

**STEELPOORT INTEGRATION PROJECT**

**VISUAL ASSESSMENT - INPUT FOR SCOPING REPORT AND  
TRANSMISSION LINE ALTERNATIVE SELECTION**

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## 1. INTRODUCTION AND BACKGROUND

The study area for the proposed Steelpoort Integration Project is located in the Limpopo Province, in the scenic Steelpoort River valley south of the Thaba Ya Sekhukhune Mountains. The project aims to integrate the proposed Steelpoort Pumped Storage Scheme (SPSS) with the national grid by means of the construction of a transmission line connecting the SPSS substation with the Merensky substation located at Steelpoort, as well as the construction of a turn-in line from the substation to the Duvha-Leseding transmission line. This report includes a scoping level assessment of the proposed transmission line, the substation at the SPSS and a proposed turn-in line from the substation to the Duvha-Leseding transmission line.



**Figure 1:** Aerial view of the Steelpoort River Valley showing the Thaba Ya Sekhukhune Mountains.

Two main alternative alignments (eastern and western alternatives) were identified for the proposed transmission line between the Steelpoort and Merensky substations, and another three sub-alternatives were further suggested for investigation. These include a northern sub-alternative near the Merensky substation, the R555 sub-alternative near the XStrata sub-station and a southern sub-alternative connecting the western and eastern alternatives. No alternative alignments were given for the turn-in line or the SPSS substation site. The turn-in line does however offer two options in terms of the transmission line infrastructure. These are the construction of the turn-in line as a double-circuit transmission line (approximately 50m high) or the option of two lines in parallel (approximately 30m high).

The study area can be divided into three broad topographical units, namely the Steelpoort River valley/floodplain as a central unit, the Sekhukhune Mountains/Escarpment north of the valley and the mountains and hills south of the valley. Other major river valleys within the southern area include the Klip River, Little Dwars River and the Dwars River.

The study area is located in a predominantly natural to rural environment (especially to the south) with increased settlements and industrial and mining activities towards the north (near the town of Steelpoort). The escarpment and the northern Steelpoort River floodplain are relatively densely populated and are characterised by

predominantly subsistence farming practises. Large tracts of land are still in a natural state, especially within the elevated and mountainous terrain, and land cover types are broadly identified as Woodland (to the south) and Thicket, Bushland and Bush Clumps to the north. An increasing amount of mining applications (or extension of existing mining activities) have recently been received for this area.

The R555 provincial road affords primary access to the area. This road extends the entire length of the valley (together with the Steelpoort River) and has formed a corridor or spine for linear development within the region. It also serves as a tourist access road to the Kruger National Park, the Lowveld region and the Escarpment. The R555 is currently being re-aligned to accommodate the construction of the De Hoop Dam that will inundate a large section of the valley. The Department of Water Affairs and Forestry's (DWAF) plan for the dam includes an environmental offsite mitigation area surrounding the dam. This will take the form of a conservation forest area.

The Steelpoort River Valley is considered to possess a high scenic value due to its multi-faceted landscape character. It is in a relatively natural state, especially to the south, where the natural vegetation remains largely unaltered, it has the river valley and the majestic Sekhukhune Mountains, and it will in future have a large water body (the De Hoop Dam) added to the visual mix. These factors all contribute to the scenic quality and future nature oriented tourism potential of this area.

The natural scenic quality progressively deteriorates towards the north where human settlement, agricultural practises, mining activities and industrial developments visually impact on the character of the valley. This area has due to its level of transformation a lower visual sensitivity and subsequently a lower potential for future eco-tourism.

## **2. ISSUES RELATED TO THE VISUAL IMPACT ASSESSMENT**

Initial viewshed analyses of the proposed transmission line alternatives, based on a 20 m contour interval digital terrain model of the study area, indicate the visibility of the various components of the Steelpoort Integration Project. The results of the viewshed analyses are displayed in Figures 2 - 8 and will be discussed in more detail under the next heading.

The initial results of the viewshed analyses broadly indicate that the western transmission line alternative would be highly visible within the Steelpoort River valley and the eastern alternative to a lesser degree as it leaves the valley near Steelpoort Park. The various sub-alternatives and the turn-in line also display fairly exposed viewshed patterns.

The fact that these areas are exposed does not imply that it constitutes a significant visual impact, at least not for all of the exposed areas. Further investigation is necessary in order to determine the specific visual impact within these exposed areas.

