

Appendix E

Appendix E: Landscape Character and Visual Assessment Report (WAX Design)

Landscape Character and Visual Assessment Report for Keyneton Wind Farm

Prepared for Pacific Hydro
By Warwick Keates and Dr Brett Grimm

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01 Introduction

1.1 Introduction

- 1.1.1 This report has been prepared by Warwick Keates of WAX Design in association with Dr Brett Grimm of Brett Grimm Landscape Architect for Pacific Hydro to assess the potential visual impact of the proposed Keyneton Wind Farm. The aim of the report is to evaluate the existing landscape character and the degree of visual change that will be produced by the proposed wind farm and its associated infrastructure. The potential visual effect has been assessed using a detailed methodology that involves on-site assessments, consultation with the community in relation to landscape values and the preparation of photomontages that illustrate the anticipated visual effect of the Keyneton Wind Farm.
- 1.1.2 The proposal is based on 42 wind turbines positioned along the ridgelines of the Eastern Mount Lofty Ranges. Each wind turbine is up to a maximum of 145.5 metres in height to the blade tip. The wind turbines will be typically located between 400 - 1000 metres apart across the underlying landscape. The wind farm layout is in two clusters, the northern cluster consists of 22 wind turbines and the southern of 20. The proposed 42 turbine wind farm results from a modification and reduction of the 57 turbine layout which was reviewed in response to the visual impact assessment, the community engagement process and other environmental assessment information. Sections 4 and 5 illustrate the modifications that were considered and the reasoning behind these changes.
- 1.1.3 Other development items associated with the wind farm include the following components:
- Hardstands (at each turbine base)
 - Gravel Access Tracks
 - Underground cable runs
 - Section of above ground transmission line
 - Substation and Control building
- 1.1.5 The visual assessment of the proposal provides an overview of the landscape of the surrounding area in order to articulate the visual character of the site in relation to the local (0-1 km), sub-regional (1-5 km) and regional (>5 km) landscapes, as well as a detailed evaluation of the visual effect and degree of visual change that will occur. This assessment then provides the basis on which an evaluation of the suitability of the development can be made with regards to the visual effect within the regional area (20km) and the provisions of the development plan to which the application will be assessed against.
- 1.1.6 In order for the visual assessment of the Keyneton Wind Farm to represent 'best practice', the report and the assessment methodology has been prepared with reference to the experience of Mr Warwick Keates and Dr Brett Grimm and the following documents:
- Mid Murray Council Development Plan (Consolidated – 19 April 2012)
 - Environment Protection and Heritage Council (2010) National Wind Farm Development Guidelines (Draft)
 - 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: a manual for evaluation, assessment, siting and design (Western Australian Planning Commission, 2007)
 - Best Practice Guidelines for the Implementation of Wind Energy Projects in Australia (2006)

01 Introduction

- Lothian, A., 2008. Scenic perceptions of the visual effects of wind farms on South Australian landscapes. *Geographical Research*, 46:2, 196 – 207
- Guidelines for Landscape and Visual Impact Assessment, Third Edition (Draft for Consultation)
- Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria (2002)
- South Australian Wind Farms Planning Bulletin (2002)
- Lothian, A., 2000. Landscape Quality Assessment of South Australia. PhD Thesis Adelaide University

1.2 Limitations and exclusions

- 1.2.1 The scope of work and assessment is based on the visual effect of the proposed wind farm and its associated infrastructure. The assessment methodology aims to provide a quantified measurement of the degree of physical visual change.
- 1.2.2 The scope of work has been undertaken as a collaborative assessment between Dr Brett Grimm and Warwick Keates. The qualitative GrimKe assessment of the landscape was also reviewed and discussed on site to ensure that a balance opinion was reached.
- 1.2.3 Limited reference is made to the potential response or sensitivity of the viewer to landscape changes from each viewpoint assessed and how this influences the perception of the visual effect. The degree of viewer sensitivity remains the personal preference of the viewer, as to whether the visual change is positive or negative. Accordingly public perception surveys for each viewpoint do not form part of this process and the degree of visual change is considered within the context of the existing landscape character, community evaluations of regional cultural value and scenic quality conducted during the community engagement process and the capacity of the landscape to accommodate the physical visual change, not the degree of perceived change.

