MUTSHO POWER COMPANY (PTY) LTD

PROPOSED ESTABLISHMENT OF A NEW COAL-FIRED POWER PLANT NEAR MAKHADO, LIMPOPO PROVINCE

VISUAL IMPACT SCOPING REPORT

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Prepared by:
Environmental Planning and Design
P.O. Box 2122,
Westville, 3630

Tel: 031 266 8241
Email: jon@enviroconsult.co.za

Prepared for:
Savannah Environmental (Pty) Ltd
1st Floor, Block 2, 5 Woodlands Drive Office Park
Cnr Woodlands Drive & Western Service Road
Woodmead, 2191

Tel: 011 656 3237
Fax: 086 684 0547
Email: joanne@savannahsa.com

PREPARED BY

PO BOX 2122, WESTVILLE, 3630, SOUTH AFRICA

TABLE OF CONTENTS

PHOTOGRAPHIC PLATES

1 INTRODUCTION

1.1 GENERAL

This Visual Impact Scoping Report (VISR) study forms part of the Scoping and Environmental Impact Assessment that is being undertaken for the proposed establishment of the proposed Makhado coal-fired power plant and associated infrastructures by Savannah Environmental (Pty) Ltd on behalf of Mutsho Power Company.

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 desktop Visual Impact Assessment Report has been prepared for inclusion in the project Environmental Impact Assessment Scoping Report.

1.2 PROJECT LOCATION

A minimum footprint of approximately 600ha is required for the proposed power station and associated infrastructure. The type of technology selected for implementation would ultimately influence the final project layout and development footprint (i.e. the area of land required for development). While the physical power generation components (power island), require only approximately 50ha, supporting areas for the establishment of coal and other raw material stockpiles, and an ash dump over life of plant, increase the development footprint significantly.

Two properties have been identified for the development of the proposed project:

Farm Name:	Farm Number:	SG21-Digit Code	Area
Du Toit	563	T0MS00000000056300000	924.5ha
Vrienden	589	T0MS00000000058900000	1 285.3ha

The possibility exists that the proposed project may be developed in its entirety on either of the abovementioned properties, or alternatively portions of the project may be developed on both.

The abovementioned properties are indicated on the Site location Plan **(Map 1)**.

1.3 BACKGROUND OF SPECIALIST

Jon Marshall qualified as a Landscape Architect in 1978. He is also a certified Environmental Assessment Practitioner (EAP) of South Africa. 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 developments, 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.**

1.4 THE NATURE OF VISUAL IMPACT

Visual impacts may relate to a general change in the character of an area or in the change in a specific view for a person or group of people.

Visual impacts can be positive or negative and a degree of subjectivity is required in deciding this point. The approach of any visual assessment should, as objectively as possible, describe a landscape and as far as is possible reflect the likely majority view regarding positive / negative aspect of an impact. This can be difficult particularly in South Africa due to different values and cultures associated with various sectors of the population. For example, poorer and particularly rural based sectors of the population are possibly more concerned with the productive nature of a landscape than its appearance, whereas the wealthier sectors might be more concerned with scenic value particularly as it is associated with property values. If possible the values and opinions of all impacted sectors of the community should be considered.

General change to a landscape might have greater or lesser significance subject to;

a) Numbers of people that might use the landscape,
b) The use of the landscape,
c) The level of protection afforded the landscape,
d) The rarity of the landscape.

In terms of change to a specific view this might be defined as either visual intrusion or visual obstruction.

a) 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 been removed as far as is possible in this assessment 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.
b) Visual obstruction is the blocking of views or foreshortening of views. This can generally be measured in terms of extent.

More often than not such an impact will be a combination of intrusion and obstruction. Obstruction can be measured in terms of the extent of an existing view that is screened by a development. However, judging intrusion requires a degree of subjectivity. It is however possible to relate this judgement to the manner in which proposed change would impact on the use or enjoyment of an area which again requires an understanding or local values.

1.5 RELEVANT GUIDELINES

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.

1.6 SCOPING OBJECTIVES

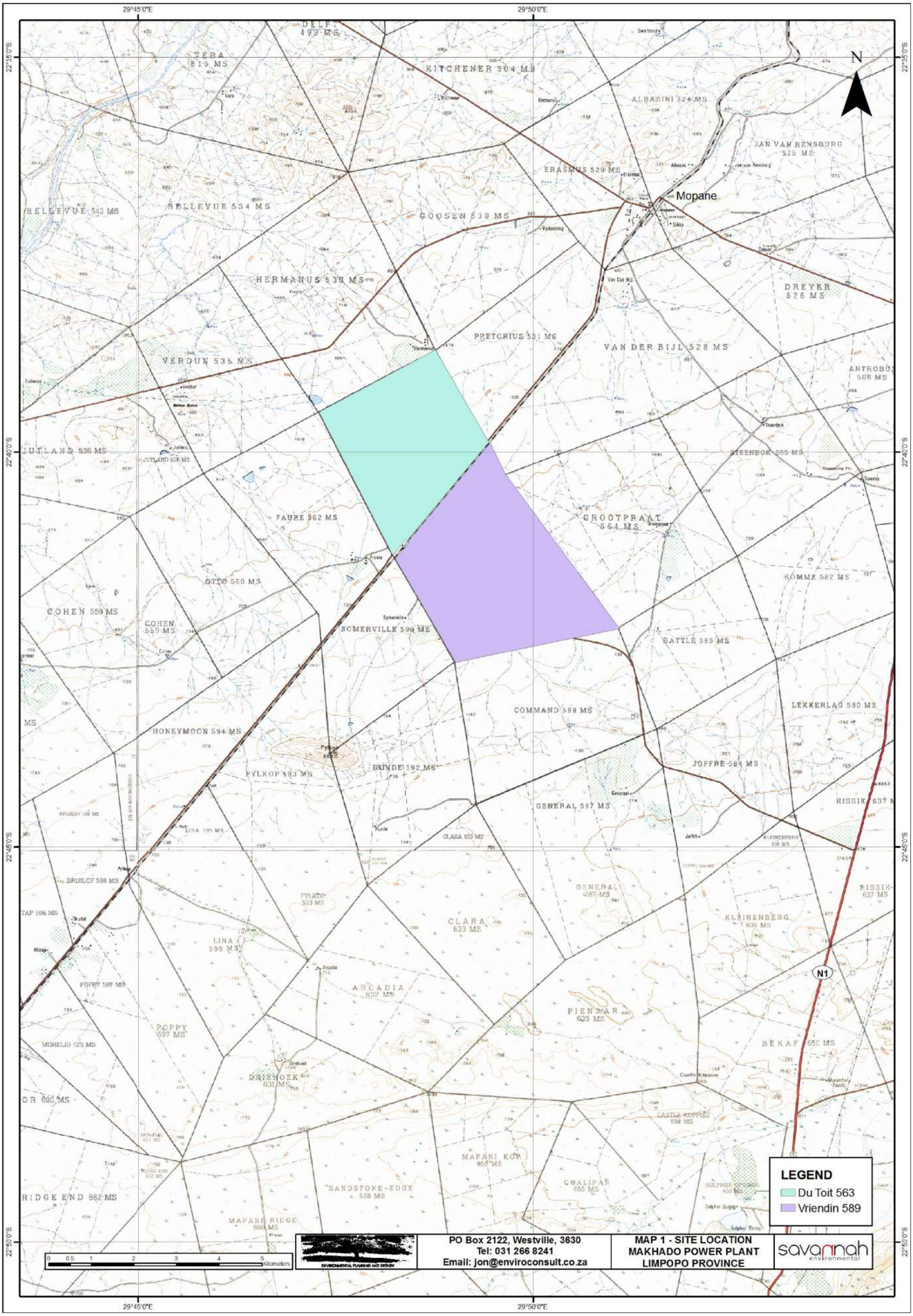
This Environmental Scoping Study identifies and evaluates potential environmental impacts associated with all aspects of the proposed Project. In terms of the EIA Regulations, feasible and reasonable alternatives should be assessed within the Scoping Study. The scope of an environmental assessment is defined by the range of issues and feasible alternatives to be considered, and the approach towards the assessment that will follow.

The characteristics of a scoping exercise are as follows:

a) Feasible and reasonable alternatives are identified and selected for further assessment;
b) Important characteristics of the affected environment are identified;
c) Significant issues that are to be examined in the assessment procedure are identified; and
d) It provides the basis for determining terms of reference for the assessment procedure.

1.7 LIMITATIONS AND ASSUMPTIONS

a) This initial assessment is a desk top study that has made use of existing GIS data sets, on line mapping / photography, and the assessor's knowledge of the area.
b) Layouts were not available at the time of reporting. Assumptions as to height and nature of the development are indicated in section 2.2.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LINA 595 MS
CLARA 633 MS
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ARCADIA 632 MS
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PO Box 2122, Westville, 3630
Tel: 031 266 8241
Email: jon@enviroconsult.co.za
MAP 1 - SITE LOCATION
MAKHADO POWER PLANT
LIMPOPO PROVINCE
savannah environmental

2. PROJECT DESCRIPTION

2.1 PROJECT MOTIVATION

The supply of electricity in South Africa has recently 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 applicantis 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 600MW.

2.2 PROJECT DESCRIPTION

Coal is proposed to be sourced from Exxaro Coal's Thabametsi Coal-Mine development which is to be located in the vicinity of the sites under investigation.

The main infrastructure proposed includes (specifications will be decided based on the technology selected):

- Access roads.
- Coal storage areas and bunkers.
- Coal mill (for grinding the coal into fine material).
- Pipeline for water supply. Water is expected to be available from the allocation to Exxaro Coal from the Mokolo-Crocodile Water Augmentation Project (MCWAP) Phase 2.
- Coal loading and offloading areas, as well as conveyor belts.
- Power plant production unit/s (boilers / furnaces, turbines, generator and associated equipment, control room).
- Ash dump.
- Water infrastructure such as Raw-Water Storage Dam, purification works and reservoirs
- A substation.
- An overhead power line to connect into the Eskom grid (600kV).
- Office and maintenance area/s.

2.2 LIKELY SCALE OF DEVELOPMENT AND NATURE OF VISUAL IMPACTS

No detail has been provided regarding the design, size or location or the various elements. As this is fundamental to visual impact, broad assumptions have to be made in order to progress the Scoping Assessment.

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.

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 Power Plant** which is likely to be housed in a tall industrial enclosure. From reference to EIA documentation for another 600MW power station proposal (KiPower), it seems likely that this structure may be in the order of 50m+ 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 asurrounding landscape.

- **The Ash Dump** for disposal of Pulverised Fuel Ash (PFA) that will arise from the process on an ongoing basis. From reference to EIA documentation for another 600MW power station proposal (KiPower), it seems likely that this dump may be in the order of 50m+ high. The need to dispose of PFA on site can be minimised through use as general use as a component in construction materials. The visual impact of the Ash Dump is often minimised through grassing which subject to surrounding topography can make the bulk of the dump difficult to differentiate from surrounding areas. In a flat landscape however, this is difficult to achieve as the nature of a dump is generally such that it is elevated above the natural topography.

- **Stacks** that will be used to remove smoke and fumes from the coal burning process. The height of these will be subject to air quality requirements. From reference to EIA documentation for another 600MW power station proposal (KiPower), it seems likely that they could be in the order of 190m+ high. These are likely to be the tallest elements within this proposed development. Like the power plant, typically they are visible over a wide area and they contrast with the scale and nature of a surrounding landscape.

