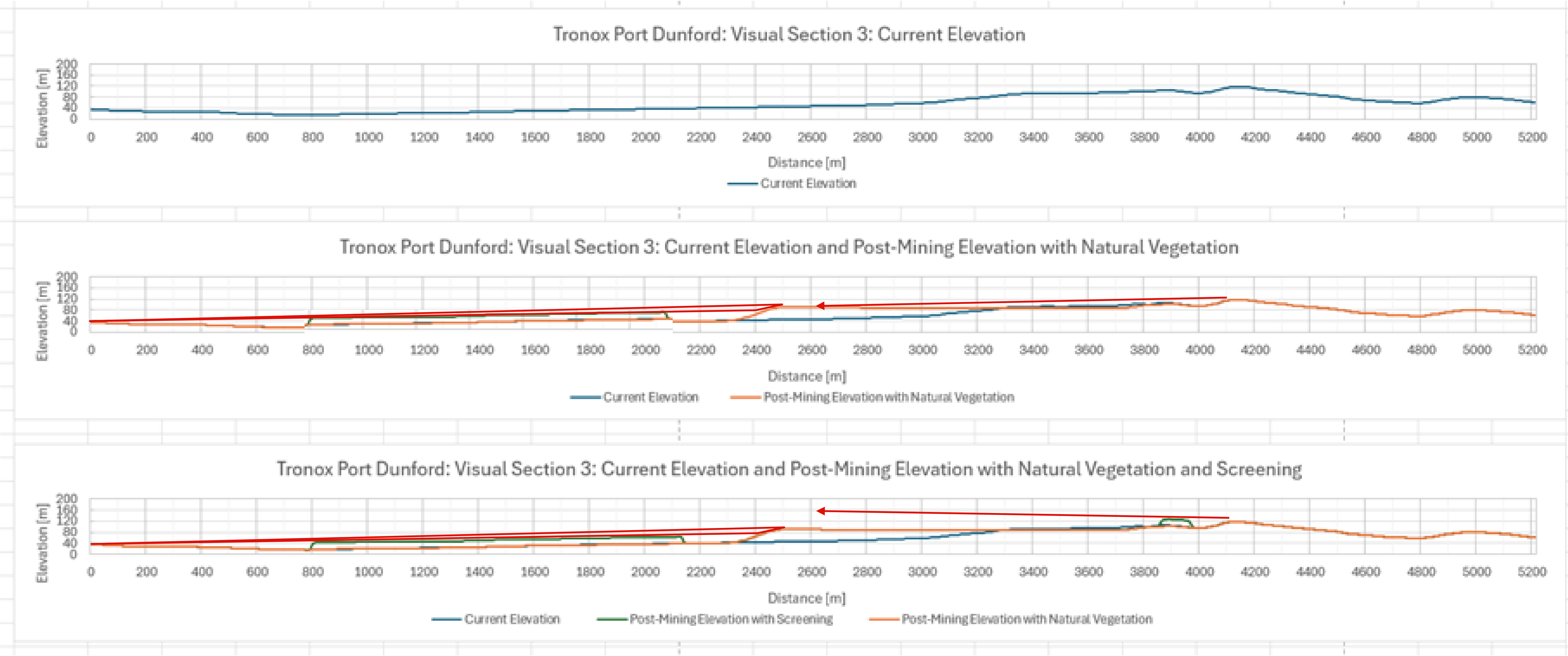

Figure 9-7 - Line-of-sight (+-1:1 vertical vs. horizontal) of section 3 (as per Figure 9-3) through the current project site (top), and post-mining site without (middle) and with additional vegetation screening (bottom) indicating reduced visibility of RSF C (red cones and arrows)

10 CUMULATIVE IMPACT STATEMENT

A cumulative impact evaluation considers the potential impacts and risks of proposed developments in the context of the effects of other similar existing and planned activities on the receiving environment. Cumulative impacts can therefore be seen as the total result of environmental impact from all existing and planned projects and activities in a defined area. A key objective of cumulative impact assessment is proposing feasible measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible, from a wholistic perspective.

From a visual perspective, the cumulative impact of a project would therefore be the extent to which the project would further contribute to the existing natural landscape being transformed in a certain manner. The region was predominantly hilly grassland interspersed by coastal forests along valleys and ravines as well as wetland swamps and coastal dune plant communities. The area was subsequently used for timber and agricultural production but has also been substantially transformed by urban expansion, localised industrial development, and localised mining over the years (Figure 10-1). Regarding the latter, the following mining activities are or will be located close to the proposed Port Durnford mine:

- The existing Fairbreeze mine is located roughly 4 km south-west of the proposed Port Durnford mine, immediately adjacent to Mtunzini;
- The previous, historically rehabilitated Hillendale mine is located directly east of Port Dunford; and
- The proposed Zulti South mineral sands mine in the coastal dunes east of Port Durnford.

These existing mining activities result in the sequential removal of the existing vegetation cover and exposed active opencast mining activities followed by concurrent backfilling and eventual rehabilitation, as well as permanent alteration of sections of the site topography, and presence of mining infrastructure, which drastically impact the visual character and appearance of the affected sections of landscape. However, it must be noted that the extent of existing mining activities so far makes up a comparatively small percentage of the visual study area, and the level of visibility of these areas are highly location specific.

The proposed Port Durnford (and Zulti South) opencast mining activities, and associated RSFs and sand tails, plant and infrastructure development, can therefore be expected to further cumulatively impact the general visual aesthetics of the study area. The level of perceived impact will also vary depending on the degree of visibility of the proposed mining activities from different receptor locations and vantage points. The implementation of the proposed visual mitigation measures and progressive rehabilitation during operations will contribute to reducing these impacts.

