ANKERLIG POWER STATION CONVERSION AND TRANSMISSION INTEGRATION PROJECT

VISUAL IMPACT ASSESSMENT

Produced for:
Eskom Holdings Limited

Produced by:
MetroGIS (Pty) Ltd.
PO Box 384, La Montagne, 0184
Tel: (012) 349 2884/5 Fax: (012) 349 2880
E-mail: lourens@metrogis.co.za Web: www.metrogis.co.za

On behalf of:
Savannah Environmental (Pty) Ltd.
PO Box 148, Sunninghill, 2157
Tel: (011) 234 6621 Fax: 086 684 0547
E-mail: joanne@savannahSA.co.za Web: www.savannahSA.com

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Lourens du Plessis from MetroGIS (Pty) Ltd. undertook the visual assessment in his capacity as a visual assessment and Geographic Information Systems specialist. Lourens has been involved in the application of Geographical Information Systems (GIS) in Environmental Planning and Management since 1990. He has extensive practical knowledge in spatial analysis, environmental modelling and digital mapping, and applies this knowledge in various scientific fields and disciplines. His GIS expertise are often utilised in Environmental Impact Assessments, State of the Environment Reports and Environmental Management Plans.

Lourens 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 utilise 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 for the visual assessment. Neither the author, nor MetroGIS will benefit from the outcome of the project decision-making.

1. INTRODUCTION AND BACKGROUND

The proposed Ankerlig power station (previously known as the Atlantis OCGT power station) conversion site is situated approximately 40km north of Cape Town and about 3km (at the closest) from the Atlantis residential area. It is located within the western corner of the Atlantis Industrial Township and is surrounded by predominantly open space and vacant land to the north, west and south. The sparsely occupied, mixed industrial area of Atlantis Industria borders the proposed site to the east. The industrial area stretches eastward for about 2 - 3km towards the Aurora-Koeberg transmission lines that form the eastern boundary of the industrial township.

The site is considered to be relatively remote and far removed from major centres, tourist attractions and major roads. It is located next to the R307 (Dassenberg Road) that functions as the primary access route to Atlantis and Mamre (north of Atlantis) from Cape Town. The closest major road is the R27 (about 5 km from the site). The R27 functions as the primary connector between Cape Town, Saldanha and the West Coast National Park.

The Ankerlig power station conversion project can be seen as a third phase of the original Atlantis OCGT power station project. The current OCGT units in operation (four units), as shown in the photograph below, are the first phase of the project. The second phase of the project (currently under construction) includes the expansion (capacity increase) of the power station by adding another five OCGT units, four fuel tanks and a switchyard to the power station. The latest phase that will be addressed by this document is the proposed conversion of the OCGT (Open Cycle Gas Turbine) units to CCGT (Combined Cycle Gas Turbine) units, the addition of 8 fuel tanks to the east of the power station, and the construction of a power line from the power station to the Omega Substation