- **Cooling towers** that will dissipate the heat generated by the plant. The technology to be used for cooling has not been confirmed. It is possible that cooling towers will be required, they are therefore addressed in this report. Typically cooling towers are used for wet and indirect dry cooling systems. They are large round concrete structures through which the plants cooling water runs. Plumes of steam can be visible above the cooling towers. From reference to EIA documentation for another 600MW power station proposal (KiPower), it seems likely that they could be in the order of 160m+ high. Like the power plant

and stacks, typically cooling towers are visible over a wide area and they contrast with the scale and nature of a surrounding landscape.

- **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 can be a similar height to the adjacent plant. As they are generally located in close proximity to the plant, visually, they appear as part of the plant structure.

- **The Coal Mill** is also typically housed in a structure adjacent to the power plant. The Coal Mill pulverises the coal before it is fed into the furnace within the power plant. Visually, this structure is likely to be read as part of the power plant.

- **Coal Stockpiles** are generally required within the power station in order to provide a buffer against delivery problems. From experience of previous visual impact assessment work, the coal stockpile at Eskom's Tutuka Coal Fired Power Station has a footprint in the order of 800m x 600m and at its highest point is in the order of 15-20m high. The proposed power station has a generating capacity that is less than a third of Tutuka and so is likely to require a proportionally smaller coal stockpile. Coal stockpiles are generally obvious due to the extent of land that they generally occupy and because the colour of the coal stored often contrasts with the colours of the surrounding landscape.

- **Conveyor belts** are generally used to move coal to stockpile and from the stockpile to the silos and the power plant. They are also used to move PFA from the power plant to the Ash Dump. Conveyor belts are generally set as close to the ground as possible, they 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.

- **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 and particularly a light industrial 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 these will be assessed under a separate application.

- **A Substation** that will be required in order to step down and power generated by the power plant for transmission into the National Grid.

Typically this would be comprised of bus bars to transfer the power into and out of the substation as well as a series of transformers and electrical switch gear. The tallest elements within a substation are usually the bus bars which are lower than the transmission towers on the incoming and outgoing overhead power lines. From close range the detail of the various elements within a substation is obvious. From a distance however, due to the transparency of a large proportion of the equipment and plant the visual influence of a substation reduces.

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 cooling towers and stacks that could be between 150 – 200m high.
- Moderately tall elements that include the Power Plant, Silos, and the Ash Dump that are likely to be in the order of 50-60m high.
- Low elements that include the coal stockpile, conveyors, offices / workshops and the substation that are likely to be in the order of 10-20m high.

These orders of height will be used in the initial scoping 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 5 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, and lower numbers of cooling towers and stacks.

Plate 1, A Power Station stack from approximately 5 km. It should be noted that these are possibly the tallest elements and may be visible in the landscape even when all other structures are screened.

Plate 2, Power Station as seen from approximately 10 km. It should be noted that the major elements including the stacks, cooling towers and power plant enclosures are highly obvious whereas the majority of low level development around the base is either screened or not obvious.

Plate 3, Ash dump from its immediate vicinity.

Plate 4, Power Station Cooling Towers from their immediate vicinity. The large structures dominate the view.

3. DESCRIPTION OF RECEIVING ENVIRONMENT AND RECEPTORS

It is possible that landscape change due to the proposed development could impact the character of the surrounding landscape. Landscape character can be derived from specific features relating to the urban or rural setting and may include key natural, historic or culturally significant elements. Importance might also relate to landscapes that are uncommon or under threat from development.

This section will;

- describe the types of landscape that may be impacted
- indicate likely degree of sensitivity
- describe how the landscape areas are likely to be impacted

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 GIS data sets supplemented by available online mapping and aerial photography. Key character components identified will be subject to verification through the EIA site visit

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

The region north, east, west and immediately to the south of the proposed site appears relatively natural whilst further to the south there are extensive areas of settlement.

The main surrounding land use appears to be agricultural with large scale grazing units interspersed with isolated farmsteads.

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

- Landform and drainage;
- Nature and density of development; and
- 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 Zimbabwe. The Limpopo

River at its closest is in excess of 50km from the proposed site. It is unlikely that views of the development will be visible from this range.

The southern valley limit is provided by the rugged Soutpansberg which forms the upper valley slope approximately 30km to the south of the proposed site.

A cross section of the valley ranges in elevation between approximately 450m amsl at the river to the north of the proposed site and 1600m amsl at the upper valley slope and ridgeline to the south. By comparison the proposed power station sites have current levels between 700-730m amsl.

The Landform and Drainage Map (Map 2) indicates that valley floor slopes gently from the proposed site towards the proposed river for approximately 5km. It then increases in gradient forming a series of koppies and secondary ridgelines with a summit at approximately 650 - 700m amsl behind which the proposed development is located. The land then falls into a minor valley through which the Sand River flows. The floor and gently sloping lower slopes of this minor valley are approximately 20km wide. To the south of this more rugged terrain 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 majority of the proposed alternative development areas are located in a secondary valley cold 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 PFA 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** includes the settlements of Musina which is approximately 40km to the north east and Louis Trichardt which is approximately 40km south of the proposed site. Both settlements have both well-established middle and upper income housing areas and more recent low cost housing areas.

  There is also a band of well established settlements approximately 25km to the south of the proposed site that extends to the east within the Soutpandburg. These settlements include Makusha, Mudimeli, Manyii,

Musekwa and Makhado which are the closest settlements to the proposed site.

Given the distances involved and the fact that topography is likely to play a major role in screening views, it is unlikely that the proposed development will be visible from these settlements.

All settlements appear to be relatively dense and have well established mature vegetation including street trees and ornamental vegetation. Should views of the development be possible, this is likely to provide significant screening from within each settlement

- **Natural areas** are the main land cover type surrounding the proposed development. It is likely that this is largely used for game and low intensity cattle grazing. This activity has resulted in the majority of the area retaining a relatively natural appearance. It is also likely that a proportion of land owners have diversified into tourism as is evident from the number of bush lodges in the area which include Tokwe Safaris approximately 12km to the north-west and Magorgor Safari Lodge approximately 25km to the north east of the proposed site.

  Within the natural areas there are also a large number of farmsteads that that are likely to include; farm sheds, farm houses and workers accommodation. It is also likely that a proportion of these are used as guest houses.

  There are a number of protected areas in the region the closest of which include the Honnet Nature Reserve which is approximately 34km to the east and the Baobab Tree Reserve which is approximately 34km to the north east of the proposed site. Within these areas vegetation is likely to be relatively dense and more pristine than surrounding areas due to conservation management.

  In terms of visual implications, natural areas are likely to provide a significant amount of screening for the development particularly where thicket and woody vegetation extends above head height.

- **Cultivation** occurs within the natural areas and is focused around the Sand River approximately 15km to the south west of the proposed site.

  Cultivated areas are likely to be relatively open providing opportunities for long distance views across the surrounding landscape.

- **Degraded areas** are evident largely on the edges of settlement. This probably stems from grazing and clearing for cultivation.

- **Industrial development** within the area is relatively sparse, however there is a limestone works in the vicinity of Mopane which is approximately

5km to the north east of the proposed site. This facility is likely to be comprised of extensive dumps and over burden stockpiles that may have a similar appearance and scale as the dumps and stockpiles that are associated with the proposed development.

3.1.3 Vegetation Patterns

The main natural vegetation types as defined by Mucina and Rutherford[1]in the vicinity of the site can be divided into:

a) Musina Mopane Bushveld;
b) Limpopo Ridge Bushveld; and
c) Soutpansberg Mountain Bushveld.

In addition the following are also evident;

d) Ornamental vegetation; and
e) Arable crops

Musina Mopane Bushveld is the most dominant vegetation type surrounding the proposed site and extending to the Limpopo River in the north and the Soutpansburg in the south. According to Muncia and Rutherford this vegetation type occurs on the undulating plains from around Baines Drift and Alldays in the west, remaining north of the Soutpansberg and south of the Limpopo River. It is comprised of open woodland to moderately closed shrubveld.

Limpopo Ridge Bushveld occurs on and around the minor ridgelines and koppies to the north and south of the proposed site. This vegetation type is a moderately open savanna with poorly developed ground layer.

Soutpansberg Mountain Bushveld occurs on the slopes of the Soutpansberg Mountains to the south of the site. It is generally comprised of a dense tree layer and poorly developed grassy layer.

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 are likely to have a greater proportion of shrub and tree vegetation whereas dryer sandier areas are likely to have a greater proportion of grass and herbaceous vegetation cover.

It is likely that trees and tall shrubs within the bushveld matrix will extend to above head height in most areas and they could have a significant screening effect for mid to long distance views.

[1] Vegetation types of South Africa (including Prince Edward and Marion Islands), Lesotho and Swaziland, 2006

Ornamental garden vegetation and street trees appear to be relatively dense within the more established settlement areas. This vegetation is likely to restrict views within these settlements.

Arable cropping occurs close to the Sand River to the south west of the site. Where this occurs, generally the natural vegetation has been cleared over a wide area which opens up long distance views.

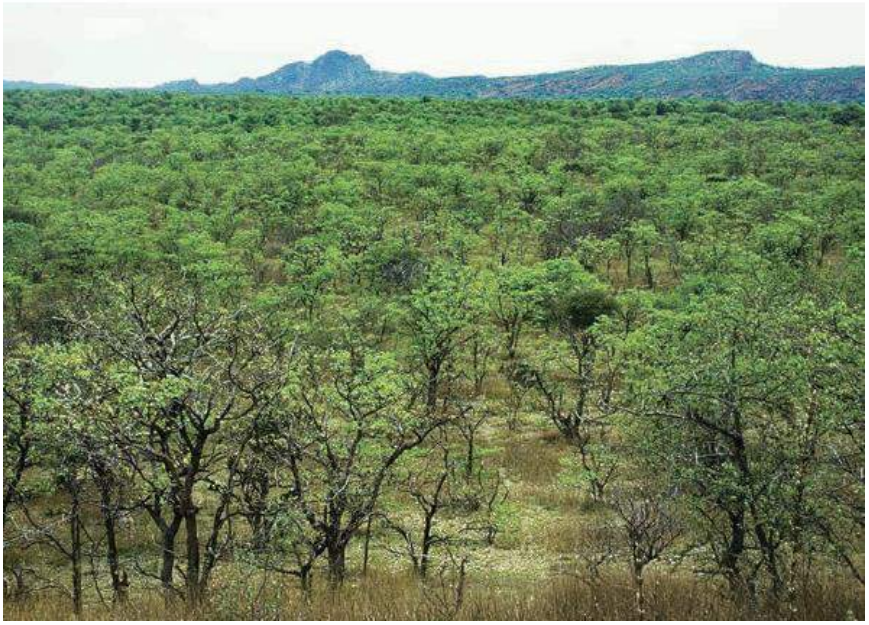


Plate 5, Musina Mopane Bushveld comprised of open woodland (extracted from Muncia and Rutherford). This is the most dominant vegetation type surrounding the site and is likely to provide a large degree of screening.

3.2 LANDSCAPE CHARACTER AREAS & VISUAL ABSOPTION 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.

- **Undulating Plains Landscape Character Area** is comprised of the undulating plains to the north of the Soutpansberg and south of the Limpopo River. It is largely covered with semi-natural bushveld. The LCA is likely to be largely used for low intensity grazing. There also appears to be 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.

