



Tronox KZN Sands (Pty) Ltd

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# COMPARATIVE VIEWSHED ANALYSIS

Fairbreeze Mine Extension into Heleza Moya





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# 1 INTRODUCTION

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## 1.1 BACKGROUND

Tronox KZN Sands (Pty) Ltd (herein referred to as Tronox) has operated the Fairbreeze mineral sands mine, located south-west of Mtunzini, for nearly 10 years. The mine is located immediately south-west of Mtunzini, where heavy mineral sands are mined and a concentrate is produced in the Primary Wet Plant (PWP). The heavy mineral concentrate is then trucked to the Tronox Central Processing Plant in Empangeni (CPC) for refinement. The CPC comprises a Mineral Separation Plant (MSP) and Smelter. The main products include titanium dioxide slag, rutile, zircon, leucoxene and high purity iron which are produced for sale mainly to international markets.

In 2022 Tronox acquired the 118 ha Heleza Moya property, located between the Fairbreeze PWP and the Pit B mining area, and incorporated this property into the Fairbreeze Mining Rights Area (MRA). Tronox is now making application to extend mineral sands mining into parts of Heleza Moya to enable this area to be mined together with the approved Pit B orebody which lies to the immediate north and west of Heleza Moya. The Heleza Moya property in relation to the full MRA, approved infrastructure and mining areas is shown in Figure 1-1, together with the proposed development areas on the Heleza Moya property. Only the crosshatched upper slope of the Heleza Moya property immediately adjacent to the Fairbreeze B orebody/pit is proposed to be mined.

There are four ore bodies presently forming part of the Fairbreeze Mine which are known as Fairbreeze A (FBA), Fairbreeze B (FBB), Fairbreeze C (FBC) and Fairbreeze C extension (FBCX).

The current proposal is to expand the FBB ore body to include economically viable mineralised areas within the Heleza Moya farm portion, as an extension to the FBB ore body which is currently being mined.

The total footprint of the current Fairbreeze mining lease area is approximately 4 120 hectares (ha) and Heleza Moya will add approximately 118.6 ha to the mining footprint, where 73.22 ha of this mineral resource has been identified as the minable reserve.

This comparative viewshed analysis is compiled to assess the overall visibility and visual impact associated with the proposal to extend mining from FBB into Heleza Moya. It is important to understand that the Fairbreeze mining operation, which has been in operation for nearly 10 years, is authorised. At the time of its initial authorisation a detailed visual impact assessment was undertaken which included viewshed analysis and visual simulation from key points of visual exposure looking back towards the mining operation ( (Newtown Landscape Architects, 2011).

Consequently, in this study only the additional impact associated with extension of mining into Heleza Moya is the subject of investigation and is considered against the backdrop of the approved mining operation and associated footprint of impact. As indicated in the figure which follows the Heleza Moya property is located on the coastal south-east facing slope, screened from the N2 by the crest of the dune which comprises FBB and by the existing PWP located to the north-east of the site. Consequently, the visual exposure of the site is primarily from the local road which runs adjacent to the railway line and, possibly from the Mtunzini beach, albeit that these are kilometres distant.

