ALINTA ENERGY REEVES PLAINS POWER STATION

DEVELOPMENT APPLICATION

12 OCTOBER 2017

APPENDIX G – LANDSCAPE AND VISUAL IMPACT ASSESSSMENT

Landscape Character and Probable Visual Effect Assessment

Reeves Plains Power Station

Prepared for Alinta Energy

12 September 2017

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01 Scope of Assessment

1.0 Scope of Assessment

1.1 Introduction

This report has been prepared by Warwick Keates of WAX Design in association with Dr Brett Grimm of Brett Grimm Landscape Architect for Alinta Energy to assess the potential visual impact of the proposed Reeves Plains Power Station project (the Project). The aim of this report is to evaluate the existing landscape character, identify viewpoints to assess the visual impact and discuss the degree of visual change that is likely to result from the introduction of the proposed power station.

The Landscape and Visual Impact Assessment (LVIA) comprises of two separate assessments, a landscape character assessment and a visual impact assessment; these are interrelated processes as described in the Guidelines for Landscape and Visual Impact Assessment[1]. The landscape character assessment described in this report considers the existing character of the landscape and the site locality. The site locality is considered as the areas around the Project from which the power station and associated infrastructure are likely to be visible in the landscape as described in section 1.3 below. The visual impact assessment considers the likely effect of the proposed development on the physical landscape which may give rise to changes in its character and the resultant effects on visual amenity.

The potential visual impact will be assessed using the Grimke matrix methodology that involves on-site assessments, GIS modeling, consultation with relevant stakeholders and interested parties through Alinta Energy, the preparation of photomontages and a detailed visual impact assessment to illustrate the predicted visual effect of the Project within the defined locality. The visual impact assessment forms the second stage of the LVIA process.

1.2 Project Description

The Reeves Plains Power Station involves the construction and operation of a gas fired power station and associated infrastructure. The project proponent is Alinta Energy (Reeves Plains) Pty Limited (Alinta Energy). The power station will be located at 1629 Redbanks Road on a 41 Ha greenfield site located in Reeves Plains, approximately 12 km south-east of Mallala and 50 km north of Adelaide.

The power station will operate as a 'peaker', providing electricity during periods of high demand, and is designed togenerate up to 300 megawatts (MW) of power. The Project includes the following infrastructure:

- A gas receival station
- Up to six (6) dual fuel (gas and diesel) turbines each capable of generating 50MW of power
- Three (3) transformers designed to convert low voltage electricity into high voltage electricity
- Connection to the electricity network including a new substation, 'cut in' transmission towers (40-45m) and communications tower (30-35m)
- Water supply and storage including:
    - *Water treatment plant*
    - *Water storage tanks*
    - *Firefighting system*
- Evaporation pond
- Diesel storage

1Swanwick, C. (2013). *Guidelines for Landscape and Visual Impact Assessment*. 3rd ed. United Kingdom: Landscape Institute and Institute of Environmental Management and Assessment.

Also included within the Project are the following:

- Control rooms and maintenance facilities and administration building (typically 3-4m high)
- Warehouse and workshop facility (5-6m high)
- Security fencing and lighting
- Onsite drainage works
- Upgrade to the Redbanks Road and Day Road intersection and sealing of Day Road from Redbanks Road to the Project entrance
- Carparking for employees and contractors
- Demolition of existing buildings onsite
- Landscaping

The Project is required to obtain development consent from the State Commission Assessment Panel before proceeding. Construction of the Project is scheduled to commence in 2018 with operation of the power station occurring in Q1 2020 at the earliest.

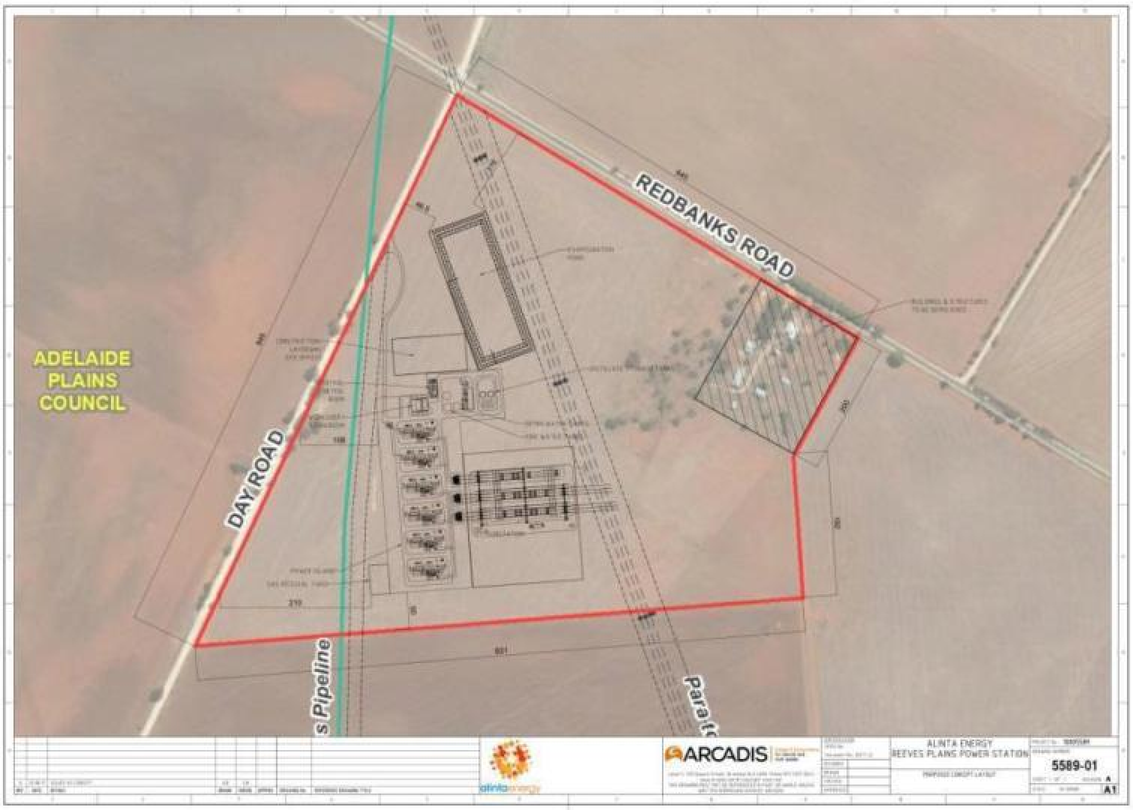

Figure 1: Draft layout for proposed development, used in LVIA

Figure 2: Modeling of proposed development base on anticipated layout

1.3 Site Locality

A 15km site locality around the Project has been defined for assessment purposes and is based on research and previous experience in defining thresholds for scale and identification of visual effect. The extent of the site locality has been reviewed against the Zone of Theoretical Visual Influence (ZTVI) mapping. This mapping provides a reference of the extent to which the Project is likely to be visible in the landscape and defines the viewshed resulting from the local topography (excluding vegetation and built form screening).

The landscape character assessment of the proposed power station consists of written descriptions and photographic surveys of the surrounding locality to articulate the character of the existing landscape that surrounds the site in relation to the local (0-1km), sub-regional (1-5km) and regional (5-15km) landscapes. This is followed by a discussion of the probable visual effect that is anticipated across the regional landscape as well as within the infrastructure corridors associated with the proposed Project. The landscape character and visual assessment provide the basis on which to measure the suitability of the development in relation to the visual impact within the regional area (15km) and in regards to the relevant provisions of the development plan.

Recognition of the potential visual impact of a layout design is implicit in the design process and concepts for visual management. This includes early reference to the Mallala Council Development Plan (Consolidated – 21 April 2016) provisions and relevant guidance reports.

02 Introduction

2.0 Introduction

2.1 Visual Assessment Approach

The aim of the LVIA methodology is to provide an objective, reliable, credible, replicable and measurable analysis of the potential visual impact when considered against the existing landscape character.

The process for the visual assessment is based on the recommendations of John Ginivanand Planning SA (2002) and considers the visual assessment regarding the Primary Landscape Character Assessment and Detailed Visual Effect Assessment (excluding Qualitative Subjective Assessment).

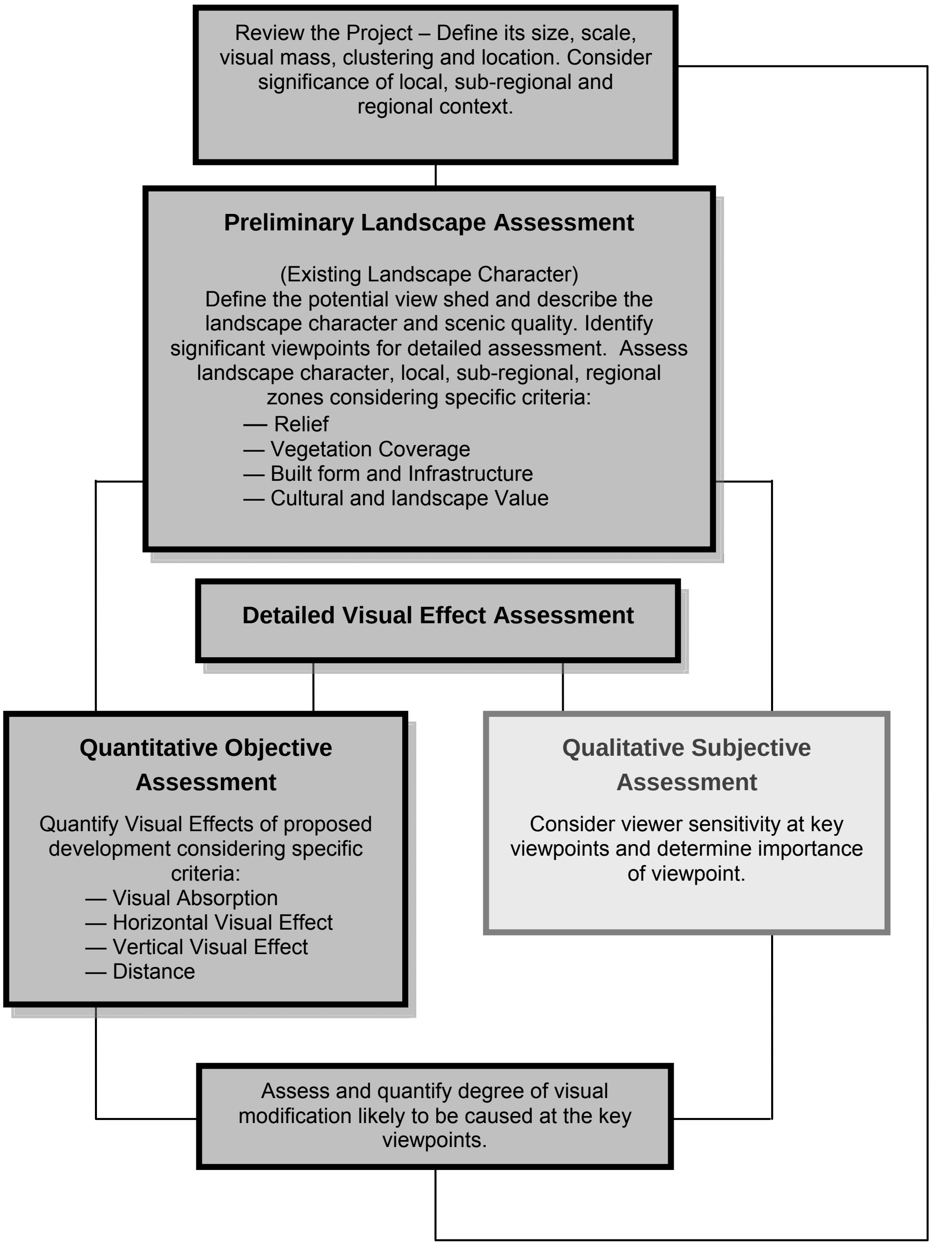

Figure 3: Detailed Visual Assessment Process

2.2 Guidance and Best Practice

Currently, there is no formalised standard visual assessment methodology within planning guidelines at local, state or federal levels of application. While various guidelines and frameworks have been produced, they do not provide a definitive methodology or technique to be applied. For the visual assessment of the Reeves Plains Power Station to follow a 'best practice' approach, the assessment methodology has been defined with reference to the following documents:

- Guidelines for Landscape and Visual Impact Assessment (Third edition) (2013), Landscape Institute;
- Grimm, B (2009). Quantifying the Visual Effects of Wind Farms; A Theoretical Process in an Evolving Australian Visual Landscape. PhD Thesis Adelaide University;
- Australian Wind Energy Association and Australian Council of National Trusts (2007) Wind Farms and Landscape Values: National Assessment Framework;
- Visual Landscape Planning in Western Australia. (2007).A manual for evaluation, assessment, siting and design, Western Australian Planning Commission;
- Best Practice Guidelines for the Implementation of Wind Energy Projects in Australia (2006);
- Lothian, A. (2008). Scenic perceptions of the visual effects of wind farms on South Australian landscapes. Geographical Research, 46:2, 196 – 207;
- Swanwick, C. (2013). Guidelines for Landscape and Visual Impact Assessment. 3rd ed. United Kingdom: Landscape Institute and Institute of Environmental Management and Assessment;
- Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria (2002);
- South Australian Wind Farms Planning Bulletin (2002); and
- Lothian, A. (2000). Landscape Quality Assessment of South Australia. PhD Thesis Adelaide University.

2.3 Methodology

The approach used for the LVIA is based on two assessment stages with reference to the Guidelines for Landscape and Visual Impact Assessment, and set out in Figure 4. Stage 1; Landscape character assessment is concerned with identifying and assessing the importance of landscape characteristics and the existing landscape quality. Stage 2; The visual assessment aims to quantify the extent to which the development is visible as well as defining the degree of visual change and the associated visual impacts using the Grimke Matrix.

The landscape character assessment and visual impact assessment are used to draw a number of conclusions about the magnitude of the visual effects of the proposed development on the site locality.

The LVIA includes two assessment stages and associated tasks as seen in Figure 4. The following table outlines a detailed description of each process conducted within the methodology.

02 Introduction

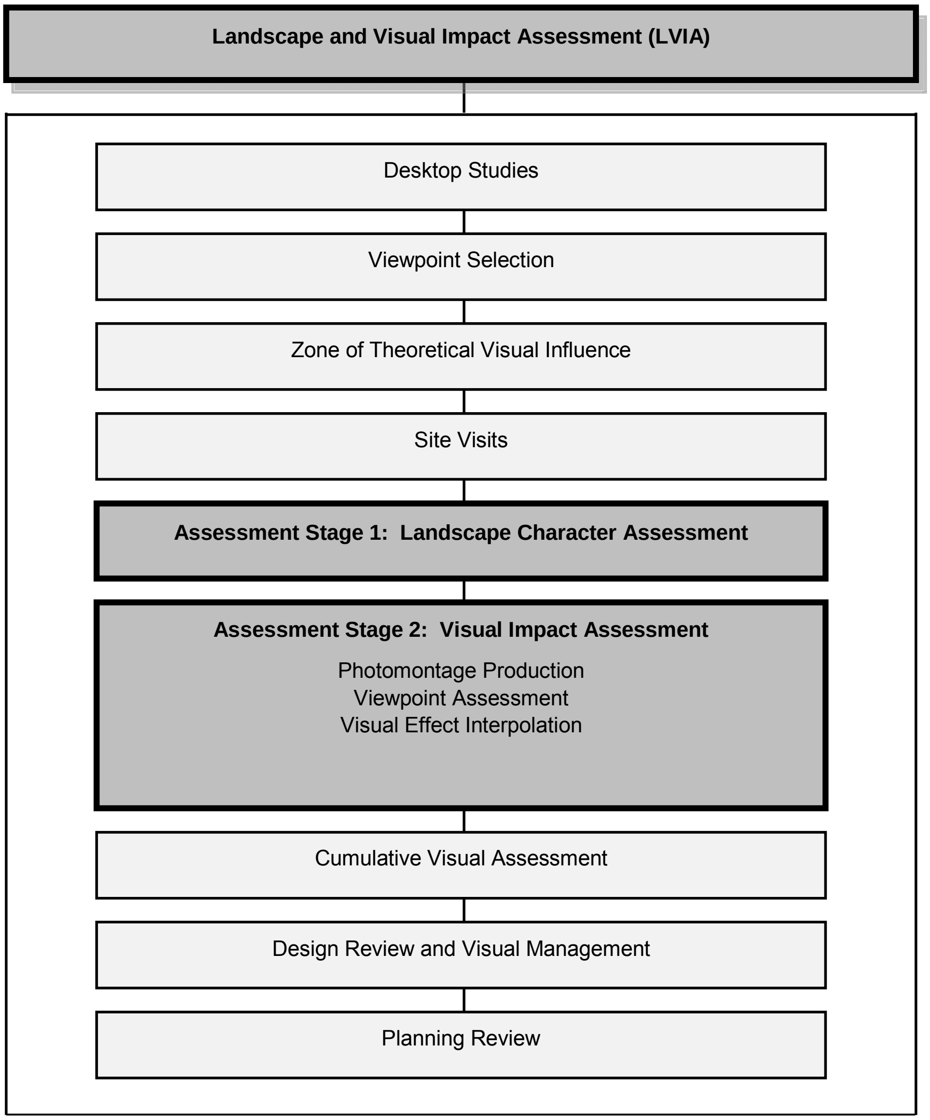

Figure 4: LVIA – Two Assessment Stages and Associated Tasks.

<u>Desktop Studies</u>

The Landscape Character Assessment for the Project includes reviews of the project documentation, the proposed development location and infrastructure associated with the proposed development. Analysis of GIS maps, landscape photography, aerial photographs and supporting literature were also reviewed to establish a broad comprehension of the scope of the proposed power station and the existing landscape character.

Viewpoint Selection

The selection of viewpoints provides locations from which a detailed visual assessment of the potential visual effect can be made as part of the Stage 2 assessment. The locations are also selected on the basis of being representative of the locality, public locations and viewpoints where a large proportion of the power station is visible.

A total of four (4) viewpoints were selected surrounding the Project during this site visit to provide an understanding of the likely visual effect.

Viewpoint locations were identified using a preliminary ZTVI map which illustrates the likely degree of visibility in accordance to topography. The site assessment certified the evaluation of the ZTVI with reference to vegetation screening and local landforms not depicted in the ZTVI.

Each viewpoint represents a typical location within the locality. The four viewpoints were confirmed by Alinta Energy and relevant stakeholders before the final stage of visual impact assessment.

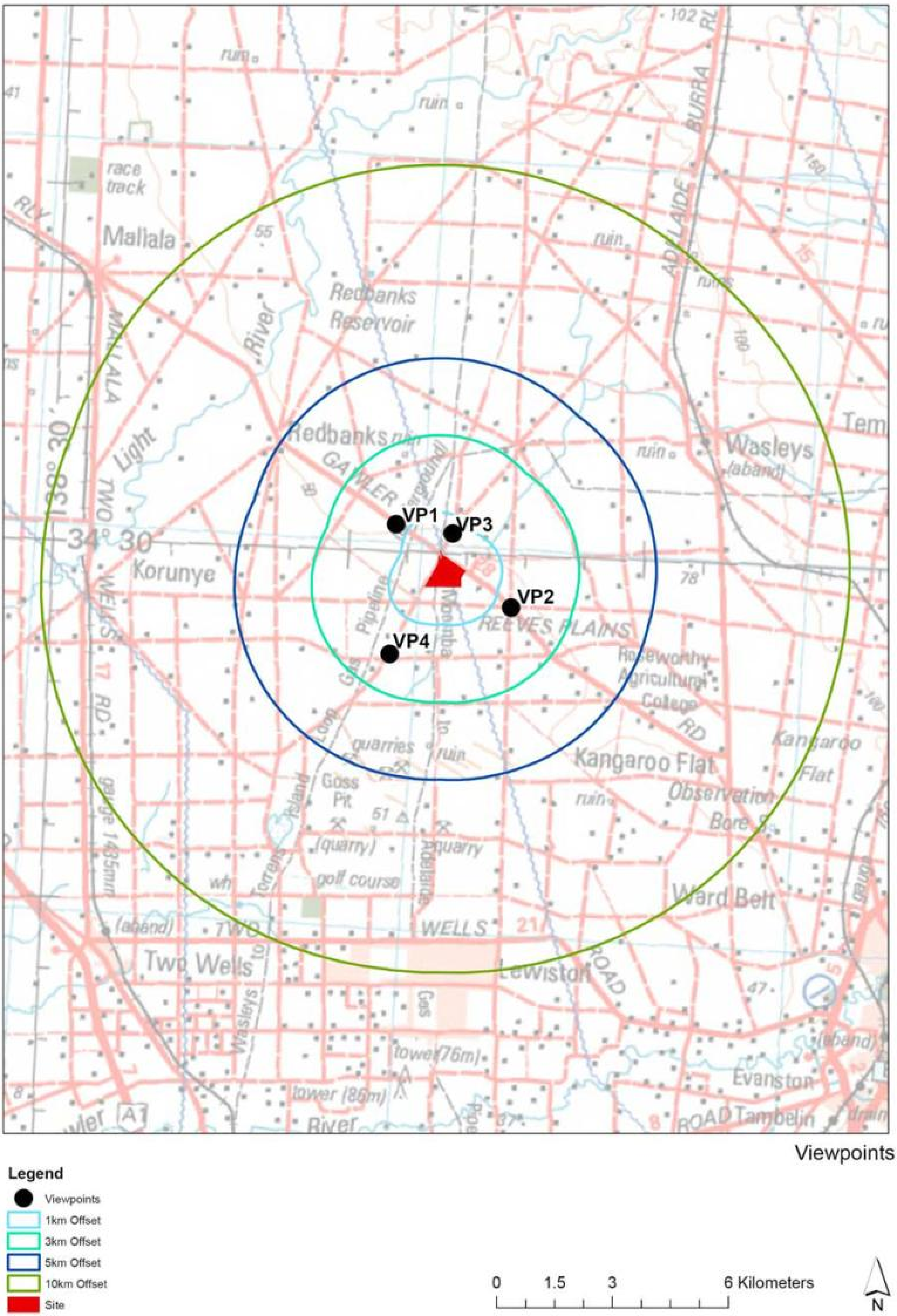

Figure 5: Viewpoint Locations

Zone of Theoretical Visual Influence

In order to gain an appreciation of where the Project will be visible from; Zone of Theoretical Visual Influence (ZTVI) maps have been produced. The mapping provides an illustrative depiction of where the development may be seen within the landscape. The maps quantify the extent to which the power station is likely to be seen considering both the of infrastructure of the gas turbine's silencers, stacks and substation gantries which are between 16 and 24-25 metres, and the height of the cut in tower at 40-45m and the communications tower at 30-35m.

The analysis uses a digital terrain model, and computer generated models of the power station to illustrate the visibility from locations around the proposed development. It should be noted that the ZTVI does not take into account the impact of local vegetation or buildings and it is based on a 1m contour data set. This means that theoretically, the visual impact of the power station is evaluated within a landscape devoid of any screening vegetation or other features and as such represents a 'worst case' scenario.

Assessment Stage 1: Landscape Character Assessment

The assessment includes identification and description of landscape character units (areas of defined quality determined by topographic form, land use, vegetation associations including patterning, colouration and texture). In addition, special landscape features are identified. Mapping and photographic surveys are undertaken in addition to written commentary to describe the locality and existing landscape character of the site locality.

As part of the landscape character assessment, the viewpoint selection was confirmed, and the base photography was taken for photomontage production.

The assessment was undertaken on the 20 June 2017 to enable the project team to develop a detailed understanding of the existing landscape character. Weather conditions were clear with no cloud cover, high visibility over several kilometres and no atmospheric interference.

Assessment Stage 2: Visual Impact Assessment

The assessment of the visual impact includes the production of photomontages to assist in the quantification and qualification of the potential visual effect. The viewpoints identified as part of the preliminary assessment stages were measured using a series of landscape and visual criteria. The assessment results were then mapped to demonstrate the likely visual impact of the project within the locality.

The Stage 2 assessment was undertaken on the 30 June 2017 with weather conditions relatively clear with minimal cloud cover, good visibility over several kilometers throughout the assessment locality.

Assessment Stage 2: Photomontage Production

Photomontages of the proposed development from each viewpoint were produced by Convergen. The photomontages represent 120 degree horizontal field of view with a 50mm lens digital equivalent photo capture. This has been proven to best represent the human binocular field of view. Details of the methodology used to produce the photomontages are described in Appendix B and represents a best practice approach with reference to 'Photography and photomontage in landscape and visual impact assessment' (2011) Landscape Institute (advice note 01/11).

WAX and BGLA validated the accuracy of the photomontages during a site visit on the 30 June 2017. The combination of a photomontage assessment and an on-site review ensures issues typically associated with photographic simulations such as image compression and distortion are mitigated by assessing and measuring the visual effect in-situ using GPS and a bearing compass.

This enables the photomontages to be ground-truthed for positional correctness and scale. Any minor distortion to the edge of the 120 degrees provided by the horizontal field extent and 2 dimensional image representations are reflected relatively in the simulated modeling overlay.

The photomontage images were used to inform the detailed viewpoint assessment.

Assessment Stage 2: Viewpoint Impact Assessment

The viewpoint assessment of the Project uses a combination of visual assessment measurements and descriptive text. This comprises site observations with reference to prepared photomontages and a detailed assessment of the baseline landscape character and visual impact.

Initially, the baseline landscape character for each viewpoint was assessed regarding:

- Relief (the complexity of the land that exists as part of the underlying landscape character);
- Vegetation Cover (the extent to which vegetation is present and its potential to screen and filter views);
- Infrastructure and Built Form (the impact of development on landscape and visual character); and
- Cultural Sensitivity (existing cultural overlays, planning designations and any identified listing of heritage items and or local sensitivities to landscape such as scenic drives and viewpoints).

A value was generated for the existing landscape relative to each viewpoint. This value formed the baseline assessment value. It is this baseline value that is modified by the impact of the development on the landscape, which in turn informs the degree of visual effect.

Following the landscape character assessment, each viewpoint was then assessed on the following visual effects:

- Percent of landscape absorption (the landscape's ability to absorb and screen the development form);
- Horizontal visual effect (percentage spread of the development in the field of view);
- Vertical visual effect (vertical scale of the development as a percentage of the existing landscape scale within the field of view); and
- Distance of visual effect (distance between viewpoint and development).

The landscape character and visual effect measurements were combined to produce a quantified value for the degree of visual change that resulted from the project at each viewpoint (refer to Appendix D for detailed assessment criteria and matrix methodology).

Assessment Stage 2:Visual Effect Interpolation

The findings of the visual impact assessment for each viewpoint were used to provide a percentage value to the degree of visual change. Each viewpoint was cartographically mapped in GIS, and the values used in a distance weighted interpolation. The ZTVI was overlayed onto the visual effect interpolation map to define the extent of visibility. The combination of Visual Effect Interpolation and ZTVI provided a map of anticipated visual impact experienced in the locality as a result of the project.

Design Review and Visual Management

A high level landscape concept plan has been developed to illustrate opportunities for visual management. The concept plan seeks to provide screening through vegetation and earthworks profiling and aims to reduce the contrast and visual presence of the development form the surrounding locality.

Planning Review

A review of the landscape and visual impacts of the development from a planning context was also undertaken. The planning review included a review of the Mallala Council Development Plan (Consolidated – 21 April 2016).

These documents provided a range of recommendations that influenced the development assessment of the Project proposal. In particular, the potential visual impact of the development has been reviewed and discussed against the relevant desired character statements with specific reference to landscape and visual considerations.

3.0 Landscape Character Assessment

3.1 The Site

The project, as shown in Figures 1 and 2, is located approximately 12 kilometres south-east of Mallala in the Adelaide Plains Council Area. The proposed development site is located on the undulating landforms formed by the topography of the Redbank Ridgeline and Reeves Plains.

On the site is an existing farm with a cluster of buildings and associated structures surrounded by vegetation. This vegetation provides significant screening within the locality and is further reinforced by vegetation belts that extend along local water courses and fence boundaries.

An existing 275kV transmission line runs through the proposed development site. This infrastructure element is of a Pi frame construction approximately 20 metres high; other infrastructure includes 11kV transmission lines which have a typical height of 12 metres. A gas distribution pipeline runs through the western edge of the site, this pipeline is located underground and does not have visual presence in the landscape.

South-east towards Reeves Plains and Kangaroo Flat the elevation of landscape drops the form a series of wide low lying tablelands. While these features are subtle, the combination of topographic variation and vegetation creates a degree of visual variation and screening within the landscape adding to the visual complexity of the locality.

At distances of 5-10 kilometres south and east of the proposed development site, views across the landscape are screened by extensive vegetation belts that extent across the regional landscape. The combination of topography and vegetation provides significant visual screening.

From certain locations such as across open fields and along ridgelines distinct view corridors are created increasing the visibility of the proposed development site. However, these locations remain isolated and are not typical of the locality.

Figure 6: View of the proposed development site

Figure 7: View of the existing transmission line running through the proposed development site

03 Landscape Character Assessment

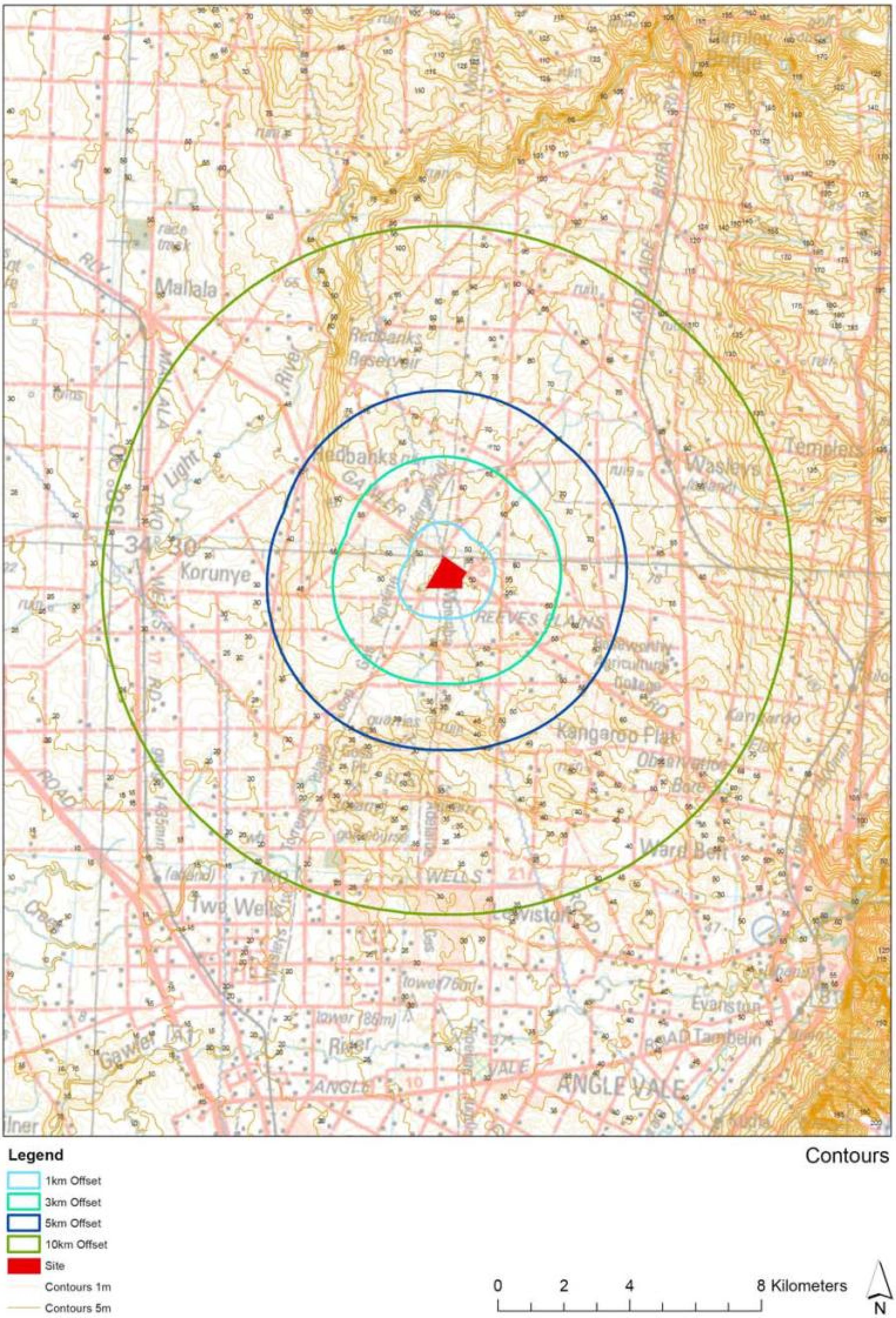

Figure 8: Proposed site location with contours

3.2 Landscape Character

The regional landscape character is a result of low lying topography associated with the Reeves Plains between the Mount Lofty Ranges and the coastal edge including Port Gawler and Middle Beach. While there is a low lying rolling landscape as a result of low local landforms and river corridors, this does not dramatically change the overall landscape character of the locality. The land use is dominated by a series of agricultural land uses including cropping, small scale grazing and defined areas of animal husbandry including horse agistment.

Within the agricultural landscape are a number of dwellings and associated farm infrastructure. Typically, these buildings are single or double storey. Other infrastructure such as the transmission lines and the height of the existing vegetation creates a defined verticality in the landscape of 10 to15 metres.

Throughout the study area are a number of infrastructure elements including transmission lines, agricultural processing facilities and a railway line corridor. These elements form defined impacts on the existing landscape character resulting in a modified agricultural landscape.

The Adelaide Crystal Brook Railway line runs parallel to the Mallala Road to the north. The embankment of the rail line provides a visual edge to the road corridor. This infrastructure limits to a certain degree visibility from the east, with glimpsed views over the embankment to the Mount Lofty Ranges.

The Mount Lofty Ranges define the backdrop to the regional locality to the north and east. The topography of the Ranges defines the horizon line and form a regional viewshed. Within this locality the topography of the Mount Lofty Ranges is a consistent topographic backdrop with little variation in landform to the local or sub-regional landscape.

3.3 Locality Features

While the landscape character for the regional context is relatively consistent, local ridgelines, water courses and townships, within the locality which create variations in the landscape character, as is shown i

Figure 9. These have been identified as:

1. Redbank Ridgeline
2. Light River Corridor
3. Mallala Township
4. Redbanks Township
5. Fischer Rural Living
6. Two Wells Township

03 Landscape Character Assessment

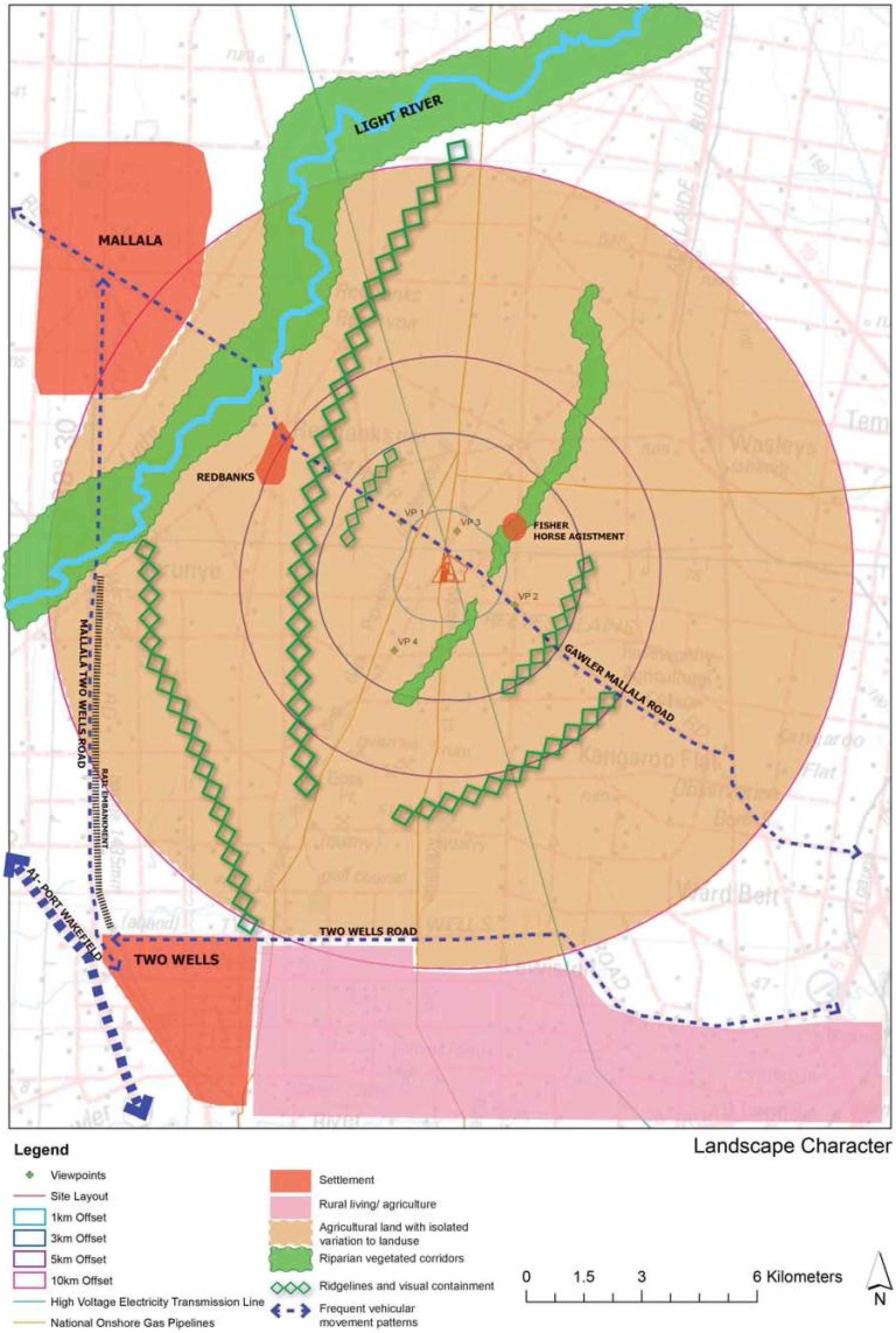

Figure 9: Locality Features/ Landscape Character Zones

3.3.1 Redbanks Ridgeline

The Redbanks Ridgeline forms a low lying visual envelope. The ridgeline create defined topographic screen in the landscape that contain, block or screen the proposed development site. The ridgeline represents a 20-30m variance in topographic form. The height and profile of the ridge provides visual containment in the locality restricting views and limiting the potential visibility of the development beyond 5 kilometres to the west.

The Redbanks Ridgeline forms a wide tabletop that extends east from Redbanks towards the proposed development site. The form of the ridgeline and its association with the Light River suggests that the topography of Reeves Plains is formed by the river catchment and associated drainage patterns around Reeves Plains.

Figure 10: Redbanks Ridgeline

3.3.2 Light River Corridor

Extensive areas of vegetation exist along the Light River corridor. The stands of Eucalypt trees associated with the river corridor provide a well-defined vegetation belt within the landscape. These trees limit views, providing a visual envelope within the low lying landscape character, particularly to the north-west.

The existing land use cover associated with the river corridor is extensively agricultural cropping with a defined field pattern that is defined by ribbons of vegetation along cadastral boundaries and around properties. Across the regional landscape character, there is little variation in the land use character.

Figure 11: Light River Corridor

3.3.3 Mallala Township

The town of Mallala is located approximatley 12km to the north-west of the proposed development site. The town represents a rural township with a large collection of dwellings and associated agricultural infrastructure. Properties within the town are typically single storey on large allotments. On the periphery of the town are a number of grain silos. These elements form large vertical visual elements within the landscape, similar in height to the belts of vegetation that extend across the landscape.

Although the grain silos are visually prominent within the town and the immediate locality, the screening provided by the existing vegetation around the town reduces the visual effect.

Surrounding the town of Mallala is an open agricultural land use that is typical of the wider region. The landscape is defined by a historic eighty-acre field pattern which forms a defined grid of roads and field boundaries across the landscape. This grid is reinforced by tree planting and belts of vegetation that produce an agricultural patchwork with open and closed views depending on the vegetation screening that is provided around the viewpoint and the viewer.

The layering of vegetation along cadastral boundaries of the grid creates a series of vegetated screens within the landscape, fragmenting the views within the landscape.

The development will not be visible from the surrounding areas of Mallala due to the existing vegetation associated with the town, the vegetation screening provided by the Light River corridor and the Redbanks Ridgeline that combine to provide a defined visual screen to the north and west.

