# PROPOSED DEVIATION OF THE 132kV DASSENBERG-KOEBERG POWER LINE FROM THE KOEBERG POWER STATION TO THE ANKERLIG POWER STATION

*WESTERN CAPE PROVINCE*

## VISUAL IMPACT ASSESSMENT

*AS PART OF A BASIC ASSESSMENT REPORT*

**Produced for:**

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# 1. STUDY APPROACH

## 1.1. Qualification and Experience of the Practitioner

This visual impact assessment was undertaken by MetroGIS (Pty) Ltd, specialists in visual assessment and Geographic Information Systems.

Lourens du Plessis, the lead practitioner undertaking the assessment, has been involved in the application of Geographical Information Systems (GIS) in Environmental Planning and Management since 1990.

The team undertaking the visual assessment has extensive practical knowledge in spatial analysis, environmental modelling and digital mapping, and applies this knowledge in various scientific fields and disciplines. The expertise of these practitioners is often utilised in Environmental Impact Assessments, State of the Environment Reports and Environmental Management Plans.

The visual assessment team is familiar with the "Guidelines for Involving Visual and Aesthetic Specialists in EIA Processes" (Provincial Government of the Western Cape: Department of Environmental Affairs and Development Planning) and utilises the principles and recommendations stated therein to successfully undertake visual impact assessments.

Savannah Environmental (Pty) Ltd appointed MetroGIS (Pty) Ltd as an independent specialist consultant to undertake the visual impact assessment for the proposed Koeberg to Ankerlig overhead power line. Neither the author nor MetroGIS will benefit from the outcome of the project decision-making.

## 1.2. Assumptions and Limitations

This assessment was undertaken during the planning stage of the project and is based on information available at that time.

## 1.3. Level of Confidence

Level of confidence[1] is determined as a function of:

- The information available, and understanding of the study area by the practitioner:
    - 3: A high level of information is available of the study area and a thorough knowledge base could be established during site visits, surveys etc. The study area was readily accessible.
    - 2: A moderate level of information is available of the study area and a moderate knowledge base could be established during site visits, surveys etc. Accessibility to the study area was acceptable for the level of assessment.
    - 1: Limited information is available of the study area and a poor knowledge base could be established during site visits and/or surveys, or no site visit and/or surveys were carried out.

[1] Adapted from Oberholzer (2005).

- The information available, understanding of the study area and experience of this type of project by the practitioner:

  - 3: A high level of information and knowledge is available of the project and the visual impact assessor is well experienced in this type of project and level of assessment.
  - 2: A moderate level of information and knowledge is available of the project and/or the visual impact assessor is moderately experienced in this type of project and level of assessment.
  - 1: Limited information and knowledge is available of the project and/or the visual impact assessor has a low experience level in this type of project and level of assessment.

These values are applied as follows:

**Table 1:** Level of confidence.

| | | **Information on the project & experience of the practitioner** | | |
|---|---|---|---|---|
| **Information on the study area** | | **3** | **2** | **1** |
| | **3** | 9 | 6 | 3 |
| | **2** | 6 | 4 | 2 |
| | **1** | 3 | 2 | 1 |

*The level of confidence for this assessment is determined to be **9** and indicates that the author's confidence in the accuracy of the findings is high:*

- The information available, and understanding of the study area by the practitioner is rated as **3** and
- The information available, understanding and experience of this type of project by the practitioner is rated as **3**.

## 1.4. Methodology

The study was undertaken using Geographic Information Systems (GIS) technology as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed power line. A detailed Digital Terrain Model (DTM) for the study area was created from 5m interval contours supplied by the Chief Directorate National Geo-Spatial Information.

The approach utilised to identify issues related to the visual impact included the following activities:

- The creation of a detailed digital terrain model (DTM) of the potentially affected environment;
- The sourcing of relevant spatial data. This included cadastral features, vegetation types, land use activities, topographical features, site placement, etc.
- The identification of sensitive environments upon which the proposed power line could have a potential impact;
- The creation of viewshed analyses from the proposed alignments in order to determine the visual exposure and the topography's potential to absorb the potential visual impact. The viewshed analyses take into account the dimensions of the proposed structures.

This report (visual impact assessment) sets out to identify and quantify the possible visual impacts related to the proposed power line, as well as offer potential mitigation measures, where required.

The following methodology has been followed for the assessment of the potential visual impact:

- **Determine Potential visual exposure**

  The visibility or visual exposure of any structure or activity is the point of departure for the visual impact assessment. It stands to reason that if the proposed power line was not visible, no impact would occur.

  Viewshed analyses of the proposed alignment indicate the potential visibility.

- **Determine Visual Distance / Observer Proximity to the power line**

  In order to refine the visual exposure of the power line on surrounding areas/receptors, the principle of reduced impact over distance is applied in order to determine the core area of visual influence for the structures.

  Proximity radii for the proposed alignment are created in order to indicate the scale and viewing distance of the structures and to determine the prominence of the structures in relation to their environment.

  The visual distance theory and the observer's proximity to the power line are closely related, and especially relevant, when considered from areas with a high viewer incidence and a predominantly negative visual perception of the proposed infrastructure.

- **Determine Viewer Incidence / Viewer Perception**

  The number of observers and their perception of a structure determine the concept of visual impact. If there are no observers, then there would be no visual impact. If the visual perception of the structure is favourable to all the observers, then the visual impact would be positive.

  It is therefore necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the proposed infrastructure.

  It would be impossible not to generalise the viewer incidence and sensitivity to some degree, as there are many variables when trying to determine the perception of the observer; regularity of sighting, cultural background, state of mind, and purpose of sighting which would create a myriad of options.

- **Determine the Visual Absorption Capacity of the natural vegetation**

  This is the capacity of the receiving environment to absorb the potential visual impact of the proposed structures. The VAC is primarily a function of the vegetation, and will be high if the vegetation is tall, dense and continuous. Conversely, low growing sparse and patchy vegetation will have a low VAC.

  The VAC would also be high where the environment can readily absorb the structure in terms of texture, colour, form and light / shade characteristics of the structure. On the other hand, the VAC for a structure contrasting markedly with one or more of the characteristics of the environment would be low.

The VAC also generally increases with distance, where discernible detail in visual characteristics of both environment and structure decreases.

The digital terrain model utilised in the calculation of the visual exposure of the power line does not incorporate the potential visual absorption capacity (VAC) of the natural vegetation of the region. It is therefore necessary to determine the VAC by means of the interpretation of the vegetation cover, supplemented with field observations.

- **Determine the Visual impact index**

  The results of the above analyses are merged in order to determine where the areas of likely visual impact would occur. These areas are further analysed in terms of the previously mentioned issues (related to the visual impact) and in order to judge the magnitude of each impact.

- **Determine Impact significance**

  The potential visual impacts identified and described are quantified in their respective geographical locations in order to determine the significance of the anticipated impact. Significance is determined as a function of extent, duration, magnitude and probability.