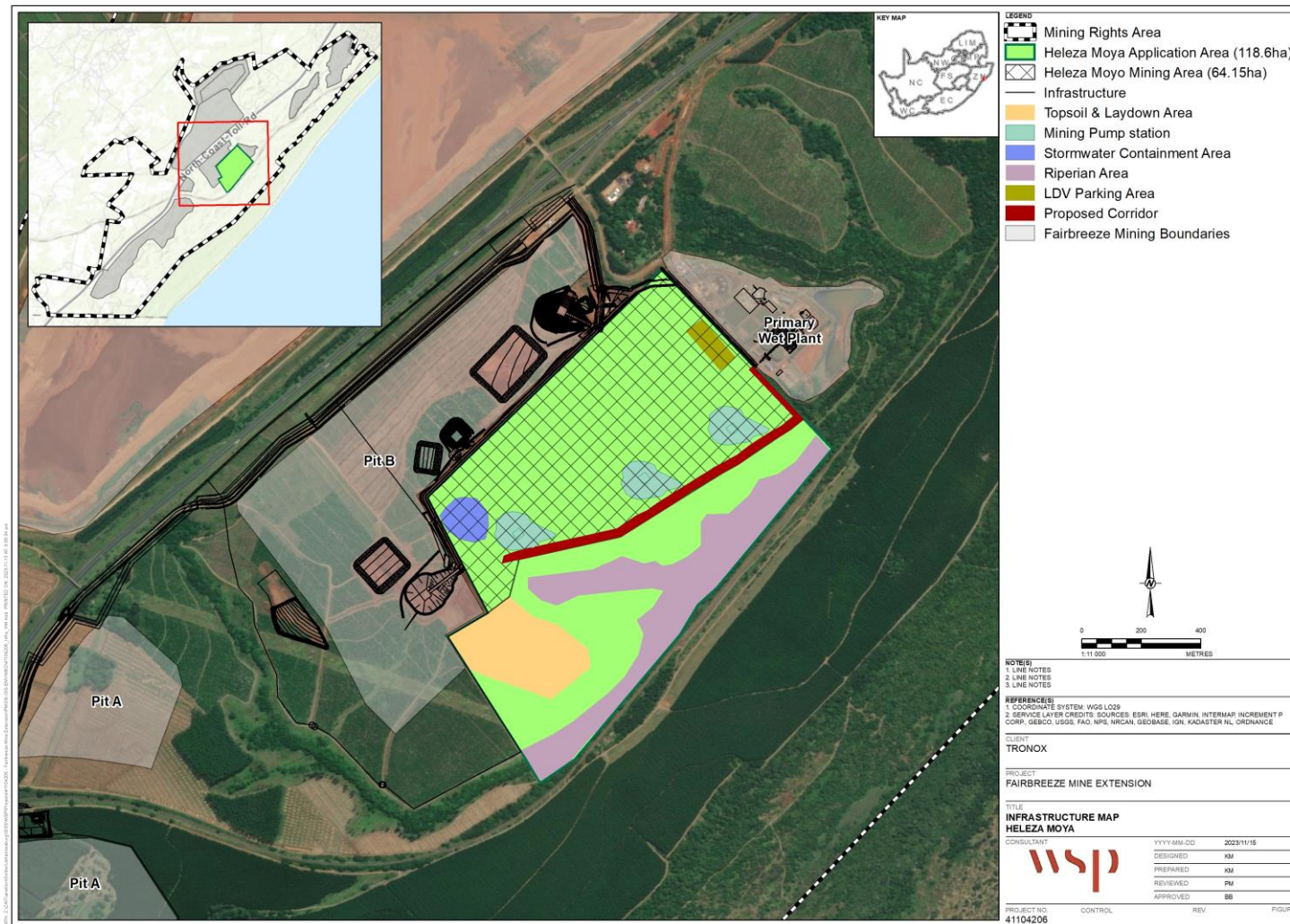


Figure 1-1 - Current mining rights area and the proposed area to be included



## 1.2 SCOPE OF WORK

The scope of works includes a comparative viewshed analysis to assess the change in visual impact due to the mining of a portion of Heleza Moya as an extension to FBB. The undertaking of this analysis is to determine:

- If there are additional visual impacts/exposure that extend beyond the area of influenced as identified by (Newtown Landscape Architects, 2011) for Fairbreeze Mine.
- Identify additional sensitive receptors (if any).
- To determine whether additional impact mitigation measures are required to the existing Environmental Management Programme (EMPr).
- Recommendation of impact mitigation measures if required.

## 1.3 CURRENT VIEWS OF HELEZA MOYA

Heleza Moya farm is bordered by FBB to the northwest and the Primary Wet Plant (PWP) on the northeast border. Fairbreeze Pit A (FBA), which has yet to be mined, is located further southwest along the N2.