Figure 12: Mallala Township

3.3.4 Redbanks Township

The township of Redbanks is located 5 kilometres from the proposed development. The township is defined by the road network that provides connections from the town centre to the other local towns. The built form is generally single storey residential dwellings on large allotments. The orientation of many of the buildings is towards the road corridor and the centre of the town.

There is extensive tree planting through the centre of the township, within the property boundaries and along the road corridors. This results in an enclosed visual character with limited visibility to the surrounding agricultural landscape. Some rear gardens have views to the surrounding areas.

Figure 13: Redbanks Township

3.3.5 Fischer Rural Living

Along Boundary Road approximately one kilometer from the development site is Fischer; a collection of large allotments and dwellings that form a local sub-division. These large allotments are predominantly for horse agistment and rural living. The sub-division appears to have been established several decades ago which is reflected by the established tree planting around many of the properties.

The large allotments and expansive areas of vegetation create an enclosed visual character with many properties orientated towards the east to capitalise on views of the Mount Lofty Ranges. A local ridgeline situated between Woolshed Road and Dogleg Road provides more elevated views towards the proposed development site from the south-west edge of Fischer.

While the Ridgeline provides elevated viewpoints, the existing vegetation along the Gawler Mallala Road, as well as other vegetation within the surrounding landscape limits the visibility of the development site.

Figure 14: Fischer Rural Living with extensive surrounding vegetation

3.3.6 Two Wells Township

Two Wells is located 12 kilometres to the south-west of the proposed development site and outside of the regional locality of the development. The town is orientated along the main street with most of the dwellings and properties facing the street. This arrangement creates a closed visual character with few views to the surrounding rural landscape.

Surrounding the town to the north and east are large areas of rural living that extend from Two Wells to Lewiston and Gawler further to the east. The land use around Two Wells is defined by large rural allotments with a strong focus on horse management and agistment. The combination of rural blocks with well vegetated boundaries creates an enclosed peri-urban visual character with limited views extending over the low lying landscape character to north and east.

Due to the distance between the development site and Two Wells, as well as surrounding presence of local landforms, river corridors and vegetation the infrastructure associated with the power station will not be visible from the Two Wells.

Figure 15: Two Wells Township peri-urban development

04 Zone of Theoretical Visual Influence

4.0 Zone of Theoretical Visual Influence

4.1 Zone of Theoretical Visual Influence (ZTVI)

The Zone of Theoretical Visual Influence (ZTVI) mapping provides an illustration of where the proposed power station may be seen within the landscape. The mapping quantifies the extent that the power station is likely to be seen within the wider landscape.

The ZTVI mapping is developed using a GIS computer program with 1m contour data that has been provided for a 15km radius of the project site. The ZTVI maps have been produced by mapping the location, the anticipated heights of various infrastructure elements associated with the proposed development and using the contour data to identify where the proposed development would be visible or not visible.

The ZTVI represents a 'worst case' scenario as it does not incorporate vegetation, built form or localised screening effects, which are assessed in more detail as part of the Stage 2 assessment on site.

04 Zone of Theoretical Visual Influence

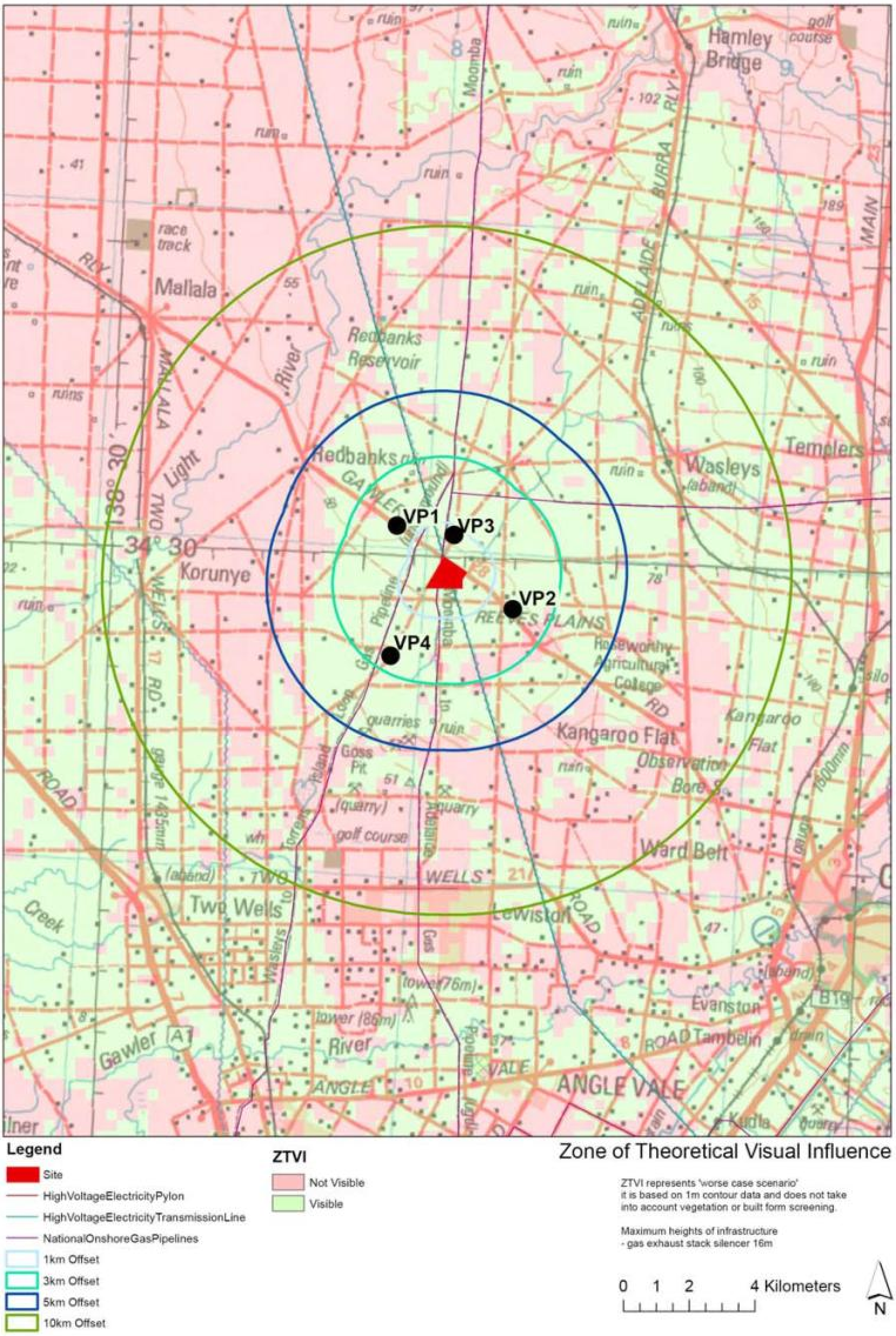

Figure 16: ZTVI map for the Reeves Plains Power Station based on 16 metre gas turbine silencers and stacks

04 Zone of Theoretical Visual Influence

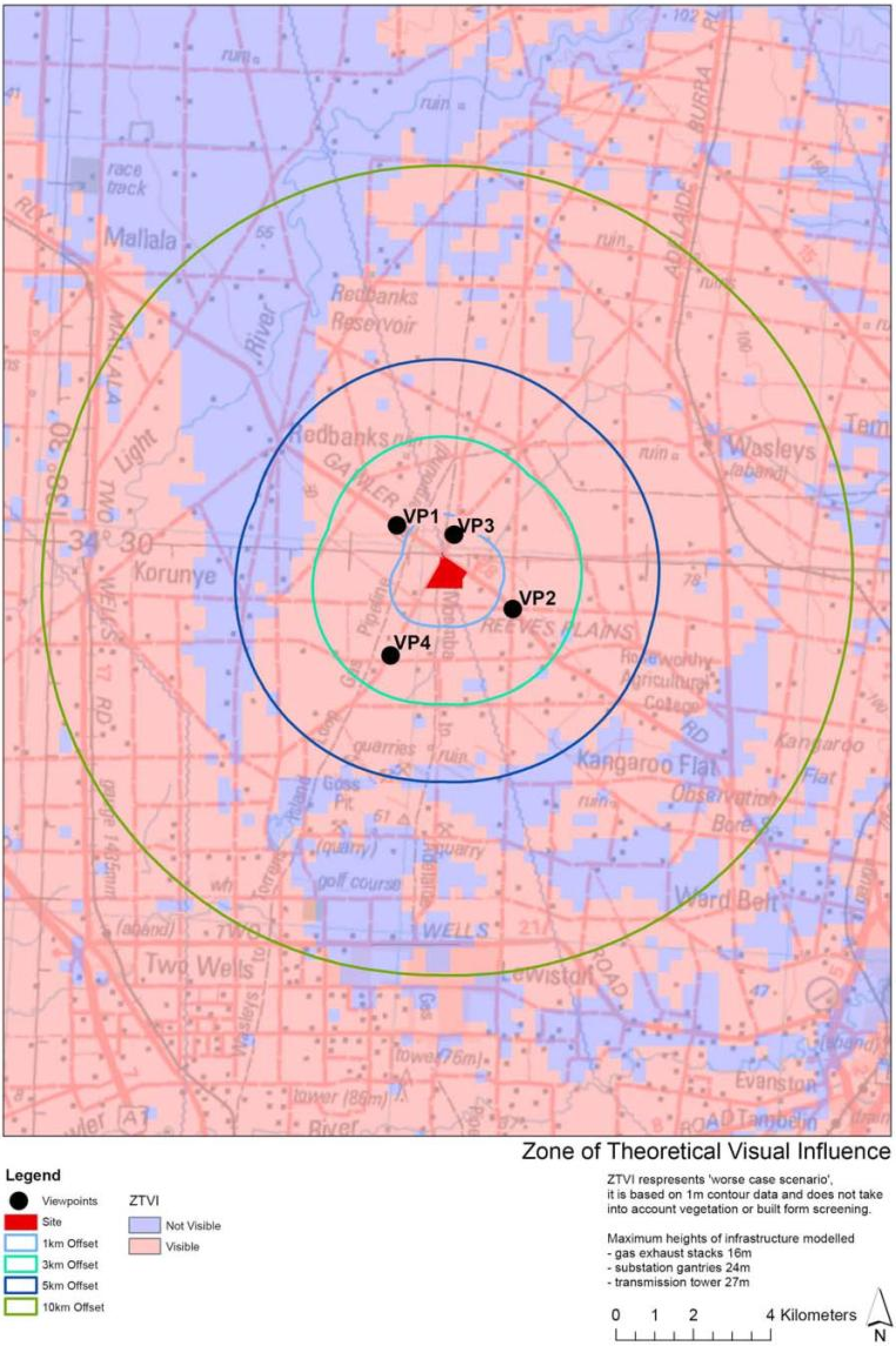

Figure 17: ZTVI map for the Reeves Plains Power Station based on 24m substation gantries and 43m (typical) cut in tower

05 Visual Impact Assessment

5.0 Visual Impact Assessment

5.1 Visual Assessment Scope

The visual impact assessment was based on a gas peaking plant with six open cycle aero derivative gas turbine units with silencer and stacks of approximately 16 metres high, transmission substation with gantries of a height of 24-25 metres, a communication tower 30-35 metres high and up to three 'cut in' tower of 40-45 metres high, evaporation pond and holding tanks and the site locality as described in the landscape character assessment to a radius of 15km of the proposed development.

The visual impact assessment considered key aspects of the existing landscape such as relief, vegetation, built form and infrastructure; as well as cultural and scenic landscape values from each of the four selected viewpoints. The key aspects from each viewpoint were rated out of 5 to produce an assessment value out of 20. This enabled a baseline landscape value to be calculated from which the visual impact measured in relation to the degree of visual change that is likely to occur as a result of the introduction of the proposed development into the existing landscape character.

The visual effect was assessed using a set of criteria that considered factors such as the degree of landscape absorption, horizontal and vertical effects and distance to the development from each viewpoint.

The visual effect was then expressed as a coefficient of visual impact and applied to the baseline landscape value to produce a measurement of the likely degree of visual change, that is to say, the extent to which the proposed development is predicted to alter the existing landscape.

5.2 Visual Impact Assessment

Using the visual assessment matrix as described in Appendix D, the potential degree of visual change and resulting visual impact of each viewpoint was measured and evaluated against the following criteria:

- Baseline Landscape Value is expressed as a value between 4 and 20;
- Visual Assessment Value is expressed as a value between 4 and 20;
- Coefficient of Visual Impact is calculated as decimal fraction of the visual assessment value;
- Relative Value of Visual Impact is calculated as the baseline landscape character multiplied by the coefficient; and
- Degree of Visual Change is expressed as the visual impact divided by the landscape character assessment range represented as a percentage.

The visual assessment also includes a description of the viewpoint context in relation the landscape character that surrounds the viewpoint and the potential visual effect. This assessment is supported by photomontages of the development and wireframe illustration of the power station.

For clarity and legibility of the report reference images, maps and photomontages have been reproduced in Appendix A and C and reproduced at A3 to enable them to be studied while reviewing the associated text for each viewpoint.

05 Visual Impact Assessment

The viewpoints selected for the visual impact assessment as shown in Table 1 are:

VP01 Gawler-Mallala Road (looking south-east - Local)

VP02 Gawler-Mallala Road and Boundary Road Intersection (looking north-west - Local)

VP03 Woolshed Road (looking south-west - Local)

VP04 Day Road (looking north-east - Local)

Ref.	Viewpoint	Longitude	Latitude	Distance to proposed development	View Direction
VP01	Gawler-Mallala Road	279327.47	6180485.75	1.76km	137 degrees
VP02	Gawler-Mallala Road and Boundary Road Intersection	282404.66	6178487.79	1.93km	296 degrees
VP03	Woolshed Road	280799.32	6180320.74	1.16km	183 degrees
VP04	Day Road	279351.94	6177134.92	2.22km	36 degrees

Table 1: Summary of Viewpoint location information

Figure 18: Viewpoint locations and Infrastructure Identification

05 Visual Impact Assessment

5.3 Viewpoint 1:Gawler-Mallala Road

Viewpoint Description

Viewpoint 1 is located on the Gawler Mallala Road approximately 2 kilometres from the proposed development site. The viewpoint is typical of the visual effect that will be experienced to the north-west of the subject land and the landscape character is representative of the existing land use of the locality.

The existing fields contain cropping, and agricultural land uses. Throughout the landscape are small tree groups and belts of vegetation that create a layered landscape effect. Further to the east the Mount Lofty Ranges are visible. The landform of the Ranges forms an elevated visual envelope which provides a backdrop to the wider landscape and specifically the proposed development site.

Adjacent to the viewpoint to the east is a large residential dwelling. The dwelling will experience the same degree of visual change to the viewpoint. The orientation of the property, the return verandah and large picture windows to the south-east suggest that the building has been designed to take advantage of the rural landscape that surrounds the dwelling and the views to the Mount Lofty Ranges to the east.

The layered formation of the vegetation surrounding the viewpoint creates a degree of visual fragmentation. The visual character of the locality is represented by filtered views across the agricultural landscape to belts of vegetation. Where the vegetation becomes more layered the visual screening increases reducing the visibility of the proposed development site.

An existing transmission line provides a defined infrastructure corridor in the landscape. It is anticipated that the development form of the gas power plant will be a similar height, although the turbines and substation will produce a larger visual mass within the landscape. In addition, the height of the communication tower will create an isolated vertical visual element.

The existing vegetation within the locality of the viewpoint is likely to provide moderate screening and will fragment the visual mass of the proposed development. Additional visual screening is provided by roadside vegetation.

Figure 19: Viewpoint 1: Gawler-Mallala Road

Figure 20: Digital Overlay showing all power station Viewpoint 1

05 Visual Impact Assessment

Figure 21: Absorption Capacity Calculations: Viewpoint 1

<u>Viewpoint Assessment</u>

Assessment	Value	Description
Relief	1	The landscape to the foreground, mid ground and background has limited to negligible variance in topographic form
Vegetation Coverage	2	The foreground presents limited vegetation, typically aligned to the road corridors. The mid ground to background provides some scattered trees that create a linear horizontal band across the view.
Infrastructure and Built Form	4	The viewshed has limited presence of built form. Isolated transmission lines which are recessive within the view. In addition some isolated farming structures and dwellings are present but of a scale to not dominate the character and field of view.
Cultural and Landscape Value	2	The frequency of views along the road corridor between Mallala and Gawler presents a moderate level of sensitivity.
Baseline Landscape	**11**	
Landscape Absorption	3	57% landscape absorption capacity. Moderate absorption capacity. Medium level of change to the landscape. The landscape is less able to absorb change due to the scale, distance and extent of the development.
Horizontal	2	23% horizontal visual effect, which is limited effect on the field of view
Vertical	1	Due to the distant Barossa and Mt Lofty Ranges providing a defined elevated horizon line the sale of the development is seen as a proportion of the existing landscape scale. This mitigates sky lining and vertical effects form this viewpoint
Distance	5	The closest gas turbine is 1.76km from the viewpoint
Visual Effect	**11**	
Coefficient	**0.55**	
11x 0.55= 6.05 Landscape visual effect		

6.05/20= Degree of visual change	
Degree of Visual Change	**30%**

Description of potential visual impact

The setback of the proposed development from the main road provides a degree of visual mitigation due to the local landforms and vegetation that will provide moderate screening to the lower elements of the proposed development.

Increasing visual effects will be experienced to the north of the proposed development along the Gawler Mallala Road. However, the arrangement of the proposed development along Day Road means that the visual effects are experience obliquely to the road corridor. From other locations the visual effect is mitigated by localised landforms and belts of vegetation that provide layered screening and fragmentation of views. The combination of topography and vegetation reduces the visual impact of the proposed development along the road corridor.

The potential introduction of additional vegetation screening to the north-eastern and north-western boundaries of the project site as well as supplemental plantings to the south-east and south-west boundaries will further reduce this visual impact. This approach will be important to reduce the potential visual effect on properties adjacent to the power station.

5.4 Viewpoint 2:Gawler-Mallala Road and Boundary Road Intersection

Viewpoint Description

Viewpoint 2 is located at the intersection of Gawler Mallala Road, Boundary Road and Verner Road. The viewpoint is located less than 2 kilometres from the proposed development site and represents the visual character that will be experienced to the south-east of the proposed development site.

The landscape character is agricultural with various belts of vegetation along road corridors and field boundaries that surround the viewpoint. The low lying undulating topography of Reeves Plains is evident from the viewpoint, rising to the north.

The existing transmission line is evident running across the landscape travelling in a north- west, south-east direction. Other pieces of infrastructure including 11kV transmission poles, fence lines, access roads as well as isolated dwellings and ancillary outbuildings are visible.

The layered visual screening provided by the existing vegetation within the locality provides a degree of screening. However, adjacent fields produce open view corridors increasing the degree of visibility of the proposed development site in turn increasing its potential visual effect.

Figure 22: Viewpoint 2: Gawler-Mallala Road and Boundary Road Intersection

Figure 23: Digital Overlay showing all power station Viewpoint 2

Figure 24: Absorption Capacity Calculations: Viewpoint 2

Viewpoint Assessment

Assessment	Value	Description
Relief	1	The landscape has limited to negligible variation in topography within the field of view
Vegetation Coverage	3	Dense vegetation is located adjacent to the east of the road corridor and surrounding dwellings to the north and west of the viewpoint.
Infrastructure and Built Form	4	Scattered dwellings and farming utilities coupled with the road corridor
Cultural and Landscape Value	2	The frequency of views along the road corridor between Mallala and Gawler presents a moderate level of sensitivity.
Baseline Landscape	**10**	
Landscape Absorption	4	22% landscape absorption capacity. Limited absorption. The development is noticeable within the landscape; however through vegetation and topography the landscape fragments and filters views of the development.
Horizontal	1	18% horizontal visual effect, which is limited effect on the field of view
Vertical	4	Due to limited to no variance in existing landscape vertical scale within the field of view the proposed development is seen to increase the vertical scale and skyline above the horizon edge. The vertical scale is defined as an increasing visual impact

Distance	5	The closest gas turbine is 1.43km from the viewpoint
Visual Effect	**14**	
Coefficient	**0.7**	
10x 0.7= 7 Landscape visual effect **7/20= Degree of visual change**		
Degree of Visual Change	**35%**	

Description of potential visual impact

It is anticipated that from the view corridors created by the existing field pattern and a lack of vegetation; the power station will be seen as a prominent visual element. While the trees around the existing farm on the site provide a degree of screening, the gas turbines and other associated infrastructure will be visible within the landscape.

Additional planting to the east of the site may assist in reducing the degree of visual effect. However, the proposed development is likely to remain a prominent visual element in the landscape.

5.5 Viewpoint 3:Woolshed Road

Viewpoint Description

Viewpoint 3 is located at the intersection of Worden Road and Woolshed Road. The viewpoint is typical of the visual effect that would be experienced to the north-east of the development as well as the potential visual effect that may be experienced from the Fischer residential area. The proposed development is located 1.2 kilometres to the south of the viewpoint.

The landscape character of the locality is visually open with the surrounding fields providing views towards the development site. However, pockets of vegetation provide isolated screening and visual fragmentation of the proposed development. Due to the orientation of the road corridor, a defined view line is provided between Woolshed Road and Day Road, increasing the potential visibility of the proposed development.

Around the intersection are a number of single storey dwellings located on large allotments surrounded by vegetated boundaries. A number of the properties are likely to experience views of the proposed development.

Within the landscape, the towers associated with the existing transmission line form prominent vertical features in the landscape. The proposed development will have a similar height, although a larger visual mass that will be visible within the landscape. The retention of the vegetation belts along Day Road will provide a degree of visual mitigation. This coupled with additional boundary planting will assist in providing additional screening over time, reducing the visual impact of the proposed development.

Figure 25: Viewpoint 3: Woolshed Road

Figure 26: Digital Overlay showing all power station Viewpoint 3

Figure 27: Absorption Capacity Calculations: Viewpoint 3

Viewpoint Assessment

Assessment	Value	Description
Relief	1	The landscape to the foreground, mid ground and background has limited to negligible variance in topographic form
Vegetation Coverage	2	Linear bands of vegetation associated to road corridors provide an element of visual relief and screening. The vegetation is of a scale proportionate to the development vertical scale, which limits the delineation of the development form. Dense vegetation is present surrounding the Fischer Development
Infrastructure and Built Form	4	The viewpoint is located adjacent to the Fischer development and rural living dwellings. This increase the presents of built form, however substantial vegetation screening is evident. Transmission lines cross the landscape in a north east direction.
Cultural and Landscape Value	2	Proximity to the Fischer rural living and farming dwelling utilities increases the level of local sensitivity

Baseline Landscape	**9**	
Landscape Absorption	5	9% landscape absorption capacity. Minor absorption within the landscape. The development is considered to be prominent within the visual landscape.
Horizontal	2	35% horizontal visual effect. Limited effect. The visual impact is a small part of the field of view.
Vertical	4	Due to limited to no variance in existing landscape vertical scale within the field of view the proposed development is seen to increase the vertical scale and skyline above the horizon edge. The vertical scale is defined as an increasing visual impact
Distance	5	The closest gas turbine is 1.16 from the viewpoint
Visual Effect	**16**	
Coefficient	**0.8**	
9x 0.8= 7.2 Landscape visual effect **7.2/20= Degree of visual change**		
Degree of Visual Change	**36%**	

Description of potential visual impact

From viewpoint 3 the proposed development will result in a moderate visual effect due to its close proximity to the development and the absence of road side vegetation along the Gawler-Mallala Road. The power station will represent a contrasting visual scale and bulk due to the clustered infrastructure elements and associated heights, particularly the cut in towers, substation gantries and communication tower. The development will be seen obliquely which will result in the infrastructure having a layered effect from the viewpoint.

Additional landscape planting in along the Gawler-Mallala Road site boundary will assist in fragmenting the visual mass, reducing the visual contrast of development form while increasing the degree of landscape absorption capacity longer term.

5.6 Viewpoint 4:Day Road

Viewpoint Description

Viewpoint 4 is located 2.2 kilometres south of the proposed development along Day Road. The viewpoint represents the visual effect that will be experienced to the south and south-west within the immediate locality of the proposed development. The landscape character is defined by the agricultural land uses that exist across the regional landscape. Belts of vegetation create defined landscape elements that are layered to form fragmented visual screens.

Surrounding the viewpoint are a number of isolated farms and dwellings, both inhabited as well as disused. The combination of building and vegetation around the development site reinforce the rural character of the landscape. The existing field pattern provides panoramic views across the wider landscape.

Figure 28: Viewpoint 4: Day Road

Figure 29: Digital Overlay showing all power station Viewpoint 4

Figure 30: Absorption Capacity Calculations: Viewpoint 4

Viewpoint Assessment

Assessment	Value	Description
Relief	1	The landscape to the foreground, mid ground and background has limited to negligible variance in topographic form
Vegetation Coverage	2	Linear bands of vegetation associated to road corridors provide an element of visual relief and screening. The vegetation is of a scale proportionate to the development vertical scale, which limits the delineation of the development form.
Infrastructure and Built Form	5	Scattered isolated dwellings evident and transmission line. Due to the vegetation pattern and scale the transmission line is a recessive piece of infrastructure within the field of view
Cultural and Landscape Value	1	A limited number of local farming properties will experience this particular field of view, however frequency of views will be limited due to fragmentation of vegetation screening.

Baseline Landscape	**9**	
Landscape Absorption	5	15% landscape absorption capacity. Minor absorption within the landscape. The development is considered to be prominent within the visual landscape.
Horizontal	1	14% horizontal visual effect. Minor visual effect. The visual impact is a small part of the field of view.
Vertical	2	Due to limited to no variance in existing landscape vertical scale within the field of view the proposed development is seen slightly above the existing landscape vertical scale. The vertical scale is defined as limited impact.
Distance	4	**The closest gas turbine is 2.22km from the viewpoint**
Visual Effect	**12**	
Coefficient	**0.6**	
9 x 0.6= 5.4 Landscape visual effect **5.4/20= Degree of visual change**		
Degree of Visual Change	**27%**	

<u>Description of potential visual impact</u>

From viewpoint 4 the backdrop of the Mount Lofty Ranges is less notable, forming a distant horizon line within the landscape. The proposed development will be seen a prominent visual element with a defined scale and mass, slightly elevated above the horizon edge.

From the viewpoint, the proposed development will be seen adjacent to existing agricultural properties. When seen in relation to existing development the proposed development is seen as an increase in built form elements within a landscape. As part of the proposed development the existing built form on the project site will be removed.

The development is seen within a narrow-horizontal field of view which, coupled with screening vegetation to road corridors and composition of the infrastructure elements, creates a moderate degree of visual change.

5.7 Summary of Visual Impacts

The visual assessment of the four viewpoints demonstrates that a consistent of visual impact will be experienced within the local, sub-regional and regional landscapes that surround the proposed power station development. Typically, the visual effect associated with the power station will occur within the local area between 1-5 kilometres.

The following tables illustrate the degree of visual change recorded at each of the viewpoints and classification of the potential visual impacts. Of note are the key factors that will affect the visual impact which occurs at each viewpoint and in the wider landscape. They include:

- Existing landscape character value and the presence or absence of significant vegetation or scenic value
- Existing infrastructure;
- The degree of landscape absorption provided by the existing landscape;
- Degree of visual containment and resulting viewshed;
- Horizontal and vertical visual effects produced by the proposed; and
- Distance to the proposed development.

As shown in Table 2 below, overall there is a moderate visual effect

Viewpoints	Relief	Vegetation Coverage	Infrastructure	Cultural/Landscape Value	Landscape Character	Landscape Absorption	Horizontal	Vertical	Distance	Visual Assessment	Degree of Visual Change
Viewpoint 1	**1**	**2**	**4**	**2**	**11**	**3**	**2**	**1**	**5**	**11**	**30%**
Viewpoint 2	**1**	**3**	**4**	**2**	**10**	**4**	**1**	**4**	**5**	**14**	**35%**
Viewpoint 3	**1**	**2**	**4**	**2**	**9**	**5**	**2**	**4**	**5**	**16**	**36%**
Viewpoint 4	**1**	**2**	**5**	**1**	**9**	**5**	**1**	**2**	**4**	**12**	**27%**

Table 2: Summary of Visual Impacts

05 Visual Impact Assessment

The following Table 3 is a summary of the classifications described in the GrimKe matrix which provides additional information on the potential visual impact used to describe each viewpoint.

Percentage of Visual Change	**Descriptive of Visual Impact**	**Descriptors – appearance in central vision field**	**Comments**
80-100%	**Extreme**	*Commanding, controlling the view*	*Extreme change in view: change very prominent involving total obstruction of existing view or change in character and composition of the landscape and view through loss of key elements or addition of new or uncharacteristic elements which significantly alter underlying landscape visual character and amenity. The sensitivity of the underlying landscape character to change is unable to accommodate or mitigate the introduction of development, and the visual effect is highly adverse.*
60-80%	**Severe**	*Standing out, striking, sharp, unmistakable, easily seen*	*Severe change in view involving the obstruction of existing views or alteration to underlying landscape visual character through the introduction of new elements. Change may be different in scale and character from the surroundings and the wider setting or a severe change in the context of the existing landscape character. Resulting in a perceived adverse visual effect and an increase in proportional change to the underlying landscape visual character.*
40-60%	**Substantial**	*Noticeable, distinct, catching the eye or attention, clearly visible, well defined*	*Substantial change in view: which may involve partial obstruction of existing view or alteration of underlying landscape visual character and composition through the introduction of new elements. Composition of the view will alter however the sensitivity of the underlying landscape character to change is low, and it provides opportunities for mitigation, management of the visual effect.*
20-40%	**Moderate**	*Visible, evident, obvious*	*Moderate change in view: change will be distinguishable from the surroundings whilecomposition, and underlying landscape visual character will be retained. The sensitivity of the existing landscape to change is low.*
0-20%	**Slight**	*Lacking sharpness of definition, not obvious, indistinct, not clear, obscure, blurred, indefinite*	*Very slight change in view: change barely distinguishable from the surroundings. Composition and character of view substantially unaltered.*

Table 3: Classification of Visual Impacts

The low lying character of the rural landscape results in views to the north, south, east and west up to a distance of 5 kilometres. The depth of field that is experienced from any viewpoint within the landscape is altered primarily by the layered screening and visual fragmentation that occurs as a result of vegetation belts and local landforms.

This contrasts with distant views across the open field boundaries towards the rising topography and horizon line formed by Mount Lofty Ranges to the north and east. To the west, the visual character and visual envelope are formed by variations in vegetation belts. In situations where the vegetation is limited, the views continue over several kilometres towards the coast.

The visual impact of the Reeves Plains Power Station will be moderate within a local to sub-regional (1-5km) locality. Local ridgelines to the west, north and south east are likely to limit the extent of visibility towards the proposed development site. The presence of vegetation belts both to the foreground and background of all viewpoints provide a degree of visual screening or fragmentation. Beyond 5 kilometres, the combination of topography, visual containment and vegetation screening significantly reduces the visual effect resulting in a slight to negligible impact.

The vertical development form is similar in height to the other infrastructure elements in the regional landscape. However, the proposed development will be seen as a more concentrated cluster of infrastructure elements within a defined field of view. The surrounding vertical scale of the vegetation, such as larger belts of established trees, provides a degree of visual absorption to some of the vertical infrastructure elements. From some viewpoints the backdrop of the Mount Lofty Ranges reduces the potential for the development to be sky-lined, particularly to the east, reducing the visual effect in these locations.

The communications tower is the highest piece of infrastructure associated with the proposed development. This is a single piece of infrastructure with a slim lattice tower construction which will be approximately 30-35 metres high. While this tower has the potential to be visible over greater distances, due to the slim profile this element is likely to be screened in many locations by trees or built form. In addition the lattice construction will reduce the visual bulk reducing its visual prominence due to an increased degree of visual permeability as well as providing a similar development to the lattice cut in tower.

The lattice cut in tower is the highest piece of infrastructure with high of 40-45 metres. The development from is different in design and scale to the existing transmission corridor. While it will be visually different to the existing infrastructure of the transmission corridor, the tower design is consistent with other transmission towers in the wider regional locality. The lattice tower construction of the cut in tower will fit into the design context of the proposed power station's associated infrastructure including the transmission substation, gantries and communications tower.

The horizontal development form including the gas turbines, water tanks and other associated structures will be similar in scale to many of the surrounding agricultural buildings and structures. The proposed power station will be seen as a concentrated cluster of development within the landscape with some elements reflective of the surrounding agricultural landscape context (such as storage sheds and water tanks). Generally, the form and visual bulk of the proposed development may result in a moderate degree of visual change in the existing rural landscape.

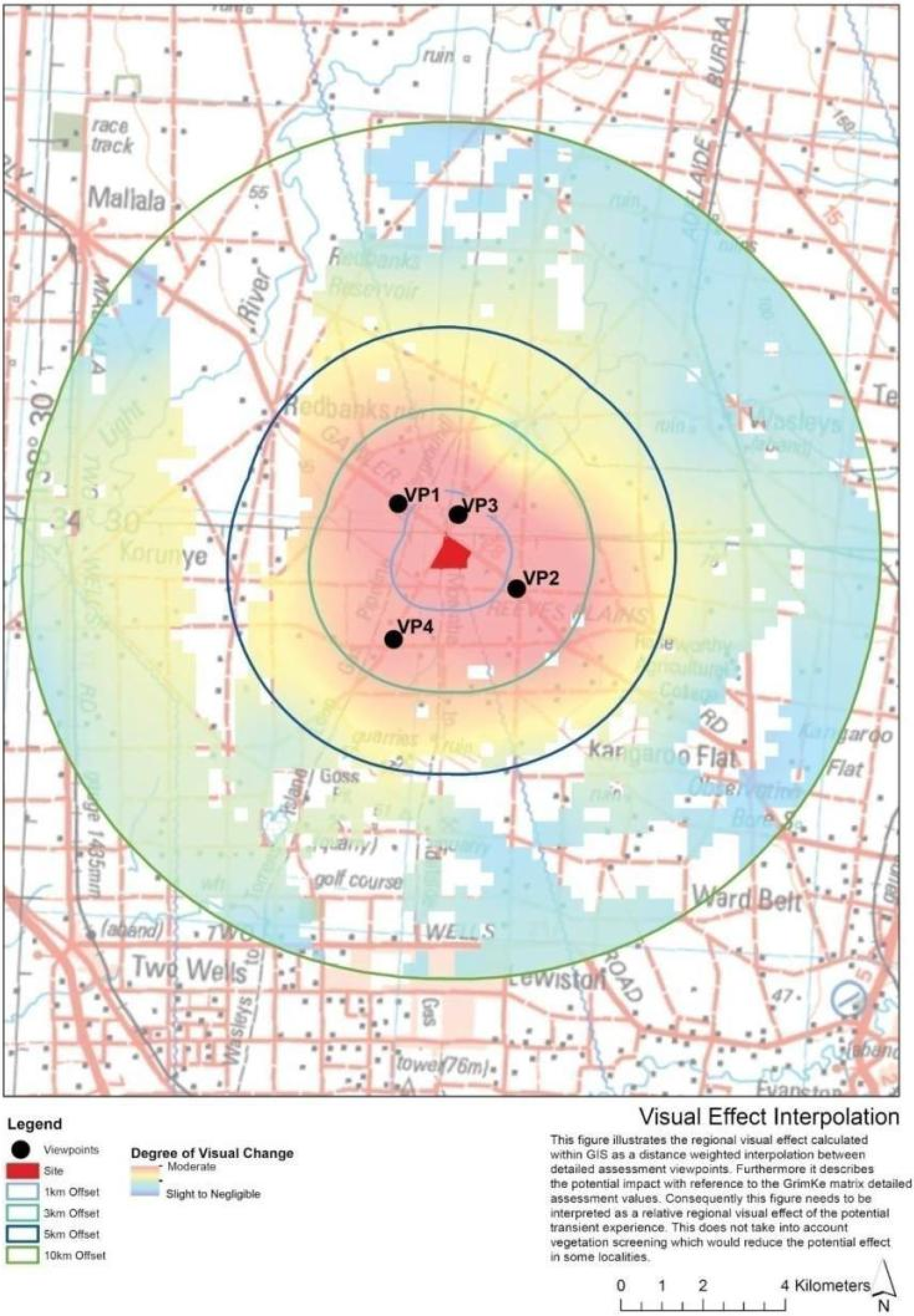

Figure 31: Summary of viewpoint visual effect

5.8 Design Review and Visual Management

The management of the visual effect was considered as part of the LVIA and was based on a review process as well as a consideration of environmental constraints and the relevant provisions of the Development Plan.

Material and finishes, such as pitched roof and colourbond zincalum finish should be considered for service buildings and other infrastructure to provide a contextual reference within the agricultural landscape. Materiality and colour finishes that are consistent with the surrounding agricultural landscape character will provide an additional visual management, enhancing the integration of the proposed development.

It is recommended that a landscape concept be prepared and a degree of visual management can be achieved through the implementation of suitable landscape treatments to the subject site. It is suggested that the following principles are used to inform the landscape concept plan.

- Landscape proposals immediately surrounding the development should be consistent with bushfire risk mitigation specifications.
- Landscaping of the existing gas pipeline and transmission line corridors should be consistent with access and electricity generation requirements.
- Establish landscape buffers, particularly along the Gawler-Mallala Road corridor and the Day Road boundary of the site. This will fragment the visual mass and bulk of the development both when viewed in front of the development and when seen as a vegetated backdrop to the development.
- Landscape screening should be established as a series of overlapping but staggered belts of vegetation with adequate gaps between them. Vegetation belts should be restricted in length and with a maximum planting width of 20 metres to restrict providing a continuous fuel source.
- Use local plant species to encourage maximum growth heights are achieved. Established trees in the locality suggest that screening trees could reach a height of approximately 15 metres over 10-20 years.
  Consider mounding with swale combination to increase stormwater collection and increase potential visual screening. The planting will then create a layered vegetation screen.

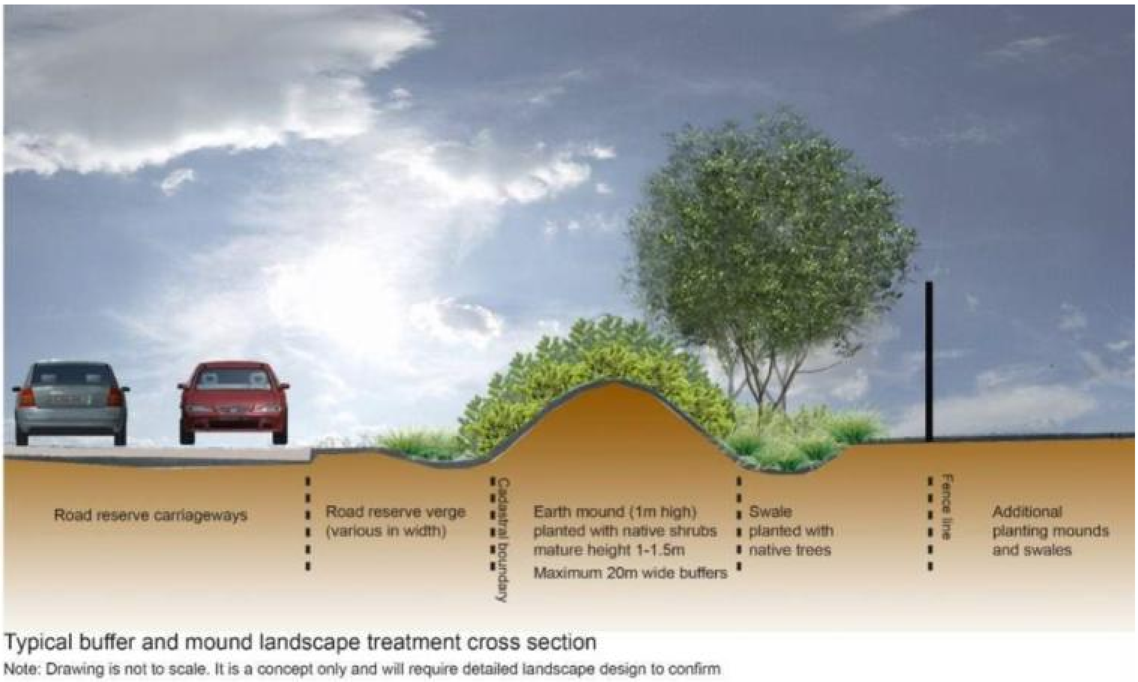

Figure 32: Typical planting buffer detail

06 Review of Development Plan

6.0 Review of Development Plan

6.1 Introduction

The following section details the various development plan provisions, zones and policy areas that have been considered in relation to the potential visual effect of the Reeves Plains Power Station and associated infrastructure. The proposed development is located within the Adelaide Plains Council area (previously the Mallala Council).