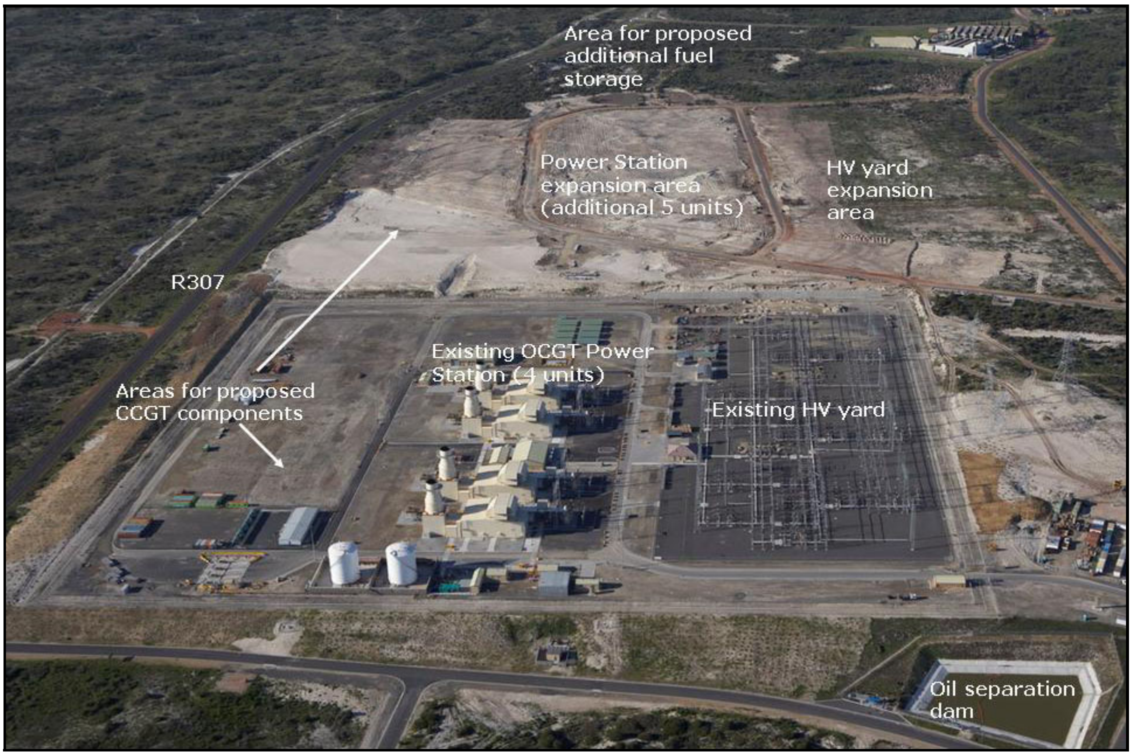

Figure 1: Aerial view of the Ankerlig OCGT power station (four OCGT units and two fuel tanks are shown).

The conversion of the power station from OCGT to CCGT technology, as a visual concern, primarily entails the increase of the dimensions of the gas turbine units. One OCGT unit measures 75m x 25m x 25m and the smoke stack is 30m above ground level. The conversion to CCGT technology will increase each turbine unit's smoke stack to 60m above ground level. Additional infrastructure associated with the conversion project includes the construction of a small water reservoir (2 million litres), and eight fuel tanks (with a total capacity of approximately 43 million litres) to the east of the power station site. All additional infrastructure associated with the power station conversion will be located within the Ankerlig Power Station site. Please refer to Figure 2 for the layout of the OCGT power station, the capacity increase area and the area identified for the additional fuel storage tanks and off-loading and other related infrastructure.