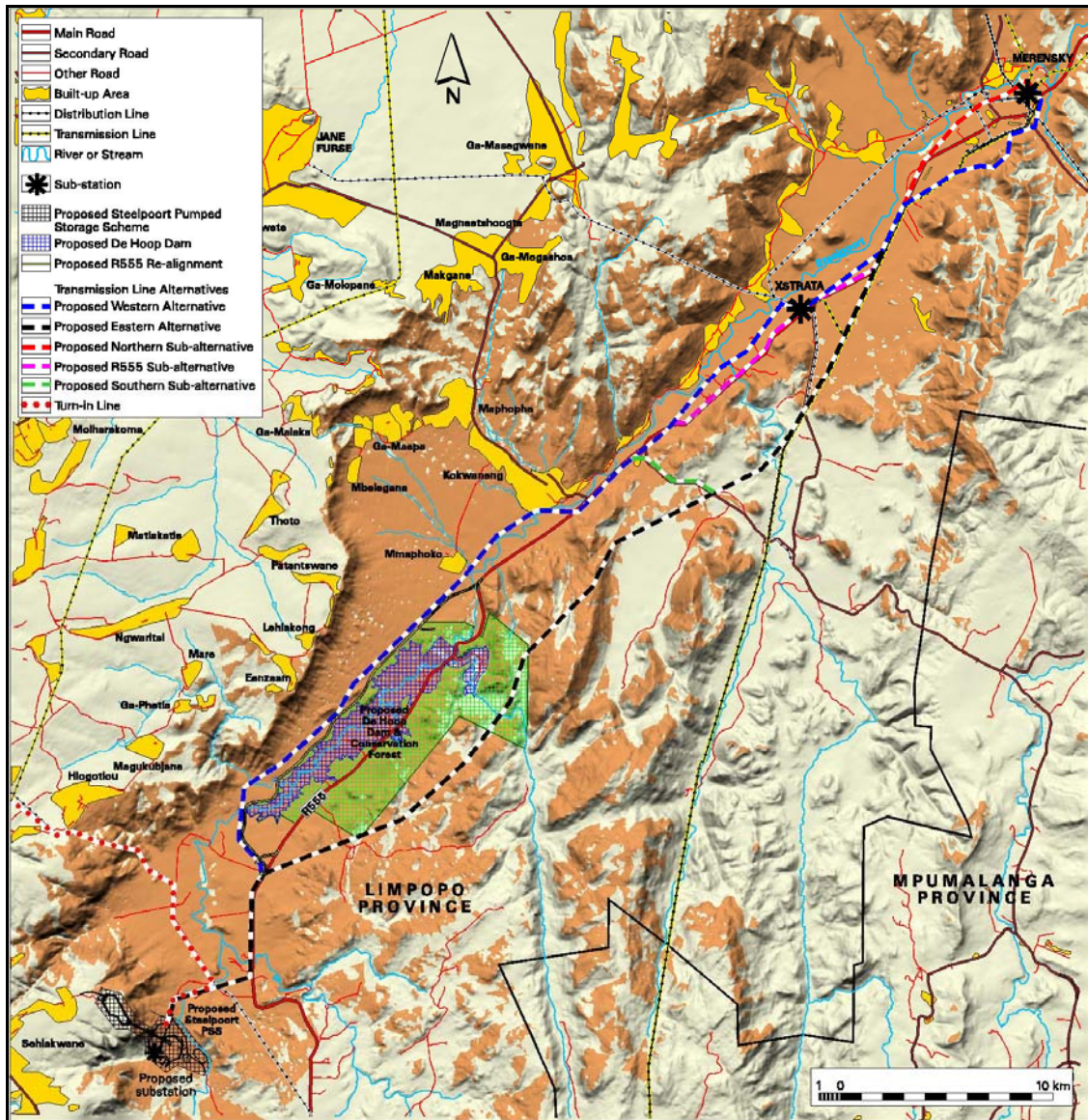
The visual impact assessment within the EIA will address other crucial issues related to the visibility of the preferred transmission line, turn-in line and substation. These issues or criteria will aim to quantify the actual visual impact and to identify areas of perceived impact.

Other issues/criteria to be addressed by the visual impact assessment include:

- Visual Distance/Observer Proximity to the transmission line (Apply the principle of reduced impact over distance).
- Viewer Incidence/Viewer Perception (Identify areas with high viewer incidence and negative viewer perception).
- Landscape Character/Land Use Character (Identify conflict areas in terms of existing and proposed land use).
- Visually Sensitive Features (scenic features or attractions).
- General Visual Quality of the affected area.
- Potential impact of the integration project on the tourism and eco-tourism potential of the area (Specifically the tourism potential of the De Hoop Dam).
- Visual Absorption Capacity of the natural vegetation.
- The effect of existing man-made structures on the visual exposure.
- Potential visual impact of lighting (after hours operations and security of the substation).
- Potential mitigation measures.

### **3. SITE/ALTERNATIVE SPECIFIC RESULTS**

#### **3.1 Steelpoort-Merensky Western Alternative**



**Figure 2:** Potential Visual Exposure (indicated in red): Western Transmission Line Alternative

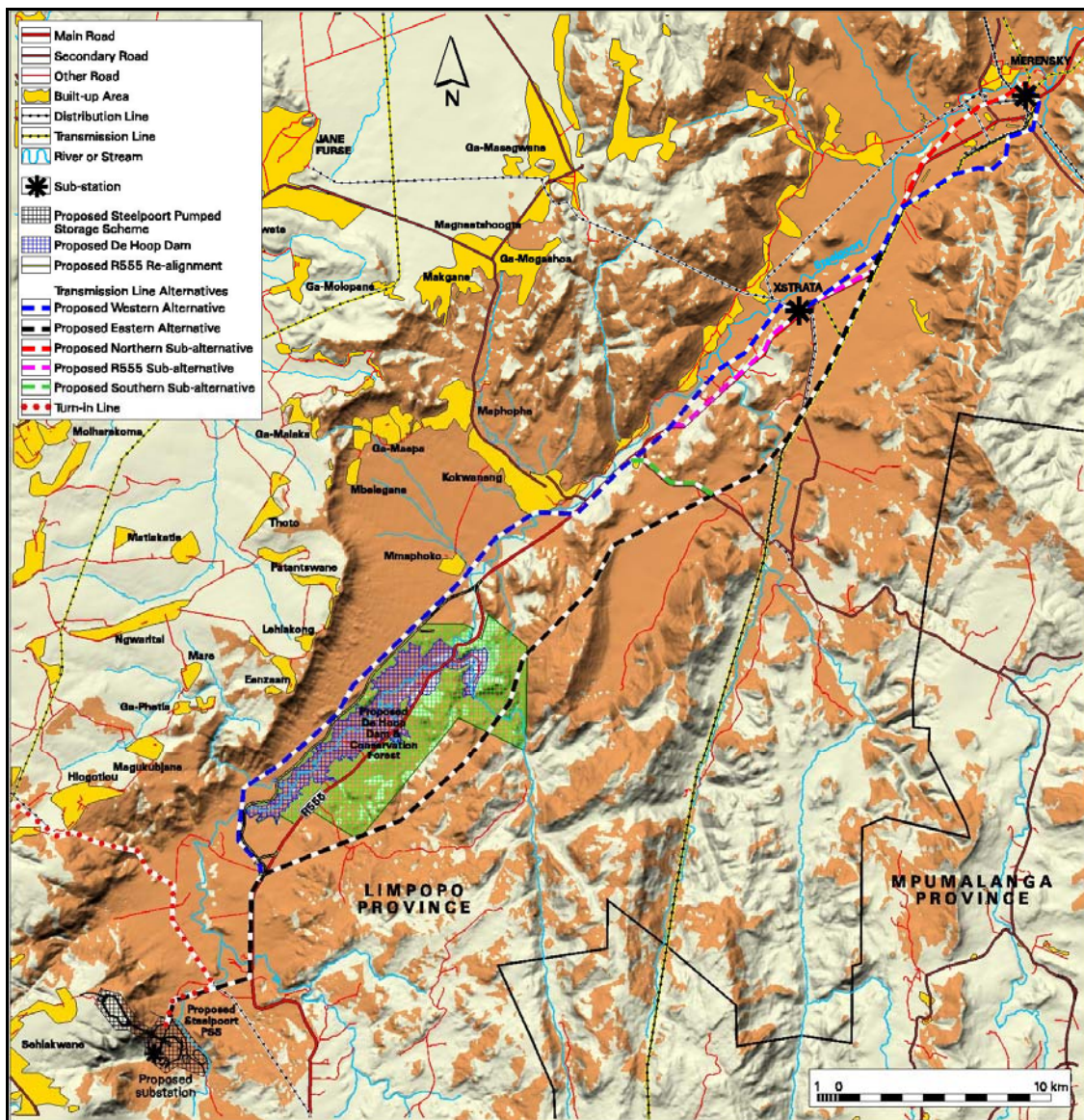
The viewshed analysis was undertaken along the entire proposed western alignment (from the SPSS to Merensky) at 500m intervals at an offset of 30m above average ground level (i.e. the approximate height of the powerline towers).