- **Soutpansberg Landscape Character Area** which is comprised of the Soutpansberg mountain range to the south of the proposed site. The mountain slopes are vegetated but much of the valley floor is developed. The dominant element is the landform which will provide a high degree of VAC within this LCA.

- **Limpopo Valley Ridgelines Landscape Character Area** is comprised of the narrow ridgelines that run through the main valley to the north and south of the proposed site. The ridgelines are generally covered with natural bushveld. This LCA provides a moderate degree of VAC. It is likely to limit visibility within the surrounding undulating plain.

This initial landscape analysis is indicated on **Map 5**. It needs to be ground truthed during the assessment phase. It should be noted that the landform is the main character defining factor. The LCAs as indicated generally coincide with vegetation types which are largely dictated by topography.

No LCA analysis has been undertaken south of the Soutpansberg as this landform is likely to effectively block views.

3.3 LANDSCAPE QUALITY AND IMPORTANCE

3.3.1 Undulating Plains Landscape Character Area.

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

Due to topography and the natural vegetation cover which results in a high VAC, it is likely that there is capacity for limited development to occur without compromising these natural aesthetics as experienced by the majority of stakeholders.

3.3.2 Soutpansberg Landscape Character Area

This is undoubtedly the most dramatic LCA. The contrast between the wide undulating plains to the north and the rugged mountains provides a dramatic and memorable scene that underpins and provides potential for tourism related activities in the region. It is also likely to be critical to regional landscape character.

3.3.3 Valley Ridgelines Landscape Character Area

This LCA provides high points within the undulating plain. It punctuates the area with points of focus within what would otherwise be a relatively featureless landform. It also breaks up and provides separation and identity to the surrounding LCA. The natural aesthetics of this area are therefore likely to be important particularly for eco-tourism activities.

From a visual perspective, the most important LCAs are therefore the Soutpansberg and the lower Valley Ridgelines. These are the two characteristics that provide the regional and local landscape with identity. Any development that reduces or changes the existing natural ruggedness of these LCAs is likely to have negative visual implications.

The contrast between the Undulating Plains and the rugged upland areas is also critical, however, due to the extent of the plains and the degree of VAC that is likely to be provided by its natural vegetative cover, it is likely that a degree of development can occur before the landscape change as experienced by most stakeholders undermines the regional and local character.

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:

- Settlement Areas, particularly Mudimeli which is the closest settlements to the proposed development; and
- There are a number of Protected Areas to the north and east of the proposed site area. The closest include the Baobab Tree Reserve which is approximately 34km to the north east and the Honnet

Nature reserve which is approximately 34km to the east of the proposed site area.

Linear Receptors:

Linear receptors generally include routes through the area. Because there is such a focus on eco-tourism activities, it is likely that both major and minor routes could be important. It might 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 N1 which is the main regional arterial route that carries traffic from the Zimbabwe border crossing at Beitbridge and Gauteng. At its closest the N1 runs approximately 6km from the proposed site;
- Regional roads including the R525, the R572, the R508 and the R523. The closest regional road is the R525 which at its closest is approximately 10km from the proposed site; and
- Local Roads that are likely to be largely unsurfaced. A number of local roads run in close proximity to the proposed site area including one that runs between the two properties that make up the site area.

In addition to roads, there is a railway line that runs between the two properties that make up the site area. This section of the railway is likely to be largely carrying freight between Zimbabwe and South Africa. Passenger services in South Africa currently terminate at Messina and commence on the Zimbabwe side of the border at Beitbridge so it is also likely to carry passengers. Initial research indicates that none of the tourist trains such as the Blue Train use this route. The importance of the railway as a receptor is therefore likely to be relatively low.

Point Receptors,

Three hundred and eighty six point receptors have been identified from mapping and aerial photography within the approximate visual limit of the proposed development (50km). These include;

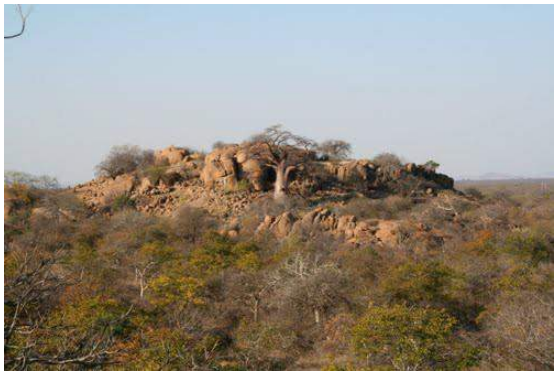
- Individual buildings that are likely to be mainly rural homesteads and farms. As indicated earlier however, it is possible that a proportion of these could include tourist lodges and accommodation; and
- Small groups of dwelling that are likely to include small settlement areas and larger farm establishments but may also include tourist bush camps.

Visual receptors will be subject to verification during the assessment phase. The main receptors that have been identified are indicated on **Map 5** which indicates the Landscape Character Areas as well as **maps 6 to 8** inclusive that indicate the initial assessment of Zones of Theoretical Visibility. This clearly highlights the receptors that are at greatest risk of being affected and need to be considered in detail during the site visit and assessment stage.