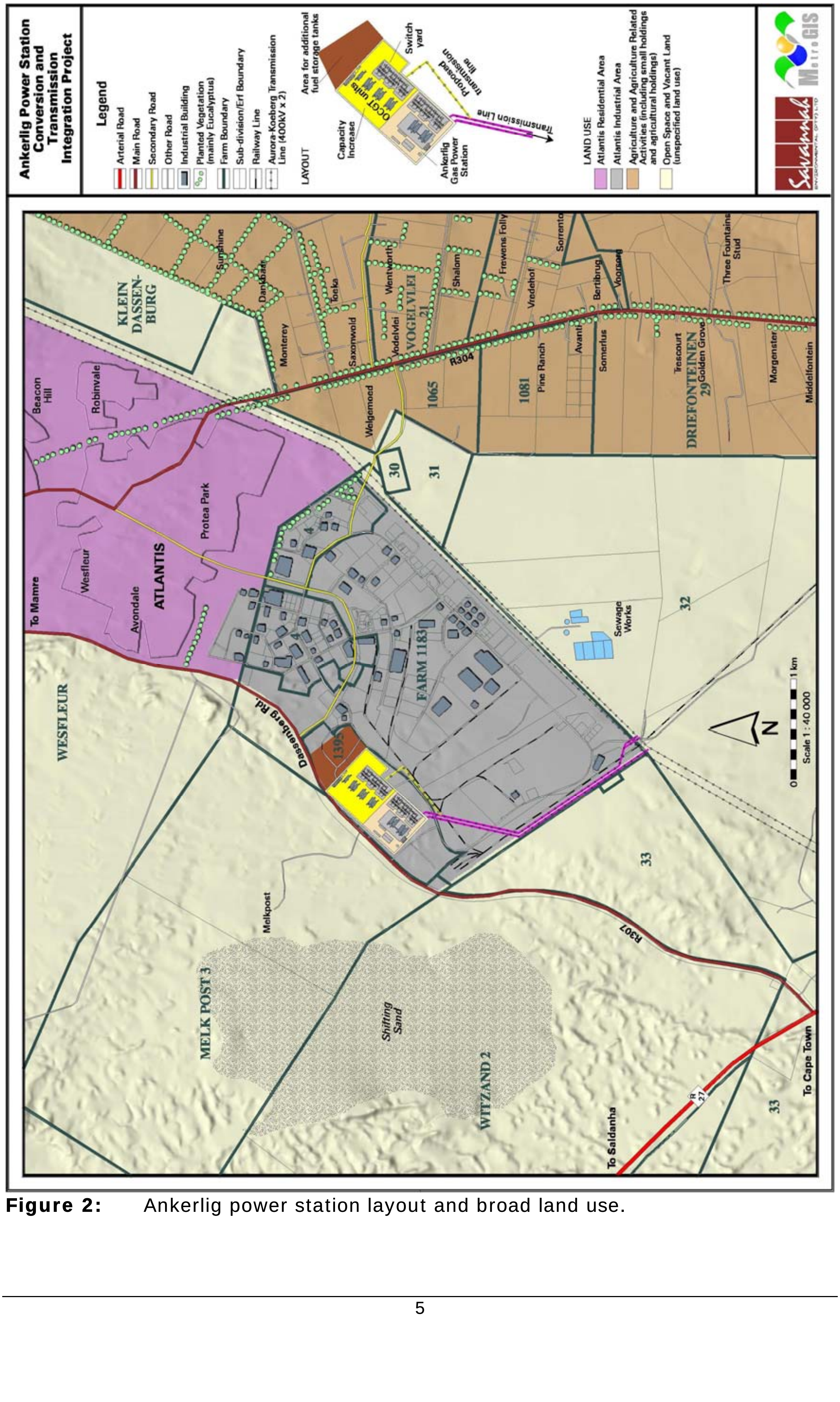

Figure 2: Ankerlig power station layout and broad land use.

The Ankerlig conversion project further includes the integration of the Ankerlig power station with the already authorised Omega substation situated approximately 13km south-east of the Atlantis industrial area on the farm Groot Oliphantskop 81 through the construction of a 400 kV transmission power line between these two points. One transmission line alternative and one sub-alternative alignment will be investigated in this report.

2. METHODOLOGY

2.1. General

The study was undertaken using Geographic Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed facilities. A detailed Digital Terrain Model (DTM) for the study area was created from the 5 m interval contours, supplied by the City of Cape Town.

Site visits were undertaken to source information regarding land use, vegetation cover, topography and general visual quality of the affected environment. It further served the purpose of verifying the results of the spatial analyses and to identify other possible mitigating/aggravating circumstances related to the potential visual impact.

The results of the spatial analysis and other relevant orientation data are displayed on a number of maps, which will be referred to in the text.

2.2. Methodology

The first step in undertaking a visual impact assessment is to identify and understand the crucial issues related to the specific impact. These issues or concerns, as stated by Interested and Affected Parties (I&AP) through the public participation process of the scoping study, highlight the envisaged potential impact and help to identify the critical factors that should be addressed in the detailed assessment phase. It also focuses the analytical procedures on site-specific issues, rather than to apply general assumptions that might not be applicable to the affected parties or study area.

Once a clear understanding was formed about the perceived visual impact of the proposed power station conversion and transmission power line, procedures were set in place to firstly, determine the potential visual impact within the study area, and secondly, to identify the location (place) where the likely impacts would occur.

The potential visual impact and location of likely impact is indicated by a visual impact index that comprises the following spatial criteria:

- ***Visual exposure (visibility) of the infrastructure.***
  This procedure is generally referred to as the viewshed analysis, indicating all the areas from which the proposed infrastructure will potentially be visible. The viewshed analysis takes into account the dimensions of the proposed power station conversion and transmission power line structures and the effect of existing man-made structures and planted vegetation on the potential visual exposure.

- ***Proximity to the project infrastructure (visual distance).***

The principle that visual impact decreases over distance is applied through the creation of buffer radii around the project infrastructure. These buffer radii indicate whether the observer/viewer has a short, medium or long distance experience of the structures. The concept of visual distance and the determination of the buffer radii are discussed further in Section 4.3. of this report.

- ***Viewer incidence / Viewer perception.***
  Visual impacts occur where there are people to be impacted on. Where more people occur, the potential impact (or frequency of impact) increases. In terms of this rationale, densely populated areas (such as residential areas) or areas frequented by observers (e.g. roads) would increase viewer incidence and need to be identified. It is also important to determine what the observer's envisaged perception of the proposed infrastructure would be in the area of likely impact. If the observer's perception were favourable or neutral, there would be no significant impact. A negative perception of the structures would alternatively increase the potential visual impact.

Once the potential impact and area of likely impact had been identified, another set of criteria was applied in order to determine the severity of the impact and to assist in identifying the preferred alternative.