## 2. BACKGROUND

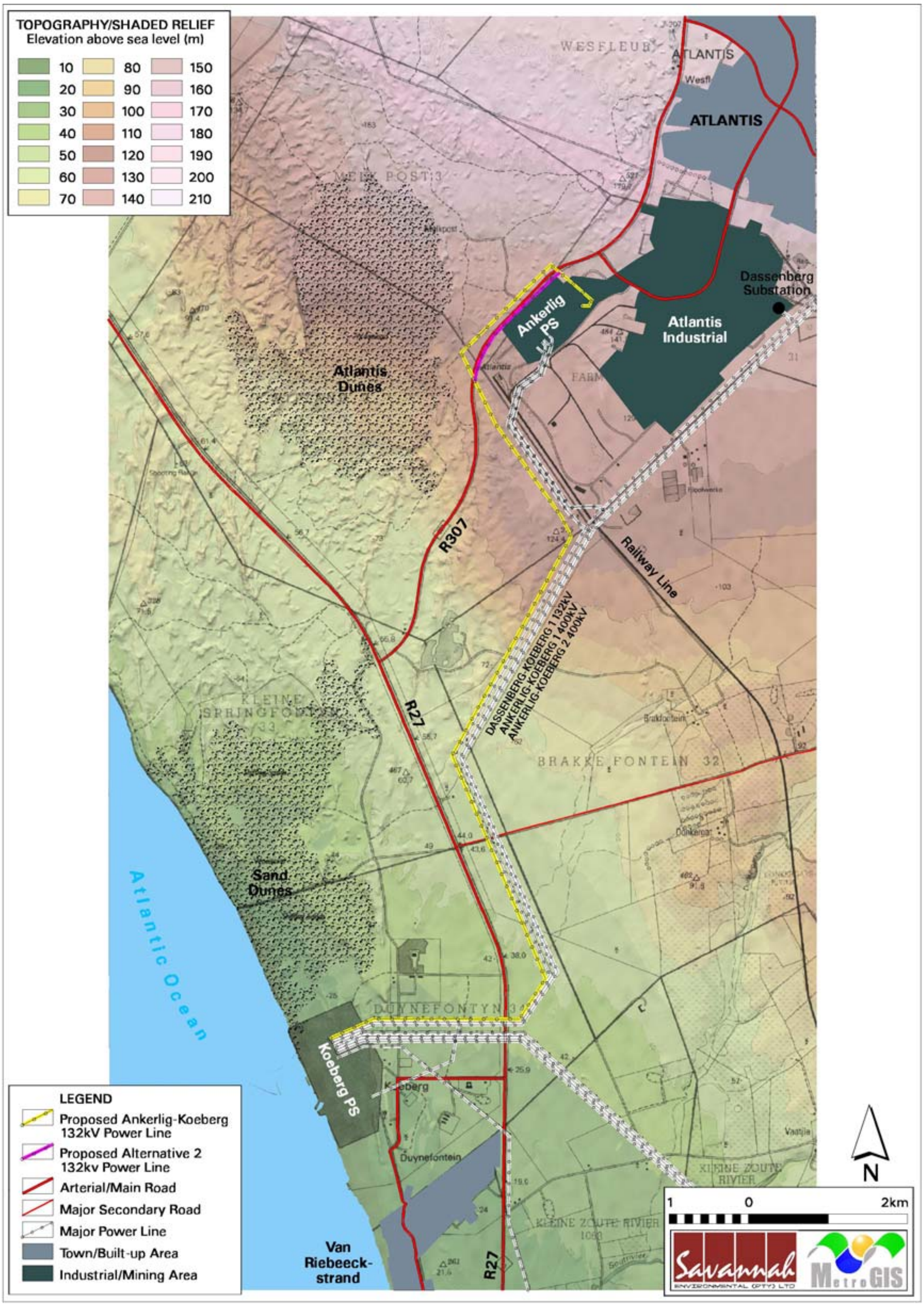
**Eskom Holdings SOC Limited** (**Eskom**) has identified the need to reroute a portion of the existing Dassenberg-Koeberg 132kV power line from the Koeberg Power Station to the Ankerlig Power Station. The existing power line is approximately 15km long and connects with the Dassenberg substation located within the east of the Atlantis industrial area.

The intention is to follow the existing Dassenberg-Koeberg 132kV power line (located adjacent to the Ankerlig-Koeberg 1 and 2 400kV transmission lines) up to a point located south of the Atlantis industrial area (near the railway line), and then follow the latter power lines in a north-westerly direction. The proposed power line will traverse over the R307 arterial road, before running adjacent to this road, north of the Ankerlig power station, before crossing the road again in order to enter the Ankerlig substation from the north.

A slight deviation (Alternative 2) to this alignment is proposed where the alignment reach the R307. Instead of crossing over the road, this alternative will continue along (south of) the road alignment as it traverses north of the Ankerlig Power Station, before joining the proposed alignment again.

It should be noted that this proposed alignment is intended to replace an existing approved power line alignment traversing between Koeberg and Ankerlig. The approved alignment is deemed to be technically unfeasible, due to space constraints in the Atlantis area. The first section of this alignment, up to the railway line, coincides with the first section of the proposed alignment.

Please refer to **Map 1** for the proposed alignment of the Koeberg-Ankerlig power line.




**Map 1:** Locality map of the study area (indicating the location of the proposed power line, as well as the topography and elevation above sea level).

## 3. SCOPE OF WORK

The determination of the potential visual impacts is undertaken in terms of nature, extent, duration, magnitude, probability and significance of the construction and operation of the proposed infrastructure.

The study area for the visual assessment encompasses a geographical area of approximately 142km² (the extent of the maps displayed in this report) and includes a minimum 3km buffer zone from the proposed alignment.

Anticipated issues related to the potential visual impact of the proposed power line include the following:

- The visibility of the power line from, and potential visual impact on observers travelling along the arterial roads (i.e. the R27 and R307) and secondary roads in close proximity[2] to the proposed alignment and within the region[3].
- The visibility of the power line from, and potential visual impact on residents of homesteads and towns in close proximity to the proposed power line.
- Potential visual impacts associated with the construction phase on observers in close proximity to the proposed power line.
- The potential visual impact of the proposed infrastructure on the visual quality of the landscape and sense of place region.
- The potential cumulative visual impact of the proposed power line in relation to other infrastructure and built forms.
- Potential residual visual impacts after the decommissioning of the proposed power line.
- The potential to mitigate visual impacts and inform the design process.

It is envisaged that the issues listed above may constitute a visual impact at a local and/or regional scale.

## 4. RELEVANT LEGISLATION AND GUIDELINES

The following legislation and guidelines have been considered in the preparation of this report:

- The Environmental Impact Assessment Amendment Regulations, 2010;
- Guideline on Generic Terms of Reference for EAPS and Project Schedules (DEADP, Provincial Government of the Western Cape, 2011).

## 5. THE AFFECTED ENVIRONMENT

The proposed Koeberg-Ankerlig 132kV power line alignment is located between the Koeberg Power Station (north of Van Riebeeckstrand) and the Atlantis Industrial Area (south of Atlantis) in the Western Cape. The entire alignment falls within the Cape Town Local Municipality.

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[2] For the purpose of this study, close proximity is considered to be within 1.5km of the proposed alignment. This would be a short to medium distance view where the structures would be easily and comfortably visible and may constitute a high visual prominence.

[3] For the purpose of this study, the region is considered to be beyond the 1.5km radius of the proposed alignment. This would be a longer distance view where the structures would become part of the visual environment, but may still be visible and constitutes a medium to low visual prominence.

The study area occurs on land that ranges in elevation from the Atlantic seaboard (sea level) at Koeberg to approximately 210m above sea level to the north-west of Atlantis. The broad terrain morphological unit for this area is *plains* and *moderately undulating* plains. The slope of the entire alignment is generally very even, with strongly undulating terrain (mainly sand dunes) to the west of the study area. Exposed sand dunes occur to the north of Koeberg and west of the Atlantis industrial area.

Refer to **Map 1** for the shaded relief and topography of the study area.

**Figure 1:** Undulating terrain and exposed sand dunes west of the Atlantis industrial area.

There are no prominent hydrological features or perennial rivers within the study area. The Sout River is located to the south of the study area with a number of non-perennial water courses or dry river channels feeding into this river during the rainy season. A wetland system is located within the centre of the study area, approximately 500m north-west of the proposed power line alignment.

The study area has a Mediterranean climate and receives approximately 300-500mm of rainfall per year. The largest part of the proposed power line alignment traverses *Thicket, Bushland, Bush Clumps,* and *High Fynbos.* See **Map 2** for the land cover.

Vegetation types[4] along the alignment include *Cape Flats Strandveld* (to the west) and *Atlantis Sand Fynbos* to the east. The Atlantis sand dunes fall within the formerly mentioned vegetation type. These dunes are a popular outdoor

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4 Department of Environmental Affairs and Tourism, 2001. *Environmental Potential Atlas for the Western Cape Province (ENPAT)*

recreation attraction for sand boarders, motor bikers, quad bikers and off road enthusiasts.