The Fairbreeze mine has been in operation for nearly 10 years. One of the key mitigation strategies employed to minimise visual impact was to establish a tree screen of *Eucalyptus* in key areas of visual exposure. This has largely been effective in minimising the direct visual exposure of portions of the mine site. Obviously, topography does not allow all parts of the site to be screened.

Views from Mtunzini towards Heleza Moya, facing southwest, are dominated by the Pit C operations and existing tree screens. When considering the southernmost boundary of Mtunzini and views from the Umlalazi Nature Reserve towards the coast, it is expected to be of a reducing horizon line due to the mining direction (i.e., south to north) (Newtown Landscape Architects, 2011).

Figure 1-2 illustrates a simulated view towards the PWP, developed before the commencement of the mining operation, in which the extent of visual exposure of the PWP is indicated. The proposed Heleza Moya mining area is located behind the PWP. In addition, the authorised FBB that is located above and immediately behind the proposed Heleza Moya area to be mined. It is unlikely that the mining operation proposed for Heleza Moya will be visible from the Mtunzini beach against this backdrop given the distance of approximately 7.5 km.

In the photo simulation on the page which follows the position marked “Plant in background” denotes the position of the existing PWP. The Heleza Moya site is immediately behind that.



**Figure 1-2 – Simulation of the Fairbreeze operation – viewpoint near the central boardwalk entrance to the beach approximately from 28°57'49.04"S; 31°46'1.19"E**

Source: (Newtown Landscape Architects, 2011)



Viewers commuting on the gravel coastal road which runs parallel to the existing rail line would experience temporary and localized visual exposure to the site. This road is used for localised commuting and for recreation (cycling, walking, jogging, etc.)

## 1.4 PROJECT TEAM

Details and expertise of specialists:

<b>Compiler</b>	<b>Khumo Mogapi</b>
	Enthusiastic GIS Analyst with a BSc Geoinformatics degree; a certified South African Qualifications Authority (SAQA) facilitator and assessor with nearly ten years of experience working in the agriculture, environmental, mining, training, and education sectors. Proficient with Quantum Geographic Information System (QGIS) and ArcGIS various software and venturing into data visualisation, applications, mapping, and analysis.
<b>Authoriser</b>	<b>Johan Bothma</b>
	<p>Johan is the Director for Rehabilitation and Closure based in the Midrand, South Africa office. He has 18 years consulting experience and is currently advancing closure planning and costing for mining and industrial sites, 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. 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.</p> <p>Johan is a professionally registered Landscape Architect with the Institute of Landscape Architecture of South Africa (ILASA) and the South African Council for the Landscape Architectural Profession (SACLAP).</p>

## 2 METHODOLOGY

### 2.1 STUDY METHOD

The study was undertaken using ArcGIS software as a to compile a viewshed analyses to the proposed development in comparison to a previous study in the same area.

The steps to undertake the visual assessment included compiling a comparative viewshed analysis to determine if the current visual exposure will change. The analysis included the following steps:

- Defining the existing topographic character to establish the baseline visual context (pre-mining context at Heleza Moya) from which visual change is evaluated.
- Determine the visual exposure though a visibility analysis (viewshed plotting/model) to define the topographical area from which portions of the Heleza Moya mining operations might be seen.
- Thereafter, identify opportunities for effective impact mitigation.

### 2.2 VISIBILITY IMPACT RATING

The methodology used by (Newtown Landscape Architects, 2011) was adopted for this analysis in order to yield a comparable result, namely using the four main factors described below in order to o assess the magnitue of the visual impact of Fairbreeze Mine (pp.51):