The criteria/elements for the evaluation of the proposed project infrastructure include:

- ***Landscape character / land use character.***
  It is necessary to evaluate the identified location where the power station conversion and transmission power line is to take place in terms of its suitability or potential conflict with existing land uses or with the general character of the area.

- ***Visually sensitive features (scenic features or attractions).***
  The region or environment within which the proposed infrastructure is located might include either general scenic features, or specific scenic attractions that may be impacted on or compromised by the construction of the transmission power lines or through the conversion of a power station.

  These features need to be identified and the significance of the proposed project infrastructure on these features must be determined.

- ***Potential impact of the project infrastructure on tourism and eco-tourism.***
  This issue relates to the potential visual impact of the proposed power station conversion and transmission power line on current tourist activities (West Coast National Park) and the envisaged impact or constraints it may place on the potential expansion of nature-oriented tourism (Cape West Coast Biosphere Reserve) in the region.

- ***Visual absorption capacity (VAC) of the natural vegetation.***
  Certain areas possess, through natural vegetation cover, the ability to absorb or greatly reduce the visual impact of proposed developments. This depends on both the vegetative species and the dimensions of the proposed development and

has been investigated for the proposed power station conversion and transmission power line.

- ***Potential visual impact of lighting.***
  After-hours operational and security lighting has the potential to impact on road users and landowners (adjacent to the industrial area) in the form of glare, light trespass and sky glow. Glare, the direct staring into a light fixture, is the severest of these lighting impacts and has the greatest potential to create a significant visual impact through the utilisation of flood lights (typically associated with power generating facilities).

- ***Potential mitigation measures.***
  Some areas may offer more opportunities in terms of the mitigation and reduction of the visual impact. The successful implementation of these measures may lessen the visual impact significantly. An example of potential mitigation may be the utilisation of vegetation screening during the operational phase of the facility.

The result of the above evaluation formed the basis for the identification and determination of the significance of the visual impact.

3. THE AFFECTED ENVIRONMENT

Figure 3 below indicates the regional location of the Ankerlig power station, the approximately 15km long preferred transmission alignment and the 2.5km proposed sub-alternative alignment (as nominated through the scoping study). The preferred alternative follows existing transmission power lines (Koeberg-Stikland 1, Atlantis-Koeberg 1 and Atlantis-Koeberg 2) for virtually the entire length of the alignment, while the proposed sub-alternative further aligns with the above-mentioned transmission power lines near the R27 and the Koeberg Power Station. The alignment crosses the R303 near the Omega substation and will traverse the Atlantis industrial area, adjacent to the existing Ankerlig transmission power lines, for a distance of about 3km before linking with the Ankerlig Power Station HV yard. No extension of the existing HV yard is required to accommodate this transmission power line.

The broad terrain morphological unit for the study area is plains and moderately undulating plains. The relatively flat topography of the region is broken only by the Kanonkop hill north-east of Atlantis (not shown on map), the Koeberg hill in the south-east of the study area and the sand dunes to the west (towards the Atlantic Ocean). The dominant vegetation cover is Thicket, Bushland, Shrubland and Fynbos, and the vegetation types are Sand Plain Fynbos and Dune Thicket (in terms of the Low and Rebelo classification).

The Atlantis industrial area borders the proposed Cape West Coast Biosphere Reserve (to the west) that stretches northwards along the coast past the West Coast National Park and Saldanha, and south towards Koeberg. The larger part of the study area consists of vacant land or unspecified land uses, with the town of Atlantis to the north and agricultural holdings and smallholdings east of the study area.

