CENNERGI (PTY) LTD

PROPOSED ESTABLISHMENT OF THE TSHIVHASO COAL-FIRED POWER PLANT NEAR LEPHALALE, LIMPOPO PROVINCE

VISUAL IMPACT ASSESSMENT REPORT

JULY 2016

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ENVIRONMENTAL PLANNING AND DESIGN

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1 INTRODUCTION

1.1 GENERAL

This Visual Impact Assessment report (VIAr) study forms part of the Environmental Impact Assessment that is being undertaken for the proposed establishment of the proposed Tshivhaso coal-fired power plant and associated infrastructures by Savannah Environmental (Pty) Ltd on behalf of Cennergi.

In terms of the amended National Environmental Management Act (NEMA) Act No. 107 of 1998, the proposed development requires environmental authorisation. A key impact to be assessed comprises the visual impact that the facility will have on surrounding areas.

This VIA report has been prepared for inclusion in the project EIA report following the approval of the Scoping report.

The site investigation was undertaken in July 2016. The key issue regarding the timing of the site investigation is that it is undertaken during a period of clear weather. This enables key landscape features to be identified more easily over the greatest distance and for the assessor to consider the project under the worst case conditions in terms of likely maximum impact.

1.2 PROJECT LOCATION AND ALTERNATIVE SITES

The site alternatives are located approximately 24 km west north west of Lephalale, adjacent to the Grootegeluk Coal Mine in the Limpopo province.

There are a number of sites under consideration for the various elements of the development, the approximate geographic coordinates of the centre of each development area are indicated below:

POWER STATION AND ASH DUMP ALTERNATIVE 1 (GRAAFWATER)			
South	23°	37′	6.92″
East	27°	31′	15.52″
APPELVLAKTE ASH-DUMP ALTERNATIVE 2			
South	23°	37′	45.09″
East	27°	35′	24.09″

At the Scoping Stage there were two site options under consideration for the Power Station, five site alternatives for the ashing facility and two grid connection alternatives.

The scoping phase recommended the alternative 1, Graaffwater/Goedehoop power station site. This is the only power station site that is being considered at the EIA stage.

Goedehoop alternative 1 was recommended as the most suitable option for the ashing facility at the scoping stage, with option 2 (Appelvlakte) a close second. However the landowner responded that it is not desirable for them to have the ashing facility located on Farm Goedehoop from a land-use perspective. Option 2 was therefore recommended as the preferred alternative at this stage.

During scoping it was also recommended that the possibility of locating the ashing facility on Graaffwater 456 which is the same farm as the power station site alternative 1 should also be investigated during the EIA phase.

At the end of the Scoping Phase therefore two of the ashing facilities considered were recommended for consideration during the EIA phase.

In addition two overhead power line loop-in configurations were under consideration at the scoping stage. However only one alternative that links the proposed power station to the National Grid close to the currently under construction Medupi Power Station (Medupi Loop-in) is being considered during the EIA stage.

The EIA phase therefore considers alternative power station site 1, alternative ashing facilities 1 and 2 and the Medupi Loop-in grid connection.

The alternative sites are indicated on **Map 1, Site location**.

1.3 PROJECT CONTEXT

The project context was confirmed during the site visit.

The project is proposed on the edge of an existing heavy industrial area which includes the existing Matimba Power Station; the Medupi Power Station, which at the time of reporting was under construction, and the Grootegeluk Coal Mine which supplies the Matimba Power Station.

Surrounding the heavy industrial area the landscape appears relatively natural with low intensity grazing and game farming being the main land uses. Vegetation is generally comprised of bushveld with trees and woody vegetation extending above head height. In many areas this vegetation extends to close to the road edge. As the topography is relatively flat, this vegetation plays a major role in screening external views and means that even from relatively close proximity (1-2km) views of even the lower structures associated with the existing power stations (80m high) are almost always screened and higher structures including the stacks (approximately 220m high) are often screened.

The entire structures only become apparent where roads provide a view corridor or where clearing of vegetation has occurred for agriculture. The latter situation only occurs some distance from the structures (in excess of 15km) where irrigation is possible close to major water courses.

Occasionally distance views of the stacks are possible above the tree line but this only occurs at relatively long distance and in areas where minor ridgelines allow the viewer to see over the tops of trees.

In general therefore the proposed development is likely to be most visually imposing in areas that are relatively close to the development and where industrial development has already transformed the landscape.

1.4 BACKGROUND OF SPECIALIST

Jon Marshall qualified as a Landscape Architect in 1978. He is also a certified Environmental Impact Assessment Practitioner. He has been involved in Visual Impact Assessment over a period of approximately 30 years. He has developed the necessary computer skills to prepare viewshed analysis and three dimensional modelling to illustrate impact assessments. He has undertaken visual impact assessments for major buildings, industrial development, mining and infrastructure projects and has been involved in the preparation of visual guidelines for large scale developments.

A brief Curriculum Vitae outlining relevant projects is included as **Appendix I.**

1.5 TERMS OF REFERENCE AND RELEVANT GUIDELINES

The brief is to assess the visual impact that the facility will have on surrounding areas.

Work is to be undertaken in accordance with the following guideline documents;

a. The Government of the Western Cape Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (Western Cape Guideline), which is the only local relevant guideline, setting various levels of assessment subject to the nature of the proposed development and surrounding landscape, and

b. The Landscape Institute and Institute of Environmental Management and Assessment (UK) Guidelines for Landscape and Visual Impact Assessment which provides detail of international best practice (UK Guidelines).

Together these documents provide a basis for the level and approach of a VIA as well as the necessary tools for assessment and making an assessment legible to stakeholders.

The Visual Assessment Scoping Report found that the proposed development could impact degraded areas that are already impacted by heavy industry as well as areas and routes of medium / high scenic and cultural significance. It is also possible that the proposed development could impact a protected area.

The Western Cape Guidelines indicate that a moderate to very high impact might be expected. If a moderate impact is predicted then a Level 3 Assessment should be undertaken, however if either a high or very high impact is expected then a Level 4 Assessment should be undertaken.

A Level 3 Assessment requires the following input;

- Identification of issues raised in scoping phase, and site visit;
- Description of the receiving environment and the proposed project;
- Establishment of view catchment area, view corridors, viewpoints and receptors;
- Indication of potential visual impacts using established criteria;
- Inclusion of potential lighting impacts at night;
- Description of alternatives, mitigation measures and monitoring programmes.

- Review by independent, experienced visual specialist (if required).

A Level 4 Assessment requires the following additional input;

- Complete 3D modelling and simulations, with and without mitigation.
- Review by independent, experienced visual specialist (if required).

The Visual Assessment Scoping Report recommended that the assessment stage is commenced as a Level 3 Assessment and that if the proposed development is found to have significant impacts on the more natural landscape areas surrounding the heavy industrial area then the assessment should be elevated to Level 4.

The project context indicates that the impacts are likely to be localised mainly affecting the existing area of heavy industry and its immediate surrounds. This conclusion was arrived at from observing the nature of views of the existing power stations from the surrounding landscape.

This means that the assessment should be a Level 3 Assessment as originally motivated.

The assessment was to a large degree determined on site by the visual experience of the existing Matimba power station as viewed from the locations of identified sensitive receptors.

Impacts are also illustrated using views of Matimba that are annotated to indicate the location and comparative impact that is likely to be associated with Tshivhaso.

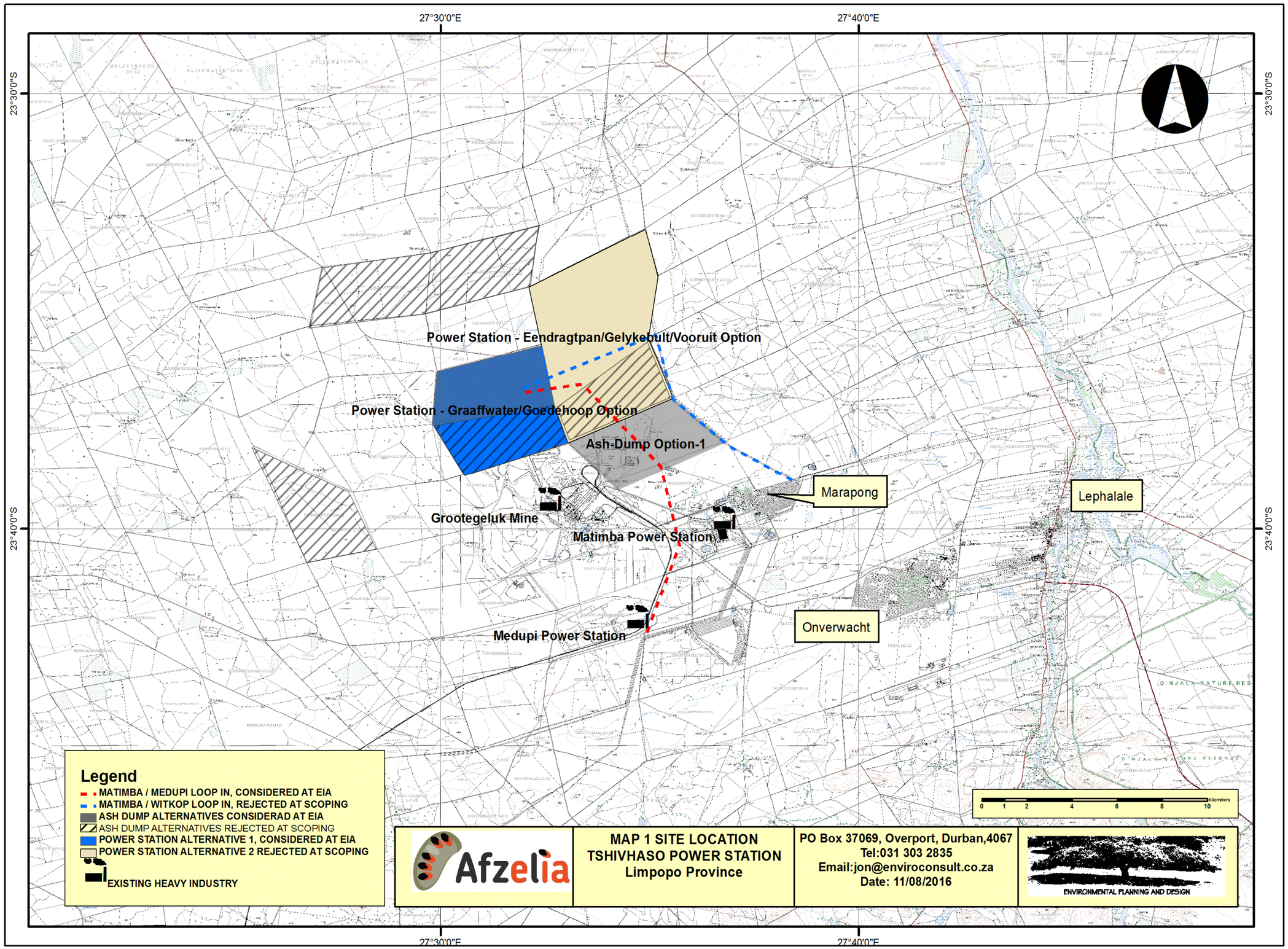
1.6 ISSUES IDENTIFIED

Anticipated issues related to the potential visual impact of the proposed project that were identified at the scoping stage include the following:

a) The proposed development could negatively impact on the character of the Lowland LCA which is largely a natural landscape which is an important tourism resource.
b) The proposed development could impact negatively on the Upland LCA which is a relatively natural landscape that is likely to be important as a tourism resource.
c) The proposed development could have a negative impact on adjacent urban areas.
d) The proposed development could be visible from important tourist routes in the area. These include the R518, the R512 and the R510 which are relatively major routes. It is likely that a number of minor, un-surfaced routes, will also be important from a tourism perspective and will need to be considered in the assessment.
e) The proposed development could impact negatively on the Riverine LCA which is likely to be important for tourism and recreational uses.
f) The proposed development could impact negatively on the D'nyala Nature Reserve.

These issues have been considered in the context of the Landscape Character Areas, visual effects identified and possible cumulative influence of other development in the area.

Possible mitigation measures have also been identified.


27°30'0"E
27°40'0"E
23°30'0"S
23°40'0"S
Power Station - Eendragtpan/Gelykebult/Vooruit Option
Power Station - Graaffwater/Goedehoop Option
Ash-Dump Option-1
Marapong
Lephalale
Grootegeluk Mine
Matimba Power Station
Medupi Power Station
Onverwacht
D'NJALA NATURE RES
Legend
MATIMBA / MEDUPI LOOP IN, CONSIDERED AT EIA
MATIMBA / WITKOP LOOP IN, REJECTED AT SCOPING
ASH DUMP ALTERNATIVES CONSIDERAD AT EIA
ASH DUMP ALTERNATIVES REJECTED AT SCOPING
POWER STATION ALTERNATIVE 1, CONSIDERED AT EIA
POWER STATION ALTERNATIVE 2 REJECTED AT SCOPING
EXISTING HEAVY INDUSTRY
0 1 2 4 6 8 10 Kilometers
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MAP 1 SITE LOCATION
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Date: 11/08/2016
ENVIRONMENTAL PLANNING AND DESIGN

2. PROJECT DESCRIPTION

2.1 PROJECT MOTIVATION

The supply of electricity in South Africa has become constrained, primarily because of insufficient generation capacity, but also due to constraints on the transmission and distribution of electricity. This situation and its repercussions (load shedding and tariff increase) threaten economic development of the country.

Considering this situation the applicant is proposing the establishment of a coal-fired power plant to generate electricity for input into the national grid to augment Eskom's power supply. The proposed plant will have a capacity of up to 1200MW.

2.2 PROJECT DESCRIPTION

The key elements under consideration during the EIA stage of the project are indicated on **Map 1, Site location**.

The following table of elements that could have an influence over visual impact associated with the proposed development was supplied by the Environmental Assessment Practitioner.

Component	Description/ Dimensions
Location of the site	Site alternative 1 - farms Graaffwater 456. Site alternative 2 - farms Eendragtpan 451, Geylkebult 450 and Vooiruit 449 (rejected at scoping)
Electricity Generating capacity	1200MW, to be developed in two phases of 600 MW each
Proposed technology	» Circulating Fluidised Bed (CFB) coal-fired power station (baseload power supply) » Dry cooled
Extent of the proposed development footprint (including Power plant production unit/s (boilers / furnaces, turbines, generator and associated equipment, control room), Office and maintenance area/s and ash dump area	» Power Plant - 50ha » Ash Dump – 500ha (extending over a 40-year period) » Strategic Coal Stockpile – 100ha (providing for a stockpile for 30 days) » A Raw-Water Dam - 2ha
Stack height	220m
Coal storage areas and bunkers, Coal loading and offloading areas, as well as conveyor belts with transfer house	» Coal is to be provided to the power station from the Thabametsi coal mine which is be established to the south-east of the site. » To be supplied at a rate of 1000 t/h » Coal will be transported to the coal storage area via overland conveyors.
Strategic Coal Stockyard	sized for a ~30-days capacity of ~700,000 tonnes
Ash dumps and associated drainage	» 660-t/h of ash and spent sorbent to be disposed of to the ash dump

Component	Description/ Dimensions
channels and pollution control dams	» 500ha in extent » Height: up to 50m » Provides storage for a volume of approximately 200 million cubic meters of ash » Ash to be transported from power station to ash dump via overland conveyors » Three pollution control dams to be associated with ash dump – capacity proposed to be 75 000m^3, 54 000m^3 and 33 000 m^3
Grid connection	» Two power evacuation Alternatives: * Alternative 1:a Matimba – Witkop loop-in line (rejected at scoping); and * Alternative 2: a Matimba – Medupi loop-in line » 400kV line required » Servitude width – 55m » Height of towers – maximum height of 35m
Pipeline for water supply	» A water supply pipeline of approximately 1m in diameter will be required to be constructed to the power station site from the point of supply. Peak throughput of >120 litres per second.
Raw-Water Storage Reservoir and Pump-station	» Capacity: 120 000m^3 » Reservoir wall height: 1-2 m (to be confirmed in final design)
Water treatment plant	» Daily treatment capacity: 4800 m^3/day
Wastewater treatment plant	» Daily throughput capacity: 6000 m^3/day

2.3 LIKELY SCALE OF DEVELOPMENT AND NATURE OF VISUAL IMPACTS

The proposed power station is relatively small when compared to Eskom's existing power stations. Eskom's coal fired power stations have a capacity of between 1000MW (Komati Power Station) and 4116MW (Kendal Power Station). Whilst technology differs between units, they are generally comprised of a number of linked generating units each with a capacity or around 600 – 700MW.

At 1200MW, the proposed power station is therefore likely to be significantly smaller than Eskom's major coal fired power stations.

In visual terms, a power station is comprised of a combination of elements that can be highly obvious in the landscape. The most obvious are likely to include;

- **The Generating Units** which are likely to be housed in tall industrial enclosures. The applicant has confirmed that the structures will be in the order of 80m high. These structures are typically visible over a wide area and appear as a large industrial building often contrasting with the nature and scale of a surrounding landscape. The proposed power station will employ dry cooling technology and will have an ultimate capacity of 1 200MW that will be developed in two phases. The fact that direct dry cooling technology will be employed will mean that large cooling towers that are associated with many power stations will not be required. By way of comparison, the adjacent Matimba Power Station which is the largest direct dry cooled Power Station in the World has a designed capacity of 4000MW divided between six 665MW generating units. The Matimba generating units are housed in six structures

that are approximately 130m high (**Bohlweki, 2006**). This comparison indicates that the proposed Tshivhaso Power Station is likely to be similar in appearance to four of the generating units associated with Matimba. They are however likely to be approximately 60% of the height of the Matimba structures. **Refer to Plate 1, Matimba Power Station.**

- **The Ash Dump** for disposal of Pulverised Fuel Ash (PFA) that will arise from the process on an ongoing basis. The applicant has confirmed that the ash dump will eventually be in the order of 500ha in extent and approximately 50m high. The eventual quantity of dumped material will be in the order of 200 million cubic metres of material that will be deposited over the life of the facility. By way of comparison, the ashing facility associated with the Matimba Power Station has approximately double the footprint of that proposed for the Tshivhaso Power Station. The Tshivhaso ash dump is however likely to have a similar height and appearance as the Matimba facility. The Matimba facility is also fed by a conveyor as is proposed for Tshivhaso. Two alternatives are under consideration during the EIA phase including;

    - Alternative 2 located on the Farm Appelvlakte 448 as considered during the scoping phase of the project; and
    - The new alternative that was raised flowing scoping that is located on the Farm Graaffwater 456 which is the same property as the proposed power station.

  Refer to Plate 2, Conveyor delivering PFA to the Ashing Facility, Matimba Power Station.

- **Stacks (stacks)** through which emissions from the coal burning process are to be emitted. The height of these will be subject to air quality requirements. The applicant has confirmed that there will be two stacks in the order of 220m high. These are likely to be the tallest elements within this proposed development. These stacks, typically are likely to be visible over a wide area. By comparison the stacks on the Matimba Power Station are 250m high (Eskom). The stacks associated with Tshivhaso will therefore be approximately 11% lower than those associated with Matimba. **Refer to Plate 1, Matimba Power Station.**

- **Coal Stockpiles** are generally required within the power station in order to provide a buffer against coal delivery problems. The applicant has confirmed that a storage capacity of approximately 700 000 tonnes will be stored at Tshivhaso. By comparison the Matimba facility has a storage capacity of approximately 1 200 000 tonnes (**Eskom**). The stockpile associated with Tshivhaso will therefore be approximately 60% of the Matimba facility. **Refer to Plate 3, Matimba Power Station and Coal Stockpile.**

- **Silos** that are used to store coal for power production. Coal is transferred from a stockpile area to silos that are located adjacent to the power plant. The silos are generally lower in height than the overall enclosure. As they are generally located in a row parallel with the power plant generator units, visually, they appear as part of the plant structure.

- **Conveyor belts** are generally used to move coal to stockpile and from the stockpile to the silos and then into the power plant. They are also used to move Pulverised Fuel Ash (PFA) from the power plant to the Ash Dump. Conveyor belts are generally set as close to the ground as possible, but are elevated however to deliver coal to the silos and to end tip the PFA onto the Ash Dump. Conveyors are also generally covered in order to prevent wind blow and minimise dust. Conveyor belts are generally obvious in the landscape due to their linear extent and the engineered precision that they cut straight lines across the landscape. **Refer to Plate 2, Conveyor delivering PFA to the Ashing Facility, Matimba Power Station**. Conveyors will also be utilised to transfer coal from the Thabametsi coal mine that is to be established to the south-east of the site. This coal mine however is not assessed by the current application.

- **Offices and Workshops** will be required for administration, security and technical personnel. It is likely that these buildings will be relatively low when compared with the main structures on site. These elements are likely to appear as similar in scale and nature to many structures that might exist within an urban area. They are likely to be most obvious from relatively close range as from a distance they will be viewed in the context of significantly larger elements.

- **Overhead Power Lines** that will be used to transfer power into the National Grid. It has been confirmed by the applicant that a 400kV power line will be used. The applicant has confirmed that this will be in the order of 35m in height. **Plate 4, Existing overhead power lines,** indicates a view of existing HV overhead power lines associated with the Matimba Power Station. The power line associated with Tshivhaso is likely to be similar in appearance to one of the power lines pictured. Two alternative alignments were under consideration during the scoping stage including;

  - Alternative 1: Matimba – Witkop loop-in line; and
  - Alternative 2: Matimba – Medupi loop-in line.

  At the scoping stage, Alternative 1 was rejected, consequently only Alternative 2 is carried forward to the EIA stage.

- The analysis of the various elements that are likely to make up the proposed power station indicates that they are likely to fall into the following categories;

  - Extremely tall elements that include stacks that could be up to 220m in height.

  - Moderately tall elements that include the generating units, silos, the ash dump that could be up to 80m in height.

  - Low elements that include the overhead power line, coal stockpile and taller conveyors that could be up to 35m in height.

  - Very low elements such as ground level conveyors, storage reservoirs, buildings and water treatment plant. These elements are likely to have a

maximum height of less than 10m and in the context of the proposed power station are likely to have negligible impact.

These orders of height will be used in the assessment to help indicate the nature of likely views of the proposed development that may be visible and identify the nature of impacts that are likely to affect sensitive receptors.

Plates 1 to 4 inclusive provide an indication of the likely scale and nature of views of the major elements associated with the proposed development. It should be noted that whilst the individual elements associated with the proposed development are likely to be similar in nature, the photographs are of a major Eskom power station. The proposed development is therefore likely to be comprised of a smaller power plant.