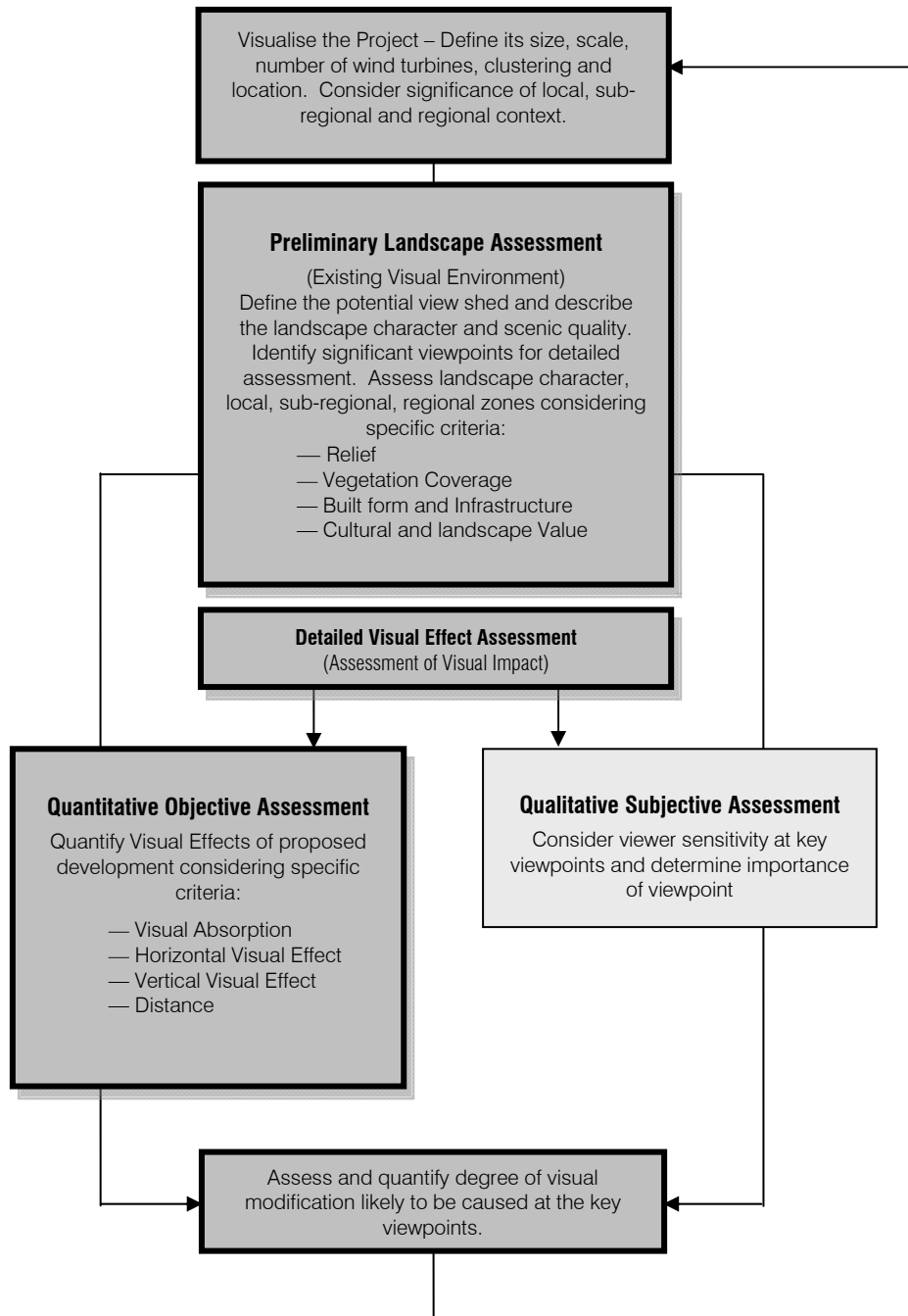
02 Methodology and Relevant Experience

2.1 Detailed Visual Effect Assessment

- 2.1.1 The assessment of the visual effect on the landscape surrounding the proposed development is undertaken using the GrimKe Matrix (Appendix D) and photomontages (Appendix C) to simulate the visual character of the wind farm in the landscape. Details of the methodology used to produce the photomontages is described in Appendix B and reviewed by Warwick Keates and Brett Grimm, to ensure that the imagery produced represents best practice.
- 2.1.2 The extent of visual effect is identified on site, using a Global Positioning System (GPS). Using the GPS, the location and extent of the wind farm is plotted as a series of 'waypoints', using longitude and latitude, elevation and distances to provide geo-referenced data. The surrounding area is then surveyed. A hand held GPS and bearing compass is used to calculate the bearing and distance between the viewpoints and the wind farm (individual wind turbines). This site assessment methodology is used to assess where the development is in the landscape and whether it is visible. Other references are used, such as buildings, trees and landmarks to confirm the location of the wind farm in the landscape (refer to appendix D for a detailed illustrated example of the process).
- 2.1.3 To provide an understanding of the overall visual effect of the proposal on the landscape, the following criteria are used to quantify the landscape character and the visual effect from specific key viewpoints. Photomontages are also analysed on site, to assist with the assessment. The following aspects of landscape character and visual effect are assessed as part of the GrimKe Matrix:
1. Topographic Relief (the complexity of the land that exists as part of the underlying landscape character)
 2. Vegetation Cover (the extent to which vegetation is present and its potential to screen and filter views)
 3. Infrastructure and Built Form (the impact of existing development on landscape and visual character)
 4. Cultural and Landscape Value (valuation on the degree of sensitivity founded within the community engagement cognitive mapping)
 5. Percentage of visual absorption (ability of landscape to absorb and screen the visual change).
 6. Horizontal visual effect (spread of the development in the visual landscape).
 7. Vertical visual effect (height of the development in proportion to the existing vertical scale of the visual landscape).
 8. Distance of visual effect (distance between viewpoint and closest turbine of the proposed development).
- 2.1.4 Two separate assessments are conducted. Firstly items 1-4 above are assessed in relation the existing landscape character. Values out of 5 for each aspect are aggregated to form a baseline value out of 20. The higher the value the more sensitive the landscape is to changes in the existing visual character. The first four categories are referenced to landscape elements, which have been established through numerous studies to depict scenic quality.
- 2.1.5 Items 5 - 8 are rated from 1 to 5 with 1 being minimal visual effect and 5 significant visual change caused by the proposed development. The scores are then aggregated out of 20 to provide an indication of the visual effect that will occur from selected viewpoints. This figure is then represented as a coefficient which can be applied the landscape character value to illustrate the degree of visual change.

2.2 Detailed Visual Site Assessment Process

2.2.1 The process for the visual assessment is based on the recommendations of John Ginivan (Executive Officer Victorian Coastal Council Submission, 2002) and considers the assessment in terms of the Primary Landscape Assessment, the Quantitative Objective Assessment and the Qualitative Subjective Assessment. These aspects are analysed and discussed in Section 3, 4 and 7 of the report. The following figure illustrates the relation of these subject areas.



Based on John Ginivan, Executive Officer Victorian Coastal Council Submission, 7 March 2002 to the Independent Panel for the Portland Wind Energy Projects.

Figure 1: Detailed Visual Site Assessment Process:

02 Methodology and Relevant Experience

2.3 Relevant Experience of Warwick Keates and Brett Grimm

- 2.3.1 Warwick Keates and Brett Grimm have worked together for the last 10 years, developing visual assessment methodologies for wind farms and other infrastructure projects. Warwick and Brett are co-authors of the GrimKe Visual Assessment Matrix and undertook one of the first formal quantified assessments of obstacle lighting in relation to wind farms in Australia.
- 2.3.2 Warwick Keates is currently a director of WAX Design. Previously, he was a Senior Associate with HASSELL for five years, and has over 20 years experience in Landscape Architecture practising in South Australia, Australia, the Middle East and the United Kingdom. During this period, Warwick has prepared numerous visual impact and landscape assessments for Planning Appeals and Tribunals, including:
- Stony Gap Transmission Line, SA
 - Allendale Wind Farm Planning Appeal, SA
 - Mount Bryan Wind Farm Planning Appeal, SA
 - Waubra Wind Farm Assessment VIC
 - The Sisters Wind Farm Assessment and Tribunal Hearing VIC
 - Area 55 Oxide Project Visual Assessment NT
 - Robertstown and Stony Gap Wind Farms SA
 - Carmody's Hill Wind Farm Assessment SA
 - Drysdale Wind Farm Assessment VIC
 - Woolsthorpe Wind Farm Assessment VIC
 - Olympic Dam Mine Expansion Visual Impact Assessment SA
 - Kanmantoo Copper Project SA
 - Berrimal Wind Farm VIC
 - Taralga Wind Farm Peer Review NSW
 - Naroghid Wind Farm Assessment VIC
 - Waitpinga Wind Farm Visual Impact Assessment SA
 - Myponga Wind Farm Visual Impact Assessment SA
 - Telstra Telephone Tower Visual Impact Assessment SA
 - IKEA Totem Visual Assessment SA
 - Hutchinson 3G Phone Tower Visual Impact Assessment SA
- 2.3.3 Warwick has provided evidence for a variety of developments, including major road corridors, telecommunication towers, residential developments, significant trees, wind farms and mine expansions. During the course of his employment, he has appeared as an expert witness before the Environment, Resources and Development Court of South Australia, and appeared before the Development Assessment Commission on numerous occasions in Victoria and South Australia. Warwick has also made presentations at Parliamentary Hearings, both in Australia and the United Kingdom.
- 2.3.4 Dr Brett Grimm is currently a director of Brett Grimm Landscape Architect (BGLA), with 10 years experience in private practice with multi- national multi-disciplinary architectural design firms. Since 2003, Brett has worked on the visual assessment of numerous wind farms, mine expansions and associated road corridor infrastructure, including:

02 Methodology and Relevant Experience

- Stony Gap Transmission Line, SA
- Allendale Wind Farm Planning Appeal, SA
- Mount Bryan Wind Farm Planning Appeal, SA
- Waubra Wind Farm Assessment VIC
- The Sisters Wind Farm Assessment and Tribunal Hearing VIC
- Area 55 Oxide Project Visual Assessment NT
- Robertstown and Stony Gap Wind Farms SA
- Carmody's Hill Wind Farm SA
- Drysdale Wind Farm Assessment VIC
- Woolsthorpe Wind Farm Assessment VIC
- Olympic Dam Mine Expansion Visual Impact Assessment SA
- Kanmantoo Copper Project SA
- Naroghid Wind Farm Assessment VIC

2.3.6 Brett has also completed a PhD as part of a postgraduate scholarship at Adelaide University. The topic of Brett's thesis is 'Quantifying the Visual Effects of Wind Farms; A Theoretical Process in an Evolving Australian Visual Landscape'.

2.3.7 The objectives of Brett's research were to provide a new approach to assess the visual effects of wind farms, which can be used in practice for strategic planning and site-specific assessments. The method developed is credible, replicable, reliable, and measurable for cross comparison of potential sites.

2.3.8 Brett has appeared as an expert witness before the Environment, Resources and Development Court of South Australia, on several occasions.

2.3.9 Additional information on Warwick and Brett's experience is provided in Appendix F of this report.

2.4 Field Work Study

2.4.1 Site assessments have been undertaken to enable the consultants to develop a detailed understanding of the existing landscape character.

2.4.2 Assessment site visits were undertaken on the 7 May, 29 June, 19 July, 19 August, 13 September 2011 and 13 January 2012. On each visit, the weather was fine with good visibility.