Furthermore, the plant, infrastructure and facilities associated with the Port Durnford mine as well as that of other local mines will be removed during eventual decommissioning and closure and the associated footprints rehabilitated, which will significantly reverse the cumulative operational visual impact of these areas. Operational rehabilitation of the RSFs and sand tails dumps if implemented where feasible, will also contribute towards reducing the cumulative visual impact of the project during operations. However, these landforms will remain permanent visible features of the landscape even following rehabilitation and revegetation and therefore result in a permanent, if reduced, cumulative visual impact.

Notwithstanding, if the mining site is appropriately rehabilitated and returned to agricultural and timber uses, the long-term/permanent cumulative visual impact will be largely negligible, and thereby ensuring the pre-mining visual condition of the study area is maintained after closure.

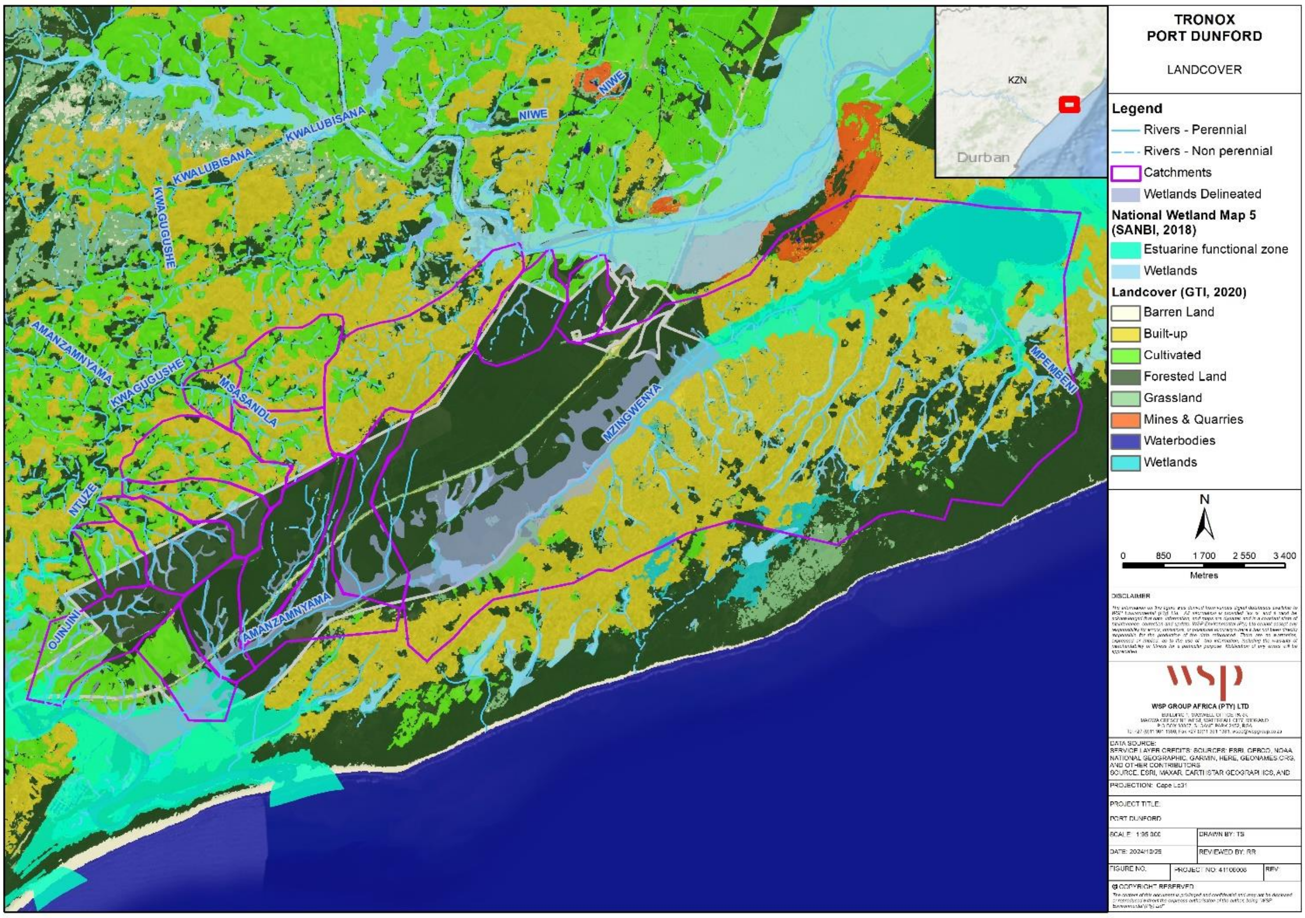

Figure 10-1 - Land cover of the site and immediate surroundings indicating presence of localised existing sand mining activities (orange) which would create a cumulative visual impact with the Port Durnford operations

11 CONCLUSIONS

The proposed Port Durnford opencast sand mining project is located in a mostly modified, visually varied setting. Various urban, industrial, and mining activities have transformed large parts of the study area from an agriculture-dominated landscape characterised by various morphological types (including closed hills, woodlands, grasslands, and subtropical forests), into a predominantly developed and complex landscape. Nevertheless, the remaining areas of natural coastal forest and swamp vegetation together with the vast areas of timber plantations and other agricultural uses provide visual diversity and appeal. The visual resource value of the study area is therefore largely rated as moderate, but with notable exceptions being the remaining areas of coastal forest and swamp vegetation, which are deemed to be of high visual resource value. Based on the varying degrees of landscape transformation and undulating topography within the surrounding landscape, in combination with the largely uniform land cover of the project site itself, the visual resource value of the receiving environment is also rated as moderate.