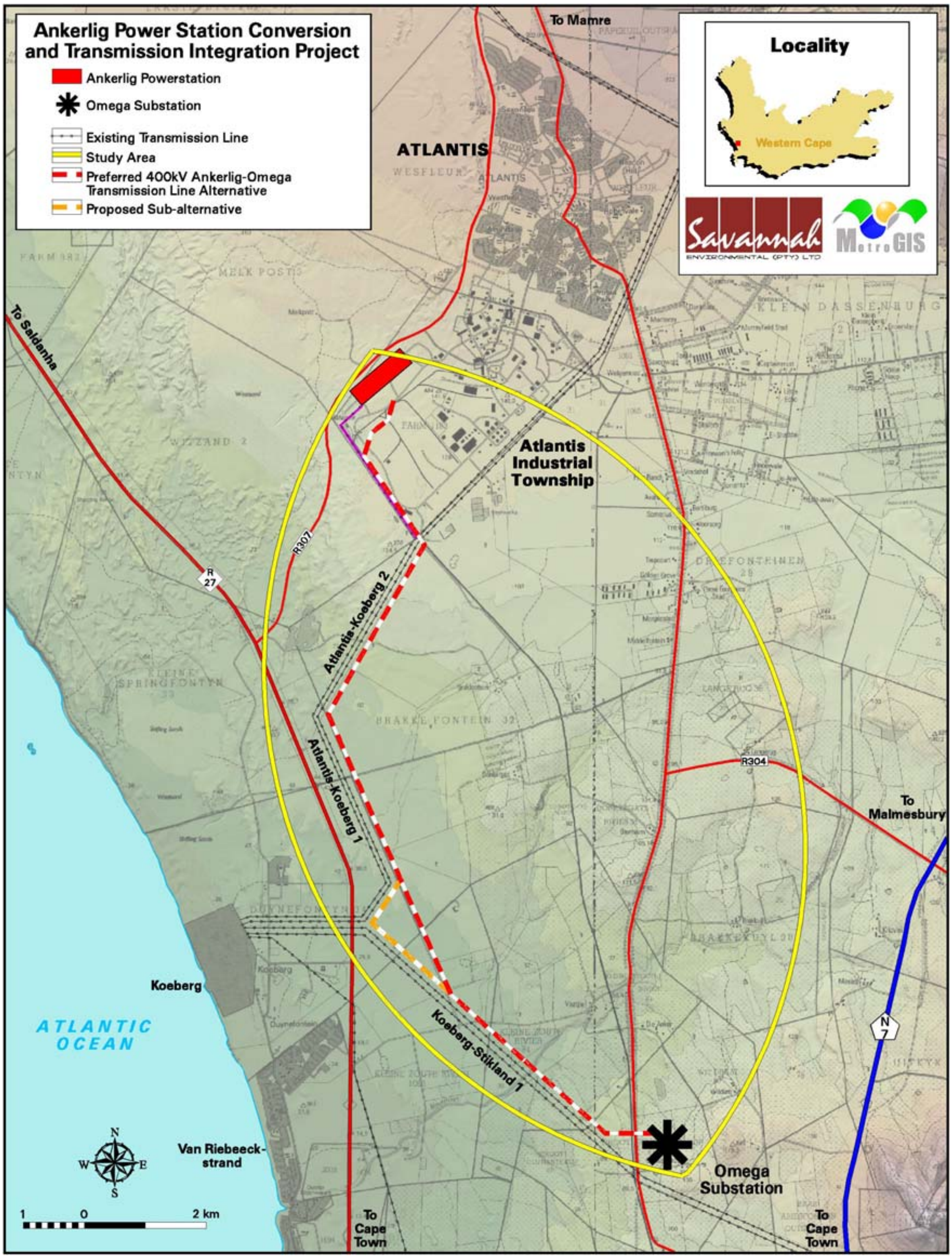

Figure 3: Regional locality of the Ankerlig power station and the preferred Ankerlig - Omega transmission alignment.