03 Landscape Character and Site Context

3.1 The Site

- 3.1.1 The proposed the Keyneton Wind Farm is located approximately 62 kilometres northeast of Adelaide, east of the Barossa Valley and close to the townships of Angaston, Eden Valley, Sedan and Cambrai.
- 3.1.2 The site extends north/south along the escarpment of the Eastern Mount Lofty Ranges for approximately 16 kilometres, with the proposed development forming two distinct clusters of wind turbines within the existing landscape.

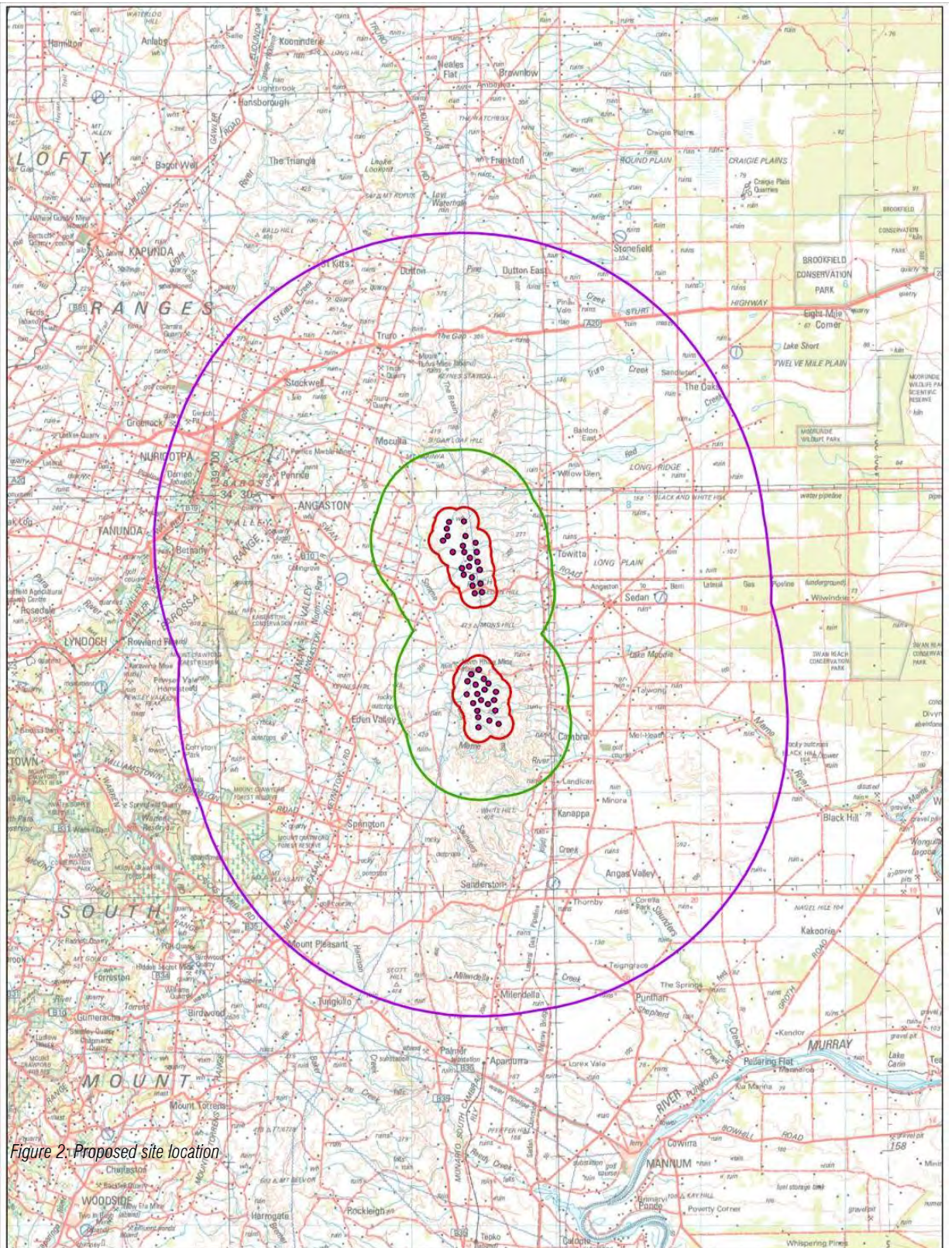


Figure 2: Proposed site location

Proposed Site Location

Scale 1:100,000@A3
December 2011 Turbine layout

Legend

- Turbines
- Buffer local 1km
- Buffer subregional 5km
- Buffer regional 20km

0 2 4 6 8
Kilometers



03 Landscape Character and Site Context

3.2 Land Use and Land Cover

- 3.2.1 The predominant land use of the local, sub-regional and regional landscape is agricultural, containing slight variations in cultivation and management techniques that create a number of land use characters in and around the site. This in turn leads to a diverse rural landscape character across the regional landscape context.
- 3.2.2 To the west the land cover is well wooded, with large areas of vegetation creating an attractive rural landscape of trees and open paddocks that is synonymous with the Barossa Valley and particularly the Eden Valley. The amenity of the rural woodland setting is also reflected in the land use and smaller scale operations that occur amongst the belts of vegetation. These include small areas of cropping, horse agistment and vineyard production.
- 3.2.3 The land use and land cover across the proposed development site and the locality immediately surrounding the proposed wind farm changes significantly. The vegetation cover that is experienced to the west of the site is replaced with heavily cleared and grazed landscapes with scattered pockets of remnant vegetation. Grazing is the dominant land use with some horse agistment and occasional residential properties.
- 3.2.4 The grazed agricultural landscape cover continues across the Eastern Mount Lofty Escarpment and east towards the low lying plains of the Murray River. The absence of vegetation creates an exposed landscape character that reinforces the agricultural character of the area. While pockets of vegetation do exist across the escarpment, particularly in relation to larger creek lines and drainage catchments, these areas remain isolated and do not create a dominant vegetation cover.
- 3.2.5 The Murray Plains that exist to the east of the development site is defined by a mixture of open paddocks, vegetation belts and isolated tree groups. This creates a distinctly rural landscape character that is typical of the Mid Murray Council area.



Figure 3 Typical view of the wider Murray Plains to the east of the proposed development site

3.3 Landform and Geomorphology

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- 3.3.1 The landform and geomorphology on which the proposed wind farm is located is dominated by a number of distinct geologies, which in turn have led to a number of defined landforms and landscape characters.
- 3.3.2 The Eastern Mount Lofty Ranges is formed by the Kanmantoo Geological Group, which includes a range of sedimentary and metamorphic deposits of sandstone and limestone, as well as areas of Delamerian granite to the Murray Plains.
- 3.3.3 The land form is created by the geophysical effects of the Bremer Fault and other minor faults along the eastern edge of the Mount Lofty Ranges. Extended periods of erosion have subsequently resulted in the gullies and hills that form the topographic character that surrounds the proposed Keyneton Wind Farm development site.