**Figure 2:** Motor bikers preparing to enter the Atlantis sand dunes (Note: Ankerlig Power Station and power lines visible in the background).

**Figure 3:** The Atlantis sand dunes have a remote desert feeling and distinctive sense of place.

The largest part of the study area has a rural and predominantly natural character. This area falls within the West Coast Biosphere Reserve that spans north-wards to the West Coast National Park. The longest section of the alignment traverses the *buffer zone* of this biosphere reserve. Other land uses include urban areas (Atlantis and Van Riebeeckstrand), industrial areas (Atlantis industrial and Koeberg) as well as dryland agriculture (wheat farming) to the south-east.

The towns mentioned above are the only built-up areas within the study area and account for the highest population concentration within the region. The average population density within this district is approximately 45 people per $km^2$. There are a very limited number of homesteads (farm residences: *Melkpost, Brakfontein* and *Donkergat*) within the study area, none of which are located closer than 1km from the proposed alignment.

The R27 arterial road traverses the study area from the south to the north, linking Cape Town with Saldanha and the West Coast National Park. Other arterial or major roads include the R307 (Dassenberg Road) and the Brakkefontein secondary road. The R307 is the main access road to the Ankerlig Power Station (Atlantis industrial area), Atlantis and the Atlantis sand dunes. This road and the R27 are official tourist routes within the Western Cape and are indicated as the *Cape West Coast Route*.

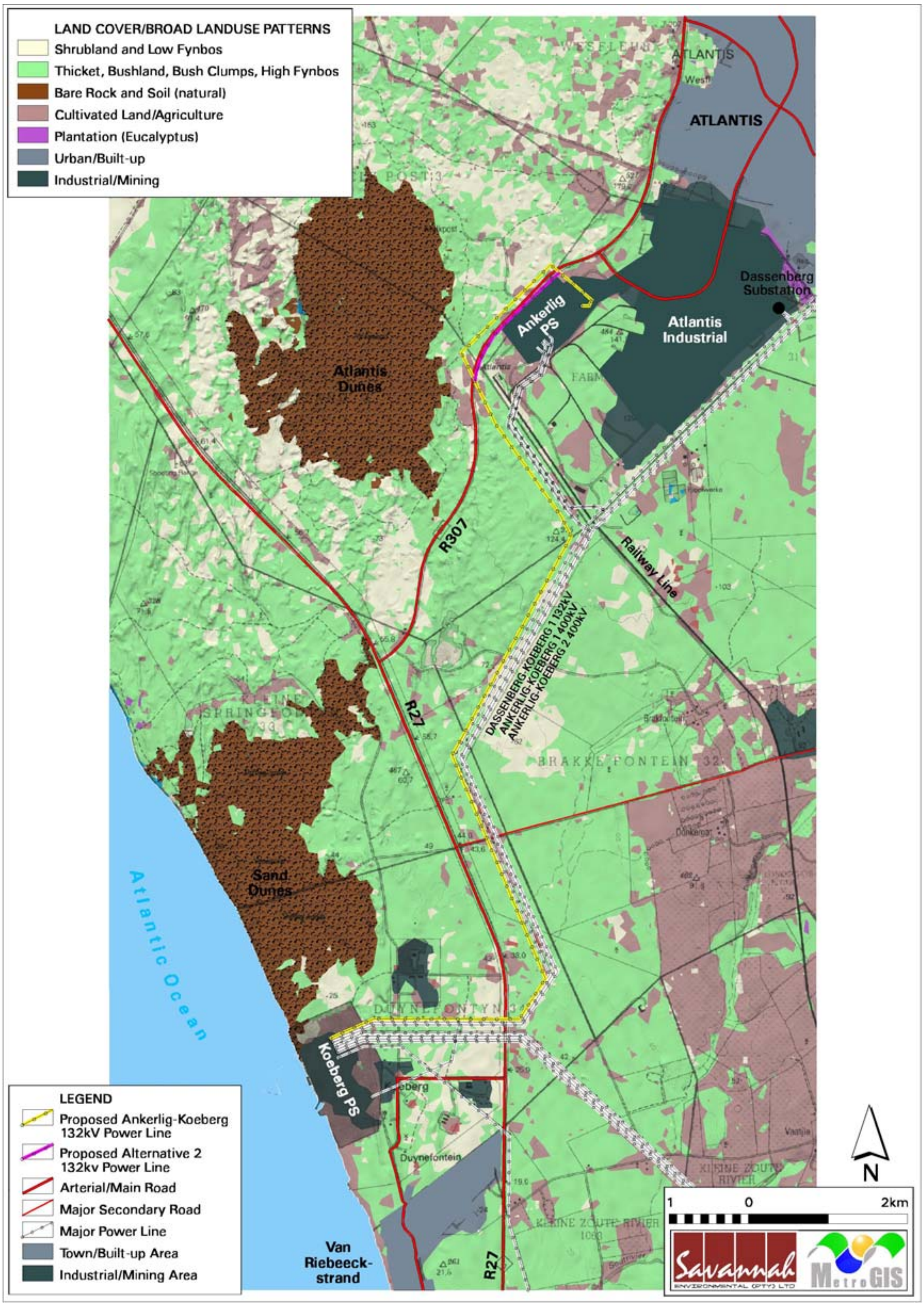
There are a considerable amount of power lines traversing the study area, especially within close proximity to the Koeberg Power Station. Power lines traversing between this power station and the Ankerlig Power Station include the *Ankerlig-Koeberg 1* and *2 400kV* lines, and the *Dassenberg-Koeberg 1 132kV* line. The Atlantis industrial area, sewage works and a disused railway line further account for built industrial structures within the region. Future land use immediately north of the study area, includes the Dassenberg Wind Energy (Pty) Ltd and the Western Wind Energy (Pty) Ltd Facilities. These applications are, to the author's knowledge, still pending approval of their respective Environmental Impact Assessments. It is expected that the construction of these facilities may further influence the visual character of the region in terms of industrial development.

**Figure 4:** Koeberg-Dassenberg and Koeberg-Ankerlig overhead power lines crossing over Brakkefontein Road.

There are no formally (statutory) protected or conservation areas present within the study area, although the Koeberg Private Nature Reserve is located north of the Koeberg Power Station. This reserve primarily encompasses the sand dunes located between the R27 and the Atlantic seaboard.

*Sources: DEAT (ENPAT Western Cape), NBI (Vegetation Map of South Africa, Lesotho and Swaziland) and NLC2000 (ARC/CSIR).*

**Figure 5:** The existing *Koeberg-Ankerlig 1* and *2 (400kV)* power line structures just before entering the Atlantis industrial area (Note: the proposed *Koeberg-Ankerlig 132kV* power line will follow these lines up to this point).




**Map 2:** Broad land cover/land use patterns map.

## 6. RESULTS

### 6.1. Potential visual exposure

The result of the viewshed analysis for the proposed Koeberg-Ankerlig power line is shown on **Map 3**. The visibility analysis was undertaken along the alignment at an offset of 30m above average ground level (i.e. the maximum height of the power line structures.

The viewshed analysis does not include the effect of vegetation cover or existing structures on the exposure of the proposed power line, therefore signifying a worst-case scenario. The area indicated as potentially visible, refers to the visibility of both the proposed and the alternative alignments. There is an insignificant difference in the visual exposure of these two alternatives due to their relative close proximity to each other, the general flat topography along the alignment, and the relatively tall (30m) power line structures.

**General**
The power line has the potential to be (theoretically) visually exposed over a fairly large area due to the fact that it traverses mainly flat terrain, with very limited topographical features to shield observers from the proposed structures. Exceptions occur to the north-west where the undulating nature of the terrain interrupts visibility, and to the south-east where a weak ridge disrupts the viewshed pattern. It should be noted that the proposed 132kV power line would hardly ever be viewed in isolation, but rather against the backdrop of, from the west, or located behind (from the east) the much taller and bulkier 400kV power lines. It is only at the Atlantis industrial area where the alignment departs from the *Ankerlig-Koeberg 1 and 2 400kV* power line servitude.