The western alternative follows the R555 (including the R555 re-alignment) for virtually the entire length of the alignment. It only veers off near the Merensky substation where mining-related and agricultural activities restrict its passage. The exposure of this alignment is greatly restricted to the visual catchment of the Steelport River Valley within which it will be highly visible.

Site-specific issues related to this alignment option include:

- The high level of (and frequent) exposure to a great number of observers travelling along the R555, considered to be a scenic route.
- The passing of the transmission line in close proximity of the De Hoop Dam and Conservation Area possibly visually impacting on the future tourism/conservation potential of the dam.
- Crossing (or traversing near) the Steelpoort River (a visually sensitive feature) at regular intervals.
- The alignment enters a relatively densely populated area from the residential areas of Mmaphoko, Kokwaneng and beyond and will be exposed to residents of these areas.

### 3.2 Steelpoort-Merensky Eastern Alternative



**Figure 3:** Potential Visual Exposure (indicated in red): Eastern Transmission Line Alternative

The viewshed analysis was undertaken along the entire proposed eastern alignment (from the SPSS to Merensky) at 500m intervals at an offset of 30m above average ground level (i.e. the approximate height of the powerline towers).

From the Steelpoort Substation, the eastern alignment follows the R555 for approximately 10km before veering east and passing south of the De Hoop Dam and DWAF conservation forest. It traverses the conservation forest and numerous elevated topographical units (hills and mountains) before it eventually joins the alignment of an existing 275kV and 400kV line. It follows the existing lines past the XStrata substation before joining the R555 road alignment for approximately 3.5km where-after it veers off east in order to avoid the mining activities south of the Merensky substation.

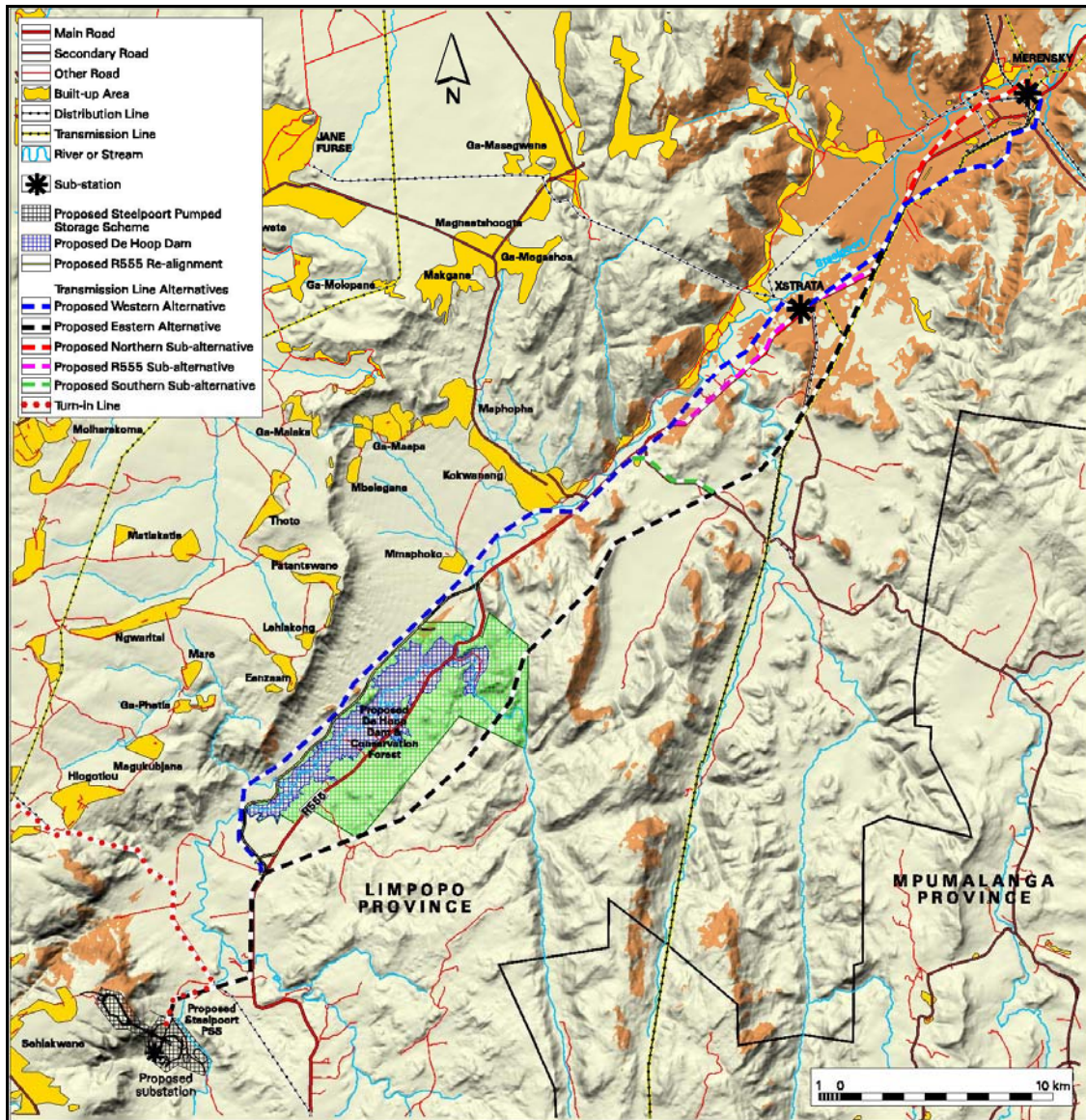
Site-specific issues related to this alignment option include:

- Exposure to observers travelling along the R555 (for approximately 13.5km), considered to be a scenic route.
- Traversing visually sensitive elevated and exposed topographical units.
- Traversing visually sensitive areas with undisturbed natural vegetation.
- Traversing a Gazetted conservation area prohibiting the deforestation and removal of endemic plant species from any area (including for the clearing of transmission line servitudes).
- Crossing the Steelpoort, Dwars and Klip Rivers (visually sensitive features).