This section will review the proposed development against the Mallala Council Development Plan (Consolidated – 21 April 2016). The intent of the review is to provide clarity as to the relevance and consistency with particular provisions in relation to the development of the power station and associated infrastructure, visual impacts, and the effects on the landscape character and amenity.

The proposed development is situated entirely within the Primary Production Zone it is located adjacent to Redbanks Road which is identified as a secondary arterial road within the development plan. The development site is located approximately 1-2 kilometers away from Fischer a small collection of Rural Living allotments. Having reviewed the Development Plan consideration has been given to a broad range of provisions that could be applied to the power station as a public infrastructure development;

- Primary Production Desired Character Statement, Objectives and Principles of Development Control (PDCs);
- Council Wide Design and Appearance – Building Setbacks from Road Boundaries, Infrastructure, Landscaping, Fencing and Walls, and Siting and Visibility Objectives and PDCs

6.2 Primary Production Zone

The Desired Character Statement for the Primary Production Zone has a focus on ensuring that the development is consistent with the desired character of primary production land uses such as farming, horticultural and animal keeping. There is focus on protecting this zone from incompatible land uses and protecting the scenic qualities.

Objective 4: Protection of primary production from encroachment by incompatible land uses and protection of scenic qualities of rural landscapes.

PDC 13: Buildings should primarily be limited to farm, horticulture and animal keeping buildings, a detached dwelling associated with primary production on the allotment and residential out buildings that are:

- grouped together on the allotment and setback from allotment boundaries to minimise the visual impact of buildings on the landscape as viewed from public roads
  - *(a) screened from public roads and adjacent land by existing vegetation or landscaped buffers.*

The Primary Production Zone is silent on the development of public infrastructure such as a power station. Public infrastructure including developments which deal with the production of energy have not been identified as non-complying development within the Primary Production Zone. Furthermore the zone does anticipate the development of substations and other infrastructure elements associated with the development of wind farms which are of a similar scale and nature as the proposed development. This indicates that the development of energy production such as the Reeves Plains Power Station could occur within the Primary Production Zone.

6.3 Council Wide Provisions

The proposed development has a minimum setback of 80 meters from both road boundaries and satisfies CW Design and Appearance PDC 25 (b). This setback helps to mitigate the immediate visual impact which could be experienced from the road corridor and allows the potential to implement a landscape treatment plan as suggested in section 5 of this report.

CW Design and Appearance PDC 25: Unless otherwise stated within the specific zone or policy area provisions, buildings and structures excluding advertisements and/or advertising hoardings should be setback at least:

- 50 metres from the road boundary of the Port Wakefield Road outside defined township and settlement zones
  (a) *20 metres from the road boundary (other than the Port Wakefield Road) in any area outside of a defined township, settlement or rural living zone boundary*
- 8 metres from the road boundary within the Township Zone or Settlement Zone.

There is generally not a consistent setback for dwellings and structures within the locality and the Primary Production Zone. While the proposed development will result in a degree of visual change in the immediate locality this is a result of the scale, height and type of development rather than the road setbacks, therefore CW Design and Appearance PDC 21.

The development site for the Reeves Plains Power Station has both an existing gas pipeline as well as an existing transmission line traversing the site. Having the connection to gas and electricity infastructure on site results in an efficient use of existing infrastructure and eliminates the requirement for extended pipeline and transmission line connections across the landscape between the peaking plant and existing infrastructure. This minimises the duplication of infrastructure elements within the landscape and contains the potential visual effect of the development of the power station to a contained locality satisfying CW Infrastructure Objective 3 and PDC 3 and 10.

The condensed layout of the proposed gas peaking plant along with the road setbacks aim to minimize the potential visual impact of the proposed development. This along with the proposed landscape treatments would significantly minimize the visual impact of the development in the immediate area satisfying CW Infrastructure Objective 2 and CW Siting and Visibility PDC 1 (b). With the visual impact decreasing significantly further than four kilometers away from the site due to topography and local vegetation screening.

The proposed development is situated within a modified agricultural landscape along a secondary arterial road. The proposed development will be visible along this road corridor particularly within the immediate area of 1-2 kilometres. Along this road corridor there are established belts of vegetation which screen the development, gaps in this vegetation will allow glimpsed views towards the proposed development.

The suggested landscape concept plan aims to manage the visual effect of the development along the public road with screen planting.

The proposed vegetation planting along the road corridor will provide a level of visual screening for the development, this type of planting is consistent with the surrounding landscape character with much of the Mallala-Gawler Road corridor and other road corridors having established road side vegetation. This vegetation could be achieved by using indigenous plant species.

Existing trees in the locality have reached a height of between 12-15 metres which would provide a significant level of screening particularly to the horizontal mass of the proposed development. Existing road side vegetation demonstrates that a dense vegetation screen can be achieved in the locality. This approach to landscape surrounding the development in our opinion would satisfy CW Landscaping, Fences and Walls Objective 1, PDC 1, 2 and CW Siting and Visibility Objective 1 and PDC 7.

07 Viewer Sensitivity

7.0 Viewer Sensitivity

The preceding assessment considers the visual effect of the power station from various locations having regard to the existing landscape quality and the degree of visual change on the existing environment. It does not measure the extent to which a viewer's response or sensitivity to landscape changes and how this influences the perception of visual effect.

Fundamental to the viewer's sensitivity is the degree to which visual change is perceived or experienced and whether this is seen as a positive or negative visual effect. Therefore, it is likely that local residents, who are most familiar with the landscape, will experience a greater degree of change than occasional visitors to the area. However, whether the change is perceived as positive or negative will depend on the viewer's opinions.

The truth may be that within all user groups, be they locals, tourists, walkers or weekenders, a spectrum of opinions can be expected based on differing views on the receiving landscape. The final level of viewer sensitivity becomes the personal preference of the viewer as to whether the visual change is positive or negative, as an assessment of social or demographic groups can only be subjective, it does not form part of this discussion.

8 Conclusion

8.0 Conclusion

The visual impact of the Reeves Plains Power Station will be moderate within a defined local to sub-regional (1-5km) locality. Local ridgelines to the west, north and south-east limit the extent of visibility around the subject site. The presence of existing vegetation belts both to the foreground and background of all viewpoints provide a degree of visual screening or fragmentation that assist in reducing the visual effect of the proposed power station.

Beyond 5 kilometres, the combination of topography, visual containment and vegetation screening significantly reduces the visual effect resulting in a slight to negligible impact.

The overall visual effect will be defined by the concentrated cluster of infrastructure elements within the existing agricultural landscape. The horizontal infrastructure elements have similarities in scale and mass to a number of existing agricultural structures. However, the extent of development will be seen as a large cluster of built form elements within the locality. While the visual effect is likely to be moderate opportunities exist to manage the visual effect through material and finishes selections which respond to the surrounding context and provision of adequate landscape treatments (with reference to the Landscape Concept Plan).

The vertical scale of the transmission substation and associated gantries is similar in height to the existing transmission corridor; again this will be seen as a concentration of infrastructure elements within the locality. The lattice tower construction of the transmission substation and cut in tower will contrast the existing transmission towers on site. However, the cut it tower it typical of other power transmission infrastructure in the wider regional landscape context.

Vertical elements of the development, such as the communications tower, will produce points of visual prominence. However the lattice tower construction and narrow profile will have a reduced visual effect.

Existing landforms within the locality as well as established belts of vegetation provide significant screening across the locality. This coupled with the proposed landscape concept plan further reduce and fragment the potential visual impact. Detailed planting plans will be required to ensure that the proposed landscape is consistent with other requirements such as bushfire risk and environmental management.

In conclusion, the potential visual impact for the Reeves Plains Power Station will be moderate and will be experienced within the local to sub-regional locality up to 5 kilometres. In addition to the contained visual effect, there is the potential to mitigate and reduced to slight the visual impact with the adoption and establishment of the visual management strategies proposed in the report.

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Landscape Character and Probable Visual Effect Assessment

Mallala Open Cycle Gas Turbine Peaking Plant

Prepared for Alinta

11 September 2017

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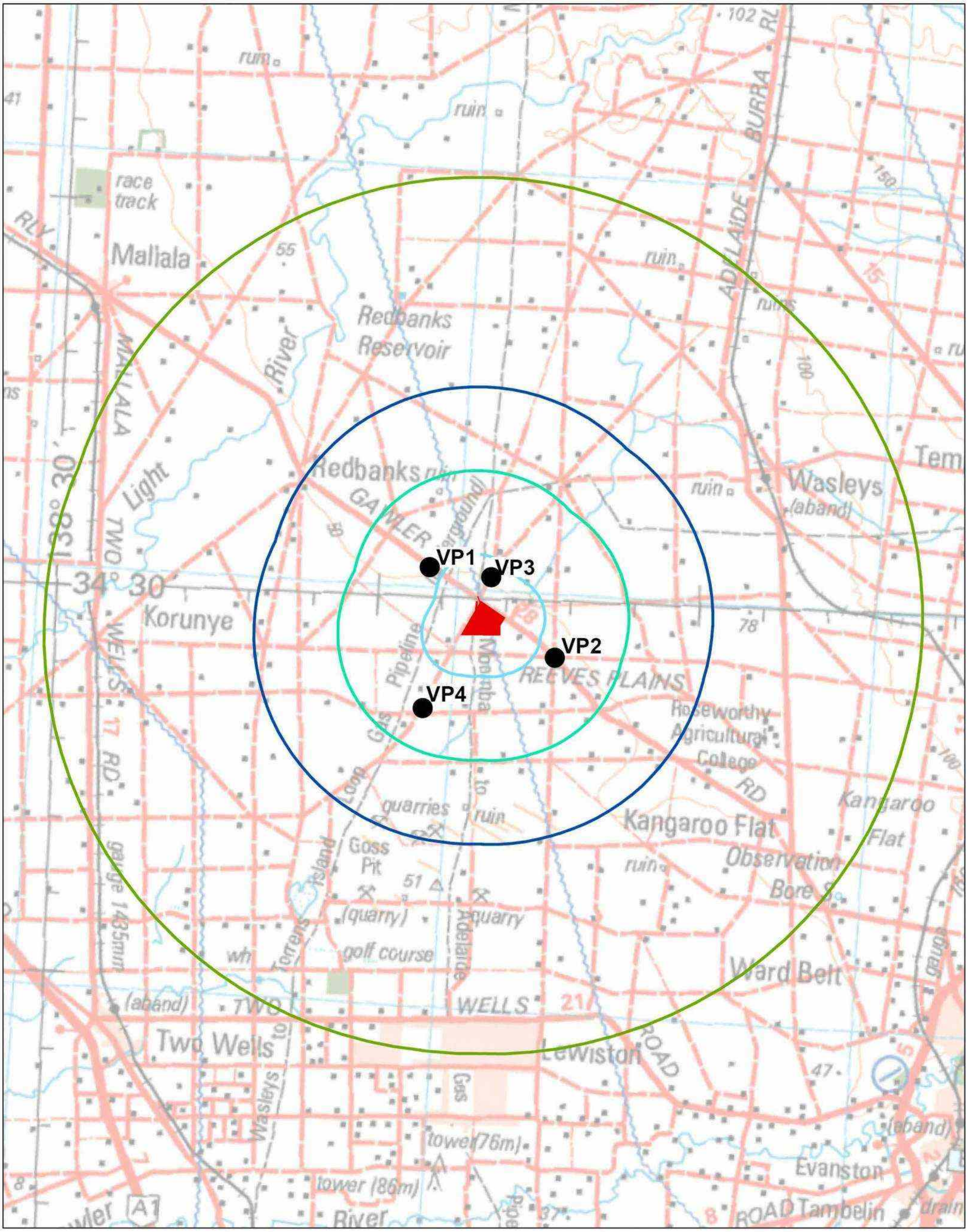
REVISION	DATE	AUTHOR	REVIEWER
B	11/09/2017	WK/BG/CS	WK
A	14/08/2017	WK/BG/CS	CS

Appendix A
Assessment Mapping



Viewpoints

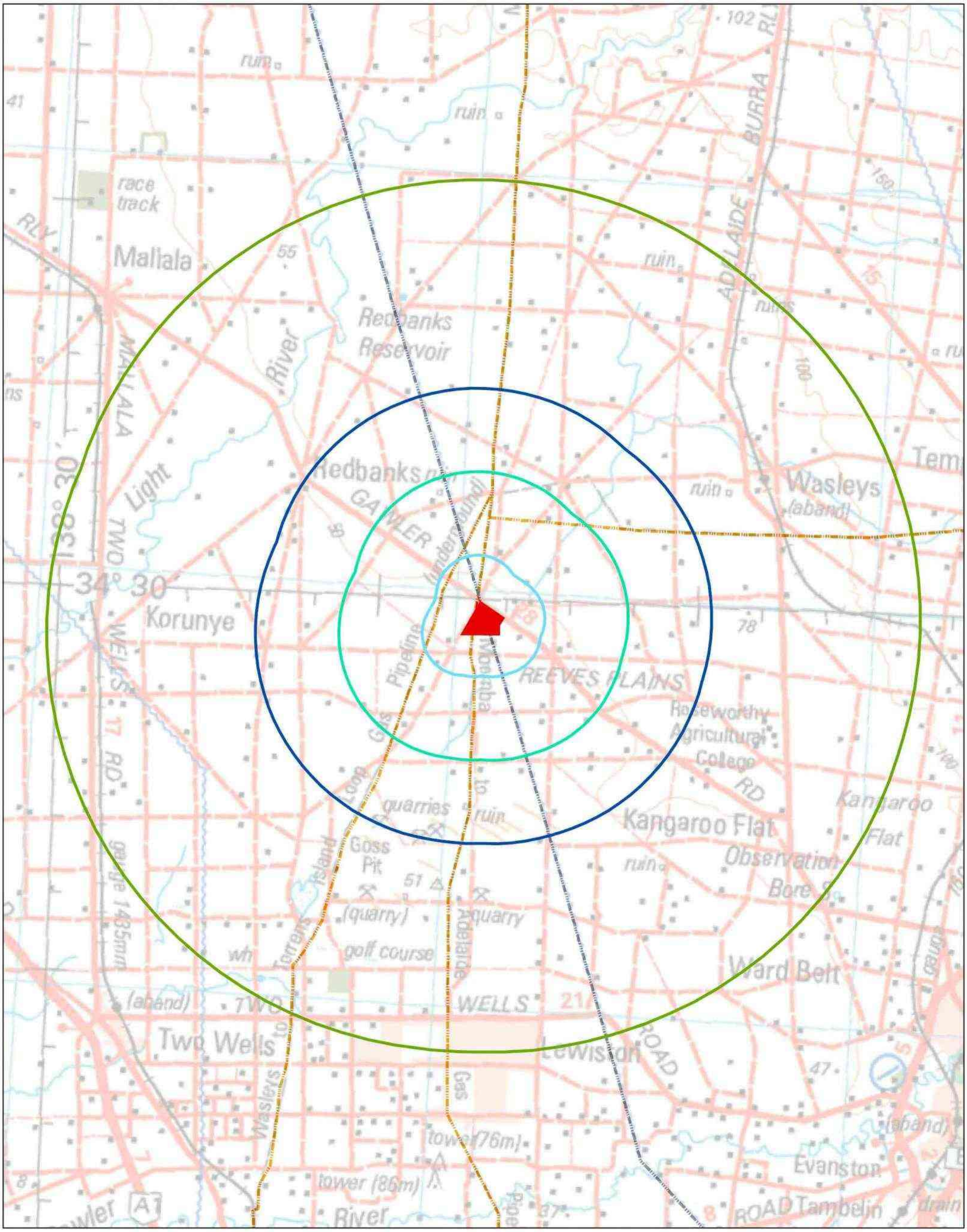
Legend

- Viewpoints
- 1km Offset
- 3km Offset
- 5km Offset
- 10km Offset
- Site

0 1.5 3 6 Kilometers

N


VP 1
VP 3
VP 2
VP 4
WOOLSHEDS ROAD
DAY ROAD
Gawler Rd
EXISTING UNDERGROUND GAS PIPELINE
EVAPORATION DAM
GAS TURBINES
EXISTING TRANSMISSION LINE
WATER TREATMENT
SUBSTATION
Viewpoints and Infrastructure
Legend
Viewpoints
Site Layout
1km Offset
0
0.5
1
2 Kilometers
N



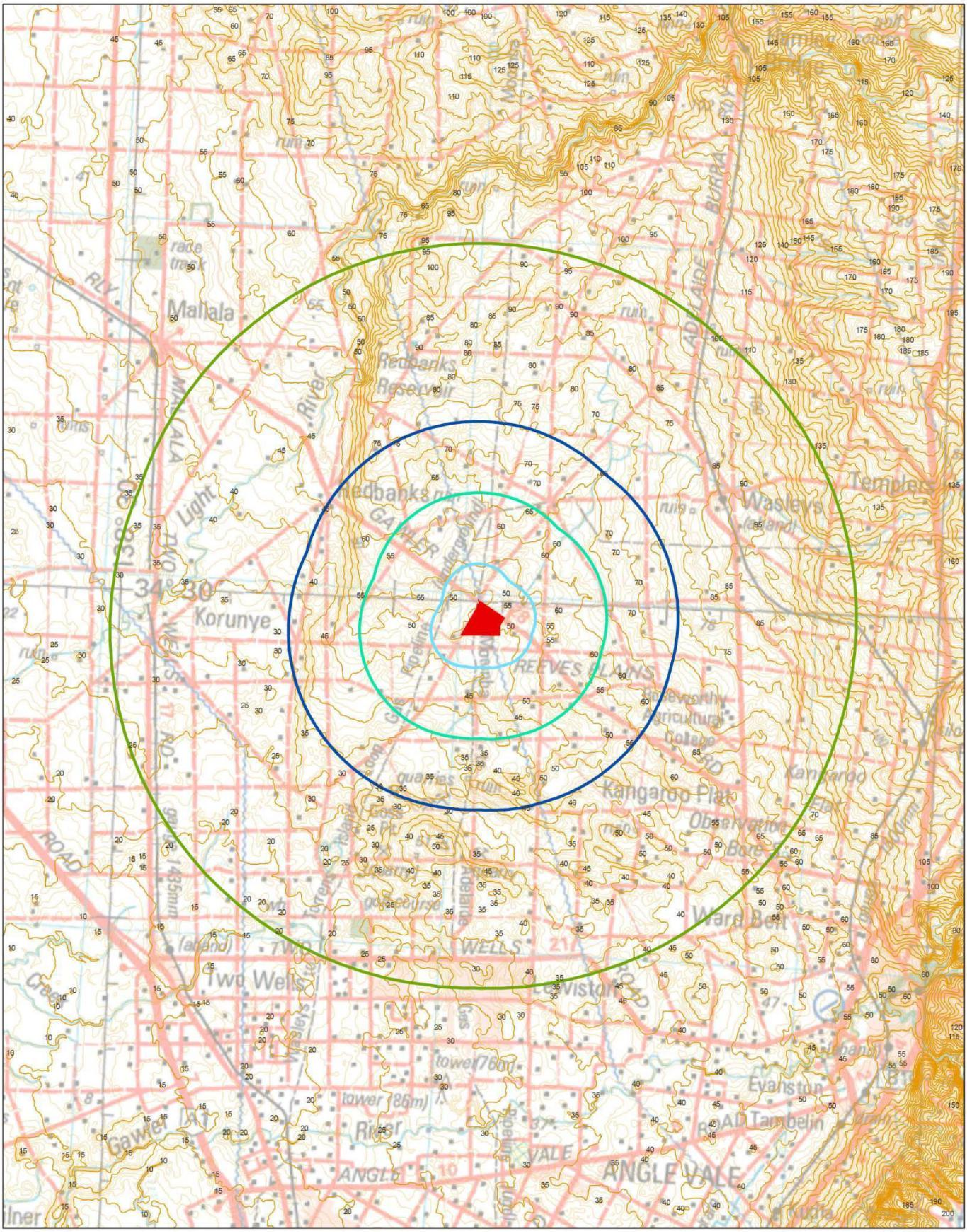
Site Locality

Legend

- Site
- HighVoltageElectricityTransmissionLine
- NationalOnshoreGasPipelines
- 1km Offset
- 3km Offset
- 5km Offset
- 10km Offset

0 1.5 3 6 Kilometers

N



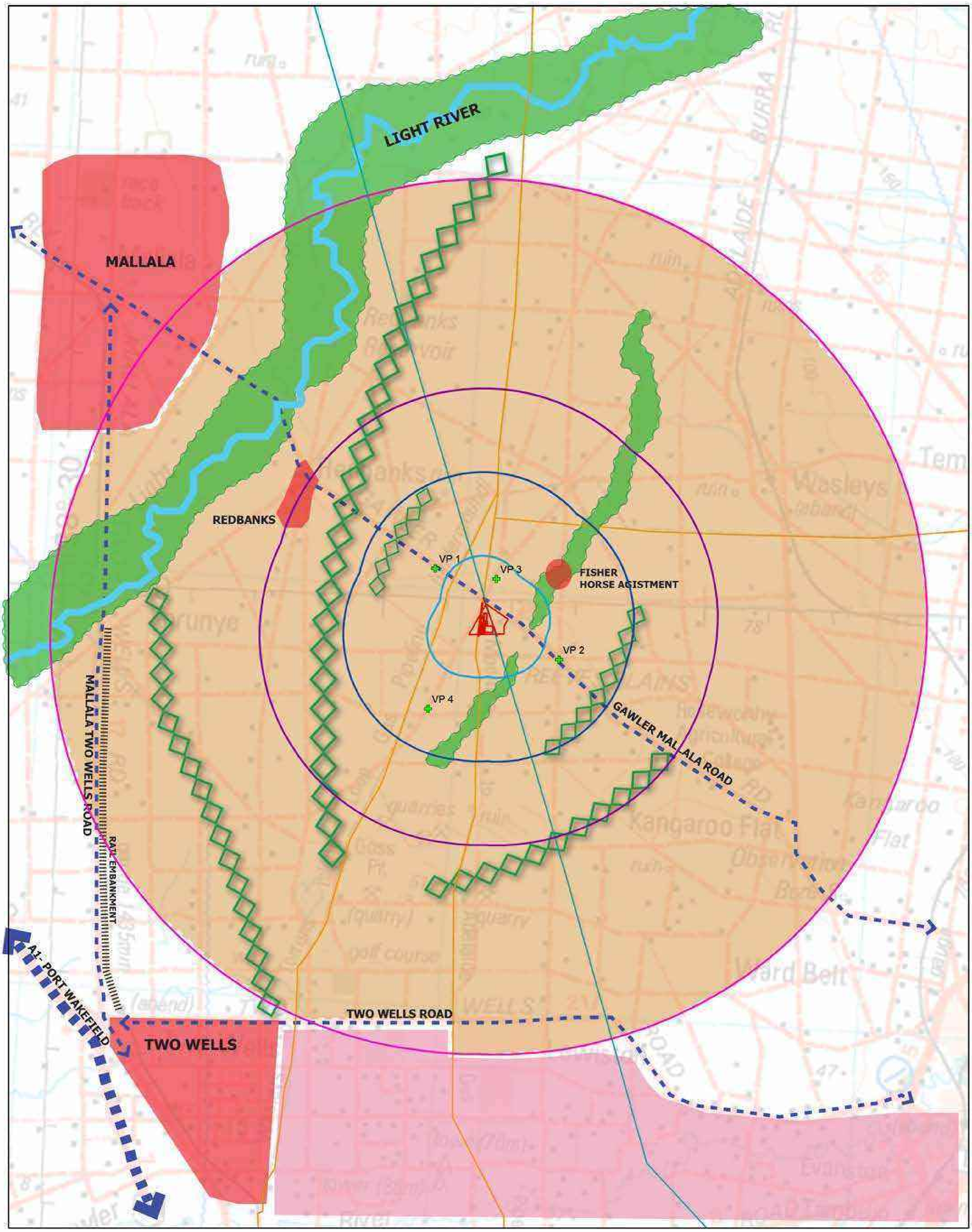
Legend

Contours

- 1km Offset
- 3km Offset
- 5km Offset
- 10km Offset
- Site
- Contours 1m
- Contours 5m

0 2 4 8 Kilometers

N



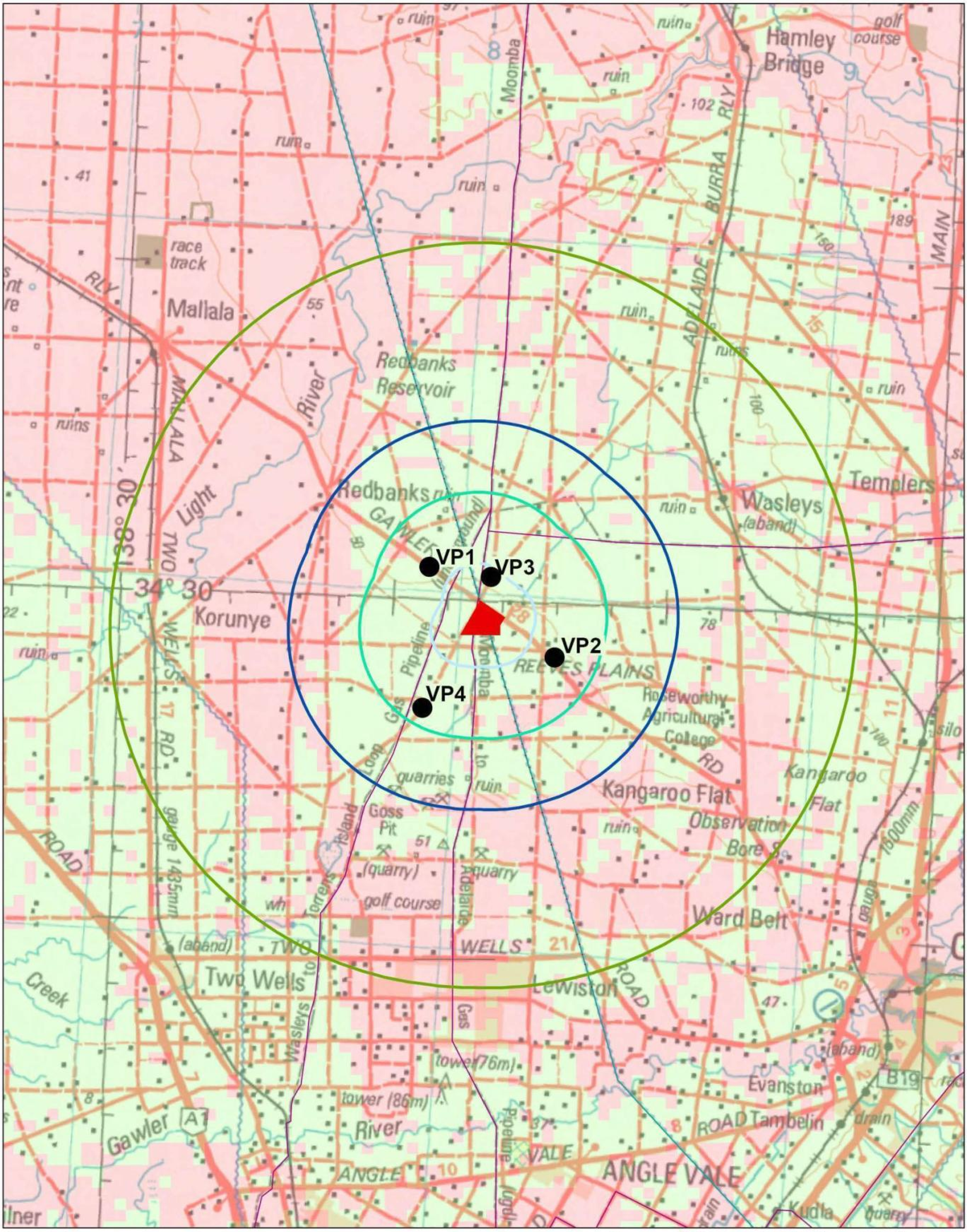
Landscape Character

Legend

- Viewpoints
- Site Layout
- 1km Offset
- 3km Offset
- 5km Offset
- 10km Offset
- High Voltage Electricity Transmission Line
- National Onshore Gas Pipelines
- Settlement
- Rural living/ agriculture
- Agricultural land with isolated variation to landuse
- Riparian vegetated corridors
- Ridgelines and visual containment
- Frequent vehicular movement patterns

0 1.5 3 6 Kilometers

N



Legend

- Site
- HighVoltageElectricityPylon
- HighVoltageElectricityTransmissionLine
- NationalOnshoreGasPipelines
- 1km Offset
- 3km Offset
- 5km Offset
- 10km Offset

ZTVI

- Not Visible
- Visible

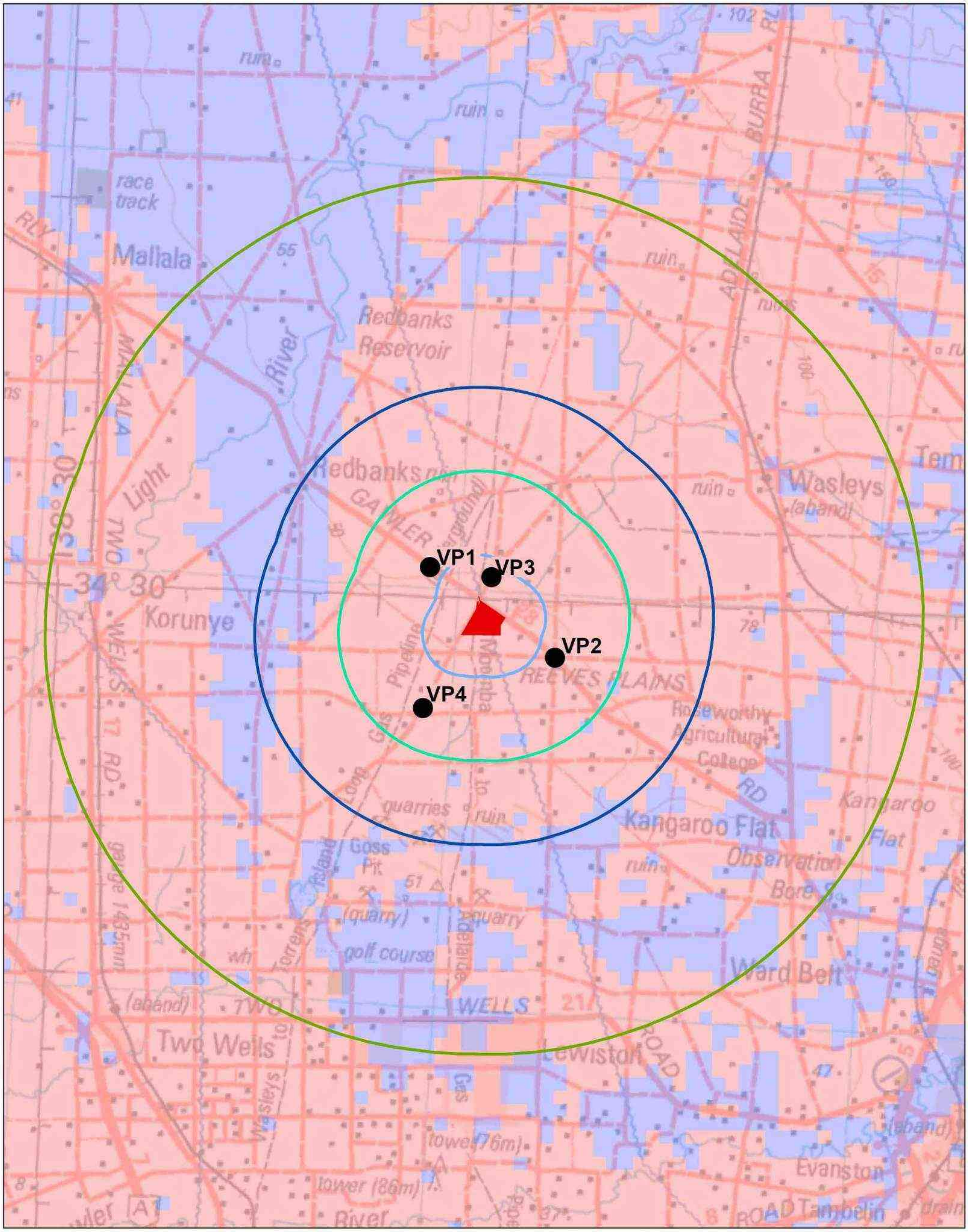
Zone of Theoretical Visual Influence

ZTVI represents 'worse case scenario'
it is based on 1m contour data and does not take into account vegetation or built form screening.

Maximum heights of infrastructure
- gas exhaust stack silencer 16m

0 1 2 4 Kilometers

N



Zone of Theoretical Visual Influence

Legend

- Viewpoints
- Site
- 1km Offset
- 3km Offset
- 5km Offset
- 10km Offset

ZTVI

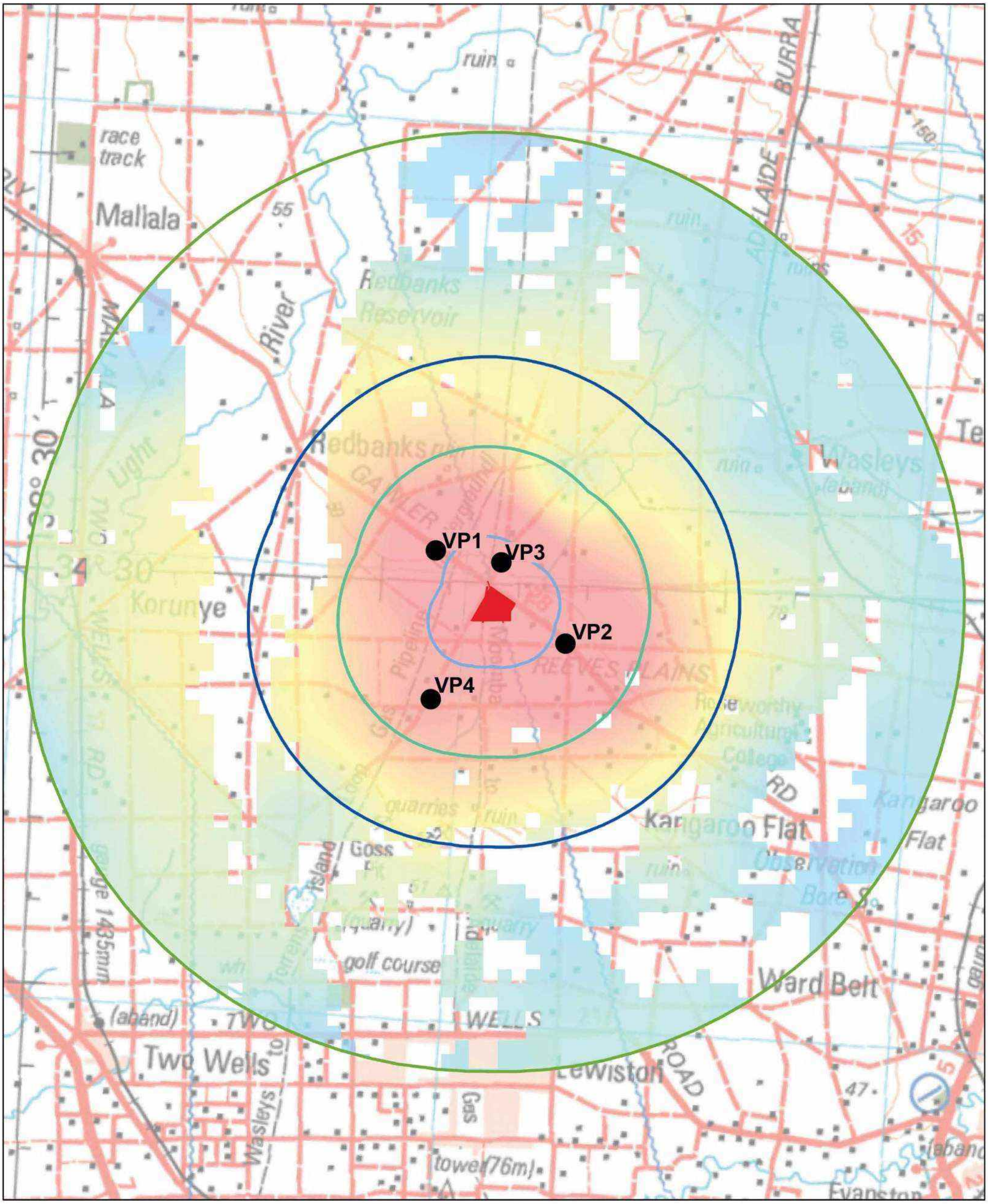
- Not Visible
- Visible

ZTVI respresents 'worse case scenario',
it is based on 1m contour data and does not take into account vegetation or built form screening.

Maximum heights of infrastructure modelled
- gas exhaust stacks 16m
- substation gantries 24m
- transmission tower 27m

0 1 2 4 Kilometers

N



Legend

- Viewpoints
- Site
- 1km Offset
- 3km Offset
- 5km Offset
- 10km Offset

Degree of Visual Change

- Moderate
- Slight to Negligible

Visual Effect Interpolation

This figure illustrates the regional visual effect calculated within GIS as a distance weighted interpolation between detailed assessment viewpoints. Furthermore it describes the potential impact with reference to the GrimKe matrix detailed assessment values. Consequently this figure needs to be interpreted as a relative regional visual effect of the potential transient experience. This does not take into account vegetation screening which would reduce the potential effect in some localities.

0 1 2 4 Kilometers

N

Appendix B
Photographic Methodology (produced by Convergen)

The method consists of 6 stages. The following summarises the stages;

1. Viewpoints are identified using a Zone of Theoretical Visibility map, site assessment and in consultation with the client and residents in the area. The viewpoints are selected to represent the worse case scenario i.e. the maximum number of turbines visible within the field of view. The locations of viewpoints are typically representative of the regional landscape character units or identified by residents. The locations represent a diverse range of views from around the wind farm at a variety of directions and distances.

2. Photos are taken onsite using a 32mm lens digital SLR camera (50mm equivalent analogue). Numerous research papers have concluded that this is most representative of the human eye for depth of field. Photos are taken on a mounted tripod and the height recorded to eye level. In addition the elevation of the viewpoint is recorded Above Sea Level (ASL) using the barometric measure on a handheld GPS device. The weather and time of day are also recorded to enable computer model rectification in stage 4 and 6 of the process.

3. The centre of the field of view is equated onsite using a bearing compass and GPS to the projected centre of the development. A field of view of 60 degrees to either side of centre is established onsite to provide the full 120 degrees. The extent of the field of view is recorded and evaluated onsite using the GPS and bearing compass. 6 photos are taken for each viewpoint with 1/3 overlap of each to enable photo stitching. The bearing to centre of each photo is recorded to enable cross reference to the next phase of developing a computer model. During the site photography numerous fixed known visual markers are recorded with a GPS location and bearing from the viewpoint. These markers provide reference points within the computer modelling for due diligence.

4. To generate the panoramic photographs the individual photographs are stitched together using PTGui software.

5. The next stage of the process involves the computer generation of a wire frame perspective view of the wind farm, which incorporates the topography from each viewpoint. Using the Wind Farmer™ software the wire frame is produced using a digital terrain model with 10 metre contour intervals. This creates the topography and positions the turbines at the correct coordinates and elevation within the wire frame. The correct field of view is established by matching the viewing centre of the view angle to the camera and lens used for the photography with the wire frame. This ensures that the image size and angle of view of the wire line matches the photos taken. The wire line is then superimposed on the stitched panoramic photograph and matched in accordance to reference markers and landscape features.

6. A second site visit is conducted with the preliminary wire lines to certify the correct locations of the turbines using a GPS and bearing compass. Minor alterations are marked up on the drafts to mitigate the effects of photographic warping to the periphery of the stitched panorama. Ground truthing the turbine locations, provides rigour to the process. Typically if any amendments are required they are within 1-5 degrees.

7. Once the wire frame and photograph have been lined up the rendered image of the turbines are created. The rendered model is created in Wind Farmer™ using the correct sun angle for the date and time of the day that the photograph was taken. The rendered model is exported to Photoshop™ for final matching with the photograph. The rendered image is edited, masking

turbines or parts their off that are screened by vegetation and other elements to the foreground. Additional visual effects are applied to match the lighting effects of shadow imposed by vegetation etc.

Viewing of Photomontages

Given that the objectives of photography and photomontage are to produce printed images of a size and resolution sufficient for use in assessment work in the field, the exact dimensions of these images will depend on the characteristics of the field of view.