A large number of resident receptors surround the mine within the surrounding 10 km study area and are expected to attach varying levels of value to the landscape (sensitivity factor), ranging from moderate to high. Specifically, residents of the Zini Riverview Estate and Mtunzini, as well as agricultural smallholdings and other enterprises located south and west of the mine, have expressed concern regarding the proposed mining development. Additionally, many transient receptors also pass through the study area, mainly via the N2 highway and R102 road.

GIS-based viewshed analyses of the mine development has indicated that aspects of the site are expected to cumulatively be visible from a large percentage of the study area. However, the visibility of the site and individual mining landforms will be far less from any given viewpoint within the study area, due to localised screening by local topography, vegetation, buildings, and other landcover.

A further point to consider is the fact that the mining process (both active mining and progressive backfilling of the mine workings, as well as construction and subsequent deposition of respective sand tails and RSF dumps) will be temporally and spatially dynamic. Consequently, the areas of the mine resulting in a visual impact will be limited to certain parts of the site at any point in time. The opencast mining blocks will typically be backfilled between one to two years after they have been mined, with the various RSF dumps being constructed over backfilled areas once they become available for this purpose. The individual RSF side walls will typically continue to be built up for between two to six years, whereafter the side walls can be progressively rehabilitated. Similarly, deposition on the various sand dumps will last for between six and eleven years, whereafter these landforms can be rehabilitated.

Notwithstanding, the proposed project will have negative impacts on the visual environment. These centre on the physical presence of the proposed mining areas, residue facilities, and the resulting nigh-time illumination and other operational activities. As mentioned, it is anticipated that some of these impacts will be partially screened by the rolling topography and land cover (especially the timber plantations), or otherwise 'absorbed' to some extent by the prevailing transformed character of the study area. Nevertheless, especially the vertically tall and expansive RSFs and sand tail dumps may at times be visible from within a large percentage of the study area.

Several initial and operational visual mitigation measures have been proposed including implementation and maintenance of additional tree screens mainly along the southern, western and northern mine boundary areas, reduction and optimisation of operational and security lighting, and progressive/concurrent rehabilitation where feasible. However, the most impactful visual mitigation will occur because of the closure-phase demolition and removal of the mine plant, final shaping and rehabilitation of the various mining landforms, and reinstatement of agricultural and timber land uses of the closed mine site.

Operational rehabilitation of the RSFs and sand tails dumps, which if implemented where feasible, will also contribute towards reducing the cumulative visual impact of the project during operations. These landforms will remain permanent visible features of the landscape after mine closure. However, if the mining site is appropriately rehabilitated and returned to agricultural and timber uses, the long-term/permanent cumulative visual impact of the project will be largely negligible, and thereby ensuring the pre-mining visual condition of the study area is maintained after closure.

11.1 VISUAL IMPACT STATEMENT

It is concluded that, from a visual impact perspective, the proposed Port Durnford Mine project can proceed, provided that the recommended visual mitigation measures as detailed in this report are implemented. It is furthermore recommended that operational and closure phase rehabilitation and visual mitigation measures be revised and updated during operations, as mining progresses and additional information becomes available.

12 REFERENCES

Coastal and Environmental Services. (2008). *Port Durnford - Terrestrial Ecological Assessments for EXXARO KZN Sands. Durban, South Africa.*

Crawford, D. (1994). *Using remotely sensed data in landscape visual quality assessment, Landscape and Urban Planning, 30, pp. 71–81.*

Demetriades, D., & Forbes , A. (2008). *Port Durnford Pre-Feasibility Study - Water Quality and Biological Monitoring. Specialist report for Exxaro KZN March 2008. 41 pp.*

Exigent Engineers Consultants . (2007). *Identification and Delineation of Wetlands and Riparian Areas using terrain, soil wetness indicators as well as the case of Sandy Coastal Aquifers, for Port Durnford Plantation in Zululand Kwazulu Natal Mapped at a reconnaissance level.* Hilton.

Oberholzer, B. (2008). *Guideline for involving visual and aesthetic specialists in EIA processes, DEA Visual Guideline, Edition 1.*

SAWS. (2022.). *South African Weather Service. Department of Forestry, Fisheries and the Environment. RSA.*

Snyman, K., & Associates. (2003). *Port Durnford Pre-Feasibility Mining Study. Report on the Soils, Land Capability and Land Use .* Pietermaritzburg.

Tronox. (2020). *Social and Labour Plan 2025-2029: Application for Port Durnford Mine.* Tronox KZN Sands.

Tyson, P., & Preston-Whyte, R. (2000). *The Weather and Climate of Southern Africa, 2nd Ed, Oxford University Press Southern Africa, .* Cape Town.

WSP. (2023). *Port Dunford Sand Mining Project_Soil and Agricultural Potential Study.* Midrand, Johannesburg.

WSP. (2024). *Air Quality Impact Assessment - Port Durnford Project.* Midrand: WSP.

WSP. (2024a). *Integrated Environmental Authorisation for the Port Durnford Mine, Kwazulu-Natal - Draft Scoping Report.* Midrand, Johannesburg: WSP.

WSP. (2024a). *Intergrated Environmental Authorisation for the Port Durnford Mine, KwaZulu-Natal. Draft Scoping Report.*

WSP. (2024b). *Port Durnford Project_Air Quality Impact Assessment.* Midrand, Johannesburg.

WSP. (2024c). *Port Dunford Sand Mining Project_Hydrofeological investigation.* Midrand, Johannesburg.