An initial scanning level assessment of the above issues (specifically bullet number 4) revealed a potential fatal flaw in this section of the proposed eastern alignment of the transmission line.

### **3.3 Northern Sub-alternative**





**Figure 4:** Potential Visual Exposure (indicated in red): Northern Sub-alternative

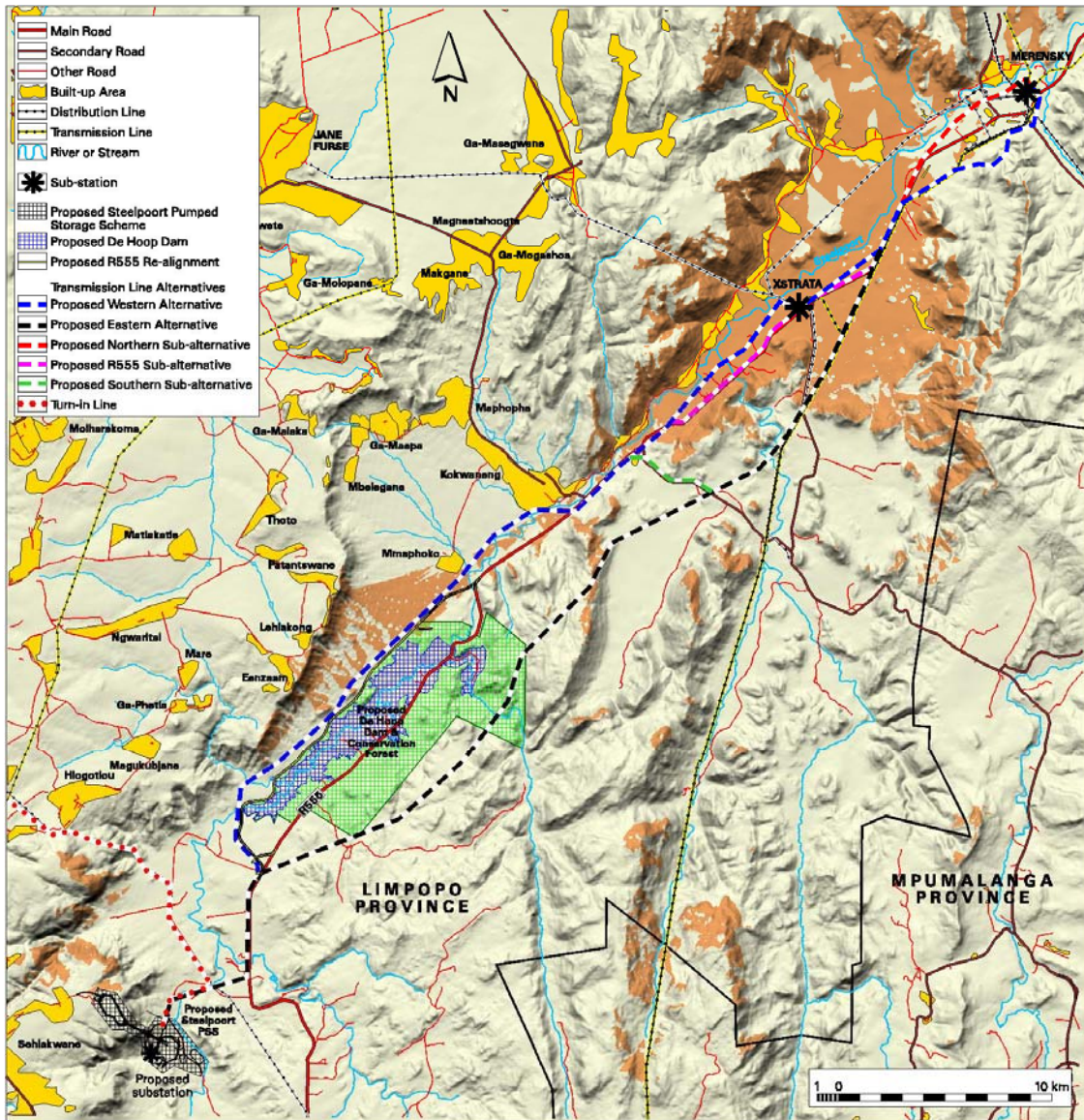
The viewshed analysis was undertaken for the northern sub-alternative alone at 500m intervals at an offset of 30m above average ground level.

The northern sub-alternative deviates from the eastern and western alternatives where the latter two alternatives veer east of the R555 to avoid mining activities. The northern sub-alternative continues along the R555 towards the Steelpoort River where it runs adjacent to the river (close to or within the floodplain) towards the Merensky substation.

Site-specific issues related to this alignment option include:

- Exposure to a number of observers travelling along the R555 (for approximately 2.3km).
- Traversing near the Steelpoort River (a visually sensitive feature).