All photographs, whether printed or digitally displayed, have a unique, correct viewing distance - that is, the distance at which the perspective in the photograph correctly reconstructs the perspective seen from the point at which the photograph was taken. The correct viewing distance is stated for all printed or digitally displayed photographs and photomontages, together with the size at which they should be printed.

The viewing distance and the horizontal field of view together determine the overall printed image size.
Photographs and photomontages should be printed or published digitally at an appropriate scale for comfortable viewing at the correct distance, noting the limitations of the printing process particularly with regards to colour and resolution. Guidance is provided on viewing the image in order to best represent how the proposal would appear if constructed, such as the required viewing distance between the eye and the printed image. Panoramic images should be curved so that peripheral parts of the image are viewed at the same intended viewing distance. The ‘before’ photograph and the ‘after’ photomontage should be presented on the same page and/or at the same scale to allow comparison if practicable.

References

Landscape Institute Photography and photomontage in landscape and visual impact assessment (March 2011)

Landscape Institute and IEMA (2002) Guidelines for landscape and visual impact assessment (2nd ed). London: Spon.

Scottish Natural Heritage (2006) Visual representation of windfarms: good practice guidance. Inverness: Scottish Natural Heritage. SNH report no. FO3 AA 308/2

Appendix C

Photomontages

Mallala Gas Peaking Plant Photomontages
Viewpoint 1 Gawler-Mallala Road (North-west of site)

Longitude	Latitude	Distance to nearest WTG	View Direction
279327.47	6180485.75	1.76km	137 degrees


Viewpoint 1 Gawler-Mallala Road, North-west of site


Viewpoint 1 Photomontage


Viewpoint 1 Digital Overlay with Infrastructure Visible

Mallala Gas Peaking Plant Photomontages
Viewpoint 2 Gawler-Mallala Road and Boundary Road Intersection (South-east of site)

Longitude	Latitude	Distance to nearest WTG	View Direction
282404.66	6178487.79	1.93km	296 degrees

Viewpoint 2 Gawler-Mallala Road and Boundary Road Intersection, South-east of site

Viewpoint 2 Photomontage

Viewpoint 2 Digital Overlay with Infrastructure Visible

Mallala Gas Peaking Plant Photomontages
Viewpoint 3 Woolshed Road (North-east of site)

Longitude	Latitude	Distance to nearest WTG	View Direction
280799.32	6180320.74	1.16km	183 degrees


Viewpoint 3 Woolshed Road, North-east of site


Viewpoint 3 Photomontage


Viewpoint 3 Digital Overlay with Infrastructure Visible

Mallala Gas Peaking Plant Photomontages
Viewpoint 4 Day Road (South-west of site)

Longitude	Latitude	Distance to nearest WTG	View Direction
279351.94	6177134.92	2.22km	36 degrees

Viewpoint 4 Day Road, South-west of site

Viewpoint 4 Photomontage

Viewpoint 4 Digital Overlay with Infrastructure Visible

Appendix D

GrimKe Assessment Matrix

The GRIMKE Matrix has been based on the WAX (2006) and HASSELL Matrix (2005), and with reference to The Visual Management System (VMS) produced by Litton (1968) primarily used for the U.S. Forest Service (1973) and the US Bureau of Land Management (1980). These models are based on a professional consultant (Landscape Architect) quantifying potential changes to landscape composition through "forms, lines, colours and textures and their interrelationships"1. Other factors such as compositional qualities, dominance, variety, animation and sensitivity to potential receptors are also considered.

The extent of visual impact was identified on site, using a GPS with a Wide Area Augmentation System (WAAS) that provides positional accuracy to within 3 metres.i Using the GPS, the location and extent of the development was plotted as 'waypoints', using longitude and latitude, elevation and distances to provide geographic referenced data. The surrounding area was then surveyed with the GPS and a SILVAii bearing compass to calculate the bearing and distance between the viewpoint and the subject area. This methodology was used to assess where the development is in the landscape and whether it is visible.

The GrimKe Matrix considers two key aspects in terms of understanding visual impact and the resulting visual assessment. The initial assessment is a quasi-objective measurement, where a landscape architect considers the landscape character of the site and particularly in relation of this landscape to the viewpoints that have been selected as part of the assessment criteria. Each viewpoint is then assessed in terms of:

— Relief (the complexity of the land that exists as part of the underlying landscape character)

— Vegetation Cover (the extent to which vegetation is present and its potential to screen and filter views)

— Infrastructure and Built Form (the impact of development on landscape and visual character)

— Cultural and Landscape Value (quantification of recognised planning overlays)

Assessing each viewpoint and the regional context (cultural and landscape value) a quantified value is generated for landscape character. This value then forms the baseline assessment value, which will be modified by the impact of the development within the landscape, which in turn will be measured as part of the visual assessment.

This two-tiered assessment methodology ensures the degree of visual impact is assessed against a quantified landscape character value enabling, the GrimKe Matrix to accurately quantify the degree of visual impact that is experienced as a result of implementing the development.

The assessment considers the landscape as three distinct zones based on the distance from the proposed development. The three zones were defined as; local (0-1km), sub-regional (1-5km) and regional (5-30km). (Planning South Australia, 2002). Specific landscape characters are also identified to provide a complete assessment of the landscape context.

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[1] *Daniel, T C & Vining, J (1980) p49*

1. Landscape Character Assessment

1.1 Relief

This is an assessment of the landscape complexity in terms of the underlying topography. The relationship of relief assists in defining the landscape and the visual character of an area. This is relevant in terms of the position and elevation of a proposed development within the landscape and the viewpoint.

The topography is assessed both on site (from each viewpoint) and as part of a desktop review (topography mapping). The assessment considers the topographical complexity in terms of local, sub-regional and regional. Within each zone an assessment is made of the topography and the complexity of landscape features.

The assessment is concerned with landscape complexity and how it impacts on the visual character. The assessment considers landform patterns, dominant elements and other distinguishing topographical features that will impact on the visual context.

Relief (expressed as percentage)	Value	Description of Landscape Relief
80-100%	5	Substantial landscape relief. The landscape possesses significant topographic variations, features and prominent elements creating a dynamic landscape context.
60-79%	4	Increasing relief. Due to the scale of the topography and frequency of features.
40-59%	3	Moderate relief. Medium level of change to the landscape. Occasional landscape features and topographic variation.
20-39%	2	Limited relief. Small amount of topographic variation in the landscape.
0-19%	1	No or minor relief within the landscape. The landscape is considered feature less, without noticeable elements or patterns.

1.2 Vegetation Coverage

Vegetation coverage is a measurement of the extent, character and frequency of vegetation that exists at each viewpoint and within the local, sub-regional and regional zones. The extent of vegetation provides the potential for screening and to reduce the visual effect of development. Conversely, a lack of vegetation results in an increase in the visual significance of a development.

This measurement responds to the potential visual absorption of the landscape as measured by the visual matrix. Again, this assessment considers the dominant vegetation patterns within each zone and in relation to each viewpoint.

Vegetation Coverage (expressed as percentage)	Value	Description of Vegetation Coverage
80-100%	5	Natural or non-harvested commercial forests. Significant areas of treed vegetation creating an arboreal landscape.
60-79%	4	Bushland or woodlands. Major areas of vegetation that define the landscape character of an area
40-59%	3	Tree groups, copse, screens, shelter belts. Defined areas of vegetation creating a layered landscape character.
20-39%	2	Sporadic trees producing a punctuated vegetation character.
0-19%	1	No trees scrub or low ground cover. Limited vegetation cover.

1.3 Infrastructure and Built Form

This assessment considers the interrelationship of landscape character and human development. The assessment considers how development and infrastructure can create a counterpoint to the existing landscape character (vegetation and topography). Alternatively, development within the landscape may assist with the assimilation of development.

Infrastructure and Built Form (expressed as percentage)	Value	Description of Infrastructure and Built Form
0-19%	5	No objects within the landscape. The landscape has a high natural or remote rural character.
20-39%	4	Isolated objects in the landscape. Single elements with limited visual impact on the landscape. Small farm building, telephone towers or houses.
40-59%	3	Small clusters of development. Increasing presence of development within the landscape.
60-79%	2	Medium scale linear infrastructure or development. More significant development within the landscape. Minor roads, culverts, warehouses, transmission lines and residential areas.
80-100%	1	Large scale infrastructure. The landscape is significantly affected by development. Freeways, power stations and opencast mining

1.4 Cultural Sensitivity Value

The cultural and landscape value assessment is a survey of the regional area around the development up to 20 kilometres. The measurement considers the recognised cultural, heritage, natural and social overlays that exist within the landscape. This assessment is predominantly a desktop survey and only measures recognised designations.

The measurement is then represented as a percentage based of the area of designation compare to the area occupied by the regional zone.

The landscape value is the aggregate value from each of the assessment criteria. Either, as a value for each viewpoint or as a baseline value for the landscape surrounding the development. This Landscape Value in then used to assess the percentage of visual change created by the introduction of development within the landscape.

Cultural and Landscape (expressed as percentage)	Value	Description of Cultural and Landscape Value
80-100%	5	Majority of regional zone is affected by planning designations or overlays. Highly valued culture, natural and social landscape.
60-79%	4	Planning designations impacts a significant area of the regional zone. Valued culture, natural and social landscape
40-59%	3	Moderate impact from planning designations. Valued community or social landscape
20-39%	2	Limited effect
0-19%	1	None to negligible effect of planning designations

1.5 Landscape Character Assessment

The aggregate of relief, vegetation, infrastructure and cultural sensitivity values determines the base line landscape character value. The following table summarises the definition of Landscape Character Values

Landscape Character Value	Value	Description of Landscape Relief
16-20	High	Landscape quality is of high value with significant areas of scenic quality provided by varied topography, large areas of natural beauty and obvious presence of cultural sensitivity to change.
12-16	Moderate to increasing	Moderate to increasing landscape character value experienced through a layered landscape of natural

		qualities, scenic beauty and cultural sensitivity.
8-12	Moderate	Moderate landscape character value experienced by small clusters of natural landscape and cultural sensitivity.
4-8	Limited	Limited landscape character value experienced. The landscape is monotonous with little visual interest through topography or vegetation and heavily modified.

2. Visual Assessment

Each viewpoint was then assessed with respect to the following aspects of visual effect

— Percent of landscape absorption (the landscape's ability to absorb and screen the development form).

— Horizontal visual effect (percentage spread of the development in the field of view).

— Vertical visual effect (height of the development as a percentage of the field of view).

— Distance of visual effect (distance between viewpoint and development).

Using the following GRIMKE matrix formula, the development was quantified and aggregated to provide an assessment of the visual effect for each viewpoint.

2.1 Percent of Visual Absorption (PVA)

This is an assessment of the landscape's ability to absorb or screen the visual effect. Due to the comprehension of the landscape and wind farm development being holistic, the area that is visually affected includes the space between the turbines.

Using photomontages of the proposed development and Adobe Photoshop™ the amount to which the landscape screens the development is described as a percent of pixel absorption. Foreground contrasting pixels are selected within the vertical and horizontal extents of the development (area A), figure 6. This area is divided by the total area occupied by the development within the active field of view (area B) and expressed as a percentage of visual absorption. The assessment takes into consideration, visual sky lining and screening from existing vegetation and other physical forms.

Figure 1 Photo with wire line model draped on top. Courtesy Wind Farm Developments (2004)

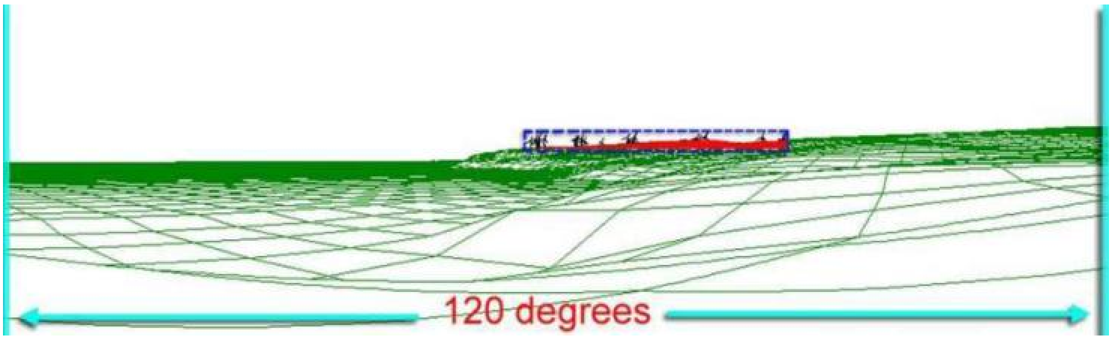


Figure 2 Wire line of showing extent of photomontage. Adapted from Wind Farm Development (2004)

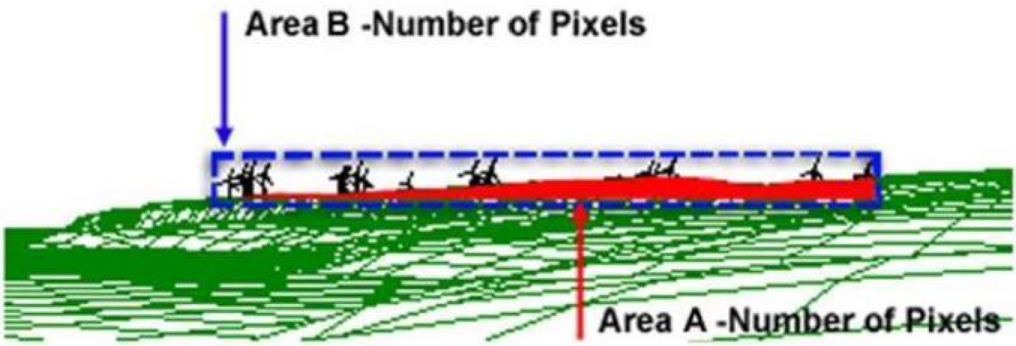


Figure 3 Detailed view of the landscape absorption (area A) and development extents (area B). Adapted from Wind Farm Development (2004)

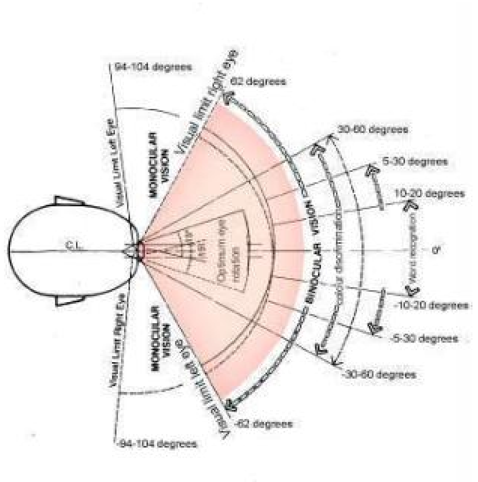
Percent of Visual Absorption (expressed as percentage of change)	Value	Description of Visual Absorption
80-100%	1	Substantial landscape absorption capacity. The landscape possesses sufficient vegetation and topography to screen any effect of the development,

		maintaining the visual character.
60-79%	2	Increasing absorption capacity. Due to the scale of the topography and density of vegetation the landscape is able to screen the development.
40-59%	3	Moderate absorption capacity. Medium level of change to the landscape. The landscape is less able to absorb change due to the scale, distance and extent of the development.
20-39%	4	Limited absorption. The development is noticeable within the landscape; however through vegetation and topography the landscape fragments and filters views of the development.
0-19%	5	No or minor absorption within the landscape. The development is considered to be prominent within the visual landscape.

2.3 Horizontal Visual Effect (HVE)

The field of vision (FOV) experienced by the human eye is described as an angle of 200-208 degrees horizontallyiii. This field of view includes the peripheral (monocular) vision, which is described as 40 degrees to each eye; within this zone colour and depth of field are not registered. For the purposes of the assessment the angle of peripheral vision has been subtracted from the field of view producing a binocular, ‘active field of view’ of 120 degrees.

Using this fixed visual reference, an assessment of the possible impact of development within this measurable area is undertaken. The centre of the development is established and an angle of 60 degrees each side is defined. The overall assessment is made of the entire development, rather than of the individual objects that may form the proposal. The angle is measured using a GPS and a bearing compass with known waypoints (geographic coordinates). Using GPS the extent of the horizontal visual field is calculated by the difference in bearing between the widest waypoints from a particular viewpoint. This measurement of effect is then described as a percentage of the 120 degrees active field of view



VISUAL FIELD IN HORIZONTAL PLANE

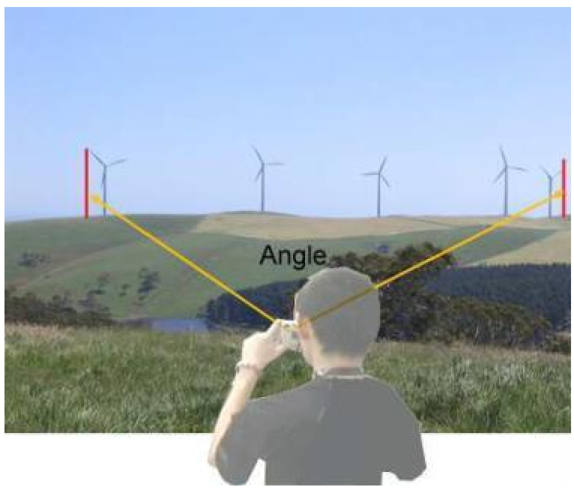


Figure 4 Active field of view is defined as the binocular field equating to 120-124 degreesiv. On the right is an illustration of horizontal measured angle as percent of active field 120 degrees. Photo Brett Grimm

Degree of Horizontal Visual Impact (expressed as an angle of impact and percentage of change)	Value	Description of Visual Modification
80-100% of the panorama measure at 120˚FOV)	5	Substantial horizontal visual impact. Visual impact throughout the entire active field of view.
60-80% of the panorama measure at 120˚FOV)	4	Increasing visual effect. A large proportion of the active field of view is affected.
40-60% of the panorama Measure at 120˚FOV	3	Moderate visual effect.
20-40% of the panorama measure at 120˚FOV)	2	Limited effect. The visual impact is a small part of the active field of view.
0-20% of the panorama measure at 120˚FOV)	1	No or minor visual effect.

2.4 Vertical Visual Effect (VVE)

The vertical visual effect evaluates the proportional scale of the development with reference to the vertical character of the existing landscape, as seen within the field of view of the assessed viewpoints.

The process of assessment is undertaken in 3 stages:

Stage 1:

The first stage of the process is to determine the vertical scale of the existing landscape. The baseline landscape scale is calculated using the photomontage viewpoint elevation (A) as a known reference height. The elevation of the viewpoint is recorded using a GPS. Using contour data, a second value (B) is recorded representing the highest topographic elevation within the field of view. Finally, the horizontal distance (C) between the viewpoint and the highest topographic feature is recorded. The vertical angle of view α_1 is then given as:

$\alpha_1 = \tan^{-1}((B-A)/C)$

as shown in Figure 6 below.

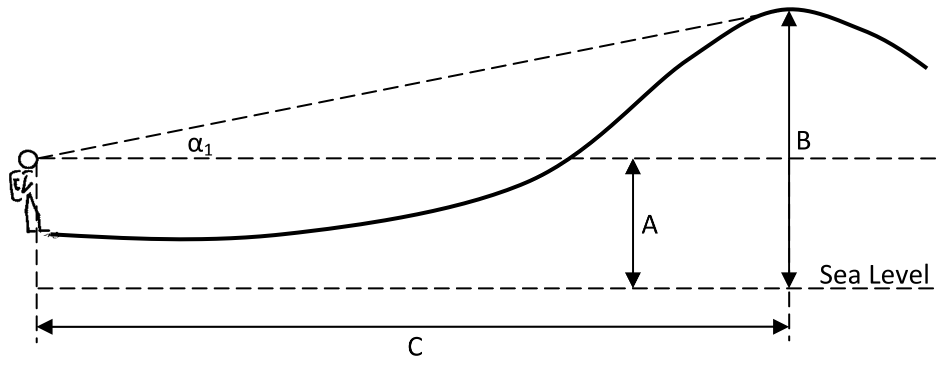


Figure 6: Vertical Scale of Existing Landscape

Stage 2:

The second stage of the process is to determine the vertical scale of the landscape modification, namely that of the apparent maximum turbine tip height as viewed from the viewpoint. Using the known turbine height (E), ground elevation (F) and its distance from the viewpoint (G), the vertical angle of view α_2 is then given by:

$\alpha_2 = \tan^{-1}((E+F - A)/G)$

as shown in Figure 7 below.

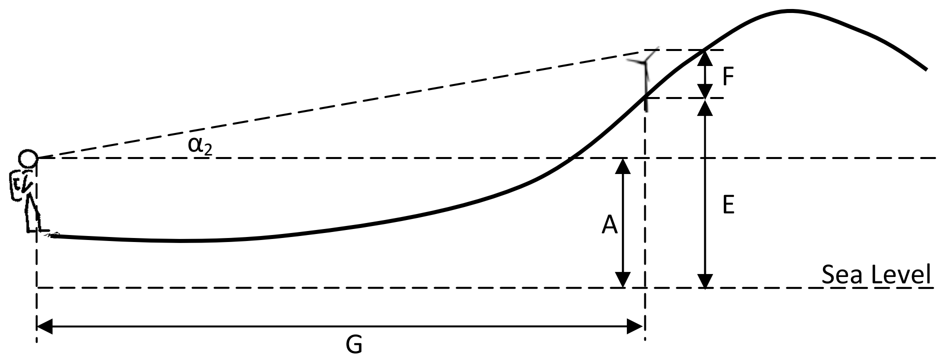


Figure 7: Vertical Scale of Landscape Modification

Stage 3:

The final stage of the process is to determine the overall proportion of the vertical scale of the development with reference to the existing landscape scale by taking the ratio of the two angles α_2 and α_1. Depending on the relative size of the vertical angles of view occupied by the existing and modified landscapes respectively, the ratio α_2 / α_1 will determine the nature and scale of the visual impact.

Depending on the relative scale of the angle of view occupied by the landscape and/or the development, the two vertical angles will depict whether there will be an increase in vertical visual impact created by the development ($\alpha_2 / \alpha_1 > 1$) or conversely the visual effect will be experienced as a vertical visual effect relative to the existing landscape scale ($\alpha_2 / \alpha_1 < 1$).

The vertical visual effect assessment will result in one of the following conditions:

- an increase in the overall vertical visual effect experienced from the viewpoint as a result of the combined vertical visual effect of the existing landscape character and the proposed development, or;

- a limited vertical visual effect as a result of the scale of the development being less than the existing landscape vertical scale when assessed from a viewpoint. This may be created by backdrop landforms or large ravines, valleys depicting a scale that within the field of view is greater than the development.

Either, the turbines or parts of the turbines are seen above ridgelines or landforms within the field of view and the effect will result in an increase in vertical visual effect, or the viewpoint contains large escarpments or deep valleys within the field of view and the vertical scale of the proposed wind turbines are likely to be seen as a proportion of the existing landscape scale resulting in a limited vertical visual effect.

In the first case (i.e. where $\alpha_2 / \alpha_1 > 1$), the proportional vertical visual impact should be assessed using Table 1 below. In the second case, the proportional vertical visual impact is considered minor and is assigned a value of 1.

Table 1 Proportional Vertical Visual Effect in existing landscape scale ($\alpha_2 / \alpha_1 > 1$)

Vertical Visual Impact (expressed as percentage increase (α_2 / α_1 - 1) x 100)	Value	Description of Visual Modification
80-100%	5	Substantial visual impact.
60-80%	4	Increasing visual impact
40-60%	3	Moderate visual impact.
20-40%	2	Limited impact
0-20%	1	No or minor visual impact within the landscape.

2.5 Distance of Visual Effect

This is a measurement of how visual impact is modified by distance. The effect of scale, topography, vegetation and weather, changes with distance, and in turn changes the degree of visual effect. The distance to the development from each viewpoint is recorded using the GPS. Standing onsite at each viewpoint the exact distance can be calculated by selecting the closest waypoint function (all the turbine locations are stored as waypoints in the GPS).

The distance categories outlined in the table below have been based on empirical research University of Newcastle (2002), Sinclair (2001), Bishop (2002).

Location of Development (from viewpoint)v	Value	Description
0 to 4 km (80-100%)	5	Adjacent: Dominant impact due to large scale, movement, proximity and number
4 to 8 km (60-80%)	4	Foreground: Major impact due to proximity: capable of dominating landscape
8 to 13 km (40-60%)	3	Middle ground: Clearly visible with moderate impact: potentially intrusive
13 to 18 km (20-40%)	2	Distant middle ground: Clearly visible with moderate impact becoming less distinct
18 km and greater (0-20%)	1	Background: Less distinct: size much reduced

2.6 Landscape Absorption Assessment

The aggregate of landscape absorption, horizontal and vertical effects and distance values determines the base visual impact value form the viewpoint. The following table summarises the definition of Visual Impact values

Visual Impact Value	Value	Description of Landscape Relief
16-20	High	High visual impact within the field of view
12-16	Moderate to increasing	Moderate to increasing visual impact within the field of view
8-12	Moderate	Moderate visual impact within the field of view
5-8	Limited	Limited visual impact within the field of view

3. Degree of Visual Impact (Percentage of Visual Change)

Degree of Visual Impact

The degree of Visual Impact is expressed as a coefficient of visual change to the baseline Landscape Value (general or viewpoint specific). This calculation directly expresses the effect of the development on the landscape, the change to the visual character and the reciprocal visual impact.

- Baseline Landscape Character : express as a value between 4 and 20)
- Coefficient of Visual Impact : calculated as the 20 divided by visual assessment value

Calculation of degree of Visual Impact

Coefficient x landscape character value expressed as a percentage = Visual Impact on Landscape Character

Example:

(a) *Visual Impact Assessment*

Horizontal visual effect	3
Vertical visual effect	1
Absorption capacity	3
Distance	2
Total visual effect	9 (0.45)

9/20 equated to a coefficient of 0.45

(b) *Landscape Character Assessment*

Relief	3
Vegetation coverage	3
Infrastructure built form	2
Cultural landscape overlays	2
Total landscape character	10

(c) *10 x 0.45 = 4.5*

(d) *4.5/20 = 0.225*

(e) *0.225 x 100 = 22.5% Visual Change to the Landscape*

3.1 Final Aggregated Visual Effect

Percentage Value of Visual Change	Descriptive Qualification of Visual Effect	Comments
80-100%	Extreme	Extreme change in view: change very prominent involving total obstruction of existing view or change in character and composition of view through loss of key elements or addition of new or uncharacteristic elements which significantly alter underlying landscape visual character and amenity
60-80%	Severe	Severe change in view involving the obstruction of existing views or alteration to character through the introduction of new elements. Change may be different in scale and character from the surroundings and the wider setting. Resulting in a perceived increase in proportional change to the underlying landscape visual character.
40-60%	Substantial	Substantial change in view: which may involve partial obstruction of existing view or alteration of character and composition through the introduction of new elements. Composition of the view will alter. View character may be partially changed through the introduction of features.
20-40%	Moderate	Moderate change in view: change will be distinguishable from the surroundings whilst composition and underlying landscape visual character will be retained.
0-20%	Slight	Very slight change in view: change barely distinguishable from the surroundings. Composition and character of view substantially unaltered.

Appendix E
Landscape Recommendations

Code	Species	Common Name	Install Size	Spacing	Form
AP	Acacia pycnantha	Golden Wattle	Tube	6.0m	LSh / ST
AS	Acacia salicina	Broughton Willow	Tube	6.0m	T
AV	Allocasuarina verticillata	Drooping Sheoa	Tube	6.0m	T
CG	Callitris gracilis	Native Pin	Tube	6.0m	T
EP	Eucalyptus porosa	Mallee Box	Tube	6.0m	T
AN	Acacia notabilis	Munno Para Wattle	Tube	1.0m	Sh
Apr	Acacia paradox	Kangaroo Thor	Tube	1.0m	SH
BS	Bursaria spinosa	Sweet Bursaria	Tube	1.0m	LSh
DV	Dodonaea viscosa	Sticky hop bush	Tube	1.0m	Sh
RC	Rhagodia crassifolia	Fleshy Saltbush	Tube	1.0m	Sh
CR	Carprobrotus rossii	Karkalla	Tube	0.4m	GC
DR	Dianella revoluta	Black-anther Flax Lily	Tube	0.4m	S
HV	Hardenbergia violaceae	Native Lilac	Tube	0.4m	GC
IN	Ficinia nodosa	Knobby Club Rush	Tube	0.4m	S
KP	Kunzea pomifera	Muntries	Tube	0.4m	GC

Acacia pycnantha

Acacia salicina

Allocasuarina verticillata

Callitris gracilis | Eucalyptus porosa | Acacia notabilis



Acacia paradox | Bursaria spinosa | Dodonaea viscosa

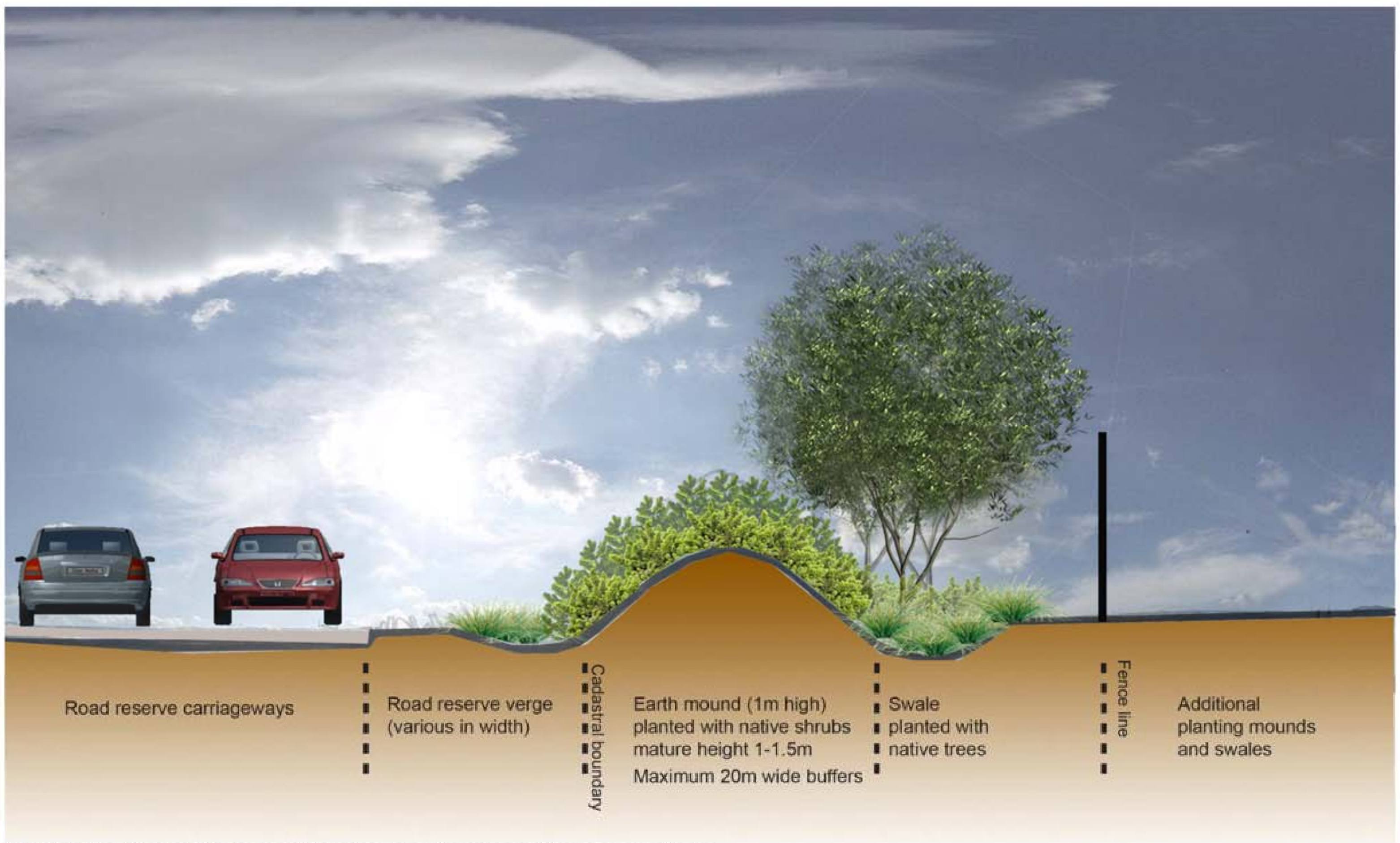


Rhagodia crassifolia | Carprobrotus rossii | Dianella revoluta



Hardenbergia violaceae | Ficinia nodosa | Kunzea pomifera

LT	*Large tree*	*>15m*
T	*Tree*	*8m–15m*
ST	*Small tree*	*5m–8m*
LSh	*Large shrub*	*1.5m–5m*
Sh	*Shrub*	*0.6m–1.5m*
H	*Herb*	*0.6m> 0.4m*
S	*Sedge*	*to 1.5m > 0.4m*
GC	*groundcover*	*to 0.4m > 0.4m*



Typical buffer and mound landscape treatment cross section

Note: Drawing is not to scale. It is a concept only and will require detailed landscape design to confirm

Appendix F
Glossary[2]

[2] *Visual Analysis of Windfarms Good Practice Guidance, Scottish Natural Heritage (2005)*

Active Field of View: The field of view excluding peripheral vision, which is described as 40° to each eye, within this zone colour, shapes and forms are not registered. The active field of view removes the angle of peripheral vision from the field of view producing an angle of 120 - 160°

Assessment (landscape): An umbrella term for description, classification and analysis of landscape.

Depth of Field: The distance between the nearest point (viewpoint) and farthest objects (visual envelope) which is visible within the field of view.

Element: A component part of the landscape or visual composition.

Effect (landscape or visual): These occur as a broad culmination of one or more impacts, incorporating professional judgement to extrapolate and/or generalise on the nature of these.

Horizontal Visual Effect: This term is used to describe the field of view occupied by the visible part of a wind farm.

Impact (landscape or visual): Impacts occur to a particular element of the environment and they can be described factually by the nature and degree of change.

Landscape: Human perception of the land conditioned by knowledge and identity with a place.

Landscape character: The distinct and recognizable pattern of elements that occurs consistently in a particular type of landscape, and how people perceive this. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement. It creates the particular sense of place of different areas of the landscape.

Landscape feature: A prominent eye-catching element, for example, wooded hilltop, isolated trees or grain silo.

Mitigation: Measures, including any process, activity or design to avoid, reduce, remedy or compensate for adverse landscape and visual impacts of a development project.

Panorama: A view, covering a wide field of view.

Photomontage: A visualisation based on the superimposition of an image onto a photograph for the purpose of creating a realistic representation of proposed or potential changes to a view. These are now mainly generated using computer software.

Sensitivity: The extent to which a landscape or visual composition can accommodate of a particular type and scale without adverse effects on its character or value.

Visual Amenity: The value of a particular area or view in terms of what is seen.

Visual Envelope: Extent of potential visibility to or from a specific area, viewpoint or feature.

Appendix G
Relevant Experience

WARWICK KEATES
Director
Landscape Architecture and Urban Design

Warwick Keates is a Director of WAX Design. With over twenty years landscape architectural experience, he has developed a diverse range of skills, working on major projects in the United Kingdom, Middle East and Australia. This experience has allowed Warwick to develop a detailed understanding the complex requirements associated with landscape assessment and design.
Warwick has been involved in the landscape and visual assessment of various developments, including open cast mines, wind farms, mobile phone towers, Significant trees, residential dwellings, commercial developments and road corridors. He has been called as an expert witness for the ERD Court on numerous occasions, as well as Planning and Parliamentary Hearings in South Australia and Planning Tribunals in Victoria .
Warwick has worked in all aspects of the profession, including large scale master plans, urban and civic spaces and small scale projects. This, coupled with his collaborative approach to other design professionals, provides Warwick with complete understanding of landscape and urban design, in respect of the assessment (physical and visual), design and creation of exceptional places.

Qualification
Graduate Diploma in Landscape Architecture, Leeds Polytechnic (United Kingdom) 1990
Bachelor of Arts (Hons) in Landscape Architecture, Leeds Polytechnic (UK) 1988

Professional Affiliations
Associate of the Australian Institute of Landscape Architects
Member of the Landscape Institute (UK) 1995

Specialist Expertise
Visual Impact Assessment
Landscape Planning
Environmental Impact Assessment
Expert Witness
Urban design
Large scale master planning

Previous Experience
Port Augusta Renewable Energy Project SA
Palmer Wind Farm Assessment SA
Keyneton Wind Farm Assessment, SA
Stony Gap Transmission Line, SA
Allendale Wind Farm Planning Appeal, SA
Mt Bryan Wind Farm Planning Appeal, SA
Area 55 Oxide Mine, Darwin NT
Waubra North Wind Farm VIC
Robertstown & Stony Gap Wind Farms SA
Gulnare Wind Farm SA
Mobile Carriers Forum Design Innovation and Visual Assessment Programme
The Sisters Wind Farm VIC
Kanmantoo Copper Mine SA
Woolsthorpe Wind Farm VIC
Olympic Dam Mine Expansion Visual Impact Assessment
Telstra Telephone Tower Visual Assessment
Taralga Wind Farm Peer Review NSW
Naroghid Wind Farm Assessment VIC
Waitpinga Wind Farm VIA
Myponga Wind Farm VIA
Hutchinson 3G Phone Tower Visual Impact Assessment

3 Sturtbrae Crescent
Bellevue Heights
Ph:0417 121 623
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Dr Brett Grimm
Director

PhD, B.Land Arch,
B.Design Studies U.Adel
Registered Landscape Architect AILA

Qualifications

2009	PhD, The University of Adelaide
2002	Bachelor Landscape Architecture, The University of Adelaide, First Class Honours
2000	Bachelor Design Studies, The University of Adelaide

Professional Affiliations

- Australian Institute of Landscape Architects (AILA)
- Lecturer and tutor Adelaide University School of Architecture, Landscape Architecture and Urban Design
- AILA Education Accreditation Panel (Chair)

Experience

2011	Director BGLA
	City of Marion
	Landscape Architect
2007- 2010	Swanbury Penglase, Associate
2006-2007	Hassell, Landscape Architect
2005-2006	Overseas Travel (PhD Scholarship exchange / Insite Environments, UK), Landscape Architect
2002-2005	Hassell, Graduate Landscape Architect

Conference Papers

IFLA World Congress 2005, Edinburgh
Australian Wind Energy Association annual conference 2004, "Best Research Paper"

Project Experience Visual Assessment

- Port Augusta Energy Park VA
- Palmer Wind Farm VA
- Seppeltsfield Visual Assessment
- Residential Visual Assessment Fullarton
- Significant Tree Visual Assessment
- Buckland Park Visual Assessment, SA
- Keyneton Wind Farm
- Crystal brook Wind Farm
- Allendale Wind Farm Appeal Hearing (in association with Wax)
- Mt Bryan ERD Wind Farm Appeal Hearing (in association with Wax)
- Willogoleche Wind Farm Extension (in association with Wax)
- Waubra North Wind Farm Visual Assessment (in association with Wax)
- Carmodies Hill Wind Farm Visual Assessment (in association with Wax)
- Tampakan Mine Phillipines Peer Review
- Area 55 Mine Assessment, Darwin (NT)
- Sisters Wind Farm Visual Assessment (in association with Wax)
- Olympic Dam EIS Visual Assessment
- Buckland Park Visual Assessment
- Project Bulla Visual Assessment
- Witton Bluff Visual Assessment
- Various urban development ERD Expert Witness cases
- Drysdale Wind Farm Visual Assessment
- Kanmantoo Mine Expansion Visual Assessment
- Naroghid Wind Farm Visual Assessment

Appendix H

Endnotes

[i] The GPS used was a Garmin X12 which differential-ready 12 parallel channel receiver continuously tracks and uses up to twelve satellites to compute and update a position

[ii] The SILVA precision M80 with a parallax free prismatic magnification-bearing compass. A magnetic bearing compass with a $\pm$ 0.5° from true magnetic course.

[iii] Pirenne, M.H. (1967). Vision and the Eye. London: Chapman and Hall

[iv] Panero, J. & Zelnik, M. (1979) Human Dimension & Interior Space- A source Book of Design Reference Standards. The Architectural Press Ltd. London.

[v] The distance zones have been developed Sinclair Thomas Matrix, which has cited field observations of the visual extents. The classification zones have been based on projected 90-100m high turbines.