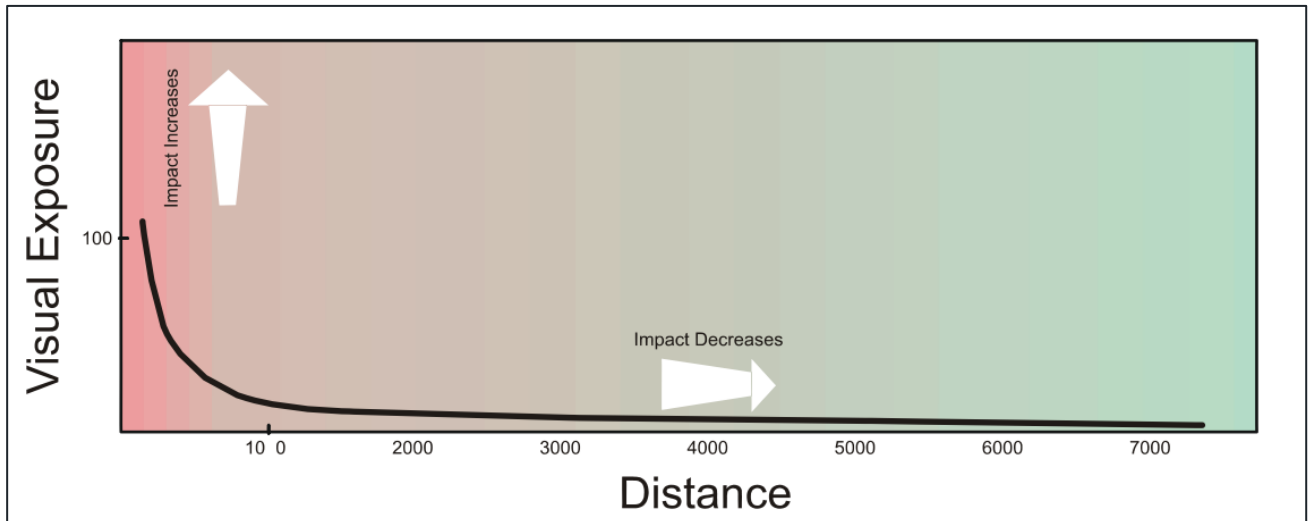
- **Visual Intrusion:** The nature of intrusion or contrast (physical characteristics) of a project component on the visual quality of the surrounding environment and its compatibility/discord with the landscape and surrounding land use.
- **Visibility:** The area/points from which project components will be visible.
- **Visual exposure:** Visibility and visual intrusion qualified with a distance rating to indicate the degree of intrusion.
- **Sensitivity:** Sensitivity of visual receptors to the proposed development

Since this is a comparative analysis, only the visual exposure of the Fairbreeze Mine will be used to compare assess the magnitude of the visual impact of Heleza Moya viewshed.

The visual exposure methodology is outlined below and visually illustrated in Figure 2-1:

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

*Distance from a viewer to a viewed object or area of the landscape influences how visual changes are perceived in the landscape. Generally, changes in form, line, colour, and texture in the landscape become less perceptible with increasing distance. Areas seen from 0 to 800m are considered foreground; foliage and fine textural details of vegetation are normally perceptible within this zone. Areas seen from 800m to 5.0km are considered middle ground; vegetation appears as outlines or patterns. Depending on topography and vegetation, middle ground is sometimes considered to be up to 8.0km. Areas seen from 5.0km to 8.0km and sometimes up to 16km and beyond are considered background. Landforms become the most dominant element at these distances. Seldom seen areas are those portions of the landscape that, due to topographic relief or vegetation, are screened from the viewpoint or are beyond 16km from the viewpoint. Landforms become the most dominant element at these distances. The impact of an object diminishes at an exponential rate as the distance between the observer and the object increases. Thus, the visual impact at 1000 m would be 25% of the impact as viewed from 500 m. At 2000 m it would be 10% of the impact at 500 m. The inverse relationship of distance and visual impact is well recognised in visual analysis literature (e.g.: Hull and Bishop (1988)) and is used as an important criteria for the study. This principle is illustrated in the figure below.” (Newtown Landscape Architects, 2011), pp. 54-55)*



**Figure 2-1 - Effect of Distance in meters on Visual Exposure**

Source: (Newtown Landscape Architects, 2011)

The potential visual sources include the proposed infrastructure, tailings storage areas and the topsoil stockpile.