### 3.4 R555 Sub-alternative



**Figure 5:** Potential Visual Exposure (indicated in red): R555 Sub-alternative

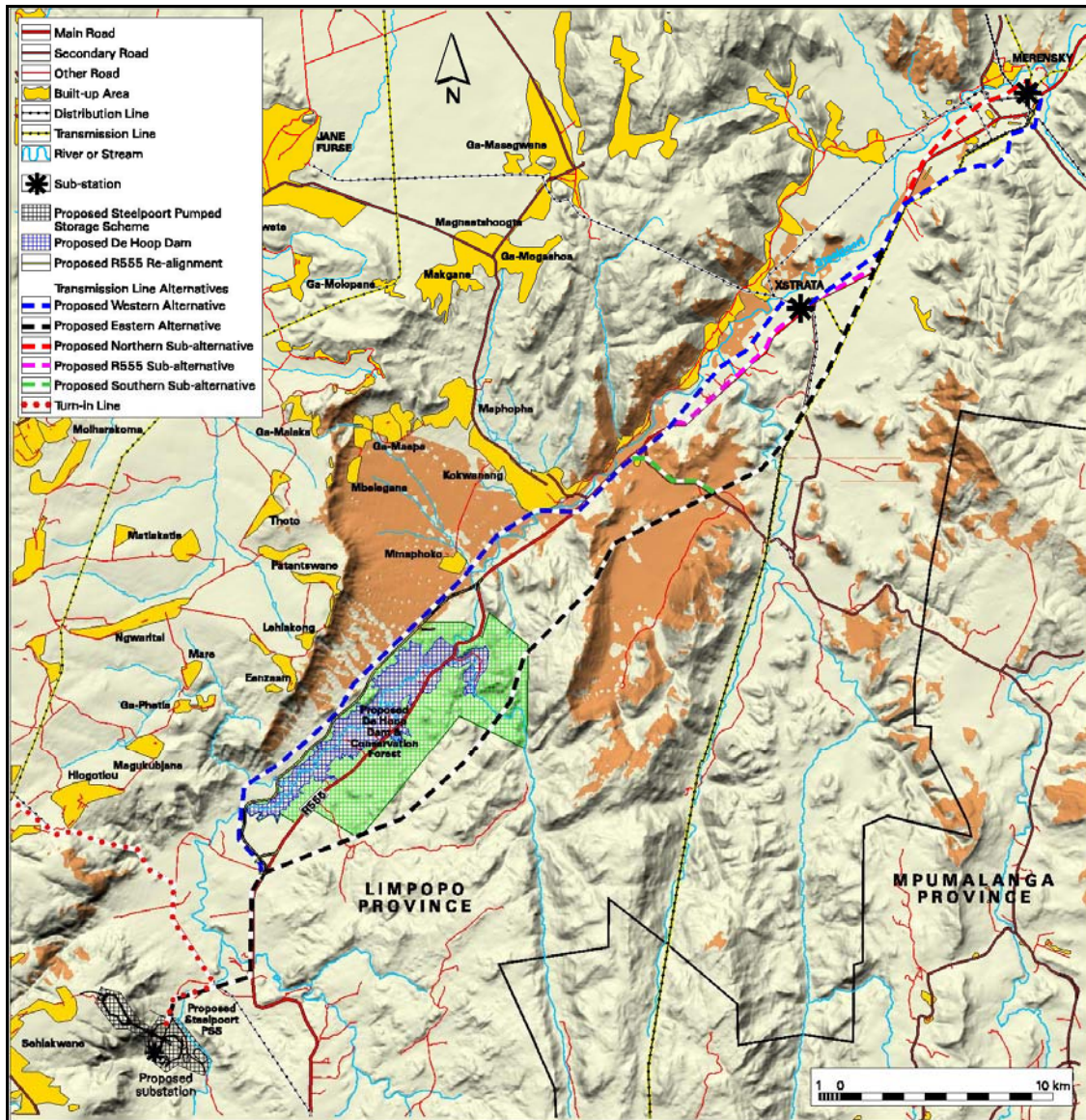
The viewshed analysis was undertaken for the R555 sub-alternative alone at 500m intervals at an offset of 30m above average ground level.

This proposed sub-alternative deviates slightly from the western alternative by closely following the R555 for a distance of approximately 12km past the XStrata substation. The visual exposure of this sub-alternative is similar to this section of the proposed western alternative with the exception being that it is in closer proximity to the R555.

Site-specific issues related to this alignment option include:

- The high level of (and frequent) exposure to a great number of observers travelling along the R555.
- The alignment transverses a densely populated residential area and will be exposed to residents.

### 3.5 Southern Sub-alternative



**Figure 6:** Potential Visual Exposure (indicated in red): Southern Sub-alternative

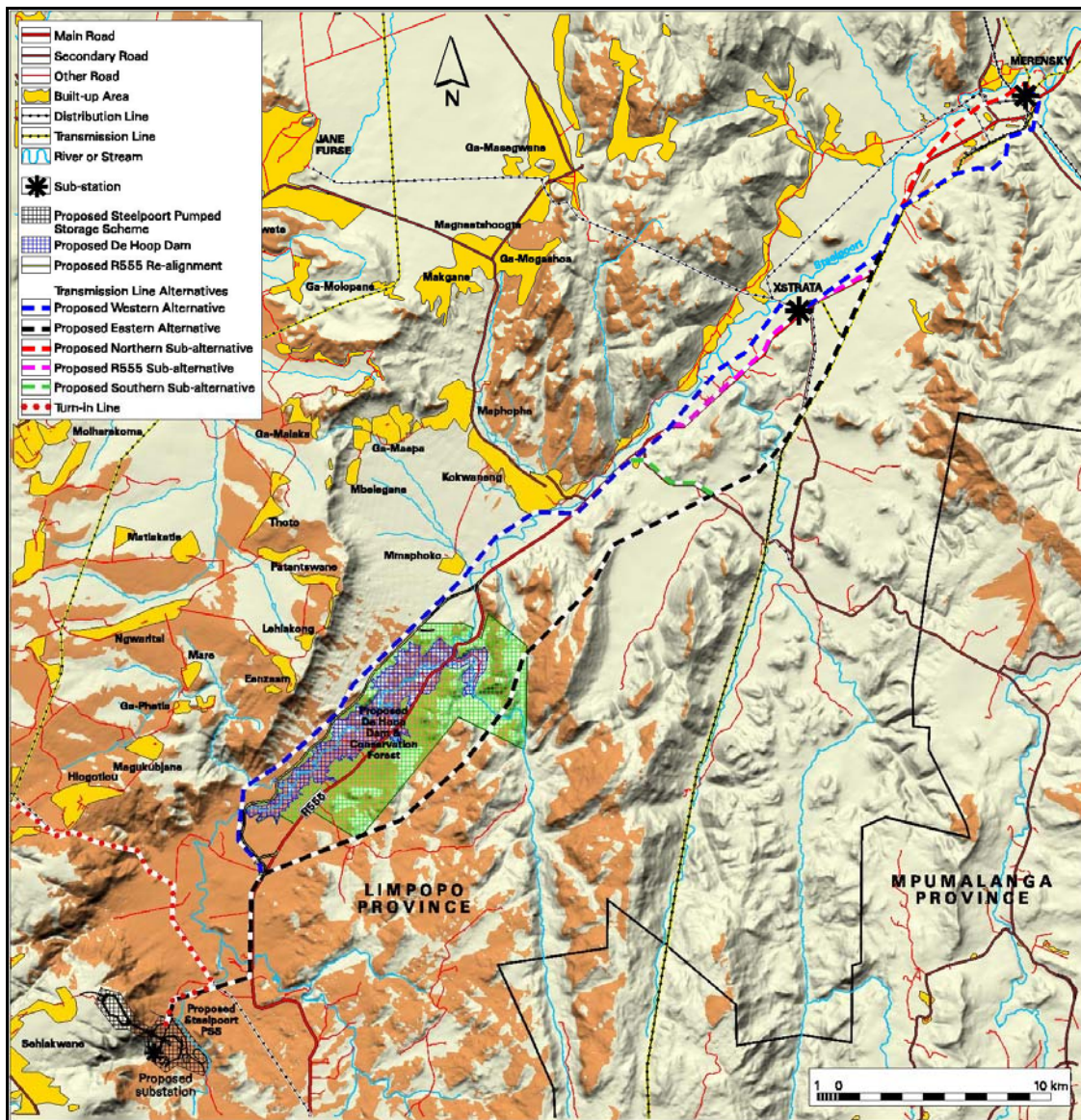
The viewshed analysis was undertaken for the southern sub-alternative alone at 500m intervals at an offset of 30m above average ground level.