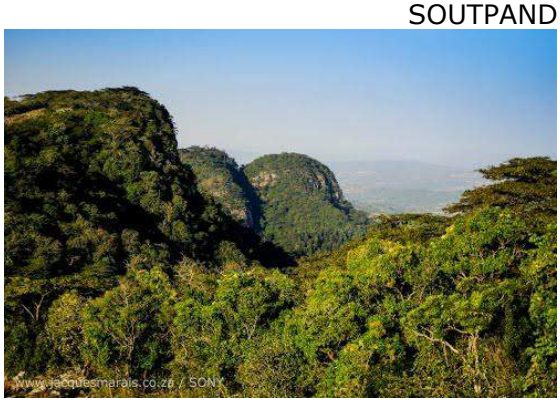
LANDSCAPE CHARACTER AREAS

UNDULATING PLAINS LCA

VALLEY RIDGELINE LCA

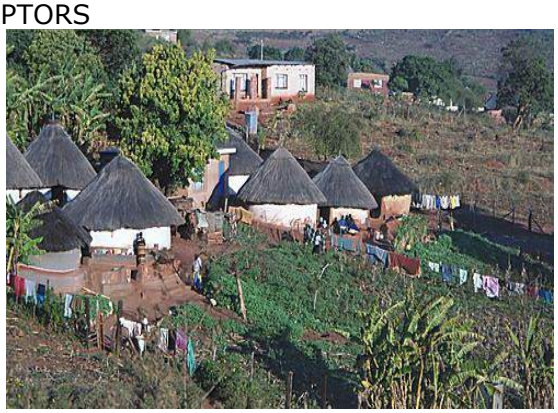


SOUTPANDBERG LCA



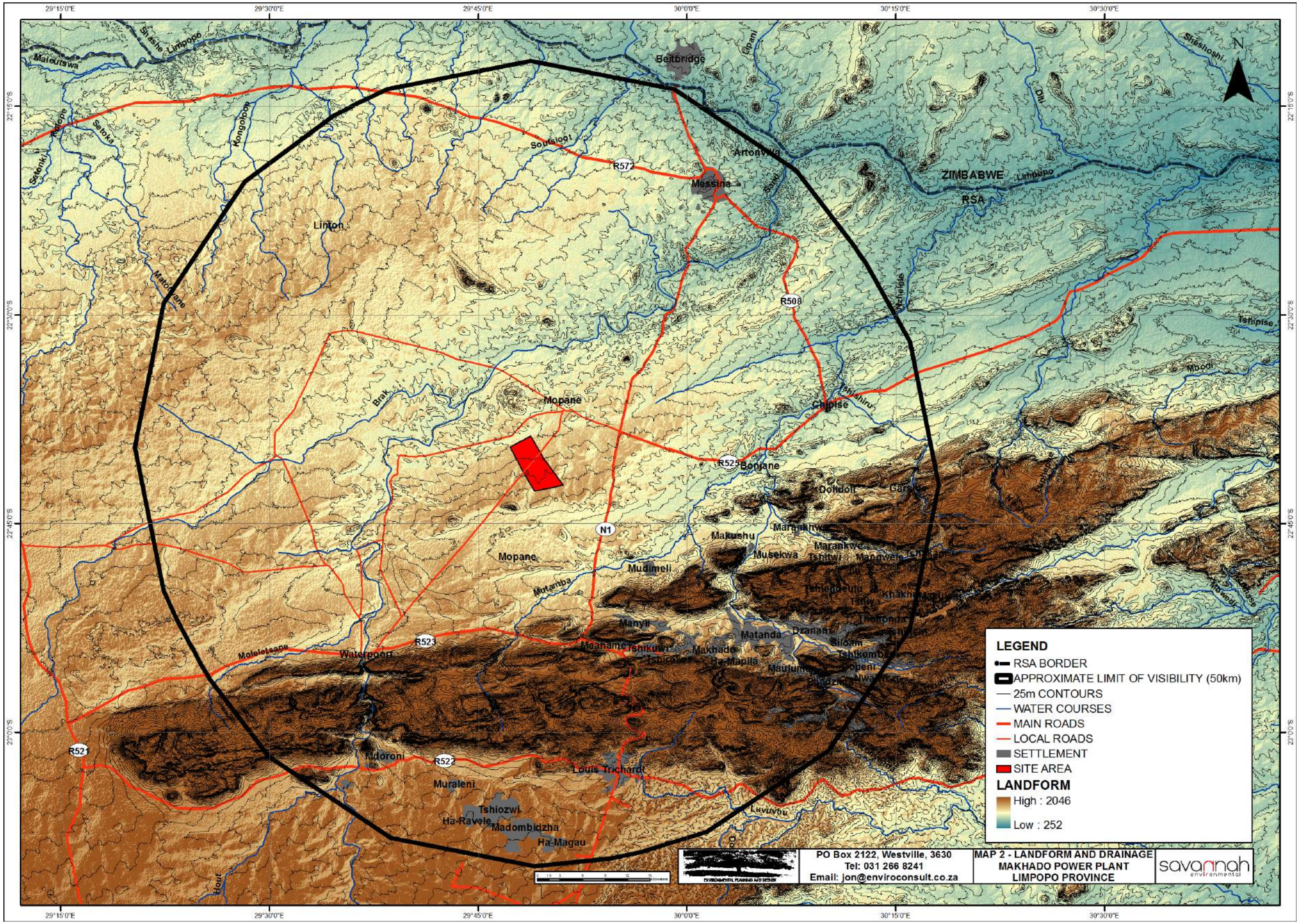
VISUAL RECEPTORS

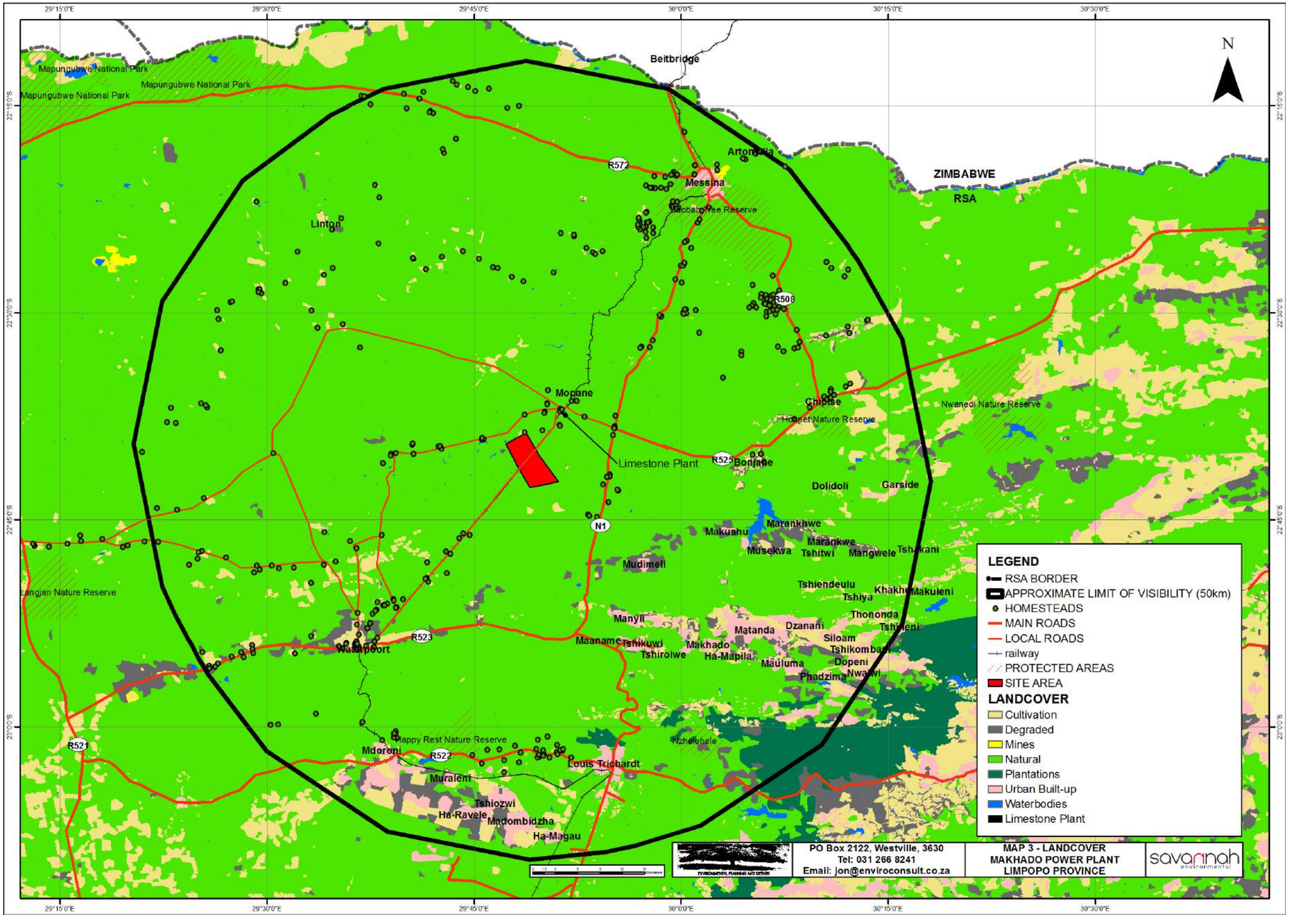
AREA RECEPTORS



POINT RECEPTORS

LINEAR RECEPTORS


LEGEND
RSA BORDER
APPROXIMATE LIMIT OF VISIBILITY (50km)
25m CONTOURS
WATER COURSES
MAIN ROADS
LOCAL ROADS
SETTLEMENT
SITE AREA
LANDFORM
High : 2046
Low : 252
PO Box 2122, Westville, 3630
Tel: 031 266 8241
Email: jon@enviroconsult.co.za
MAP 2 - LANDFORM AND DRAINAGE
MAKHADO POWER PLANT
LIMPOPO PROVINCE
savannah
environmental
N
ZIMBABWE
RSA
Beitbridge
Messina
Artonvilla
Linton
Mopane
Bonjane
Chipise
Makushu
Musekwa
Mudimeli
Waterpoort
Manyii
Matanda
Dzanani
Makhado
Louis Trichardt
Mdoroni
Muraleni
Tshiozwi
Ha-Ravele
Madombidzha
Ha-Magau
R572
R508
R525
N1
R523
R522
R521
29°15'0"E
29°30'0"E
29°45'0"E
30°0'0"E
30°15'0"E
30°30'0"E
22°15'0"S
22°30'0"S
22°45'0"S
23°0'0"S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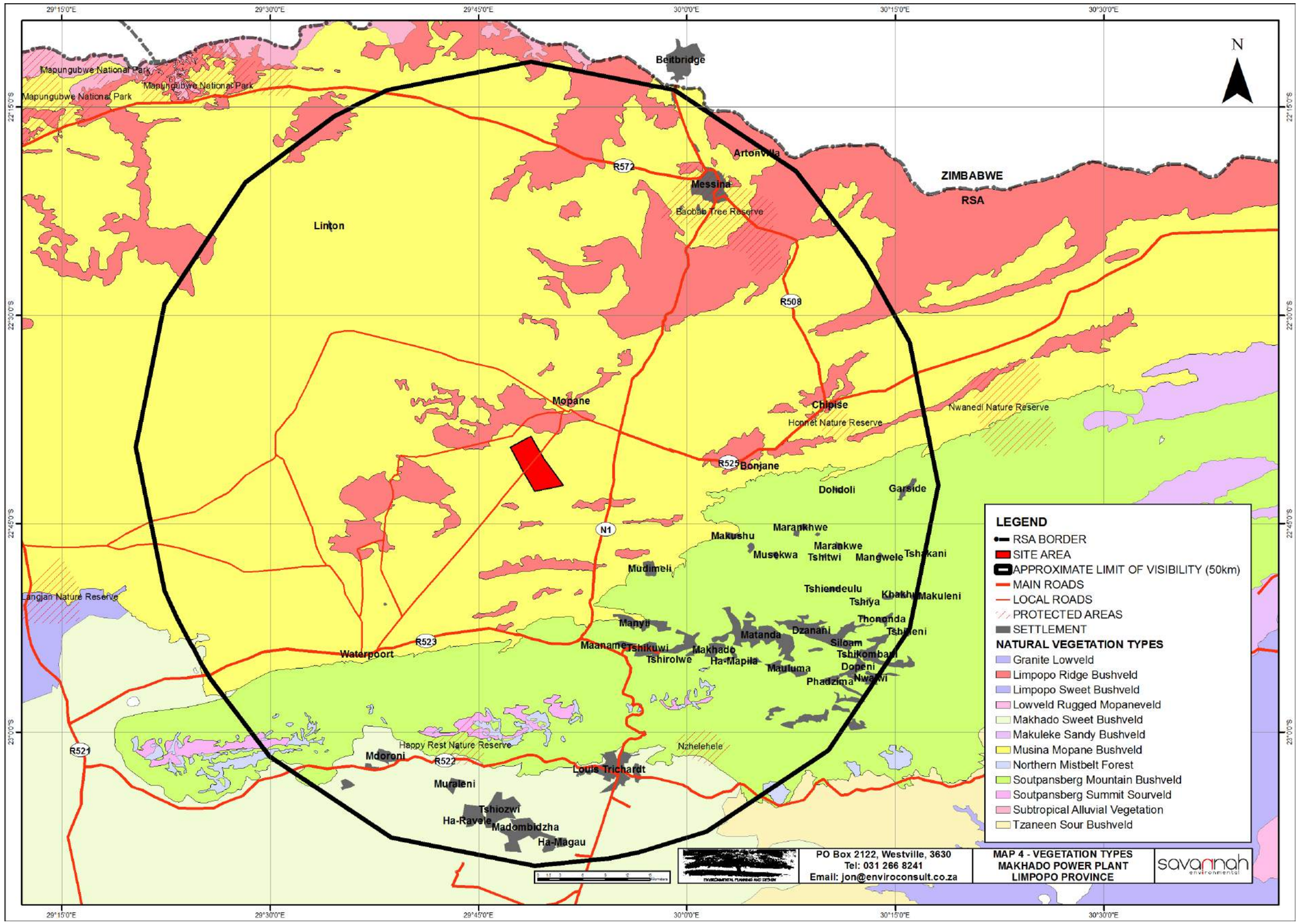
N
Beitbridge
Mapungubwe National Park
Mapungubwe National Park
Mapungubwe National Park
R572
Messina
Artonville
ZIMBABWE
RSA
Kobabonwee Reserve
Linton
R508
Mopane
Chipise
Nwanedi Nature Reserve
Honet Nature Reserve
Limestone Plant
R529
Bonjane
Dolidoli
Garside
N1
Makushu
Marankhwe
Musekwa
Marankwe
Tshitwi
Mangwele
Tshakani
Mudimeli
Langjan Nature Reserve
Tshiendeulu
Khakhu
Makuleni
Tshiya
Thononda
Manyii
Matanda
Dzanani
Tshileni
Siloam
Maanamer
Tshikuwi
Tshirolwe
Makhado
Ha-Mapila
Tshikombani
Dopeni
Mauluma
Nwamwi
Phadzima
R523
Nwanedi
Happy Rest Nature Reserve
R521
Mdoreni
R522
Louis Trichardt
Nzhelehele
Muraleni
Tshiozwi
Ha-Ravele
Madombidzha
Ha-Magau
LEGEND
RSA BORDER
APPROXIMATE LIMIT OF VISIBILITY (50km)
HOMESTEADS
MAIN ROADS
LOCAL ROADS
railway
PROTECTED AREAS
SITE AREA
LANDCOVER
Cultivation
Degraded
Mines
Natural
Plantations
Urban Built-up
Waterbodies
Limestone Plant
PO Box 2122, Westville, 3630
Tel: 031 266 8241
Email: jon@enviroconsult.co.za
MAP 3 - LANDCOVER
MAKHADO POWER PLANT
LIMPOPO PROVINCE
savannah environmental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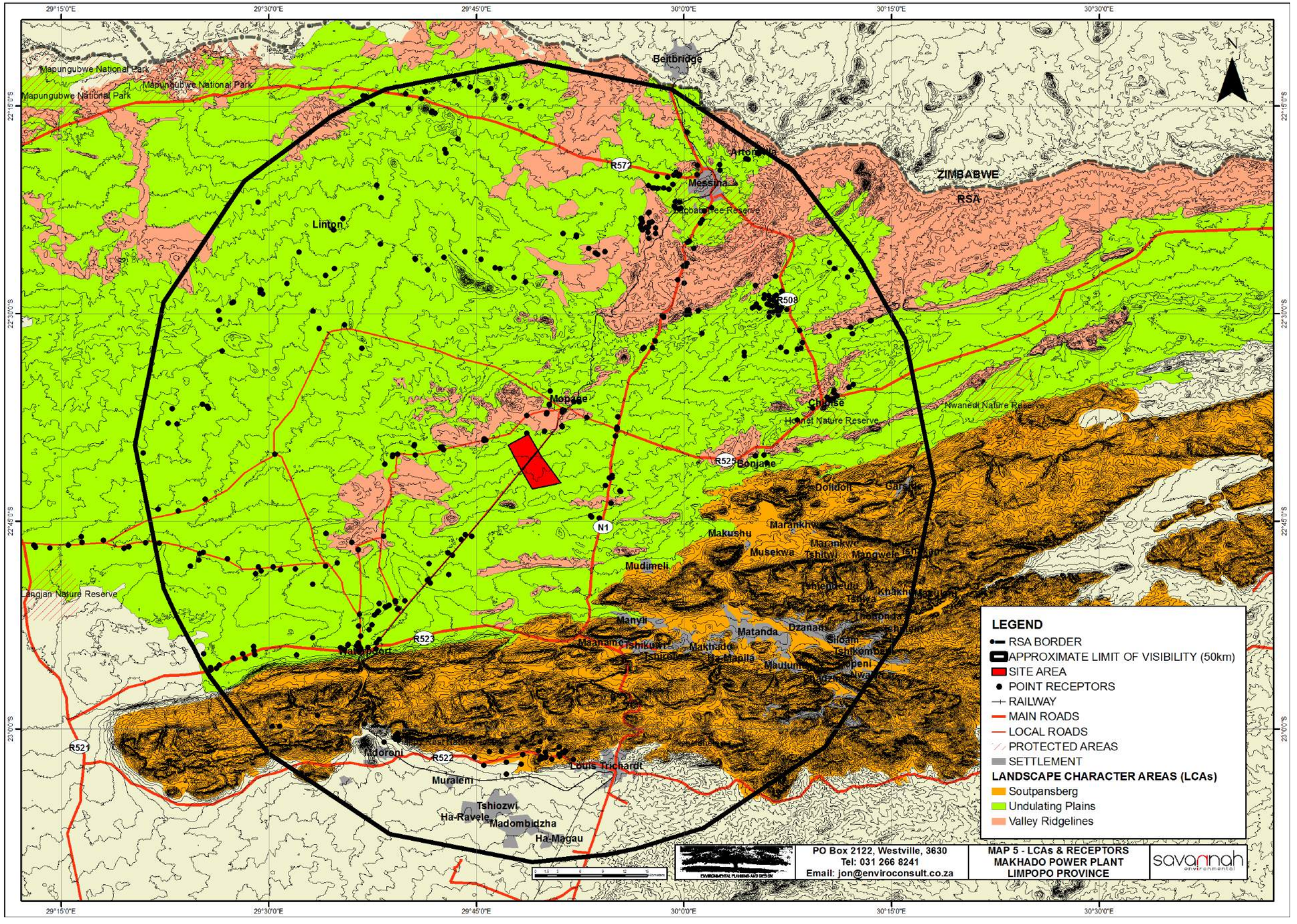
Beitbridge
Mapungubwe National Park
Mapungubwe National Park
Mapungubwe National Park
Artonville
R572
Messina
Baobab Tree Reserve
ZIMBABWE
RSA
Linton
R508
Mopane
Chipise
Honnet Nature Reserve
Nwanedi Nature Reserve
R525
Bonjane
Dolidoli
Garside
N1
Marankhwe
Makushu
Marankwe
Musekwa
Tshitwi
Mangwele
Tshikani
Mudimeli
Tshiendeulu
Tshiya
Khakhu
Makuleni
Thononda
Tshileni
Manyii
Matanda
Dzanani
Siloam
Tshikombani
Dopeni
Nwami
Phadzima
Mauluma
Maanani
Tshikuwi
Tshirolwe
Makhado
Ha-Mapila
Langjan Nature Reserve
Waterpoort
R523
R521
Happy Rest Nature Reserve
Mdoroni
R522
Muraleni
Louis Trichardt
Nzhelehele
Tshiozwi
Ha-Ravele
Madombidzha
Ha-Magau
LEGEND
RSA BORDER
SITE AREA
APPROXIMATE LIMIT OF VISIBILITY (50km)
MAIN ROADS
LOCAL ROADS
PROTECTED AREAS
SETTLEMENT
NATURAL VEGETATION TYPES
Granite Lowveld
Limpopo Ridge Bushveld
Limpopo Sweet Bushveld
Lowveld Rugged Mopaneveld
Makhado Sweet Bushveld
Makuleke Sandy Bushveld
Musina Mopane Bushveld
Northern Mistbelt Forest
Soutpansberg Mountain Bushveld
Soutpansberg Summit Sourveld
Subtropical Alluvial Vegetation
Tzaneen Sour Bushveld
PO Box 2122, Westville, 3630
Tel: 031 266 8241
Email: jon@enviroconsult.co.za
MAP 4 - VEGETATION TYPES
MAKHADO POWER PLANT
LIMPOPO PROVINCE
savannah environmental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22°30'0"S
22°45'0"S
23°0'0"S
N
Mapungubwe National Park
Mapungubwe National Park
Mapungubwe National Park
Beitbridge
Artonville
Messina
Baobab Tree Reserve
ZIMBABWE
RSA
R572
Linton
R508
Mopane
Chuniespoort
Hornet Nature Reserve
Nwanedi Nature Reserve
R529
Bonjane
Dolidoli
Garsfontein
Makushu
Marankhiwe
Musekwa
Tshitwi
Mangwele
Mudimeli
Langjan Nature Reserve
Manyii
Matanda
Dzanani
Maahlamé
Tshikuwi
Tshirolo
Makhado
Ha-Mapila
Siloam
Tshikombani
Mpeni
Nwamitwa
R523
N1
R521
Louis Trichardt
Idoroni
R522
Muraleni
Tshiozwi
Ha-Ravele
Madombidzha
Ha-Magau
LEGEND
RSA BORDER
APPROXIMATE LIMIT OF VISIBILITY (50km)
SITE AREA
POINT RECEPTORS
RAILWAY
MAIN ROADS
LOCAL ROADS
PROTECTED AREAS
SETTLEMENT
LANDSCAPE CHARACTER AREAS (LCAs)
Soutpansberg
Undulating Plains
Valley Ridgelines
PO Box 2122, Westville, 3630
Tel: 031 266 8241
Email: jon@enviroconsult.co.za
MAP 5 - LCAs & RECEPTORS
MAKHADO POWER PLANT
LIMPOPO PROVINCE
savannah environmental