### 3 LIMITATIONS

- The digital map/model digital files for the viewshed that was plotted by (Newtown Landscape Architects, 2011) for Fairbreeze Mine was not available and the output map was consequently geo-referenced as a base against which to project the Heleza Moya viewshed. This enabled the Heleza Moya viewshed to be presented overlaying the original viewshed.
- This Visual Impact Assessment and all associated mapping has been undertaken according to the worst-case scenario.
- The model used in the current study (2023) only took the topographic elevation into consideration in reaching the comparative outcome, this varies to the model used by Young (2011) which also simulates the projected height of the current tree screens.
- This report should be read in conjunction with the original VIA compiled by Newtown Landscape Architects in March 2011.

### 4 COMPARATIVE VIEWSHED OUTCOME

It is key to note that the results from (Newtown Landscape Architects, 2011) encompass all of the four ore bodies presently forming part of the Fairbreeze Mine, and that the Heleza Moya tenement falls within Fairbreeze MRA. The components considered in the Fairbreeze Mine viewshed included the Primary Wet Plant, Mega Sebek Residue Storage Facility and the four ore bodies.

Therefore, the outcome of the analysis is representative of the total potential envisaged visual exposure of Fairbreeze Mine with the inclusion of Heleza Moya.

A visual exposure analysis was undertaken from the potential visual sources where the maximum height from these sources is 50 m above ground level. This is again a conservative position in which

it is assumed that sand tailings backfill at the site would extend 50 m above the natural ground surface before shaping for rehabilitation. The result of the comparative visual analysis is indicated in Figure 4-1.

The proposed extension of Fairbreeze Mine into Heleza Moya has a limited influence on the overall existing visual exposure due to the already existing mining activities and associated infrastructure. Additionally, there are no new visual receptors that will be affected by this extension.

When evaluated from the perspective of Mtunzini, it is evident that there will be no deterioration in visual exposure associated with the proposed mining at Heleza Moya, beyond that which is already experienced due to the PWP and the authorised mining of FBB (Figure 4-2).

The existing mitigation measures proposed by (Newtown Landscape Architects, 2011) recommended the planting of trees along the perimeter of the site to provide a screen to the mine. This mitigation measure has been implemented by Tronox and Figure 4-3 provides a visual analysis of the exposure experienced (with a focus on Mtunzini) with the tree screen in place. In all these images, the crosshatched areas represent the modelled areas from which the proposed Heleza Moya mining area would be visible, with or without litigation. The backdrop represents the original view shed analysis. In all of the images it is evident that mining at the Heleza Moya site will not be visible from areas beyond which the existing mining structure is already visible.

The impacts are summarised as follows:

- Visibility and visual exposure:

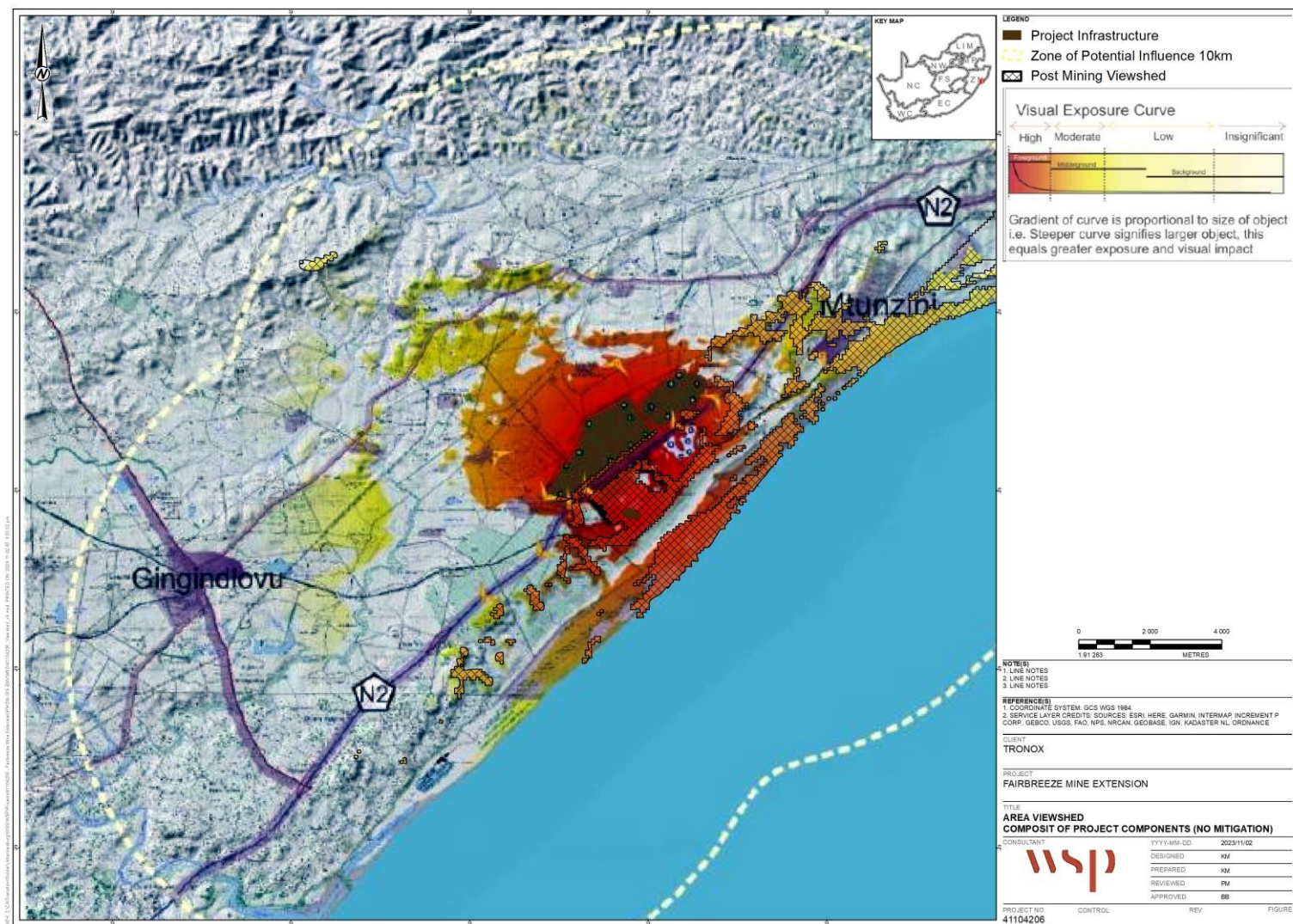
The viewshed analysis indicated that Heleza Moya would be visible to an extent which does not go beyond the current Fairbreeze Mine zone of influence, resulting in “very low” visibility before and after mitigation.

- Visual Intrusion:

The visual intrusion would be rated as “very low” before and after mitigation since Heleza Moya is compatible with the land use patterns within the study area, i.e., Fairbreeze Mine. Receptors from the coast may experience a temporary change in landscape, however this will be short-lived and transient.