WWF, & IUCN. (1994). *Centres of plant diversity. A guide and strategy for their conservation. Volume 1. .*

Young, G. (2004). *Visual impact assessment for proposed long-term coal supply to Eskom's Majuba NLA.* Johannesburg.

Appendix A

CV OF SPECIALIST

Johan Bothma

Earth & Environment - Rehabilitation & Closure, Visual Assessment Specialist, Registered Landscape Architect

CAREER SUMMARY

Johan is the Director for Rehabilitation and Closure based in the Midrand, South Africa office. He has 20 years consulting experience and is currently advancing closure planning and costing for mining, industrial, power, and renewable sector operations, with a focus on risk mitigation, post mining land use planning, and land stewardship. Johan has completed mine closure related projects for a wide variety of commodities throughout Africa and abroad, including sites throughout South Africa, and in Zambia, Mozambique, Botswana, Namibia, Uganda, the DRC and Congo, Ghana, Guinea, Mauritania, the UK, Mexico, and Uzbekistan. He specialises in visual assessment and graphic representation of project impact and mitigation and also has considerable experience in impact assessment, environmental management plans, and auditing for mining, industrial, commercial and property development and projects.

Johan is a professionally registered Landscape Architect and completed his master's degree in 2004, focusing on climate responsive design and energy efficiency for residential developments. He has previously worked on various landscape planning and design projects, including large scale open space management plans, as well as landscape architectural design for prestige governmental projects including the Presidential residence in Bryntirion Estate in Pretoria.

16 years with WSP

20 years of experience

Area of expertise

Advancing Closure Planning and Costing

Land Use Planning and Latent Risk Mitigation

Visual Assessment

Environmental Management Plans

Auditing for Mining, Industrial & Commercial

Property Development

Open Space Management Plans

Landscape Design Projects

Open Space Management Plans

Language

Afrikaans – Fluent

English – Fluent

EDUCATION

MLArch Landscape Architecture, University of Pretoria, Pretoria	2004
BL Landscape Architecture, University of Pretoria, Pretoria,	2001

Johan Bothma

Earth & Environment - Rehabilitation & Closure, Visual Assessment Specialist, Registered Landscape Architect

PROFESSIONAL AFFILIATIONS

Institute of Landscape Architecture of South Africa (ILASA)	2007
South African Council for the Landscape Architectural Profession (SACLAP)	2007

PROFESSIONAL HISTORY

WSP Group Africa (Pty) Ltd.	July 2022 – present
Golder Associates Africa (Pty) Ltd.	2008 – June 2022
African EPA	2004 – 2007
University of Pretoria (part-time contract)	2003
Strategic Environmental Focus SA (part-time contract)	2002 – 2003
Karien Hanekom Landscape Architects (part-time contract)	2001 - 2002
Maarten Venter Landscape Architects (part-time contract)	2000

PROFESSIONAL EXPERIENCE

REHABILITATION AND CLOSURE

Anglo American Platinum – Limpopo Province, South Africa
2021 – ongoing
Project director
Ongoing closure planning and costs development aligned to the requirements of GN R. 1147, Anglo American Mine Closure Toolbox Version 3 and IRMA, including operational rehabilitation planning and residual costs quantifications.

Sasol Secunda - Mpumalanga, South Africa
2015; 2017; 2019; 2021-2022
Project manager/technical director
Project manager 2015 and 2017, and technical direction and review 2019 and 2021-22 closure costs updates, for the Sasol Secunda Synfuels and Chemicals operations complex, including waste disposal, post-closure water treatment and cash flows.

Sibanye-Stillwater Gold Mines - Gauteng, Free State, and Mpumalanga, South Africa
2013 - ongoing
Project manager/project director
Ongoing closure planning and costs updates for the Kloof, Driefontein, Cooke, Ezulwini, RUSO, Beatrix and Burnstone operations, including operational rehabilitation planning and residual costs quantifications.

Sibanye-Stillwater Platinum operations - Northwest Province and Limpopo, South Africa
2017 - ongoing
Project manager/project director
Ongoing closure planning and costs updates for RPM, Kroondal, Marikana and Blue Ridge operations, including operational rehabilitation planning and residual costs quantifications.

Johan Bothma

Earth & Environment - Rehabilitation & Closure, Visual Assessment Specialist, Registered Landscape Architect

ICL Boulby Polyhalite Mine – North York Moors National Park, UK
2023
Closure Planning Specialist
Development of a comprehensive mine closure plan which formed part of a larger mine-wide water management project, was the first comprehensive closure planning that had been done for the mine, and included several components, namely: Closure environmental risk assessment, Mine-wide demolition, remediation and rehabilitation planning, including implementation of post-mining land uses, Development of conceptual shaft and sea outfall decommissioning, plugging, and sealing measures, which had not been fully addressed before, Measures for closure of the extensive off-site infrastructure associated with the mine, including conceptual measures for making safe of numerous heritage features such as historical bridges, Computing of the mine-wide and off-site closure costs, for likely and higher-case scenarios, Inclusion of company overheads, retrenchment and reskilling, and committed post-closure costs, Scheduling and costing of operational demolition and rehabilitation activities

Rio Tinto Iron Ore Simandou Project – Guinea
2021 – ongoing
Closure specialist
Development of conceptual closure planning and associated costs for the RTIO Simandou open pit mining project, including further detailed site assessment and technical review of the ongoing for day-of-assessment and life-of-mine closure costs and further mine closure planning updates

Golden Star Resources – Ghana
2013, 2018, 2022
Closure specialist
Compilation of decommissioning plan and asset retirement obligations for its two mines, Golden Star Wassa Limited and Golden Star Bogoso/Prestea Limited. Develop detailed quantity survey based on site assessment to determine individual infrastructure volumes and identification of material to determine the quantities of materials needed for demolition, disposal, including rehabilitation of associated process water dams and impoundments, residue facilities, and associated contamination related remediation.