4 THE NATURE OF POTENTIAL VISUAL IMPACTS

4.1 GENERAL

Impacts could include general landscape change or 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. Generally 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 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".

Initial ZVT maps have been prepared for the various elements of the proposed development that are identified in section 2.2 including; extremely tall elements that such as cooling towers and stacks that could be between 150 – 200m high, moderately tall elements that include the Power Plant, Silos, the Ash Dump that could be up to 50m high and Low elements that include the coal stockpile, conveyors, offices / workshops and the substation that could be up to 20m high.

As site layouts have not been provided at the time of reporting, it was assumed that the various elements within the power station sites could be located at any point within the site. It is possible therefore that the ZTV areas will reduce marginally when exact locations are assessed.

It should be noted that overhead power lines that will be necessary to tie into the grid have not been assessed as these will be assessed under a separate application.

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 NASSA and is freely available on the CIAT-CCAFS website (http://www.cgiar-csi.org).

The GIS Assessment does not take the curvature of the earth into account. In order to provide an indication of the likely limit of visibility due to this effect a universally accepted navigational formula (**appendix II**) 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 distances;

ELEMENT	APPROXIMATE LIMIT OF VISIBILITY
Extremely tall elements up to 200m high	50 kilometres (maximum visibility of overall development)
Moderately tall elements up to 50m high	25 kilometres
Low elements up to 20m high	16 kilometres

In reality these distances 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. This is most likely to be the case for the proposed sub station as the higher elements, particularly cables and pylons will have a relatively small section.

4.2.1 Likely Visibility of the proposed elements

Maps 6 to 8 inclusive indicate the likely ZTVs of the various elements identified above.

a) **Extremely tall elements (stacks)** are likely to be visible from the site to the limit of visibility to the east. To the north views will be limited to approximately 30km and from the east limited to approximately 24km by minor ridgelines. Outside which occasional glimpses of the stacks may be possible to the approximate limit of visibility (50km). From the south views will be possible over a distance of approximately 24km outside which views of the development will be screened by the Soutpansberg mountain range. The assessment indicates that the stacks could be visible from limited sections of the Baobab Tree Reserve and the majority of the Honnet Nature Reserve which appears to be largely located on a local high point. They will also be visible from approximately 24km of the N1, approximately 6km of the R525, 11km of the R523, 34km of the adjacent railway and extensive

sections of local roads. There are also approximately 58 point receptors within the ZTV that are likely to largely consist of homesteads.

b) Moderately tall elements are likely to be visible in a band that runs roughly south west to north east extending approximately 13km to the north east, 12km to the south west and approximately 2.5km to the north and south of the proposed site. To the north east, north and south views outside these limits are almost completely screened by local ridgelines with the exception of views from higher sections of the Soutpansberg approximately 16km to the south of the site. To the south west and north-west views will partially screened by local ridgelines meaning that occasional views may be possible to the approximate imit of visibility (25km). In terms of receptors, these elements are likely to be visible to approximately 7km of the N1, 3km of the R525, and approximately 15km of an adjacent local road and railway. There are also approximately 13 point receptors that are likely to largely consist of homesteads that may be affected.

c) **Low elements** are likely to be visible over a relatively limited area extending approximately 6km to the north east, 2km to the south east, 2km to the north and 1km to the south. Outside this area, occasional views may be possible from the north east and south west extending to the approximate limit of visibility (16km). In terms of receptors, views are likely to be possible from approximately 16km of local roads and 12km of the railway. There are also approximately 9 point receptors that are likely to largely consist of homesteads that may be affected.

4.3 LIKELY IMPLICATIONS FOR LANDSCAPE CHARACTER

Due to height, the extremely tall elements associated with the proposed power station are likely to be highly visible. **Plate 6** is a view of the existing Matimba Power Station from a position close to the limit approximate limit of visibility. This both justifies the limits set and provides an indication of the nature of long range views; if the viewer were within the bushveld beneath the elevated viewpoint, it is doubtful that the power station would be visible, it is only when the viewer is elevated above the natural vegetation that the large structures on the horizon become obvious. It might be argued that in general terms this is unlikely to spoil a visitors experience of the landscape.

Plate 6, View of Matimba Power Station from an elevated view point approximately 45km to the east

As the viewer moves closer to the development however, the impact is likely to increase in areas where the views or the facility are possible either along vistas provided by roads or other cleared areas or where the viewer is elevated above natural vegetation. The influence of lower elements within the development will also increase. It will be important to identify the limit, beyond which these taller elements impose a built / industrial character which negates the natural experience. This can only be achieved from on-site analysis.

In addition impacts on the enjoyment of the natural areas of the landscape, the proposed development will be located close to settlement areas. These urban areas are currently not impacted by existing large scale industry however, distance and screening provided by buildings and vegetation is likely to minimise impacts from most settlement areas.