Plate 1, Matimba Power Station. The conveyor supplying coal into the silos can be seen at the front of the image. Conveyors then run from the base of the silos to supply coal into the six generating units that are located at the back of the image. There will be four generating units (each being 300MW in capacity) associated with Tshivhaso that will be 40% lower than those at Matimba. The Tshivhaso stacks will also be 10% lower than those at Matimba.

Plate 2, Conveyor delivering PFA to the ashing Facility associated with the Matimba Power Station. Note the elevated conveyor approximately centre of image that is dumping ash on the dump as well as the covered conveyor to prevent wind blow of ash. The ashing facility will gradually grow during the life of the power station. Vegetation that has established on the ash dump helps to disguise the fact that it is a waste dump.

Plate 3, Matimba Power Station and Coal Stockpile. The coal stockpile can be seen to the right of the power station. The coal stockpile associated with the Tshivhaso power station will be approximately 40% smaller than that associated with the Matimba facility.

Plate 4, Existing overhead power lines delivering generated power into the National Grid with Matimba Power Station in the background. Note that lower development within the power station is totally screened including the coal stockpile.

3. DESCRIPTION OF RECEIVING ENVIRONMENT AND RECEPTORS

3.1 LANDSCAPE CHARACTER

Landscape character is defined as "a distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another".

Landscape character was defined from a site visit supplemented by available online mapping and aerial photography. Key character components identified were subject to verification through the EIA site visit

The region has a strong natural character, interspersed with agricultural activities (maize crop production) and human settlement.

The landscape north of the proposed site appears relatively natural whilst to the south there are major industrial elements including: Exxaro's Grootegeluk Coal Mine, Eskom's Matimba Power Station and Eskom's new Medupi Power Station. These existing large scale industrial elements all lie within 12km of the proposed power station sites.

The region to the south, east and west of the industrial area also appears relatively natural.

To the south the main topographic feature is the Waterberg plateau from which the land falls to the north towards the Limpopo River.

Landscape Character is a composite of a number of influencing factors including;

- Landform and drainage
- Nature and density of development
- Vegetation patterns

3.1.1 Landform and Drainage

The proposed site is located on the southern edge of the broad Limpopo Valley.

The Limpopo River is the main regional drainage feature. As this river forms the border between the Republic of South Africa and Botswana, it is possible that views of the proposed development may be visible in Botswana.

A cross section of the valley ranges in elevation between approximately 827m amsl at the river to the north of the proposed site and 1000m amsl at the upper valley slope and ridgeline to the south of the proposed site that is formed by the northern edge of the Waterberg plateau. By comparison the proposed power station sites have current levels between 920-930m amsl.

The Landform and Drainage Map (Map 2) indicates that valley floor slopes gently towards the proposed site for approximately 12km. It then increases in gradient forming a small ridgeline with a summit at approximately 140m amsl behind which the proposed development is located. The land then falls into a minor valley through which the Sandloop and Rietspruit Rivers flow. The floor and gently sloping lower slopes of this minor valley are approximately 20km wide. To the south of this more rugged terrain of the Waterberg rises steeply forming the southern edge of the Limpopo Valley.

This landform is likely to have a number of implications for visibility of the proposed development:

- The fact that the proposed alternative development areas are located in the minor valley could mean that the development is at least part screened from the majority of the Limpopo Valley to the north.
- The fact that the terrain to the south of the proposed development rises steeply is likely to mean that this will provide significant screening of views from areas further south.
- The undulating terrain of the minor valley in which the proposed development is set could provide opportunity for blending the necessary ash dump into the landscape. This will require contouring to give the dump the appearance of a natural part of the landform.

Refer to Map 2 for analysis of the landform and drainage.

3.1.2 Landcover

Landcover within the study area can be divided into the following types;

- **Urban development** in the study area includes the settlements of Lephalale, Onverwacht and Marapong. All three areas have both well-established middle and upper income housing areas and more recent low cost housing areas. Lephalale has a broad range of development types including; industry, commercial and residential whereas the other two settlements are largely comprised of residential development.

  Particularly within the well-established areas of these settlements, streets are relatively broad and are lined with trees. Gardens generally have mature woody ornamental plants. The density of development and the extent of vegetation is likely to serve to screen most external views from the urban area. Newer areas of development however, appear to have little street or garden vegetation which could mean that views of external areas and particularly large scale industrial areas will permeate further into the settlement.

- **Natural areas** are the main landcover type surrounding the proposed development. This area is largely used for game and cattle farming. This activity has resulted in the majority of the area retaining a relatively natural appearance. A large proportion of land owners appear to have diversified into eco-tourism as is evident from the number of bush lodges in the area particularly to the north of the proposed development sites.

- **Cultivation** occurs in limited areas where irrigation is possible adjacent to the main water courses. Typically these areas are comprised of a number of circular cultivated areas, the shape and extent of which is dictated by the area covered by pivot irrigation systems. Within the agricultural area there are also a large number of farmsteads that include farm sheds, farm houses and workers accommodation. It is also likely that a proportion of these are used as guest houses.

- **Degraded areas** are also evident. From reference to aerial photography, these appear to be associated with mining and with clearance of vegetation for intensive grazing.

- **Large scale industrial development** includes the adjacent Grootegeluk mine, the existing Matimba Power Station and the Medupi Power Station currently under construction. These establishments are all located within the minor valley indicated in Section 3.1.1. They have a led to significant landscape change within the area with large scale structures and spoil heaps being visible over a wide area. In addition associated infrastructure including railway, conveyors and overhead power lines are all highly obvious within the area. Future development in the area includes the authorised Thabametsi Power Station located to the north of the sites, the authorised Thabametsi mine located to the south of the sites and the proposed Sekoko mine located to the west of the sites.

3.1.3 Vegetation Patterns

Vegetation types can be divided into;

a) Natural Bushveld
b) Riverine Vegetation
c) Ornamental vegetation
d) Arable crops

Natural Bushveld covers the majority of the study area, according to Vegetation of South Africa, Lesotho and Swaziland (Low and Rebelo), it can be further divided into three types:

- Sweet Bushveld occupies the lower valley slopes on either side of the Limpopo and its tributaries.
- Mixed Bushveld occupies the mid to upper valley slopes, and,
- Waterberg Moist Mountain Bushveld occupies the upland areas to the south of the study area.

Whilst botanically, these vegetation types are different, in visual terms they are all comprised of a matrix of herbaceous / grasses and small trees and shrubs. Areas with greater water retention close to water courses and pans have a greater proportion of shrub and tree vegetation whereas dryer sandier areas have a greater proportion of grass and herbaceous vegetation cover.

Trees and tall shrubs within the bushveld matrix extend to above head height in most areas, resulting in a significant screening effect. In many areas this results in limiting views to the immediate area.

Dense riverine vegetation fringes the major water courses in the area including the Limpopo River. This is comprised of large tree species. This also has a major screening effect, preventing external views from within the river channel and screening views from one side of the river channel to the other.

Ornamental garden vegetation and trees along streets appear to be relatively dense within the more established areas of Lephalale and Onverwacht. This vegetation is likely to foreshorten views within these settlement areas.

Arable cropping occurs adjacent to major water courses particularly the Mokolo to the south and east of Lephalale. Where this occurs, generally the natural vegetation has been cleared over a wide area which opens up long distance views.

3.2 LANDSCAPE CHARACTER AREAS & VISUAL ABSORPTION CAPACITY

Landscape Character Areas (LCAs) are defined as "single unique areas which are the discrete geographical areas of a particular landscape type".

Visual Absorption Capacity (VAC) is defined as the landscape's ability to absorb physical changes without transformation in its visual character and quality. Where elements that contrast with existing landscape character are proposed, VAC is dependent on elements such as landform, vegetation and other development to provide screening of a new element. The scale and texture of a landscape is also critical in providing VAC, for example; a new large scale industrial development located within a rural small scale field pattern is likely to be all the more obvious due to its scale.

The affected landscape can be broadly divided into the following LCAs that are largely defined by development.

- **The Lowland Landscape Character Area** is comprised of the lower slopes of the Limpopo Valley that are largely covered with semi-natural bushveld. The LCA is largely used for grazing. There is also a large eco-tourism secondary bias to the landuse.

  The bushveld and in particular the taller shrubs and trees that extend above head height are likely to provide significant VAC in this LCA screening outside elements from the area. It is only likely that elements outside this LCA will be obvious when the viewer is located in an elevated area above the natural vegetation or when a road alignment or clearing channels external views into the area.

- **The Industrial Landscape Character Area** is largely contained within the minor valley in which the development is proposed. Within this area two existing / under construction power stations and the existing Grootegeluk mine dominate the landscape. Due to landform and surrounding natural vegetation, this is a relatively enclosed character area. Because of the scale of industrial elements, it might be thought that this zone would have a large visual influence over surrounding areas. However, the density and height of surrounding natural vegetation effectively limits the majority of this influence to 1 – 2km from the edge of development. Beyond this range, occasional views of taller structures, particularly the existing stacks is possible particularly where surrounding vegetation is thin, however, the main industrial elements are generally screened. Therefore whilst there is relatively limited VAC within this zone, the VAC of the surrounding natural landscape is important in containing the visual influence of this zone.

- **The Urban Landscape Character Area** which is comprised of the small urban areas of Lephalale, Onverwacht and Marapong. During the scoping phase these were included within the Industrial LCA as it was felt that the larger industrial elements would exert influence over these areas. In reality however these zones are relatively well insulated from one another by surrounding natural vegetation.

Marapong being located immediately adjacent to the Matimba Power Station is perhaps an exception to this. It was noted during the site visit however that although there is a major influence associated with the power station on the edge of the settlement, a couple of streets into the urban area, industrial structures are largely screened by houses. The density and orientation of buildings that generally focus onto local roads rather than external views and street / garden vegetation all help to minimise the impact of industry within these settlement areas. The level of VAC both surrounding and within this zone is therefore high.

- **The Riverine Landscape Character Area** is comprised of the narrow corridor either side of the major water courses in the area. It is generally depressed below the level of the surrounding valley floor and is lined with mature vegetation that is mainly comprised of woody tree and shrub species. Whilst in areas there are irrigated arable schemes that open views across the landscape, this zone is generally inward looking with few external views.

- **The Upland Landscape Character Area** is comprised of the upper valley slope that is formed by the northern edge of the Waterberg Plateau. This forms a major ridgeline to the south of the proposed development area. This zone provides a high backdrop to the Industrial LCA. The rugged nature of the zone results in general screening of existing industrial development to the south with high level views over the development area being possible from the edge of the ridge only. It also results in a limited number of narrow vistas into the zone along valley lines. VAC on high areas of the northern edge of this zone is therefore low, however once within the zone VAC that is provided by the rugged landform is high.

This landscape analysis is indicated on **Map 5** and was ground truthed during the site visit. This has resulted in a reduction in the extent of the area of the Industrial LCA identified at the scoping stage due to the extent of screening provided by surrounding natural areas.

3.3 LANDSCAPE QUALITY AND IMPORTANCE

3.3.1 Lowland Landscape Character Area.

The importance of this LCA lies both with its agricultural and tourism role. It is therefore both important for its productivity as well as its natural aesthetics which support ecotourism activities.

From the site visit, it was also apparent from the high proportion of obvious tourism related traffic particularly on the R518 and R510 that in addition to the area being an ecotourism destination in its own right, it is also part of a corridor that is used by tourists whose ultimate destination is possibly the large reserve areas in Botswana.

This area therefore benefits from and adds to the general ecotourism attraction of the region.

3.3.2 Industrial Landscape Character Area

This is undoubtedly the most dramatic but un-natural LCA. The large man-made industrial forms possibly fit more comfortably into the surrounding large scale and

relatively simple landforms that are uniformly vegetated than they might in a smaller scale landscape.

The site visit also showed that despite the scale of the industrial elements, natural vegetation helps to contain the visual influence of industry to within a relatively limited area surrounding the main structures.

The main importance of the Industrial LCA is in the production of electrical power to supply to the country.

3.3.3 Urban Landscape Character Area

This zone is primarily important as a living and working environment particularly for local people.

3.3.4 Upland Landscape Character Area

As with the Lowland LCA, the importance of this zone lies with agricultural production as well as eco-tourism activities. The natural aesthetics of this area are therefore likely to be important particularly for eco-tourism activities.

3.3.5 Riverine Landscape Character Area

This zone is a relatively narrow corridor. It has obvious importance from a drainage perspective. It is also an important local recreational resource as well as being important from a tourism perspective. There are also areas where it is important from an agricultural production perspective.

3.4 VISUAL RECEPTORS

3.4.1 Definition

Visual Receptors are defined as "individuals and / or defined groups of people who have the potential to be affected by the proposal".

It is also possible that an area might be sensitive due to an existing use. The nature of an outlook is generally more critical to areas that are associated with recreation, tourism and in areas where outlook is critical to land values.

3.4.2 Possible visual receptors

This section is intended to highlight possible Receptors within the landscape which due to use could be sensitive to landscape change. They include;

Area Receptors;

- The urban areas of Lephalale, Marapong and Onverwacht. Areas associated with this use as are likely to be the most sensitive to possible changes in outlook associated with the proposed development. However, due to the already highly industrialised landscape backdrop and the minimal visual impact, it is possible that residents would not object unless the proposed development is likely to significantly increase existing impacts.
- There are a number of protected areas to the east and south of the proposed development area. These include: the D'nyala Nature Reserve, the Hans Strijdom Nature Reserve and the Marakele National Park. These areas are approximately 24km, 41km and 64km from the proposed development respectively.

- There are a number of private nature reserves that are generally located in the Lowland LCA, they include the Fahad Reserve which is approximately 26km to the north east of the proposed development and the Grootwater Reserve which is approximately 28km to the south east of the proposed development and to the south of the D'nyala Nature Reserve. Exxaro (Manketti Reserve) has also established a private reserve (which includes visitor accommodation in the form of a lodge and tented camp. The reserve area currently extends over the proposed development sites. It is assumed that Exaro has established this reserve as an offset for impacts associated with their adjacent mining operations.
- Many of the game farms surrounding the area are also likely to have a focus on eco-tourism. This really means that the general area surrounding the proposed project could be sensitive to visual impacts.

- **Linear Receptors** which include routes through the area. Because there is such a focus on eco-tourism activities, it is likely that both major and minor routes are likely to be important. It could be argued that minor unsurfaced roads are more important than major surfaced roads as they are likely to provide access to the eco-tourism attractions. Major routes include the R572 which provides access to the N11 to the north east, the R510 which provides access to Lephalale and the Stockpoort Border Crossing to the north west of the study area, and the R518 to the east of the study area. It will be necessary to identify and assess impacts on these and on minor unsurfaced roads in the area.
- **Point Receptors.** In excess of 300 point receptors have been identified these include individual farmsteads, bush camps, small groups of dwellings, and the Stockpoort Border Crossing.

The main receptors that have been identified are indicated on **maps 6 to 16 inclusive indicating the initial assessment of Zones of Theoretical Visibility.**

LANDSCAPE CHARACTER AREAS

INDUSTRIAL LANDSCAPE CHARACTER AREA

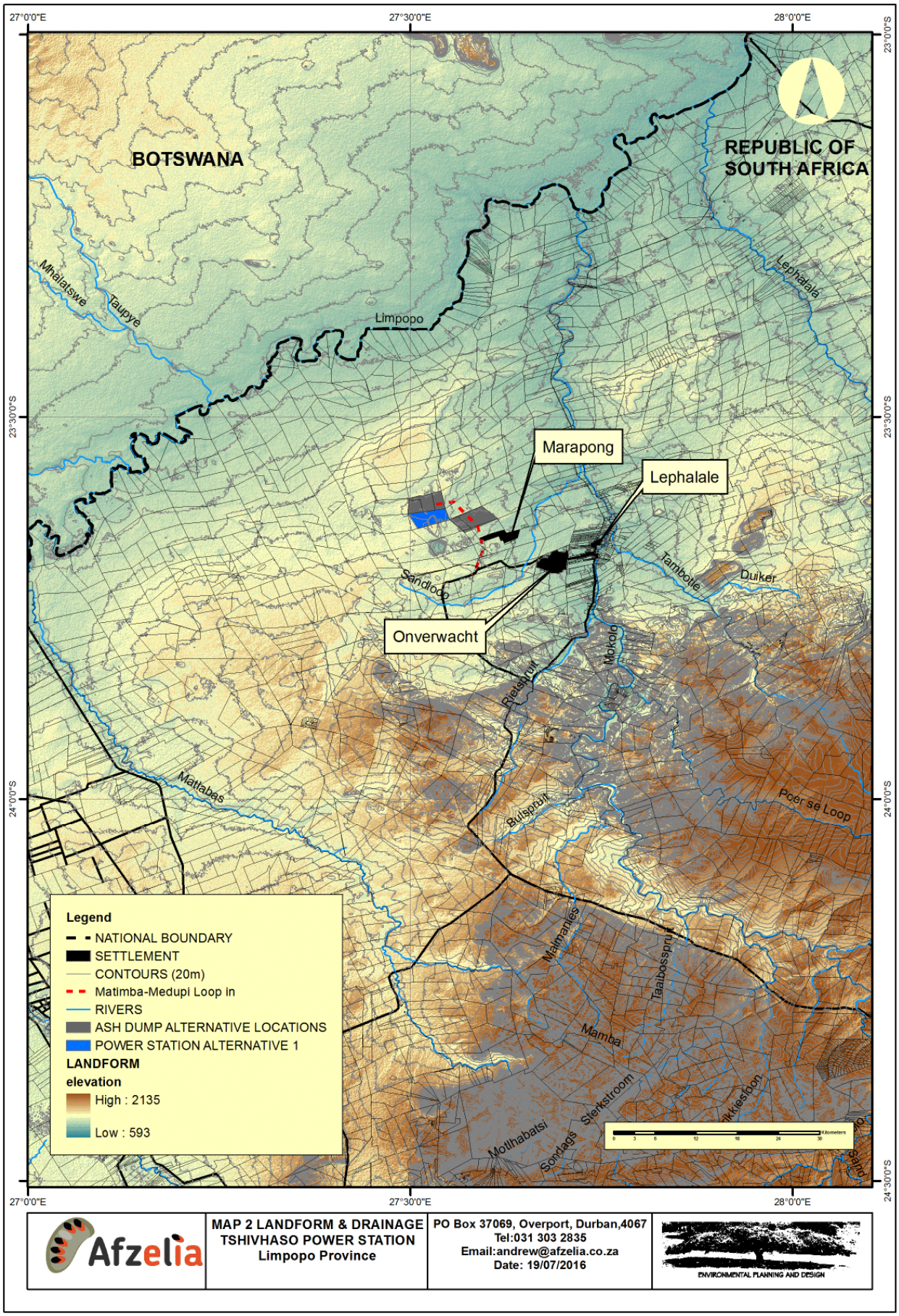
LOWLAND LANDSCAPE CHARACTER AREA

UPLAND LANDSCAPE CHARACTER AREA

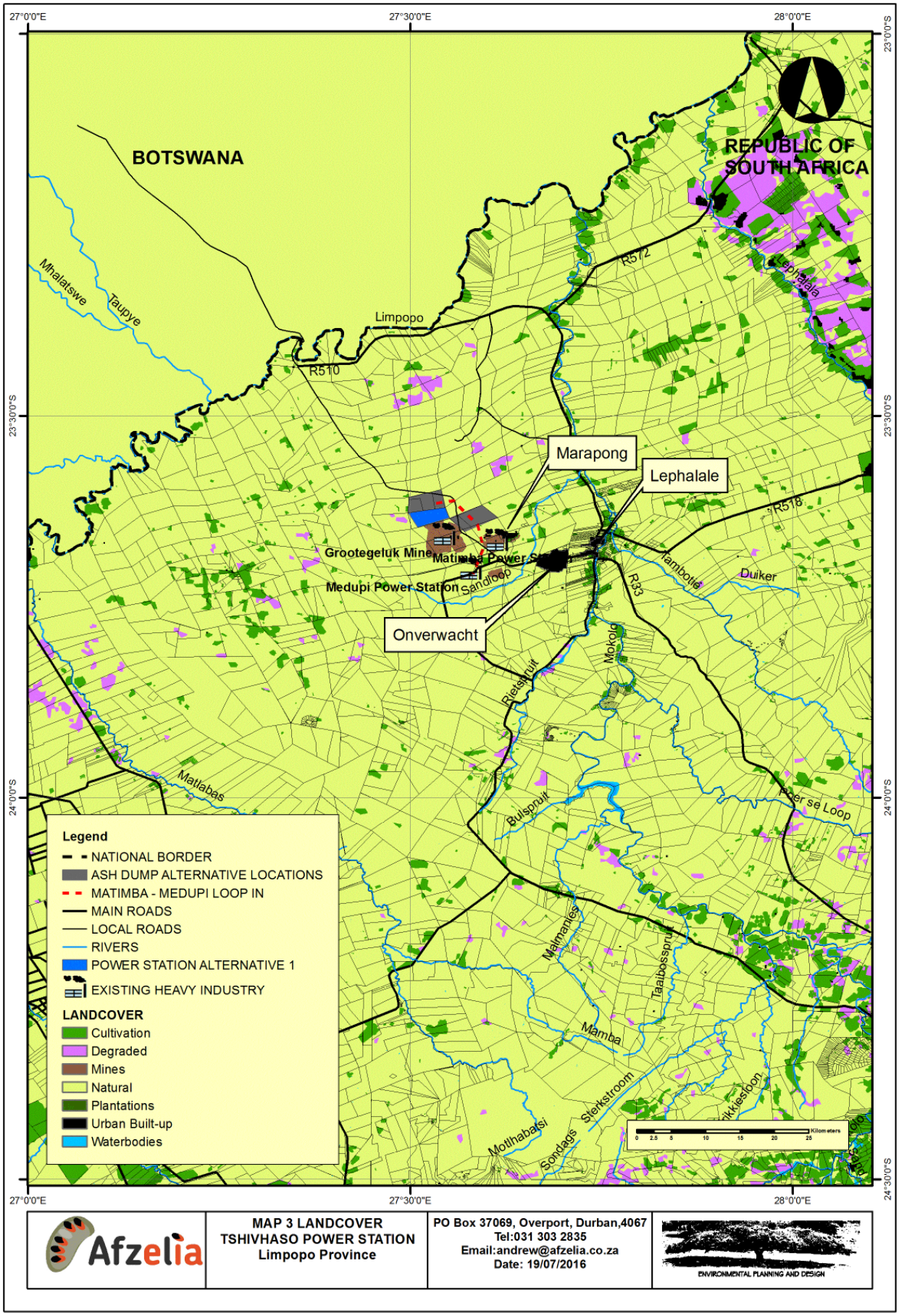
LANDSCAPE CHARACTER AREAS

RIVERINE LANDSCAPE CHARACTER AREA

URBAN LANDSCAPE CHARACTER AREA



Afzelia	**MAP 2 LANDFORM & DRAINAGE** **TSHIVHASO POWER STATION** **Limpopo Province**	**PO Box 37069, Overport, Durban,4067** **Tel:031 303 2835** **Email:andrew@afzelia.co.za** **Date: 19/07/2016**	ENVIRONMENTAL PLANNING AND DESIGN