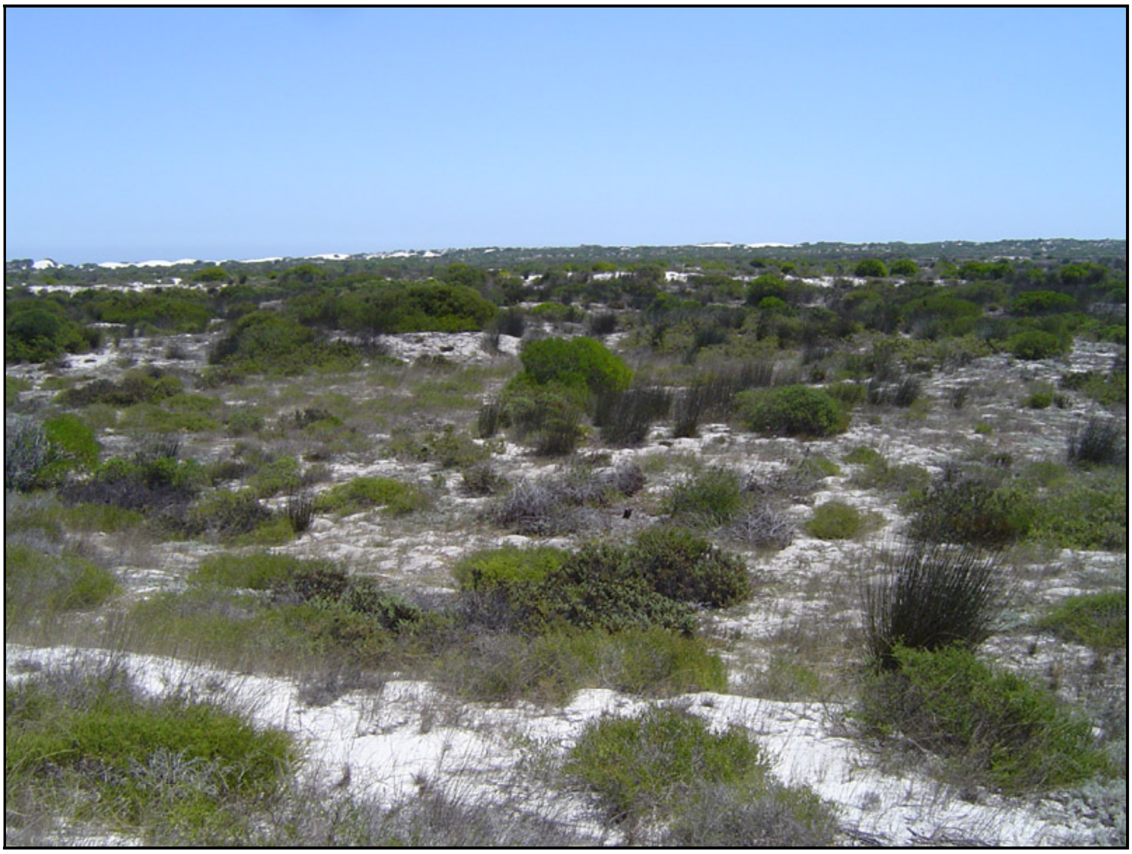

Figure 4: Vegetation cover and general topography of the area west of the Atlantis Industrial Area.

4. VISUAL IMPACT ASSESSMENT

The visual impact assessment is based on the visual exposure (visibility), the visual distance (proximity of the observer) and the viewer incidence (number of observers) of the proposed project infrastructure. It takes into account the size (width, height and length) of the structures for both the power station conversion and the transmission power line. These spatial criteria will be discussed in the following sections and are displayed on Figures 5 to 8.

4.1. Visual exposure - power station conversion

Figure 5 shows the visual exposure of the proposed OCGT to CCGT conversion. An accurate digital terrain model, calculated from the 5m interval contours and the dimensions of the CCGT units and additional infrastructure, illustrates how the topography of the area and the placement of the structures either shield or expose the facility. The effect of existing natural vegetation cover, as a potential to absorb the visual exposure, was not considered as the smoke stacks (i.e. the tallest of the new infrastructure proposed) will be approximately 60m in height and the average vegetation cover (thicket/bushland and shrubland/Fynbos) is only 2 to 3 m high. This was also done in order to calculate the maximum potential visual exposure of the facility in case of natural vegetation being cleared for agricultural or other purposes. The existing buildings in the industrial area and planted eucalyptus trees (along the R304) were included in the terrain model in order to accurately calculate the influence of existing visual obstructions on the visual exposure.

It becomes apparent that the facility would be relatively exposed due to the predominantly flat topography of the region. The general trend of the visual exposure shows a larger area with a short to medium distance exposure, and a smaller, scattered area with medium to long distance exposure. The increase in dimensions of the power station, following the conversion process, increases the medium to long distance exposure of the power station considerably (refer to the original visual exposure also indicated on Figure 5), especially to the south-east of the industrial area.

The influence of existing structures and planted vegetation cover also becomes apparent when looking at Figure 5. The nature of the exposure, towards the north-east (and the Atlantis residential area), is almost entirely contained within the industrial area due the presence of existing structures. The dominant area of exposure, outside of the industrial area, is towards the north-west and the south-east. The facility will be visible from the Dassenberg Road (R307) and the R27.