ALINTA ENERGY REEVES PLAINS POWER STATION

DEVELOPMENT APPLICATION

12 OCTOBER 2017

APPENDIX G – LANDSCAPE AND VISUAL IMPACT ASSESSSMENT

Landscape Character and Probable Visual Effect Assessment

Reeves Plains Power Station

Prepared for Alinta Energy

12 September 2017

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REVISION	DATE	AUTHOR(s)	REVIEWER
D	11/09/17	WK/BG/CS	WK
C	07/09/17	WK/BG/CS	WK
B	28/08/2017	WK/BG/CS	CS
A	16/08/2017	WK/BG/CS	CS/WK
A	14/08/2017	WK/BG/CS	CS/WK
A	13/08/2017	WK/BG/CS	BG
A	13/06/2017	WK/BG/CS	CS

Contents

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Appendix B Photographic Methodology (produced by Convergen)

Appendix C Photomontages and Turbine Locations

Appendix D GrimKe Assessment Matrix

Appendix E Landscape Concept Plan

Appendix F Glossary

Appendix G Relevant Experience

Appendix H Endnotes

Figures and Tables

01 Scope of Assessment

1.0 Scope of Assessment

1.1 Introduction

This report has been prepared by Warwick Keates of WAX Design in association with Dr Brett Grimm of Brett Grimm Landscape Architect for Alinta Energy to assess the potential visual impact of the proposed Reeves Plains Power Station project (the Project). The aim of this report is to evaluate the existing landscape character, identify viewpoints to assess the visual impact and discuss the degree of visual change that is likely to result from the introduction of the proposed power station.

The Landscape and Visual Impact Assessment (LVIA) comprises of two separate assessments, a landscape character assessment and a visual impact assessment; these are interrelated processes as described in the Guidelines for Landscape and Visual Impact Assessment[1]. The landscape character assessment described in this report considers the existing character of the landscape and the site locality. The site locality is considered as the areas around the Project from which the power station and associated infrastructure are likely to be visible in the landscape as described in section 1.3 below. The visual impact assessment considers the likely effect of the proposed development on the physical landscape which may give rise to changes in its character and the resultant effects on visual amenity.

The potential visual impact will be assessed using the Grimke matrix methodology that involves on-site assessments, GIS modeling, consultation with relevant stakeholders and interested parties through Alinta Energy, the preparation of photomontages and a detailed visual impact assessment to illustrate the predicted visual effect of the Project within the defined locality. The visual impact assessment forms the second stage of the LVIA process.

1.2 Project Description

The Reeves Plains Power Station involves the construction and operation of a gas fired power station and associated infrastructure. The project proponent is Alinta Energy (Reeves Plains) Pty Limited (Alinta Energy). The power station will be located at 1629 Redbanks Road on a 41 Ha greenfield site located in Reeves Plains, approximately 12 km south-east of Mallala and 50 km north of Adelaide.

The power station will operate as a ‘peaker’, providing electricity during periods of high demand, and is designed togenerate up to 300 megawatts (MW) of power. The Project includes the following infrastructure:

- A gas receival station
- Up to six (6) dual fuel (gas and diesel) turbines each capable of generating 50MW of power
- Three (3) transformers designed to convert low voltage electricity into high voltage electricity
- Connection to the electricity network including a new substation, ‘cut in’ transmission towers (40-45m) and communications tower (30-35m)
- Water supply and storage including:
    - *Water treatment plant*
    - *Water storage tanks*
    - *Firefighting system*
- Evaporation pond
- Diesel storage

1Swanwick, C. (2013). *Guidelines for Landscape and Visual Impact Assessment. 3rd ed. United Kingdom: Landscape Institute and Institute of Environmental Management and Assessment.*

01 Scope of Assessment

Also included within the Project are the following:

- Control rooms and maintenance facilities and administration building (typically 3-4m high)
- Warehouse and workshop facility (5-6m high)
- Security fencing and lighting
- Onsite drainage works
- Upgrade to the Redbanks Road and Day Road intersection and sealing of Day Road from Redbanks Road to the Project entrance
- Carparking for employees and contractors
- Demolition of existing buildings onsite
- Landscaping

The Project is required to obtain development consent from the State Commission Assessment Panel before proceeding. Construction of the Project is scheduled to commence in 2018 with operation of the power station occurring in Q1 2020 at the earliest.

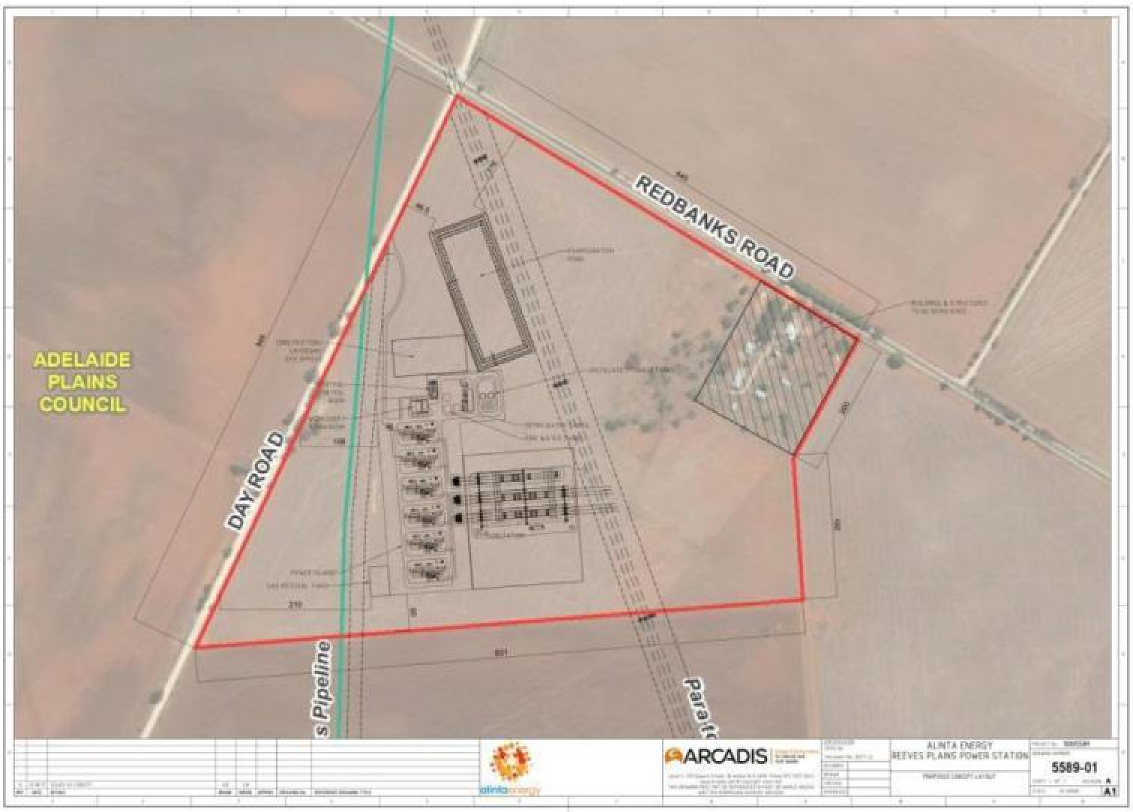


Figure 1: Draft layout for proposed development, used in LVIA

01 Scope of Assessment

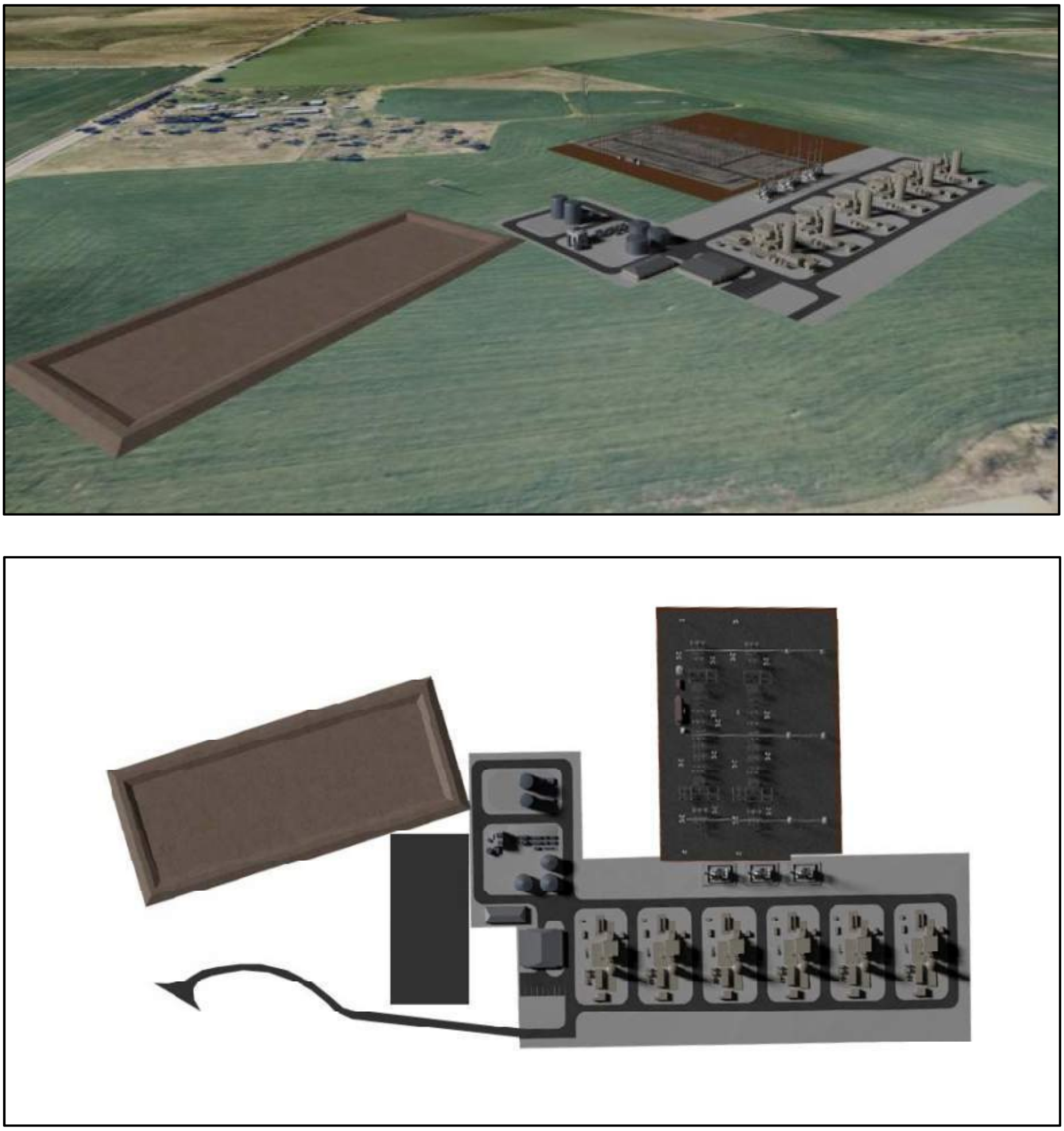


Figure 2: Modeling of proposed development base on anticipated layout

1.3 Site Locality

A 15km site locality around the Project has been defined for assessment purposes and is based on research and previous experience in defining thresholds for scale and identification of visual effect. The extent of the site locality has been reviewed against the Zone of Theoretical Visual Influence (ZTVI) mapping. This mapping provides a reference of the extent to which the Project is likely to be visible in the landscape and defines the viewshed resulting from the local topography (excluding vegetation and built form screening).

The landscape character assessment of the proposed power station consists of written descriptions and photographic surveys of the surrounding locality to articulate the character of the existing landscape that surrounds the site in relation to the local (0-1km), sub-regional (1-5km) and regional (5-15km) landscapes. This is followed by a discussion of the probable visual effect that is anticipated across the regional landscape as well as within the infrastructure corridors associated with the proposed Project. The landscape character and visual assessment provide the basis on which to measure the suitability of the development in relation to the visual impact within the regional area (15km) and in regards to the relevant provisions of the development plan.

Recognition of the potential visual impact of a layout design is implicit in the design process and concepts for visual management. This includes early reference to the Mallala Council Development Plan (Consolidated – 21 April 2016) provisions and relevant guidance reports.

02 Introduction

2.0 Introduction

2.1 Visual Assessment Approach

The aim of the LVIA methodology is to provide an objective, reliable, credible, replicable and measurable analysis of the potential visual impact when considered against the existing landscape character.

The process for the visual assessment is based on the recommendations of John Ginivanand Planning SA (2002) and considers the visual assessment regarding the Primary Landscape Character Assessment and Detailed Visual Effect Assessment (excluding Qualitative Subjective Assessment).

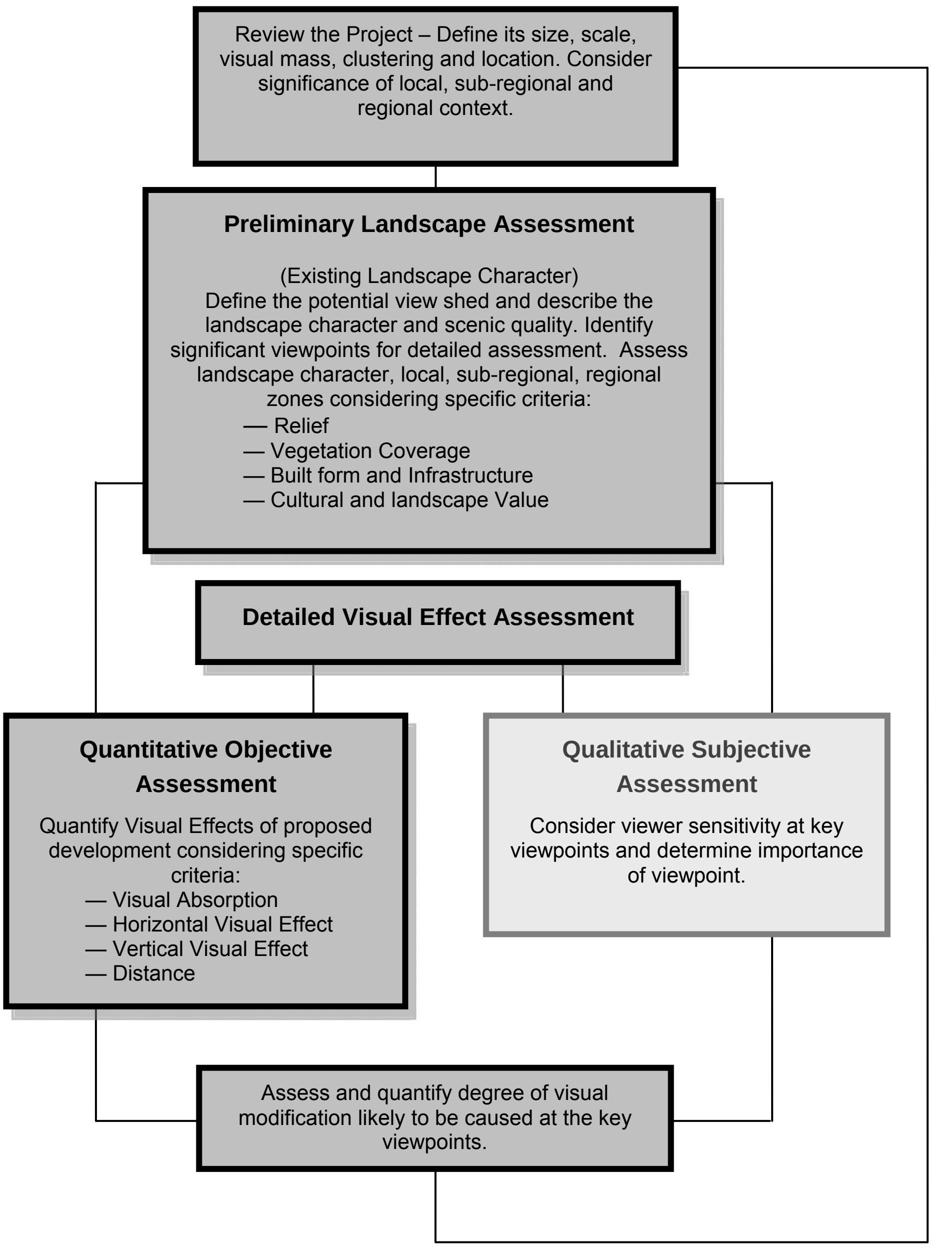


Figure 3: Detailed Visual Assessment Process

2.2 Guidance and Best Practice

Currently, there is no formalised standard visual assessment methodology within planning guidelines at local, state or federal levels of application. While various guidelines and frameworks have been produced, they do not provide a definitive methodology or technique to be applied. For the visual assessment of the Reeves Plains Power Station to follow a 'best practice' approach, the assessment methodology has been defined with reference to the following documents:

- Guidelines for Landscape and Visual Impact Assessment (Third edition) (2013), Landscape Institute;
- Grimm, B (2009). Quantifying the Visual Effects of Wind Farms; A Theoretical Process in an Evolving Australian Visual Landscape. PhD Thesis Adelaide University;
- Australian Wind Energy Association and Australian Council of National Trusts (2007) Wind Farms and Landscape Values: National Assessment Framework;
- Visual Landscape Planning in Western Australia. (2007).A manual for evaluation, assessment, siting and design, Western Australian Planning Commission;
- Best Practice Guidelines for the Implementation of Wind Energy Projects in Australia (2006);
- Lothian, A. (2008). Scenic perceptions of the visual effects of wind farms on South Australian landscapes. Geographical Research, 46:2, 196 – 207;
- Swanwick, C. (2013). Guidelines for Landscape and Visual Impact Assessment. 3rd ed. United Kingdom: Landscape Institute and Institute of Environmental Management and Assessment;
- Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria (2002);
- South Australian Wind Farms Planning Bulletin (2002); and
- Lothian, A. (2000). Landscape Quality Assessment of South Australia. PhD Thesis Adelaide University.

2.3 Methodology

The approach used for the LVIA is based on two assessment stages with reference to the Guidelines for Landscape and Visual Impact Assessment, and set out in Figure 4. Stage 1; Landscape character assessment is concerned with identifying and assessing the importance of landscape characteristics and the existing landscape quality. Stage 2; The visual assessment aims to quantify the extent to which the development is visible as well as defining the degree of visual change and the associated visual impacts using the Grimke Matrix.

The landscape character assessment and visual impact assessment are used to draw a number of conclusions about the magnitude of the visual effects of the proposed development on the site locality.

The LVIA includes two assessment stages and associated tasks as seen in Figure 4. The following table outlines a detailed description of each process conducted within the methodology.

02 Introduction

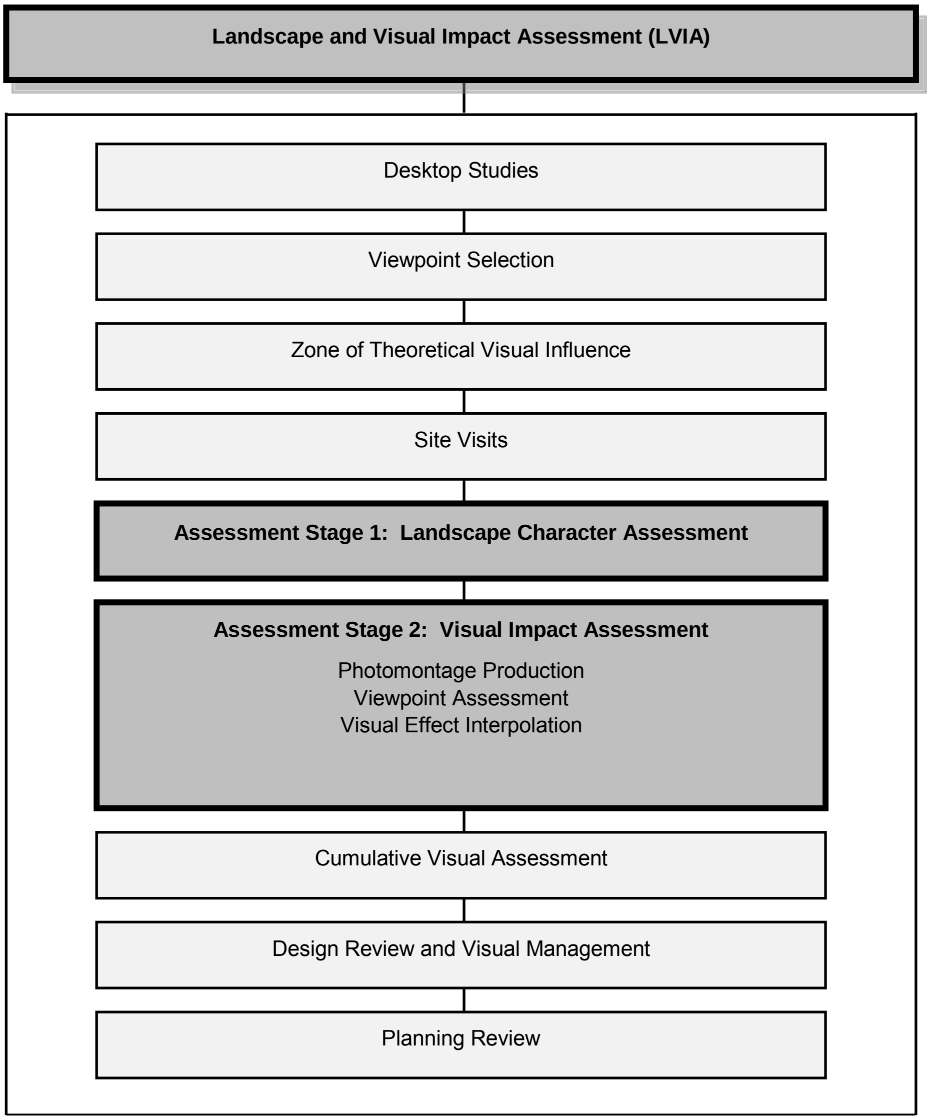


Figure 4: LVIA – Two Assessment Stages and Associated Tasks.

<u>Desktop Studies</u>

The Landscape Character Assessment for the Project includes reviews of the project documentation, the proposed development location and infrastructure associated with the proposed development. Analysis of GIS maps, landscape photography, aerial photographs and supporting literature were also reviewed to establish a broad comprehension of the scope of the proposed power station and the existing landscape character.

02 Introduction

Viewpoint Selection

The selection of viewpoints provides locations from which a detailed visual assessment of the potential visual effect can be made as part of the Stage 2 assessment. The locations are also selected on the basis of being representative of the locality, public locations and viewpoints where a large proportion of the power station is visible.

A total of four (4) viewpoints were selected surrounding the Project during this site visit to provide an understanding of the likely visual effect.

Viewpoint locations were identified using a preliminary ZTVI map which illustrates the likely degree of visibility in accordance to topography. The site assessment certified the evaluation of the ZTVI with reference to vegetation screening and local landforms not depicted in the ZTVI.

Each viewpoint represents a typical location within the locality. The four viewpoints were confirmed by Alinta Energy and relevant stakeholders before the final stage of visual impact assessment.

02 Introduction

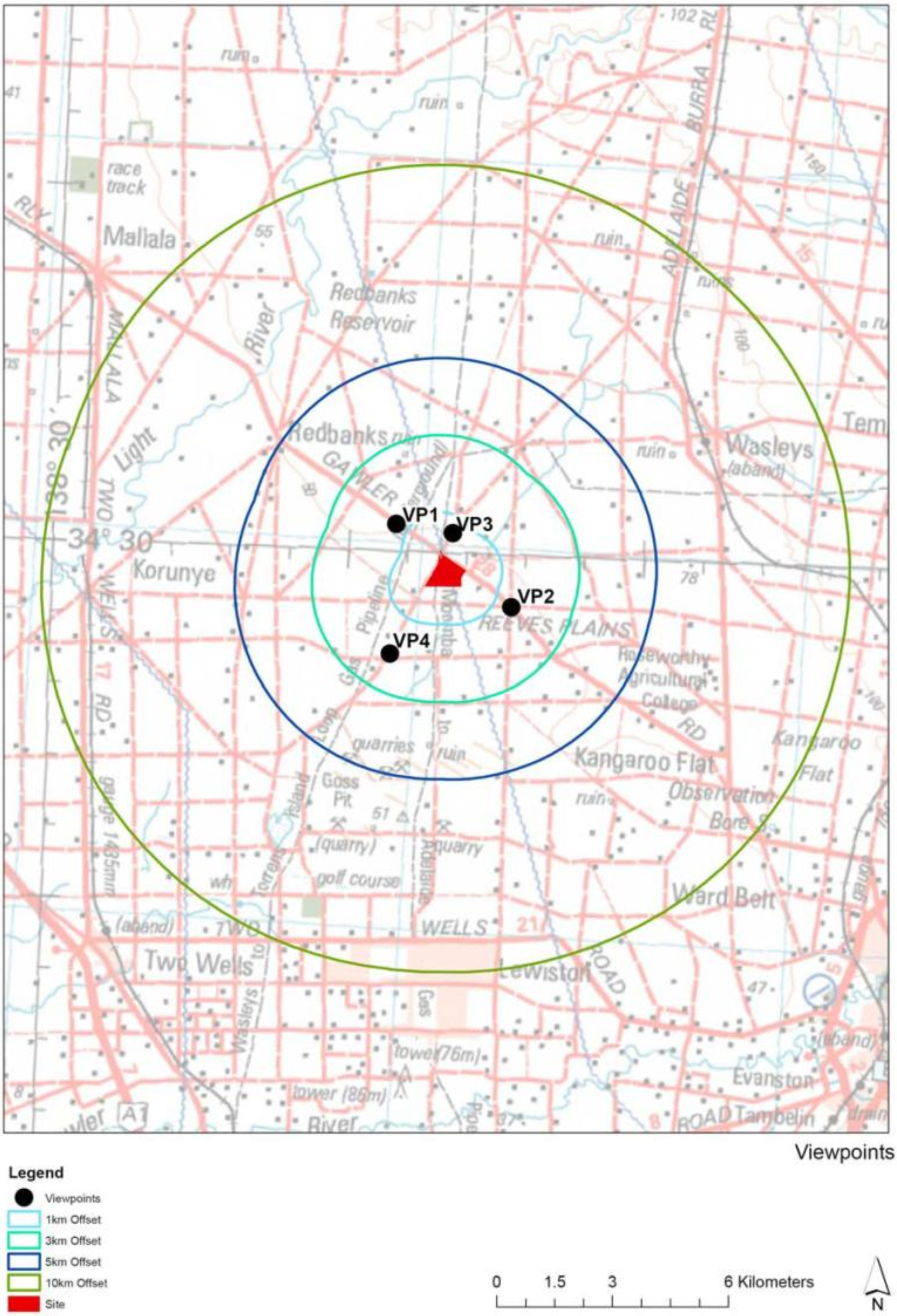


Figure 5: Viewpoint Locations

Zone of Theoretical Visual Influence

In order to gain an appreciation of where the Project will be visible from; Zone of Theoretical Visual Influence (ZTVI) maps have been produced. The mapping provides an illustrative depiction of where the development may be seen within the landscape. The maps quantify the extent to which the power station is likely to be seen considering both the of infrastructure of the gas turbine's silencers, stacks and substation gantries which are between 16 and 24-25 metres, and the height of the cut in tower at 40-45m and the communications tower at 30-35m.

The analysis uses a digital terrain model, and computer generated models of the power station to illustrate the visibility from locations around the proposed development. It should be noted that the ZTVI does not take into account the impact of local vegetation or buildings and it is based on a 1m contour data set. This means that theoretically, the visual impact of the power station is evaluated within a landscape devoid of any screening vegetation or other features and as such represents a 'worst case' scenario.

Assessment Stage 1: Landscape Character Assessment

The assessment includes identification and description of landscape character units (areas of defined quality determined by topographic form, land use, vegetation associations including patterning, colouration and texture). In addition, special landscape features are identified. Mapping and photographic surveys are undertaken in addition to written commentary to describe the locality and existing landscape character of the site locality.

As part of the landscape character assessment, the viewpoint selection was confirmed, and the base photography was taken for photomontage production.

The assessment was undertaken on the 20 June 2017 to enable the project team to develop a detailed understanding of the existing landscape character. Weather conditions were clear with no cloud cover, high visibility over several kilometres and no atmospheric interference.

Assessment Stage 2: Visual Impact Assessment

The assessment of the visual impact includes the production of photomontages to assist in the quantification and qualification of the potential visual effect. The viewpoints identified as part of the preliminary assessment stages were measured using a series of landscape and visual criteria. The assessment results were then mapped to demonstrate the likely visual impact of the project within the locality.

The Stage 2 assessment was undertaken on the 30 June 2017 with weather conditions relatively clear with minimal cloud cover, good visibility over several kilometers throughout the assessment locality.

Assessment Stage 2: Photomontage Production

Photomontages of the proposed development from each viewpoint were produced by Convergen. The photomontages represent 120 degree horizontal field of view with a 50mm lens digital equivalent photo capture. This has been proven to best represent the human binocular field of view. Details of the methodology used to produce the photomontages are described in Appendix B and represents a best practice approach with reference to 'Photography and photomontage in landscape and visual impact assessment' (2011) Landscape Institute (advice note 01/11).

WAX and BGLA validated the accuracy of the photomontages during a site visit on the 30 June 2017. The combination of a photomontage assessment and an on-site review ensures issues typically associated with photographic simulations such as image compression and distortion are mitigated by assessing and measuring the visual effect in-situ using GPS and a bearing compass.

This enables the photomontages to be ground-truthed for positional correctness and scale. Any minor distortion to the edge of the 120 degrees provided by the horizontal field extent and 2 dimensional image representations are reflected relatively in the simulated modeling overlay.

The photomontage images were used to inform the detailed viewpoint assessment.

Assessment Stage 2: Viewpoint Impact Assessment

The viewpoint assessment of the Project uses a combination of visual assessment measurements and descriptive text. This comprises site observations with reference to prepared photomontages and a detailed assessment of the baseline landscape character and visual impact.

Initially, the baseline landscape character for each viewpoint was assessed regarding:

- Relief (the complexity of the land that exists as part of the underlying landscape character);
- Vegetation Cover (the extent to which vegetation is present and its potential to screen and filter views);
- Infrastructure and Built Form (the impact of development on landscape and visual character); and
- Cultural Sensitivity (existing cultural overlays, planning designations and any identified listing of heritage items and or local sensitivities to landscape such as scenic drives and viewpoints).

A value was generated for the existing landscape relative to each viewpoint. This value formed the baseline assessment value. It is this baseline value that is modified by the impact of the development on the landscape, which in turn informs the degree of visual effect.

Following the landscape character assessment, each viewpoint was then assessed on the following visual effects:

- Percent of landscape absorption (the landscape's ability to absorb and screen the development form);
- Horizontal visual effect (percentage spread of the development in the field of view);
- Vertical visual effect (vertical scale of the development as a percentage of the existing landscape scale within the field of view); and
- Distance of visual effect (distance between viewpoint and development).

The landscape character and visual effect measurements were combined to produce a quantified value for the degree of visual change that resulted from the project at each viewpoint (refer to Appendix D for detailed assessment criteria and matrix methodology).

Assessment Stage 2:Visual Effect Interpolation

The findings of the visual impact assessment for each viewpoint were used to provide a percentage value to the degree of visual change. Each viewpoint was cartographically mapped in GIS, and the values used in a distance weighted interpolation. The ZTVI was overlayed onto the visual effect interpolation map to define the extent of visibility. The combination of Visual Effect Interpolation and ZTVI provided a map of anticipated visual impact experienced in the locality as a result of the project.

Design Review and Visual Management

A high level landscape concept plan has been developed to illustrate opportunities for visual management. The concept plan seeks to provide screening through vegetation and earthworks profiling and aims to reduce the contrast and visual presence of the development form the surrounding locality.

Planning Review

A review of the landscape and visual impacts of the development from a planning context was also undertaken. The planning review included a review of the Mallala Council Development Plan (Consolidated – 21 April 2016).

These documents provided a range of recommendations that influenced the development assessment of the Project proposal. In particular, the potential visual impact of the development has been reviewed and discussed against the relevant desired character statements with specific reference to landscape and visual considerations.

03 Landscape Character Assessment

3.0 Landscape Character Assessment

3.1 The Site

The project, as shown in Figures 1 and 2, is located approximately 12 kilometres south-east of Mallala in the Adelaide Plains Council Area. The proposed development site is located on the undulating landforms formed by the topography of the Redbank Ridgeline and Reeves Plains.

On the site is an existing farm with a cluster of buildings and associated structures surrounded by vegetation. This vegetation provides significant screening within the locality and is further reinforced by vegetation belts that extend along local water courses and fence boundaries.

An existing 275kV transmission line runs through the proposed development site. This infrastructure element is of a Pi frame construction approximately 20 metres high; other infrastructure includes 11kV transmission lines which have a typical height of 12 metres. A gas distribution pipeline runs through the western edge of the site, this pipeline is located underground and does not have visual presence in the landscape.

South-east towards Reeves Plains and Kangaroo Flat the elevation of landscape drops the form a series of wide low lying tablelands. While these features are subtle, the combination of topographic variation and vegetation creates a degree of visual variation and screening within the landscape adding to the visual complexity of the locality.

At distances of 5-10 kilometres south and east of the proposed development site, views across the landscape are screened by extensive vegetation belts that extent across the regional landscape. The combination of topography and vegetation provides significant visual screening.

From certain locations such as across open fields and along ridgelines distinct view corridors are created increasing the visibility of the proposed development site. However, these locations remain isolated and are not typical of the locality.

Figure 6: View of the proposed development site

03 Landscape Character Assessment

Figure 7: View of the existing transmission line running through the proposed development site

03 Landscape Character Assessment

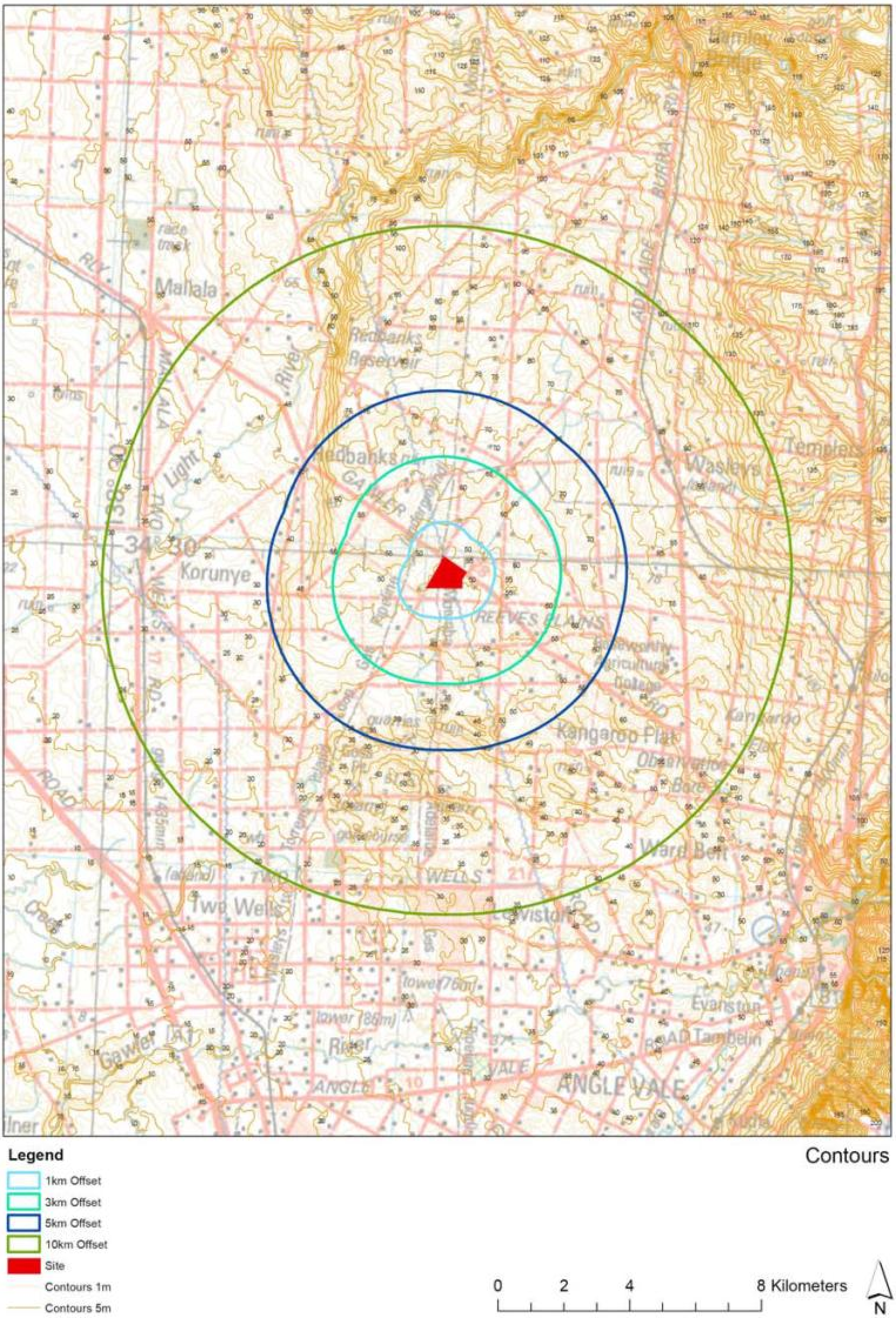


Figure 8: Proposed site location with contours

3.2 Landscape Character

The regional landscape character is a result of low lying topography associated with the Reeves Plains between the Mount Lofty Ranges and the coastal edge including Port Gawler and Middle Beach. While there is a low lying rolling landscape as a result of low local landforms and river corridors, this does not dramatically change the overall landscape character of the locality. The land use is dominated by a series of agricultural land uses including cropping, small scale grazing and defined areas of animal husbandry including horse agistment.

Within the agricultural landscape are a number of dwellings and associated farm infrastructure. Typically, these buildings are single or double storey. Other infrastructure such as the transmission lines and the height of the existing vegetation creates a defined verticality in the landscape of 10 to15 metres.

Throughout the study area are a number of infrastructure elements including transmission lines, agricultural processing facilities and a railway line corridor. These elements form defined impacts on the existing landscape character resulting in a modified agricultural landscape.

The Adelaide Crystal Brook Railway line runs parallel to the Mallala Road to the north. The embankment of the rail line provides a visual edge to the road corridor. This infrastructure limits to a certain degree visibility from the east, with glimpsed views over the embankment to the Mount Lofty Ranges.

The Mount Lofty Ranges define the backdrop to the regional locality to the north and east. The topography of the Ranges defines the horizon line and form a regional viewshed. Within this locality the topography of the Mount Lofty Ranges is a consistent topographic backdrop with little variation in landform to the local or sub-regional landscape.