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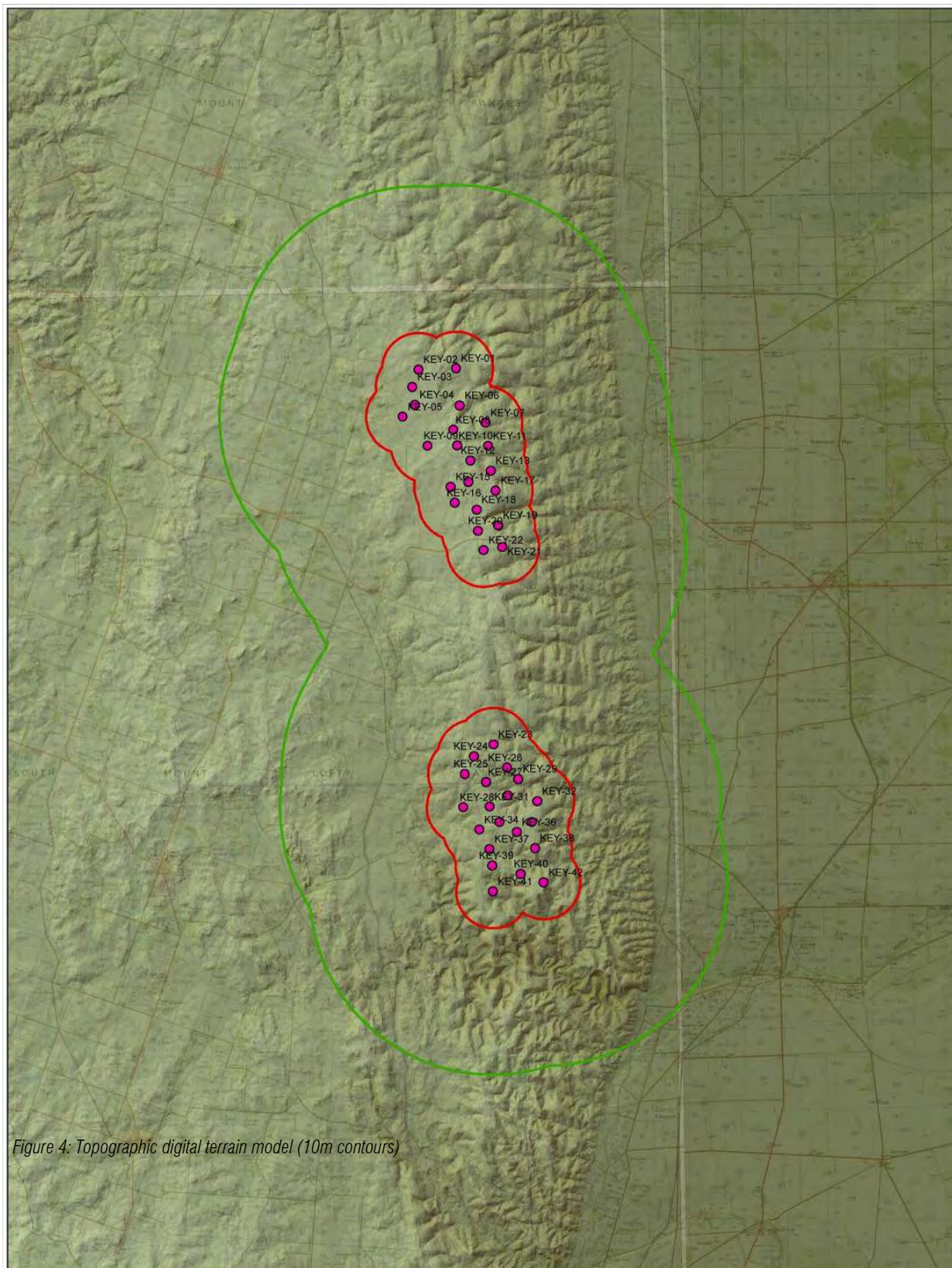


Figure 4: Topographic digital terrain model (10m contours)

Topography

Scale 1:100,000@A3
December 2011 Turbine layout

Legend

- Turbines
- Buffer local 1km
- Buffer subregional 5km

0 0.5 1 2 3 4
Kilometers

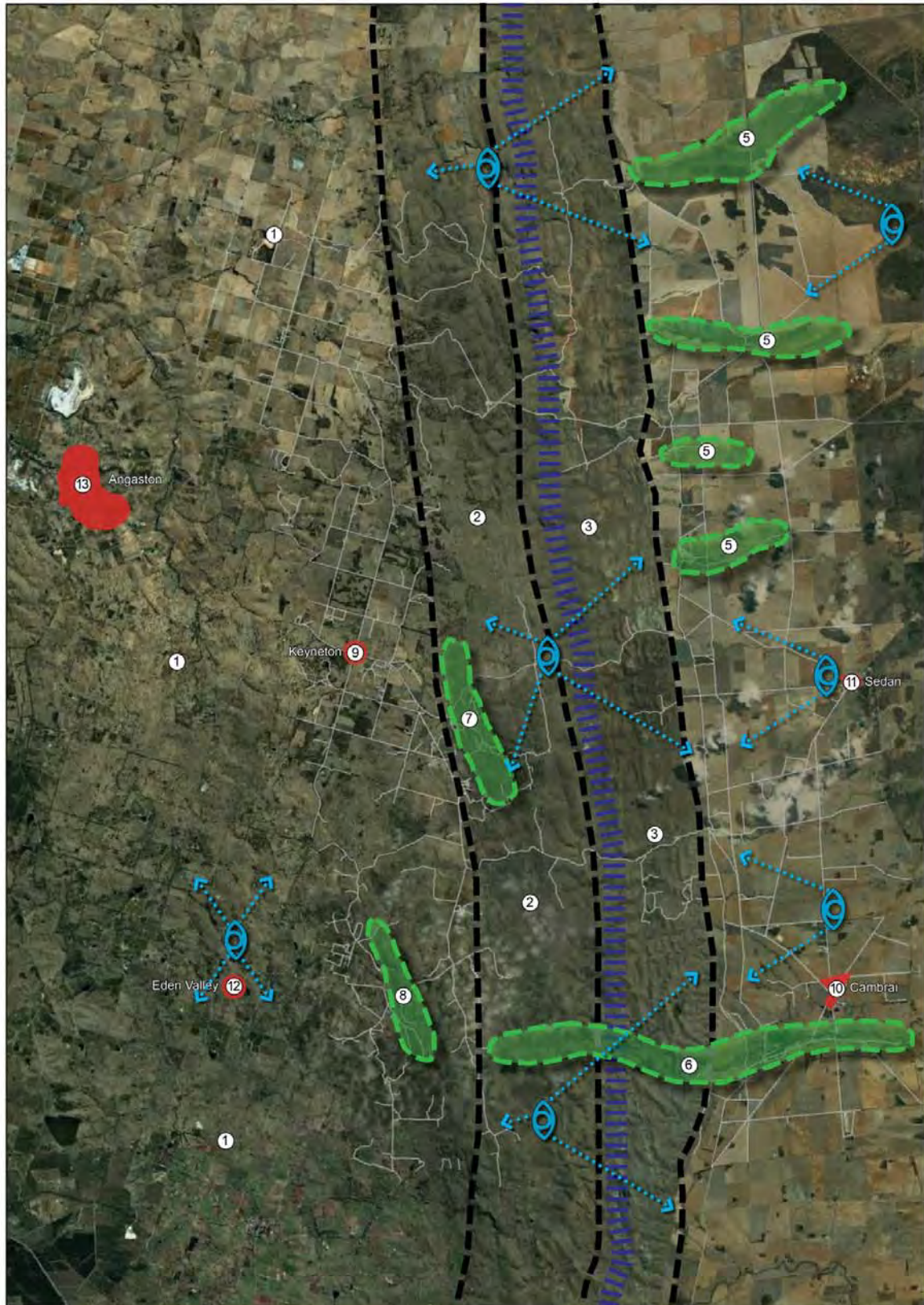


03 Landscape Character and Site Context

3.4 Landscape Character Units (LCU)

- 3.4.1 In order to understand how the proposed wind farm will visually affect the landscape character, a detailed assessment of the existing landscape has been undertaken. This assessment considers landscape character units that express similar visual patterning through line, colour, texture and scale resulting in unique landscape characteristics in relation to topography, vegetation cover and land use.
- 3.4.2 The visual effect and degree of visual change produced by the wind farm will be similar from different viewpoints within each landscape character units. In this way, the visual effect can be interpolated across the landscape character units (LCU), providing a comprehensive understanding of the impact of the proposal on the wider landscape character and the degree of visual change.
- 3.4.3 The regional landscape context surrounding the Keyneton Wind Farm contains four major landscape character units and a number of other areas of special landscape value (refer to Appendix A). The following provides a description of each unit and the responding landscape and visual character.