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MAP 3 LANDCOVER
TSHIVHASO POWER STATION
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Date: 19/07/2016

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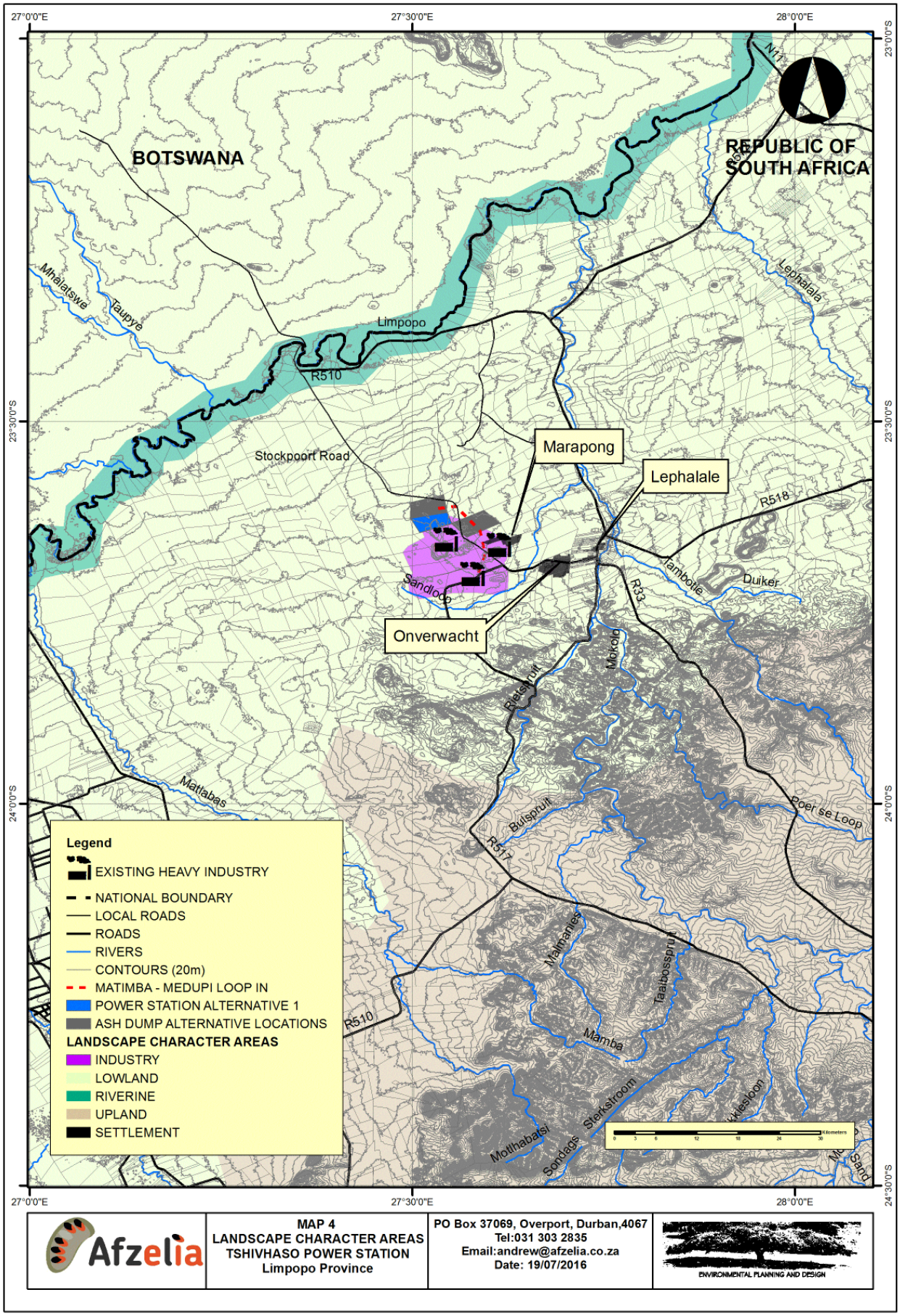
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24°0'0"S
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BOTSWANA
REPUBLIC OF SOUTH AFRICA
N11
Limpopo
Mhalatswe
Taupye
Lephalala
R510
Stockpoort Road
Marapong
Lephalale
R518
Sandloop
Tambotie
Duiker
R33
Onverwacht
Mokolo
Retiefspruit
Matlabas
Bultspruit
R517
Poer se Loop
Malmanies
Taaibosspruit
Mamba
Sterkstroom
Uitkoppen
Motlhabatsi
Sondags
Legend
EXISTING HEAVY INDUSTRY
NATIONAL BOUNDARY
LOCAL ROADS
ROADS
RIVERS
CONTOURS (20m)
MATIMBA - MEDUPI LOOP IN
POWER STATION ALTERNATIVE 1
ASH DUMP ALTERNATIVE LOCATIONS
LANDSCAPE CHARACTER AREAS
INDUSTRY
LOWLAND
RIVERINE
UPLAND
SETTLEMENT
Afzelia
MAP 4
LANDSCAPE CHARACTER AREAS
TSHIVHASO POWER STATION
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ENVIRONMENTAL PLANNING AND DESIGN

4 THE NATURE OF POTENTIAL VISUAL IMPACTS

4.1 GENERAL

Impacts could include general landscape change due to the development as it could detract from the existing character as well as change of view for affected people and / or activities;

a. General landscape change or degradation. This is particularly important for protected areas where the landscape character might be deemed to be exceptional or rare. However it can also be important in non-protected areas particularly where landscape character is critical to a specific broad-scale use such as tourism or just for general enjoyment of an area. This is generally assessed by the breaking down of a landscape into components that make up the overall character and understanding how proposed elements may change the balance of the various elements. The height, mass, form and colour of new elements all help to make new elements more or less obvious as does the structure of an existing landscape which can provide screening ability or texture that helps to assimilate new elements. This effect is known as visual absorption capacity.
b. Change in specific views within the affected area from which the character of a view may be important for a specific use or enjoyment of the area.
    - Visual intrusion is a change in a view of a landscape that reduces the quality of the view. This can be a highly subjective judgement. Subjectivity has however been removed as far as is possible by classifying the landscape character of each area and providing a description of the change in the landscape that will occur due to the proposed development. The subjective part of the assessment is to define whether the impact is negative or positive. Again to make the assessment as objective as possible, the judgement is based on the level of dependency of the use in question on existing landscape characteristics.
    - Visual obstruction is the blocking of views or foreshortening of views. This can generally be measured in terms of extent.

    Due to the nature of the proposed development, visual impacts are expected to relate largely to intrusion.

4.2 POSSIBLE VISUAL IMPLICATIONS OF DEVELOPMENT

As noted previously, the screening effect of surrounding natural vegetation generally limits the visual influence of existing large-scale industrial development to 1 – 2km from the edge of development.

Beyond this range very occasional views of higher structures such as stacks are possible only where the density of vegetation particularly canopy trees is limited. Views of lower structures are only possible where roads are aligned directly towards the development providing view corridors and where large-scale clearing has occurred for agriculture or development. The latter case only occurs at distances from development generally in excess of 12km. Overviews from the northern edge of the Waterberg are also possible, these are also relatively long distance views.

Views of HV power lines associated with the existing power stations are highly obvious from areas immediately adjacent to a power line servitude, however as the viewer moves away from the servitude, existing vegetation quickly screens views of the overhead lines. This is illustrated in Plates 5 and 6. In Plate 5, the view is taken within a power line servitude and the full extent of power lines is obvious. Plate 6 is a view looking towards the same power line servitude from a distance of approximately 800m. In this image the power lines are screened with the exception of those crossing the road.

These effects will also apply to the proposed development.

The following types of view are therefore likely to be possible:

Plate 5, View from within the Industrial ZTV from which a large proportion of the proposed development is likely to be visible.

Plate 6, View from areas close to the Industrial ZTV from which partial views of the proposed development, may be visible

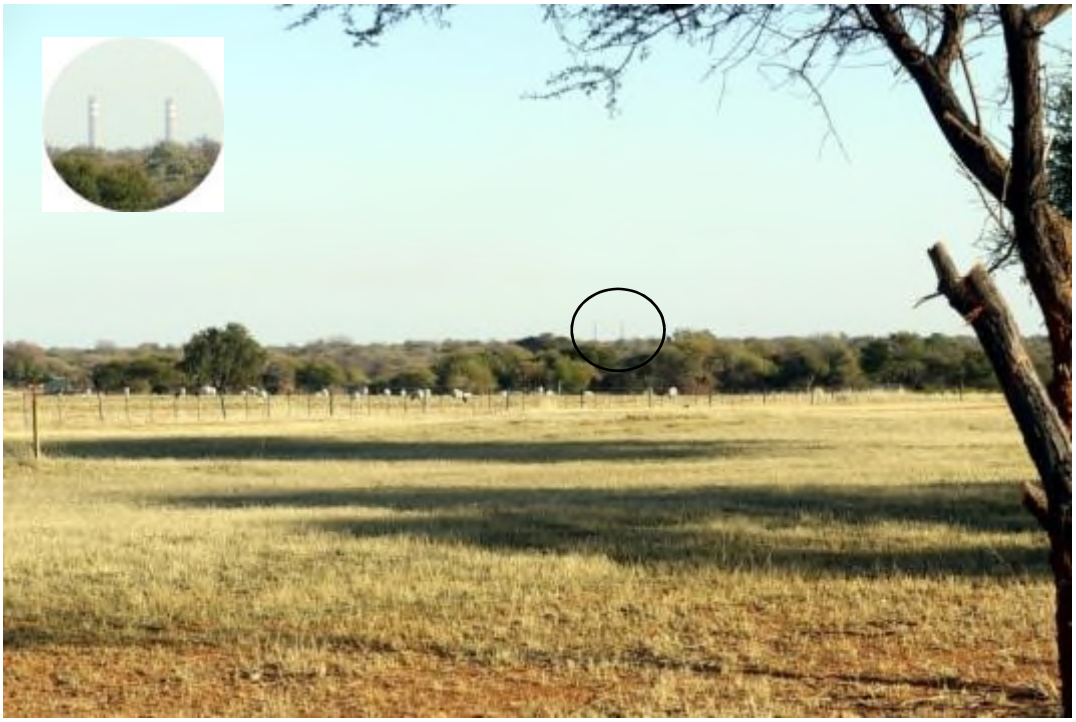


Plate 7, Distance view where local clearing for agriculture and development affords views over canopy trees.

Plate 8, Distance view from minor ridgeline that affords view over the landform and canopy trees.

Plate 9, Distance view of the major industrial elements from the north facing slopes of the Waterberg.

5 VISIBILITY OF THE PROPOSED DEVELOPMENT

5.1 ZONES OF THEORETICAL VISIBILITY

Zones of Theoretical Visibility (ZTV) are defined by the UK Guidelines as "a map usually digitally produced showing areas of land within which a development is theoretically visible".

The ZTV analysis has been undertaken using Arc Spatial Analyst GIS. The assessment is based on terrain data that has been derived from satellite imagery. This data was originally prepared by NASA and is freely available on the CIAT-CCAFS website (http://www.cgiar-csi.org).

No site layout has been provided. Therefore, for the sake of the ZTV analysis it has been assumed that any of the elements of the proposed development might occur anywhere within the subject properties.

Rough alignments have been provided for the required 400kV overhead power lines. The ZTV analysis for these elements has therefore been undertaken based on locations provided.

5.2 ASSESSMENT LIMIT

The GIS based assessment of ZTV's does not take the curvature of the earth or reduction in scale due to distance into account. In order to provide an indication of the likely limit of visibility due to this effect a universally accepted navigational calculation (**Appendix III**) has been used to calculate the likely distance that the proposed structures might be visible over.

This indicates that in a flat landscape the proposed structures may be visible for the following distance;

ELEMENT	APPROXIMATE LIMIT OF VISIBILITY
Extremely tall elements including the stacks up to 220m high	53 kilometres
Moderately tall elements including the generating units up to 80m high.	32 kilometres
Low elements including overhead power lines and the PFA dump up to 50m high	25 kilometres

It is noted that the landscape within these distances from the proposed development is relatively flat and so this approximate limit of visibility is considered appropriate.

In reality visibility could be reduced by;

- Weather conditions that limit visibility. This would include hazy conditions during fine weather as well as mist and rain.
- Scale and colour of individual elements making it difficult to differentiate structures from background.
- Landform.

It should be noted that ZTV analysis the very low elements within the proposed development as noted in Section 2 has not been undertaken. This is because the site visit indicated that the very low elements associated with existing similar development were not visible past the site boundary due to surrounding vegetation.

5.2.1 Likely Visibility of the proposed elements

Maps 5 to 17 inclusive indicate the likely ZTVs of the various elements identified above.

a) **The ZTV of extremely tall elements (stacks) associated with both Power Station Alternatives** is nearly identical. These elements could be visible from the site to the limit of visibility to the north east and west. To the west and north-west from approximately 30km from the site these views are likely to be at least partially broken by landform. To the south, southeast and south west views of these extremely tall elements are likely to be largely screened by landform; however, occasional views of stacks are likely to be possible from hill tops and through valley lines. These views are likely to be at least partially screened however. These extremely tall elements could be visible from extended sections of the R512, the R510, the R518, Marapong, Onverwacht, Lephalale and the D'nyala Nature Reserve.

b) **The visibility of moderately tall elements (generating units) associated with both Power Station Alternatives** is nearly identical. Both alternatives could be visible to the limit of visibility to the north, east and west. There is likely to be a view shadow that is created by the minor ridgeline to the north of both developments. To the south visibility will be limited by the Waterburg. The ZTV analysis does indicate that there is small chance of the power station being visible to the R510 as it approaches the Stockpoort Border Crossing.

c) **The visibility of PFA dump alternatives** is likely to vary considerably;
   - The Graafwater Alternative, being located at a relatively high elevation, could also be visible to the south, east and west.
   - The Appelvlakte Alternatives which are set at a relatively low level within the minor valley appears likely to result in the lowest visibility. This alternative is likely to be visible to the east to the limit of visibility.

d) **The visibility of the Overhead Power Line** is likely to be very similar. The ZTV analysis indicates it as beingvisible to the limit of visibility (25km) from the east and west, relatively screened from the north and visible intermittently from the south. .

The ZTV analysis undertaken indicated on Maps 5 to 10 inclusive and described in Section 5.2.1 above indicates that the proposed Tshivasho Power Station could be visible to an extensive area. However, observations made during the site visit show that the Visual Absorption Capacity (VAC) of the surrounding landscape will play a major role in mitigating possible impacts. The surrounding natural vegetation will generally limit significant impacts to a distance of 2 – 4km from the development edge. This means that visibility of the proposed development will generally be limited to immediately surrounding areas and will not be as extensive as the ZTV analysis indicates.

The modifying effect of the VAC of the landscape is described below and illustrated in Plates 10 to 16 inclusive.

5.3 IMPLICATIONS FOR LANDSCAPE CHARACTER AREAS

5.3.1 Views from the Urban LCA

From the majority of this LCA, the proposed development is unlikely to be obvious. **Plate 10** indicates the current view from the north western edge of Marapong **(Viewpoint 1)** which is the closest settlement edge to the proposed power station.

Plate 11 indicates the current view of the Matimba Power Station from the closest edge of settlement within Lephalale **(Viewpoint 2).**

From both these viewpoints it is obvious that existing natural vegetation will provide significant screening of the proposed power station.

This indicates that the surrounding natural vegetation provides significant screening and because of this only views of the higher sections of the development may be visible from the urban edges. From within the settlement areas buildings, street and garden vegetation are all likely to combine to screen views of the development.

5.3.2 Views from the Lowland LCA

From within the Lowland LCA the proposed development is likely to be screened from most areas. The exceptions to this will be:

a) In areas within 2 – 4 km of the proposed development where views through trees may be possible of upper sections of the power plants, stockpiles and the ashing facility and views of the stacks are likely to be obvious. Outside this limit, views of the development are likely to be difficult to see;
b) In areas where large-scale clearing has occurred for development or agriculture, where long range views of the development are likely to be possible. From observations of the existing Matimba power station, where these long range views are possible, it is likely to be the generator units and stacks that are obvious ; and
c) In areas where minor ridgelines afford slightly elevated views over the surrounding tree canopy. These are generally long range views and because of the relatively low nature of the ridgelines, only the upper sections of the stacks are likely to be obvious.

From observations made during the site visit, the last two exceptions are likely to occur in areas in excess of 15km from the proposed power station site such as at the intersection between the R33 and R510 to the south of Lephalale and at two short sections of the R510 to the north of Lephalale. These exceptions are both long range views, however, the bulk of the Matimba power station is visible indicating a likelihood that the proposed power station will be visible to the same extent.

There is also one short section of the R510 immediately south of the junction with the R572 from which the very top of the Matimba stacks are visible which indicates that the tops of the proposed power station stacks are also likely to be visible.

Other than the noted exceptions, as the viewer travels northwards along both the Stockpoort Road, the R510 and the R572 views of Matimba are screened by dense vegetation. Views of the proposed power station will therefore be screened.

Plates 12 indicates views looking towards the proposed power station from **View Point 4** which is located on the Stockpoort Road on the boundary of the site. The

proposed power station is likely to be located within 2km of this viewpoint. Even from this relatively close viewpoint, because of the density and height of surrounding vegetation, the proposed lower sections of the development are unlikely to be visible. The upper sections of the generator units and stacks will be visible. It should be noted that the Grootegeluk Mine dump which is estimated at 10m in height, is visible from this viewpoint to the south of the road close to the proposed power station **(Plate 13).** Approximately 7-8km of this road is likely to be impacted.

Plate 14 indicates the view looking towards the proposed power station site from the Stockpoort Road at a distance of approximately 10km. The proposed structures are unlikely to be visible from this viewpoint. If any structures are visible they are likely to be comprised of the tops of the stacks which even if visible are unlikely to be obvious through the vegetation.

Plate 15 indicates a view from the R510 to the north of Lephalale looking across a cleared agricultural area. The bulk of the Matimba power station is clearly visible from this viewpoint at an approximate distance of 15km. The proposed power station will also be visible to right of picture, however it will be approximately 21km from the viewpoint and so the relative impact is likely to be smaller.

5.3.3 Views from the Upland LCA

The proposed Power Station could be visible to an extensive area of the Upland LCA. However the majority of the north facing slope of the Waterberg that overlooks the proposed power station sites is densely vegetated. This means that views of the proposed power station are only likely to be visible in areas where roads, tracks and clearings allow views beyond the immediate area. These views are also likely to be long range views in excess of 20km.

Plate 16 indicates the closest view overlooking the alternative power station sites that is possible from public roads crossing the Waterberg ridgeline. From this viewpoint the Matimba power station is obvious at an approximate distance of 22km. The proposed Power Station will also be seen in this view at an approximate distance of 31km from the viewpoint. Whilst it will be visible, it will be less obvious than Matimba due to the additional distance.

5.3.4 Views from the Riverine LCA

The site visit indicated that due to distance (minimum 16km) the slightly depressed nature of river channels and the extent of vegetation along the water courses, the proposed power station alternatives are highly unlikely to be visible from this LCA.

5.4 REAL VISUAL LIMITS

The above assessment shows that die to the high VAC of the surrounding landscape, the ZTV analysis which is based purely on landform is largely irrelevant for the Lowland LCA and the Urban LCA. Within the majority of these areas in most areas dense vegetation limits views of the development to immediately surrounding areas. The exception to this is in areas where large scale clearing has occurred which has opened up long distance views of the proposed development.

The on site assessment with particular reference to existing views of the Matimba Power Station indicates that the following limits reflect the real situation;

ELEMENT	REAL LIMIT OF VISIBILITY DUE TO VAC
Extremely tall elements including the stacks up to 220m high	4 kilometres
Moderately tall elements including the generating units up to 80m high.	3 kilometres
Low elements including overhead power lines and the PFA dump up to 50m high	2 kilometres
Overhead power lines	1 kilometres

These limits are indicated on maps 5 to 10 inclusive which indicate the ZTV analysis for each item.

The onsite assessment also indicated that views of the development from the Riverine LCA are highly unlikely to be possible.

Views from the Upland LCA however will be possible from the areas indicated on the ZTV analysis. This is due to as fact that these views are from elevated areas that overlook the proposed development area.

Plate 10, View from Viewpoint 1 located on the north west corner of Marapong looking towards the proposed Power Station . This viewpoint is approximately 3.6km from the Appelvlakte Ashing alternative and 10.4km from Power Station 1 / Graaffwater Ashing Alternative. From this location the upper section of the Appelvlakte Ashing alternative may be visible as well as the upper sections of the stacks of the power station, although these are not likely to be obvious.
The largest impact is likely to result from the Appelvlakte Ashing alternative. The inset image indicates the Grootegluk Mine Dump from a similar distance. The Appelvlakte Ashing alternative is likely to have a similar impact being visible just below / above the tree line.

Plate 11, View from Viewpoint 2 located on the western edge of Lephalale looking towards Matimba and the proposed Power Station. The stacks of Matimba Power Station are just visible (circled). It is likely that the proposed power station will be visible to a similar or smaller extent as Matimba. It is highly unlikely that lower structures or the ash dump will be visible.