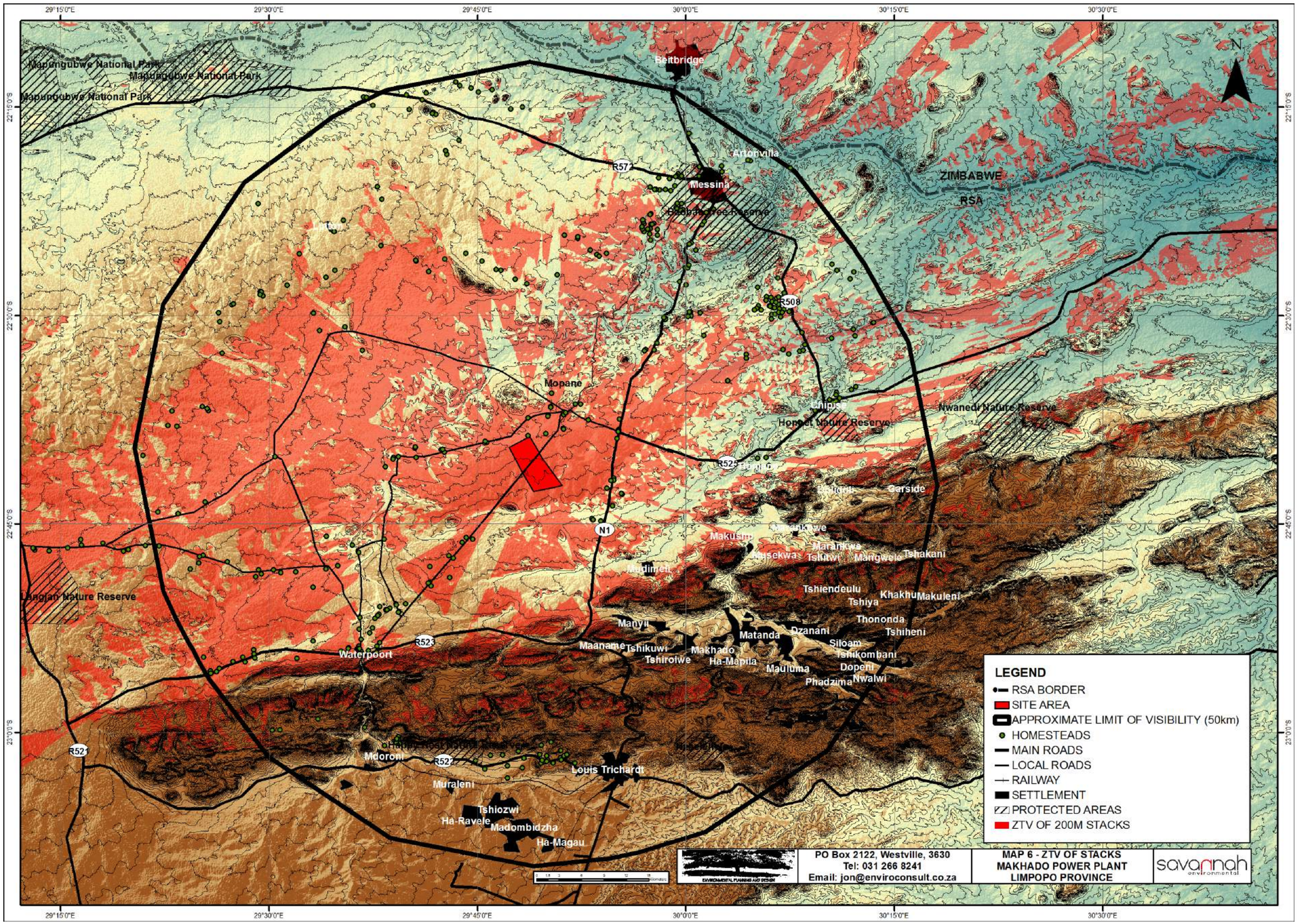
4.4 POSSIBLE IMPLICATIONS FOR VISUAL RECEPTORS

The analysis undertaken indicates that;

- The proposed Power Station could be visible to an extensive area of the Undulating Plain LCA. It should be noted however that due to the many minor ridgelines that surround the development area, only the exceptionally tall elements such as the stacks may be visible from a wider area, all other elements are likely to be screened or part screened by the local landform. This area is a relatively natural landscape that is important for grazing and eco-

tourism. It is possible that the introduction of an industrial component within the landscape could make areas from which the development is obvious unattractive for ecotourism. It is anticipated that the degree to which the minor ridgelines surrounding the proposed development reduces this impact is likely to be critical in minimising this impact.

- The proposed Power Station is likely to be visible to the majority of surrounding Valley Ridgelines LCA. This area is likely to be a relatively natural landscape where shallower gradients are used for low intensity grazing and possibly eco-tourism. Views over the development are likely to be possible. The introduction of a new large scale industrial component into views could make affected areas unattractive for ecotourism.
- The proposed power station is likely to be visible from the higher areas of the Soutpansberg approximately 16km to the south. At this distance, lower and smaller elements are likely to blend into the landscape. Larger elements including the power plant and stacks are however likely to be obvious during most weather conditions.
- The proposed Power Station is unlikely to be highly obvious to settlement areas due to distance and the likelihood that buildings and vegetation will help to soften / screen views.
- The proposed Power Station is likely to be visible from both major and minor routes through the area that could be important for tourism. The roads that are likely to be most heavily impacted include the N1, the R525 and two local roads closest to the proposed development. The extent to which the development will be visible will depend on the alignment of the route relative to the development, the distance from the development as well as the nature of surrounding vegetation.
- The proposed development could be visible from the Baobab Tree Nature Reserve as well as the Honnet Nature Reserve. However, distance and vegetation within and surrounding the reserves is likely to provide significant mitigation. Views are only likely to be obvious in areas where views over surrounding vegetation are possible. This is most likely to occur within the Honnet Nature Reserve which appears to be located on higher land.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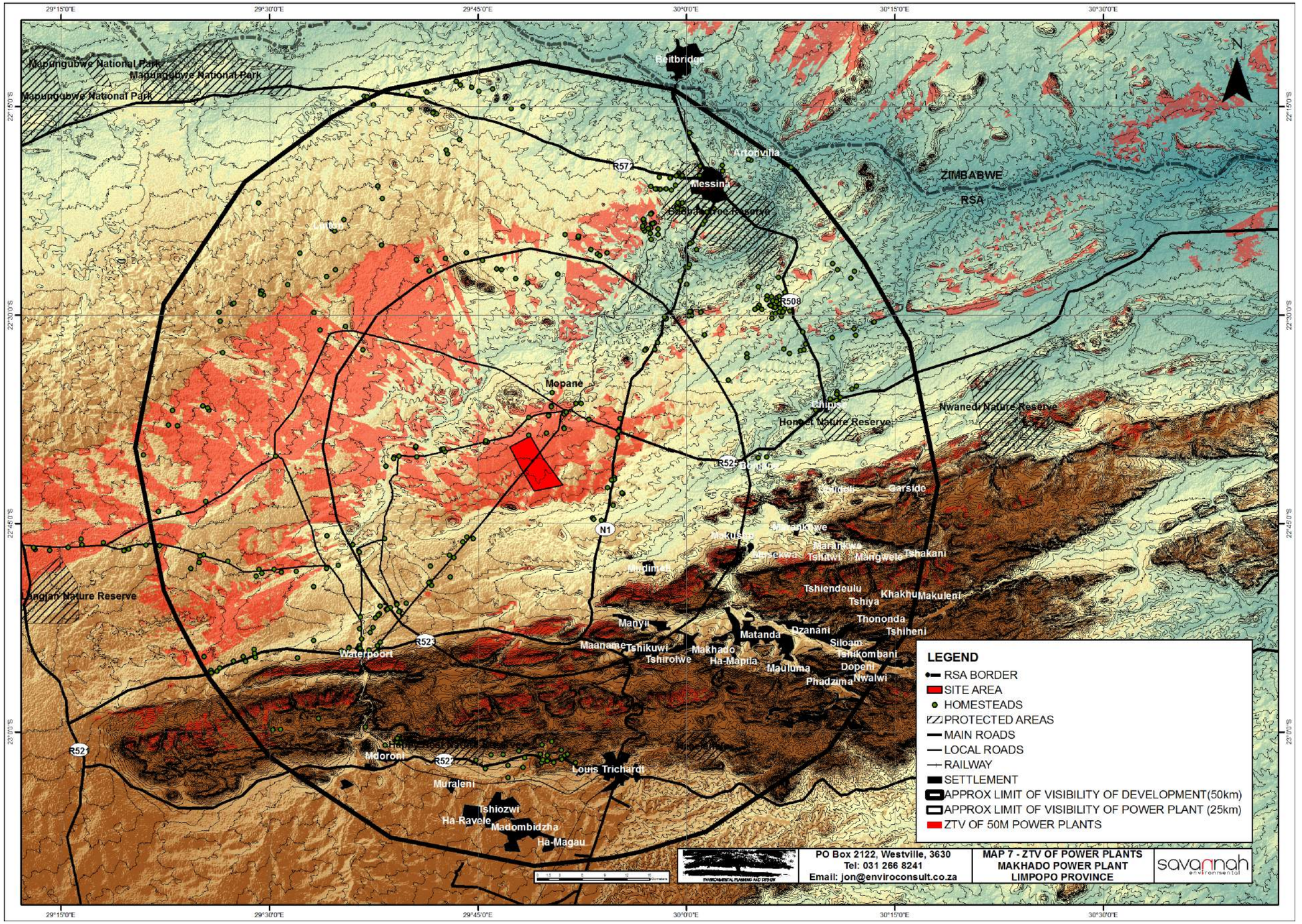
Mapungubwe National Park
Mapungubwe National Park
Mapungubwe National Park
Beitbridge
Artonvilla
Messina
ZIMBABWE
RSA
Limpopo Nature Reserve
R572
R508
R525
N1
R523
R521
Mopane
Nwanedi Nature Reserve
Honeot Nature Reserve
Garside
Makuleke
Tshiendeulu
Khakhu
Makuleni
Tshiya
Thononda
Tshiheni
Dzanani
Matanda
Siloam
Tshikombani
Dopeni
Nwalwi
Phadzima
Maluluma
Makhado
Ha-Mapila
Maanamer
Tshikuwi
Tshirolwe
Manyii
Waterpoort
Louis Trichardt
Muraleni
Tshiozwi
Ha-Ravele
Madombidzha
Ha-Magau
Mdoroni
Langjan Nature Reserve
LEGEND
RSA BORDER
SITE AREA
APPROXIMATE LIMIT OF VISIBILITY (50km)
HOMESTEADS
MAIN ROADS
LOCAL ROADS
RAILWAY
SETTLEMENT
PROTECTED AREAS
ZTV OF 200M STACKS
PO Box 2122, Westville, 3630
Tel: 031 266 8241
Email: jon@enviroconsult.co.za
MAP 6 - ZTV OF STACKS
MAKHADO POWER PLANT
LIMPOPO PROVINCE
savannah environmental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Mapungubwe National Park
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Mapungubwe National Park
Beitbridge
Musina
Messina
ZIMBABWE
RSA
Limpopo
Mopane
Nwanedi Nature Reserve
Hornet Nature Reserve
Garside
Tshakani
Mangwele
Tshiendeulu
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Thononda
Tshiheni
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Dzanani
Siloam
Tshikombani
Dopeni
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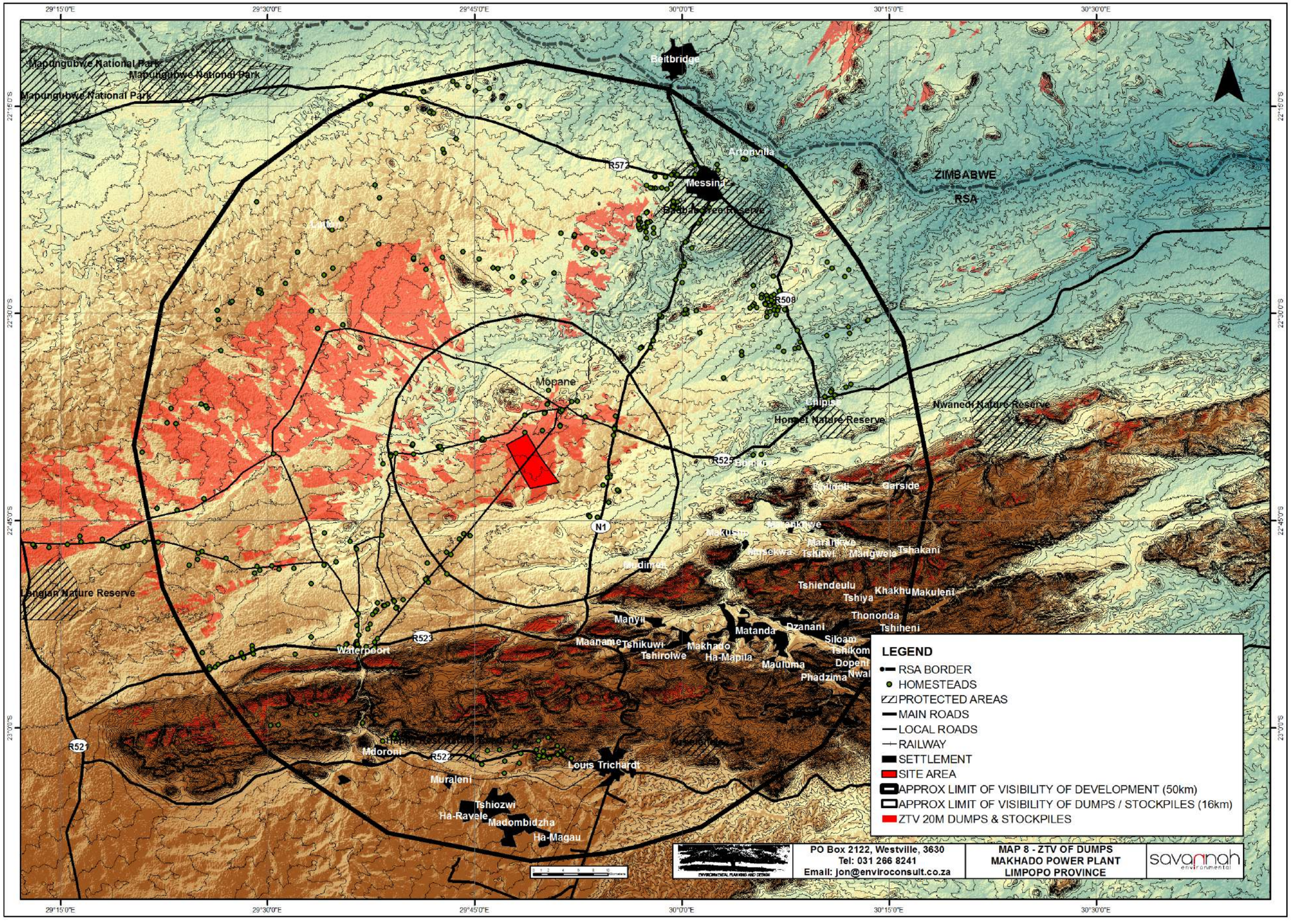
Mauluma
Makhado
Ha-Mapila
Maanane
Tshikuwi
Tshirolwe
Manyii
Waterpoort
Anglan Nature Reserve
Mdoroni
Louis Trichardt
Muraleni
Tshiozwi
Ha-Ravele
Madombidzha
Ha-Magau
R572
R508
R529
R523
R522
R521
N1
LEGEND
RSA BORDER
SITE AREA
HOMESTEADS
PROTECTED AREAS
MAIN ROADS
LOCAL ROADS
RAILWAY
SETTLEMENT
APPROX LIMIT OF VISIBILITY OF DEVELOPMENT(50km)
APPROX LIMIT OF VISIBILITY OF POWER PLANT (25km)
ZTV OF 50M POWER PLANTS
PO Box 2122, Westville, 3630
Tel: 031 266 8241
Email: jon@enviroconsult.co.za
MAP 7 - ZTV OF POWER PLANTS
MAKHADO POWER PLANT
LIMPOPO PROVINCE
savannah environmental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Mapungubwe National Park
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Mopane
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Hamel Nature Reserve
Garside
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Tshiendeulu
Khakhu
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Tshiya
Thononda
Tshiheni
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Ha-Mapila
Maanamel
Tshikuwi
Tshirolwe
Manyii
Waterpoort
Louis Trichardt
Muraleni
Tshiozwi
Ha-Ravele
Madombidzha
Ha-Magau
Mdoroni
LEGEND
RSA BORDER
HOMESTEADS
PROTECTED AREAS
MAIN ROADS
LOCAL ROADS
RAILWAY
SETTLEMENT
SITE AREA
APPROX LIMIT OF VISIBILITY OF DEVELOPMENT (50km)
APPROX LIMIT OF VISIBILITY OF DUMPS / STOCKPILES (16km)
ZTV 20M DUMPS & STOCKPILES
PO Box 2122, Westville, 3630
Tel: 031 266 8241
Email: jon@enviroconsult.co.za
MAP 8 - ZTV OF DUMPS
MAKHADO POWER PLANT
LIMPOPO PROVINCE
savannah environmental