This alignment option links the western and eastern alternatives where it runs alongside the Steelpoort/Lydenburg secondary road for approximately 4.4km. Its close distance visual exposure (within a 10km radius) is almost entirely contained within a less-populated secondary valley.

Site-specific issues related to this alignment option include:

- The high level of exposure to a number of observers (mainly local people commuting between Steelpoort and Lydenburg) travelling along the secondary road.
- Exposure to residents living adjacent to the Lydenburg/Steelpoort road.

### 3.6 Turn-in Line



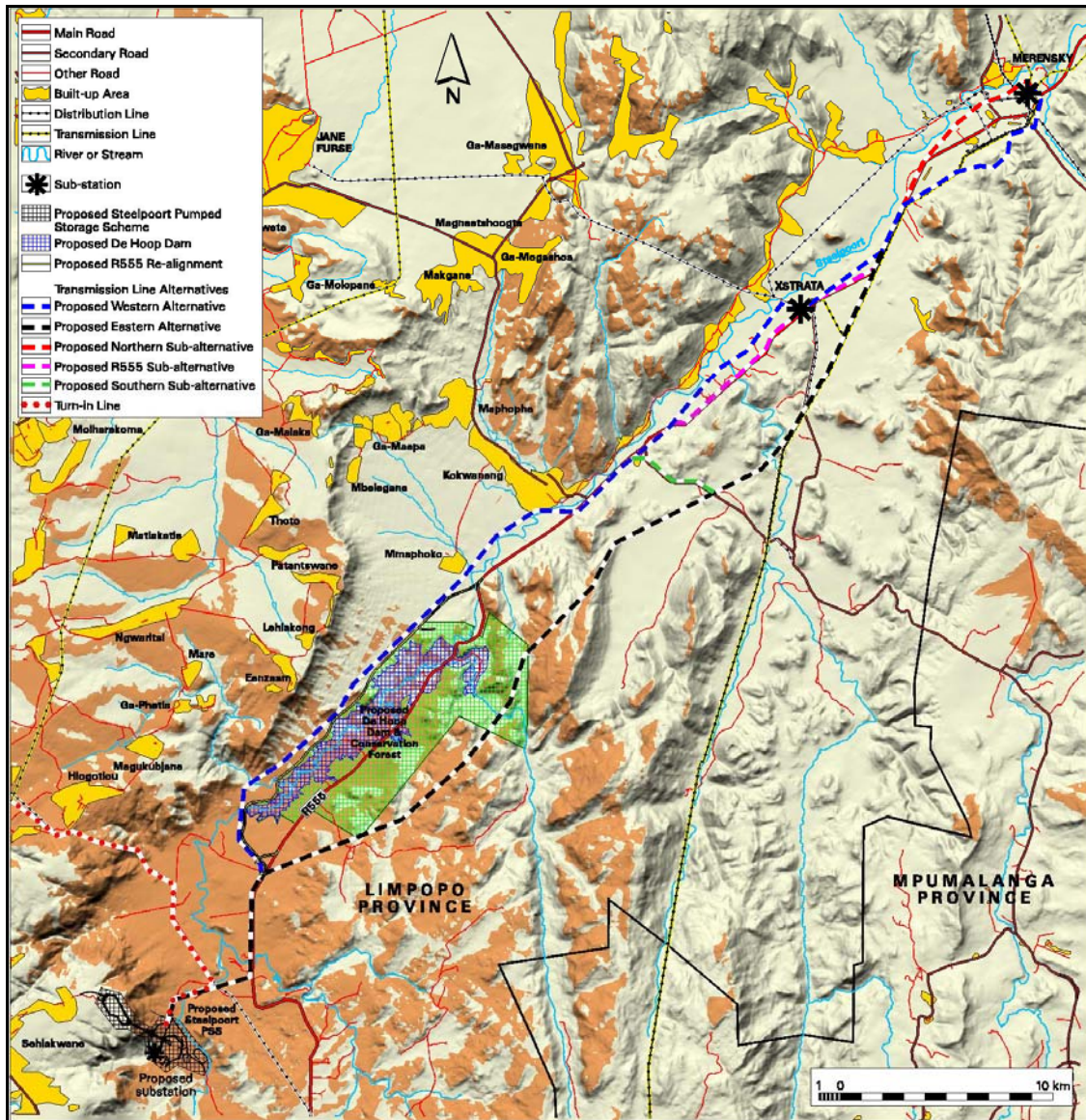
**Figure 7.1:** Potential Visual Exposure (indicated in red): Turn-in Line (Double Circuit Powerline Option)

The viewshed analysis was undertaken for the turn-in line at 500m intervals at an offset of 50m above average ground level (i.e. the approximate height of a double-circuit powerline tower).

The turn-in line follows the eastern/western alignment options for approximately 3.3km before joining an existing distribution line (across the farm Tigerhoek) up the scarp face until it joins with the Duvha-Leseding transmission line. The location of the line within the Steelpoort River Valley is relatively remote (removed from observers) until it crests the escarpment and traverses through the Hlogotlou village.

Site-specific issues related to this alignment option include:

- The traversing of elevated and exposed topographical units.
- The potential clearing of natural vegetation to widen the distribution line servitude in order to accommodate the additional transmission line.
- The exposure to residents from the Hlogotlou settlement located on top of the escarpment.
- The visual exposure of the transmission line to the landowner of farm Tigerhoek (Kwalata Lodge).