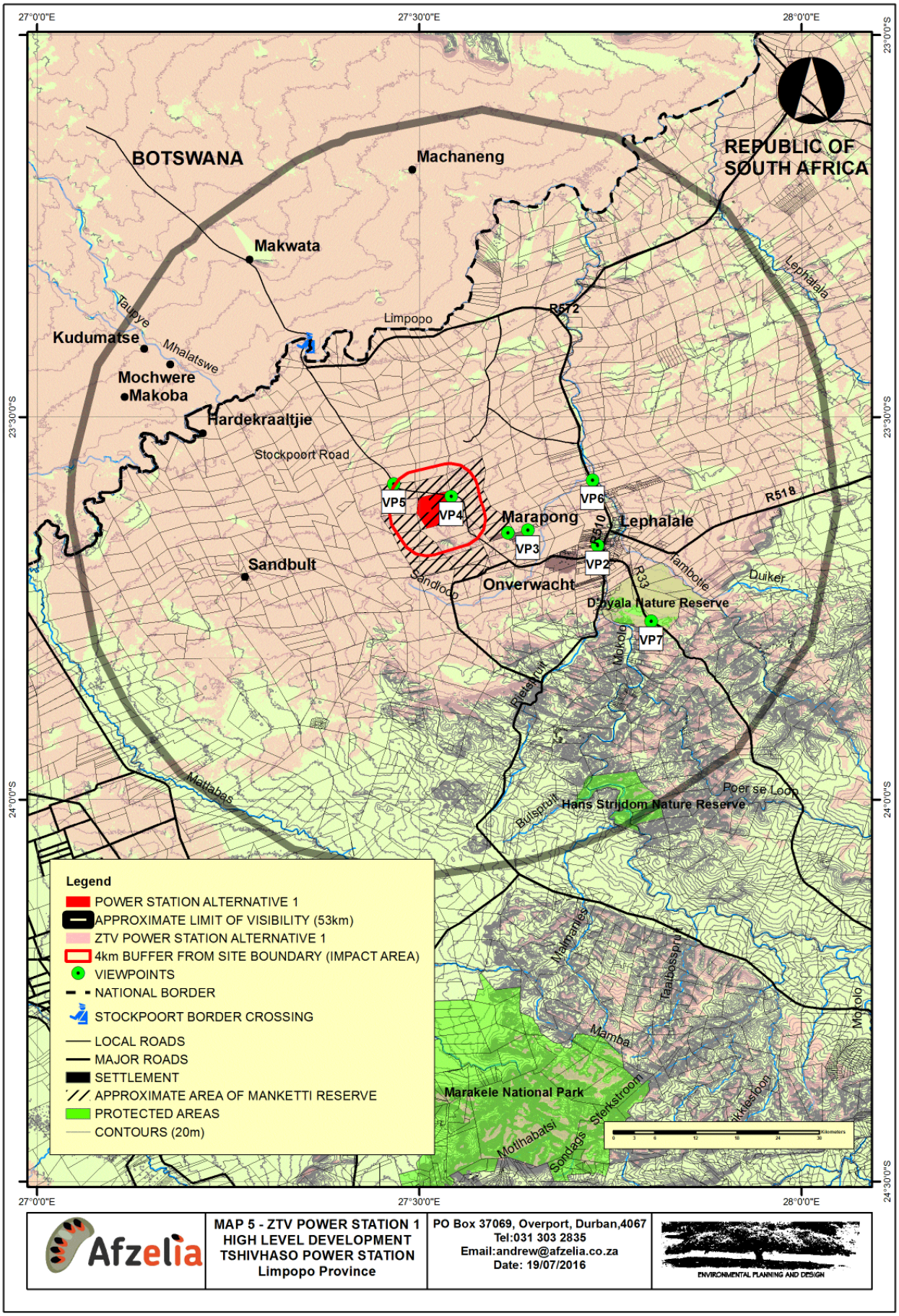
Plate 12, View from View Point 4 located on the Stockpoort Road looking at the proposed Power Station from a distance of approximately 2.5km. From this location, the taller structures including the upper sections of the stacks and generator units of the power station are likely to be visible as insert left. The upper section of the Graaffwater ashing alternative is also likely to be visible between taller trees as indicated on the insert on the right.

Plate 13, View from View Point 4 located on the Stockpoort Road looking at the Grootegeluk mine dump to the south of the road from a distance of approximately 2.5km. From this location, the dump is just visible between the taller trees.

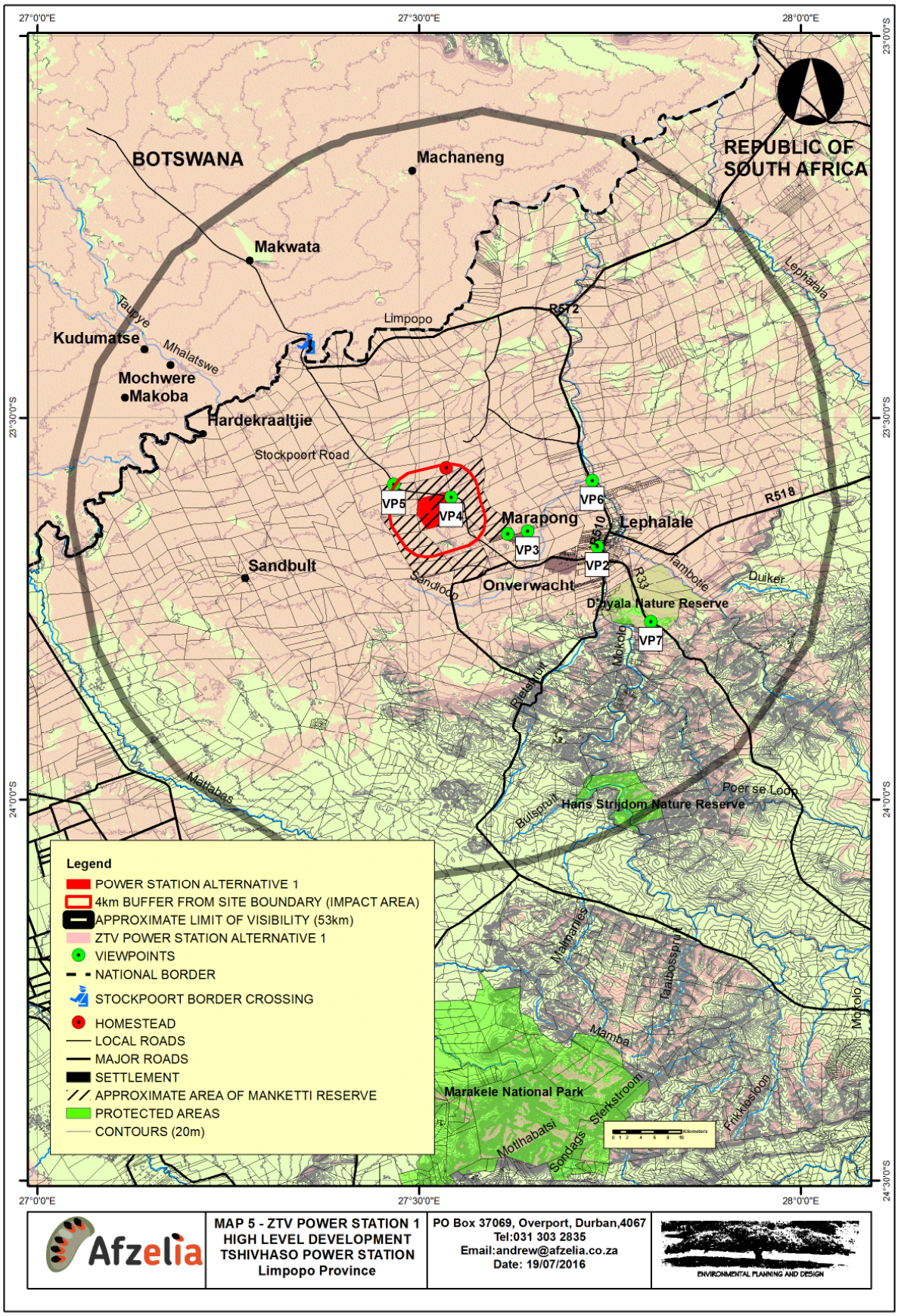
Plate 14, View from View Point 5 located on the Stockpoort Road looking at the proposed Power Station from a distance of approximately 10.0km. From this location the proposed Power Station and the Ashing Alternatives are highly unlikely to be visible.

Plate 15, View from View Point 6 located on the R510 north of Lephalale looking at the Matimba Power Station (circled) which is approximately 15km from the viewpoint. The proposed Power station is approximately 21km from the viewpoint. It will be located on the horizon to the right of the picture. The proposed ashing alternatives are highly unlikely to be visible from this viewpoint.

Plate 16, View from View Point 7 located on the R33 looking at the Matimba Power Station (circled) which is approximately 22km from the viewpoint. The proposed Power station is approximately 31km from the viewpoint. It will be visible above the ridgeline to the left of picture. Due to the additional distance, it is will not be as prominent as Matimba. The proposed ashing alternatives are highly unlikely to be obvious from this viewpoint.



Afzelia	MAP 5 - ZTV POWER STATION 1 HIGH LEVEL DEVELOPMENT TSHIVHASO POWER STATION Limpopo Province	PO Box 37069, Overport, Durban,4067 Tel:031 303 2835 Email:andrew@afzelia.co.za Date: 19/07/2016	ENVIRONMENTAL PLANNING AND DESIGN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24°30'0"S
BOTSWANA
REPUBLIC OF SOUTH AFRICA
Machaneng
Makwata
Kudumatse
Mochwere
Makoba
Hardekraaltjie
Stockpoort Road
Limpopo
Taupye
Mhalatswe
Lephalala
R572
VP1
VP2
VP3
VP4
VP5
VP6
VP7
Marapong
Lephalale
R518
R33
Sandsloot
Sandbult
Onverwacht
Tambotie
Duiker
D'nyala Nature Reserve
Mokolo
Matlabas
Poer se Loop
Hans Strijdom Nature Reserve
Bultspruit
Marakele National Park
Motlhabatsi
Sondags
Sterkstroom
Mamba
Taaibosspruit
Legend
POWER STATION ALTERNATIVE 1
4km BUFFER FROM SITE BOUNDARY (IMPACT AREA)
APPROXIMATE LIMIT OF VISIBILITY (53km)
ZTV POWER STATION ALTERNATIVE 1
VIEWPOINTS
NATIONAL BORDER
STOCKPOORT BORDER CROSSING
HOMESTEAD
LOCAL ROADS
MAJOR ROADS
SETTLEMENT
APPROXIMATE AREA OF MANKETTI RESERVE
PROTECTED AREAS
CONTOURS (20m)
Afzelia
MAP 5 - ZTV POWER STATION 1
HIGH LEVEL DEVELOPMENT
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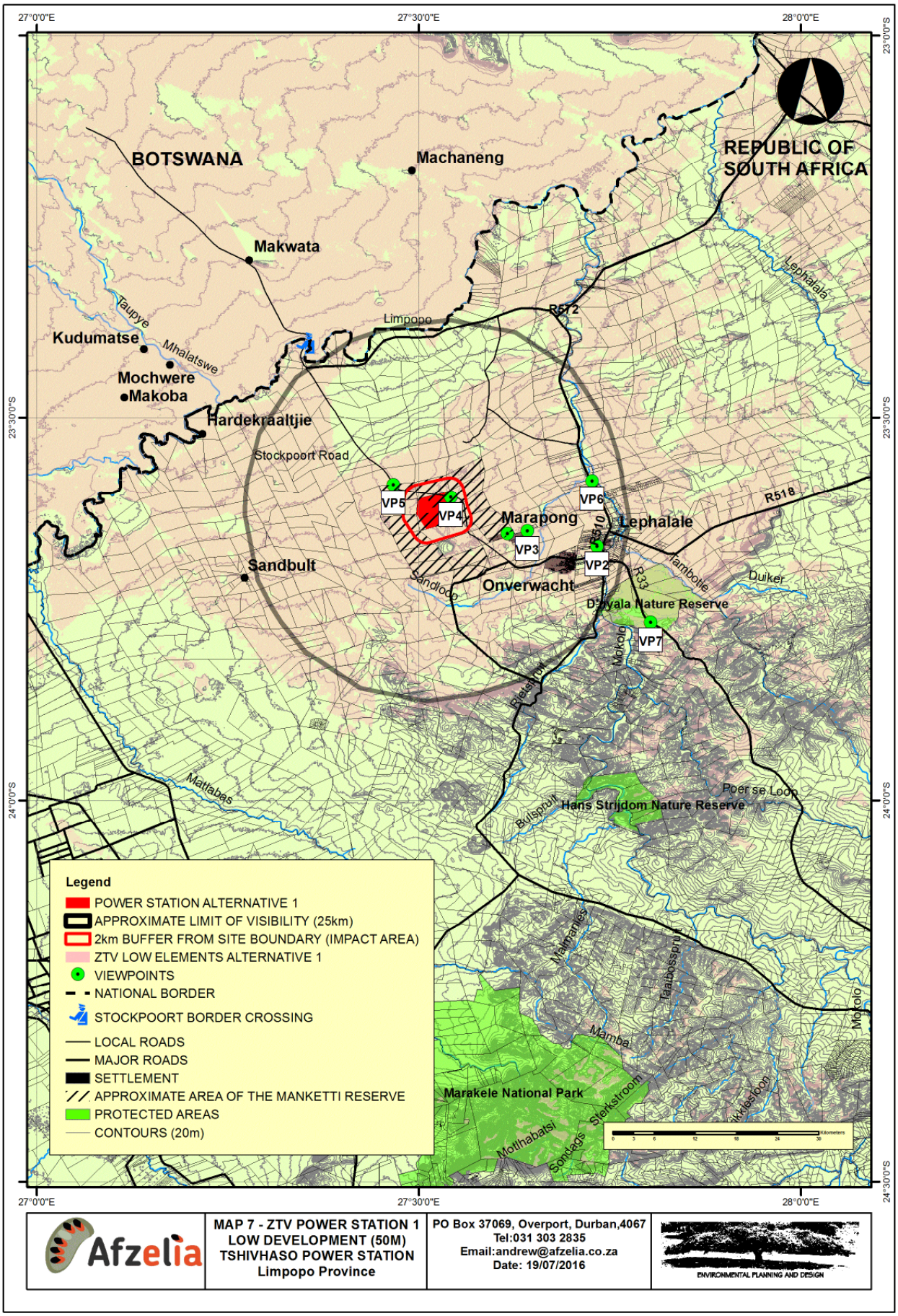
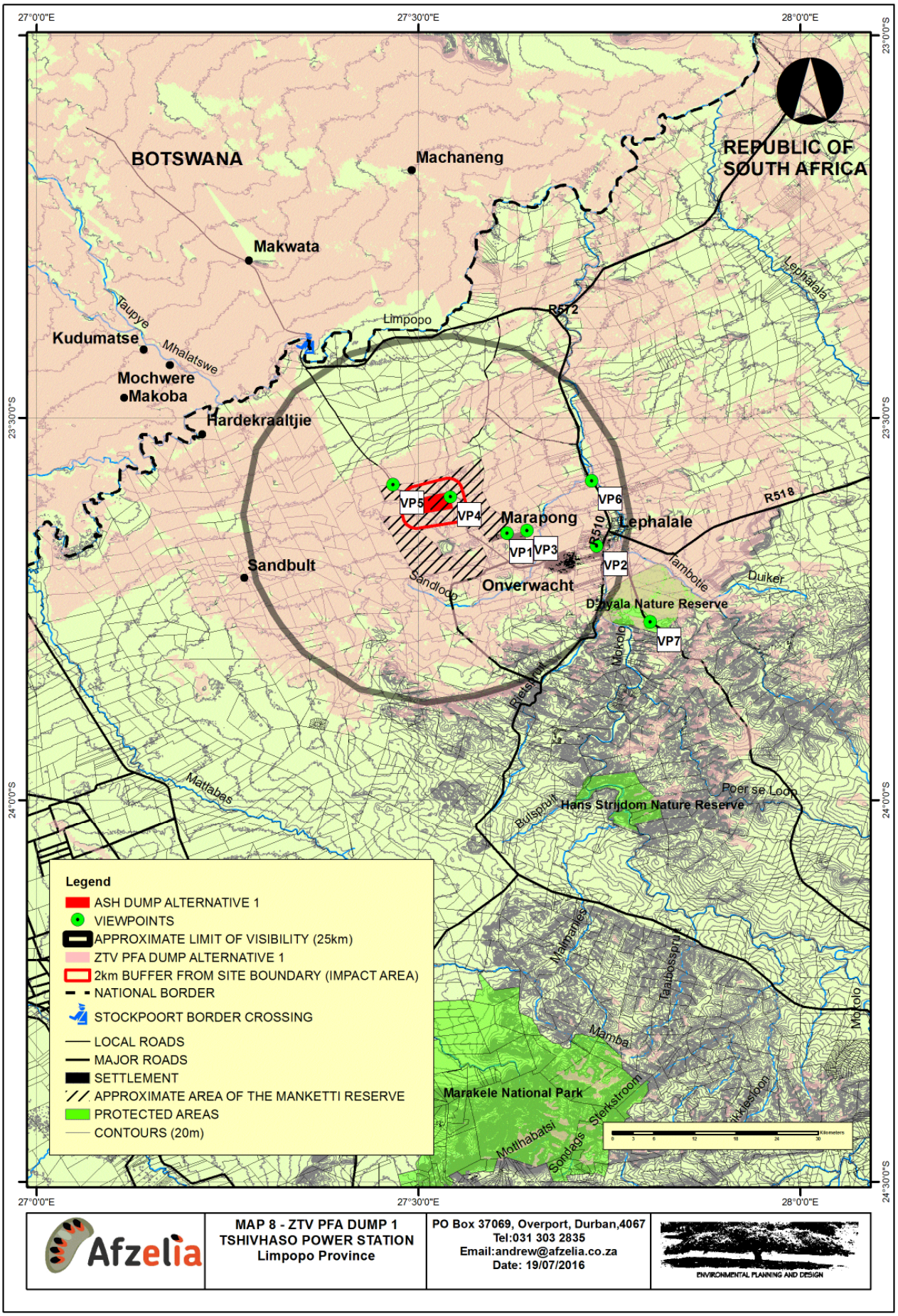
Date: 19/07/2016
ENVIRONMENTAL PLANNING AND DESIGN



Afzelia	MAP 7 - ZTV POWER STATION 1 LOW DEVELOPMENT (50M) TSHIVHASO POWER STATION Limpopo Province	PO Box 37069, Overport, Durban,4067 Tel:031 303 2835 Email:andrew@afzelia.co.za Date: 19/07/2016	ENVIRONMENTAL PLANNING AND DESIGN



Afzelia

MAP 8 - ZTV PFA DUMP 1
TSHIVHASO POWER STATION
Limpopo Province

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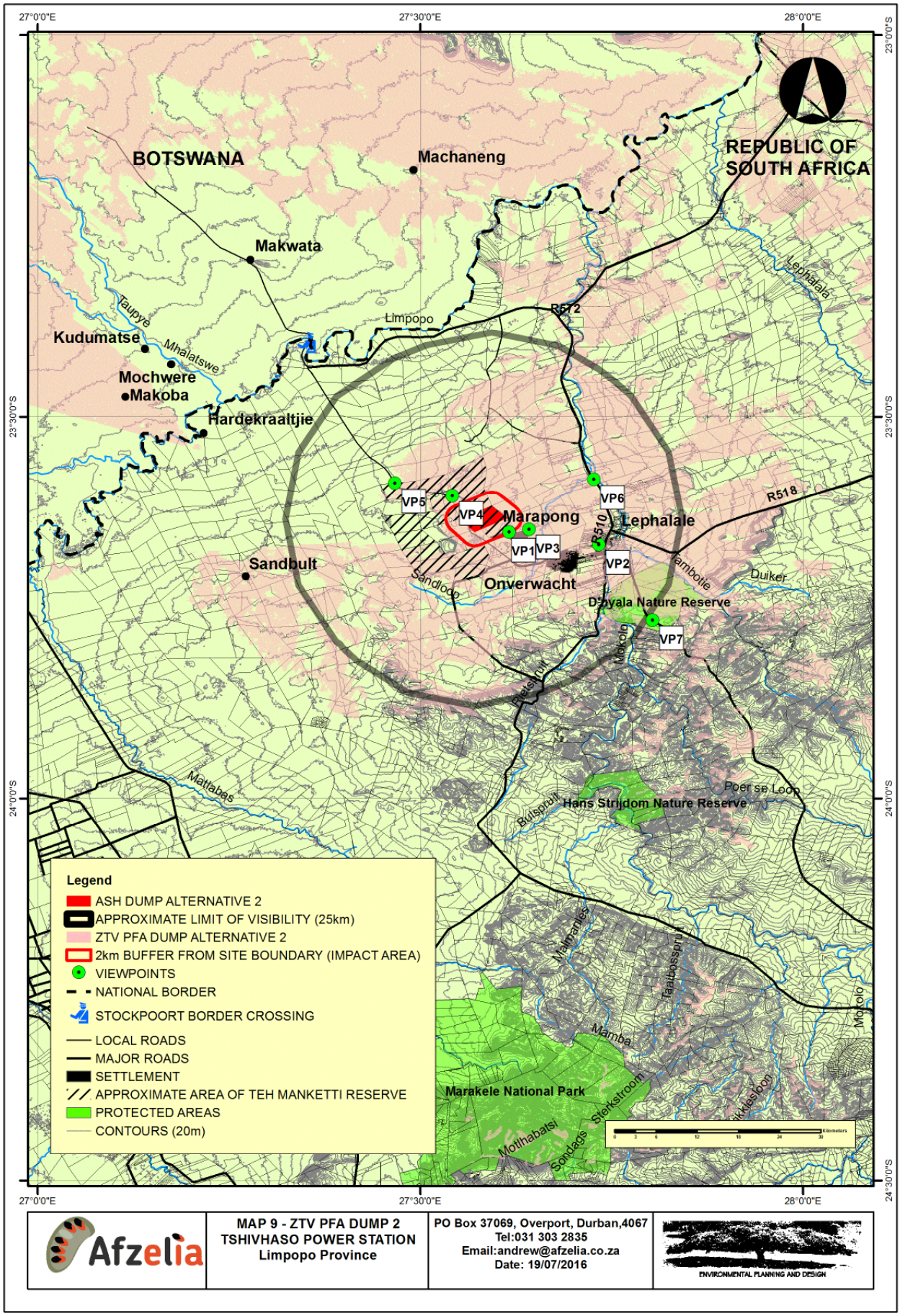
Date: 19/07/2016