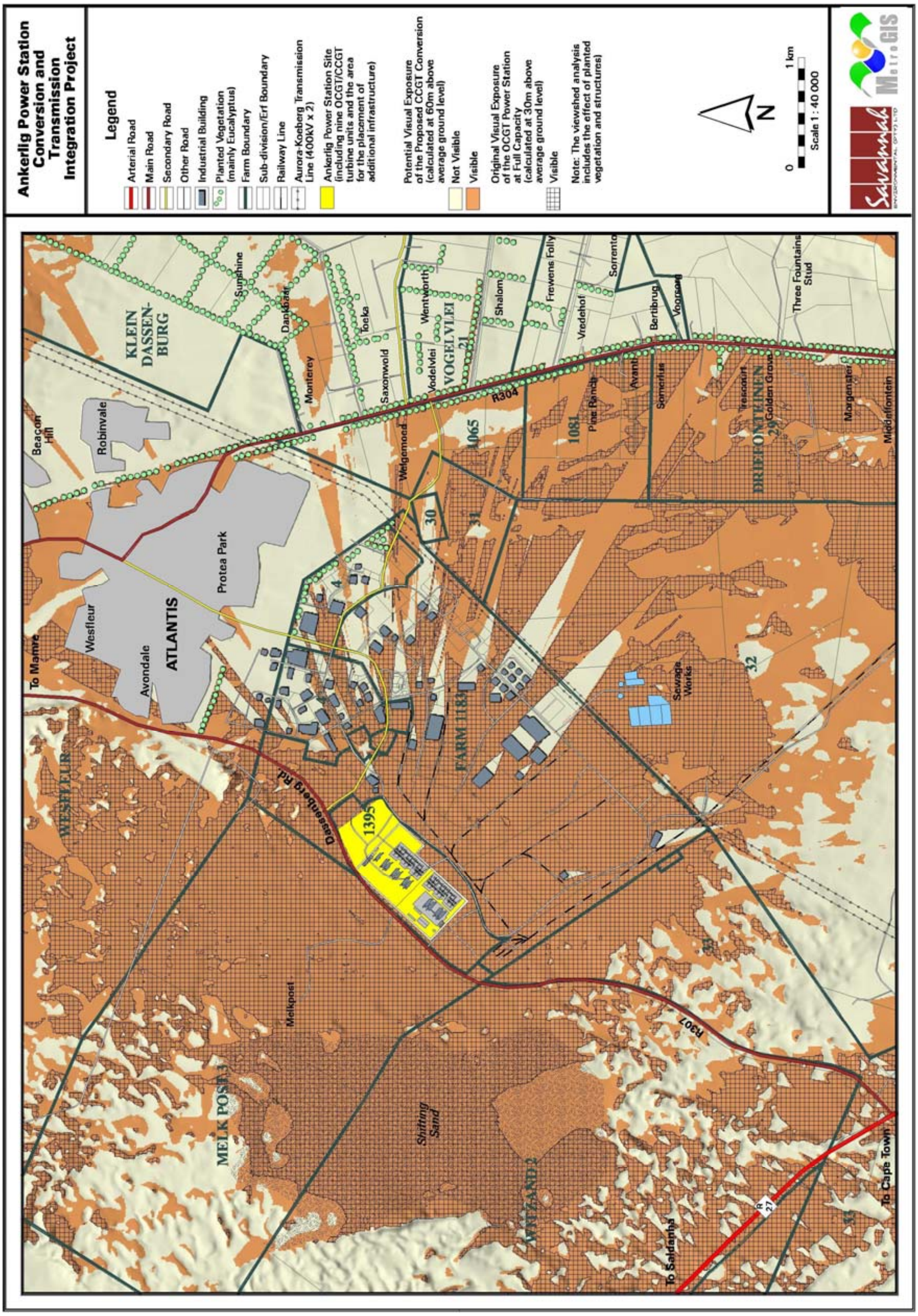

Figure 5: Potential visual exposure - Ankerlig power station conversion.

4.2. *Visual exposure - transmission power line*

The result of the viewshed analysis for the transmission power line alternatives is shown in Figure 6. The visibility of the transmission power line towers were calculated at a maximum offset of 50m above ground level (i.e. the approximate height of the structures associated with the proposed 400kV power lines) for a maximum radius of 5km from the alignment. The existing buildings in the industrial area and planted eucalyptus trees (along the R304) were included in the terrain model in order to accurately calculate the influence of existing visual obstructions on the visual exposure.

It becomes clear that the proposed transmission power line has the potential to be visually exposed over a large area along the length of its alignment. This is due mainly to the flat topography and the relatively low growth form of the natural vegetation within the study area. It must however be borne on mind that the area of exposure also represents the area of visual exposure for the existing power line infrastructure already present adjacent to the proposed alignment.