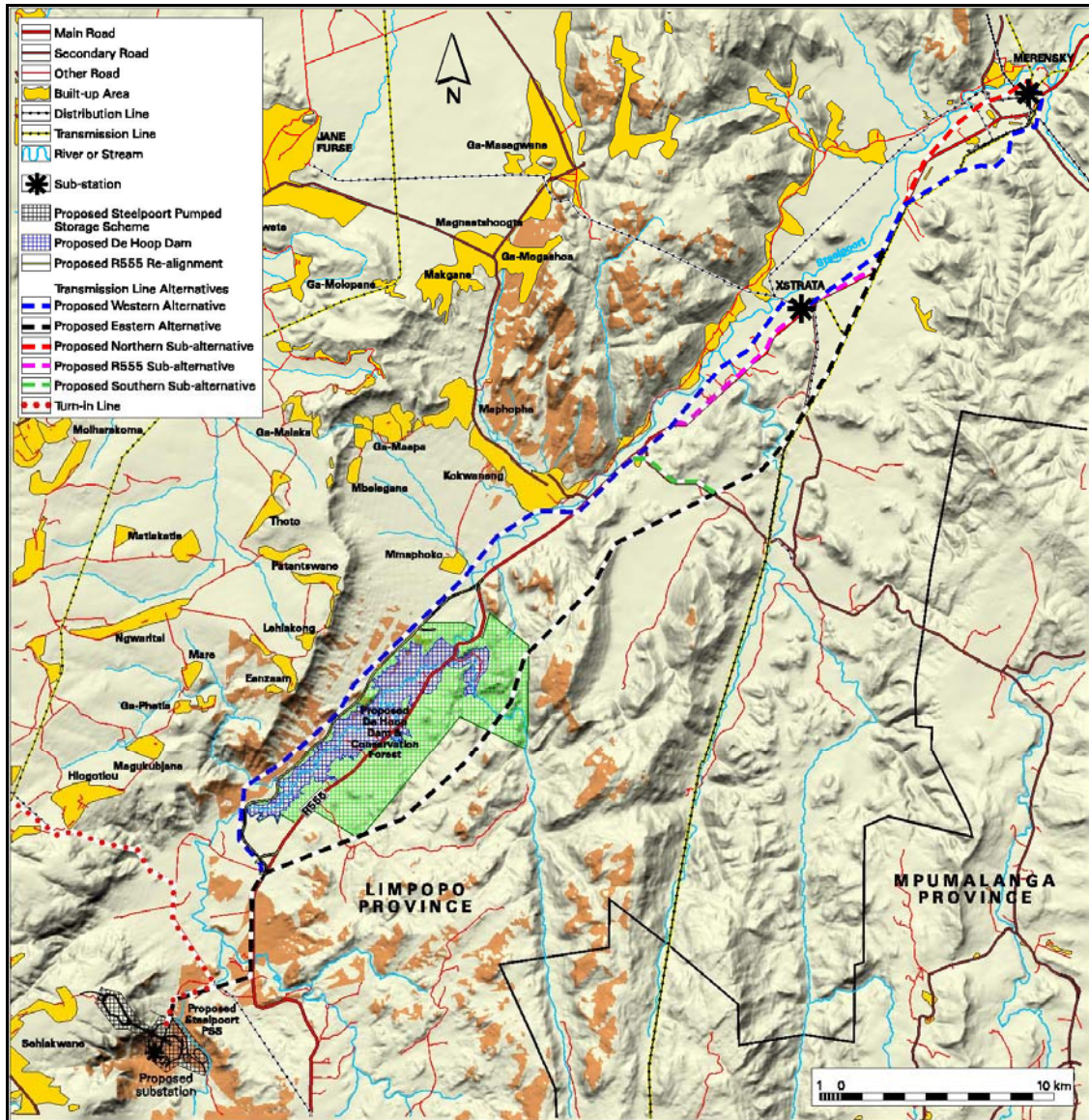


**Figure 7.2:** Potential Visual Exposure (indicated in red): Turn-in Line (Two Lines in Parallel)

The viewshed analysis was undertaken for the turn-in line at 500m intervals at an offset of 30m above average ground level (i.e. the approximate height of a powerline tower for two lines in parallel).

The pattern of visual exposure for the two parallel lines is virtually similar to the exposure of the double circuit line (offset 50m above ground level - see Figure 7.1 above). The main difference between the two options is the size (width) of the servitude where the two lines in parallel would require a larger servitude. This would imply that a larger area would be cleared of natural vegetation beneath the parallel lines than would be required for the double circuit line. This would aggravate the potential visual impact of the parallel lines compared to the double circuit line.

### 3.7 Steelpoort Pumped Storage Scheme Substation



**Figure 8:** Potential Visual Exposure (indicated in red): Proposed SPSS Substation

The viewshed analysis was undertaken for the substation at an offset of 30m above average ground level (i.e. the approximate height of the substation components and the proposed communication tower).

The visual exposure of the substation is greatly contained within the remote valley of its location. Occasional short distance observations may occur from the R555.

Site-specific issues related to the visual exposure of the substation include:

- Potential observation from the R555.
- Potential observation from individual landowners residing in the area.
- The potential visual impact of lighting (both security and operational lighting) within the area.

It must be noted that the viewshed analysis for the substation was undertaken for the substation alone and that it does not include the structures associated with the proposed pumped storage scheme. These structures may further influence the potential visual impact of the substation and should ideally have been addressed during the EIA for the pumped storage scheme.

#### **4. TRANSMISSION LINE ALTERNATIVES**

The selection of a preferred transmission line alternative (combination of alternatives) integrating the SPSS and the Merensky substation is largely based on the identified issues as listed above. The listed issues indicate that the construction of the transmission line in question would in all likelihood have some degree of visual impact on various observers/visual environments within the study area. This visual impact is envisaged to occur, but not necessarily be restricted to, a visible area of 5km from the transmission line.

The alternatives/sub-alternatives were firstly judged on the severity of each of its listed issues in order to eliminate certain options, and secondly compared to each other in order to identify the least exposed alternatives.