03 Landscape Character and Site Context



- Landscape Character Units
- Prominent Ridgelines
- Landscape Features (woodlands, valleys and rocky outcrops)
- Open views (panoramic landscape character)
- Townships

1. Eastern Mount Lofty Ranges
2. Eastern Mount Lofty Plateaux
3. Eastern Mount Lofty Escarpment
4. Murray Plains
5. Murray Creeks
6. River Marne
7. North Rhine Valley
8. Keyneton Gap
9. Keyneton
10. Cambria
11. Sedan
12. Eden Valley
13. Angaston

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3.5 Eastern Mount Lofty Ranges (Sub-regional and Regional – west) [1]

- 3.5.1 The topography of the south eastern edge of the Mount Lofty Ranges is defined by a complex series of inter-related landforms that create a complex landscape of rolling and eroded ridgelines and wide valleys that criss-cross the regional landscape that surrounds the development site. The topographic complexity of the landscape defines the visual character of the area with confined views occurring over several hundred metres to adjacent ridgelines or along valleys before the surrounding relief creates a defined viewshed. The topography of the Eastern Mount Lofty Ranges creates localised view corridors across the landscape limiting panoramic views within the landscape character unit.
- 3.5.2 The landscape unit contains a number of notable landscape features such as Mount Pleasant, Eden Valley, Flaxman Valley and the topography associated with Angaston.
- 3.5.3 Across the landscape character unit is a vegetation overlay of mature Eucalypts and smaller pine plantations that enhances the visual enclosure. The extent and density of vegetation fragments views and reinforces the visual containment of the area. This interaction between landform and vegetation across the landscape occurs throughout the landscape character unit, extending north and south parallel with the orientation of the Ranges. The scale and extent of the vegetation, limits the visual impact of development and infrastructure in the landscape. As a result, power lines, radio masts, buildings and roads are seen as recessive elements, visually fragmented by the vegetation and screened by the underlying topography.
- 3.5.3 The dominant land use and landscape character of the Eastern Mount Lofty Ranges consists of a well-vegetated rural landscape with extensive areas of Eucalypt woodland broken up by grazing land, horse agistment as well as vineyards. These open landscape areas provide a spatial contrast to the well established treed landscape character and create glimpsed and framed views into and across the surrounding landscape.
- 3.5.4 The Eastern Mount Lofty Ranges landscape character unit provides a significant degree of scenic value to the subregional and regional landscape west of the proposed development. This is primarily due to the extent of Eucalypt and coniferous vegetation and the visual amenity provided by the rural land uses such as horse rearing and vineyards. While the underlying land use is rural and expresses agricultural characteristics, these productive land uses are offset by the extent of vegetation cover that creates a semi-naturalistic character to the agricultural landscape.



Figure 6 Typical view of sub regional and regional west Mount Lofty Ranges character

3.6 Eastern Mount Lofty Ranges Plateaux (transitional edge landscape character) (Local) [2]

- 3.6.1 Between the well vegetated landscape character of the Eastern Mount Lofty Ranges and the eastern escarpment of the Ranges is a transitional landscape defined by a complex topography of low undulating landform, incised creeks and rocky outcrops, predominantly absent of vegetation (except for a grazed herb layer). These geological features combined with an absence of vegetation to create a wind-swept and at time desolate visual character, which expresses a rugged quality that contrasts the visually enclosed and well-vegetated qualities of the Eastern Mount Lofty Ranges.
- 3.6.2 The landscape contains a number of defined landforms including, Scotts Hill, White Hill, Sedan Hill, North Rhine Valley, Marne Valley and Sugarloaf Hill
- 3.6.3 Throughout the dominant north/south ridgelines of the escarpment edge are local topographic variations that create additional complexity and at times a more intimate scale with small ridgelines, promontories and valleys developing an additional degree of visual complexity that is contrasted by the panoramic characteristics of the wider landscape further to the east.
- 3.6.4 The landscape character unit creates a defined separation between the complex enclosed visual character that occurs around Mount Pleasant, Eden Valley, Flaxman Valleys and Angaston and the open visual character of the Murray Plains escarpment and its associated landforms such as Scotts Hill, White Hill, Sedan Hill and Sugarloaf Hill.
- 3.6.5 The edge of the escarpment is defined by a denuded, heavily grazed landscape almost devoid of any tree vegetation that is punctuated by rocky outcrops and a complex rolling topography.
- 3.6.6 The presence of the Morgan Whyalla pipeline that extends east/west across the face of the escarpment and a 275kV power line that runs north/south along the top of the escarpment reinforces the sense of a 'worked/ modified' landscape, emphasised by the denuded and agro-industrialised character of the landscape.
- 3.6.7 The elevated and undulating characteristic of the escarpment provide opportunities for panoramic views to the east across the Murray Plains. These views over the Plains extend for significant distances due to the limited vegetation and absence of major topographic variations.

03 Landscape Character and Site Context

- 3.6.8 While the landscape is agricultural and denuded of vegetation, the elevated location and expansive views provide the landscape with significant scenic value when viewing the wider landscape from the Eastern Mount Lofty Escarpment Edge.



Figure 7 Typical view across the eastern plateau with undulating topographic of the Eastern escarpment.

3.7 The Eastern Mount Lofty Ranges Escarpment (Local and Sub-regional – East) [3]

- 3.7.1 The Eastern Mount Lofty Ranges escarpment is a prominent north/south landform that defines the eastern edge of the Mount Lofty Ranges. The escarpment provides significant topographic elevation within the region rising approximately 360 m above the low lying land of the Murray Plains.
- 3.7.2 The north/south ridgelines of the escarpment are defined by a series of complex landforms with numerous smaller east/west promontories and gullies forming serrations and distinct undulations across the escarpment, which transitions into more eroded forms to the lower slopes of the escarpment.
- 3.7.4 The serrated landform qualities and interrelationship of ridges and gullies create significant visual and topographic variation. This provides a distinct scale to the local topography, reinforcing the escarpment as the prominent landscape feature, particularly when experienced from the Murray Plains and the townships of Cambrai and Sedan.
- 3.7.5 The diversity in visual character of the escarpment is reinforced by perceived variations created by the light and shade that is cast across the landscape by the topography of the escarpment. Areas of significant tonal variation (patches of light and dark) occur in response to localised ridges and gullies. This tonal variation is further reinforced during periods of cloud cover when shadows formed by clouds travelling over the landscape increase the visual contrast of the landscape. The visual patterning of light as well as the topographic variation creates a visually complex character to the Eastern Mount Lofty Ranges Escarpment. This visual complexity contrasts the uniformity of the agricultural land use that covers the escarpment, which consists of extensive areas of grazing and an absence of woodland or remnant vegetation.
- 3.7.6 The denuded land cover reinforces the agricultural context, which is typical of the Murray Plains and Mid North agricultural areas of South Australia.