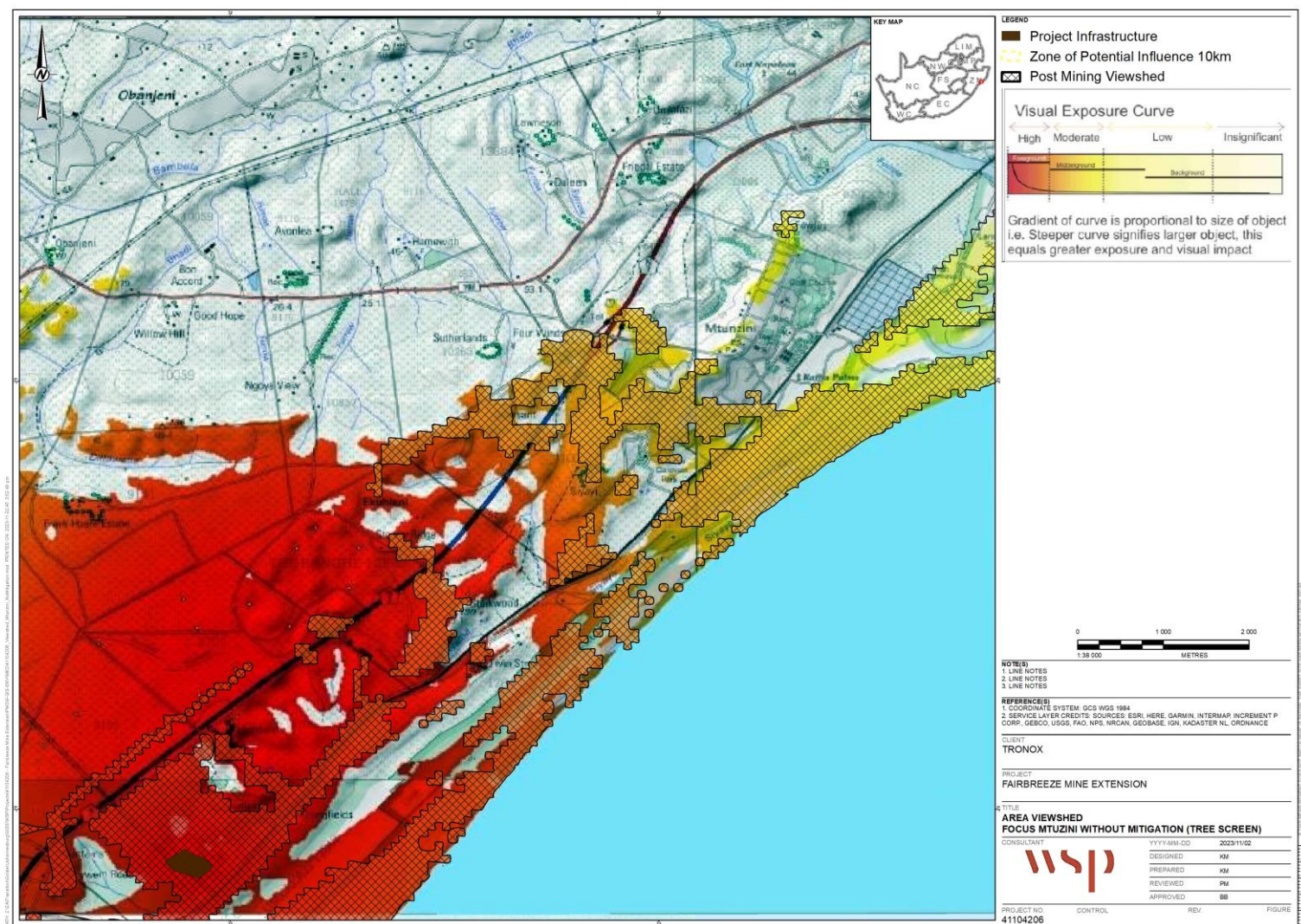
Therefore, the impact of Heleza Moya inclusion into Fairbreeze Mine will not be significant.