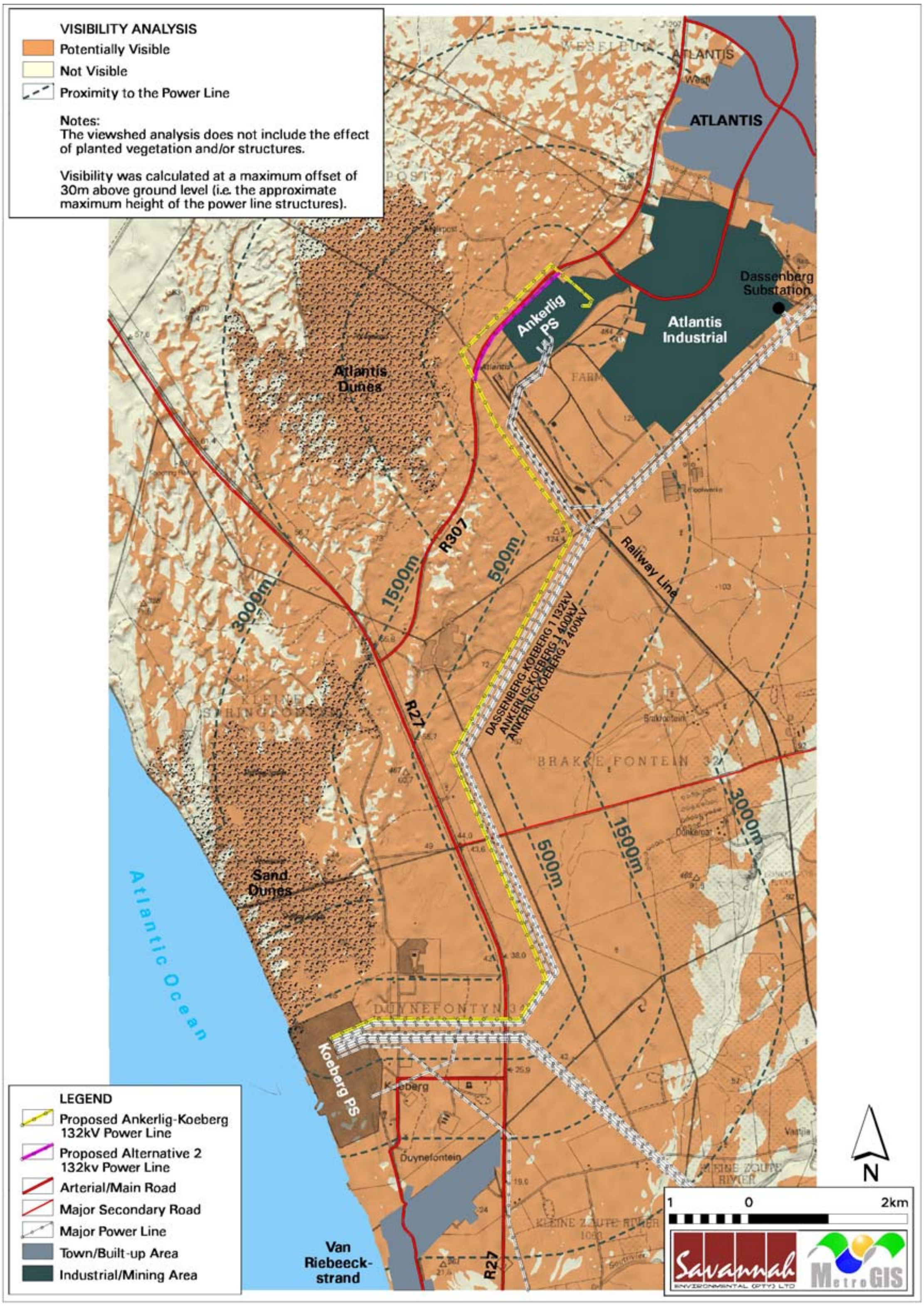
**0 – 500m**
The visible area within a 500m radius of the proposed power line is generally devoid of sensitive visual receptors as it falls mainly within vacant natural land or adjacent to the existing power Koeberg-Ankerlig power lines. It is only where the alignment crosses over the R27, Brakkefontein and Dassenberg (R307) roads that it would be exposed to observers travelling along these routes. At the R27 and Brakkefontein roads the power line will be adjacent to the existing power lines. It is only at the Dassenberg Road (R307) that the power line will cross over this road (Alternative 1) and/or traverse adjacent to it (Alternative 2) before entering the Ankerlig Power Station.

**500 – 1500m**
The 500-1500m buffer zone generally encompasses vacant natural land, as well as the roads mentioned under the previous heading. It may theoretically be visible from the *Melkpost* homestead, although it is expected to be shielded by the vegetation cover present at this locality. Within this zone the proposed power line will become increasing difficult to distinguish as a separate entity, especially where it traverses adjacent to the existing power lines. Along the northern section it may be visible from the Atlantis sand dunes, especially from the crests of the taller dunes. The power line will however be seen against the backdrop of the existing, taller 400kV power lines and the Ankerlig Power Station structures. Refer to **Figure 2**.

**1500 – 3000m**
Visual exposure at 1500-300m of the power line is expected to be greatly diminished due to the presence of the existing power line and power station structures. Most of this zone encompasses vacant land, with the exception of the *Brakfontein* and *Donkergat* homesteads, and the Atlantis industrial area.

**Beyond 3000m**

Visibility of the power line beyond a 3km radius of the alignment is highly unlikely and generally expected to be negligible from a visual impact perspective.




**Map 3:** Potential visual exposure of the proposed Koeberg-Ankerlig power line.

### 6.2. Visual distance / observer proximity to the power line

MetroGIS determined the proximity radii based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger power line structures (e.g. 400kV) and downwards for smaller power lines (e.g. 132kV). MetroGIS developed this methodology in the absence of any known and/or acceptable standards for South African power line infrastructure.

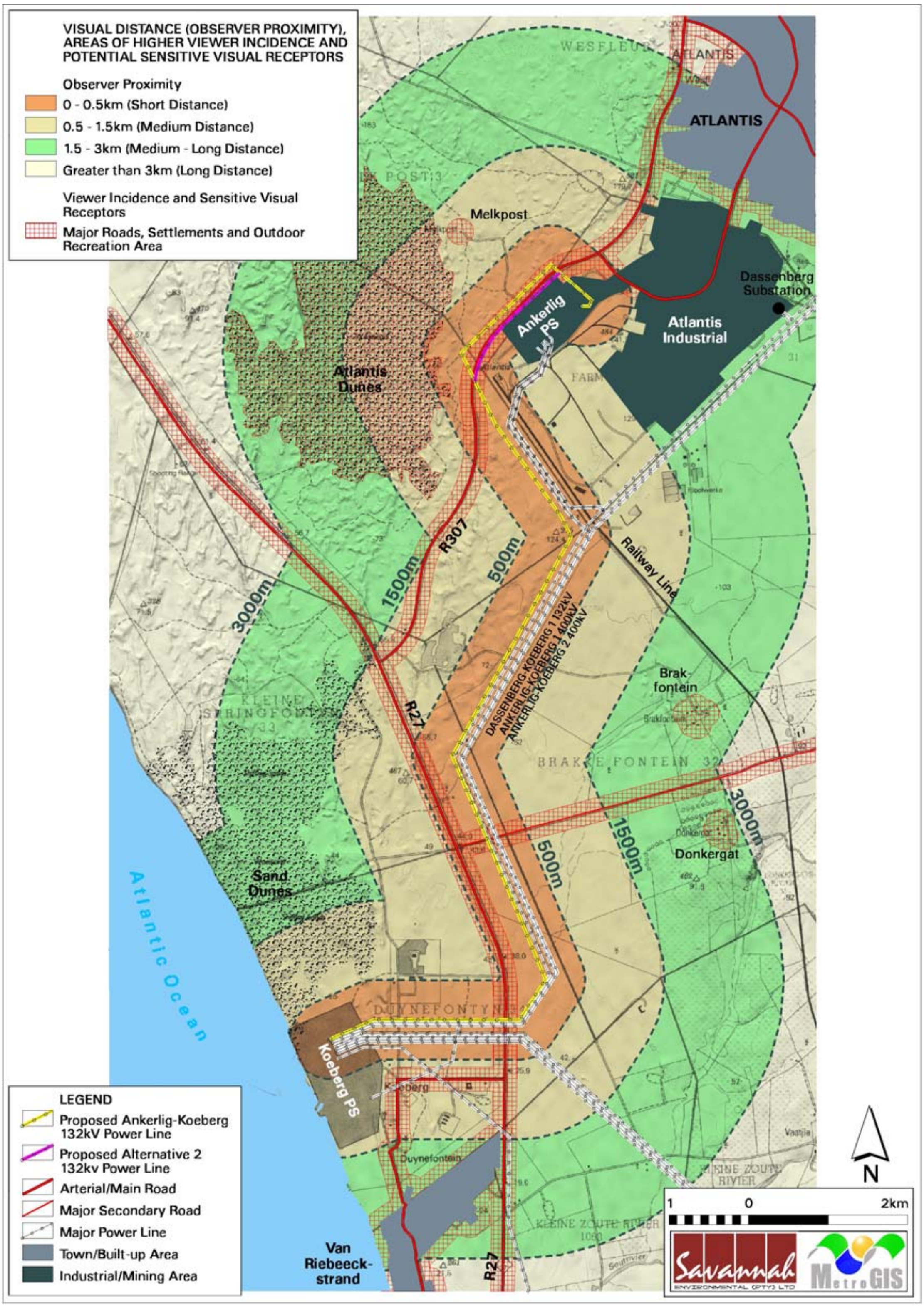
The proximity radii (calculated from the proposed project infrastructure) are shown on **Map 4** and are as follows:

- 0 – 0.5km - Short distance view where the structures would dominate the frame of vision and constitute a very high visual prominence.
- 0.5 – 1.5km - Medium distance views where the structures would be easily and comfortably visible and constitute a high visual prominence.
- 1.5 - 3km - Medium to longer distance view where the structures would become part of the visual environment, but would still be visible and recognisable. This zone constitutes a medium visual prominence.
- Greater than 3km - Long distance view where the structures may still be visible though not as easily recognisable. This zone constitutes a low visual prominence for the power line.

### 6.3. Viewer incidence / viewer perception

Refer to **Map 5**. Viewer incidence is calculated to be the highest along the roads (mentioned under the previous heading). Commuters using these roads could be negatively impacted upon by visual exposure to the power line, and are thus considered to be sensitive to visual intrusion. The Atlantis sand dunes are also considered as an area that may contain sensitive visual receptors, due to its popularity as an outdoor recreation area. Visitors to these dunes are generally expected to be preoccupied with sand boarding or off-road driving activities, but expect to do this within the distinct scenery of the white dunes without additional visual intrusions.

Other than the above, viewer incidence (and expected negative viewer perception) will be concentrated within the homesteads and farm residences within the study area. Refer to section 6.1 (Potential visual exposure). These are generally far removed from the alignment, but are still included for completeness sake.




**Map 4:** Observer proximity to the proposed Koeberg-Ankerlig power line and areas of higher viewer incidence/sensitive visual receptors.

### 6.4. Visual absorption capacity

The broader study area receives between 300mm and 500mm of rainfall per year (i.e. a Mediterranean climate) and the proposed alignment is situated primarily within *Thicket, Bushland, Bush Clumps,* and *High Fynbos.* These land cover types are described as:

*Communities typically composed of tall, woody, self-supporting, single or multi-stemmed plants (branching at or near the ground), with, in most cases no clearly definable structure. Total canopy cover is greater than 10%, with canopy heights between 2 – 5 metres. It is essentially indigenous species, growing under natural or semi-natural conditions (although it may include some areas of self-seeded exotic species, especially along riparian zones).*

Overall, the Visual Absorption Capacity (VAC) of the receiving environment and especially the area in close proximity to the proposed alignment is deemed *moderate* by virtue of the nature of the vegetation and the low occurrence of urban development.

The significant height of power line structures adds to the potential visual intrusion of the power line, with the tall towers (pylons) against the background of the horizon. In addition, the scale and form of the structures mean that it is unlikely that the environment will visually absorb them in terms of texture, colour, form and light/shade characteristics.

Where homesteads and settlements occur, some more significant vegetation and trees may have been planted, which would contribute to visual absorption. As this is not a consistent occurrence, however, VAC will not be taken into account for any of the homesteads or settlements, thus assuming a worst case scenario in the impact assessment.

Within the built-up areas of Van Riebeeckstrand and Atlantis, as well as the industrial area, VAC will be of relevance, due to the presence of buildings, structures and equipment, referred to as visual clutter. In this respect, the presence of the built-up environment will 'absorb' the visual impact to a large extent.

In areas where no VAC is present (e.g. where vegetation cover had been removed along the power line servitudes; see **Figure 4**), especially in close proximity of the alignment, no VAC will be considered. This would ultimately simulate a worst case scenario.

**Figure 6:** Power line structures partially obscured by thicket and bushland.

### 6.5. Visual impact index

The combined results of the visual exposure, viewer incidence/perception and visual distance of the proposed power line are displayed on **Map 5**. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index. Values have been assigned for each potential visual impact per data category and merged in order to calculate the visual impact index.

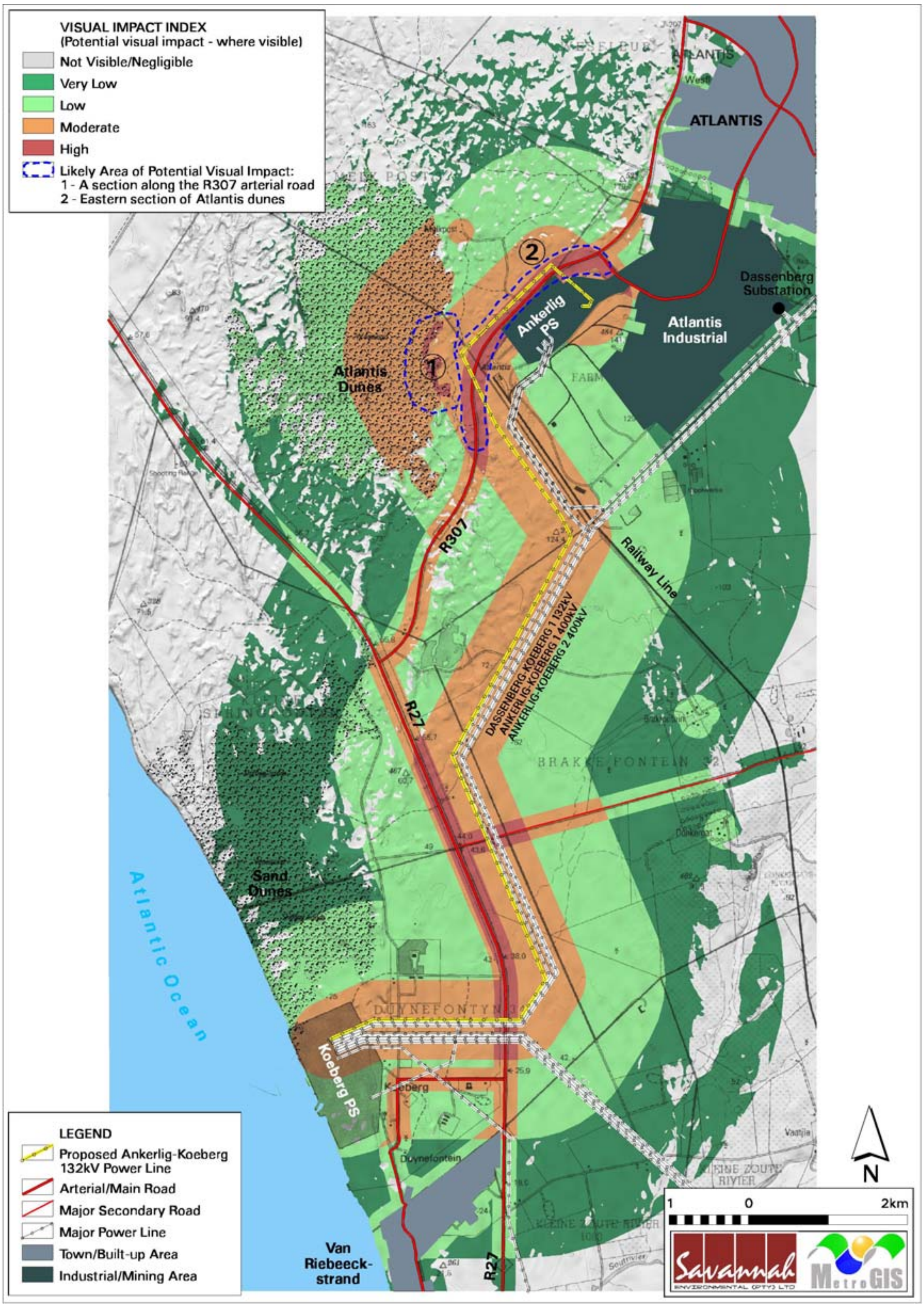
An area with short distance visual exposure to the proposed power line, a high viewer incidence and a predominantly negative perception would therefore have a higher value (greater impact) on the index. This helps in focussing the attention to the critical areas of potential impact when evaluating the issues related to the visual impact.