Figure 8 Typical view back towards the eastern Mount Lofty Ranges escarpment

3.8 Murray Plains (Regional – East) [4]

- 3.8.1 The Murray Plains area is formed by an expansive low-lying landscape that extends from the foothills of the Eastern Mount Lofty Ranges Escarpment east towards the Murray River and beyond.
- 3.8.2 The landscape is criss-crossed with occasional small low-lying ridgelines and belts of vegetation that provide moderate visual screening and areas of visual enclosure.
- 3.8.3 Local ridgelines form wide east/west running undulations that extend across the across the Plains. These undulations and associated valleys respond predominantly to the flood plain and associated drainage features within the landscape. Extending along these seasonal watercourses, flood ways and creek features are large belts of vegetation. In some instances, such as the Swan Reach Conservation Park, the extent of vegetation increases significantly, and is visible as a prominent landscape element.
- 3.8.4 The vegetation cover is supplemented by linear bands of Eucalypts along field boundaries, together with the underlying topography; these features define the visual and physical containment within the landscape character unit.
- 3.8.5 The land use character is formed by an open field structure of arable and cropping land which capitalises on the flat landscape and remnant alluvial soils of the Murray Plains. The openness of the horizontal field pattern provides a contrast to the localised visual enclosure of the vegetation and topography. Views across the landscape character unit extend over the underlying field structure, providing pockets of visibility that extend over a few hundred metres. To the west is the elevated landscape of the Eastern Mount Lofty Ranges Escarpment.
- 3.8.6 The Murray Plains landscape character unit contains numerous townships as well as road corridors, power lines and other infrastructure associated with the human habitation and extensive farming of the landscape. The frequency and form of development reinforces the rural qualities of the landscape.
- 3.8.7 The visual character of the Murray Plains is defined by localised views to adjacent ridgelines and vegetation belts. The combination of a horizontal landform and defined containment creates a specific visual character. The panoramic qualities associated with the escarpment are not evident and a framed

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visual character is created throughout the landscape creating glimpsed views to surrounding regional landscapes and across fields.



Figure 9 Typical view of the Murray Plain back towards the eastern escarpment

3.9 Murray Plains Creeks (Sub-regional and Regional – East) [5]

- 3.9.1 Red Creek and Truro Creek represent two larger waterways that extend east/west across the Murray Plains. The landforms, vegetation and amenity associated with these features extend across the escarpment creating defined landscape character units that dissect the surrounding Murray Plains as the creek lines extend further to the east. Outside these landscape units, the escarpment and plains return to their agricultural landscape character.



Figure 10 Typical view of sub regional Murray Plains Creeks LCU.

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3.10 River Marne (Sub-regional – South) [6]

- 3.10.1 The landscape character of the Marne River corridor is defined by significant belts of vegetation consisting of mature eucalypts. The river is one of only a handful that runs west-east from the Mount Lofty Ranges. The incised and eroded character of the river corridor as it traverses through the Eastern Mount Lofty Ranges creates significant areas of scenic value that is recognised by the community.
- 3.10.2 The landscape character surrounding the river remains agricultural to the north and south with large areas of cropping, grazing, as well as specific land use operations such as turf cultivation and horticulture. These land uses are contrasted by the natural characteristics of the River Marne.
- 3.10.3 The topography and scenic value increases to the west as the river dissects the topography of the escarpment. The incised landforms of the river create a defined visual enclosure. This visual enclosure is contrasted by the open and panoramic qualities that occur to the surrounding ridgelines and edges of the river corridor.
- 3.10.4 While the river represents a natural corridor within the landscape, its natural characteristics remain isolated, contrasting the surrounding agricultural land uses and although these land uses do not detract from the landscape character, neither do they enhance the amenity and scenic value of the landscape.



Figure 11 Typical view of the Marne River corridor and visual enclosure created by the escarpment

3.11 North Rhine Valley (Local) [7]

- 3.11.1 The North Rhine River valley is a recognisable landscape area located along the watercourses and catchment areas that flow in a north/south direction within the landscape character zone of the Eastern Mount Lofty Ranges Plateaux. The associated vegetation of the area increases the visual amenity; however the landscape quality is isolated to a small area with less perceived amenity value than the Marne River.

03 Landscape Character and Site Context



Figure 12 View looking towards the isolated landscape amenity of the North Rhine Valley LCU

3.12 Keynes Gap (Sub-regional – South) [8]

- 3.12.1 Keynes Gap is defined by a series of large rocky outcrops that form a pronounced ridge between the landscape areas of Eden Valley and the Eastern Mount Lofty Ranges Escarpment to the east.
- 3.12.2 These large elevated landforms create a defined sense of visual enclosure which separates the more sensitive landscape amenity and scenic value of areas to the west such as Eden Valley and the agricultural and panoramic character of the escarpment and Murray Plains.
- 3.12.4 While the rocky outcrops of Keynes Gap provides a defined visual separation between the surrounding landscape areas; from locations on the rocky outcrop ridgeline, panoramic views can be experienced both east and west.



Figure 13 Typical view of the rocky outcrop ridgeline at Keynes Gap which forms an enclosed visual character

03 Landscape Character and Site Context

3.13 Keyneton (Sub-regional – West) [9]

- 3.13.1 Keyneton is a small township on the Sedan Hill Road (also referred to as the Angaston – Sedan Road) and is described as a scenic route within the Mid Murray Development Plan). Typical of other townships within the region, the town has a defined settlement pattern and road network with a mixture of vegetation cover including exotics, native species and evergreen conifers. This contrasts with the open agricultural context and topographic variation that surrounds the town.



Figure 14 Contained views within the streetscape of Keyneton looking west from the intersection of Sedan Hill and Eden Valley Moculta Roads

3.14 Cambrai (Regional – Southeast) [10]

- 3.14.1 The main street and general orientation of the town is in a north/south direction and is defined by the arterial road that connects Cambrai with Sedan further to the north (Ridley Road). The majority of residential properties in the town face towards the main street, creating an enclosed visual character to the centre of the town. This is reinforced by minor ridgelines that create an added degree of enclosure to the town.
- 3.14.2 While the town centre is visually enclosed, there are a number of elevated views of the Eastern Mount Lofty Ranges from the north eastern and south eastern edges of the town. At these locations, the escarpment to the west forms a prominent visual element in the landscape defining the visual envelope of the regional landscape.
- 3.14.4 South and west of the town are broad ribbons of vegetation associated with the River Marne. This provides a visually pleasant context to the edge of the town as well as providing an attractive landscape context to the town's football oval and golf course and other locations to the south. The golf course and football oval are both located within a low-lying flood plain of the Marne River to the southeast. While this location is an important community site, the low-lying and enclosed visual characteristics of the oval and golf course ensure that any potential visual effects created by the proposed wind farm development will not be visible.



Figure 15 View within the streetscape of Cambrai, illustrating extensive vegetation and infrastructure

3.15 Sedan (Regional – East) [11]

- 3.15.1 Sedan is located on Ridley Road, which is a main arterial route that runs north/south across the Murray Plains parallel to the Eastern Mount Loft Ranges Escarpment. Typical of many townships on the Plains, the residential properties are predominately single storey with occasional larger civic buildings orientated towards the main roads of the town. Furthermore, the periphery of town has extensive vegetation plantings associated with streetscape verge plantings and backyards.
- 3.15.2 The underlying settlement pattern of the town is centred on the main road intersection that segments the town rather than the typically 'main street' form of other towns in the area such as Cambria. The concentration of development around the intersection produces a contained visual character, which is contrasted by the open views that surround the town, particularly to the west.
- 3.15.3 Sedan contains a number of community buildings and public spaces such as the oval, church, as well as commercial buildings including the town store and pub. The low-lying character of the town and surrounding vegetation associated with roads and residential properties, limits views from the town to the surrounding landscape.
- 3.15.4 Where views into and out of town do occur they are typically associated with the road network or from locations on the outskirts of the town where the low-lying and open agricultural character of the landscape provides panoramic views either across the landscape of the Murray Plains to the east or towards the predominant elevation of the escarpment of the Eastern Mount Lofty Ranges to the west.

03 Landscape Character and Site Context



Figure 16 Typical internalized view within the streetscape of Sedan

3.16 Eden Valley (Regional – Southwest) [12]

3.16.1 Eden Valley is one of the numerous townships located within the regional assessment area and is located within the western edge of the regional landscape assessment zone, approximately 8 kilometres from the proposed development. The township is typical of many within the Adelaide Hills with a well-vegetated main street defined by predominately single storey dwellings located along an established road network that runs through the centre of the town.

3.16.2 The residential areas are punctuated with a mixture of native and exotic tree species, which create a visually enclosed character to the settlement, particularly along the main street. This enclosed vegetated character is reinforced by ridgelines that surround the town.