5 RECOMMENDED ASSESSMENT METHODOLOGY

5.1 REQUIREMENTS IN ACCORDANCE WITH THE WESTERN CAPE GUIDELINES

The criterion recommended by the Western Cape Guidelines for justification of level of input for a VIA is the expected level of visual impact. This categorisation is derived from the following matrix;

Type of environment	Type of development (see Box 3) Low to high intensity				
	Category 1 development	Category 2 development	Category 3 development	Category 4 development	Category 5 development
Protected/wild areas of international, national, or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high scenic, cultural, historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected
Areas or routes of medium scenic, cultural or historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected
Areas or routes of low scenic, cultural, historical significance / disturbed	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected
Disturbed or degraded sites / run-down urban areas / wasteland	Little or no visual impact expected. Possible benefits	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

The categorisation of development is indicated below;

Category 1 development:
e.g. nature reserves, nature-related recreation, camping, picnicking, trails and minimal visitor facilities.

Category 2 development:
e.g. low-key recreation / resort / residential type development, small-scale agriculture / nurseries, narrow roads and small-scale infrastructure.

Category 3 development:
e.g. low density resort / residential type development, golf or polo estates, low to medium-scale infrastructure.

Category 4 development:
e.g. medium density residential development, sports facilities, small-scale commercial facilities / office parks, one-stop petrol stations, light industry, medium-scale infrastructure.

Category 5 development:
e.g. high density township / residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large-scale infrastructure generally. Large-scale development of agricultural land and commercial tree plantations. Quarrying and mining activities with related processing plants.

The proposed development is a Category 5 development.

The appropriate level of assessment will be subject to the quality of the existing landscape. A site visit is required in order to confirm this, however from aerial photography, it appears unlikely that the landscape is degraded or wasteland. Either a high or very high impact might therefore be expected indicating that a Level 4 assessment in accordance with the Western Cape Guidelines should be undertaken.

From experience of projects in the region, it seems likely that existing vegetation may provide significant mitigation over a substantial area of the identified ZTV. If this should prove to be the case then impacts might be considered to be moderate and a lesser (Level 3) assessment might be considered appropriate.

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;

- As per Level 3 assessment, plus complete 3D modelling and simulations, with and without mitigation.
- Review by independent, experienced visual specialist (if required).

It is proposed that the assessment stage is commenced as a Level 3 Assessment. If the proposed development is found to have significant impacts on the Undulating Plain LCA or on surrounding land uses, then the assessment will be elevated to Level 4.

Confirmation of the need for a review by a second independent specialist is required from the Relevant Authority.

5.2 IMPACTS TO BE CONSIDERED

From the review of the proposed projects, it is proposed that the following issues should be addressed during the assessment;

a) The proposed development could negatively impact on the character of the Undulating Plain LCA which is largely a natural landscape which may be an important tourism resource.
b) The proposed development could impact negatively on the Valley Ridgeline and the Soutpansberg upland areas that overlook the Undulating Plain. Levels

of impact will be subject to distance and there being viewpoints overlooking the site.

c) The proposed development could be visible from tourist routes in the area. These include the N1, the R525 and local roads that may be used for access to lodges and private reserves / game farms that might be utilised for tourism.

d) The proposed development could impact on views from trains as they pass close to the proposed development. A proportion of these trains are likely to carry passengers although it is understood that major tourism related trains do not utilise this route.

e) The proposed development could impact negatively on the formally protected areas including the Baobab Tree Reserve and the Honnet Nature Reserve. It is likely that distance and local vegetation will mitigate impacts on these resources.

f) The proposed development could impact negatively on settlement. However, it is likely that distance and local vegetation will mitigate these impacts.

g) The proposed development could impact negatively on local point receptors. These are likely to be comprised largely of homesteads but it is also highly likely that a number of these have been developed for tourism purposes.

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.

Possible mitigation measures will also be identified.

6.2.1 Initial Assessment of Likely Impacts

Impact
a) Visual impact on Undulating Plain LCA possibly affecting eco-tourism uses.

Desktop Sensitivity Analysis of the Site:

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Industrialisation of a natural landscape	The affected landscape appears to be relatively natural with few areas impacted by other heavy industrial operations. There is however a limestone quarry approximately 5km to the north east of the proposed site. It is therefore possible that the proposed development could change the nature of the local landscape through the introduction of a new large scale industrial development.	The development could impact up to 50km from the site. However, it is likely that landform and local vegetation will provide significant mitigation which could result in major impact areas being relatively limited. Glimpses of taller elements are however likely to be possible for substantial	No no-go areas are obvious from the desk top review, however, a site visit is required to confirm this.

		distances.	

Description of expected significance of impact

The proposed Power Station could be visible to an extensive area (up to 50km) of the Undulating Plain LCA. It should be noted however that due to the many minor ridgelines that surround the development area, only the exceptionally tall elements such as the stacks may be visible from a wider area, all other elements are likely to be screened or part screened by the local landform limiting their visibility to 2 – 6 km.

It is therefore anticipated that the visual absorption capacity of the landscape is high and is likely to provide significant mitigation resulting in generally low levels of impact.

Gaps in knowledge & recommendations for further study

Layout and heights of proposed elements.

Confirmation of landscape character, VAC and sensitive areas from a site visit.

Impact

b) Visual impact on the Upland LCAs including Valley Ridgelines and the Soutpansberg.

Desktop Sensitivity Analysis of the Site:

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Industrialisation of a natural landscape	The proposed development could erode the feeling of overlooking a natural landscape from ridgelines and the Soutpansberg. The affected landscape appears to be relatively natural with few areas impacted by other heavy industrial operations. All elements of the proposed development are only likely to be visible from the closest ridgelines. Only the taller elements are likely to be visible from the majority of minor ridgelines and the Soutpansberg which is approximately 20km to the south.	This is likely to be a local impact as the closer ridgelines are likely to be most affected most. It is possible however that the Soutpansberg may be affected. As this area has regional importance and due to distance, this could elevate the issue to regional importance.	No no-go areas are obvious from the desk top review, however, a site visit is required to confirm this.

Description of expected significance of impact

The closer that the viewer is to the development then the greater the influence that the development is likely to have on landscape character.

From a distance, views of the development, particularly when viewing from the south and into the sun which is likely from the Soutpansberg, the lower elements are likely to blend with the background particularly if colours are neutral.

From closer viewpoints, it is possible that the entire development might be obvious. There is however only one local ridgeline which is approximately 4.5km to the north that is likely to be exposed to this level of impact.

It is possible therefore that impacts could be relatively high, however distance and the screening effect of existing vegetation is likely to help provide a degree of mitigation.