Torex Gold – Mexico
2013, 2018
Closure specialist
Development of conceptual closure planning and determination of unscheduled and scheduled closure costs for the Torex gold open pit gold mine in Mexico

Arnot OpCo Coal Mine - Mpumalanga, South Africa
2016 – 2019 (Exxaro), 2020 – ongoing (OpCo)
Project manager/technical review
Comprehensive GN R. 1147 compliant closure plan and costs for final closure of Arnot Coal mine, including qualitative and quantitative risk assessments, residual and latent risk mitigation and costs.

Gold Fields South Deep Mine - Gauteng, South Africa
2013-2017; 2019
Project manager
Operational rehabilitation, closure planning and costs, detailed next land use plan, residual and latent costs determination towards GN R. 1147 compliance. Compilation of joint Sibanye/Gold Fields rehabilitation options analysis, planning and costing for the Leeuwspruit.

Mafube Coal Mine - Mpumalanga, South Africa
2017
Project manager
Closure plan and bio-physical closure costs, qualitative and quantitative risk assessments, residual and latent risk mitigation and water treatment costs, towards GN R. 1147 compliance.

Morupule thermal power station, and coal mine - Morupule area, Botswana
2016; 2018, 2021 - ongoing
Project manager/project director
Closure costs determination and closure framework for Phase 2 expansion of Morupule thermal coal power station (2016), and closure costs review and update of Morupule coal mine (2018, 2021).

Kenmare Moma Mine - Sofala, Mozambique
2015; 2018; 2020
Project manager
Scheduled and unscheduled closure cost updates for Moma sand mine in Mozambique.

Anglo New Denmark, New Vaal, Union and Goedehoop Mines interim closure planning and costing - Mpumalanga, South Africa
2013 – 2014
Project manager/closure specialist
Anglo Closure Toolbox interim closure planning for respective Anglo Coal mines, including state of the environment, rapid strategic environmental assessment, closure criteria, risk assessment, closure costing and next land use planning.

Zincor detailed land use plan - Gauteng, South Africa
2013
Project manager
Detailed evaluation of post-closure next land use options for decommissioned Zincor zinc smelter complex.
Letlhakane and Jwaneng land use plans and graphic modelling - Botswana

2012 – 2014
Closure specialist
Post-closure land use plans for the Letlhakane and Jwaneng open pit diamond mines in Botswana. Graphic modelling direction for various waste rock disposal, site-wide rehabilitation and end land use planning alternatives. Closure costs final review for Jwaneng.
Thaba Metsi Coal Mine - Limpopo, South Africa

2012
Closure specialist
Scheduled and unscheduled closure cost determinations, preliminary end land use plan for Thaba Metsi opencast and underground coal mine.

Goedehoop Colliery - Mpumalanga, South Africa
2012
Closure specialist
Scheduled and unscheduled closure cost determinations, preliminary land use plan for Goedehoop North and South underground coal mines.
International closure projects review and technical inputs (various)

Project manager/closure specialist
Specialist closure planning and costs direction and review for various African and international mines, including Kinsevere, Kipushi and Kamoa copper mines (DRC), Kansanshi copper mine (Zambia), Guelb Moghrein gold-copper mine (Mauritania), Maamba coal mine (Zambia), Torex gold mine (Mexico).

VISUAL IMPACT ASSESSMENTS

Verkykerskop, Phefumula Emoyeni, Mukondeleli Visual Impact Assessments – South Africa
2023 – ongoing
Visual assessment specialist
Visual impact assessments for various proposed renewables sector PV and wind turbine installations, including directing viewshed analysis and graphic simulation of the implemented project to evaluate visual impacts.

CNOOC on-shore gas project Visual Impact Assessment - Lake Albert, Uganda
2018 – 2019
Project manager/visual assessment specialist
Visual impact assessment and strategic direction for night-time light glare pollution for the new CNOOC offshore oil project on the shore of Lake Albert in Uganda.

Lonmin solar plant Visual Impact Assessment - Northwest Province, South Africa
2013
Project manager
VIA, including viewshed analysis and complex glare path analysis of a proposed photovoltaic installation at Lonmin mine.

Zonnebloem, Schoonoord, Brakfontein, Optimum, Rondebult, Doornrug, and Middelkraal mines – various locations in South Africa
2006 – 2013
Project manager/visual assessment specialist
Complex, staged VIA including viewshed analysis, for various phases of mining.

Letlhakane and Jwaneng diamond mines Visual Impact Assessment - Botswana
2012
Project manager/visual assessment specialist
Visual assessment and extensive graphic modelling for the rehabilitation, closure, and end land use of Lethlakane and Jwaneng open pit diamond mines in Botswana.

Kamoa, Dumasi mines Visual Impact Assessment - DRC, Ghana
2013
Visual assessment specialist
Visual impact assessments for open pit mines.

Schoonoord coal mine Visual Impact Assessment - Mpumalanga, South Africa
2012
Visual assessment specialist
Complex, staged VIA including viewshed analysis, for various phases of mining.

Prestea gold mine Visual Impact Assessment - Ghana, Ghana
2012
Visual assessment specialist
VIA for the redevelopment and expansion of the mothballed Prestea mine at the town of Prestea.

Letlhakane Diamond Mine Visual Impact Assessment - Orapa, Botswana
2012
Visual assessment specialist
Visual assessment and extensive graphic modelling for the rehabilitation, closure, and end land use of Letlhakane open pit diamond mine in Botswana.