ENVIRONMENTAL PLANNING AND DESIGN



Afzelia

MAP 9 - ZTV PFA DUMP 2
TSHIVHASO POWER STATION
Limpopo Province

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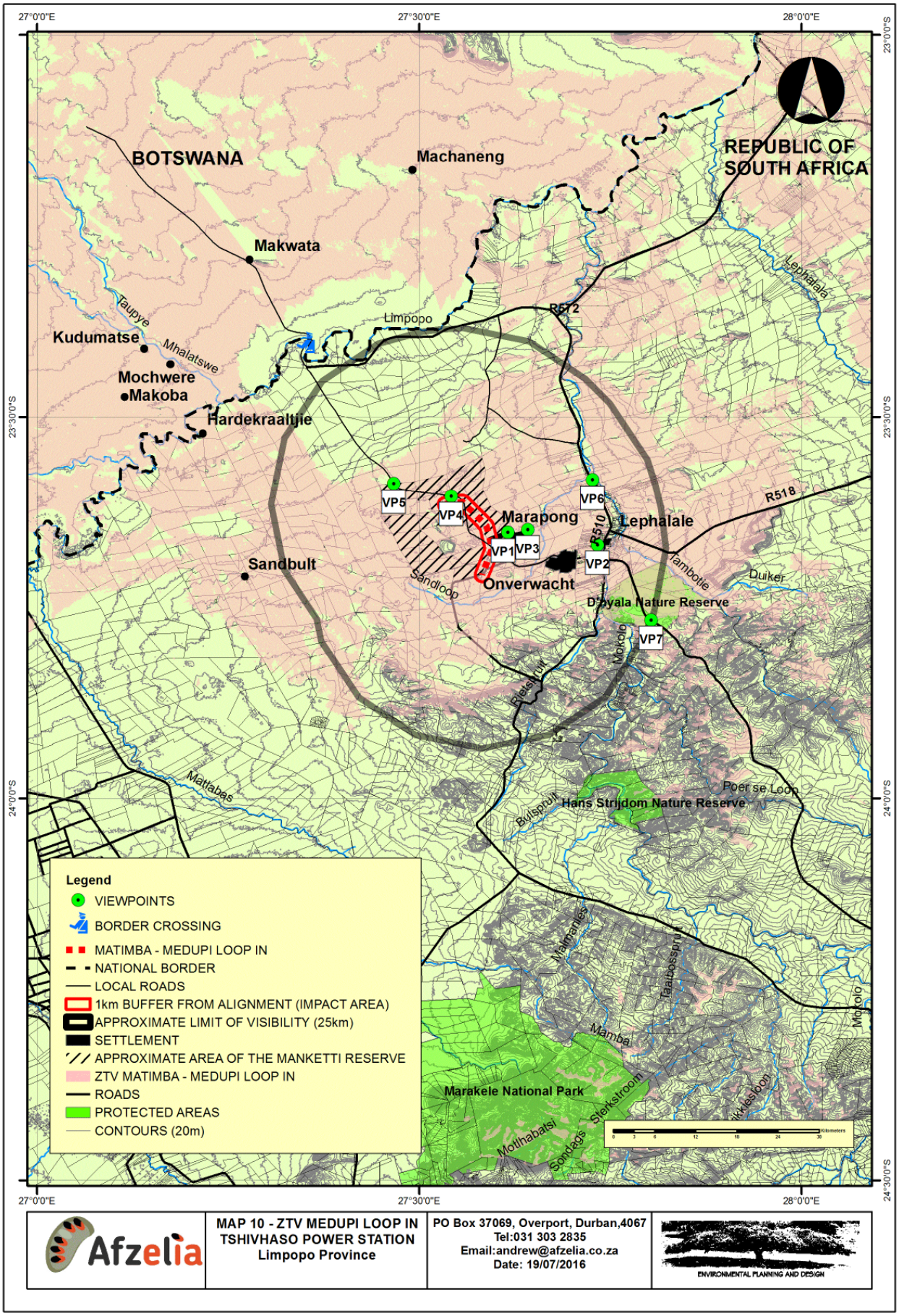
Date: 19/07/2016

ENVIRONMENTAL PLANNING AND DESIGN


27°0'0"E
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28°0'0"E
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BOTSWANA
Machaneng
REPUBLIC OF SOUTH AFRICA
Makwata
Kudumatse
Mochwere
Makoba
Hardekraaltjie
Taupye
Mhalatswe
Limpopo
R572
Lephalala
VP1
VP2
VP3
VP4
VP5
VP6
VP7
Marapong
Lephalale
R518
R511
Sandbult
Onverwacht
Sandloop
Tambotie
Duiker
D'nyala Nature Reserve
Mokolo
Matlabas
Buisspruit
Hans Strijdom Nature Reserve
Poer se Loop
Marakele National Park
Motlhabatsi
Sondags
Sterkstroom
Mamba
Legend
VIEWPOINTS
BORDER CROSSING
MATIMBA - MEDUPI LOOP IN
NATIONAL BORDER
LOCAL ROADS
1km BUFFER FROM ALIGNMENT (IMPACT AREA)
APPROXIMATE LIMIT OF VISIBILITY (25km)
SETTLEMENT
APPROXIMATE AREA OF THE MANKETTI RESERVE
ZTV MATIMBA - MEDUPI LOOP IN
ROADS
PROTECTED AREAS
CONTOURS (20m)
Afzelia
MAP 10 - ZTV MEDUPI LOOP IN TSHIVHASO POWER STATION Limpopo Province
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Email:andrew@afzelia.co.za
Date: 19/07/2016
ENVIRONMENTAL PLANNING AND DESIGN

6 VISUAL IMPACT ASSESSMENT

6.1 ASSESSMENT METHODOLOGY

The previous section of the report identified specific areas where visual impacts may occur. This section will quantify these impacts in their respective geographical locations and in terms of the identified issues (see Section 1.5).

The methodology for the assessment of potential visual impacts includes:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional:
    - local extending only as far as the development site area – assigned a score of 1;
    - limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
    - will have an impact on the region – assigned a score of 3;
    - will have an impact on a national scale – assigned a score of 4; or
    - will have an impact across international borders – assigned a score of 5.
- The **duration**, wherein it will be indicated whether:
    - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5.
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
    - 0 is small and will have no effect on the environment;
    - 2 is minor and will not result in an impact on processes;
    - 4 is low and will cause a slight impact on processes;
    - 6 is moderate and will result in processes continuing but in a modified way;
    - 8 is high (processes are altered to the extent that they temporarily cease); and
    - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale, and a score assigned:
    - Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
    - Assigned a score of 2 is improbable (some possibility, but low likelihood);
    - Assigned a score of 3 is probable (distinct possibility);
    - Assigned a score of 4 is highly probable (most likely); and
    - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).
- The **significance**, which shall be determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
- The **status**, which will be described as either positive, negative or neutral.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.
- The *degree* to which the impact can be *mitigated.*

- The **significance** is determined by combining the criteria in the following formula:
    - S=(E+D+M)P; where S = Significance weighting, E = Extent, D = Duration, M = Magnitude, P = Probability

The **significance weightings** for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

6.2 ASSESSMENT

The following assessment focuses on the issues identified during the scoping process which include:

a) The proposed development could negatively impact on the character of the Lowland LCA which is largely a natural landscape which is an important tourism resource.
b) The proposed development could impact negatively on the Upland LCA which is a relatively natural landscape that is likely to be important as a tourism resource.
c) The proposed development could have a negative impact on adjacent urban areas.
d) The proposed development could be visible from important tourist routes in the area. These include the R518, the R517, the R512 and the R510 which are relatively major routes. It is likely that a number of minor, un-surfaced routes will also be important from a tourism perspective and will need to be considered in the assessment.
e) The proposed development could impact negatively on the Riverine LCA which is likely to be important for tourism and recreational uses.
f) The proposed development could impact negatively on nature reserves. In reality and as indicated on by the ZTV analysis it is only the D'nyala Nature Reserve and the Manketti Reserves that are likely to be impacted.

These issues will be considered in the context of the Landscape Character Areas, visual effects identified and possible cumulative influence of other possible infrastructure projects that are planned in the vicinity.

It should be noted that due to the VAC of the surrounding landscape that is provided by the gently undulating landform and dense vegetation, the ZTV analysis is really only an indicator of where views of the development may be possible from where either where roads or clearing of vegetation for agricultural purposes provide open vistas. Such areas are minimal in extent and for the most part the effects noted in plates **10 to 19** inclusive provide an understanding of likely views of the proposed development.

Possible mitigation measures will also be identified.

6.2.1 Industrialisation of the Lowland Landscape Character Area.

Nature of impact:

This impact relates to further industrialisation of the relatively natural landscape surrounding the Industrial LCA. This will occur if views of the proposed power station and associated infrastructure become visible and obvious from areas that currently are not impacted by views of industry. The area surrounding the Industrial LCA is used extensively for eco-tourism activities. Additional industrialisation of this landscape is likely to negatively impact on these activities.

The assessment indicates that due to the extent and height of surrounding vegetation, the proposed development including power station, ashing facility and overhead power line is likely to affect a relatively small area surrounding the development area. The lower elements including ashing facility, lower structures and overhead power line are only likely to have an impact on the natural landscape for approximately 2km. Beyond this distance the upper structures including the upper sections of the generator units and upper sections of the stacks are likely to be visible to the same extent as the existing Matimba facility. This is generally limited to a slightly greater distance of approximately 3-4km than the lower structures with the exception of areas where natural vegetation has been cleared.

The character of the rural landscape adjacent to the proposed development will be modified. It is possible that subject to planning and detailed design, it may be possible to minimise impact. It is likely that ashing facility 2 being located to the east of the industrial area would extend the impact to a greater degree than ashing facility 1 which is located on the same site as the proposed power station.

	Without mitigation	**With mitigation**
Extent	**Power Station Alternative 1** Regional **(3)** **Ashing Facility Alternative 1 (Graaffwater)** Site and immediate surroundings **(2)** **Ashing Facility Alternative 2 (Applevlakte)** Site and immediate surroundings **(2)** **Overhead Power Line (Medupi)** Site and immediate surroundings **(2)**	Regional, **(3)** Local **(1)** Local **(1)** Site and immediate surroundings **(2)**
Duration	**Power Station Alternative 1** Long term **(4)** **Ashing Facility Alternative 1 (Graaffwater)** Long term **(4)** **Ashing Facility Alternative 2 (Applevlakte)** Long term **(4)** **Overhead Power Line (Medupi)** Long term **(4)**	Long term **(4)** Long term **(4)** Long term **(4)** Long term **(4)**
Magnitude	**Power Station Alternative 1** Minor **(2)**	Minor **(2)**

	Power Station Alternative 2 Low **(4)** **Ashing Facility Alternative 1 (Graaffwater)** Minor **(2)** **Ashing Facility Alternative 2 (Applevlakte)** Low **(4)** **Overhead Power Line Alternative 1 (WitKop)** Low **(4)** **Overhead Power Line (Medupi)** Minor **(2)**	Low **(4)** Minor **(2)** Low **(4)** Low **(4)** Minor **(2)**
Probability	**All Alternatives** Highly probable **(4)**	Highly probable **(4)**
Significance	**Power Station Alternative 1** Medium **(36)** **Ashing Facility Alternative 1 (Graaffwater)** Medium **(32)** **Ashing Facility Alternative 2 (Applevlakte)** Medium **(40)** **Overhead Power Line (Medupi)** Minor **(32)**	Medium **(36)** Low **(28)** Medium **(36)** Minor **(32)**
Status	For those people that are attracted to the area for its natural attributes and those travelling through the area for recreational and tourism reasons, it is likely that development of natural areas will be seen as a **negative impact**.	**Negative**
Irreplaceable loss	The proposed development will industrialise a small area of existing natural landscape. **There will therefore be a small area of irreplaceable loss.** The broader impacts associated with the higher elements such as the upper sections of the stacks and generator units are however unlikely to cause irreplaceable loss as these elements will impact areas that are currently impacted by existing power stations.	**Small area of irreplaceable loss.**
Can impacts be mitigated?	**Yes** to a small degree	

Mitigation / Management:

Planning:

- Plan to maintain the height of structures as low as possible;
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Construction:

- Minimise disturbance and loss of vegetation;

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions (monthly until establishment , thereafter at the middle and end of every growing season);
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- Colouring of taller structures should be such that they are not made prominent and preferably visually recede;
- Dust control at ashing facility must be implemented and maintained.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all possible areas to their original state;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative Impacts:

Development of the Graaffwater (Alternative 1) with ashing facility on the same site would ensure that the development was as compact as possible and largely impacts on areas that are currently impacted by heavy industry.

Development of the Graaffwater (Alternative 1) with Appelvlakte ashing facility would extend impacts slightly to the east of areas that are currently impacted by heavy industry and is therefore likely to have slightly higher cumulative impacts.

The power line will largely follow existing servitudes. Where this is not the case, dense vegetation will hide it from all but the closest views. It is therefore unlikely to significantly add to additional industrialisation.

Residual Risks:

The residual risk relates to loss of natural landscape being obvious on decommissioning of the proposed project. In order to minimise this impact, it is critical that existing natural landscape areas in and around the development are maintained and protected and that effective rehabilitation is undertaken during and after construction as well as on closure of the plant.

6.2.2 Industrialisation of Views from the Upland LCA

Nature of impact:

This impact relates to industrialisation of views from the north facing ridge of the Waterberg overlooking the existing industrial development area as well as the proposed development sites. Where views over the lowland are possible, the major structures associated with the existing power stations are highly obvious.

Without mitigation, due to their scale, it is possible that ashing facilities may also be obvious from this area. It is also possible that dust blow from the facilities could make them more obvious from a distance.

The overhead power line is highly unlikely to be obvious from this distance and so is not included in the assessment.

The impacts noted above could have negative implications for ecotourism activities in areas close to the development.

Views from this area are largely screened by dense natural vegetation. There are however a number of areas where roads and clearings open up long views over the landscape towards the Limpopo River.

The view from these areas already includes two major power station complexes as well as disturbance caused by ancillary infrastructure. The concern is that further industrialisation will significantly increase the extent of industrial development within the view.

The assessment has indicated that due to the distances involved, small scale development around the power stations tends to blend into the background whereas larger scale development including the generator units and stacks tends to stand out and is relatively obvious.

The proposed power station is slightly further from the Waterberg than existing power station sites. The proposed structures are also slightly smaller than the existing power stations. It is therefore likely that they will be slightly less obvious.

the proposed power station will be seen within the context of the existing Power Stations.

	Without mitigation	**With mitigation**
Extent	**Power Station Alternative 1** Regional **(3)** **Ashing Facility Alternative 1 (Graaffwater)** Regional **(3)** **Ashing Facility Alternative 2 (Applevlakte)** Regional **(3)**	Regional, **(3)** Regional, **(3)** Regional, **(3)**
Duration	**Power Station Alternative 1** Long term **(4)** **Ashing Facility Alternative 1 (Graaffwater)**	Long term **(4)**

	Long term **(4)** **Ashing Facility Alternative 2 (Applevlakte)** Long term **(4)**	Long term **(4)** Long term **(4)**
Magnitude	**Power Station Alternative 1** Minor **(2)** **Ashing Facility Alternative 1 (Graaffwater)** Minor **(2)** **Ashing Facility Alternative 2 (Applevlakte)** Minor **(2)**	Minor **(2)** Small **(0)** Small **(0)**
Probability	**All Alternatives** Highly probable **(4)**	Highly probable **(4)**
Significance	**Power Station Alternative 1** Medium **(36)** **Ashing Facility Alternative 1 (Graaffwater)** Medium **(36)** **Ashing Facility Alternative 2 (Applevlakte)** Medium **(40)**	Medium **(36)** Low **(28)** Low **(28)**
Status	For those people that are attracted to the area for its natural attributes and those travelling through the area for recreational and tourism reasons, it is likely that development of natural areas will be seen as a **negative impact**.	**Negative**
Irreplaceable loss	The relatively small additional section of the view that will be industrialised will constitute **a small area of irreplaceable loss.**	**Small area of irreplaceable loss.**
Can impacts be mitigated?	**Yes** to a small degree	

Mitigation / Management:

Planning:

- Plan to maintain the height of structures as low as possible;
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Construction

- Minimise disturbance and loss of vegetation.

Operations:

- Reinstate any areas of vegetation that have been disturbed during

construction and on the ashing facility as work proceeds;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions (monthly until establishment , thereafter at the middle and end of every growing season);
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- control dust on the ashing facility
- Colouring of taller structures should be such that they are not made prominent and preferably visually recede.

Decommissioning:
- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all possible areas to their original relatively natural state;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative Impacts:

Further industrialisation of views from the north facing ridge of the Waterberg overlooking the existing industrial development area as well as the proposed development sites. Where views over the lowland are possible, the major structures associated with the existing power stations are currently highly obvious.

The proposed development will add slightly to this extent. However the Graaffwater (Alternative 1) with ashing facility on the same site is likely to be more compact with all elements including the ashing facility in close proximity to existing industry. The Appelvlakte ashing facility will add an additional area of industrial development to the east of the existing industrial area.

The power line is unlikely to be distinguishable from the background at the distances involved.

Residual Risks:

The residual risk relates to loss of natural landscape being obvious on decommissioning of the proposed project. In order to minimise this impact, it is critical that existing natural landscape areas in and around the development are maintained and protected and that effective rehabilitation is undertaken during and after construction as well as on closure of the plant.

6.2.3 Industrialisation of Views from the Urban LCA

Nature of impact:

The onsite analysis indicates that whilst long range views of higher structures associated with existing power stations may be visible from the urban edge, the majority of urban areas are insulated from significant impacts by both distance and the density of relatively natural vegetation that exists in the intervening landscape.

The one exception to the above noted conditions is the western and eastern edges of Marapong. On the western edge, Matimba power station structures overshadow the settlement and on the eastern edge overhead HV power lines dominate the landscape.

Because the distances from urban areas associated with the alternative power

station locations are likely to be greater than those associated with existing power stations, in general terms, impacts associated with these structures is likely to be negligible.

The exception to this again however is Marapong where the Appelvlakte ashing facility could be located at a distance of approximately 3km from the northern edge of the settlement. In terms of views, existing vegetation is likely to help screen the ashing facility; however, dust could exacerbate the impact.

The retention of existing vegetation will be critical in maintaining general low levels of impact and will be particularly important for helping to minimise views and dust associated with the Appelvlakte ashing facility.

	Without mitigation	**With mitigation**
Extent	**Power Station Alternative 1** Regional **(3)** **Ashing Facility Alternative 1 (Graaffwater)** Site and immediate surroundings **(2)** **Ashing Facility Alternative 2 (Applevlakte)** Site and immediate surroundings **(2)** **Overhead Power Line Alternative 2 (Medupi)** Site and immediate surroundings **(2)**	Regional, **(3)** Local **(1)** Local **(1)** Site and immediate surroundings **(2)**
Duration	**Power Station Alternative 1** Long term **(4)** **Ashing Facility Alternative 1 (Graaffwater)** Long term **(4)** **Ashing Facility Alternative 2 (Applevlakte)** Long term **(4)** **Overhead Power Line Alternative 2 (Medupi)** Long term **(4)**	Long term **(4)** Long term **(4)** Long term **(4)** Long term **(4)**
Magnitude	**Power Station Alternative 1** Minor **(2)** **Power Station Alternative 2** Minor **(2)** **Ashing Facility Alternative 1 (Graaffwater)** Small **(0)** **Ashing Facility Alternative 2 (Applevlakte)** Low **(4)**	Small **(0)** Small **(0)** Small **(0)** Minor **(2)**

	Overhead Power Line Alternative 2 (Medupi) Small **(0)**	Small **(0)**
Probability	**All Alternatives** Highly probable **(4)**	Highly probable **(4)**
Significance	**Power Station Alternative 1** Medium **(36)** **Ashing Facility Alternative 1 (Graaffwater)** Low **(24)** **Ashing Facility Alternative 2 (Applevlakte)** Medium **(40)** **Overhead Power Line Alternative 2 (Medupi)** Low **(24)**	Low **(28)** Low **(10)** Medium **(40)** Low **(24)**
Status	The community that could experience the highest impacts, (Marapong) is already impacted to a large degree by existing power station and infrastructure development. Long range views of additional development are unlikely to be considered to be negative however impacts that affect the quality of life within the settlement that could result from close development and dust blow from the Applevlakte ashing facility are likely to be seen as **negative**. The occasional long distance view of power station stacks that is likely to result is not likely to be considered to be negative by most residents.	**Negative to Neutral**
Irreplaceable loss	The development of the Applevlakte ashing facility alternative in close proximity to Marapong could further erode the quality of the settlement **This will therefore be an irreplaceable loss.**	**Small area of irreplaceable loss.**
Can impacts be mitigated?	**Yes** to a small degree.	
Mitigation / Management: Planning: • Plan to maintain the height of structures as low as possible; • Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development. Construction:		

- Minimise disturbance and loss of vegetation.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction and on the ashing facility as work proceeds;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions (monthly until establishment , thereafter at the middle and end of every growing season);
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- control dust on the ashing facility
- Colouring of taller structures should be such that they are not made prominent and preferably visually recede.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all possible areas to their original state;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative Impacts:

As the distances associated with the proposed power station will be greater than those associated with existing power stations, in general terms, impacts associated with the proposed power station structures are likely to be negligible.

The exception to this however is Marapong where the Appelvlakte ashing facility could be located at a distance of approximately 3km from the northern edge of the settlement. In terms of views, existing vegetation is likely to help screen the ashing facility, however, dust could exacerbate the impact.

With the exception of the impact of the added impact of the Appelvlakte ashing facility on the northern edge of Marapong, cumulative visual impacts associated with the alternative sites on urban areas are likely to be negligible.

Residual Risks:

The residual risk relates to loss of natural landscape being obvious on decommissioning of the proposed project. In order to minimise this impact, it is critical that existing natural landscape areas in and around the development are maintained and protected and that effective rehabilitation is undertaken during and after construction as well as on closure of the plant.

6.2.4 Industrialisation of Views from Tourists Routes

Nature of impact:

The proposed development could be visible from important tourist routes in the area. These include the R518, the R517, the R512 and the R510 which are relatively major routes. It is likely that a number of minor, un-surfaced routes, will also be important from a tourism perspective have therefore been considered in the assessment

The onsite analysis indicates that whilst long range views of higher structures may be visible from isolated sections, the majority of the major routes are insulated from significant impacts by both distance and the density of relatively natural

vegetation that exists in the intervening landscape.

A short section of the Stockpoort Road that starts within the Industrial LCA and ends close to the Stockpoort Border Post will be affected. This road however is already impacted by industrial development and motorists have to drive through the entire industrial area to use the road. Views over the proposed development will therefore not be a new experience. The proposed development could however extend the experience.

Power Station Alternative 1 including the Graaffwater ashing facility is located to the south of the Stockpoort Road within an area that is already affected by the Grootegeluk Mine (a mine stockpile is visible over a short section of this road).

Views of the proposed overhead power line are also likely to be visible from the affected section of the road.

Views of industry are currently screened from all other unsurfaced roads. The proposed development alternatives will also be screened.