3.3 Locality Features

While the landscape character for the regional context is relatively consistent, local ridgelines, water courses and townships, within the locality which create variations in the landscape character, as is shown i

Figure 9. These have been identified as:

1. Redbank Ridgeline
2. Light River Corridor
3. Mallala Township
4. Redbanks Township
5. Fischer Rural Living
6. Two Wells Township

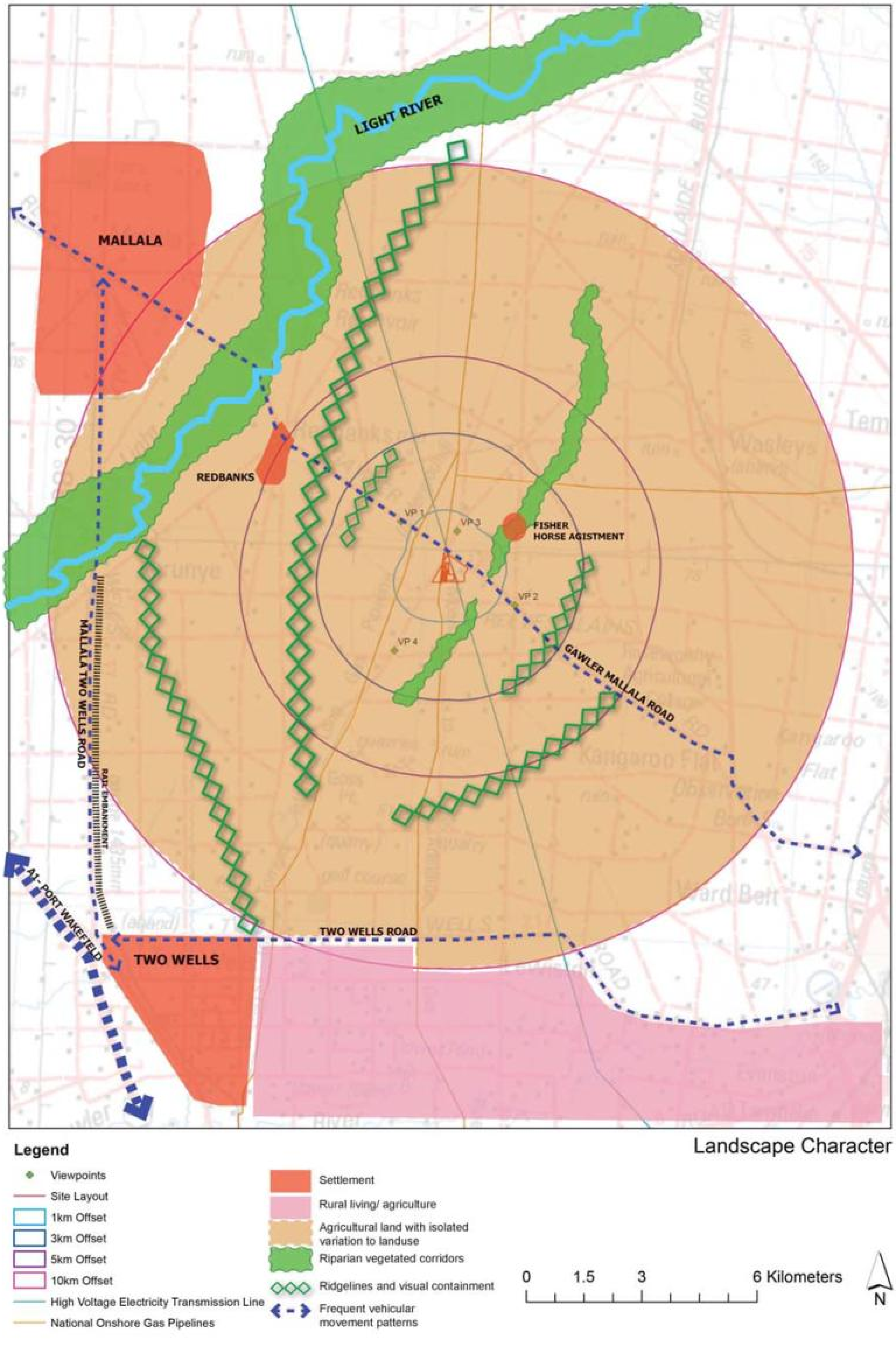


Figure 9: Locality Features/ Landscape Character Zones

3.3.1 Redbanks Ridgeline

The Redbanks Ridgeline forms a low lying visual envelope. The ridgeline create defined topographic screen in the landscape that contain, block or screen the proposed development site. The ridgeline represents a 20-30m variance in topographic form. The height and profile of the ridge provides visual containment in the locality restricting views and limiting the potential visibility of the development beyond 5 kilometres to the west.

The Redbanks Ridgeline forms a wide tabletop that extends east from Redbanks towards the proposed development site. The form of the ridgeline and its association with the Light River suggests that the topography of Reeves Plains is formed by the river catchment and associated drainage patterns around Reeves Plains.

Figure 10: Redbanks Ridgeline

3.3.2 Light River Corridor

Extensive areas of vegetation exist along the Light River corridor. The stands of Eucalypt trees associated with the river corridor provide a well-defined vegetation belt within the landscape. These trees limit views, providing a visual envelope within the low lying landscape character, particularly to the north-west.

The existing land use cover associated with the river corridor is extensively agricultural cropping with a defined field pattern that is defined by ribbons of vegetation along cadastral boundaries and around properties. Across the regional landscape character, there is little variation in the land use character.

Figure 11: Light River Corridor

3.3.3 Mallala Township

The town of Mallala is located approximatley 12km to the north-west of the proposed development site. The town represents a rural township with a large collection of dwellings and associated agricultural infrastructure. Properties within the town are typically single storey on large allotments. On the periphery of the town are a number of grain silos. These elements form large vertical visual elements within the landscape, similar in height to the belts of vegetation that extend across the landscape.

Although the grain silos are visually prominent within the town and the immediate locality, the screening provided by the existing vegetation around the town reduces the visual effect.

Surrounding the town of Mallala is an open agricultural land use that is typical of the wider region. The landscape is defined by a historic eighty-acre field pattern which forms a defined grid of roads and field boundaries across the landscape. This grid is reinforced by tree planting and belts of vegetation that produce an agricultural patchwork with open and closed views depending on the vegetation screening that is provided around the viewpoint and the viewer.

The layering of vegetation along cadastral boundaries of the grid creates a series of vegetated screens within the landscape, fragmenting the views within the landscape.

The development will not be visible from the surrounding areas of Mallala due to the existing vegetation associated with the town, the vegetation screening provided by the Light River corridor and the Redbanks Ridgeline that combine to provide a defined visual screen to the north and west.

Figure 12: Mallala Township

3.3.4 Redbanks Township

The township of Redbanks is located 5 kilometres from the proposed development. The township is defined by the road network that provides connections from the town centre to the other local towns. The built form is generally single storey residential dwellings on large allotments. The orientation of many of the buildings is towards the road corridor and the centre of the town.

There is extensive tree planting through the centre of the township, within the property boundaries and along the road corridors. This results in an enclosed visual character with limited visibility to the surrounding agricultural landscape. Some rear gardens have views to the surrounding areas.

Figure 13: Redbanks Township

3.3.5 Fischer Rural Living

Along Boundary Road approximately one kilometer from the development site is Fischer; a collection of large allotments and dwellings that form a local sub-division. These large allotments are predominantly for horse agistment and rural living. The sub-division appears to have been established several decades ago which is reflected by the established tree planting around many of the properties.

The large allotments and expansive areas of vegetation create an enclosed visual character with many properties orientated towards the east to capitalise on views of the Mount Lofty Ranges. A local ridgeline situated between Woolshed Road and Dogleg Road provides more elevated views towards the proposed development site from the south-west edge of Fischer.

While the Ridgeline provides elevated viewpoints, the existing vegetation along the Gawler Mallala Road, as well as other vegetation within the surrounding landscape limits the visibility of the development site.

Figure 14: Fischer Rural Living with extensive surrounding vegetation

3.3.6 Two Wells Township

Two Wells is located 12 kilometres to the south-west of the proposed development site and outside of the regional locality of the development. The town is orientated along the main street with most of the dwellings and properties facing the street. This arrangement creates a closed visual character with few views to the surrounding rural landscape.

Surrounding the town to the north and east are large areas of rural living that extend from Two Wells to Lewiston and Gawler further to the east. The land use around Two Wells is defined by large rural allotments with a strong focus on horse management and agistment. The combination of rural blocks with well vegetated boundaries creates an enclosed peri-urban visual character with limited views extending over the low lying landscape character to north and east.

Due to the distance between the development site and Two Wells, as well as surrounding presence of local landforms, river corridors and vegetation the infrastructure associated with the power station will not be visible from the Two Wells.

03 Landscape Character Assessment

Figure 15: Two Wells Township peri-urban development

04 Zone of Theoretical Visual Influence

4.0 Zone of Theoretical Visual Influence

4.1 Zone of Theoretical Visual Influence (ZTVI)

The Zone of Theoretical Visual Influence (ZTVI) mapping provides an illustration of where the proposed power station may be seen within the landscape. The mapping quantifies the extent that the power station is likely to be seen within the wider landscape.

The ZTVI mapping is developed using a GIS computer program with 1m contour data that has been provided for a 15km radius of the project site. The ZTVI maps have been produced by mapping the location, the anticipated heights of various infrastructure elements associated with the proposed development and using the contour data to identify where the proposed development would be visible or not visible.

The ZTVI represents a 'worst case' scenario as it does not incorporate vegetation, built form or localised screening effects, which are assessed in more detail as part of the Stage 2 assessment on site.

04 Zone of Theoretical Visual Influence

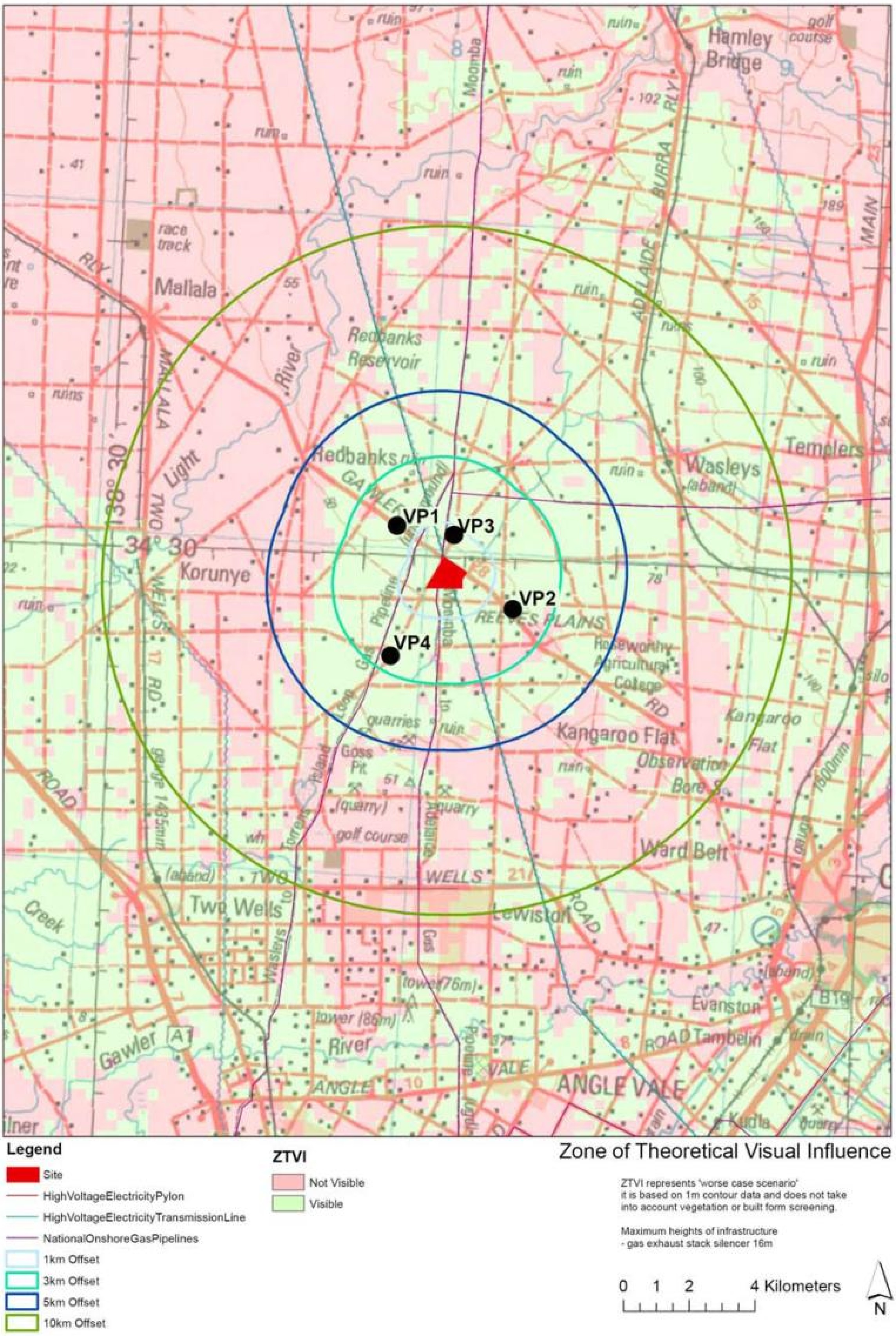


Figure 16: ZTVI map for the Reeves Plains Power Station based on 16 metre gas turbine silencers and stacks

04 Zone of Theoretical Visual Influence

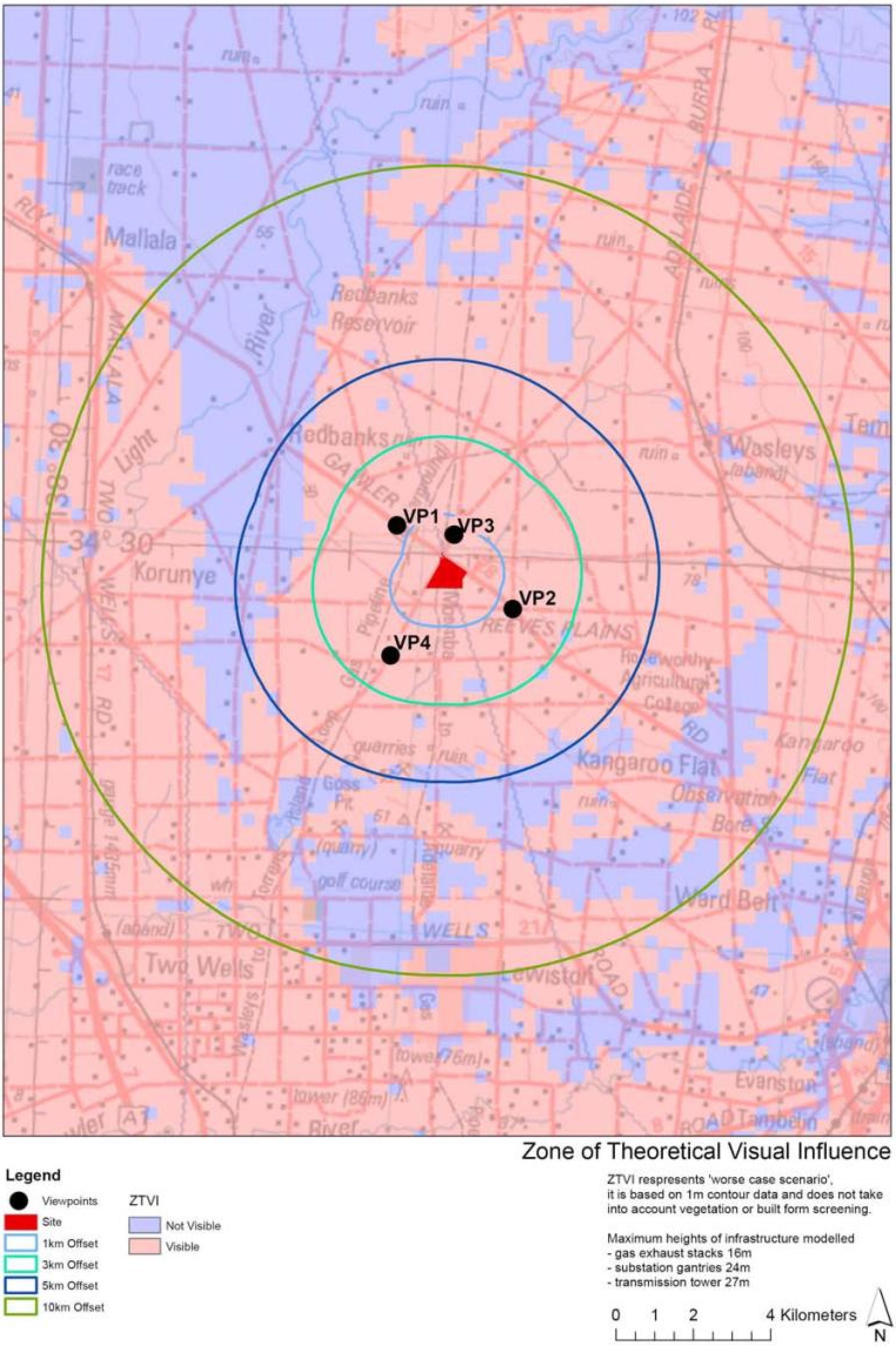


Figure 17: ZTVI map for the Reeves Plains Power Station based on 24m substation gantries and 43m (typical) cut in tower

05 Visual Impact Assessment

5.0 Visual Impact Assessment

5.1 Visual Assessment Scope

The visual impact assessment was based on a gas peaking plant with six open cycle aero derivative gas turbine units with silencer and stacks of approximately 16 metres high, transmission substation with gantries of a height of 24-25 metres, a communication tower 30-35 metres high and up to three 'cut in' tower of 40-45 metres high, evaporation pond and holding tanks and the site locality as described in the landscape character assessment to a radius of 15km of the proposed development.

The visual impact assessment considered key aspects of the existing landscape such as relief, vegetation, built form and infrastructure; as well as cultural and scenic landscape values from each of the four selected viewpoints. The key aspects from each viewpoint were rated out of 5 to produce an assessment value out of 20. This enabled a baseline landscape value to be calculated from which the visual impact measured in relation to the degree of visual change that is likely to occur as a result of the introduction of the proposed development into the existing landscape character.

The visual effect was assessed using a set of criteria that considered factors such as the degree of landscape absorption, horizontal and vertical effects and distance to the development from each viewpoint.

The visual effect was then expressed as a coefficient of visual impact and applied to the baseline landscape value to produce a measurement of the likely degree of visual change, that is to say, the extent to which the proposed development is predicted to alter the existing landscape.

5.2 Visual Impact Assessment

Using the visual assessment matrix as described in Appendix D, the potential degree of visual change and resulting visual impact of each viewpoint was measured and evaluated against the following criteria:

- Baseline Landscape Value is expressed as a value between 4 and 20;
- Visual Assessment Value is expressed as a value between 4 and 20;
- Coefficient of Visual Impact is calculated as decimal fraction of the visual assessment value;
- Relative Value of Visual Impact is calculated as the baseline landscape character multiplied by the coefficient; and
- Degree of Visual Change is expressed as the visual impact divided by the landscape character assessment range represented as a percentage.

The visual assessment also includes a description of the viewpoint context in relation the landscape character that surrounds the viewpoint and the potential visual effect. This assessment is supported by photomontages of the development and wireframe illustration of the power station.

For clarity and legibility of the report reference images, maps and photomontages have been reproduced in Appendix A and C and reproduced at A3 to enable them to be studied while reviewing the associated text for each viewpoint.

05 Visual Impact Assessment

The viewpoints selected for the visual impact assessment as shown in Table 1 are:

VP01 Gawler-Mallala Road (looking south-east - Local)

VP02 Gawler-Mallala Road and Boundary Road Intersection (looking north-west - Local)

VP03 Woolshed Road (looking south-west - Local)

VP04 Day Road (looking north-east - Local)

Ref.	Viewpoint	Longitude	Latitude	Distance to proposed development	View Direction
VP01	Gawler-Mallala Road	279327.47	6180485.75	1.76km	137 degrees
VP02	Gawler-Mallala Road and Boundary Road Intersection	282404.66	6178487.79	1.93km	296 degrees
VP03	Woolshed Road	280799.32	6180320.74	1.16km	183 degrees
VP04	Day Road	279351.94	6177134.92	2.22km	36 degrees

Table 1: Summary of Viewpoint location information

05 Visual Impact Assessment

Figure 18: Viewpoint locations and Infrastructure Identification

5.3 Viewpoint 1:Gawler-Mallala Road

<u>Viewpoint Description</u>

Viewpoint 1 is located on the Gawler Mallala Road approximately 2 kilometres from the proposed development site. The viewpoint is typical of the visual effect that will be experienced to the north-west of the subject land and the landscape character is representative of the existing land use of the locality.

The existing fields contain cropping, and agricultural land uses. Throughout the landscape are small tree groups and belts of vegetation that create a layered landscape effect. Further to the east the Mount Lofty Ranges are visible. The landform of the Ranges forms an elevated visual envelope which provides a backdrop to the wider landscape and specifically the proposed development site.

Adjacent to the viewpoint to the east is a large residential dwelling. The dwelling will experience the same degree of visual change to the viewpoint. The orientation of the property, the return verandah and large picture windows to the south-east suggest that the building has been designed to take advantage of the rural landscape that surrounds the dwelling and the views to the Mount Lofty Ranges to the east.

The layered formation of the vegetation surrounding the viewpoint creates a degree of visual fragmentation. The visual character of the locality is represented by filtered views across the agricultural landscape to belts of vegetation. Where the vegetation becomes more layered the visual screening increases reducing the visibility of the proposed development site.

An existing transmission line provides a defined infrastructure corridor in the landscape. It is anticipated that the development form of the gas power plant will be a similar height, although the turbines and substation will produce a larger visual mass within the landscape. In addition, the height of the communication tower will create an isolated vertical visual element.

The existing vegetation within the locality of the viewpoint is likely to provide moderate screening and will fragment the visual mass of the proposed development. Additional visual screening is provided by roadside vegetation.

Figure 19: Viewpoint 1: Gawler-Mallala Road

Figure 20: Digital Overlay showing all power station Viewpoint 1

05 Visual Impact Assessment

Figure 21: Absorption Capacity Calculations: Viewpoint 1

Viewpoint Assessment

Assessment	Value	Description
Relief	1	The landscape to the foreground, mid ground and background has limited to negligible variance in topographic form
Vegetation Coverage	2	The foreground presents limited vegetation, typically aligned to the road corridors. The mid ground to background provides some scattered trees that create a linear horizontal band across the view.
Infrastructure and Built Form	4	The viewshed has limited presence of built form. Isolated transmission lines which are recessive within the view. In addition some isolated farming structures and dwellings are present but of a scale to not dominate the character and field of view.
Cultural and Landscape Value	2	The frequency of views along the road corridor between Mallala and Gawler presents a moderate level of sensitivity.
Baseline Landscape	**11**	
Landscape Absorption	3	57% landscape absorption capacity. Moderate absorption capacity. Medium level of change to the landscape. The landscape is less able to absorb change due to the scale, distance and extent of the development.
Horizontal	2	23% horizontal visual effect, which is limited effect on the field of view
Vertical	1	Due to the distant Barossa and Mt Lofty Ranges providing a defined elevated horizon line the sale of the development is seen as a proportion of the existing landscape scale. This mitigates sky lining and vertical effects form this viewpoint
Distance	5	The closest gas turbine is 1.76km from the viewpoint
Visual Effect	**11**	
Coefficient	**0.55**	
11x 0.55= 6.05 Landscape visual effect		

6.05/20= Degree of visual change	
Degree of Visual Change	**30%**

Description of potential visual impact

The setback of the proposed development from the main road provides a degree of visual mitigation due to the local landforms and vegetation that will provide moderate screening to the lower elements of the proposed development.

Increasing visual effects will be experienced to the north of the proposed development along the Gawler Mallala Road. However, the arrangement of the proposed development along Day Road means that the visual effects are experience obliquely to the road corridor. From other locations the visual effect is mitigated by localised landforms and belts of vegetation that provide layered screening and fragmentation of views. The combination of topography and vegetation reduces the visual impact of the proposed development along the road corridor.

The potential introduction of additional vegetation screening to the north-eastern and north-western boundaries of the project site as well as supplemental plantings to the south-east and south-west boundaries will further reduce this visual impact. This approach will be important to reduce the potential visual effect on properties adjacent to the power station.

5.4 Viewpoint 2:Gawler-Mallala Road and Boundary Road Intersection

Viewpoint Description

Viewpoint 2 is located at the intersection of Gawler Mallala Road, Boundary Road and Verner Road. The viewpoint is located less than 2 kilometres from the proposed development site and represents the visual character that will be experienced to the south-east of the proposed development site.

The landscape character is agricultural with various belts of vegetation along road corridors and field boundaries that surround the viewpoint. The low lying undulating topography of Reeves Plains is evident from the viewpoint, rising to the north.

The existing transmission line is evident running across the landscape travelling in a north- west, south-east direction. Other pieces of infrastructure including 11kV transmission poles, fence lines, access roads as well as isolated dwellings and ancillary outbuildings are visible.

The layered visual screening provided by the existing vegetation within the locality provides a degree of screening. However, adjacent fields produce open view corridors increasing the degree of visibility of the proposed development site in turn increasing its potential visual effect.

Figure 22: Viewpoint 2: Gawler-Mallala Road and Boundary Road Intersection

Figure 23: Digital Overlay showing all power station Viewpoint 2

Figure 24: Absorption Capacity Calculations: Viewpoint 2

<u>Viewpoint Assessment</u>

Assessment	Value	Description
Relief	1	The landscape has limited to negligible variation in topography within the field of view
Vegetation Coverage	3	Dense vegetation is located adjacent to the east of the road corridor and surrounding dwellings to the north and west of the viewpoint.
Infrastructure and Built Form	4	Scattered dwellings and farming utilities coupled with the road corridor
Cultural and Landscape Value	2	The frequency of views along the road corridor between Mallala and Gawler presents a moderate level of sensitivity.
Baseline Landscape	**10**	
Landscape Absorption	4	22% landscape absorption capacity. Limited absorption. The development is noticeable within the landscape; however through vegetation and topography the landscape fragments and filters views of the development.
Horizontal	1	18% horizontal visual effect, which is limited effect on the field of view
Vertical	4	Due to limited to no variance in existing landscape vertical scale within the field of view the proposed development is seen to increase the vertical scale and skyline above the horizon edge. The vertical scale is defined as an increasing visual impact

Distance	5	The closest gas turbine is 1.43km from the viewpoint
Visual Effect	**14**	
Coefficient	**0.7**	
10x 0.7= 7 Landscape visual effect **7/20= Degree of visual change**		
Degree of Visual Change	**35%**	

Description of potential visual impact

It is anticipated that from the view corridors created by the existing field pattern and a lack of vegetation; the power station will be seen as a prominent visual element. While the trees around the existing farm on the site provide a degree of screening, the gas turbines and other associated infrastructure will be visible within the landscape.

Additional planting to the east of the site may assist in reducing the degree of visual effect. However, the proposed development is likely to remain a prominent visual element in the landscape.

5.5 Viewpoint 3:Woolshed Road

Viewpoint Description

Viewpoint 3 is located at the intersection of Worden Road and Woolshed Road. The viewpoint is typical of the visual effect that would be experienced to the north-east of the development as well as the potential visual effect that may be experienced from the Fischer residential area. The proposed development is located 1.2 kilometres to the south of the viewpoint.

The landscape character of the locality is visually open with the surrounding fields providing views towards the development site. However, pockets of vegetation provide isolated screening and visual fragmentation of the proposed development. Due to the orientation of the road corridor, a defined view line is provided between Woolshed Road and Day Road, increasing the potential visibility of the proposed development.

Around the intersection are a number of single storey dwellings located on large allotments surrounded by vegetated boundaries. A number of the properties are likely to experience views of the proposed development.

Within the landscape, the towers associated with the existing transmission line form prominent vertical features in the landscape. The proposed development will have a similar height, although a larger visual mass that will be visible within the landscape. The retention of the vegetation belts along Day Road will provide a degree of visual mitigation. This coupled with additional boundary planting will assist in providing additional screening over time, reducing the visual impact of the proposed development.

Figure 25: Viewpoint 3: Woolshed Road

Figure 26: Digital Overlay showing all power station Viewpoint 3

Figure 27: Absorption Capacity Calculations: Viewpoint 3

Viewpoint Assessment

Assessment	Value	Description
Relief	1	The landscape to the foreground, mid ground and background has limited to negligible variance in topographic form
Vegetation Coverage	2	Linear bands of vegetation associated to road corridors provide an element of visual relief and screening. The vegetation is of a scale proportionate to the development vertical scale, which limits the delineation of the development form. Dense vegetation is present surrounding the Fischer Development
Infrastructure and Built Form	4	The viewpoint is located adjacent to the Fischer development and rural living dwellings. This increase the presents of built form, however substantial vegetation screening is evident. Transmission lines cross the landscape in a north east direction.
Cultural and Landscape Value	2	Proximity to the Fischer rural living and farming dwelling utilities increases the level of local sensitivity

Baseline Landscape	**9**	
Landscape Absorption	5	9% landscape absorption capacity. Minor absorption within the landscape. The development is considered to be prominent within the visual landscape.
Horizontal	2	35% horizontal visual effect. Limited effect. The visual impact is a small part of the field of view.
Vertical	4	Due to limited to no variance in existing landscape vertical scale within the field of view the proposed development is seen to increase the vertical scale and skyline above the horizon edge. The vertical scale is defined as an increasing visual impact
Distance	5	The closest gas turbine is 1.16 from the viewpoint
Visual Effect	**16**	
Coefficient	**0.8**	
9x 0.8= 7.2 Landscape visual effect **7.2/20= Degree of visual change**		
Degree of Visual Change	**36%**	

Description of potential visual impact

From viewpoint 3 the proposed development will result in a moderate visual effect due to its close proximity to the development and the absence of road side vegetation along the Gawler-Mallala Road. The power station will represent a contrasting visual scale and bulk due to the clustered infrastructure elements and associated heights, particularly the cut in towers, substation gantries and communication tower. The development will be seen obliquely which will result in the infrastructure having a layered effect from the viewpoint.

Additional landscape planting in along the Gawler-Mallala Road site boundary will assist in fragmenting the visual mass, reducing the visual contrast of development form while increasing the degree of landscape absorption capacity longer term.

5.6 Viewpoint 4:Day Road

Viewpoint Description

Viewpoint 4 is located 2.2 kilometres south of the proposed development along Day Road. The viewpoint represents the visual effect that will be experienced to the south and south-west within the immediate locality of the proposed development. The landscape character is defined by the agricultural land uses that exist across the regional landscape. Belts of vegetation create defined landscape elements that are layered to form fragmented visual screens.

Surrounding the viewpoint are a number of isolated farms and dwellings, both inhabited as well as disused. The combination of building and vegetation around the development site reinforce the rural character of the landscape. The existing field pattern provides panoramic views across the wider landscape.

Figure 28: Viewpoint 4: Day Road

Figure 29: Digital Overlay showing all power station Viewpoint 4

Figure 30: Absorption Capacity Calculations: Viewpoint 4

Viewpoint Assessment

Assessment	Value	Description
Relief	1	The landscape to the foreground, mid ground and background has limited to negligible variance in topographic form
Vegetation Coverage	2	Linear bands of vegetation associated to road corridors provide an element of visual relief and screening. The vegetation is of a scale proportionate to the development vertical scale, which limits the delineation of the development form.
Infrastructure and Built Form	5	Scattered isolated dwellings evident and transmission line. Due to the vegetation pattern and scale the transmission line is a recessive piece of infrastructure within the field of view
Cultural and Landscape Value	1	A limited number of local farming properties will experience this particular field of view, however frequency of views will be limited due to fragmentation of vegetation screening.

Baseline Landscape	**9**	
Landscape Absorption	5	15% landscape absorption capacity. Minor absorption within the landscape. The development is considered to be prominent within the visual landscape.
Horizontal	1	14% horizontal visual effect. Minor visual effect. The visual impact is a small part of the field of view.
Vertical	2	Due to limited to no variance in existing landscape vertical scale within the field of view the proposed development is seen slightly above the existing landscape vertical scale. The vertical scale is defined as limited impact.
Distance	4	**The closest gas turbine is 2.22km from the viewpoint**
Visual Effect	**12**	
Coefficient	**0.6**	
9 x 0.6= 5.4 Landscape visual effect **5.4/20= Degree of visual change**		
Degree of Visual Change	**27%**	

Description of potential visual impact

From viewpoint 4 the backdrop of the Mount Lofty Ranges is less notable, forming a distant horizon line within the landscape. The proposed development will be seen a prominent visual element with a defined scale and mass, slightly elevated above the horizon edge.

From the viewpoint, the proposed development will be seen adjacent to existing agricultural properties. When seen in relation to existing development the proposed development is seen as an increase in built form elements within a landscape. As part of the proposed development the existing built form on the project site will be removed.

The development is seen within a narrow-horizontal field of view which, coupled with screening vegetation to road corridors and composition of the infrastructure elements, creates a moderate degree of visual change.

5.7 Summary of Visual Impacts

The visual assessment of the four viewpoints demonstrates that a consistent of visual impact will be experienced within the local, sub-regional and regional landscapes that surround the proposed power station development. Typically, the visual effect associated with the power station will occur within the local area between 1-5 kilometres.

The following tables illustrate the degree of visual change recorded at each of the viewpoints and classification of the potential visual impacts. Of note are the key factors that will affect the visual impact which occurs at each viewpoint and in the wider landscape. They include:

- Existing landscape character value and the presence or absence of significant vegetation or scenic value
- Existing infrastructure;
- The degree of landscape absorption provided by the existing landscape;
- Degree of visual containment and resulting viewshed;
- Horizontal and vertical visual effects produced by the proposed; and
- Distance to the proposed development.

As shown in Table 2 below, overall there is a moderate visual effect

Viewpoints	Relief	Vegetation Coverage	Infrastructure	Cultural/Landscape Value	Landscape Character	Landscape Absorption	Horizontal	Vertical	Distance	Visual Assessment	Degree of Visual Change
Viewpoint 1	**1**	**2**	**4**	**2**	**11**	**3**	**2**	**1**	**5**	**11**	**30%**
Viewpoint 2	**1**	**3**	**4**	**2**	**10**	**4**	**1**	**4**	**5**	**14**	**35%**
Viewpoint 3	**1**	**2**	**4**	**2**	**9**	**5**	**2**	**4**	**5**	**16**	**36%**
Viewpoint 4	**1**	**2**	**5**	**1**	**9**	**5**	**1**	**2**	**4**	**12**	**27%**

Table 2: Summary of Visual Impacts

The following Table 3 is a summary of the classifications described in the GrimKe matrix which provides additional information on the potential visual impact used to describe each viewpoint.

Percentage of Visual Change	Descriptive of Visual Impact	Descriptors – appearance in central vision field	Comments
80-100%	**Extreme**	*Commanding, controlling the view*	*Extreme change in view: change very prominent involving total obstruction of existing view or change in character and composition of the landscape and view through loss of key elements or addition of new or uncharacteristic elements which significantly alter underlying landscape visual character and amenity. The sensitivity of the underlying landscape character to change is unable to accommodate or mitigate the introduction of development, and the visual effect is highly adverse.*
60-80%	**Severe**	*Standing out, striking, sharp, unmistakable, easily seen*	*Severe change in view involving the obstruction of existing views or alteration to underlying landscape visual character through the introduction of new elements. Change may be different in scale and character from the surroundings and the wider setting or a severe change in the context of the existing landscape character. Resulting in a perceived adverse visual effect and an increase in proportional change to the underlying landscape visual character.*
40-60%	**Substantial**	*Noticeable, distinct, catching the eye or attention, clearly visible, well defined*	*Substantial change in view: which may involve partial obstruction of existing view or alteration of underlying landscape visual character and composition through the introduction of new elements. Composition of the view will alter however the sensitivity of the underlying landscape character to change is low, and it provides opportunities for mitigation, management of the visual effect.*
20-40%	**Moderate**	*Visible, evident, obvious*	*Moderate change in view: change will be distinguishable from the surroundings whilecomposition, and underlying landscape visual character will be retained. The sensitivity of the existing landscape to change is low.*
0-20%	**Slight**	*Lacking sharpness of definition, not obvious, indistinct, not clear, obscure, blurred, indefinite*	*Very slight change in view: change barely distinguishable from the surroundings. Composition and character of view substantially unaltered.*

Table 3: Classification of Visual Impacts

The low lying character of the rural landscape results in views to the north, south, east and west up to a distance of 5 kilometres. The depth of field that is experienced from any viewpoint within the landscape is altered primarily by the layered screening and visual fragmentation that occurs as a result of vegetation belts and local landforms.

This contrasts with distant views across the open field boundaries towards the rising topography and horizon line formed by Mount Lofty Ranges to the north and east. To the west, the visual character and visual envelope are formed by variations in vegetation belts. In situations where the vegetation is limited, the views continue over several kilometres towards the coast.

The visual impact of the Reeves Plains Power Station will be moderate within a local to sub-regional (1-5km) locality. Local ridgelines to the west, north and south east are likely to limit the extent of visibility towards the proposed development site. The presence of vegetation belts both to the foreground and background of all viewpoints provide a degree of visual screening or fragmentation. Beyond 5 kilometres, the combination of topography, visual containment and vegetation screening significantly reduces the visual effect resulting in a slight to negligible impact.

The vertical development form is similar in height to the other infrastructure elements in the regional landscape. However, the proposed development will be seen as a more concentrated cluster of infrastructure elements within a defined field of view. The surrounding vertical scale of the vegetation, such as larger belts of established trees, provides a degree of visual absorption to some of the vertical infrastructure elements. From some viewpoints the backdrop of the Mount Lofty Ranges reduces the potential for the development to be sky-lined, particularly to the east, reducing the visual effect in these locations.

The communications tower is the highest piece of infrastructure associated with the proposed development. This is a single piece of infrastructure with a slim lattice tower construction which will be approximately 30-35 metres high. While this tower has the potential to be visible over greater distances, due to the slim profile this element is likely to be screened in many locations by trees or built form. In addition the lattice construction will reduce the visual bulk reducing its visual prominence due to an increased degree of visual permeability as well as providing a similar development to the lattice cut in tower.

The lattice cut in tower is the highest piece of infrastructure with high of 40-45 metres. The development from is different in design and scale to the existing transmission corridor. While it will be visually different to the existing infrastructure of the transmission corridor, the tower design is consistent with other transmission towers in the wider regional locality. The lattice tower construction of the cut in tower will fit into the design context of the proposed power station's associated infrastructure including the transmission substation, gantries and communications tower.

The horizontal development form including the gas turbines, water tanks and other associated structures will be similar in scale to many of the surrounding agricultural buildings and structures. The proposed power station will be seen as a concentrated cluster of development within the landscape with some elements reflective of the surrounding agricultural landscape context (such as storage sheds and water tanks). Generally, the form and visual bulk of the proposed development may result in a moderate degree of visual change in the existing rural landscape.

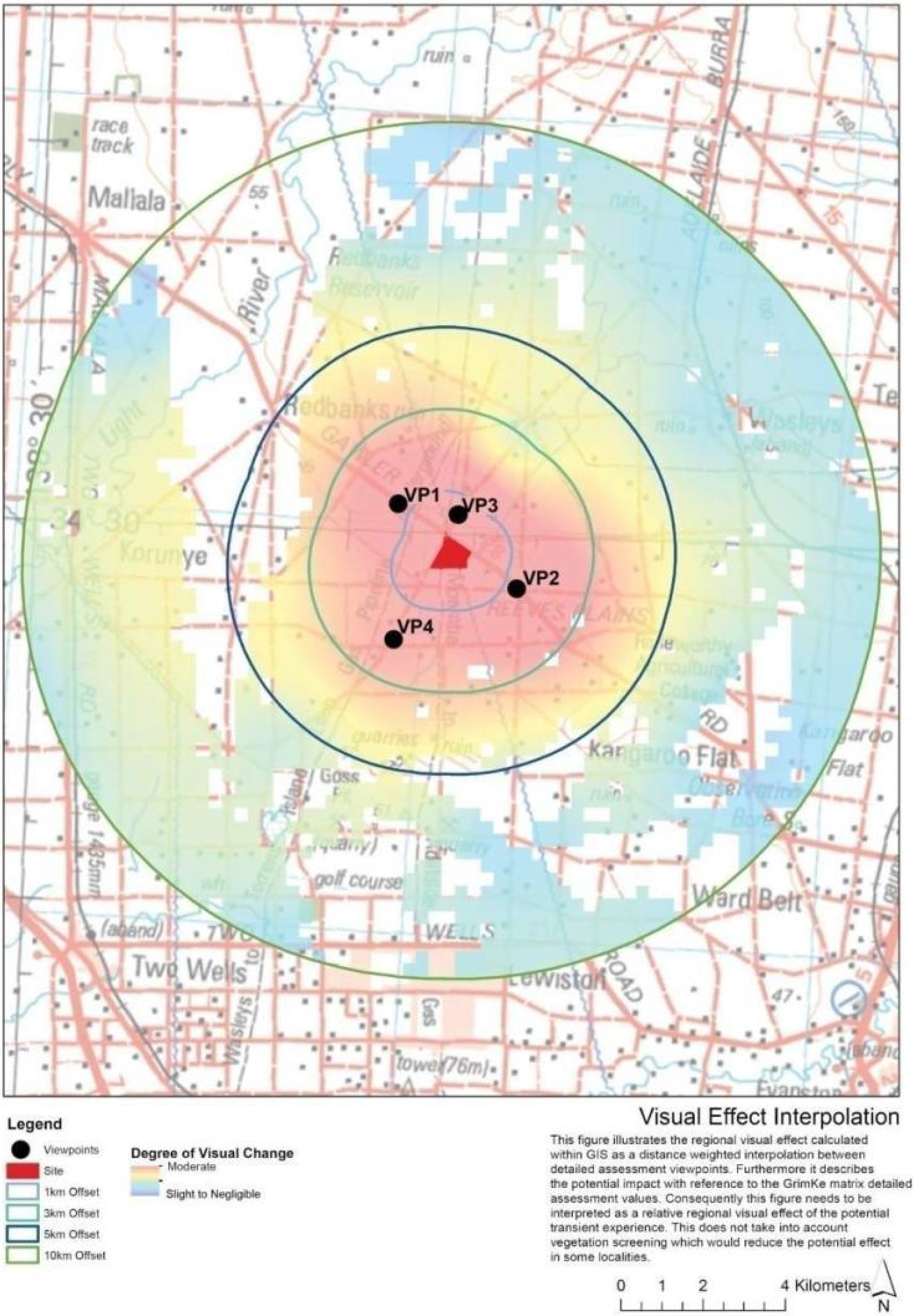


Figure 31: Summary of viewpoint visual effect

05 Visual Impact Assessment

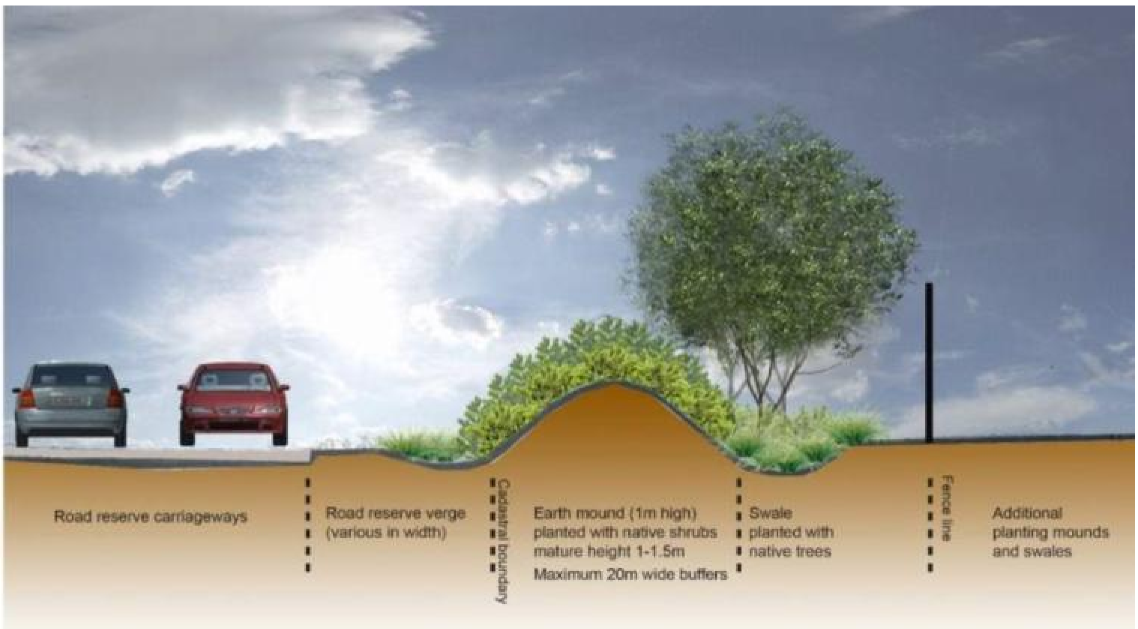
5.8 Design Review and Visual Management

The management of the visual effect was considered as part of the LVIA and was based on a review process as well as a consideration of environmental constraints and the relevant provisions of the Development Plan.