Scantogo, Project title, Tabligbo, Togo
2011
Visual assessment specialist
VIA for the construction of a quarry and clinker production plant.

Crossways & Sunnyvale Estate Visual Impact Assessment - Kouga Municipality, EC, South Africa
2009
Visual assessment specialist
VIA Report for proposed new residential development just outside of Jeffrey's Bay. Report included photographic assessment of existing site conditions, GIS viewshed analysis and modelling of visual impact before and after proposed development, Graphic representation of the visibility of the development from key visual vantage points and assessment of visual mitigation measures.

Client, Boplaas Residential Estate Visual Impact Assessment - Kouga Municipality, EC, South Africa
2009
Visual assessment specialist
VIA for proposed new residential development just outside of Jeffrey's Bay. Report included photographic assessment of existing site conditions, GIS viewshed analysis and modelling of visual impact before and after proposed development, Graphic representation of the visibility of the development from key visual vantage points and assessment of visual mitigation measures.

KUKA, KUKA Aerial Ropeway Visual Impact Assessment - Mpumalanga, South Africa
2009
Visual assessment specialist
VIA specialist study for the proposed new 50 km aerial ropeway, that will transport coal ore between the Lion and CMI Smelters and Thorncliff Mine, via suspended buckets. The Ropeway itself is suspended from a series of pylons up to 22 m high, spaced several hundred meters apart. The VIA included a thorough photographic baseline assessment of the study area, modelling of the proposed infrastructure, a complex viewshed analysis that illustrated the impact of the ropeway over distance as well as the number of pylons that will be visible, a 3-dimensional photo montage of the proposed infrastructure within the landscape as well as impact assessment and mitigation report.

Tubatse Chrome WTP Visual Impact Assessment - Mpumalanga, South Africa
2009
Project manager/visual assessment specialist
VIA specialist study for the proposed new Water Treatment Plant and associated additional infrastructure for Tubatse Chrome, as part the overall Environmental Impact Assessment (EIA) process for the project. The existing Tubastse Chrome plant is situated just south of the town of Steelpoort along the R555 Road in Mpumalanga Province, South Africa.

Anglo, Coal bed methane - Anglo Coal Gas Projects, Limpopo, South Africa
2009
Visual assessment specialist
VIA specialist study for the proposed new Anglo Coal Gas Projects (Anglo Coal) 4,000 ha coal bed methane gas production site 25 km northwest of Lephalale (Ellisras), and an electricity transmission line to be routed from the proposed 4,000 ha site to a substation north of Lephalale in the Limpopo Province.
The development includes the development of 37 gas well on the farm Nooitgedacht that is approximately 1,000 ha in extent. The proposed 37 spot will be run as an extension to exploration activities, in order to provide a large-scale production test.

Western Utilities Corporation Visual Impact Assessment - Gauteng, South Africa
2009
Visual assessment specialist
VIA specialist study for the proposed new collection and distribution pipelines and associated purification and pumping infrastructure, for the ambitious WUC project, that aims to address the acid mine drainage problem in the West Rand. Although the pipeline will be mostly buried, they traverse a vast area and may potentially affect several areas of some visual significance and the project will potentially influence a very large number of people during the construction phases of the project. the VIA included a thorough photographic baseline assessment of the study area, modelling of the proposed infrastructure, GIA mapping of the visual resource quality of the landscape and anticipated of visual impact during construction, as well as impact assessment and mitigation report. the VIA report was awarded with the first Golder Africa Technical Writing Award, for excellence in technical report writing.

Cape Gate waste site Visual Impact Assessment - Gauteng, South Africa
2009
Visual assessment specialist
VIA specialist study for the proposed expansion of the Cape Gate waste and by-product storage site, which will include several large storage and discard dumps, storm water management dams, vehicular parking and loading areas and ancillary infrastructure. Analysis included extensive modelling of the dumps over the lifespan of the project, projected visibility of the dumps, the development of visual mitigation strategies and modelling of the anticipated effectiveness of the proposed mitigation of the development and management strategy.

Umcebo Rondebult, Doornrug, Steelecoal and Middelkraal mines Visual Impact Assessment - Mpumalanga, South Africa
2006
Visual assessment specialist
VIA for new opencast coal mine infrastructure and mining operations. Report included photographic assessments of existing site conditions, assessment of visual impact before and after proposed mine infrastructure, and graphic representation of proposed visual mitigation measures.

Xstrata Rhovan mine VIA - Brits, South Africa
2006
Visual assessment specialist
VIA for expansion of existing slimes dam, related infrastructure and plant area. Report included photographic assessments of existing site conditions, GIS viewshed analysis and modelling of visual impact before and after proposed mine infrastructure, and graphic representation of proposed visual mitigation measures. Preliminary cost assessment and implementation plan for proposed visual mitigation measures.

Xstrata Aloys, Lydenburg Works VIA - Mpumalanga, South Africa
2006
Visual assessment specialist
VIA for expansion of existing slimes dam, related infrastructure and plant area. Report included photographic assessments of existing site conditions, GIS viewshed analysis and modelling of visual impact before and after proposed mine infrastructure, and graphic representation of proposed visual mitigation measures. Preliminary cost assessment and implementation plan for proposed visual mitigation measures.

Paardeplaats Residential Estate VIA - Gauteng, South Africa
2006
Visual assessment specialist
VIA compiled for proposed new residential development near the National Botanical Gardens in Krugersdorp. Report included photographic assessments of existing site conditions, modelling of visual impact before and

after proposed development, Graphic representation of the visibility of the development from key visual vantage points and assessment of visual mitigation measures.