	Without mitigation	**With mitigation**
Extent	**Power Station Alternative 1** Regional **(3)** **Ashing Facility Alternative 1 (Graaffwater)** Site and immediate surroundings **(2)** **Ashing Facility Alternative 2 (Applevlakte)** Site and immediate surroundings **(2)** **Overhead Power Line (Medupi)** Site and immediate surroundings **(2)**	Regional, **(3)** Local **(1)** Local **(1)** Site and immediate surroundings **(2)**
Duration	**Power Station Alternative 1** Long term **(4)** **Ashing Facility Alternative 1 (Graaffwater)** Long term **(4)** **Ashing Facility Alternative 2 (Applevlakte)** Long term **(4)** **Overhead Power Line (Medupi)** Long term **(4)**	Long term **(4)** Long term **(4)** Long term **(4)** Long term **(4)**
Magnitude	**Power Station Alternative 1** Minor **(2)** **Ashing Facility Alternative 1 (Graaffwater)** Minor **(2)** **Ashing Facility Alternative 2 (Applevlakte)** Small **(0)**	Minor **(2)** Small **(0)** Small **(0)**

	Overhead Power Line (Medupi) Small **(0)**	Small **(0)**
Probability	**All Alternatives** Highly probable **(4)**	Highly probable **(4)**
Significance	**Power Station Alternative 1** Medium **(36)** **Ashing Facility Alternative 1 (Graaffwater)** Medium **(32)** **Ashing Facility Alternative 2 (Applevlakte)** Low **(24)** **Overhead Power Line (Medupi)** Low **(24)**	Medium **(36)** Low **(10)** Low **(10)** Low **(24)**
Status	Generally the impact on tourist routes is low. The only route that could be impacted to a significant level is the Sockpoort Road which is already impacted by industrial development. Whilst this is an unsurfaced road and not a major route, unsurfaced roads are generally used by tourists to access game farms and eco-tourism attractions in the area. All roads therefore are likely to have a degree of importance for tourism. The further industrialisation of the landscape as seen from the road is likely to be considered as **negative** by tourists who are attracted to the area for its natural attributes.	**Negative**
Irreplaceable loss	The development of a section of natural landscape as seen from the Stockpoort Road (power station alternative 2) will result in a **small area of irreplaceable loss.**	**Small area of irreplaceable loss.**
Can impacts be mitigated?	**Yes** to a small degree.	

Mitigation / Management:

Planning:

- Plan to maintain the height of structures as low as possible;
- Plan to locate main elements as far from the Stockpoort road as possible;
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Construction:

- Minimise disturbance and loss of vegetation.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction and on the ashing facility as work proceeds;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions (monthly until establishment , thereafter at the middle and end of every growing season);
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- control dust on the ashing facility
- Colouring of taller structures should be such that they are not made prominent and preferably visually recede.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all possible areas to their original state;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative Impacts:

The cumulative effect on the main through routes is expected to be negligible.

There could however be a significant localised effect on the Stockpoort Road which in essence would extend the influence of industry along the road and into areas that are currently relatively pristine. Whilst this is not a key tourist route it does provide access to lowland areas that are used for ecotourism. People using the road will also experience the existing industrial area.

The key to minimising cumulative effects therefore lies in ensuring that additional industry is focused on areas that are currently disturbed as well as effective site planning and mitigation.

The proposed power station is located south of the Stockpoort road in close proximity to existing large scale mine dumps. Development of the site could however extend the visual influence of industrial development on the road.

The addition of the ashing facility on the same site could exacerbate impacts on a short section of this road, whereas the use of the Appelvlakte ashing facility could reduce the risks of impact.

The proposed power line is likely to have minimal visual effect as seen from roads.

Residual Risks:

The residual risk relates to loss of views over natural landscape being obvious on decommissioning of the proposed project. In order to minimise this impact, it is critical that existing natural landscape areas in and around the development are maintained and protected and that effective rehabilitation is undertaken during and after construction as well as on closure of the plant.

6.2.5 Industrialisation of Views from Riverine Areas

Nature of impact:

This LCA is important for regional tourism with the Limpopo River and its tributaries being a key attraction beside which a number of lodges have been developed. It is however some distance (approximate minimum 20km) from the proposed development area.

The onsite analysis indicated that due to distance and to screening that is provided largely by vegetation, existing industrial elements are generally not visible from this LCA. Therefore, the proposed development alternatives are also highly unlikely to be visible.

It is possible that wind-blown dust from the ashing facilities could the impact over a wider area than anticipated. The key mitigation measure therefore is control of dust at the ashing facilities.

This area is therefore unlikely to suffer significant impact.

	Without mitigation	**With mitigation**
Extent	**Power Station Alternative 1** Regional **(3)** **Ashing Facility Alternative 1 (Graaffwater)** Site and immediate surroundings **(2)** **Ashing Facility Alternative 2 (Applevlakte)** Site and immediate surroundings **(2)** **Overhead Power Line (Medupi)** Site and immediate surroundings **(2)**	Regional, **(3)** Local **(1)** Local **(1)** Site and immediate surroundings **(2)**
Duration	**Power Station Alternative 1** Long term **(4)** **Ashing Facility Alternative 1 (Graaffwater)** Long term **(4)** **Ashing Facility Alternative 2 (Applevlakte)** Long term **(4)** **Overhead Power Line (Medupi)** Long term **(4)**	Long term **(4)** Long term **(4)** Long term **(4)** Long term **(4)**
Magnitude	**Power Station Alternative 1** Small **(0)** **Ashing Facility Alternative 1 (Graaffwater)** Small **(0)** **Ashing Facility Alternative 2 (Applevlakte)** Small **(0)**	Small **(0)** Small **(0)** Small **(0)**

	Overhead Power Line (Medupi) Small **(0)**	Small **(0)**
Probability	**All Alternatives** Improbable **(2)**	Improbable **(2)**
Significance	**Power Station Alternative 1** Low **(14)** **Ashing Facility Alternative 1 (Graaffwater)** Low **(12)** **Ashing Facility Alternative 2 (Applevlakte)** Low **(12)** **Overhead Power Line (Medupi)** Low **(12)**	Low **(14)** Low **(10)** Low **(10)** Low **(12)**
Status	The likelihood of impact on this area is low and should glimpses of the development be possible they are unlikely to be obvious. However, the further industrialisation of the landscape as seen from the area may be considered as **negative** by people who are attracted to the area for its natural attributes.	**Negative**
Irreplaceable loss	**No irreplaceable loss.**	**No irreplaceable loss.**
Can impacts be mitigated?	Mitigation for this impact does not appear necessary, however, it is possible that wind-blown dust from the ashing facilities could extent their impact over a wider area than anticipated. The key mitigation therefore is control of dust at the ashing facilities.	
Mitigation / Management: Operations: • control dust blow from ashing facility.		
Cumulative Impacts: None of the proposed development elements are likely to be visible from this zone and if they are they will not be obvious although dust blow from the ashing facility could make it obvious. Subject to controlling dust blow, it is highly unlikely that there will be a cumulative impact.		
Residual Risks: No residual risks.		

6.2.6 Industrialisation of Views from Homesteads and Bush Lodges

Nature of impact: Homesteads and Bushlodges are assessed together because most farms in the area

appear to have either a secondary or primary tourism use.

Due to the high level of VAC of the landscape, affected properties will be located within the Lowland LCA and within 4km of the proposed power station.

Whilst a large number of homesteads have been identified within the landscape, particularly in the area to the north of the proposed development, only one homestead was found within the potential impact area (4km buffer from the proposed power station) as indicated on Map 6. This homestead is approximately 3.5km from the edge of the proposed development site.

It is unlikely but possible that properties at a greater distance from the development may have long range views of the development. This is only likely to occur in areas where land has been cleared for agricultural use. In these areas the development is likely to be viewed in the context of the two existing power stations.

Only the upper sections of the proposed power station are likely to be visible.

	Without mitigation	**With mitigation**
Extent	**Power Station Alternative 1** Site and immediate surroundings **(2)**	Site and immediate surroundings **(2)**
Duration	**Power Station Alternative 1** Long term **(4)**	Long term **(4)**
Magnitude	**Power Station Alternative 1** Minor **(2)**	Small **(0)**
Probability	**All Alternatives** Probable **(3)**	Improbable **(2)**
Significance	**Power Station Alternative 1** Low **(24)**	Low **(12)**
Status	For those people that are attracted to the area for its natural attributes and those travelling through the area for recreational and tourism reasons, it is likely that development of natural areas will be seen as a **negative impact**.	**Negative**
Irreplaceable loss	**No irreplaceable loss.**	**No irreplaceable loss.**
Can impacts be mitigated?	**Yes**	

Mitigation / Management:

Planning:

- Plan to maintain the height of structures as low as possible;
- Plan to locate the proposed power station to the south of the site area, maximising the distance between the higher elements and the homestead.
- Minimise disturbance of the surrounding landscape and maintain existing

vegetation around the development.

Construction:

- Minimise disturbance and loss of vegetation;

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions (monthly until establishment , thereafter at the middle and end of every growing season);
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- Colouring of taller structures should be such that they are not made prominent and preferably visually recede;
- Dust control at ashing facility must be implemented and maintained.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all possible areas to their original state;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative Impacts:

Whilst a large number of homesteads have been identified within the landscape, particularly in the area to the north of the proposed development, only one homestead was found within the potential impact area (4km buffer from the proposed power station) as indicated on Map 6. This homestead is approximately 3.5km from the edge of the proposed development site.

The nature of views of the industrial development within the region from homesteads and bush lodges is comprised of long distance views of the upper sections of existing power stations. The proposed development is unlikely to change the nature of this view.

Residual Risks:

The residual risk relates to loss of natural landscape being obvious on decommissioning of the proposed project. In order to minimise this impact, it is critical that existing natural landscape areas in and around the development are maintained and protected and that effective rehabilitation is undertaken during and after construction as well as on closure of the plant.

6.2.7 Industrialisation of Views from the D'nyala Nature Reserve

Nature of impact:

This impact relates to further industrialisation of views from the D'nyala Nature Reserve which is located on the Waterberg to the south east of the proposed development. It is only the north facing slopes within the reserve that are potentially impacted.

Where views over the lowland are possible, the major structures associated with the existing power stations are highly obvious at a distance of approximately 21km.

This indicates that the proposed facility is likely to be visible all be it at a distance approaching 30km.

Without mitigation, due to their scale, it is possible that ashing facilities may also be obvious from this area. It is also possible that dust blow from the facilities could make them more obvious from a distance.

The overhead power line is highly unlikely to be obvious from this distance and so is not included in the assessment.

Views from this area are largely screened by dense natural vegetation. There are however a number of areas where roads and clearings open up long views over the landscape towards the Limpopo River.

The view from these areas already includes two major power station complexes as well as disturbance caused by ancillary infrastructure. The concern is that further industrialisation will significantly increase the extent of industrial development within the view.

The on-site analysis indicated that due to the distances involved, small scale development around the power stations tends to blend into the background whereas larger scale development including the generator units and stacks tend to stand out and are relatively obvious.

The proposed power station is slightly further from the reserve than existing power station sites. The proposed structures are also slightly smaller than the existing power station structures. It is therefore likely that they will be slightly less obvious.

The proposed power station will be seen within the context of the existing Power Stations.

	Without mitigation	**With mitigation**
Extent	**Power Station Alternative 1** Regional **(3)** **Ashing Facility Alternative 1 (Graaffwater)** Regional **(3)** **Ashing Facility Alternative 2 (Applevlakte)** Regional **(3)**	Regional, **(3)** Regional, **(3)** Regional, **(3)**
Duration	**Power Station Alternative 1** Long term **(4)** **Ashing Facility Alternative 1 (Graaffwater)** Long term **(4)** **Ashing Facility Alternative 2 (Applevlakte)** Long term **(4)**	Long term **(4)** Long term **(4)** Long term **(4)**

Magnitude	**Power Station Alternative 1** Minor **(2)** **Ashing Facility Alternative 1 (Graaffwater)** Minor **(2)** **Ashing Facility Alternative 2 (Applevlakte)** Minor **(2)**	Minor **(2)** Small **(0)** Small **(0)**
Probability	**All Alternatives** Highly probable **(4)**	Highly probable **(4)**
Significance	**Power Station Alternative 1** Medium **(36)** **Ashing Facility Alternative 1 (Graaffwater)** Medium **(36)** **Ashing Facility Alternative 2 (Applevlakte)** Medium **(40)**	Medium **(36)** Low **(28)** Low **(28)**
Status	For those people that are attracted to the area for its natural attributes and those travelling through the area for recreational and tourism reasons, it is likely that development of natural areas will be seen as a **negative impact**.	**Negative**
Irreplaceable loss	The relatively small additional section of the view that will be industrialised will constitute **a small area of irreplaceable loss.**	**Small area of irreplaceable loss.**
Can impacts be mitigated?	**Yes** to a small degree.	

Mitigation / Management:

Planning:

- Plan to maintain the height of structures as low as possible;
- Plan to locate main elements as far from the Stockpoort road as possible;
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Construction:

- Minimise disturbance and loss of vegetation.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction and on the ashing facility as work proceeds;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions (monthly until establishment , thereafter at the middle and end of every growing season);
- Minimise disturbance and maintain existing vegetation as far as is possible

both within and surrounding the development area;
- control dust on the ashing facility
- Colouring of taller structures should be such that they are not made prominent and preferably visually recede.

Decommissioning:
- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all possible areas to their original state;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative Impacts:

It is likely that the proposed development will add slightly to the extent of industry that is visible.

The proposed Graaffwater (Alternative 1) with ashing facility on the same site is likely to be a more compact development than the same power station with the Appelvlakte ashing facility which will use an additional site to the east of the exiting industrialised zone.

Graaffwater (Alternative 1) with ashing facility on the same site is therefore likely to extend the influence of industrial development to a lesser degree than use of the Appelvlakte ashing facility.

Residual Risks:

The residual risk relates to loss of natural landscape being obvious on decommissioning of the proposed project. In order to minimise this impact, it is critical that existing natural landscape areas in and around the development are maintained and protected and that effective rehabilitation is undertaken during and after construction as well as on closure of the plant.

6.2.8 Industrialisation of Views due to development within the Manketti Nature Reserve

Nature of impact:

Manketti Reserve is the wildlife area of Grootegeluk Mine. The reserve is reported to be 16 000 hectares in extent and is located on land around the mine that is currently owned by Kumba Coal (Pty) Ltd.

In 2013, Exxaro indicated plans for expansion of the reserve as an offset area representative of plant communities impacted by existing and future developments.

Manketti also forms part of an ongoing monitoring programme conducted by Exxaro's Grootegeluk mine to assess the impact of mine operations on surrounding areas twice a year.

Manketti, was developed around the mine and adjacent industrial area in oreder to mitigate and monitor the impacts of industry on surrounding areas. As such the edges of the reserve that are closest to the Grootegeluk Mine and Matimba Power Station are currently impacted to a similar degree as might be expected by the proposed power station.

The proposed power station, overhead power line and ashing facility alternative 1 will reduce the area of the reserve.

The ashing facility alternative 2 will have no impact on the reserve.

The proposed mine, ashing facility alternative 1 and the grid connection will all be located within the existing reserve area. Given the current location of the reserve immediately adjacent to existing heavy industry, it is a given that the impact on the edges of the reserve will be similar after development of the proposed power station. The assessment therefore focused on the possible erosion of this buffer function. It found that there could be a loss of this to the north of the development area. The degree of this loss however is subject to the location of key elements of the development and the success of mitigation measures.

In short therefore, the Manketti Reserve plays a major role in mitigating the visual and other impacts of the industrial area on surrounding natural areas. The proposed development is not expected to negate this function but it could reduce its effectiveness particularly for areas to the north.

	Without mitigation	**With mitigation**
Extent	**Power Station Alternative 1** Site and immediate surroundings **(2)** **Ashing Facility Alternative 1 (Graaffwater)** Site and immediate surroundings **(2)** **Overhead Power Line (Medupi)** Site and immediate surroundings **(2)**	Site and immediate surroundings **(2)** Site and immediate surroundings **(2)** Site and immediate surroundings **(2)**
Duration	**Power Station Alternative 1** Long term **(4)** **Ashing Facility Alternative 1 (Graaffwater)** Long term **(4)** **Overhead Power Line (Medupi)** Long term **(4)**	Long term **(4)** Long term **(4)** Long term **(4)**
Magnitude	**Power Station Alternative 1** Moderate **(6)** **Ashing Facility Alternative 1 (Graaffwater)** Low **(4)** **Overhead Power Line (Medupi)** Low **(4)**	Low **(4)** Minor **(2)** Minor **(2)**
Probability	**All Alternatives** Highly probable **(4)**	**Power Station Alternative 1** Probable **(3)**

		Ashing Facility Alternative 1 (Graaffwater) Probable **(3)** **Overhead Power Line (Medupi)** Improbable **(2)**
Significance	**Power Station Alternative 1** Medium **(48)** **Ashing Facility Alternative 1 (Graaffwater)** Medium **(40)** **Ashing Facility Alternative 2 (Applevlakte)** Medium **(40)**	**Power Station Alternative 1** Low / Medium **(30)** **Ashing Facility Alternative 1 (Graaffwater)** Low **(24)** **Ashing Facility Alternative 2 (Applevlakte)** Low **(16)**
Status	For those people that are attracted to the area for its natural attributes and those travelling through the area for recreational and tourism reasons, it is likely that development of natural areas will be seen as a **negative impact**.	**Negative**
Irreplaceable loss	The loss of a section of the buffer area could constitute **a small area of irreplaceable loss.**	If mitigation is successful then the loss of buffer area will **not constitute an irreplaceable loss**
Can impacts be mitigated?	**Yes**.	

Mitigation / Management:

Planning:

- Plan to maintain the height of structures as low as possible;
- Plan to locate main elements as far from the Stockpoort road as possible;
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Construction:

- Minimise disturbance and loss of vegetation.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction and on the ashing facility as work proceeds;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions (monthly until establishment , thereafter at the middle and end of every growing season);
- Minimise disturbance and maintain existing vegetation as far as is possible

both within and surrounding the development area;
- control dust on the ashing facility
- Colouring of taller structures should be such that they are not made prominent and preferably visually recede.

Decommissioning:
- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all possible areas to their original state;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative Impacts:

The Manketti Reserve plays a major role in mitigating the visual and other impacts of the industrial area on surrounding natural areas. The proposed development is not expected to negate this function but the reduction in the width of the reserve (7.5 to 2.5km) could reduce its effectiveness particularly for areas to the north.
The development of the ashing facility on the same site as the proposed power station could slightly exacerbate impacts, whereas the use of the Appelvlakte ashing facility could reduce the loss of land within the reserve.

Residual Risks:

The residual risk relates to loss of natural landscape being obvious on decommissioning of the proposed project. In order to minimise this impact, it is critical that existing natural landscape areas in and around the development are maintained and protected and that effective rehabilitation is undertaken during and after construction as well as on closure of the plant.

7 CONCLUSIONS

7.1 GENERAL

There are existing major industrial installations in the vicinity of the proposed sites including two power stations that are larger than the proposed facility. The assessment indicates that the proposed power station and associated infrastructure will be seen in the context of these facilities which means that it will not be impacting a pristine environment although the landscape outside the industrial area is relatively natural.

The presence of the existing power stations was used in the onsite analysis to help gauge the likely visibility and nature of views associated with the proposed development.

7.2 LANDSCAPE CHARACTER AND IMPORTANCE

The existing industrial area is surrounded by relatively natural landscape that is largely flat with the exception of the Waterberg to the south from which occasional panoramic views over the lowland that falls to the north towards the Limpopo River.

The proposed power station will therefore impact on relatively natural areas to the north and south of the development area that is important as both an ecotourism corridor and destination.

The following distinct Landscape Character Areas (LCAs) have been identified

7.2.1 Lowland Landscape.

This LCA is comprised of the lower slopes of the Limpopo Valley that fall gently from the Waterburg in the south to the Limpopo River in the north. The area is largely covered with semi-natural bushveld. The LCA is largely used for grazing. There is also a large eco-tourism secondary bias to the landuse.

The importance of this LCA lies both with its agricultural and tourism role. It is therefore both important for its productivity as well as its natural aesthetics which support ecotourism activities.

7.2.2 Industrial Landscape

This LCA is largely contained within the shallow valley in which the development is proposed. Within this area two existing power stations and the existing Grootegeluk mine dominate the landscape. Due to landform and surrounding natural vegetation, this is a relatively enclosed character area. As a result of the scale of industrial elements, it might be thought that this zone would have a large visual influence over surrounding areas. However, the density and height of surrounding natural vegetation effectively limits the majority of this influence to 1 – 2km from the edge of development. Beyond this range, occasional views of taller structures, particularly the existing stacks is possible particularly where surrounding vegetation is thin; however, the main industrial elements are generally screened. Therefore whilst there is relatively limited VAC within this zone, the VAC of the surrounding natural landscape is important in containing the visual influence of this zone.

The main importance of the Industrial LCA is in the production of electrical power to supply to the country.

7.2.3 Urban Landscape Character Area

This LCA is comprised of the small urban areas of Lephalale, Onverwacht and Marapong. During the scoping phase it was felt that the larger industrial elements would exert influence over these areas. In reality however both zones are relatively well insulated from one another by surrounding natural vegetation. Marapong being located immediately adjacent to the Matimba Power Station is perhaps an exception to this.

This zone is primarily important as a living and working environment particularly for local people.

7.2.4 Upland Landscape Character Area

This LCA is comprised of the upper valley slope that is formed by the northern edge of the Waterberg Plateau. This forms a major ridgeline to the south of the proposed development area. This zone provides a high backdrop to the Industrial LCA. The rugged nature of the zone results in general screening of existing industrial development to the south with high level views over the development area being possible from the edge of the ridge only.

As with the Lowland LCA, the importance of this zone lies with agricultural production as well as eco-tourism activities. The natural aesthetics of this area are therefore likely to be important particularly for eco-tourism activities.

7.2.5 Riverine Landscape Character Area

This zone is comprised of the narrow corridor either side of the major water courses in the area. It is generally slightly depressed below the level of the surrounding valley floor and is lined with mature vegetation that is mainly comprised of woody tree and shrub species. Whilst in areas there are irrigated arable schemes that open views across the landscape, this zone is generally inward looking with few external views.

It has obvious importance from a drainage perspective. It is also an important local recreational resource as well as being important from a tourism perspective as there are a number of lodges located adjacent to the river. There are also areas where it is important from an agricultural production perspective.

7.3 AREAS AND NATURE OF VISUAL IMPACT

Possible visual receptors that have been identified include;

- Homesteads that could possibly have secondary tourism importance;
- Bush lodges;
- A protected area (D'nyala Nature Reserve);
- A number of private Nature Reserves;
- Local roads that have tourism importance; and
- Urban areas.

Whilst the assessment indicates that the development might be visible over a distance of 50+km, in reality, the Visual Absorption Capacity of the surrounding landscape which is generally relatively flat and covered with dense natural vegetation will significantly reduce the impact area to the extent that the main impact area is likely to extend a distance of no more than 4km from the site boundary.