Material and finishes, such as pitched roof and colourbond zincalum finish should be considered for service buildings and other infrastructure to provide a contextual reference within the agricultural landscape. Materiality and colour finishes that are consistent with the surrounding agricultural landscape character will provide an additional visual management, enhancing the integration of the proposed development.

It is recommended that a landscape concept be prepared and a degree of visual management can be achieved through the implementation of suitable landscape treatments to the subject site. It is suggested that the following principles are used to inform the landscape concept plan.

- Landscape proposals immediately surrounding the development should be consistent with bushfire risk mitigation specifications.
- Landscaping of the existing gas pipeline and transmission line corridors should be consistent with access and electricity generation requirements.
- Establish landscape buffers, particularly along the Gawler-Mallala Road corridor and the Day Road boundary of the site. This will fragment the visual mass and bulk of the development both when viewed in front of the development and when seen as a vegetated backdrop to the development.
- Landscape screening should be established as a series of overlapping but staggered belts of vegetation with adequate gaps between them. Vegetation belts should be restricted in length and with a maximum planting width of 20 metres to restrict providing a continuous fuel source.
- Use local plant species to encourage maximum growth heights are achieved. Established trees in the locality suggest that screening trees could reach a height of approximately 15 metres over 10-20 years.
  Consider mounding with swale combination to increase stormwater collection and increase potential visual screening. The planting will then create a layered vegetation screen.



Typical buffer and mound landscape treatment cross section

Note: Drawing is not to scale. It is a concept only and will require detailed landscape design to confirm

Figure 32: Typical planting buffer detail

06 Review of Development Plan

6.0 Review of Development Plan

6.1 Introduction

The following section details the various development plan provisions, zones and policy areas that have been considered in relation to the potential visual effect of the Reeves Plains Power Station and associated infrastructure. The proposed development is located within the Adelaide Plains Council area (previously the Mallala Council).

This section will review the proposed development against the Mallala Council Development Plan (Consolidated – 21 April 2016). The intent of the review is to provide clarity as to the relevance and consistency with particular provisions in relation to the development of the power station and associated infrastructure, visual impacts, and the effects on the landscape character and amenity.

The proposed development is situated entirely within the Primary Production Zone it is located adjacent to Redbanks Road which is identified as a secondary arterial road within the development plan. The development site is located approximately 1-2 kilometers away from Fischer a small collection of Rural Living allotments. Having reviewed the Development Plan consideration has been given to a broad range of provisions that could be applied to the power station as a public infrastructure development;

- Primary Production Desired Character Statement, Objectives and Principles of Development Control (PDCs);
- Council Wide Design and Appearance – Building Setbacks from Road Boundaries, Infrastructure, Landscaping, Fencing and Walls, and Siting and Visibility Objectives and PDCs

6.2 Primary Production Zone

The Desired Character Statement for the Primary Production Zone has a focus on ensuring that the development is consistent with the desired character of primary production land uses such as farming, horticultural and animal keeping. There is focus on protecting this zone from incompatible land uses and protecting the scenic qualities.

Objective 4: Protection of primary production from encroachment by incompatible land uses and <u>protection of scenic qualities of rural landscapes</u>.

PDC 13: Buildings should primarily be limited to farm, horticulture and animal keeping buildings, a detached dwelling associated with primary production on the allotment and residential out buildings that are:

- grouped together on the allotment and setback from allotment boundaries to minimise the visual impact of buildings on the landscape as viewed from public roads
  - *(a) <u>screened from public roads and adjacent land by existing vegetation or landscaped buffers.</u>*

The Primary Production Zone is silent on the development of public infrastructure such as a power station. Public infrastructure including developments which deal with the production of energy have not been identified as non-complying development within the Primary Production Zone. Furthermore the zone does anticipate the development of substations and other infrastructure elements associated with the development of wind farms which are of a similar scale and nature as the proposed development. This indicates that the development of energy production such as the Reeves Plains Power Station could occur within the Primary Production Zone.

6.3 Council Wide Provisions

The proposed development has a minimum setback of 80 meters from both road boundaries and satisfies CW Design and Appearance PDC 25 (b). This setback helps to mitigate the immediate visual impact which could be experienced from the road corridor and allows the potential to implement a landscape treatment plan as suggested in section 5 of this report.

CW Design and Appearance PDC 25: Unless otherwise stated within the specific zone or policy area provisions, buildings and structures excluding advertisements and/or advertising hoardings should be setback at least:

- 50 metres from the road boundary of the Port Wakefield Road outside defined township and settlement zones
  - *(a)* *20 metres from the road boundary (other than the Port Wakefield Road) in any area outside of a defined township, settlement or rural living zone boundary*
- 8 metres from the road boundary within the Township Zone or Settlement Zone.

There is generally not a consistent setback for dwellings and structures within the locality and the Primary Production Zone. While the proposed development will result in a degree of visual change in the immediate locality this is a result of the scale, height and type of development rather than the road setbacks, therefore CW Design and Appearance PDC 21.

The development site for the Reeves Plains Power Station has both an existing gas pipeline as well as an existing transmission line traversing the site. Having the connection to gas and electricity infastructure on site results in an efficient use of existing infrastructure and eliminates the requirement for extended pipeline and transmission line connections across the landscape between the peaking plant and existing infrastructure. This minimises the duplication of infrastructure elements within the landscape and contains the potential visual effect of the development of the power station to a contained locality satisfying CW Infrastructure Objective 3 and PDC 3 and 10.

The condensed layout of the proposed gas peaking plant along with the road setbacks aim to minimize the potential visual impact of the proposed development. This along with the proposed landscape treatments would significantly minimize the visual impact of the development in the immediate area satisfying CW Infrastructure Objective 2 and CW Siting and Visibility PDC 1 (b). With the visual impact decreasing significantly further than four kilometers away from the site due to topography and local vegetation screening.

The proposed development is situated within a modified agricultural landscape along a secondary arterial road. The proposed development will be visible along this road corridor particularly within the immediate area of 1-2 kilometres. Along this road corridor there are established belts of vegetation which screen the development, gaps in this vegetation will allow glimpsed views towards the proposed development.

The suggested landscape concept plan aims to manage the visual effect of the development along the public road with screen planting.

The proposed vegetation planting along the road corridor will provide a level of visual screening for the development, this type of planting is consistent with the surrounding landscape character with much of the Mallala-Gawler Road corridor and other road corridors having established road side vegetation. This vegetation could be achieved by using indigenous plant species.

Existing trees in the locality have reached a height of between 12-15 metres which would provide a significant level of screening particularly to the horizontal mass of the proposed development. Existing road side vegetation demonstrates that a dense vegetation screen can be achieved in the locality. This approach to landscape surrounding the development in our opinion would satisfy CW Landscaping, Fences and Walls Objective 1, PDC 1, 2 and CW Siting and Visibility Objective 1 and PDC 7.

07 Viewer Sensitivity

7.0 Viewer Sensitivity

The preceding assessment considers the visual effect of the power station from various locations having regard to the existing landscape quality and the degree of visual change on the existing environment. It does not measure the extent to which a viewer's response or sensitivity to landscape changes and how this influences the perception of visual effect.

Fundamental to the viewer's sensitivity is the degree to which visual change is perceived or experienced and whether this is seen as a positive or negative visual effect. Therefore, it is likely that local residents, who are most familiar with the landscape, will experience a greater degree of change than occasional visitors to the area. However, whether the change is perceived as positive or negative will depend on the viewer's opinions.

The truth may be that within all user groups, be they locals, tourists, walkers or weekenders, a spectrum of opinions can be expected based on differing views on the receiving landscape. The final level of viewer sensitivity becomes the personal preference of the viewer as to whether the visual change is positive or negative, as an assessment of social or demographic groups can only be subjective, it does not form part of this discussion.

8 Conclusion

8.0 Conclusion

The visual impact of the Reeves Plains Power Station will be moderate within a defined local to sub-regional (1-5km) locality. Local ridgelines to the west, north and south-east limit the extent of visibility around the subject site. The presence of existing vegetation belts both to the foreground and background of all viewpoints provide a degree of visual screening or fragmentation that assist in reducing the visual effect of the proposed power station.

Beyond 5 kilometres, the combination of topography, visual containment and vegetation screening significantly reduces the visual effect resulting in a slight to negligible impact.

The overall visual effect will be defined by the concentrated cluster of infrastructure elements within the existing agricultural landscape. The horizontal infrastructure elements have similarities in scale and mass to a number of existing agricultural structures. However, the extent of development will be seen as a large cluster of built form elements within the locality. While the visual effect is likely to be moderate opportunities exist to manage the visual effect through material and finishes selections which respond to the surrounding context and provision of adequate landscape treatments (with reference to the Landscape Concept Plan).

The vertical scale of the transmission substation and associated gantries is similar in height to the existing transmission corridor; again this will be seen as a concentration of infrastructure elements within the locality. The lattice tower construction of the transmission substation and cut in tower will contrast the existing transmission towers on site. However, the cut it tower it typical of other power transmission infrastructure in the wider regional landscape context.

Vertical elements of the development, such as the communications tower, will produce points of visual prominence. However the lattice tower construction and narrow profile will have a reduced visual effect.

Existing landforms within the locality as well as established belts of vegetation provide significant screening across the locality. This coupled with the proposed landscape concept plan further reduce and fragment the potential visual impact. Detailed planting plans will be required to ensure that the proposed landscape is consistent with other requirements such as bushfire risk and environmental management.

In conclusion, the potential visual impact for the Reeves Plains Power Station will be moderate and will be experienced within the local to sub-regional locality up to 5 kilometres. In addition to the contained visual effect, there is the potential to mitigate and reduced to slight the visual impact with the adoption and establishment of the visual management strategies proposed in the report.

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Landscape Character and Probable Visual Effect Assessment

Mallala Open Cycle Gas Turbine Peaking Plant

Prepared for Alinta

11 September 2017

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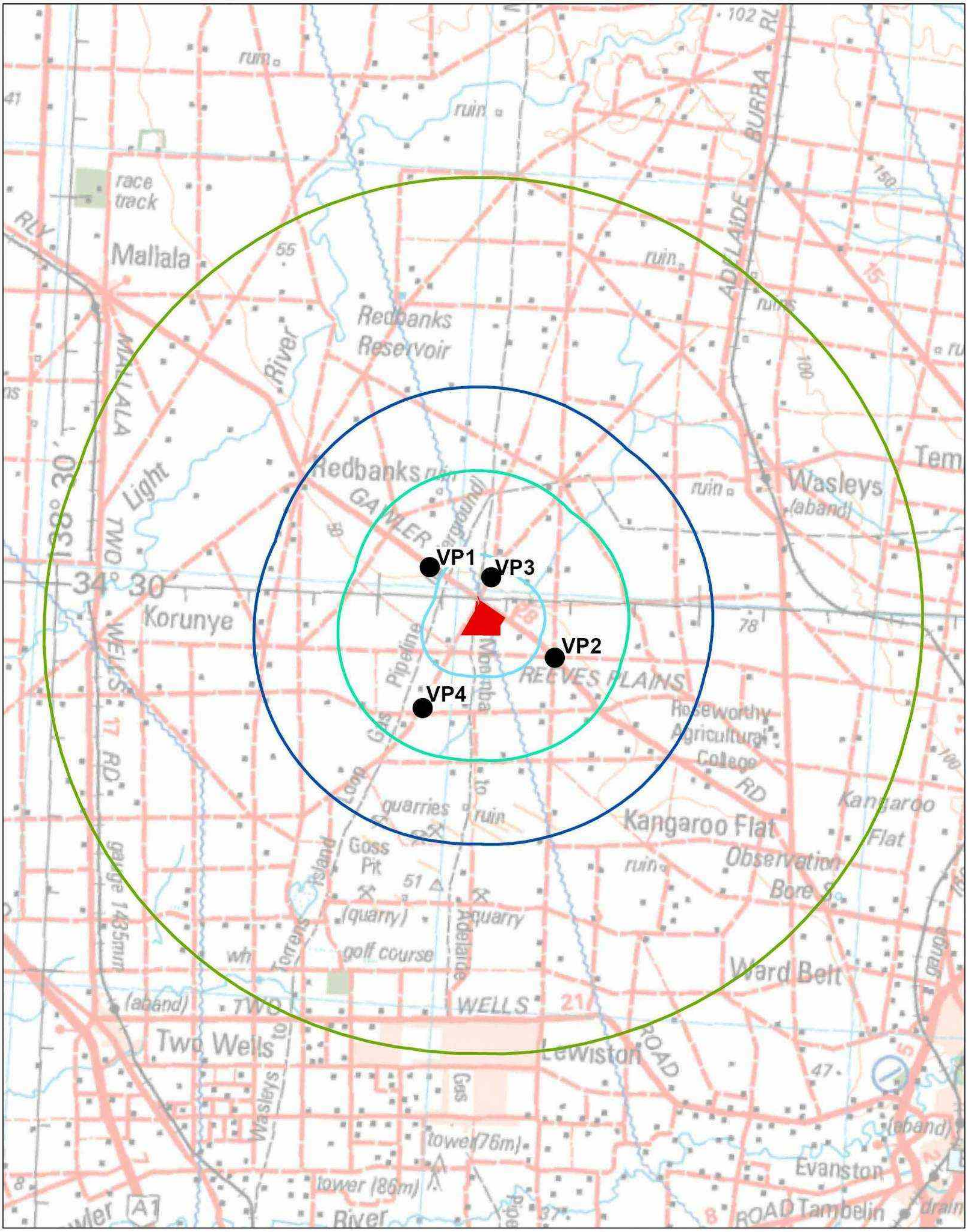
REVISION	DATE	AUTHOR	REVIEWER
B	11/09/2017	WK/BG/CS	WK
A	14/08/2017	WK/BG/CS	CS

Appendix A
Assessment Mapping



Viewpoints

Legend

- Viewpoints
- 1km Offset
- 3km Offset
- 5km Offset
- 10km Offset
- Site

0 1.5 3 6 Kilometers

N

Viewpoints and Infrastructure

Legend

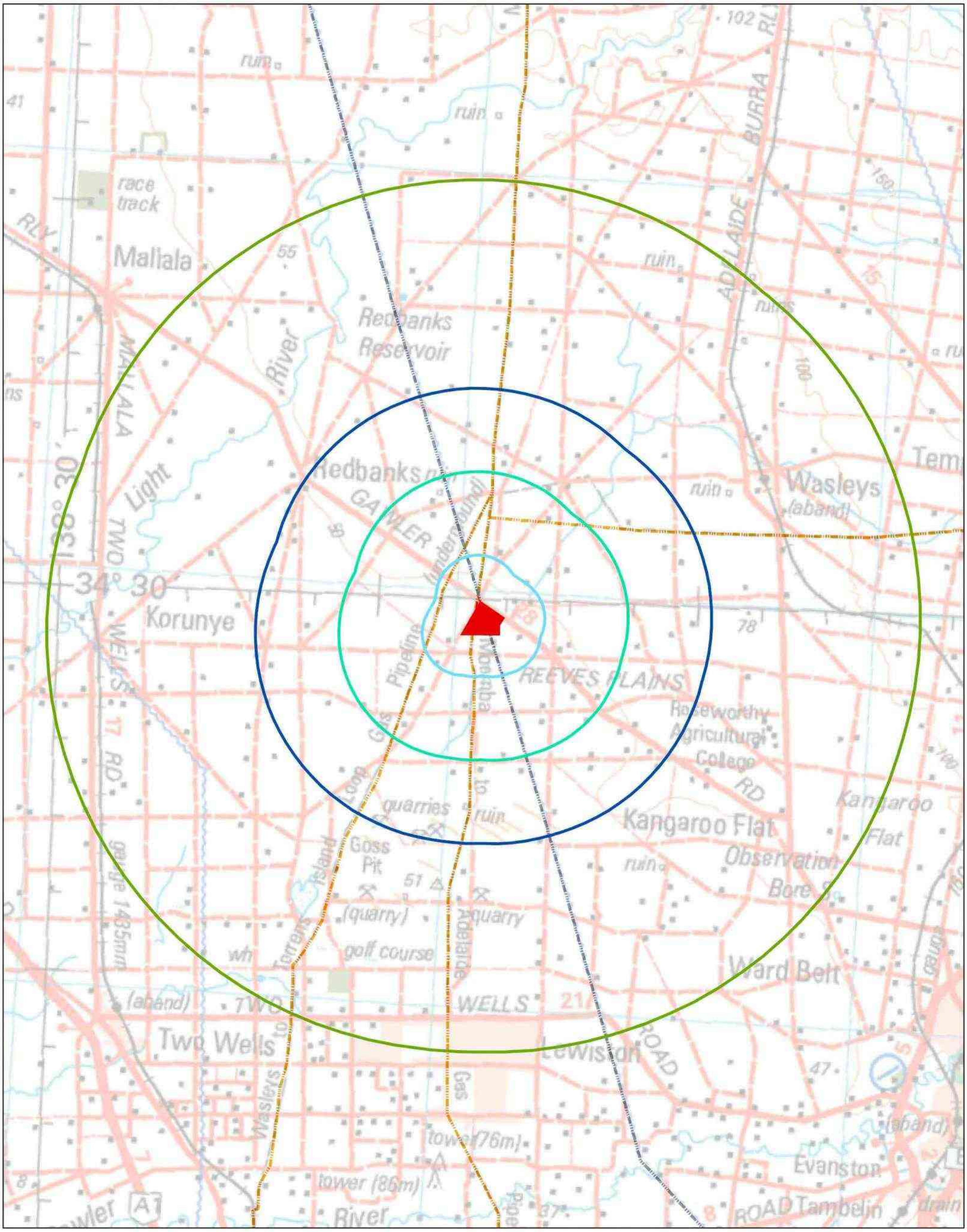
Viewpoints

Site Layout

1km Offset

0 0.5 1 2 Kilometers

N



Site Locality

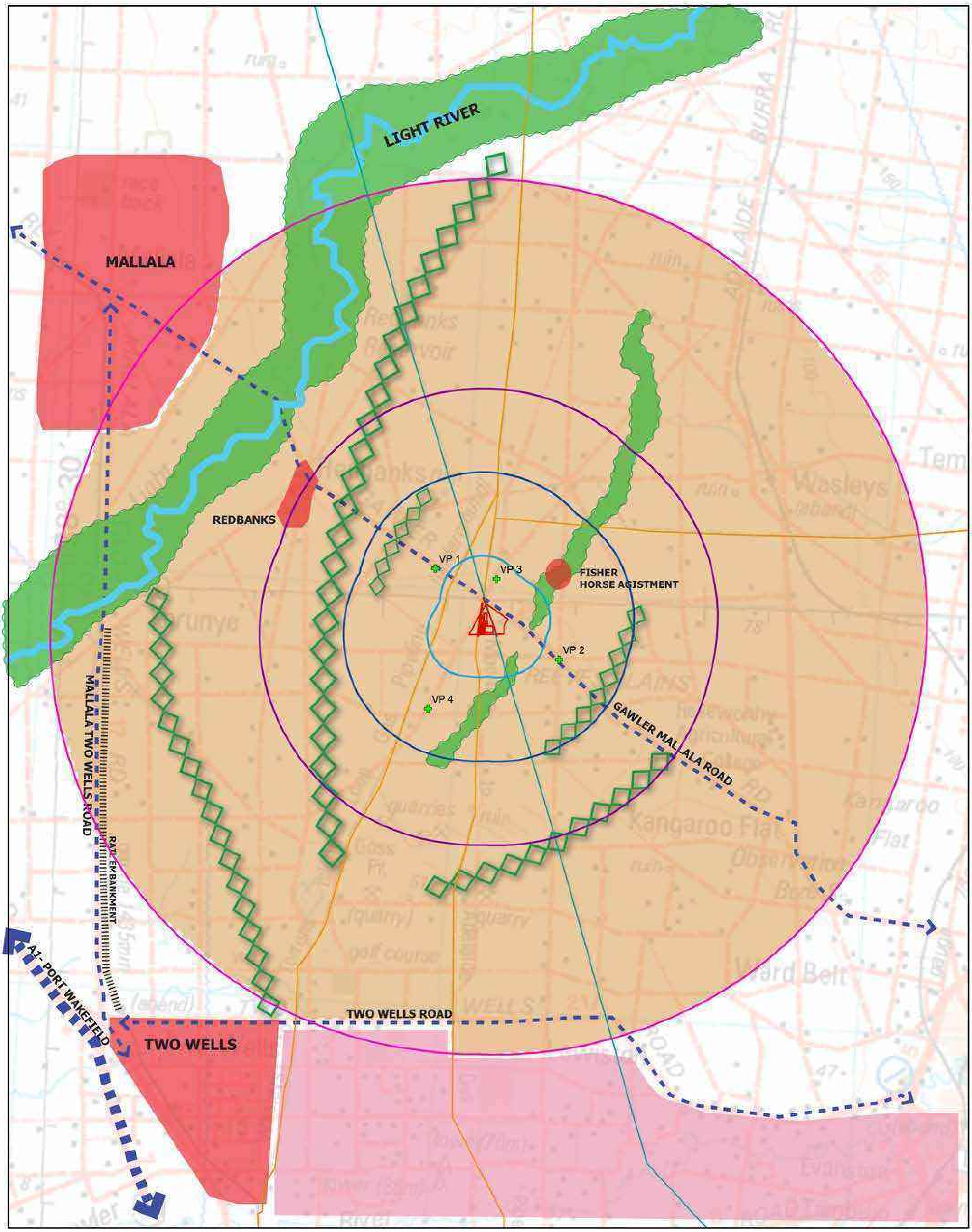
Legend

- Site
- HighVoltageElectricityTransmissionLine
- NationalOnshoreGasPipelines
- 1km Offset
- 3km Offset
- 5km Offset
- 10km Offset

0 1.5 3 6 Kilometers

N


Mallala
Redbanks Reservoir
Redbanks
Korunye
Reeves Plains
Wasleys
Templers
Roseworthy Agricultural College
Kangaroo Flat
Ward Belt
Two Wells
Lewiston
Evanston
Angle Vale
Contours
Legend
1km Offset
3km Offset
5km Offset
10km Offset
Site
Contours 1m
Contours 5m
0 2 4 8 Kilometers
N



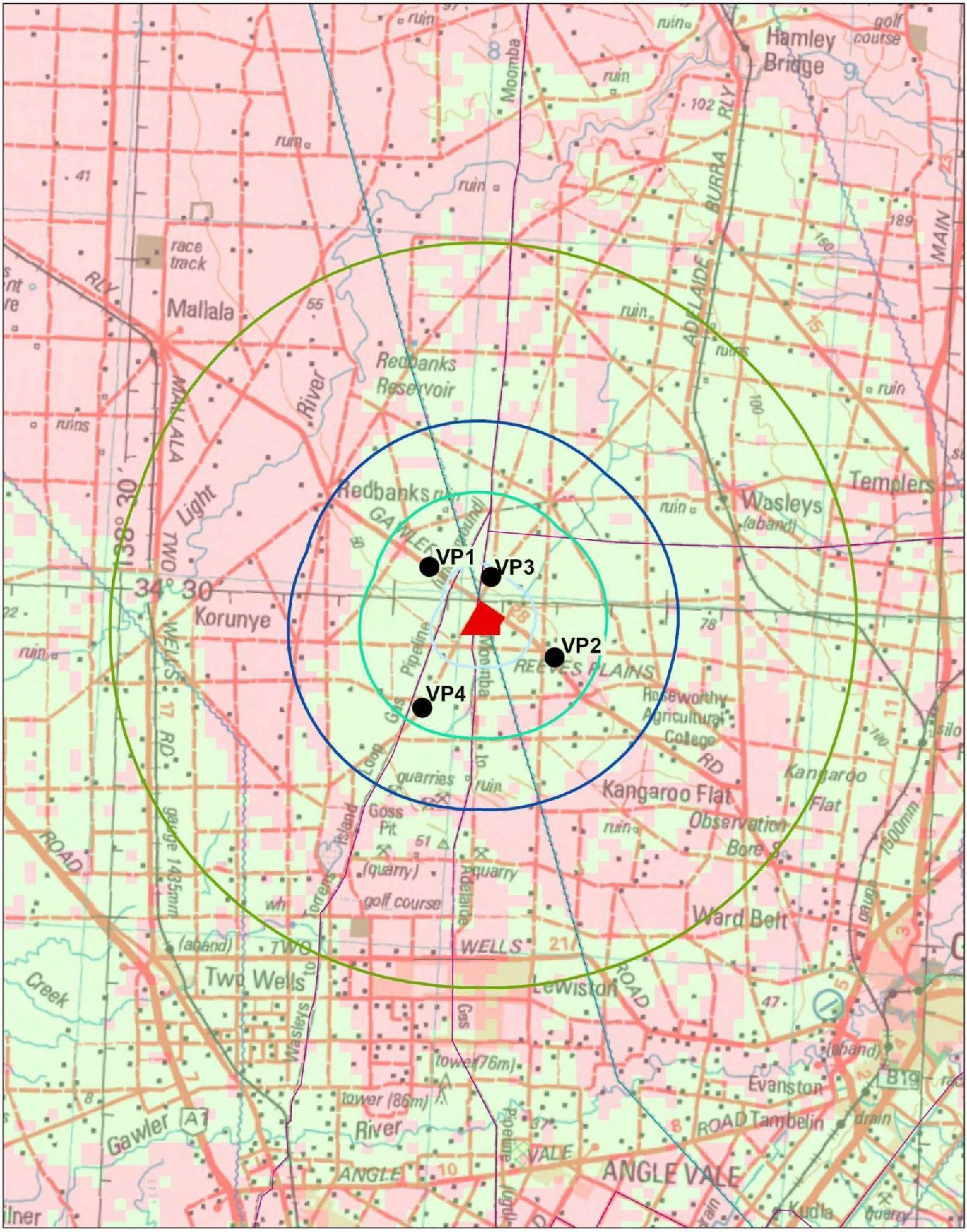
Landscape Character

Legend

- Viewpoints
- Site Layout
- 1km Offset
- 3km Offset
- 5km Offset
- 10km Offset
- High Voltage Electricity Transmission Line
- National Onshore Gas Pipelines
- Settlement
- Rural living/ agriculture
- Agricultural land with isolated variation to landuse
- Riparian vegetated corridors
- Ridgelines and visual containment
- Frequent vehicular movement patterns

0 1.5 3 6 Kilometers

N



Legend

- Site
- HighVoltageElectricityPylon
- HighVoltageElectricityTransmissionLine
- NationalOnshoreGasPipelines
- 1km Offset
- 3km Offset
- 5km Offset
- 10km Offset

ZTVI

- Not Visible
- Visible

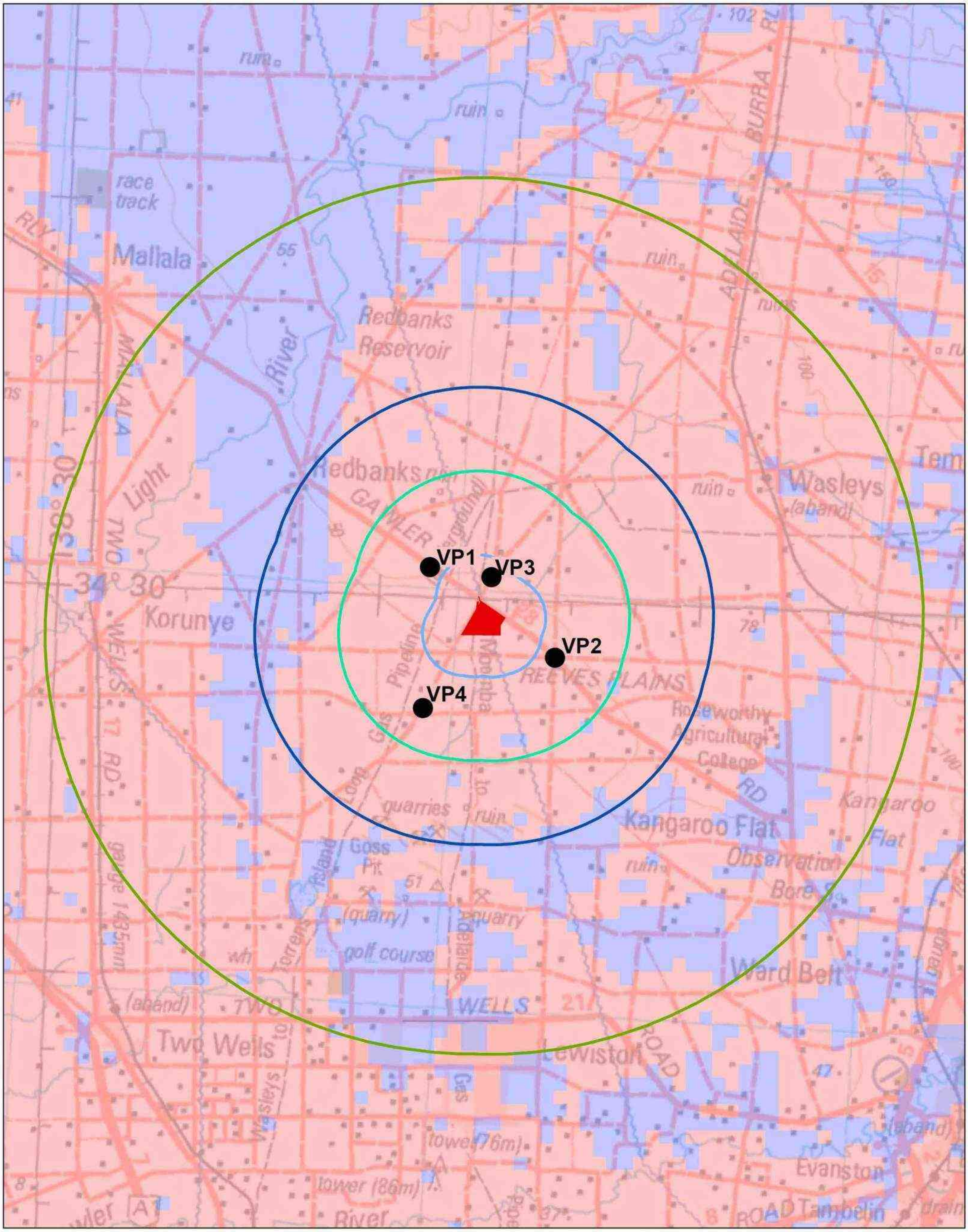
Zone of Theoretical Visual Influence

ZTVI represents 'worse case scenario'
it is based on 1m contour data and does not take into account vegetation or built form screening.

Maximum heights of infrastructure
- gas exhaust stack silencer 16m

0 1 2 4 Kilometers

N



Zone of Theoretical Visual Influence

Legend

- Viewpoints
- Site
- 1km Offset
- 3km Offset
- 5km Offset
- 10km Offset

ZTVI

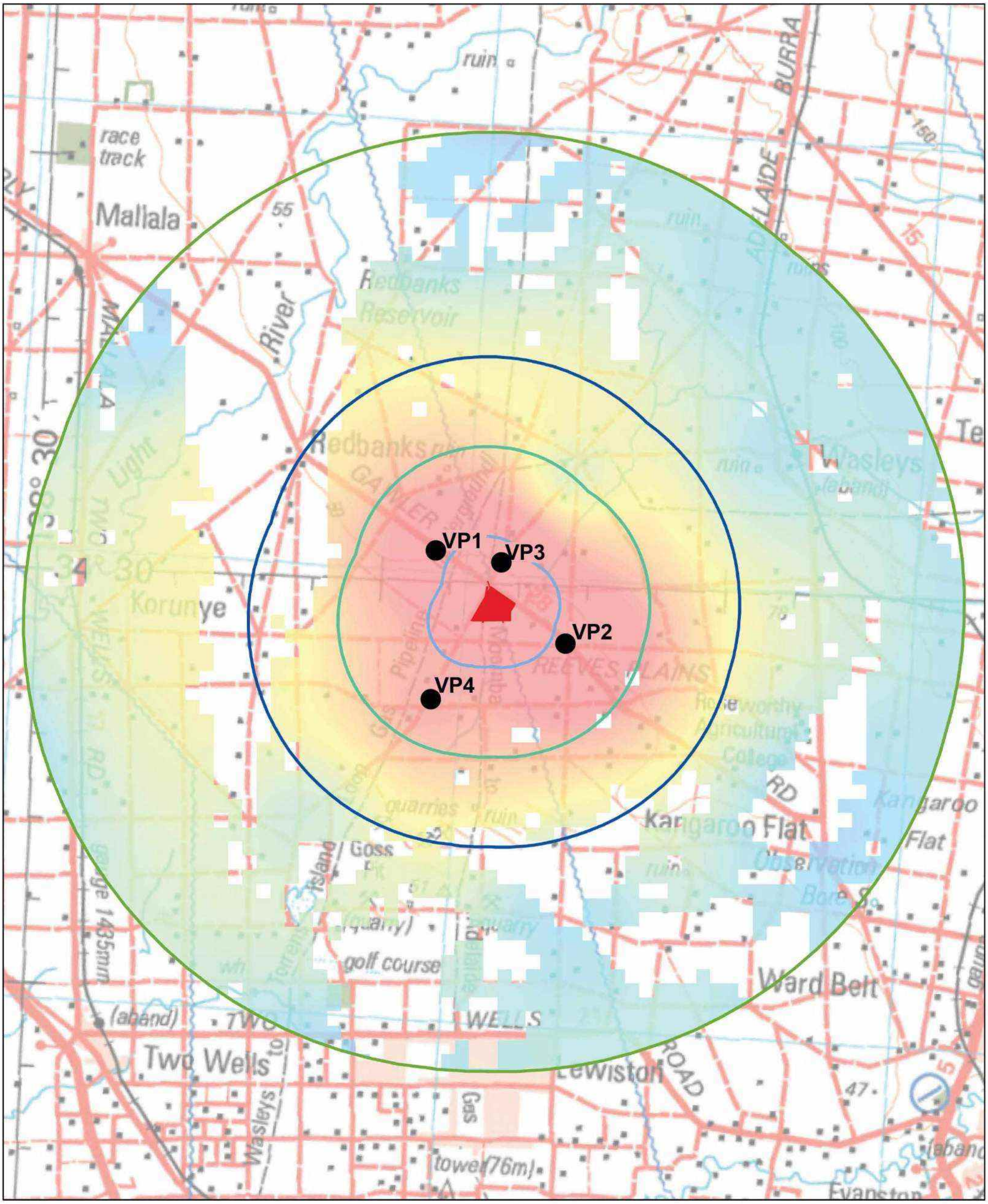
- Not Visible
- Visible

ZTVI respresents 'worse case scenario', it is based on 1m contour data and does not take into account vegetation or built form screening.

Maximum heights of infrastructure modelled
- gas exhaust stacks 16m
- substation gantries 24m
- transmission tower 27m

0 1 2 4 Kilometers

N



Legend

- Viewpoints
- Site
- 1km Offset
- 3km Offset
- 5km Offset
- 10km Offset

Degree of Visual Change

- Moderate
- Slight to Negligible

Visual Effect Interpolation

This figure illustrates the regional visual effect calculated within GIS as a distance weighted interpolation between detailed assessment viewpoints. Furthermore it describes the potential impact with reference to the GrimKe matrix detailed assessment values. Consequently this figure needs to be interpreted as a relative regional visual effect of the potential transient experience. This does not take into account vegetation screening which would reduce the potential effect in some localities.

0 1 2 4 Kilometers

N

Appendix B
Photographic Methodology (produced by Convergen)

The method consists of 6 stages. The following summarises the stages;

1. Viewpoints are identified using a Zone of Theoretical Visibility map, site assessment and in consultation with the client and residents in the area. The viewpoints are selected to represent the worse case scenario i.e. the maximum number of turbines visible within the field of view. The locations of viewpoints are typically representative of the regional landscape character units or identified by residents. The locations represent a diverse range of views from around the wind farm at a variety of directions and distances.

2. Photos are taken onsite using a 32mm lens digital SLR camera (50mm equivalent analogue). Numerous research papers have concluded that this is most representative of the human eye for depth of field. Photos are taken on a mounted tripod and the height recorded to eye level. In addition the elevation of the viewpoint is recorded Above Sea Level (ASL) using the barometric measure on a handheld GPS device. The weather and time of day are also recorded to enable computer model rectification in stage 4 and 6 of the process.

3. The centre of the field of view is equated onsite using a bearing compass and GPS to the projected centre of the development. A field of view of 60 degrees to either side of centre is established onsite to provide the full 120 degrees. The extent of the field of view is recorded and evaluated onsite using the GPS and bearing compass. 6 photos are taken for each viewpoint with 1/3 overlap of each to enable photo stitching. The bearing to centre of each photo is recorded to enable cross reference to the next phase of developing a computer model. During the site photography numerous fixed known visual markers are recorded with a GPS location and bearing from the viewpoint. These markers provide reference points within the computer modelling for due diligence.

4. To generate the panoramic photographs the individual photographs are stitched together using PTGui software.

5. The next stage of the process involves the computer generation of a wire frame perspective view of the wind farm, which incorporates the topography from each viewpoint. Using the Wind Farmer™ software the wire frame is produced using a digital terrain model with 10 metre contour intervals. This creates the topography and positions the turbines at the correct coordinates and elevation within the wire frame. The correct field of view is established by matching the viewing centre of the view angle to the camera and lens used for the photography with the wire frame. This ensures that the image size and angle of view of the wire line matches the photos taken. The wire line is then superimposed on the stitched panoramic photograph and matched in accordance to reference markers and landscape features.

6. A second site visit is conducted with the preliminary wire lines to certify the correct locations of the turbines using a GPS and bearing compass. Minor alterations are marked up on the drafts to mitigate the effects of photographic warping to the periphery of the stitched panorama. Ground truthing the turbine locations, provides rigour to the process. Typically if any amendments are required they are within 1-5 degrees.