The visual impact index indicates a potentially **moderate** area of visual impact within a 500m radius of the power line, along the entire length of the alignment. This area generally represents a zone within close proximity of the power line structures, where observers are absent. Where sensitive visual receptors are present within this 500m radius (e.g. along roads) the visual impact may potentially be **high**.

These areas along the southern section of the alignment (i.e. along the R27 and Brakkefontein Road) are indicated as **high**, although this impact is unlikely to occur due to the 132kV power line traversing adjacent to the much taller 400kV power line structures (an existing visual disturbance).

Areas of *likely potential visual impact* are indicated to the north of the alignment, where the power line cross over (and traverse adjacent to) the Dassenberg Road (R307). A similar area of likely visual impact includes the eastern section of the Atlantis sand dunes. This includes the parking area for visitors to the dunes that may be impacted on by the Alternative 1 alignment. The Alternative 2 alignment (south of this road) is not expected to have a significant influence on this area.

It is generally believed (within these likely areas of visual impact), that the Ankerlig Power Station and 400kV power lines are expected to still dominate the visual landscape even in the event of the construction of the new power line. The additional power line may however contribute to the cumulative visual impact within this area.




**Map 5:** Visual impact index of the proposed Koeberg-Ankerlig power line.

### 6.6. Visual impact assessment: methodology

The previous section of the report identified specific areas where likely visual impacts would occur. This section will attempt to quantify these potential visual impacts in their respective geographical locations and in terms of the identified issues (see Chapter 3: SCOPE OF WORK) related to the visual impact.

The methodology for the assessment of potential visual impacts states the **nature** of the potential visual impact (e.g. the visual impact on users of major roads in the vicinity of the proposed alignment) and includes a table quantifying the potential visual impact according to the following criteria:

- **Extent** - site only (very high = 5), local (high = 4), regional (medium = 3), national (low = 2) or international (very low = 1)[5].
- **Duration** - very short (0-1 yrs. = 1), short (2-5 yrs. = 2), medium (5-15 yrs. = 3), long (>15 yrs. = 4), and permanent (= 5).
- **Magnitude** - None (= 0), minor (= 2), low (= 4), medium/moderate (= 6), high (= 8) and very high (= 10)[6].
- **Probability** – very improbable (= 1), improbable (= 2), probable (= 3), highly probable (= 4) and definite (= 5).
- **Status** (positive, negative or neutral).
- **Reversibility** - reversible (= 1), recoverable (= 3) and irreversible (= 5).
- **Significance** - low, medium or high.

The **significance** of the potential visual impact is equal to the **consequence** multiplied by the **probability** of the impact occurring, where the consequence is determined by the sum of the individual scores for magnitude, duration and extent (i.e. **significance = consequence (magnitude + duration + extent) x probability**).

The significance weighting for each potential visual impact (as calculated above) is as follows:

- <30 points: Low (where the impact would not have a direct influence on the decision to develop in the area)
- 31-60 points: Medium/moderate (where the impact could influence the decision to develop in the area)
- >60: High (where the impact must have an influence on the decision to develop in the area)

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[5] Due to the declining visual impact over distance, the **extent** (or spatial scale) rating is reversed (i.e. a localised visual impact has a higher value rating than a national or regional value rating). This implies that the visual impact is highly unlikely to have a national or international extent, but that the local or site-specific impact could be of high significance.

[6] This value is read from the visual impact index. Where more than one value is applicable, the higher of these will be used as a worst case scenario.

### 6.7. Visual impact assessment

The primary visual impacts of the proposed power line are further assessed as follows:

#### 6.7.1. Potential visual impact on users of the R307 arterial road in close proximity to the proposed power line.

The proposed Koeberg-Ankerlig power line (both alternatives) may impact on observers travelling along the Dassenberg (R307) arterial road where the alignment crosses over this road and/or traverses adjacent to it. This impact is expected to be of **moderate** significance.

No mitigation of this impact is possible (i.e. the power line structures will be visible regardless), but measures are recommended as best practice. The table below illustrates this impact assessment.

**Table 2:** Visual impact on users of the R307 arterial road in close proximity to the proposed power line.

<table>
<tr><td colspan="2">Nature of Impact:<br>Visual impact on users of the R307 arterial road in close proximity to the proposed power line</td></tr>
<tr><td>Extent</td><td>Local (4)</td></tr>
<tr><td>Duration</td><td>Long term (4)</td></tr>
<tr><td>Magnitude</td><td>High (8)</td></tr>
<tr><td>Probability</td><td>Probable (3)</td></tr>
<tr><td>Significance</td><td>Moderate (48)</td></tr>
<tr><td>Status (positive, neutral or negative)</td><td>Negative</td></tr>
<tr><td>Reversibility</td><td>Recoverable (3)</td></tr>
<tr><td>Irreplaceable loss of resources?</td><td>No</td></tr>
<tr><td>Can impacts be mitigated?</td><td>Yes</td></tr>
<tr><td colspan="2">Mitigation / Management:<br><u>Planning:</u><br>➢ Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude.<br><u>Operations:</u><br>➢ Maintain the general appearance of the servitude as a whole.<br><u>Decommissioning:</u><br>➢ Remove infrastructure not required for the post-decommissioning use of the servitude.<br>➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.<br>➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions.</td></tr>
<tr><td colspan="2">Cumulative impacts:<br>The construction of this power line, together with the existing power lines, power station and the potential future wind energy facilities, is likely to increase the potential cumulative visual impact of electricity generation and distribution infrastructure within the region.</td></tr>
<tr><td colspan="2">Residual impacts:<br>The visual impact will be removed after decommissioning, provided the power line infrastructure is removed. Failing this, the visual impact will remain.</td></tr>
</table>

#### 6.7.2. Potential visual impact on visitors to the Atlantis dunes in close proximity to the proposed power line.

The potential visual impact on visitors to the Atlantis dunes adjacent to the proposed alignment is expected to be of **moderate** significance for the Alternative 1 alignment and **low** for the Alternative 2 alignment. This is largely due to the fact that there is an existing visual disturbance in the form of the current power station and power line infrastructure.

No mitigation of this impact is possible, but measures are recommended as best practice. The table below illustrates this impact assessment.