Beyond this range occasional views of higher structures such as stacks are possible only where the density of vegetation, particularly canopy trees, is limited. Views of lower structures are only possible where roads are aligned directly towards the development providing view corridors and where large scale clearing has occurred for agriculture or development. The latter case only occurs at distances from development generally in excess of 12km. Overviews from the northern edge of the Waterberg are also possible. These are also relatively long distance views (in excess of 20km).

This limitation means that the majority of visual impacts will be experienced close to the proposed development and either in or close to an area within which similar impacts are already experienced.

a) Of the more than 300 identified within the potential Zone of Theoretical Visibility only one homestead / bush lodge was identified as potentially being impacted.
b) The D'Nyala Reserve being located on the Waterberg overlooking the lowland will be the only formally protected area impacted. The impact will be minor and similar in nature to views over existing power stations from a small area of the reserve that are seen at a distance of approximately 21km. The views of the proposed power station will be seen from a distance of approximately 30km which is likely to mean that they will be less obvious than the existing facilities.
c) Of the private reserves that have been identified, only Exxaro's Manketti Reserve will be impacted. This reserve was established on land surrounding the Grootegeluk Mine with the intention of offsetting and monitoring impacts associated with the mine. It has served as an effective buffer protecting surrounding land uses from the intensive industrial operations that occur in the area. It is largely due to this initiative that the surrounding landscape is so well insulated from visual impacts associated with these operations. The proposed mine, ashing facility alternative 1 and the grid connection will all be located within the existing reserve area. Given the current location of the reserve immediately adjacent to existing heavy industry, it is a given that the impact on the edges of the reserve will be similar after development of the proposed power station. The assessment therefore focused on the possible erosion of this buffer function. It found that there could be a loss of this to the north of the development area. The degree of this loss however is subject to the location of key elements of the development and the success of mitigation measures.
d) Due to the extent of tourism traffic observed during the site visit, it has been assumed that all roads in the area are likely to have some tourism significance. Only approximately 7-8km of the unsurfaced Stockpoort Road which runs through and adjacent to the proposed power station site will be impacted in any significant way. Immediately to the south of the affected section, this road is already impacted my heavy industry including the Matimba Power Station and the Grootegeluk Mine. All other roads will be unaffected with the exception of occasional long range views from short sections of the R510 and R33. These views will be seen at a long distance (16km and 30km respectively) and will be seen in the context of the existing power stations.
e) Views from within urban areas of the existing power stations are limited to the western edges and to places where there is a degree of clearing of surrounding natural vegetation. It is generally highly unlikely that the proposed power station will increase this level of existing impact. The exception to this is the northern edge of Marapong which is located within 3km of the alternative 2

ashing facility. It is possible that, as it grows, the ash dump will become just visible between trees in the intervening landscape. Given current impacts associated with the existing Matimba power station on this community; the power station overshadows sections of the settlement, the possible view of the ashing facility through the tops of trees is not likely to be significant. It is possible however that dust blow could reinforce the industrial nature of this facility.

7.4 CUMULATIVE IMPACT

Because the proposed development will occur close to the edge of the existing heavy industrial area, minimising cumulative impacts is seen as critical.

The alternatives considered are:

a) Graaffwater (Alternative 1) with ashing facility on the same site; and
b) Graaffwater (Alternative 1) with Appelvlakte ashing facility

Of these two alternatives, a) is likely result in all elements being located in close proximity to the existing Grootegeluk Mine dumps to the south of the Stockpoort Road and within an area that is already industrialised whereas b) will see the proposed ashing facility located more remotely from the power station site on the eastern edge of the existing industrial area and closer to existing settlement (Marapong).

The Graaffwater (Alternative 1) with Appelvlakte ashing facility will therefore increase the area of industrial influence to a greater degree than Graaffwater (Alternative 1) with ashing facility on the same site.

The Medupi Loop-in, follows existing transmission line servitudes over a proportion of their length. It is also largely located in areas where screening provided by vegetation prevents major impacts from most public areas. Cumulative impacts associated with the grid connection are therefore expected to be limited.

7.5 MITIGATION POTENTIAL

The affected landscape surrounding the existing industrial zone and the proposed development sites has a large degree of visual absorption capacity due to the relatively flat topography and dense natural vegetation.

The retention and management of this vegetation during construction and operation is the key to maintaining relatively low visual impacts considering the scale and nature of the proposed development.

Minimising the extent of obvious disturbance associated with the development is also critical particularly from close viewpoints and for views from higher areas on the northern edge of the Waterberg. Undertaking rehabilitation of the facility on a progressive basis and ensuring that it has a reasonable cover of vegetation will help to minimise this impact. Dust control will also be critical in minimising wider impacts.

The potential to undertake successful mitigation is therefore high.

7.6 CONCLUSION

Considering the scale and nature of the proposed development, because of the nature of the surrounding landscape, the visual impact that is likely to be experienced by the majority of identified sensitive receptors is anticipated to be low. More significant impacts are likely to be limited to areas that are already impacted by heavy industry including the two existing power stations and the Grootegeluk Mine.

Of the alternatives considered, Graaffwater (Alternative 1) with the ashing facility on the same site is favoured from a visual perspective. This alternative will result in a more compact impact zone that really only has a significant visual effect on the existing industrialised area.

The development of the Graaffwater (Alternative 1) with Appelvlakte ashing facility will result in an extension of the industrial impact zone to the east. This could have a small impact on the Marapong community which could be exacerbated by dust from the Appelvlakte ashing facility.

It is noted that the assessment has been undertaken without the benefit of site layout plans and that the proposed development sites are relatively large. Because of this, the worst case scenario with development occurring to the edge of the identified sites has been assumed. It therefore needs to be borne in mind that it should be possible to mitigate impacts particularly those associated with closer view-points through careful site planning and development.

The assessment has confirmed that there are no visual impacts that will preclude development and that whilst the Graaffwater (Alternative 1) with the ashing facility on the same site is favoured, the Graaffwater (Alternative 1) with Appelvlakte ashing facility with appropriate mitigation measures cannot be precluded.

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APPENDIX I

SPECIALIST'S BRIEF CV

Name JONATHAN MARSHALL
Nationality British
Year of Birth 1956
Specialisation Landscape Architecture / Landscape & Visual Impact Assessment / Environmental Planning / Environmental Impact Assessment.

Qualifications

Education
- Diploma in Landscape Architecture, Gloucestershire College of Art and Design, UK (1979)
- Environmental Law, University of KZN (1997)

Professional
- Registered Professional Landscape Architect (South Africa)
- Chartered Member of the Landscape Institute (UK)
- Certified Environmental Assessment Practitioner of South Africa.
- Member of the International Association of Impact Assessment, South Africa

Languages

English	-	Speaking	-	Excellent
	-	Reading	-	Excellent
	-	Writing	-	Excellent

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Key Experience

Jon qualified as a Landscape Architect (Dip LA) at Cheltenham (UK) in 1979. He has also been a Certified Environmental Assessment Practitioner of South Africa since 2009.

During the early part of his career (1981 - 1990) He worked with Clouston (now RPS) in Hong Kong and Australia. During this period he was called on to undertake visual impact assessment (VIA) input to numerous environmental assessment processes for major infrastructure projects. This work was generally based on photography with line drawing superimposed to illustrate the extent of development visible.

He has worked in the United Kingdom (1990 - 1995) for a major supermarket chain and prepared CAD based visual impact assessments for public enquiries for new green field store development. He also prepared the VIA input to the environmental statement for the Cardiff Bay Barrage for consideration by the UK Parliament in the passing of the Barrage Bill.

His more recent VIA work (1995 to present) includes a combination of CAD and GIS based work for a new international airport to the north of Durban, new heavy industrial operations, overhead electrical transmission lines, mining operations in West Africa and numerous commercial and residential developments.

VIA work undertaken during the last eighteen months includes assessments for proposed new mine developments in Ghana and Guinea, numerous solar plant projects for Eskom and private clients, proposed wind farm development and a proposed tourism development within the Isimangaliso Wetland Park World Heritage Site.

Jon has also had direct experience of working with UNESCO representatives on a candidate World Heritage Site and has undertaken VIAs within and adjacent to other World Heritage Sites.

Relevant Visual Impact Assessment Projects

1. **Isundu Sub- Station Development -** Visual impact assessment for a new major sub – station in KwaZulu-Natal for Eskom.
2. **Bhangazi Lake Tourism Development** – Visual impact assessment for a proposed lodge development within the Isimangaliso Wetland Park World Heritage Site. This work is ongoing.
3. **Quarry Development for the Upgrade of Sani Pass –** Visual Impact Assessments for two proposed quarry developments on the edge of the uKhalamba-Drakensburg World Heritage Site.
4. **Mtubatuba to St Lucia Overhead Power Line** – Visual Impact Assessment for a proposed power line bordering on the Isimangaliiso Wetland Park World Heritage Site for Eskom.
5. **St Faiths 400/132 kV Sub-Station and Associated Power Lines** - Visual Impact Assessment for a proposed new major sub-station and approximately 15 km of overhead power line for Eskom.
6. **Clocolan to Ficksburg Overhead Power Line** – Visual Impact Assessment for a proposed power line for Eskom.
7. **Solar Plant Projects including Photovoltaic and Concentrating Solar Power Plants** – Numerous projects for Eskom and private clients in the Northern Cape, Limpopo, Mpumalanga and the Free State.
8. **Moorreesburg Wind Farm.** Visual impact assessment for a proposed new wind farm in the Western Cape.
9. **AngloGold Ashanti, Dokyiwa (Ghana)** – Visual Impact Assessment for proposed new Tailings Storage Facility at a mine site working with SGS as part of their EIA team.
10. **Camperdown Industrial Development** - Visual Impact Assessment for proposed new light industrial area to the north o Camperdown for a private client.
11. **Wild Coast N2 Toll Highway** – Peer review of VIA undertaken by another consultant.
12. **Gamma to Grass Ridge 765kv transmission line** – Peer review of VIA undertaken by another consultant.
13. **Gateway Shopping Centre Extension (Durban)** – Visual Impact Assessment for a proposed shopping centre extension in Umhlanga, Durban.
14. **Kouroussa Gold Mine (Guinea)** – Visual impact assessment for a proposed new mine in Guinea working with SGS as part of their EIA team.
15. **Mampon Gold Mine (Ghana)** - Visual impact assessment for a proposed new mine in Ghana working with SGS as part of their EIA team.
16. **Telkom Towers** – Visual impact assessments for numerous Telkom masts in KwaZulu-Natal
17. **Dube Trade Port, Durban International Airport** – Visual Impact Assessment for a new international airport.
18. **Sibaya Precinct Plan** – Visual Impact Assessment as part of Environmental Impact Assessment for a major new development area to the north of Durban.

19. **Umdloti Housing** – Visual Impact Assessment as part of Environmental Impact Assessment for a residential development beside the Umdloti Lagoon to the north of Durban.
20. **Tata Steel Ferrochrome Smelter** - Visual impact assessment of proposed new Ferrochrome Smelter in Richards Bay as part of EIA undertaken by the CSIR.
21. **Diamond Mine at Rooipoort Nature Reserve near Kimberley** – Visual impact assessment for a proposed diamond mine within an existing nature reserve for De Beers.
22. **Durban Solid Waste Large Landfill Sites –** Visual Impact Assessment of proposed development sites to the North and South of the Durban Metropolitan Area. The project utilised 3d computer visualisation techniques.
23. **Hillside Aluminium Smelter, Richards Bay -** Visual Impact Assessment of proposed extension of the existing smelter. The project utilised 3d computer visualisation techniques.
24. **Estuaries of KwaZulu Natal Phase 1 and Phase 2 –** Visual character assessment and GIS mapping as part of a review of the condition and development capacity of eight estuary landscapes for the Town and Regional Planning Commission. The project was extended to include all estuaries in KwaZulu Natal.
25. **Signage Assessments** – Numerous impact assessments for proposed signage developments for Blast Media.
26. **Signage Strategy** – Preparation of an environmental strategy report for a national advertising campaign on National Roads for Visual Image Placements.
27. **Zeekoegatt, Durban** - Computer aided visual impact assessment. Acted as advisor to the Province of KwaZulu Natal in an appeal brought about by a developer to extend a light industrial development within a 60 metre building line from the National N3 Highway.
28. **La Lucia Mall Extension** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed extension to shopping mall for public consultation exercise.
29. **Redhill Industrial Development** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed new industrial area for public consultation exercise.
30. **Avondale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
31. **Hammersdale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
32. **Southgate Industrial Park, Durban** - Computer Aided Visual Impact Assessment and Landscape Design for AECI.
33. **Sainsbury's Bryn Rhos (UK)** - Computer Aided Visual Impact Assessment/ Planning Application for the development of a new store within the Green Wedge North of Swansea.
34. **Ynyston Farm Access (UK)** - Computer Aided Impact Assessment of visual intrusion of access road to proposed development in Cardiff for the Land Authority for Wales.
35. **Cardiff Bay Barrage (UK)** - Concept Design, Detail Design, Documentation, and Visual Input

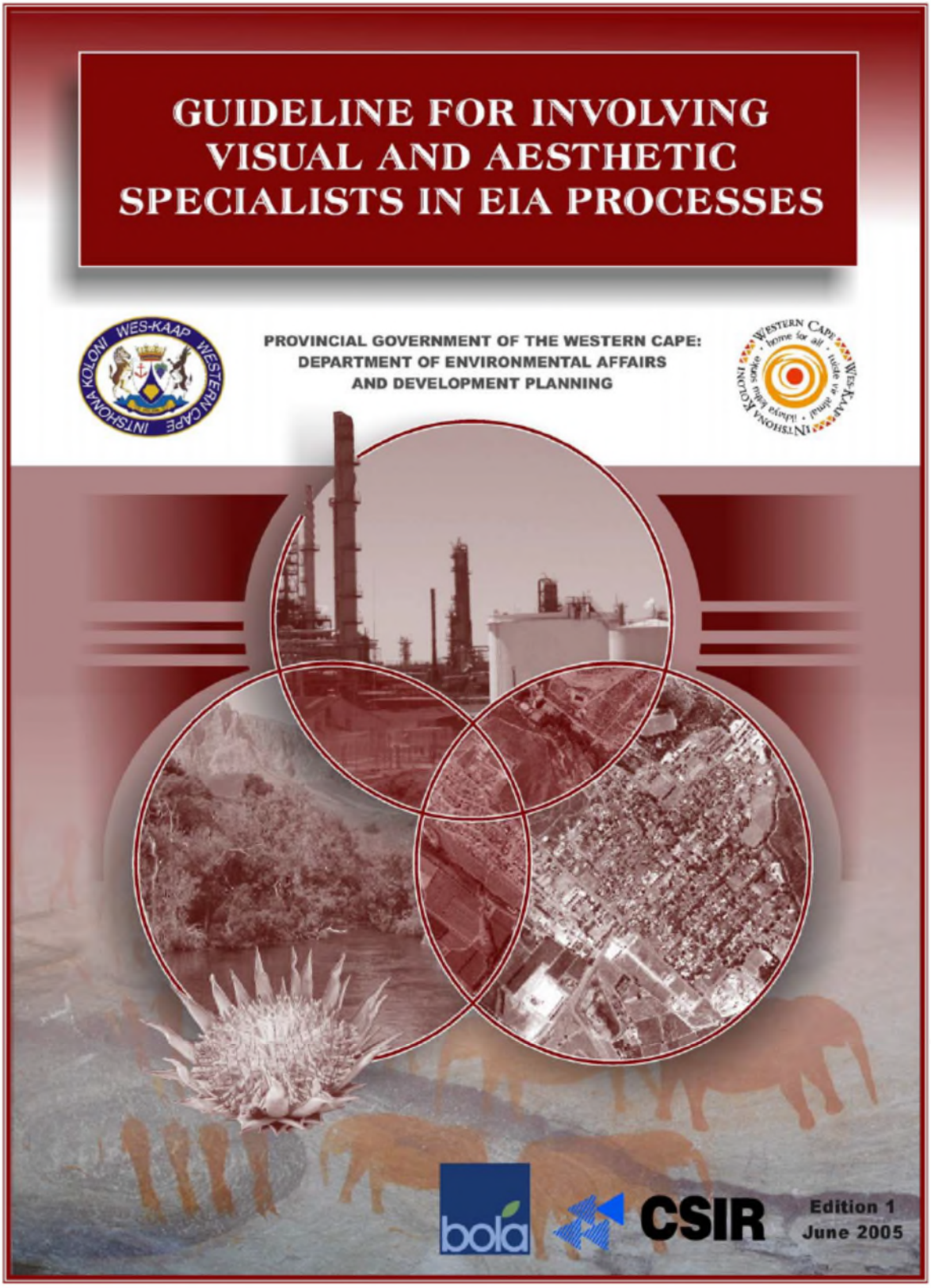
to Environmental Statement for consideration by Parliament in the debate prior to the passing of the Cardiff Bay Barrage Bill. The work was undertaken for Cardiff Bay Development Corporation.

36. **A470, Cefn Coed to Pentrebach (UK)** - Preparation of frameworks for the assessment of the impact of the proposed alignment on the landscape for The Welsh Office.
37. **Sparkford to Illchester Bye Pass (UK)** - The preparation of the landscape framework and the draft landscape plan for the Department of Transport.
38. **Green Island Reclamation Study (Hong Kong)** - Visual Impact Assessment of building massing, Urban Design Guidelines and Masterplanning for a New Town extension to Hong Kong Island.
39. **Route 3 (Hong Kong)** - Visual Impact Assessment for alternative road alignments between Hong Kong Island and the Chinese Border.
40. **China Border Link (Hong Kong)** - Visual Impact Assessment and initial Landscape Design for a new border crossing at Lok Ma Chau.
41. **Route 81, Aberdeen Tunnel to Stanley (Hong Kong)** - Visual Impact Assessment for alternative highway alignments on the South side of Hong Kong Island.

APPENDIX II

GUIDELINES FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

(Preface, Summary and Contents for full document go to the Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning web site, http://eadp.westerncape.gov.za/your-resource-library/policies-guidelines)


GUIDELINE FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES
PROVINCIAL GOVERNMENT OF THE WESTERN CAPE:
DEPARTMENT OF ENVIRONMENTAL AFFAIRS
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GUIDELINE FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

Edition 1

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Stakeholders engaged in the guideline development process:

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PREFACE

The purpose of an Environmental Impact Assessment (EIA) is to provide decision-makers (be they government authorities, the project proponent or financial institutions) with adequate and appropriate information about the potential positive and negative impacts of a proposed development and associated management actions in order to make an informed decision whether or not to approve, proceed with or finance the development.

For EIA processes to retain their role and usefulness in supporting decision-making, the involvement of specialists in EIA needs to be improved in order to:

- Add greater value to project planning and design;
- Adequately evaluate reasonable alternatives;
- Accurately predict and assess potential project benefits and negative impacts;
- Provide practical recommendations for avoiding or adequately managing negative impacts and enhancing benefits;
- Supply enough relevant information at the most appropriate stage of the EIA process to address adequately the key issues and concerns, and effectively inform decision-making in support of sustainable development.

It is important to note that not all EIA processes require specialist input; broadly speaking, specialist involvement is needed when the environment could be significantly affected by the proposed activity, where that environment is valued by or important to society, and/or where there is insufficient information to determine whether or not unavoidable impacts would be significant.

The purpose of this series of guidelines is to improve the efficiency, effectiveness and quality of specialist involvement in EIA processes. The guidelines aim to improve the capacity of roleplayers to anticipate, request, plan, review and discuss specialist involvement in EIA processes. Specifically, they aim to improve the capacity of EIA practitioners to draft appropriate terms of reference for specialist input and assist all roleplayers in evaluating whether or not specialist input to the EIA process is appropriate for the type of development and environmental context. Furthermore, they aim to ensure that specialist inputs support the development of effective, practical Environmental Management Plans where projects are authorised to proceed (refer to *Guideline for Environmental Management Plans*).

The guidelines draw on best practice in EIA in general, and within specialist fields of expertise in particular, to address the following issues related to the timing, scope and quality of specialist input. The terms "specialist involvement" and "input" have been used in preference to "specialist assessment" and "studies" to indicate that the scope of specialists' contribution (if required) depends on the nature of the project, the environmental context and the amount of available information and does not always entail detailed studies or assessment of impacts.

The guidelines draw on best practice in EIA in general, and within specialist fields of expertise in particular, to address the following issues related to the timing, scope and quality of specialist input. The terms "specialist involvement" and "input" have been used in preference to "specialist

assessment" and "studies" to indicate that the scope of specialists' contribution depends on the nature of the project, the environmental context and the amount of available information.

	ISSUES
TIMING	▪ When should specialists be involved in the EIA process; i.e. at what stage in the EIA process should specialists be involved (if at all) and what triggers the need for their input?
SCOPE	▪ Which aspects must be addressed through specialist involvement; i.e. what is the purpose and scope of specialist involvement? ▪ What are appropriate approaches that specialists can employ? ▪ What qualifications, skills and experience are required?
QUALITY	▪ What triggers the review of specialist studies by different roleplayers? ▪ What are the review criteria against which specialist inputs can be evaluated to ensure that they meet minimum requirements, are reasonable, objective and professionally sound?

The following guidelines form part of this first series of guidelines for involving specialists in EIA processes:

- Guideline for determining the scope of specialist involvement in EIA processes
- Guideline for the review of specialist input in EIA processes
- Guideline for involving biodiversity specialists in EIA processes
- Guideline for involving hydrogeologists in EIA processes
- Guideline for involving visual and aesthetic specialists in EIA processes
- Guideline for involving heritage specialists in EIA processes
- Guideline for involving economists in EIA processes

The *Guideline for determining the scope of specialist involvement in EIA processes* and the *Guideline for the review of specialist input in EIA processes* provide generic guidance applicable to any specialist input to the EIA process and clarify the roles and responsibilities of the different roleplayers involved in the scoping and review of specialist input. It is recommended that these two guidelines are read first to introduce the generic concepts underpinning the guidelines which are focused on specific specialist disciplines.

Who is the target audience for these guidelines?

The guidelines are directed at authorities, EIA practitioners, specialists, proponents, financial institutions and other interested and affected parties involved in EIA processes. Although the guidelines have been developed with specific reference to the Western Cape province of South Africa, their core elements are more widely applicable.

What type of environmental assessment processes and developments are these guidelines applicable to?

The guidelines have been developed to support project-level EIA processes regardless of whether they are used during the early project planning phase to inform planning and design decisions (i.e. during pre-application planning) or as part of a legally defined EIA process to obtain statutory approval for a proposed project (i.e. during screening, scoping and/or impact assessment). Where specialist input may be required the guidelines promote early, focused and appropriate involvement of specialists in EIA processes in order to encourage proactive consideration of potentially significant impacts, so that negative impacts may be avoided or

effectively managed and benefits enhanced through due consideration of alternatives and changes to the project.