Schurveberg Residential Estate, Northwest Province, South Africa
2006
Visual assessment specialist
VIA for proposed new residential development east of Pelindaba, within ecologically significant valley. Report included photographic assessments of existing site conditions, GIS viewshed analysis and modelling of visual impact before and after proposed development, Graphic representation of the visibility of the development from key visual vantage points and assessment of visual mitigation measures.

ENVIRONMENTAL ASSESMENTS

Menlyn Maine EMPs and environmental audits, Pretoria, South Africa
2011 – 2013
Project manager, EMP auditor
Compiled Environmental Management Plans for the Menlyn Maine Clinton Climate Change Initiative-endorsed Phase 1 infrastructure development as well as Falcon, Epsilon and Pegasus Buildings; and conducted construction environmental compliance audits. All projects are targeting a minimum Green Star SA four-star rating, and LEED ND certification.

Tubatse, Water treatment and pelletiser plant EMP audits, Limpopo Province, South Africa
2010 – 2013
Project manager, EMP auditor
Six-monthly environmental compliance audits in terms of approved EMP and Environmental Authorisations for construction and operation of new water treatment plant and pelletiser plant.

Rand Uranium, TSF EIA, Gauteng, South Africa
2010
EIA Lead
Long term tailings storage facility for disposal of up to 350 million tons of re-processed tailing from a number of tailing resources in the Randfontein area, including 40 km associated pipelines. Coordination of specialist assessment and public participation in terms of overall EIA process.

Transnet, New Multi-Products Pipeline (NMPP) EMP, Durban, Kwa Zulu-Natal to Jameson Park Near Heidelberg, South Africa
2008
EMP development
Compiled the Environmental Management Plan (EMP) for the design, construction, operations, and decommissioning phases of the NMPP project. This consisted of a new multi-products liquid fuel pipeline (or "Trunkline") running from Durban, Kwa Zulu-Natal to Jameson Park near Heidelberg in Gauteng, with a pump station at each terminal, and eight pump stations along the route. A coastal fuel terminal either at the Durban International Airport or and inland fuel terminal at Jameson Park near Heidelberg. The EMP ensured that recommendations of numerous specialists from a wide variety of fields were implemented. Following the compilation of a draft version of the EMP, I also facilitated a detailed workshop between the Contractor and the Client to establish that the mitigation measures proposed are feasible, following which the EMP was amended as required.

City of Tshwane, KH2 and KK1,2,3 Pipelines, Pretoria, South Africa
2008
Project manager, EMP auditor
Various environmental processes to obtain authorisation for the installation of the proposed pipeline. Amendment and update of detailed Environmental Management plan for planning, construction, and operation phases.

The Hills and Sammy Marx lifestyle estates, Water Use Licence Applications, East of Pretoria, South Africa
2008 and 2013
Project manager
Water use licence applications for two extensive mixed use lifestyle estates.

Northwest Province Department of Roads and Transport Road D419 EIA, Northwest Province, South Africa
2005
EMP development
EMP for the construction of road D419, including extensive addressing of erosion prevention and mitigation. EIA Scoping report for the proposed D419 Road between the two Lekgophung and Swartkopfontein in the Northwest Province. The distance between the two termini of the road (approximately 15 km) required extensive consideration of several alignment option and extensive public participation.

The Hills Estate EIA and WULA, Pretoria, South Africa
2004
Project manager, EIA and WULA development, EMP auditor
EIA Scoping Report, EMP and various Water Use Licence Applications for "The Hills" mixed use development in Kungwini, east of Tshwane. This project was particularly complex due to the large extent of the site, large scale of the development and many environmental factors that had to be accommodated. The project includes single stands within an ecological conservation area, medium and high density residential and commercial sectors, resort and hotel facilities, a golf course designed by Greg Norman and the Jacques Kallis cricket oval.

Landscape Design

South African Police Services, Roodeplaat dog school landscape, Gauteng, South Africa
2007 – 2014
Project manager, landscape architect
Initial planning and detail landscape design as well as construction supervision for expanded and upgraded South African Police Services dog school facilities.

DPW Mahlamba Ndlopfu, Presidential residence landscape design, Pretoria, South Africa
2006 – 2009
Project manager, landscape architect
Conceptual and detail design of landscape architectural improvements. Set up of tender documentation and full administration and management of tendering and tender adjudication process for main landscaping contractor, contractor supervision and instruction for interim improvement measures and implementation. Coordination of process with Bryntirion ISM requirements.

DPW Bryntirion Estate Detail Landscaping Design, Pretoria, South Africa
2006 – 2008
Project manager, landscape architect
Initial conceptual and detail design of the landscape associated with the proposed new inner and outer fences around the entire estate, as well as the proposed new gatehouses. Extensive coordination with the entire project team and integration of all relevant Bryntirion ISM planning principles.

Rustenburg Local Municipality, Open Space and Heritage Management Plan (ROSHMAP), Rustenburg, South Africa
2007
Spatial planning expert
Initial project execution planning and engagement of stakeholders and public as well as various departments of Rustenburg Local Municipality (RLM). Coordination of all GIS mapping and databases associated with the project. Administration and management of the Public Participation and Ward Council Engagement processes.

Co-author and compilation of the Draft, Final Draft and Final versions of the comprehensive project report outlining open space and heritage management plan, including proposed genetic project proposal and management strategies.

Bloemhof, Bloemhof Dam Landscape Planning and Conceptual Design, Free State, South Africa
2007
Landscape architect
Conceptual layout and design as for the proposed Bloemhof Dam tourism and recreation resort development, as well as master plan proposal for the development. Development includes water park, sports facilities, multi-functional halls, agricultural show grounds, caravan park, fish amenities and associated facilities, as well as residential golf estate. Integration with engineering services and design of jetty structure.