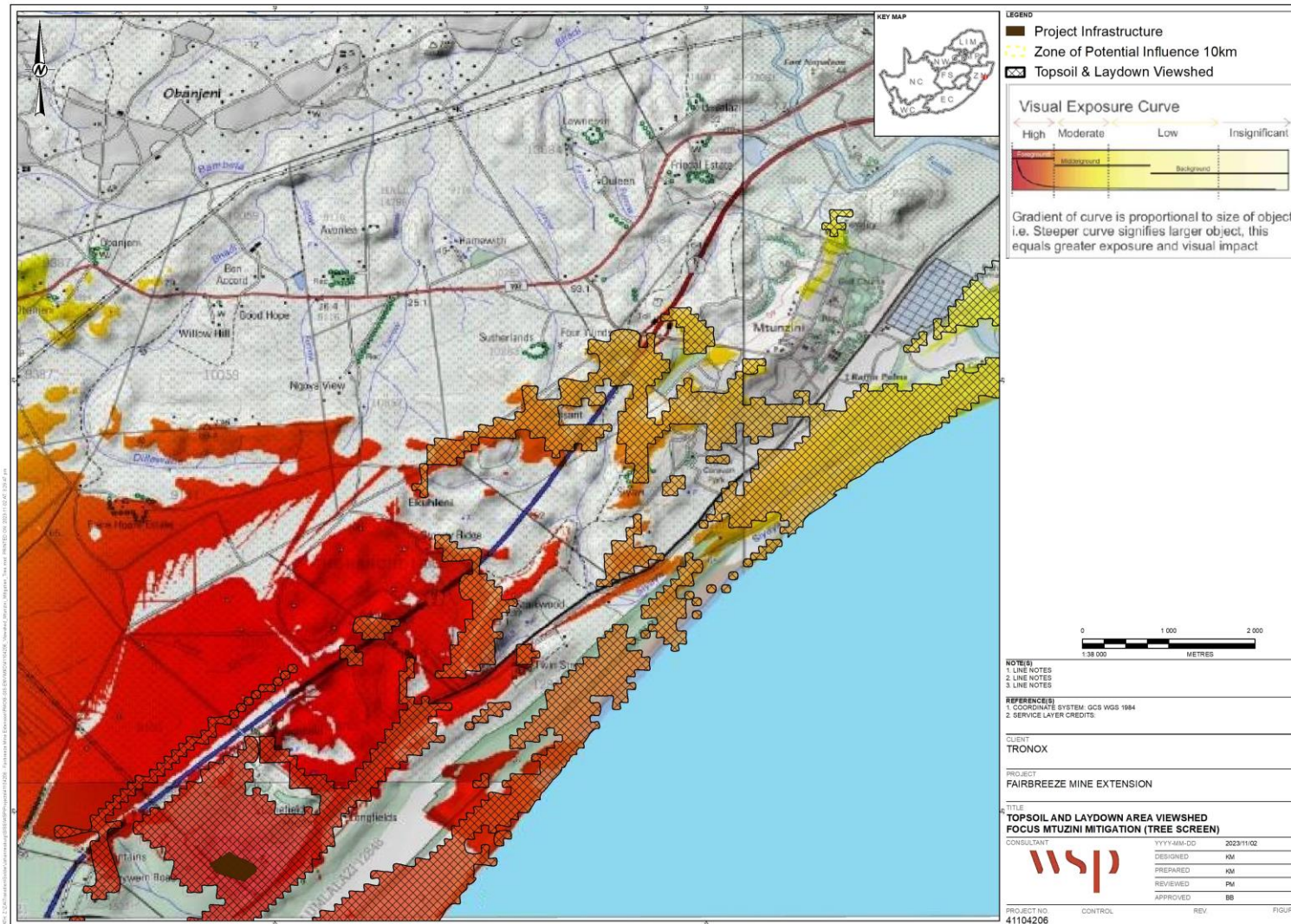
**Figure 4-1 - Composite map indicating the visual exposure of Heleza Moya in relation to Fairbreeze**





**Figure 4-2 - Focus on Mtunzini – without mitigation**





**Figure 4-3 - Focus on Mtunzini – with mitigation**

## 5 CONCLUSION AND RECOMMENDATIONS

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The proposed expansion of the FBB mining area into the upper portions of the Heleza Moya property will not result in significant additional visual impact.

The tree screens (evergreen *Eucalyptus*, 15 m high and 8 m wide) which have been established during the life of the Fairbreeze mining operation creates an effective screen which screens large parts of the Fairbreeze mining activity from the public eye. These tree screens should be maintained's has been committed to in the Fairbreeze environmental management program (EMP) views to Heleza Moya.

The mitigation measures contained in the Fairbreeze Environmental Management Program are adequate, and should be applied to the current project.

No supplementary mitigation measures are recommended in relation to the proposal to mine the upper portions of Heleza Moya.

## 6 REFERENCES

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Newtown Landscape Architects (2011). *Visual Impact Assessment: Proposed Construction of Fairbreeze Mine, Kwazulu-Natal*. .



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