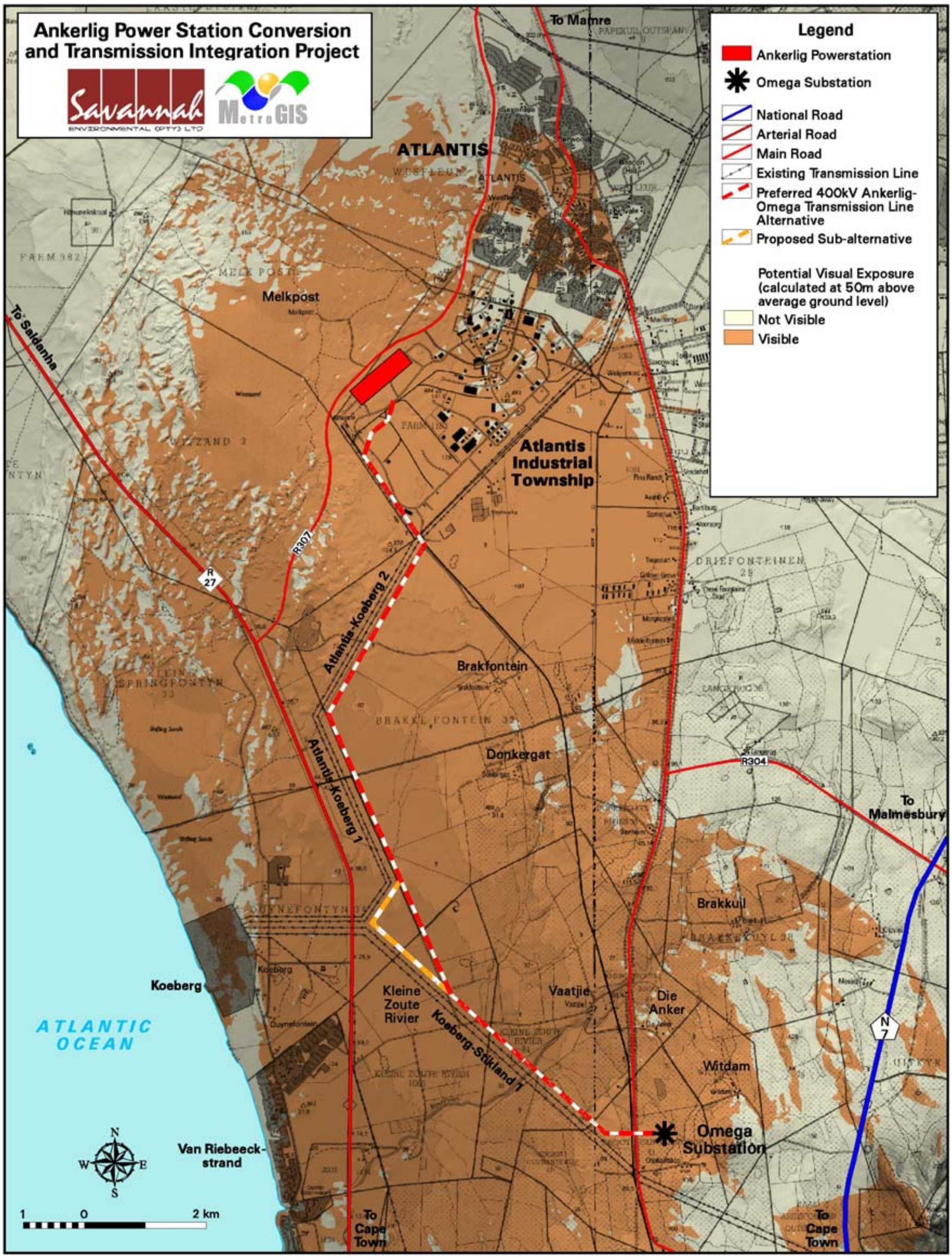

Figure 6: Potential visual exposure - transmission power line.

4.3. Visual distance

The visual distance theory relates to the scale of the proposed power station conversion and the transmission power line infrastructure, and the distance over which they are viewed in order to determine the prominence of the structures in relation to their surrounding environment. Figures 7 and 8 indicate the visual distances as buffer radii from the power station and the transmission power line.

The buffer distances selected for this study are 500m, 1000m, 2000m and greater than 2000m.

- **0 - 500m.** Short distance view where the project infrastructure could potentially dominate the frame of vision and constitute a high visual prominence.

- **500 - 1000m.** Medium distance view where the project infrastructure could potentially be easily and comfortably visible and constitute a medium visual prominence.

- **1000 - 2000m.** Medium to longer distance view where the project infrastructure would become part of the visual environment, but could still be visible and recognisable. This zone constitutes a low visual prominence.

- **Greater than 2000m.** A Long distance view of the project infrastructure where the structures would more than likely not be visible or recognisable. This zone constitutes a low to negligible visual prominence.