Bryntirion Estate, Union Building and Ministerial Residential FM Tender, Pretoria, South Africa
2007
Project manager, landscape architect
Drafting setup and completion of tender documentation for DPW Facilities management project, including all specification, contractual matters and Provisional Bills of Quantities for landscape architectural and horticultural services for the project, and integration with architectural, engineering, safety and main Quantity Surveyor consultants on project, as well as DPW Horticultural Services. Facilities Estate and properties included in the project are the entire union Building complex, Brynition Estate and over 20 prestige portfolio residences in Gauteng. Projected landscape value of the project over 3 years amount to upwards of R 350 million.

Bryntition Estate, Heritage Conservation Management Plan, Pretoria, South Africa
2007
Project manager, landscape architect
Part of a multi-disciplinary consortium involved with the Bryntirion Heritage Integrated Services Management Plan. Duties included a landscape inventory and assessment of the individual landscape elements and gardens of Bryntition Estate. Specifically, the trees and built landscape elements were inventoried. Furthermore, the different landscape areas, that have distinct qualities and attributes that distinguish them from each other, were also identified and prescribed according to the definitions of the National Heritage Resources Act (Act No. 25 of 1999). Area of "cultural significance" in terms of aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance were identified and inventoried. The significance of the individual landscape elements and areas, both natural and man-made, was determined using the criteria of the NHRA. This was done using a set of assessment sheets, developed specifically for the project. The overall purpose of the landscape character assessment and inventory was to guide the development of the landscape character assessment and inventory was to guide the development of the landscape Heritage Conservation Plan, Landscape Development Plan and Landscape Management Programme, which I carried out for the project. Conservation, development and management guideline in terms of planting design, hard landscaping design and spatial design were set up for the entire estate and a report was written for the integration of the new outer boundary fence with the existing landscape elements of significance. Pilot projects from a landscape point of view were also identified and described.

City of Tshwane, Environmental Guidelines, Pretoria, South Africa
2005
Environmental Guidelines
Civil municipal infrastructure projects for Tshwane Municipality. This project involved determining all environmental impact caused by municipal infrastructure during the contraction, operational and maintenance phases and displaying these impacts in a matrix with all the infra-structural components. The process involved extensive participation from the various relevant departments of CTMM, including several workshops. An extended EMP was produced for all three phases of the infrastructure. A tool was developed in consultation

with a programmer, which allows the electronic capture of the information, enabling the user to carry out various kinds of searches per impact or to update the database.

Bryntirion Estate, VIP Residence and Staff Quarters Landscape, Pretoria, South Africa
2005
Landscape Design
VIP residence and staff housing on Bryntirion Estate in Pretoria: Extensive co-ordination with the architectural design team, taking into account the requirement for extensive indigenous planting design, due to the proximity of the site to the Meintjieskop Hill natural area. Integration of the landscape design with the Bryntirion Estate Heritage Conservation Management Plan Final tender documentation and Bills of Quantities. Site supervision/ inspection for construction process.

Galeshewe, Open Space and Landscape Plan (GOSLP), Kimberley, South Africa
2003
Primary Project Planner
Responsibilities included liaison with all parties involved in the project, on site survey of open space network with members of the community, research and background study work, writing of articles to promote the project, participation in workshops to involve community members in the decision-making process and conceptual design solution for the identified priority projects. Extensive GIS mapping and categorisation of open space network including suggested future development and proposed projects. Creation of an interactive electronic database of all spatial and written information of the open space inventory and spatial development programme.

PUBLICATIONS

Hattingh, R and Bothma, J. 2013. Taking the risk out of a risky business: a land use approach to closure planning, in Mine Closure 2013. Edited by M. Tibbett, A.B. Fourie and C. Dogby. Australian Centre for Geomechanics: Perth.

Bothma, J. and Theron, G. 2012. Human comfort and the South African climate design regions in terms of small-scale development design, in South African Landscape Architecture - a Reader. Pretoria: Unisa Press.

Bothma, J., Crockett, D. and Southwood, J. 2012. Siting a building for human comfort, on SABMag homepage. [Online] Available: www.sabmagazine.com/blog/2011/12/21/siting-a-building-for-human-comfort/

Bothma, J. 2011. Greening the building: Plants, planting and detailing, in Green Building Handbook South Africa - the Essential Guide Volume 3. Edited by L. Van Wyk, Cape Town. Alive2green (pp209-226)

Bothma, J. 2010. Siting a building for Human Comfort, in Green Building Handbook South Africa - The Essential Guide Volume 2. Edited by L.V. Wyk, Cape Town
Alive2green (pp57-72)

Theron, G. and Bothma, J. 2009. The Ecology of Building and Landscape Design, in Green Building Handbook South Africa Volume 1: A Guide to Ecological Design. Edited by L. van Wyk, Cape Town: Alive2green cc (pp61-75).

Bothma, J. 2004. “Landscape and Architectural Devices for Energy-Efficient South African Suburban Residential Design” Submitted in partial fulfilment of the requirements for the degree Master of Landscape Architecture. Pretoria: University of Pretoria.

Johan Bothma

Earth & Environment - Rehabilitation & Closure, Visual Assessment Specialist, Registered Landscape Architect

AWARDS

2023. WSP Project of the Year Finalist, for the ICL Boulby Mine Closure Plan and Associated Costs

2022. Golder Africa Mentor of the Year Award

2009. Golder Award for Excellence in Technical Writing, for the Visual Impact Assessment for the Proposed Zonnebloem Opencast Coal Mine

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

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