7. Once the wire frame and photograph have been lined up the rendered image of the turbines are created. The rendered model is created in Wind Farmer™ using the correct sun angle for the date and time of the day that the photograph was taken. The rendered model is exported to Photoshop™ for final matching with the photograph. The rendered image is edited, masking

turbines or parts their off that are screened by vegetation and other elements to the foreground. Additional visual effects are applied to match the lighting effects of shadow imposed by vegetation etc.

Viewing of Photomontages

Given that the objectives of photography and photomontage are to produce printed images of a size and resolution sufficient for use in assessment work in the field, the exact dimensions of these images will depend on the characteristics of the field of view.

All photographs, whether printed or digitally displayed, have a unique, correct viewing distance - that is, the distance at which the perspective in the photograph correctly reconstructs the perspective seen from the point at which the photograph was taken. The correct viewing distance is stated for all printed or digitally displayed photographs and photomontages, together with the size at which they should be printed.

The viewing distance and the horizontal field of view together determine the overall printed image size.
Photographs and photomontages should be printed or published digitally at an appropriate scale for comfortable viewing at the correct distance, noting the limitations of the printing process particularly with regards to colour and resolution. Guidance is provided on viewing the image in order to best represent how the proposal would appear if constructed, such as the required viewing distance between the eye and the printed image. Panoramic images should be curved so that peripheral parts of the image are viewed at the same intended viewing distance. The 'before' photograph and the 'after' photomontage should be presented on the same page and/or at the same scale to allow comparison if practicable.

References

Landscape Institute Photography and photomontage in landscape and visual impact assessment (March 2011)

Landscape Institute and IEMA (2002) Guidelines for landscape and visual impact assessment (2nd ed). London: Spon.

Scottish Natural Heritage (2006) Visual representation of windfarms: good practice guidance. Inverness: Scottish Natural Heritage. SNH report no. FO3 AA 308/2

Appendix C

Photomontages

Mallala Gas Peaking Plant Photomontages
Viewpoint 1 Gawler-Mallala Road (North-west of site)

Longitude	Latitude	Distance to nearest WTG	View Direction
279327.47	6180485.75	1.76km	137 degrees

Viewpoint 1 Gawler-Mallala Road, North-west of site

Viewpoint 1 Photomontage

Viewpoint 1 Digital Overlay with Infrastructure Visible

Mallala Gas Peaking Plant Photomontages
Viewpoint 2 Gawler-Mallala Road and Boundary Road Intersection (South-east of site)

Longitude	Latitude	Distance to nearest WTG	View Direction
282404.66	6178487.79	1.93km	296 degrees


Viewpoint 2 Gawler-Mallala Road and Boundary Road Intersection, South-east of site


Viewpoint 2 Photomontage


Viewpoint 2 Digital Overlay with Infrastructure Visible

Mallala Gas Peaking Plant Photomontages
Viewpoint 3 Woolshed Road (North-east of site)

Longitude	Latitude	Distance to nearest WTG	View Direction
280799.32	6180320.74	1.16km	183 degrees

Mallala Gas Peaking Plant Photomontages
Viewpoint 4 Day Road (South-west of site)

Longitude	Latitude	Distance to nearest WTG	View Direction
279351.94	6177134.92	2.22km	36 degrees

Viewpoint 4 Day Road, South-west of site

Viewpoint 4 Photomontage

Viewpoint 4 Digital Overlay with Infrastructure Visible

Appendix D
GrimKe Assessment Matrix

The GRIMKE Matrix has been based on the WAX (2006) and HASSELL Matrix (2005), and with reference to The Visual Management System (VMS) produced by Litton (1968) primarily used for the U.S. Forest Service (1973) and the US Bureau of Land Management (1980). These models are based on a professional consultant (Landscape Architect) quantifying potential changes to landscape composition through "forms, lines, colours and textures and their interrelationships"1. Other factors such as compositional qualities, dominance, variety, animation and sensitivity to potential receptors are also considered.

The extent of visual impact was identified on site, using a GPS with a Wide Area Augmentation System (WAAS) that provides positional accuracy to within 3 metres.i Using the GPS, the location and extent of the development was plotted as 'waypoints', using longitude and latitude, elevation and distances to provide geographic referenced data. The surrounding area was then surveyed with the GPS and a SILVAii bearing compass to calculate the bearing and distance between the viewpoint and the subject area. This methodology was used to assess where the development is in the landscape and whether it is visible.

The GrimKe Matrix considers two key aspects in terms of understanding visual impact and the resulting visual assessment. The initial assessment is a quasi-objective measurement, where a landscape architect considers the landscape character of the site and particularly in relation of this landscape to the viewpoints that have been selected as part of the assessment criteria. Each viewpoint is then assessed in terms of:

- Relief (the complexity of the land that exists as part of the underlying landscape character)
- Vegetation Cover (the extent to which vegetation is present and its potential to screen and filter views)
- Infrastructure and Built Form (the impact of development on landscape and visual character)
- Cultural and Landscape Value (quantification of recognised planning overlays)

Assessing each viewpoint and the regional context (cultural and landscape value) a quantified value is generated for landscape character. This value then forms the baseline assessment value, which will be modified by the impact of the development within the landscape, which in turn will be measured as part of the visual assessment.

This two-tiered assessment methodology ensures the degree of visual impact is assessed against a quantified landscape character value enabling, the GrimKe Matrix to accurately quantify the degree of visual impact that is experienced as a result of implementing the development.

The assessment considers the landscape as three distinct zones based on the distance from the proposed development. The three zones were defined as; local (0-1km), sub-regional (1-5km) and regional (5-30km). (Planning South Australia, 2002). Specific landscape characters are also identified to provide a complete assessment of the landscape context.

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[1] *Daniel, T C & Vining, J (1980) p49*

1. Landscape Character Assessment

1.1 Relief

This is an assessment of the landscape complexity in terms of the underlying topography. The relationship of relief assists in defining the landscape and the visual character of an area. This is relevant in terms of the position and elevation of a proposed development within the landscape and the viewpoint.

The topography is assessed both on site (from each viewpoint) and as part of a desktop review (topography mapping). The assessment considers the topographical complexity in terms of local, sub-regional and regional. Within each zone an assessment is made of the topography and the complexity of landscape features.

The assessment is concerned with landscape complexity and how it impacts on the visual character. The assessment considers landform patterns, dominant elements and other distinguishing topographical features that will impact on the visual context.

Relief (expressed as percentage)	Value	Description of Landscape Relief
80-100%	5	Substantial landscape relief. The landscape possesses significant topographic variations, features and prominent elements creating a dynamic landscape context.
60-79%	4	Increasing relief. Due to the scale of the topography and frequency of features.
40-59%	3	Moderate relief. Medium level of change to the landscape. Occasional landscape features and topographic variation.
20-39%	2	Limited relief. Small amount of topographic variation in the landscape.
0-19%	1	No or minor relief within the landscape. The landscape is considered feature less, without noticeable elements or patterns.

1.2 Vegetation Coverage

Vegetation coverage is a measurement of the extent, character and frequency of vegetation that exists at each viewpoint and within the local, sub-regional and regional zones. The extent of vegetation provides the potential for screening and to reduce the visual effect of development. Conversely, a lack of vegetation results in an increase in the visual significance of a development.

This measurement responds to the potential visual absorption of the landscape as measured by the visual matrix. Again, this assessment considers the dominant vegetation patterns within each zone and in relation to each viewpoint.

Vegetation Coverage (expressed as percentage)	Value	Description of Vegetation Coverage
80-100%	5	Natural or non-harvested commercial forests. Significant areas of treed vegetation creating an arboreal landscape.
60-79%	4	Bushland or woodlands. Major areas of vegetation that define the landscape character of an area
40-59%	3	Tree groups, copse, screens, shelter belts. Defined areas of vegetation creating a layered landscape character.
20-39%	2	Sporadic trees producing a punctuated vegetation character.
0-19%	1	No trees scrub or low ground cover. Limited vegetation cover.

1.3 Infrastructure and Built Form

This assessment considers the interrelationship of landscape character and human development. The assessment considers how development and infrastructure can create a counterpoint to the existing landscape character (vegetation and topography). Alternatively, development within the landscape may assist with the assimilation of development.

Infrastructure and Built Form (expressed as percentage)	Value	Description of Infrastructure and Built Form
0-19%	5	No objects within the landscape. The landscape has a high natural or remote rural character.
20-39%	4	Isolated objects in the landscape. Single elements with limited visual impact on the landscape. Small farm building, telephone towers or houses.
40-59%	3	Small clusters of development. Increasing presence of development within the landscape.
60-79%	2	Medium scale linear infrastructure or development. More significant development within the landscape. Minor roads, culverts, warehouses, transmission lines and residential areas.
80-100%	1	Large scale infrastructure. The landscape is significantly affected by development. Freeways, power stations and opencast mining

1.4 Cultural Sensitivity Value

The cultural and landscape value assessment is a survey of the regional area around the development up to 20 kilometres. The measurement considers the recognised cultural, heritage, natural and social overlays that exist within the landscape. This assessment is predominantly a desktop survey and only measures recognised designations.

The measurement is then represented as a percentage based of the area of designation compare to the area occupied by the regional zone.

The landscape value is the aggregate value from each of the assessment criteria. Either, as a value for each viewpoint or as a baseline value for the landscape surrounding the development. This Landscape Value in then used to assess the percentage of visual change created by the introduction of development within the landscape.

Cultural and Landscape (expressed as percentage)	Value	Description of Cultural and Landscape Value
80-100%	5	Majority of regional zone is affected by planning designations or overlays. Highly valued culture, natural and social landscape.
60-79%	4	Planning designations impacts a significant area of the regional zone. Valued culture, natural and social landscape
40-59%	3	Moderate impact from planning designations. Valued community or social landscape
20-39%	2	Limited effect
0-19%	1	None to negligible effect of planning designations

1.5 Landscape Character Assessment

The aggregate of relief, vegetation, infrastructure and cultural sensitivity values determines the base line landscape character value. The following table summarises the definition of Landscape Character Values

Landscape Character Value	Value	Description of Landscape Relief
16-20	High	Landscape quality is of high value with significant areas of scenic quality provided by varied topography, large areas of natural beauty and obvious presence of cultural sensitivity to change.
12-16	Moderate to increasing	Moderate to increasing landscape character value experienced through a layered landscape of natural

		qualities, scenic beauty and cultural sensitivity.
8-12	Moderate	Moderate landscape character value experienced by small clusters of natural landscape and cultural sensitivity.
4-8	Limited	Limited landscape character value experienced. The landscape is monotonous with little visual interest through topography or vegetation and heavily modified.

2. Visual Assessment

Each viewpoint was then assessed with respect to the following aspects of visual effect

— Percent of landscape absorption (the landscape's ability to absorb and screen the development form).

— Horizontal visual effect (percentage spread of the development in the field of view).

— Vertical visual effect (height of the development as a percentage of the field of view).

— Distance of visual effect (distance between viewpoint and development).

Using the following GRIMKE matrix formula, the development was quantified and aggregated to provide an assessment of the visual effect for each viewpoint.

2.1 Percent of Visual Absorption (PVA)

This is an assessment of the landscape's ability to absorb or screen the visual effect. Due to the comprehension of the landscape and wind farm development being holistic, the area that is visually affected includes the space between the turbines.

Using photomontages of the proposed development and Adobe Photoshop™ the amount to which the landscape screens the development is described as a percent of pixel absorption. Foreground contrasting pixels are selected within the vertical and horizontal extents of the development (area A), figure 6. This area is divided by the total area occupied by the development within the active field of view (area B) and expressed as a percentage of visual absorption. The assessment takes into consideration, visual sky lining and screening from existing vegetation and other physical forms.

Figure 1 Photo with wire line model draped on top. Courtesy Wind Farm Developments (2004)

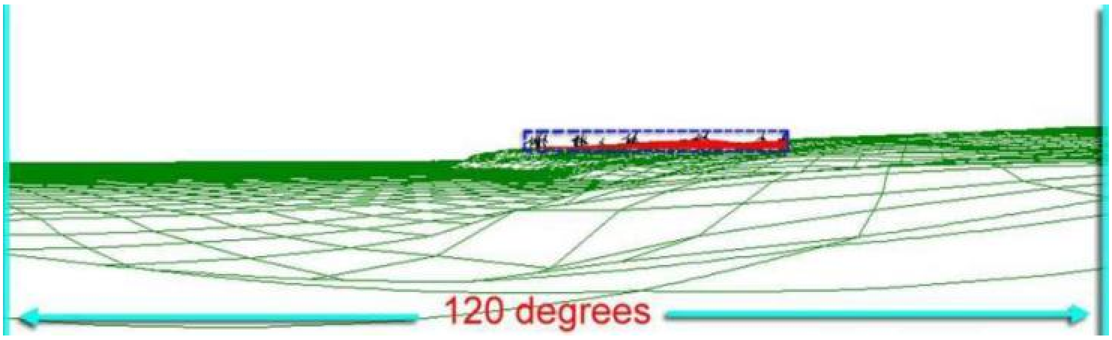


Figure 2 Wire line of showing extent of photomontage. Adapted from Wind Farm Development (2004)

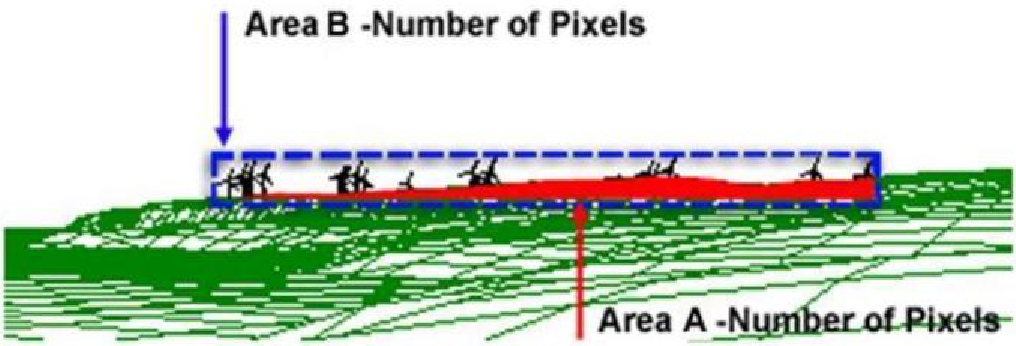


Figure 3 Detailed view of the landscape absorption (area A) and development extents (area B). Adapted from Wind Farm Development (2004)

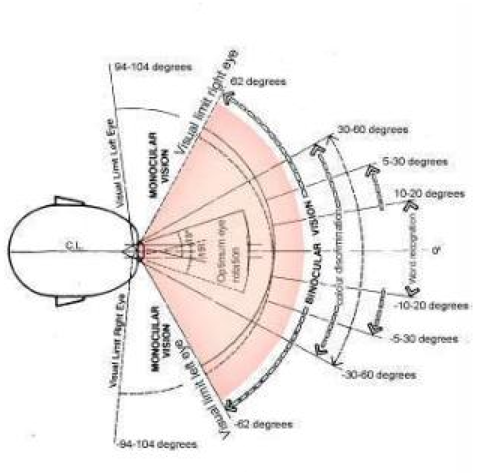
Percent of Visual Absorption (expressed as percentage of change)	Value	Description of Visual Absorption
80-100%	1	Substantial landscape absorption capacity. The landscape possesses sufficient vegetation and topography to screen any effect of the development,

		maintaining the visual character.
60-79%	2	Increasing absorption capacity. Due to the scale of the topography and density of vegetation the landscape is able to screen the development.
40-59%	3	Moderate absorption capacity. Medium level of change to the landscape. The landscape is less able to absorb change due to the scale, distance and extent of the development.
20-39%	4	Limited absorption. The development is noticeable within the landscape; however through vegetation and topography the landscape fragments and filters views of the development.
0-19%	5	No or minor absorption within the landscape. The development is considered to be prominent within the visual landscape.

2.3 Horizontal Visual Effect (HVE)

The field of vision (FOV) experienced by the human eye is described as an angle of 200-208 degrees horizontallyiii. This field of view includes the peripheral (monocular) vision, which is described as 40 degrees to each eye; within this zone colour and depth of field are not registered. For the purposes of the assessment the angle of peripheral vision has been subtracted from the field of view producing a binocular, ‘active field of view’ of 120 degrees.

Using this fixed visual reference, an assessment of the possible impact of development within this measurable area is undertaken. The centre of the development is established and an angle of 60 degrees each side is defined. The overall assessment is made of the entire development, rather than of the individual objects that may form the proposal. The angle is measured using a GPS and a bearing compass with known waypoints (geographic coordinates). Using GPS the extent of the horizontal visual field is calculated by the difference in bearing between the widest waypoints from a particular viewpoint. This measurement of effect is then described as a percentage of the 120 degrees active field of view



VISUAL FIELD IN HORIZONTAL PLANE

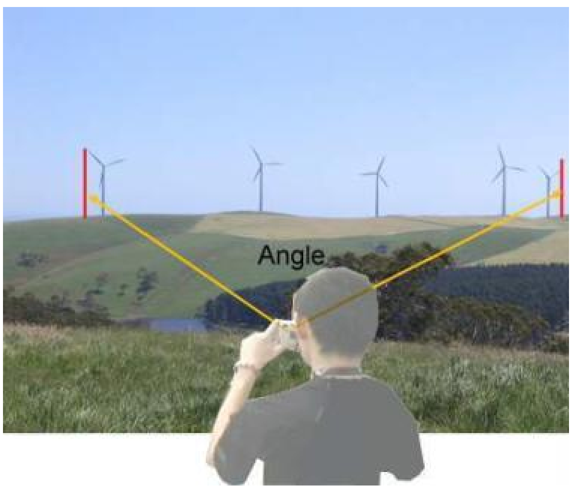


Figure 4 Active field of view is defined as the binocular field equating to 120-124 degreesiv. On the right is an illustration of horizontal measured angle as percent of active field 120 degrees. Photo Brett Grimm

Degree of Horizontal Visual Impact (expressed as an angle of impact and percentage of change)	Value	Description of Visual Modification
80-100% of the panorama measure at 120˚FOV)	5	Substantial horizontal visual impact. Visual impact throughout the entire active field of view.
60-80% of the panorama measure at 120˚FOV)	4	Increasing visual effect. A large proportion of the active field of view is affected.
40-60% of the panorama Measure at 120˚FOV	3	Moderate visual effect.
20-40% of the panorama measure at 120˚FOV)	2	Limited effect. The visual impact is a small part of the active field of view.
0-20% of the panorama measure at 120˚FOV)	1	No or minor visual effect.

2.4 Vertical Visual Effect (VVE)

The vertical visual effect evaluates the proportional scale of the development with reference to the vertical character of the existing landscape, as seen within the field of view of the assessed viewpoints.

The process of assessment is undertaken in 3 stages:

Stage 1:

The first stage of the process is to determine the vertical scale of the existing landscape. The baseline landscape scale is calculated using the photomontage viewpoint elevation (A) as a known reference height. The elevation of the viewpoint is recorded using a GPS. Using contour data, a second value (B) is recorded representing the highest topographic elevation within the field of view. Finally, the horizontal distance (C) between the viewpoint and the highest topographic feature is recorded. The vertical angle of view α_1 is then given as:

$\alpha_1 = \tan^{-1}((B-A)/C)$

as shown in Figure 6 below.

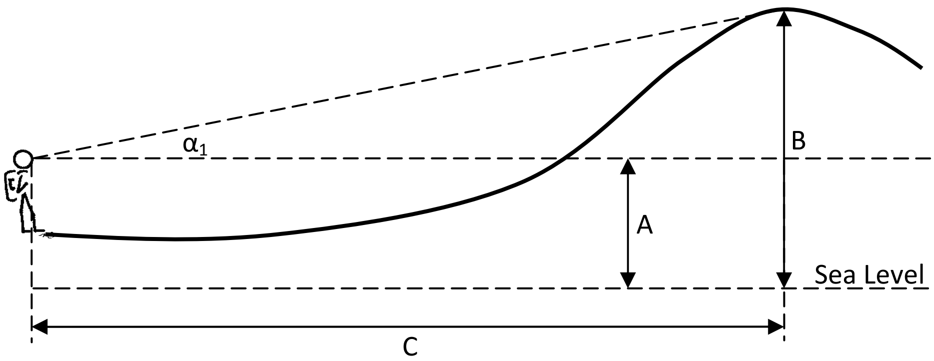


Figure 6: Vertical Scale of Existing Landscape

Stage 2:

The second stage of the process is to determine the vertical scale of the landscape modification, namely that of the apparent maximum turbine tip height as viewed from the viewpoint. Using the known turbine height (E), ground elevation (F) and its distance from the viewpoint (G), the vertical angle of view α_2 is then given by:

$\alpha_2 = \tan^{-1}((E+F - A)/G)$

as shown in Figure 7 below.

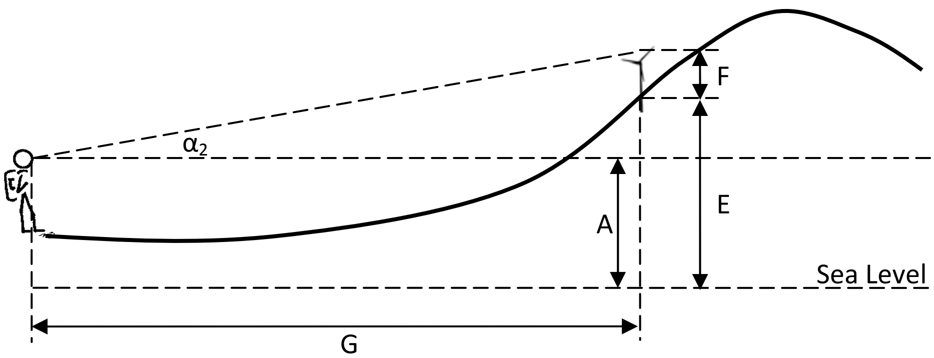


Figure 7: Vertical Scale of Landscape Modification

Stage 3:

The final stage of the process is to determine the overall proportion of the vertical scale of the development with reference to the existing landscape scale by taking the ratio of the two angles α_2 and α_1. Depending on the relative size of the vertical angles of view occupied by the existing and modified landscapes respectively, the ratio α_2 / α_1 will determine the nature and scale of the visual impact.

Depending on the relative scale of the angle of view occupied by the landscape and/or the development, the two vertical angles will depict whether there will be an increase in vertical visual impact created by the development ($\alpha_2 / \alpha_1 > 1$) or conversely the visual effect will be experienced as a vertical visual effect relative to the existing landscape scale ($\alpha_2 / \alpha_1 < 1$).

The vertical visual effect assessment will result in one of the following conditions:

- an increase in the overall vertical visual effect experienced from the viewpoint as a result of the combined vertical visual effect of the existing landscape character and the proposed development, or;

- a limited vertical visual effect as a result of the scale of the development being less than the existing landscape vertical scale when assessed from a viewpoint. This may be created by backdrop landforms or large ravines, valleys depicting a scale that within the field of view is greater than the development.

Either, the turbines or parts of the turbines are seen above ridgelines or landforms within the field of view and the effect will result in an increase in vertical visual effect, or the viewpoint contains large escarpments or deep valleys within the field of view and the vertical scale of the proposed wind turbines are likely to be seen as a proportion of the existing landscape scale resulting in a limited vertical visual effect.

In the first case (i.e. where $\alpha_2 / \alpha_1 > 1$), the proportional vertical visual impact should be assessed using Table 1 below. In the second case, the proportional vertical visual impact is considered minor and is assigned a value of 1.

Table 1 Proportional Vertical Visual Effect in existing landscape scale ($\alpha_2 / \alpha_1 > 1$)

Vertical Visual Impact (expressed as percentage increase ($\alpha_2 / \alpha_1 - 1$) x 100)	Value	Description of Visual Modification
80-100%	5	Substantial visual impact.
60-80%	4	Increasing visual impact
40-60%	3	Moderate visual impact.
20-40%	2	Limited impact
0-20%	1	No or minor visual impact within the landscape.

2.5 Distance of Visual Effect

This is a measurement of how visual impact is modified by distance. The effect of scale, topography, vegetation and weather, changes with distance, and in turn changes the degree of visual effect. The distance to the development from each viewpoint is recorded using the GPS. Standing onsite at each viewpoint the exact distance can be calculated by selecting the closest waypoint function (all the turbine locations are stored as waypoints in the GPS).

The distance categories outlined in the table below have been based on empirical research University of Newcastle (2002), Sinclair (2001), Bishop (2002).

Location of Development (from viewpoint)v	Value	Description
0 to 4 km (80-100%)	5	Adjacent: Dominant impact due to large scale, movement, proximity and number
4 to 8 km (60-80%)	4	Foreground: Major impact due to proximity: capable of dominating landscape
8 to 13 km (40-60%)	3	Middle ground: Clearly visible with moderate impact: potentially intrusive
13 to 18 km (20-40%)	2	Distant middle ground: Clearly visible with moderate impact becoming less distinct
18 km and greater (0-20%)	1	Background: Less distinct: size much reduced

2.6 Landscape Absorption Assessment

The aggregate of landscape absorption, horizontal and vertical effects and distance values determines the base visual impact value form the viewpoint. The following table summarises the definition of Visual Impact values

Visual Impact Value	Value	Description of Landscape Relief
16-20	High	High visual impact within the field of view
12-16	Moderate to increasing	Moderate to increasing visual impact within the field of view
8-12	Moderate	Moderate visual impact within the field of view
5-8	Limited	Limited visual impact within the field of view

3. Degree of Visual Impact (Percentage of Visual Change)

Degree of Visual Impact

The degree of Visual Impact is expressed as a coefficient of visual change to the baseline Landscape Value (general or viewpoint specific). This calculation directly expresses the effect of the development on the landscape, the change to the visual character and the reciprocal visual impact.

- Baseline Landscape Character : express as a value between 4 and 20)
- Coefficient of Visual Impact : calculated as the 20 divided by visual assessment value

Calculation of degree of Visual Impact

Coefficient x landscape character value expressed as a percentage = Visual Impact on Landscape Character

Example:

(a) *Visual Impact Assessment*

Horizontal visual effect	3
Vertical visual effect	1
Absorption capacity	3
Distance	2
Total visual effect	9 (0.45)

9/20 equated to a coefficient of 0.45

(b) *Landscape Character Assessment*

Relief	3
Vegetation coverage	3
Infrastructure built form	2
Cultural landscape overlays	2
Total landscape character	10

(c) *10 x 0.45 = 4.5*

(d) *4.5/20 = 0.225*

(e) *0.225 x 100 = 22.5% Visual Change to the Landscape*

3.1 Final Aggregated Visual Effect

Percentage Value of Visual Change	Descriptive Qualification of Visual Effect	Comments
80-100%	Extreme	Extreme change in view: change very prominent involving total obstruction of existing view or change in character and composition of view through loss of key elements or addition of new or uncharacteristic elements which significantly alter underlying landscape visual character and amenity
60-80%	Severe	Severe change in view involving the obstruction of existing views or alteration to character through the introduction of new elements. Change may be different in scale and character from the surroundings and the wider setting. Resulting in a perceived increase in proportional change to the underlying landscape visual character.
40-60%	Substantial	Substantial change in view: which may involve partial obstruction of existing view or alteration of character and composition through the introduction of new elements. Composition of the view will alter. View character may be partially changed through the introduction of features.
20-40%	Moderate	Moderate change in view: change will be distinguishable from the surroundings whilst composition and underlying landscape visual character will be retained.
0-20%	Slight	Very slight change in view: change barely distinguishable from the surroundings. Composition and character of view substantially unaltered.

Appendix E
Landscape Recommendations

Code	Species	Common Name	Install Size	Spacing	Form
AP	Acacia pycnantha	Golden Wattle	Tube	6.0m	LSh / ST
AS	Acacia salicina	Broughton Willow	Tube	6.0m	T
AV	Allocasuarina verticillata	Drooping Sheoa	Tube	6.0m	T
CG	Callitris gracilis	Native Pin	Tube	6.0m	T
EP	Eucalyptus porosa	Mallee Box	Tube	6.0m	T
AN	Acacia notabilis	Munno Para Wattle	Tube	1.0m	Sh
Apr	Acacia paradox	Kangaroo Thor	Tube	1.0m	SH
BS	Bursaria spinosa	Sweet Bursaria	Tube	1.0m	LSh
DV	Dodonaea viscosa	Sticky hop bush	Tube	1.0m	Sh
RC	Rhagodia crassifolia	Fleshy Saltbush	Tube	1.0m	Sh
CR	Carprobrotus rossii	Karkalla	Tube	0.4m	GC
DR	Dianella revoluta	Black-anther Flax Lily	Tube	0.4m	S
HV	Hardenbergia violaceae	Native Lilac	Tube	0.4m	GC
IN	Ficinia nodosa	Knobby Club Rush	Tube	0.4m	S
KP	Kunzea pomifera	Muntries	Tube	0.4m	GC

Acacia pycnantha

Acacia salicina

Allocasuarina verticillata

Callitris gracilis

Eucalyptus porosa

Acacia notabilis

Acacia paradox

Bursaria spinosa

Dodonaea viscosa

Rhagodia crassifolia

Carprobrotus rossii

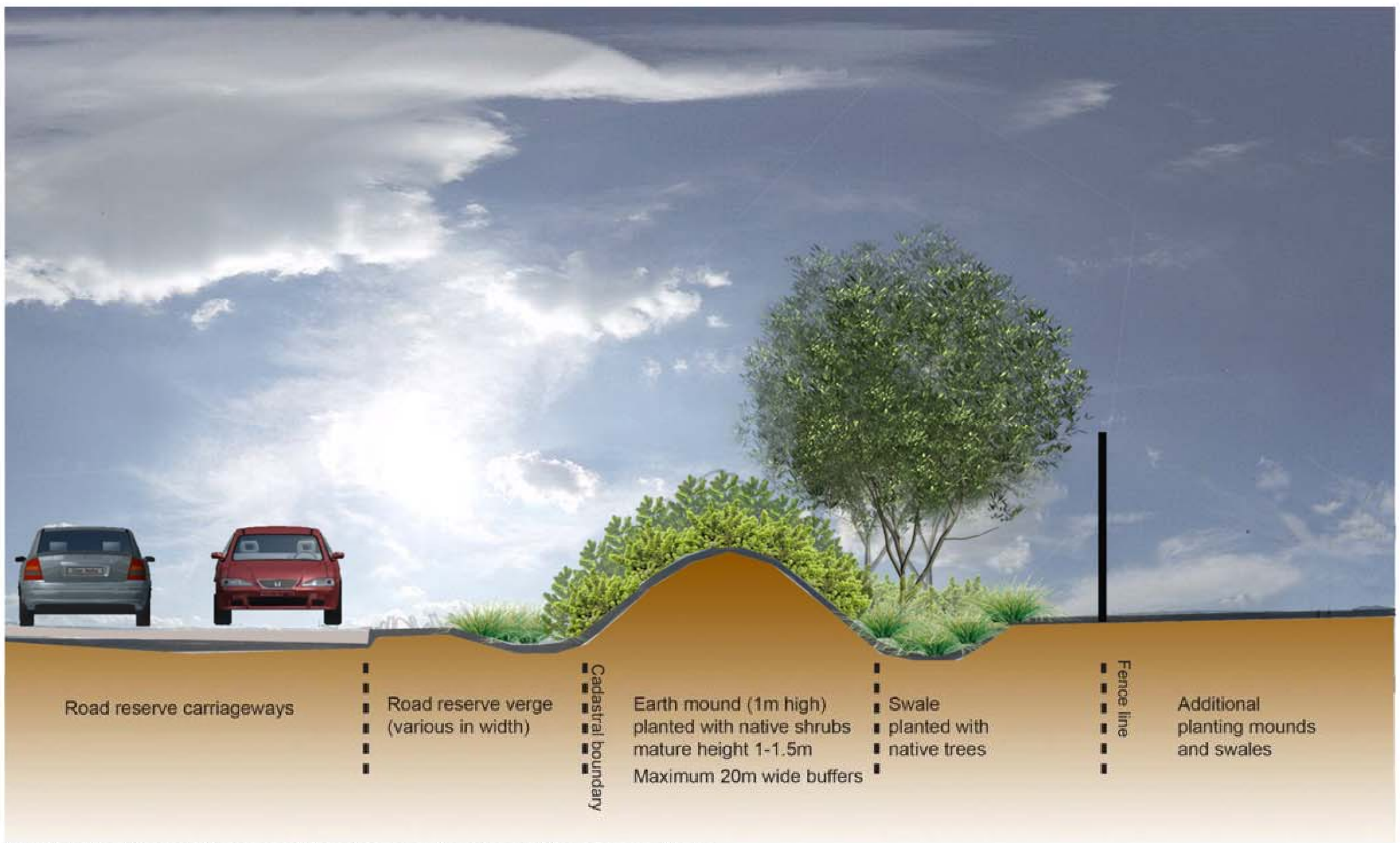
Dianella revoluta

Hardenbergia violaceae

Ficinia nodosa

Kunzea pomifera

LT	*Large tree*	*>15m*
T	*Tree*	*8m–15m*
ST	*Small tree*	*5m–8m*
LSh	*Large shrub*	*1.5m–5m*
Sh	*Shrub*	*0.6m–1.5m*
H	*Herb*	*0.6m> 0.4m*
S	*Sedge*	*to 1.5m > 0.4m*
GC	*groundcover*	*to 0.4m > 0.4m*



Typical buffer and mound landscape treatment cross section

Note: Drawing is not to scale. It is a concept only and will require detailed landscape design to confirm

Appendix F
Glossary[2]

[2] *Visual Analysis of Windfarms Good Practice Guidance, Scottish Natural Heritage (2005)*

Active Field of View:	The field of view excluding peripheral vision, which is described as 40° to each eye, within this zone colour, shapes and forms are not registered. The active field of view removes the angle of peripheral vision from the field of view producing an angle of 120 - 160°
Assessment (landscape):	An umbrella term for description, classification and analysis of landscape.
Depth of Field:	The distance between the nearest point (viewpoint) and farthest objects (visual envelope) which is visible within the field of view.
Element:	A component part of the landscape or visual composition.
Effect (landscape or visual):	These occur as a broad culmination of one or more impacts, incorporating professional judgement to extrapolate and/or generalise on the nature of these.
Horizontal Visual Effect:	This term is used to describe the field of view occupied by the visible part of a wind farm.
Impact (landscape or visual):	Impacts occur to a particular element of the environment and they can be described factually by the nature and degree of change.
Landscape:	Human perception of the land conditioned by knowledge and identity with a place.
Landscape character:	The distinct and recognizable pattern of elements that occurs consistently in a particular type of landscape, and how people perceive this. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement. It creates the particular sense of place of different areas of the landscape.
Landscape feature:	A prominent eye-catching element, for example, wooded hilltop, isolated trees or grain silo.
Mitigation:	Measures, including any process, activity or design to avoid, reduce, remedy or compensate for adverse landscape and visual impacts of a development project.
Panorama:	A view, covering a wide field of view.
Photomontage:	A visualisation based on the superimposition of an image onto a photograph for the purpose of creating a realistic representation of proposed or potential changes to a view. These are now mainly generated using computer software.
Sensitivity:	The extent to which a landscape or visual composition can accommodate of a particular type and scale without adverse effects on its character or value.
Visual Amenity:	The value of a particular area or view in terms of what is seen.
Visual Envelope:	Extent of potential visibility to or from a specific area, viewpoint or feature.

Appendix G
Relevant Experience

WARWICK KEATES
Director
Landscape Architecture and Urban Design

Warwick Keates is a Director of WAX Design. With over twenty years landscape architectural experience, he has developed a diverse range of skills, working on major projects in the United Kingdom, Middle East and Australia. This experience has allowed Warwick to develop a detailed understanding the complex requirements associated with landscape assessment and design.

Warwick has been involved in the landscape and visual assessment of various developments, including open cast mines, wind farms, mobile phone towers, Significant trees, residential dwellings, commercial developments and road corridors. He has been called as an expert witness for the ERD Court on numerous occasions, as well as Planning and Parliamentary Hearings in South Australia and Planning Tribunals in Victoria .

Warwick has worked in all aspects of the profession, including large scale master plans, urban and civic spaces and small scale projects. This, coupled with his collaborative approach to other design professionals, provides Warwick with complete understanding of landscape and urban design, in respect of the assessment (physical and visual), design and creation of exceptional places.

Qualification

Graduate Diploma in Landscape Architecture, Leeds Polytechnic (United Kingdom) 1990
Bachelor of Arts (Hons) in Landscape Architecture, Leeds Polytechnic (UK) 1988

Professional Affiliations

Associate of the Australian Institute of Landscape Architects
Member of the Landscape Institute (UK) 1995

Specialist Expertise

Visual Impact Assessment
Landscape Planning
Environmental Impact Assessment
Expert Witness
Urban design
Large scale master planning

Previous Experience

Port Augusta Renewable Energy Project SA
Palmer Wind Farm Assessment SA
Keyneton Wind Farm Assessment, SA
Stony Gap Transmission Line, SA
Allendale Wind Farm Planning Appeal, SA
Mt Bryan Wind Farm Planning Appeal, SA
Area 55 Oxide Mine, Darwin NT
Waubra North Wind Farm VIC
Robertstown & Stony Gap Wind Farms SA
Gulnare Wind Farm SA
Mobile Carriers Forum Design Innovation and Visual Assessment Programme
The Sisters Wind Farm VIC
Kanmantoo Copper Mine SA
Woolsthorpe Wind Farm VIC
Olympic Dam Mine Expansion Visual Impact Assessment
Telstra Telephone Tower Visual Assessment
Taralga Wind Farm Peer Review NSW
Naroghid Wind Farm Assessment VIC
Waitpinga Wind Farm VIA
Myponga Wind Farm VIA
Hutchinson 3G Phone Tower Visual Impact Assessment

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Dr Brett Grimm
Director

PhD, B.Land Arch,
B.Design Studies U.Adel
Registered Landscape Architect AILA

Qualifications

2009	PhD, The University of Adelaide
2002	Bachelor Landscape Architecture, The University of Adelaide, First Class Honours
2000	Bachelor Design Studies, The University of Adelaide

Professional Affiliations

- Australian Institute of Landscape Architects (AILA)
- Lecturer and tutor Adelaide University School of Architecture, Landscape Architecture and Urban Design
- AILA Education Accreditation Panel (Chair)

Experience

2011	Director BGLA
	City of Marion
	Landscape Architect
2007- 2010	Swanbury Penglase, Associate
2006-2007	Hassell, Landscape Architect
2005-2006	Overseas Travel (PhD Scholarship exchange / Insite Environments, UK), Landscape Architect
2002-2005	Hassell, Graduate Landscape Architect

Conference Papers

IFLA World Congress 2005, Edinburgh
Australian Wind Energy Association annual conference 2004, "Best Research Paper"

Project Experience Visual Assessment

- Port Augusta Energy Park VA
- Palmer Wind Farm VA
- Seppeltsfield Visual Assessment
- Residential Visual Assessment Fullarton
- Significant Tree Visual Assessment
- Buckland Park Visual Assessment, SA
- Keyneton Wind Farm
- Crystal brook Wind Farm
- Allendale Wind Farm Appeal Hearing (in association with Wax)
- Mt Bryan ERD Wind Farm Appeal Hearing (in association with Wax)
- Willogoleche Wind Farm Extension (in association with Wax)
- Waubra North Wind Farm Visual Assessment (in association with Wax)
- Carmodies Hill Wind Farm Visual Assessment (in association with Wax)
- Tampakan Mine Phillipines Peer Review
- Area 55 Mine Assessment, Darwin (NT)
- Sisters Wind Farm Visual Assessment (in association with Wax)
- Olympic Dam EIS Visual Assessment
- Buckland Park Visual Assessment
- Project Bulla Visual Assessment
- Witton Bluff Visual Assessment
- Various urban development ERD Expert Witness cases
- Drysdale Wind Farm Visual Assessment
- Kanmantoo Mine Expansion Visual Assessment
- Naroghid Wind Farm Visual Assessment

Appendix H
Endnotes

[i] The GPS used was a Garmin X12 which differential-ready 12 parallel channel receiver continuously tracks and uses up to twelve satellites to compute and update a position

[ii] The SILVA precision M80 with a parallax free prismatic magnification-bearing compass. A magnetic bearing compass with a $\pm$ 0.5° from true magnetic course.

[iii] Pirenne, M.H. (1967). Vision and the Eye. London: Chapman and Hall

[iv] Panero, J. & Zelnik, M. (1979) Human Dimension & Interior Space- A source Book of Design Reference Standards. The Architectural Press Ltd. London.

[v] The distance zones have been developed Sinclair Thomas Matrix, which has cited field observations of the visual extents. The classification zones have been based on projected 90-100m high turbines.