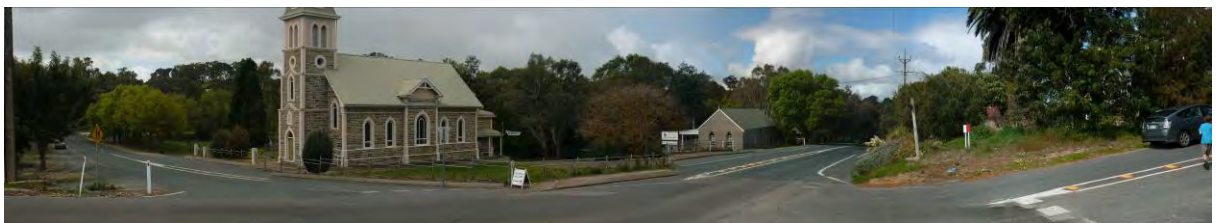


Figure 17 North eastern corner of Eden Valley township. View is orientated towards the proposed development site which is screened by built form, vegetation and topography

03 Landscape Character and Site Context

3.17 Angaston (Regional – East) [13]

- 3.17.1 Angaston is recognised as one of the main tourist and service centres of the Barossa Valley region and is located approximately 16 kilometres northwest of the proposed development site. The town is located within a defined valley that runs north-south and follows the alignment of the North Para River.
- 3.17.2 The valley defines the settlement pattern of the town. Buildings are typically orientated towards the street network and public spaces that follow the alignment and topography of the river. The streets have a well-established treescape and the town itself is surrounded by significant belts of vegetation that run across the surrounding hills and ridges that contain the town.
- 3.17.3 Due to the relationship of landform and vegetation, the visual character of Angaston is enclosed with limited views from the town out to the surrounding landscape character units, particularly to the east and the proposed wind farm.
- 3.17.4 To the southeast of Angaston is the Torrens Scenic Drive. The Torrens Scenic Drive forms a tourist corridor between Mount Pleasant and the outskirts of Angaston. The drive has significant scenic value due to the extensive belts of mature vegetation and attractive agricultural land uses that exist along the route.
- 3.17.5 The drive is one of many areas of increased landscape amenity that occur in and around the proposed wind farm. While the amenity and scenic value of the corridor is more significant than others, the enclosed topography both to the east and west that form the valley through which the Torrens Valley Scenic Drive is located creates an enclosed visual character. This has the effect of amplifying the visual character of the area by way of removing the potential for visual impact from other features including the proposed wind farm development in addition to existing transmission lines, road corridors or larger industrial areas.



Figure 18 View of Angaston township on Murray Street

03 Landscape Character and Site Context

3.18 Stone Walls (special landscape features)

- 3.18.1 The existence of stone walls, particularly along the road of the local, sub-regional and regional area, reinforces the cultural overlay within the landscape. The dry stone walls built during the 'Great Depression', increase the visual amenity and cultural context of the landscape. This is particularly relevant in relation to Pine Hut Road which crosses the proposed wind farm site, where the existence of the wall frame views within the road corridor providing an additional cultural overlay to the locality.
- 3.18.2 While the walls have a cultural representation, within the wider context of the landscape their visibility is limited to a very local context and experience and they appear as narrow linear elements that criss-cross the rural landscape.



Figure 19 Typical view of stone walls from Pine Hut Road

04 Community Consultation and Landscape Values

4.1 Introduction

4.1.1 As part of the development application and landscape assessment process, a number of community information and engagement sessions were held in the following towns

- Keyneton (21 June 2011)
- Cambrai (22 June 2011)
- Eden Valley (13 September 2011)

4.1.2 These sessions were designed to provide the community with information in relation to the scope of the wind farm proposal, including the anticipated visual effect of the wind turbines in the landscape. During the information sessions the community were also given the opportunities to express their opinion in relation to the landscape value and scenic qualities of the regional landscape context surrounding the wind farm.

4.1.3 The consultation sessions were based on a 57 wind turbine development. Members of the community were asked to provide information on the landscape character of the area and discuss the potential effect of the proposed wind farm.

4.1.4 As part of the community engagement an assessment of the landscape value was undertaken through a cognitive mapping exercise and the completion of a designated landscape survey (see Appendix D). The cognitive mapping exercise involved the analysis of a series of qualitative values relating to the landscape surrounding the Keyneton Wind Farm. The locations of these values were then identified by local members of the community on a reference map.

4.1.5 This process allowed the community's perceived value of the landscape to be included in the landscape assessment methodology. In doing so, the responses provided by members of the community were directly fed into the landscape assessment undertaken in Section 6 and are represented in the Cultural and Landscape Values of the Landscape Character assessment.

4.1.6 The resulting mapping provided by the community provided an insight into how local members of the community experience see and value the landscape. The mapping also provides information on specific location and land marks that were important to the community and which would require further assessment and discussion as part of the landscape character and visual assessment report.

4.2 Cognitive Mapping Process

4.2.1 The cognitive mapping process asked community members to think about the landscape character that surrounded the proposed development site and to consider where certain landscape values could be experienced or what landscape features might represent specific landscape characteristics. Participants are shown a base regional map with key locations, roads, and landmarks within the study area identified. Each participant was given sticker dots (or markers) to identify landscape values, special places, activities, or any spatial attributes of interest. Five dots were provided and each one assigned a landscape value (i.e. rural and agricultural, natural, scenic, recreation, history and culture) so that members of the community could locate landscape areas or features that most strongly represented the assigned landscape value. The mapping within section 4 has been redrawn to illustrate the values selected by the community.

4.2.2 The cognitive mapping exercise considered five landscape value categories that represent a broad range of landscape values. These included;

04 Community Consultation and Landscape Values

1. **Rural and Agricultural Value:** Describing areas of the landscape that were seen as productive with a farming land use.
 2. **Natural Value:** Locations where farming, human intervention or activity is absent and where natural processes and features are prominent. These could include area of woodland, rivers and rock outcrops.
 3. **Scenic Value:** Locations which are picturesque or beautiful, where there are views and high degree of visual amenity associated either with the place or the surrounding landscape.
 4. **Recreation Value:** Places and areas of recreation that are used by the community for leisure, sport or other social interaction and community purpose.
 5. **History and Culture Value:** Site and places of historic and cultural value where the social value is evident either as an existing or historical reference.
- 4.2.3 The age of respondents was also recorded in order to provide additional information regarding the community's response to the value of the landscape.
- 4.2.4 In instances where members of the community valued the entire regional landscape or a non specific location, general categories were provided as part of the mapping. These are presented in the boxes at the top of the mapping (figures 20, 21 and 22)

4.3 Landscape Values Survey

- 4.3.1 The landscape values survey asked similar questions to those expressed by the Cognitive Mapping Process; however the survey allowed participants to provide more detailed responses. The survey also allowed respondents to use their own words to describe the landscape. This descriptive response provided another level of understanding in relation to the value that community members placed on the existing landscape character. Item 4.7.1 describes the findings from the survey in more detail.

4.4 Keyneton Cognitive Mapping Session (held on the 21 June 2011)

- 4.4.1 Of the people who attended the Keyneton community consultation session approximately 36 people provided feedback in relation to the cognitive mapping exercise.
- 4.4.2 The mapping from the Keyneton community consultation highlighted the landscape values that participants associated with the North Rhine Valley and the landscape areas east of Jutland Road. The mapping responses also indicated many members of local community recognised and valued the natural and scenic values associated with the landscape that surrounded their properties.
- 4.4.3 Similar values were expressed in relation to Keynes Gap and the Marne River again highlighting the scenic and natural values of the landscape in these locations, as well as the opportunities for recreation, such as walking, particularly along the Marne River.
- 4.4.4 Significant scenic value was placed on the Sedan Hill Road, particularly the existing vehicle pull-in-bay and lookout that is located on the road.
- 4.4.5 Other isolated points of scenic value were identified throughout the landscape. These were typically associated with views from private dwellings and recognised viewpoints such as the Eden Valley Lookout.
- 4.4.6 Generally, the landscape character of the locality around the wind farm was seen by the community as rural, containing some cultural value. This rural value is illustrated by the 16 orange dots that were used to express the landscape value of the entire area (refer to the box at the top of figure 20). The escarpment

04 Community Consultation and Landscape Values

evoked similar values, although an equivalent number of people felt the escarpment had natural values that needed to be recognised.