The guidelines aim to be applicable to a range of types and scales of development, as well as different biophysical, social, economic and governance contexts.

What will these guidelines not do?

In order to retain their relevance in the context of changing legislation, the guidelines promote the principles of EIA best practice without being tied to specific legislated national or provincial EIA terms and requirements. They therefore do not clarify the specific administrative, procedural or reporting requirements and timeframes for applications to obtain statutory approval. They should, therefore, be read in conjunction with the applicable legislation, regulations and procedural guidelines to ensure that mandatory requirements are met.

It is widely recognized that no amount of theoretical information on how best to plan and coordinate specialist inputs, or to provide or review specialist input, can replace the value of practical experience of coordinating, being responsible for and/or reviewing specialist inputs. Only such experience can develop sound judgment on such issues as the level of detail needed or expected from specialists to inform decision-makers adequately. For this reason, the guidelines should not be viewed as prescriptive and inflexible documents. Their intention is to provide best practice guidance to improve the quality of specialist input.

Furthermore, the guidelines do not intend to create experts out of non-specialists. Although the guidelines outline broad approaches that are available to the specialist discipline (e.g. field survey, desktop review, consultation, modeling), specific methods (e.g. the type of model or sampling technique to be used) cannot be prescribed. The guidelines should therefore not be used indiscriminately without due consideration of the particular context and circumstances within which an EIA is undertaken, as this influences both the approach and the methods available and used by specialists.

How are these guidelines structured?

The specialist guidelines have been structured to make them user-friendly. They are divided into six parts, as follows:

- **Part A**: Background;
- **Part B**: Triggers and key issues potentially requiring specialist input;
- **Part C**: Planning and coordination of specialist inputs (drawing up terms of reference);
- **Part D**: Providing specialist input;
- **Part E**: Review of specialist input; and
- **Part F**: References.

Part A provides grounding in the specialist subject matter for all users. It is expected that authorities and peer reviewers will make most use of Parts B and E; EIA practitioners and project proponents Parts B, C and E; specialists Part C and D; and other stakeholders Parts B, D and E. Part F gives useful sources of information for those who wish to explore the specialist topic.

SUMMARY

This guideline document, which deals with specialist visual input into the EIA process, is organised into a sequence of interleading sections. These follow a logical order covering the following:

- the background and context for specialist visual input;
- the triggers and issues that determine the need for visual input;
- the type of skills and scope of visual inputs required in the EIA process;
- the methodology, along with information and steps required for visual input;
- finally, the review or evaluation of the visual assessment process.

Part A is concerned with defining the visual and aesthetic component of the environment, and with principles and concepts relating to the visual assessment process. The importance of the process being logical, holistic, transparent and consistent is stressed in order for the input to be useful and credible.

The legal and planning context within which visual assessments take place indicate that there are already a number of laws and bylaws that protect visual and scenic resources. These resources within the Western Cape context have importance for the economy of the region, along with the proclaimed World Heritage Sites in the Province.

The role and timing of specialist visual inputs into the EIA process are outlined, with the emphasis being on timely, and on appropriate level of input, from the early planning stage of a project, through to detailed mitigation measures and management controls at the implementation stage.

Part B deals with typical factors that trigger the need for specialist visual input to a particular project. These factors typically relate to:

(a) the nature of the receiving environment, in particular its visual sensitivity or protection status;
(b) the nature of the project, in particular the scale or intensity of the project, which would result in change to the landscape or townscape.

The correlation between these two aspects are shown in a table, in order to determine the varying levels of visual impact that can be expected, i.e. from little or no impact, to very high visual impact potential.

Part C deals with the choice of an appropriate visual specialist, and the preparation of the terms of reference (TOR) for the visual input. Three types of visual assessment are put forward, each requiring different expertise, namely:
Type A: assessments involving large areas of natural or rural landscape;
Type B: assessments involving local areas of mainly built environment;
Type C: assessments involving smaller scale sites with buildings, or groups of buildings.

The scope of the visual input would in summary relate to the following:

- the issues raised during the scoping process;
- the time and space boundaries, i.e. the extent or zone of visual influence;

- the types of development alternatives that are to be considered;
- the variables and scenarios that could affect the visual assessment;
- the inclusion of direct, indirect and cumulative effects.

Approaches to the visual input relate to the level of potential impact and range from minimal specialist input, to a full visual impact assessment (VIA). A list of the typical components of a visual assessment is given, and the integration with other studies forming part of the EIA process is discussed.

Part D provides guidance for specialist visual input, and on the information required by specialists. Notes on predicting potential visual impacts are given, along with suggested criteria for describing and rating visual impacts. The assessment of the overall significance of impacts, as well as thresholds of significance are discussed.

Further aspects that need to be considered by visual specialists in EIA processes include:

- affected parties who stand to benefit or lose,
- risks and uncertainties related to the project,
- assumptions that have been made, and their justification,
- levels of confidence in providing the visual input or assessment,
- management actions that can be employed to avoid or mitigate adverse effects and enhance benefits, and
- the best practicable environental option from the perspective of the visual issues and impacts.

Finally, pointers for the effective communication of the findings are given.

Part E lists specific evaluation criteria for reviewing visual input by a specialist, where this becomes necessary. Further guidance on this is given in the document on *Guideline for the review of specialist input in EIA processes.*

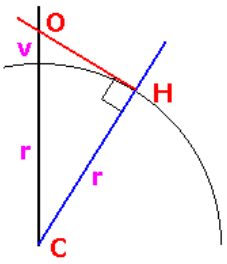
CONTENTS

APPENDIX III

FORMULA FOR DERIVING THE APPROXIMATE VISUAL HORIZON

The Mathematics behind this Calculation

This calculation should be taken as a guide only as it assumes the earth is a perfect ball 6378137 metres radius. It also assumes the horizon you are looking at is at sea level. A triangle is formed with the centre of the earth (C) as one point, the horizon point (H) is a right angle and the observer (O) the third corner. Using Pythagoras's theorem we can calculate the distance from the observer to the horizon (OH) knowing CH is the earth's radius (r) and CO is the earth's radius (r) plus observer's height (v) above sea level.



Sitting in a hotel room 10m above sea level a boat on the horizon will be 11.3km away. The reverse is also true, whilst rowing across the Atlantic, the very top of a mountain range 400m high could be seen on your horizon at a distance of 71.4 km assuming the air was clear enough.

APPENDIX IV

CUMULATIVE IMPACT ASSESSMENT

1 Industrialisation of the Lowland Landscape Character Area.

Nature:
Adding to the industrialisation of the area.

The alternatives considered are:

a) Graaffwater (Alternative 1) with ashing facility on the same site; and
b) Graaffwater (Alternative 1) with Appelvlakte ashing facility.

The analysis has shown that the existing heavy industrial area is relatively insulated from surrounding natural landscape areas by dense natural vegetation which helps to minimise visibility from surrounding areas. The proposed development will add to the this industrial area and could extend the visual influence of industry within the lowland landscape.

Development of the Graaffwater (Alternative 1) with ashing facility on the same site would ensure that the development was as compact as possible and largely impacts on areas that are currently impacted by heavy industry.

Development of the Graaffwater (Alternative 1) with Appelvlakte ashing facility would extend impacts slightly to the east of areas that are currently impacted by heavy industry and is therefore likely to have slightly higher cumulative impacts.

The power line will largely follow existing servitudes. Where this is not the case, dense vegetation will hide it from all but the closest views. It is therefore unlikely to significantly add to additional industrialisation.

	Graaffwater (Alternative 1) with ashing facility on the same site	**Graaffwater (Alternative 1) with Appelvlakte ashing facility**
Extent	Regional, **(3)**	Regional, **(3)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Minor, **(2)**	Low, **(3)**
Probability	Probable **(3)**	Highly probable **(4)**
Significance	**low**, **(24)**	**Medium, (40)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Loss of Resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Confidence in findings:	High	

Mitigation:

Planning:

- Plan to maintain the height of structures as low as possible;
- Plan to locate the main structures as close to existing heavy industry as possible.
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Construction:

- Minimise disturbance and loss of vegetation.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- Colouring of taller structures should be such that they are not made prominent and preferably visually recede;
- Implement and maintain dust control at ashing facility.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all possible areas to their original state;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

2 Adding to the industrialisation of views as seen from the Upland LCA

Nature:
This impact relates to further industrialisation of views from the north facing ridge of the Waterberg overlooking the existing industrial development area as well as the proposed development sites. Where views over the lowland are possible, the major structures associated with the existing power stations are currently highly obvious.

The alternatives considered are:

a) Graaffwater (Alternative 1) with ashing facility on the same site; and
b) Graaffwater (Alternative 1) with Appelvlakte ashing facility.

Both alternatives will add slightly to this extent. However the Graaffwater (Alternative 1) with ashing facility on the same site is likely to be more compact with all elements including the ashing facility in close proximity to existing industry. The Appelvlakte ashing facility will add an additional area of industrial development to the east of the existing industrial area.

The power line will largely follow existing servitudes. Where this is not the case, dense vegetation will hide it from all but the closest views. It is therefore are unlikely to significantly add to additional industrialisation.

The power line is unlikely to be distinguishable from the background at the distances involved.

	Graaffwater (Alternative 1) with ashing facility on the same site	**Graaffwater (Alternative 1) with Appelvlakte ashing facility**
Extent	Regional, **(3)**	Regional, **(3)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Minor, **(2)**	Minor, **(2)**
Probability	Probable, **(3)**	Probable, **(3)**
Significance	Low, **(24)**	Medium, **(27)**
Status (positive or negative)	Negative	Negative

Reversibility	Low	Low
Loss of Resources?	Yes	Yes
Can impacts be mitigated?	Yes to a small degree	Yes to a small degree
Confidence in findings:	High	

Mitigation:

Planning:

- Plan to maintain the height of structures as low as possible;
- Plan to locate the main structures as close to existing heavy industry as possible.
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Construction:

- Minimise disturbance and loss of vegetation.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- Colouring of taller structures should be such that they are not made prominent and preferably visually recede;
- Implement and maintain dust control at ashing facility.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all possible areas to their original state;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

3 Adding to the industrialisation of views as seen from urban areas

Nature:

The onsite analysis indicates that whilst long range views of higher structures associated with existing power stations may be visible from small sections of the urban edge, the majority of urban areas are insulated from significant impacts by both distance and the density of relatively natural vegetation that exists in the intervening landscape.

The one exception to the above noted conditions is the western and eastern edges of Marapong. On the western edge, Matimba power station structures overshadow the settlement and on the eastern edge overhead HV power lines dominate the landscape.

As the distances associated with the proposed power station will be greater than those associated with existing power stations, in general terms, impacts associated with power station structures are likely to be negligible.

The exception to this again however is Marapong where the Appelvlakte ashing facility could be located at a distance of approximately 3km from the northern edge of the

settlement. In terms of views, existing vegetation is likely to help screen the ashing facility, however, dust could exacerbate the impact.

With the exception of the impact of the added impact of the Appelvlakte ashing facility on the northern edge of Marapong, cumulative visual impacts associated with the alternative sites on urban areas are likely to be negligible.

	Graaffwater (Alternative 1) with ashing facility on the same site	**Graaffwater (Alternative 1) with Appelvlakte ashing facility**
Extent	Regional, **(3)**	Regional, **(3)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Small, **(0)**	Small to minor, **(1)**
Probability	Very improbable, **(1)**	Probable **(3)**
Significance	**Low**, **(4)**	**Low, (15)**
Status (positive or negative)	Neutral	Negative
Reversibility	High	High
Loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes to a small degree
Confidence in findings:	High	High

Mitigation :

Planning:

- Plan to maintain the height of structures as low as possible;
- Plan to locate the main structures as close to existing heavy industry as possible.
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Construction:

- Minimise disturbance and loss of vegetation.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- Colouring of taller structures should be such that they are not made prominent and preferably visually recede;
- Implement and maintain dust control at ashing facility.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all possible areas to their original state;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

4 Increase in industrial development visible from tourist routes

Nature:
The onsite analysis indicates that whilst long range views of higher structures may be visible from isolated sections of the main through routes. The majority of the major routes are insulated from significant impacts by both distance and the density of relatively natural vegetation that exists in the intervening landscape.

The cumulative effect on the main through routes is therefore expected to be negligible.

There could however be a significant localised effect on the Stockpoort Road which in essence would extend the influence of industry along the road and into areas that are currently relatively pristine. Whilst this is not a key tourist route it does provide access to lowland areas that are used for ecotourism. People using the road will also experience the existing industrial area.

The key to minimising cumulative effects therefore lies in ensuring that additional industry is focused on areas that are currently disturbed as well as effective site planning and mitigation.

The proposed power station is located south of the Stockpoort road in close proximity to existing large scale mine dumps. Development of the site could however extend the visual influence of industrial development on the road.

The addition of the ashing facility on the same site could exacerbate impacts on a short section of this road, whereas the use of the Appelvlakte ashing facility could reduce the risks of impact.

The proposed power line is likely to have minimal visual effect as seen from roads.

	Graaffwater (Alternative 1) with ashing facility on the same site	**Graaffwater (Alternative 1) with Appelvlakte ashing facility**
Extent	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Minor **(2)**	Low to minor**(1)**
Probability	Probable **(3)**	Probable **(3)**
Significance	**Low (27)**	**Medium (24)**
Status (positive or negative)	**Negative**	**Negative**
Reversibility	Low	Low
Loss of resources?	Small irreplaceable loss	Small irreplaceable loss
Can impacts be mitigated?	Yes, largely subject to careful site planning.	Yes, largely subject to careful site planning.
Confidence in findings:	High	

Mitigation:

Planning:

- Plan to maintain the height of structures as low as possible;
- Plan to locate the main structures as close to existing heavy industry as possible.
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Construction:

- Minimise disturbance and loss of vegetation.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- Colouring of taller structures should be such that they are not made prominent and preferably visually recede;
- Implement and maintain dust control at ashing facility.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all possible areas to their original state;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

5 Increase in industrial development visible from riverine areas.

Nature:
None of the proposed development elements are likely to be visible from this zone and if they are they will not be obvious although dust blow from the ashing facility could make it obvious.

Subject to controlling dust blow, it is highly unlikely that there will be a cumulative impact.

	Graaffwater (Alternative 1) with ashing facility on the same site	**Graaffwater (Alternative 1) with Appelvlakte ashing facility**
Extent	Region **(3)**	Region **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Small **(0)**	Small **(0)**
Probability	Very improbable **(1)**	Very improbable **(1)**
Significance	Very low **(7)**	Very low **(7)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Loss of resources?	No	No
Can impacts be mitigated?	Yes	
Confidence in findings:	High	

Mitigation:
Operations:

1) Control dust blow from ashing facility.

6 Increase in Industrialisation of views from Homesteads and Bush Lodges.

Nature:
Whilst a large number of homesteads have been identified within the landscape,

particularly in the area to the north of the proposed development, only one homestead was found within the potential impact area (4km buffer from the proposed power station) as indicated on Map 6. This homestead is approximately 3.5km from the edge of the proposed development site.

The nature of views of the industrial development within the region from homesteads and bush lodges is comprised of long distance views of the upper sections of existing power stations. The proposed development is unlikely to change the nature of this view.

Extent	Region **(3)**
Duration	Long term **(4)**
Magnitude	Small **(0)**
Probability	Very improbable **(1)**
Significance	Very low **(7)**
Status (positive or negative)	Negative
Reversibility	Low
Loss of resources?	No
Can impacts be mitigated?	Yes
Confidence in findings:	High

Mitigation:

Planning:

- Plan to maintain the height of structures as low as possible;
- Plan to locate the main structures as close to existing heavy industry as possible.
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Construction:

- Minimise disturbance and loss of vegetation.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- Colouring of taller structures should be such that they are not made prominent and preferably visually recede;
- Implement and maintain dust control at ashing facility.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all possible areas to their original state;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

7 Increase in industrial development visible from D'nyala Reserve.

Nature:

The view from this reserve already includes two major power station complexes as well as disturbance caused by ancillary infrastructure. The concern is that further industrialisation will significantly increase the extent of industrial development

within the view.

The on-site analysis indicated that due to the distances involved, small scale development around the power stations tends to blend into the background whereas larger scale development including the generator units and stacks tends to stand out and is relatively obvious.

The proposed power station site is slightly further from the reserve than existing power station sites. The proposed structures are also slightly smaller than the existing power station structures. It is therefore likely that they will be slightly less obvious. They will however add slightly to the extent of industry that is visible.

The proposed Graaffwater (Alternative 1) with ashing facility on the same site is likely to be a more compact development than the same power station with the Appelvlakte ashing facility which will use an additional site to the east of the exiting industrialised zone.

Graaffwater (Alternative 1) with ashing facility on the same site is therefore likely to extend the influence of industrial development to a lesser degree than use of the Appelvlakte ashing facility.

	Graaffwater (Alternative 1) with ashing facility on the same site	**Graaffwater (Alternative 1) with Appelvlakte ashing facility**
Extent	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Small to minor **(1)**	Minor **(2)**
Probability	Probable **(3)**	Probable **(3)**
Significance	low **(24)**	Medium **(27)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Loss of resources?	There will be a small loss.	There will be a small loss.
Can impacts be mitigated?	**Yes** to a small degree,	
Confidence in findings:	High	

Mitigation:

Planning:

- Plan to locate the main structures as close to existing heavy industry as possible.
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Construction:

- Minimise disturbance and loss of vegetation.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;

- Colouring of taller structures should be such that they are not made prominent and preferably visually recede;
- Implement and maintain dust control at ashing facility.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all possible areas to their original state;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

8 Industrialisation of Views due to development within the Manketti Nature Reserve

Nature:

The Manketti Reserve plays a major role in mitigating the visual and other impacts of the industrial area on surrounding natural areas. The proposed development is not expected to negate this function but the reduction in the width of the reserve (7.5 to 2.5km) could reduce its effectiveness particularly for areas to the north.

The development of the ashing facility on the same site as the proposed power station could slightly exacerbate impacts, whereas the use of the Appelvlakte ashing facility could reduce the loss of land within the reserve.

	Graaffwater (Alternative 1) with ashing facility on the same site	**Graaffwater (Alternative 1) with Appelvlakte ashing facility**
Extent	Site **(2)**	Site **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Minor **(2)**	Small to minor **(1)**
Probability	Probable **(3)**	Probable **(3)**
Significance	low **(24)**	Medium **(21)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Loss of resources?	There will be a small loss.	There will be a small loss.
Can impacts be mitigated?	**Yes** to a small degree,	
Confidence in findings:	High	

Mitigation:

Planning:

- Plan to locate the main structures as close to existing heavy industry as possible.
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Construction:

- Minimise disturbance and loss of vegetation.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Monitor rehabilitated areas post-decommissioning and implement remedial

actions;

- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- Colouring of taller structures should be such that they are not made prominent and preferably visually recede;
- Implement and maintain dust control at ashing facility.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all possible areas to their original state;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

APPENDIX V

ENVIRONMENTAL MANAGEMENT PLAN

Project component/s	Tshivhaso Coal-Fired Power Plant, Construction, Operation and Decommissioning.
Potential Impact	Further industrialisation of Landscape Character impacting on: • Lowland LCA; • Upland LCA; • Urban LCA; • Tourism routes; • D'Nyala Nature Reserve; • Homesteads.
Activity/risk source	Location of tall elements close to the northern site boundary is likely to make the power station more obvious to routes, homesteads and game farm areas to the north. Location of main elements away from the existing industrial land uses could make the power station more obvious and increase cumulative impacts of industrial development particularly when viewed from the Upland LCA and the D'Nyala Nature Reserve. Vegetation clearance generally during construction could make the power station more visible to surrounding areas. Loss of vegetation between the Stockpoort Road and the power station could make the development visible from the road. Excessive dust during the operational phase from the ashing facility could exacerbate the visibility of the dump. Disturbance and lack of vegetation on the ashing facility could make the development obvious from closer viewpoints in the Lowland LCA (Stockpoort Road and Marapong) and from higher viewpoints in the Upland LCA including the D'Nyala Nature Reserve. The colour of taller elements could make them more obvious. Degradation of areas after decommissioning could result in the development area being obvious.
Mitigation: Target/Objective	Plan the development to minimise visibility particularly from the Stockpoort Road and from areas to the north of the development. Plan the development to minimise the apparent area of industrial development particularly when viewed from higher area within the Upland LCA. Ensure that colours used particularly for larger elements within the development do not draw attention to the development particularly when viewed from a distance.

	Minimise and reinstate vegetation loss during construction. Manage vegetation buffers during the operational period to ensure their effectiveness in screening the development from surrounding areas. Undertake effective dust control at the ashing facility during the operational phase. Rehabilitate the ashing facility on a progressive basis during the operational phase and decommissioning. Remove structures and rehabilitate site on decommissioning.

Mitigation: Action/control	**Responsibility** Developer (D) Contractor (C) Environmental Control Officer (ECO) Environmental Liaison Officer (ELO)	**Timeframe** Planning Phase (P) Construction Phase (C) Operational Phase (O) Decommissioning Phase (D)
Plan the development to minimise visibility particularly from the Stockpoort Road and from areas to the north of the development.	D, C	P
Plan the development to minimise the apparent area of industrial development particularly when viewed from higher area within the Upland LCA.	D, C	P
Ensure that colours used particularly for larger elements within the development do not draw attention to the development particularly when viewed from a distance.	D	P D
Minimise and reinstate vegetation loss.	C, ECO, ELO	C, D
Manage vegetation buffers during the operational period to ensure their effectiveness in screening the development from surrounding areas.	ECO, ELO	O

Undertake effective dust control at the ashing facility during the operational phase.	ECO, ELO	O
Rehabilitate the ashing facility on a progressive basis during the operational phase and decommissioning.	ECO, ELO	O, D
Remove structures and rehabilitate site to natural state on decommissioning.	C, ECO, ELO	C
Monitor rehabilitated areas post-construction and post-decommissioning and implement remedial actions.	C, ECO, ELO	O, D

Performance Indicators	Vegetation presence and density. Presence of unnecessary infrastructure. Visibility of the power station. Vegetation cover on the ashing facility.
Monitoring	Evaluate the effectiveness of colours and surface finishes to visually recede from selected viewpoints in the Upland LCA. It should be possible to compare results with other existing power stations. Evaluate health and effectiveness of vegetation to provide necessary screening before, during and after construction and annually thereafter. Evaluate vegetation growth and reinstatement during decommissioning and for five years thereafter. Take regular time-line photographic evidence. Responsibility: ECO and ELO. Prepare regular reports.