**Table 3:** Visual impact on visitors to the Atlantis dunes in close proximity to the proposed power line.

| ***Nature of Impact:*** Visual impact on visitors to the Atlantis dunes in close proximity to the proposed power line | | |
|---|---|---|
| | ***Alternative 1*** | ***Alternative 2*** |
| ***Extent*** | Local **(4)** | Local **(4)** |
| ***Duration*** | Long term **(4)** | Long term **(4)** |
| ***Magnitude*** | High **(8)** | Moderate **(6)** |
| ***Probability*** | Probable **(3)** | Improbable **(2)** |
| ***Significance*** | Moderate **(48)** | Low **(28)** |
| ***Status (positive, neutral or negative)*** | Negative | Negative |
| ***Reversibility*** | Recoverable **(3)** | Recoverable **(3)** |
| ***Irreplaceable loss of resources?*** | No | No |
| ***Can impacts be mitigated?*** | Yes | Yes |
| ***Mitigation / Management:***<br>Planning:<br>➢ Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude.<br>Operations:<br>➢ Maintain the general appearance of the servitude as a whole.<br>Decommissioning:<br>➢ Remove infrastructure not required for the post-decommissioning use of the servitude.<br>➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.<br>➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions. | | |
| ***Cumulative impacts:***<br>The construction of this power line, together with the existing power lines, power station and the potential future wind energy facilities, is likely to increase the potential cumulative visual impact of electricity generation and distribution infrastructure within the region. | | |
| ***Residual impacts:***<br>The visual impact will be removed after decommissioning, provided the power line infrastructure is removed. Failing this, the visual impact will remain. | | |

### 6.7.3. Potential visual impact on sensitive visual receptors within the region.

The visual impact on the users of roads and the residents of towns, settlements and homesteads within the region (i.e. beyond the 1.5km radius) is expected to be **low.**

**Table 4:** Visual impact on sensitive visual receptors within the region.

| ***Nature of Impact:*** Visual impact on sensitive visual receptors within the region | |
|---|---|
| ***Extent*** | Regional **(3)** |
| ***Duration*** | Long term **(4)** |
| ***Magnitude*** | Low **(4)** |
| ***Probability*** | Improbable **(2)** |
| ***Significance*** | Low **(22)** |
| ***Status (positive, neutral or negative)*** | Negative |
| ***Reversibility*** | Recoverable **(3)** |
| ***Irreplaceable loss of resources?*** | No |
| ***Can impacts be mitigated?*** | Yes |

| **_Mitigation / Management:_**<br>Planning:<br>➢ Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude.<br>Operations:<br>➢ Maintain the general appearance of the servitude as a whole.<br>Decommissioning:<br>➢ Remove infrastructure not required for the post-decommissioning use of the servitude.<br>➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.<br>➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions. |
|---|
| **_Cumulative impacts:_**<br>The construction of this power line, together with the existing power lines, power station and the potential future renewable energy facilities, is likely to increase the potential cumulative visual impact of electricity generation and distribution infrastructure within the region. |
| **_Residual impacts:_**<br>The visual impact will be removed after decommissioning, provided the power line infrastructure is removed. Failing this, the visual impact will remain. |

### 6.7.4. Construction Impacts

**Potential visual impact of construction on sensitive visual receptors in close proximity to the proposed power line.**

During construction, there may be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and land owners in the area.

Access to the proposed alignment will be along the existing power line servitude and very limited removal of vegetation cover is expected and no new access roads are required. This anticipated impact is likely to be of **low** significance.

**Table 5:** Visual impact of construction on sensitive visual receptors in close proximity to the proposed power line.

| **_Nature of Impact:_**<br>Visual impact of construction on sensitive visual receptors in close proximity to the proposed power line. | |
|---|---|
| **_Extent_** | Local **(4)** |
| **_Duration_** | Long term **(4)** |
| **_Magnitude_** | Low **(4)** |
| **_Probability_** | Improbable **(2)** |
| **_Significance_** | Low **(24)** |
| **_Status (positive, neutral or negative)_** | Negative |
| **_Reversibility_** | Recoverable **(3)** |
| **_Irreplaceable loss of resources?_** | No |
| **_Can impacts be mitigated?_** | Yes |

| |
|---|
| ***Mitigation:***<br>Planning:<br>➢ Retain and maintain natural vegetation in all areas outside of the development footprint/servitude.<br>Construction:<br>➢ Ensure that vegetation is not unnecessarily removed during the construction period.<br>➢ Reduce the construction period through careful logistical planning and productive implementation of resources.<br>➢ Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.<br>➢ Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.<br>➢ Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.<br>➢ Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).<br>➢ Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts.<br>➢ Rehabilitate all disturbed areas immediately after the completion of construction works. |
| ***Cumulative impacts:***<br>None. |
| ***Residual impacts:***<br>None, provided rehabilitation works are carried out as specified. |

## 6.8. Visual impact assessment: secondary impacts

**Potential visual impact of the proposed power line on the visual quality of the landscape and sense of place of the region.**

Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria, specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.), play a significant role.

An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

The greater environment has a rural, undeveloped character and a natural appearance. These generally undeveloped landscapes are considered to have a high visual quality, except where urban and industrial developments (i.e. power stations, power lines, etc.) represent existing visual disturbances.

The anticipated visual impact of the proposed power line on the regional visual quality, and by implication, on the sense of place, is expected to be of **low** significance. This is largely due to the presence of the existing power line infrastructure and Ankerlig power station.

No mitigation of this impact is possible, but measures are recommended as best practice. The table below illustrates this impact assessment.

**Table 6:** Visual impact of the proposed power line on the visual quality of the landscape and sense of place of the region.

| ***Nature of Impact:*** Visual impact of the proposed power line on the visual quality of the landscape and sense of place of the region | |
|---|---|
| ***Extent*** | Local **(4)** |

| | |
|---|---|
| ***Duration*** | Long term **(4)** |
| ***Magnitude*** | Low **(4)** |
| ***Probability*** | Improbable **(2)** |
| ***Significance*** | Low **(24)** |
| ***Status (positive, neutral or negative)*** | Negative |
| ***Reversibility*** | Recoverable **(3)** |
| ***Irreplaceable loss of resources?*** | No |
| ***Can impacts be mitigated?*** | Yes |
| ***Mitigation / Management:***<br>Planning:<br>➢ Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude.<br>Operations:<br>➢ Maintain the general appearance of the servitude as a whole.<br>Decommissioning:<br>➢ Remove infrastructure not required for the post-decommissioning use of the servitude.<br>➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.<br>➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions. | |
| ***Cumulative impacts:***<br>The construction of this power line, together with the existing power lines, power station and the potential future renewable energy facilities, is likely to increase the potential cumulative visual impact of electricity generation and distribution infrastructure within the region. | |
| ***Residual impacts:***<br>The visual impact will be removed after decommissioning, provided the power line infrastructure is removed. Failing this, the visual impact will remain. | |

### 6.9. The potential to mitigate visual impacts

The primary visual impact, namely the appearance of the power line is not possible to mitigate. The functional design of the structures cannot be changed in order to reduce visual impacts.

Secondary impacts anticipated as a result of the proposed power line (i.e. visual character and sense of place) are also not possible to mitigate.

The following mitigation is, however possible:

- Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude. This measure will help to soften the appearance of the power line within its context.

- Mitigation of visual impacts associated with the construction phase, albeit temporary, would entail proper planning, management and rehabilitation of the construction site. Recommended mitigation measures include the following:

    - Ensure that vegetation is not unnecessarily cleared or removed during the construction period.
    - Reduce the construction period through careful logistical planning and productive implementation of resources.
    - Plan the placement of lay-down areas and any potential temporary construction camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
    - Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.

- Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
- Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
- Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.
- Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.

- During operation, the maintenance of the power line structures will ensure that the power line does not degrade, thus aggravating visual impact.

- Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required.

- Once the power line has exhausted its life span, all associated infrastructure not required for the post rehabilitation use of the site/servitude should be removed and all disturbed areas appropriately rehabilitated. An ecologist should be consulted to give input into rehabilitation specifications.

- All rehabilitated areas should be monitored for at least a year following decommissioning, and remedial actions implemented as and when required.

Good practice requires that the mitigation of both primary and secondary visual impacts as listed above be implemented and maintained on an ongoing basis.

## 7. CONCLUSION AND RECOMMENDATIONS

The visual impact assessment acknowledges that there may be potential visual impacts associated with the construction of the new Koeberg-Ankerlig 132kV power line. These visual impacts are expected to primarily influence observers travelling along the Dassenberg Road and potentially impact on observers visiting the Atlantis sand dunes. These visual impacts relate to the northern section of the alignment, where the alignment do not traverse adjacent to the existing Koeberg-Ankerlig 400kV lines (i.e. effectively along the section that deviates from the already authorised alignment to the Dassenberg substation).