It is therefore anticipated that the visual absorption capacity of the landscape will generally mitigate impacts to a low level. It is possible however that isolated ridgelines could be exposed to a high level of impact.

Gaps in knowledge & recommendations for further study

Layout and heights of proposed elements.
Confirmation of landscape character, VAC and sensitive areas from a site visit.

Impact

c) Visual impact on routes used by tourists travelling through the area and to local tourism attractions / establishments.

Desktop Sensitivity Analysis of the Site:

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Industrialisation of views from urban areas	The affected landscape appears to be relatively natural with few major development areas that are likely to detract from this perception. The proposed development will introduce a large scale industrial development into the landscape which will influence landscape character.	This is likely to be largely a local impact. However, it is possible that an effect may be experienced at a regional level.	No no-go areas are obvious from the desk top review, however, a site visit is required to confirm this.

Description of expected significance of impact

Due to existing vegetation, it is thought that visibility of the bulk of the development is likely to be relatively localised and focused within a small area surrounding the plant. This needs to be confirmed through a site visit however.

The assessment indicates that moderately tall elements which includes the power plants will be visible for 7km of the N1, 3km of the R525, and approximately 15km of an adjacent local road and railway

Whilst areas of highest impact are likely to be experienced close to the plant, views of taller elements are likely to be possible over a long distance. These views are likely to be fleeting and towards the limit of visibility (50km) the development whilst visible may not be obvious unless the viewer is intentionally looking for the development.

Because the impact is anticipated to be relatively localised, it seems likely that travellers on the closest section of the N1 and two local roads are likely to experience the greatest levels of impact.

The N1 is likely to carry a high proportion of tourism related traffic. The nature of traffic on affected local roads is unknown and will depend on the nature of land uses that the roads serve.

The impact is therefore subject to the nature of traffic and the degree of visual exposure. There is potential for a high level of impact, however, it is likely that existing vegetation will help screen or at least soften impacts. On site assessment needs to be undertaken to gauge the extent of roads that will be affected.

Gaps in knowledge & recommendations for further study

Layout and heights of proposed elements.
Confirmation of landscape character, VAC and sensitive areas from a site visit.

Impact

d) Visual impact on travellers on trains travelling to and from Zimbabwe.

Desktop Sensitivity Analysis of the Site:

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Industrialisation of views from urban areas	The affected landscape appears to be relatively natural with few major development areas that are likely to detract from this perception. The proposed development will introduce a large scale industrial	This is likely to be largely a local impact.	No no-go areas are obvious from the desk top review, however, a site visit is required to confirm this.

	development into the landscape which will influence landscape character which will be obvious from passing trains.		

Description of expected significance of impact

The location of the development relative to the railway is unknown, it is possible that elements of the power station could be obvious on either side of the track.

The impact therefore might be relatively high although in the context of the journey, the impact will be experienced for a relatively short duration.

There is possibly potential within the proposed development site to locate the development in such a way that existing vegetation will help screen or at least soften impacts.

Gaps in knowledge & recommendations for further study

Layout and heights of proposed elements.

Confirmation of landscape character, VAC and sensitive areas from a site visit.

Impact

e) Visual impact on formally protected areas including the Baobab Tree Reserve and the Honnet Nature Reserve.

Desktop Sensitivity Analysis of the Site:

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Industrialisation of a natural landscape	It is possible that teh introduction of a large scale industrial development into the view as seen from protected areas could spoil enjoyment of the natural landscape for visitors.	Due to distance and the importance of protected areas, this impact may be experienced at a regional level.	No no-go areas are obvious from the desk top review, however, a site visit is required to confirm this.

Description of expected significance of impact

These protected areas are some 34km from the proposed development site.

Due to distance and to screening that is likely to be provided by intervening vegetation it is likely that only the taller elements may impact on these areas.

Vegetation within protected areas is also likely to screen views towards the proposed development.

Both protected areas are set at a slightly lower elevation than the proposed site which is likely to result in optimisation of the screening effect of intervening vegetation.

It is likely that long distance views will only be possible from elevated positions within these protected areas.

The impact is anticipated to be low and subject to the screening effect of vegetation and the number of high vantage points within the areas will possibly be negligible.

Gaps in knowledge & recommendations for further study

Layout and heights of proposed elements.

Confirmation of landscape character, VAC and sensitive areas from a site visit.

Impact

f) The proposed development could impact negatively on settlement.

Desktop Sensitivity Analysis of the Site:

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Industrialisation of a natural	Settlement areas are some distance from the proposed	Due to distance, this	No no-go areas are obvious from the

landscape	development. The closest area and that most likely to be impacted is Mudimeli which is approximately 15km from the proposed site.	impact may be experienced at a regional level.	desk top review, however, a site visit is required to confirm this.

Description of expected significance of impact

Due to distance and to screening that is likely to be provided by and intervening vegetation it is likely that only the taller elements may impact on this area.
Mudimeli is also set at a slightly lower elevation than the proposed site which is likely to result in optimisation of the mitigation effect of intervening vegetation.
The majority of settlement areas will be screened from the development by landform.
It is therefore anticipated that impact levels on settlement will be relatively low and will possibly be negligible.

Gaps in knowledge & recommendations for further study

Layout and heights of proposed elements.
Confirmation of landscape character, VAC and sensitive areas from a site visit.

Impact

g) The proposed development could impact negatively on local point receptors.

Desktop Sensitivity Analysis of the Site:

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Industrialisation of a natural landscape	13 point receptors have been identified from which the moderately tall elements of the proposed development may be visible.. It is possible that a number of these receptors will include uses that could be sensitive to the proposed development. Such uses are likely to include any use that depends on a natural outlook such as tourism uses. Should close clear views of the development be possible from such a use then it is likely to have a significant impact on that use.	This is likely to be a local impact.	No no-go areas are obvious from the desk top review, however, a site visit is required to confirm this.

Description of expected significance of impact

The screening effect of surrounding vegetation is likely to result in views of the development from ground level close to the development being screened or at least softened visually by natural vegetation.
Where vegetation has been cleared however, it is likely that clear views of the development will be possible.
It is possible that impacts will range from high to negligible subject to use and the extent of mitigation provided by existing vegetation.

Gaps in knowledge & recommendations for further study

When details of the proposed development are available, existing impacts from adjacent power stations may be used by way of detailed comparison.
Screening capacity of vegetation.
A site visit is required.

6.3 DETAILED METHODOLOGY

As indicated above a site visit is required in order to investigate and finalise the issues and impacts highlighted by this initial scoping exercise.

The following methodology will be used in preparation of the VIA report.

6.3.1 Identification of issues raised in scoping phase, and site visit

Likely issues have already been identified in this scoping analysis. These issues will be verified from a site visit as well as response from stakeholders to the scoping documentation.

6.3.2 Description of the receiving environment and the proposed project

The receiving environment has been described and categorised. This will be verified from a site visit.

6.3.3 Establishment of view catchment area, view corridors, viewpoints and receptors

Zones of theoretical visibility and visual receptors have been established from GIS analysis. These will be verified from a site visit.

Viewpoints will be identified from a site visit to represent views of visual receptors.

6.3.4 Indication of potential visual impacts using established criteria

Areas of likely visual impacts have been identified and described from this scoping exercise. These impacts will be verified from a site visit.

It is possible that additional impacts might be identified form the site visit and from comments by stakeholders.

Types of identified impacts include;

- General landscape degradation or changes to landscape character areas that most people are likely consider as negative. In this case this could be the introduction of a relatively large scale development into a natural landscape. This introduction could erode the natural character of the landscape. This is partly a subjective judgement as it is based on the assumption that the majority of people would prefer views over a more natural landscape (loss of rural characteristics is rated as a negative impact). It can however be measured in terms of likely extent of change. The influence of existing urban areas and service related development on existing landscape character will be assessed from a site visit. The area and nature of impacts associated with the proposed development will overlaid and an assessment made as to how these additional impacts are likely to change general landscape character.
- Change to the views of visual receptors. These impacts might relate to visual obstruction and / or intrusion. The assessment will make judgements as to how changes in view are likely impact on land uses.

Impacts will be assessed using a numerical assessment system that has been adopted by Savannah Environmental for the overall assessment. This methodology is tried and tested and its use will ensure that the Visual Impact Assessment can be easily incorporated into the Environmental Impact Assessment.

6.3.5 Inclusion of potential lighting impacts at night

The impact of lighting at night will be included in the assessment using the above criteria.

6.3.6 Description of alternatives, mitigation measures and monitoring programmes.

The alternatives that have been identified for this project as well as the "no go" alternative will be considered in the assessment.

Mitigation and monitoring measures will be developed during the preparation of the VIA report.

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

Confirmation of this requirement is needed.

7 CONCLUSIONS

The brief scoping assessment indicates that the development of the proposed power station could impact on relatively natural areas that may be important for tourism related uses.

The introduction of a major industrial element could change the character of the local landscape which could result in negative impact on surrounding sensitive land uses.

Possible visual receptors that have been identified are likely to include:

i. Point receptors that are likely to include homesteads, lodges and bush camps;
ii. Major roads including the N1, the R525 and local roads;
iii. The adjacent railway;
iv. Protected areas the closest of which are the Baobab Tree Reserve and the Honnet Nature Reserve both of which are approximately 34km from the proposed site;
v. Settlement areas the closest of which is Mudimeli which is approximately 15km from the proposed site;

The assessment indicates that the proposed location of the development lies within a series of minor ridgelines to the north and the Soutpansberg to the south and south east is likely to provide significant screening limiting views of the development from these directions .

The natural vegetation that covers the majority of the affected area could also provide significant screening particularly if trees and tall shrubs extend above eye level.

It is possible therefore that the affected landscape has a degree of visual absorption capacity although the likely scale of larger elements associated with the proposed development is likely to be such that where, vegetation is cleared, the location of the power station will be obvious over a considerable distance.

There are few existing major industrial installations in the vicinity of the proposed site. The only obvious major industrial operation is a limestone plant which is located approximately 5km to the north east in the vicinity of Mopane. The proposed power station will therefore be seen in the context of what appears to be a relatively natural landscape.

The fact that the proposed power station may be seen in the context of an existing industry could mean that its impact will be largely cumulative in nature.

The scoping analysis indicates that the proposed development could impact on a relatively large area. The full extent of visibility could extend for a maximum distance of 50km. However, it is anticipated that the visual absorption capacity of the landscape, provided by both landform and natural vegetation, is likely to significantly mitigate impacts. The degree of mitigation provided will be assessed in detail during a site visit.

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Environmental Impact Assessment for the construction of a 600 mw independent power plant and associated infrastructure for Kipower (Pty) Ltd near Delmas in Mpumalanga, Jones and Wagener Engineering and Environmental Consultants, 2014.

APPENDIX I
ASSESSROR'S BRIEF CURRICULUM VITAE

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

Contact Details

Post: PO Box 2122
Westville
3630
Republic of South Africa

Phone: +27 31 2668241, Cell: +27 83 7032995

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 mnew 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 15km 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

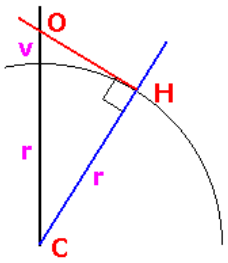
development sites to the North and South of the Durban Metropolitan Area. The project utilised 3d computer visualisation techniques.

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, CefnCoed 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
CALCULATION OF 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.