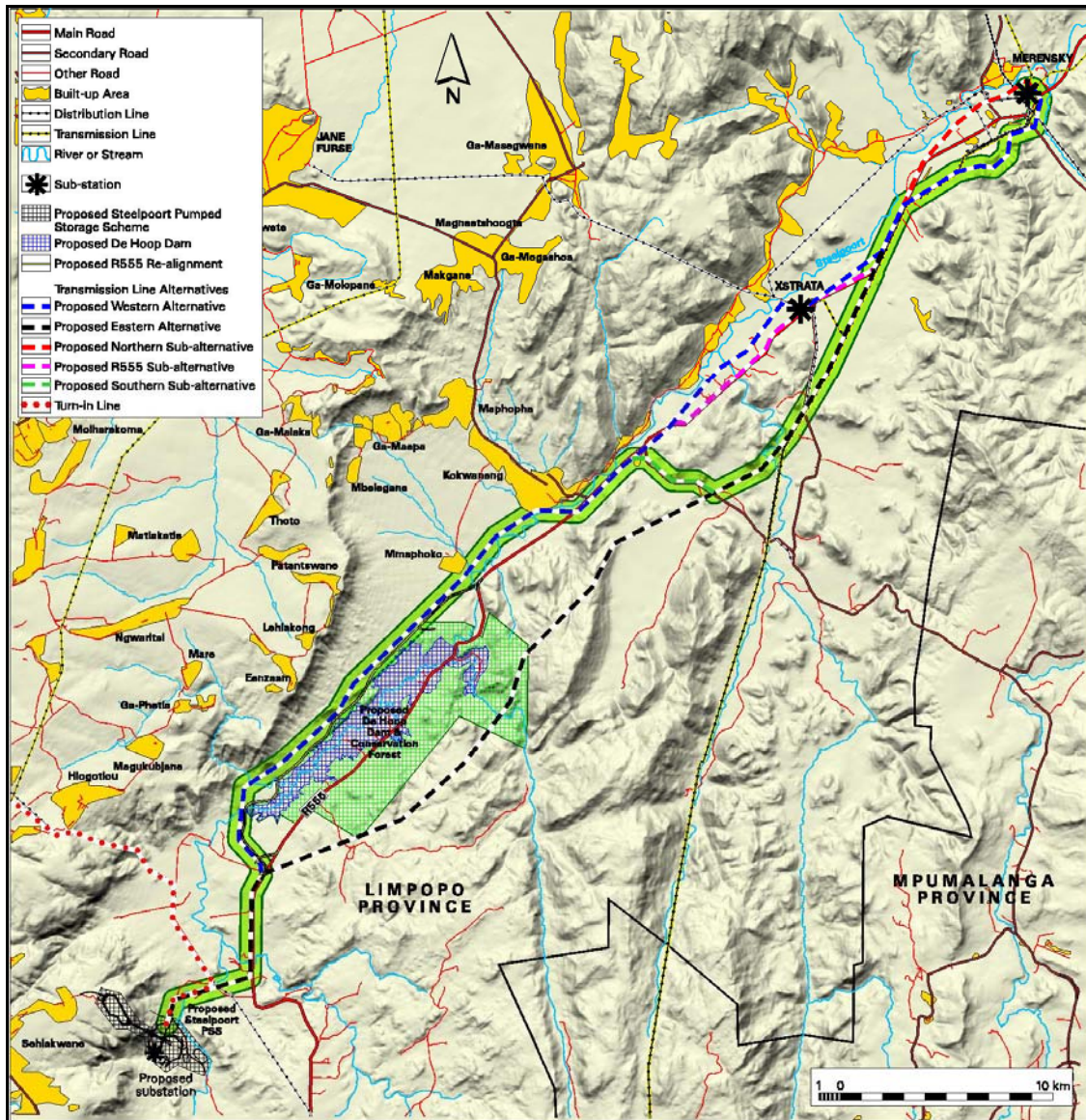
Sections of alternatives that were eliminated include the eastern alternative where the alignment traverses sensitive topographical, vegetative and conservation areas east and north-east of the De Hoop Dam and Conservation Area. The clearing of protected plant species for the construction of the transmission line within this conservation area would constitute a critically high visual impact. The prohibition under which the conservation forest area was declared also legally prohibits any activities within this protected area that "...may cause deforestation". This elimination practically ensures that the only alternative option would be the western alternative up to Steelpoort Park.

The continuation of the western alternative (and the proposed R555 sub-alternative) was deemed to be less favourable than the southern sub-alternative due to the high number of observers, both along the R555 and from the residential settlements in the area. The crowded nature of these alternatives (being wedged between the R555 and the Steelpoort River), and the relatively secluded nature of the northern section of the eastern alternative, suggested that the southern sub-alternative would provide a good link between the two alternatives. The northern section of the eastern alternative also had the added advantage of following at least 16km of existing transmission line servitudes, thus consolidating impacts.

The northern sub-alternative was not preferred above the proposed eastern/western alternative due to the fact that this alignment would unnecessarily encroach on the Steelpoort River floodplain and would be more exposed from the R555.

Figure 8 below indicates the preferred combination of alternatives for the Steelpoort Integration Project from a visual assessment perspective. It must be noted that should this preference not be feasible, for whatever reason, the western alternative in its entirety should be investigated as an alternative to the preferred alignment as indicated below.





**Figure 9:** Preferred Transmission Line Alternative

The options related to the turn-in line (discussed under heading 3.6) identify the double circuit transmission line as the preferred option. The removal of natural vegetation, especially against steep slopes and exposed elevated topographical units, should ideally be restricted to the minimum. As the double circuit line affords the opportunity to minimize the servitude surface area it is preferred above the two parallel lines option.

## 5. CONCLUSION/RECOMMENDATIONS

The construction of the Steelport Integration Project transmission line and turn-in line will in all likelihood have a negative visual impact on a number of observers or sensitive visual receptors in the study area. These sensitive receptors should be identified and the severity of the visual impact should be assessed.

The area further has a high potential for future tourism development due to its unique scenic qualities and breathtaking landscapes. Indirect visual impacts of the proposed project on the future potential for tourism development should be considered. This should be done within the context of the regional development plan for this region.

It is recommended that additional spatial analyses (as mentioned under heading 2. ISSUES RELATED TO THE VISUAL IMPACT ASSESSMENT) be undertaken in order to create a visual impact index for each of the components of the Steelpoort Integration Project (i.e. the transmission line, the turn-in line and the substation). This will further aid in determining potential areas of visual impact. The site-specific issues and potential sensitive visual receptors should be measured against this visual impact index and be addressed individually in terms of nature, extent, duration, probability, severity and significance of visual impact.

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