The greater environment is considered to have a high visual quality and a specific sense of place related to the natural and rural characteristics of the region. There is however a great number of existing structures (e.g. the existing power lines, railway line, power station, industrial area, etc.) as well as a number of applications for future renewable energy facilities north-west of Atlantis. It is generally expected that the region may come under increasing pressure from similar developments, especially due to the presence of the wind resource.

In spite of the potential visual impacts associated with the re-aligned section of the alignment, the proposed power line is not considered to be fatally flawed. It is expected that the potential visual impacts associated with this power line would be within acceptable limits.

**The Visual Impact Assessment favours the Alternative 2 alignment** above the Alternative 1 alignment, as the former alignment is expected to largely mitigate the potential visual impact of power line structures on observers visiting the Atlantis Dunes. This alignment (Alternative 2), along the edge of the Atlantis Industrial Area, also does not cross the R307 arterial road, which is seen as an added benefit in terms of visual impact reduction.

A number of mitigation measures have been proposed (Section 6.9). Mitigation will be effective in terms of construction. Regardless of whether or not mitigation measures will reduce the significance of the anticipated visual impacts, they are considered to be good practice and should all be implemented and maintained throughout the construction and operational life span of the proposed power line.

## 8. IMPACT STATEMENT

The following is a summary of impacts remaining, assuming mitigation as recommended is exercised:

- The proposed Koeberg-Ankerlig power line may impact on observers travelling along the Dassenberg (R307) arterial road where the alignment crosses over this road and/or traverses adjacent to it. This impact is expected to be of **moderate** significance.
- The potential visual impact on visitors to the Atlantis dunes adjacent to the proposed alignment is expected to be of **moderate** significance for the Alternative 1 alignment and **low** for the Alternative 2 alignment. This is largely due to the fact that there is an existing visual disturbance in the form of the current power station and power line infrastructure.
- The visual impact on the users of roads and the residents of towns, settlements and homesteads within the region (i.e. beyond the 3km radius) is expected to be **low.**
- During the construction phase access to the proposed alignment will be along the existing power line servitude and very limited removal of vegetation cover is expected and no new access roads are required. This anticipated impact is likely to be of **low** significance.
- The anticipated visual impact of the proposed power line on the regional visual quality, and by implication, on the sense of place, is expected to be of **low** significance. This is largely due to the presence of the existing power line infrastructure and Ankerlig power station.

The anticipated visual impacts listed above (i.e. post mitigation impacts) are not considered to be fatal flaws from a visual perspective, especially considering the presence of the existing power lines and power station structures.

It is therefore recommended that the construction of the power line (**preferably Alternative 2**) as proposed be supported, subject to the implementation of the recommended mitigation measures (section 6.9) and management actions (Chapter 10).

## 9. MANAGEMENT PROGRAMME

The following management plan tables aim to summarise the key findings of the visual impact report and to suggest possible management actions in order to mitigate the potential visual impacts.

*(Refer to tables overleaf).*

**Table 7**: Management Programme: Planning.

| OBJECTIVE: The mitigation and possible negation of visual impacts associated with the planning of the proposed power line. | | |
|---|---|---|
| Project component/s | The power line and associated infrastructure. | |
| Potential Impact | Primary visual impact of the infrastructure due to the presence of the power line and the associated infrastructure in the landscape. | |
| Activity/risk source | The viewing of the above mentioned by observers near the infrastructure as well as within the region. | |
| Mitigation: Target/Objective | Optimal planning of infrastructure so as to minimise visual impact. | |
| **Mitigation: Action/control** | **Responsibility** | **Timeframe** |
| Implement an environmentally responsive planning approach to roads and infrastructure to limit cut and fill requirements. Plan with due cognisance of the topography. | Project proponent / design consultant | Planning phase. |
| Consolidate infrastructure and make use of already disturbed sites rather than pristine areas. | Project proponent / design consultant | Planning phase. |
| Performance Indicator | No access roads and other associated infrastructure are visible from surrounding areas. | |
| Monitoring | Not applicable. | |

**Table 8**: Management Programme: Construction.

| OBJECTIVE: The mitigation and possible negation of visual impacts associated with the construction of the power line. | | |
|---|---|---|
| Project component/s | Construction activities along the power line | |
| Potential Impact | Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing. | |
| Activity/risk source | The viewing of the above mentioned by observers near the infrastructure. | |
| Mitigation: Target/Objective | Minimal visual intrusion by construction activities and intact vegetation cover outside of immediate works areas. | |
| **Mitigation: Action/control** | **Responsibility** | **Timeframe** |
| Ensure that vegetation is not unnecessarily cleared or removed during the construction period. | Project proponent / contractor | Early in the construction phase. |
| Reduce the construction period through careful logistical planning and productive implementation of resources. | Project proponent / contractor | Early in the construction phase. |
| Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible. | Project proponent / contractor | Early in and throughout the construction phase. |
| Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. | Project proponent / contractor | Throughout the construction phase. |
| Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities. | Project proponent / contractor | Throughout the construction phase. |

| | | |
|---|---|---|
| Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent). | Project proponent / contractor | Throughout the construction phase. |
| Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting. | Project proponent / contractor | Throughout the construction phase. |
| Rehabilitate all disturbed areas, construction areas, servitudes etc. immediately after the completion of construction works. Consult an ecologist to give input into rehabilitation specifications. | Project proponent / contractor | Throughout and at the end of the construction phase. |
| Performance Indicator | Vegetation cover within the servitudes and in the vicinity of the infrastructure is intact with no evidence of degradation or erosion. | |
| Monitoring | Monitoring of vegetation clearing during construction.<br>Monitoring of rehabilitated areas post construction. | |

**Table 9**: Management Programme: Operation.

| OBJECTIVE: The mitigation and possible negation of visual impacts associated with the operation of the proposed power line. | | |
|---|---|---|
| Project component/s | Power line and associated infrastructure. | |
| Potential Impact | Visual impact of vegetation rehabilitation failure. | |
| Activity/risk source | The viewing of the above mentioned by observers near the infrastructure. | |
| Mitigation: Target/Objective | Well-rehabilitated and maintained servitudes. | |
| Mitigation: Action/control | Responsibility | Timeframe |
| Maintain roads to forego erosion and to suppress dust. | Project proponent / operator | Throughout the operational phase. |
| Monitor rehabilitated areas, and implement remedial action as and when required. | Project proponent / operator | Throughout the operational phase. |
| Performance Indicator | Intact vegetation within servitudes and in the vicinity of the infrastructure. | |
| Monitoring | Monitoring of rehabilitated areas. | |

**Table 10**: Management Programme: Decommissioning.

| OBJECTIVE: The mitigation and possible negation of visual impacts associated with the decommissioning of the proposed power line. | | |
|---|---|---|
| Project component/s | Power line | |
| Potential Impact | Visual impact of residual visual scarring and vegetation rehabilitation failure. | |
| Activity/risk source | The viewing of the above mentioned by observers along or near the corridors. | |
| Mitigation: Target/Objective | Rehabilitated vegetation in all disturbed areas. | |
| Mitigation: Action/control | Responsibility | Timeframe |
| Remove infrastructure not required for the post-decommissioning use of the site/servitude. | Project proponent / operator | During the decommissioning phase. |
| Rehabilitate access roads and servitudes not required for the post-decommissioning use of the sites. Consult an ecologist to give | Project proponent / operator | During the decommissioning phase. |

| | | |
|---|---|---|
| input into rehabilitation specifications. | | |
| Monitor rehabilitated areas quarterly for at least a year following decommissioning, and implement remedial action as and when required. | Project proponent / operator | Post decommissioning. |

| | |
|---|---|
| Performance Indicator | Intact vegetation along and in the vicinity of the corridors. |
| Monitoring | Monitoring of rehabilitated areas. |

## 10. REFERENCES / DATA SOURCES


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