- 4.4.7 The townships of Keyneton and Sedan were identified as having a strong recreational and cultural focus. This was typically associated with ovals, sports clubs, schools and churches. The mapping of these locations acknowledges the community value of these facilities and the need to preserve their significance within the community.
- 4.4.8 While a number of specific areas were identified as having important scenic and natural characters, some members of the community who provided responses felt that certain qualities were attributable to the escarpment of the Eastern Mount Lofty Ranges or the Murray Plains. In particular, a number of respondents considered that the Murray Plains had a strong rural character, while a similar number of respondents felt that the escarpment best represented the rural character of the area. In addition, a few people felt that the escarpment possessed certain natural qualities.
- 4.4.9 When considering the cultural value of the landscape, many people identified the stone walls as having the highest value. This reinforces the importance of the stone walls as historic and cultural references in the landscape.
- 4.4.10 The Keyneton community consultation highlights the value of the Rhine Valley and immediate surrounding area as a location that community members value for a number of reasons, including scenic, natural, recreational and cultural. The scenic qualities of the Sedan Hill Road and Pine Hut Road were also strongly acknowledged. The community also placed significant value on the natural, scenic and recreation values of the Marne River and Keynes Gap.

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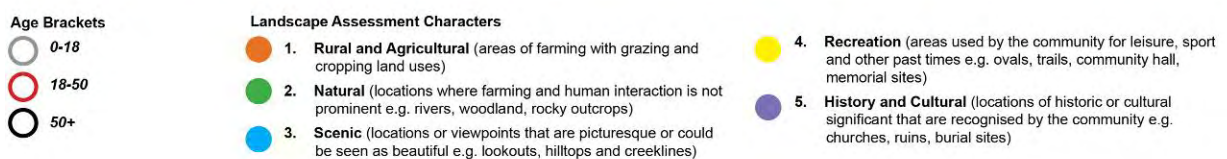
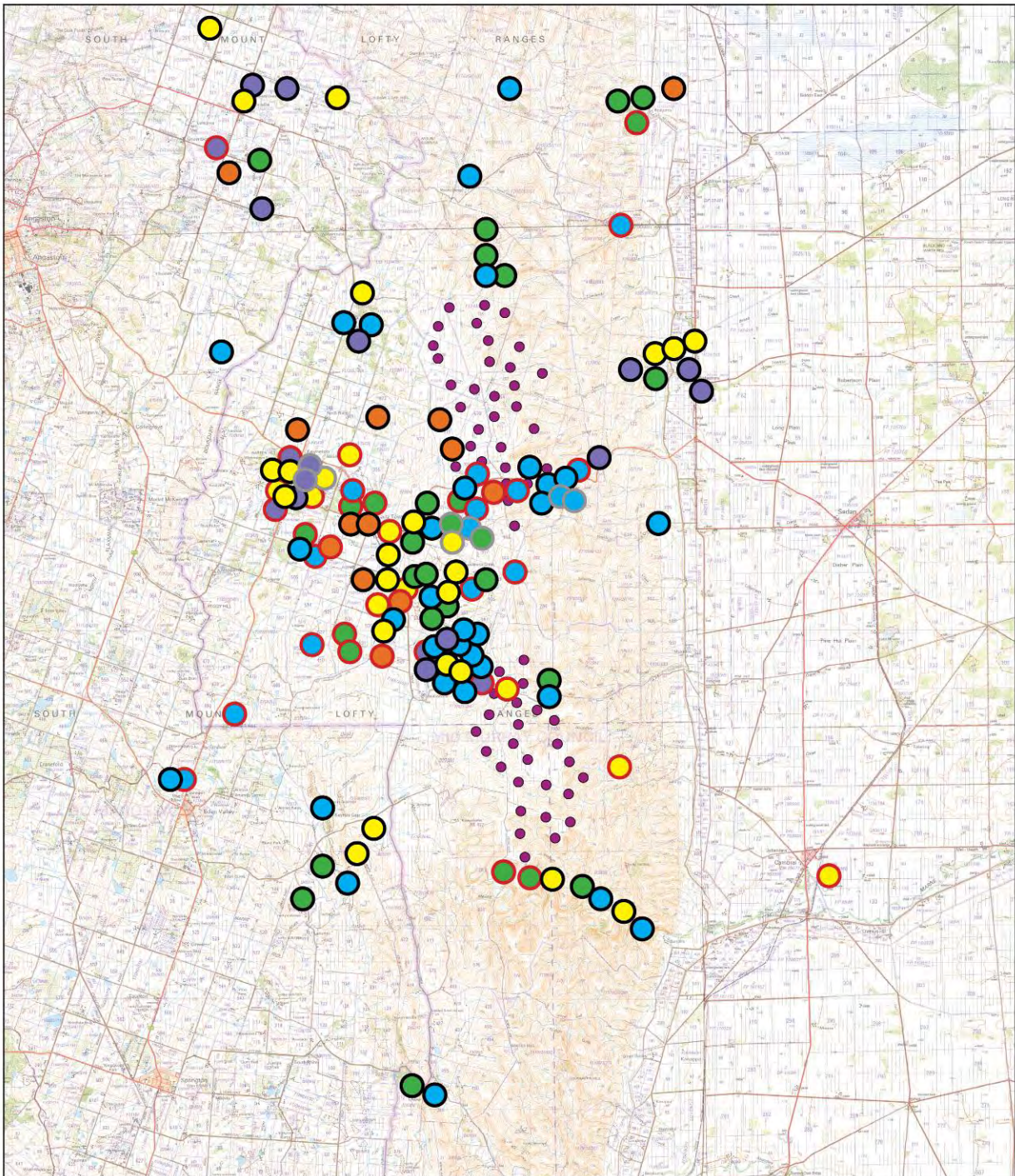
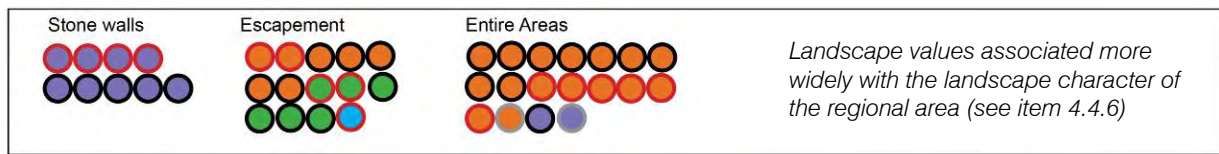


Figure 20 Keyneton community cognitive map

04 Community Consultation and Landscape Values

4.5 Cambrai Cognitive Mapping Session (held on the 22 June 2011)

- 4.5.1 At the Cambrai community consultation session approximately 16 people provided feedback on the values associated with the landscape surrounding the Keyneton Wind Farm.
- 4.5.2 The mapping from the Cambrai session illustrated a different focus in terms of landscape value to those identified at the Keyneton community consultation. Greater emphasis was placed on the Murray Plains as a feature that provides amenity, scenic values and opportunities for recreation.
- 4.5.3 Particular attention was given to the landscape values associated with the Marne River. Natural, scenic and recreational values were identified along the entire length of the river as it traverses the Eastern Mount Lofty Ranges Escarpment.
- 4.5.4 Both Sedan and Cambrai were recognised by the community as having recreational value. This was associated with sports club and recreation grounds.
- 4.5.5 In terms of the scenic value of the landscape, the Marne River provided the most significant value for the Cambrai and Sedan communities; however, similar to findings of the Keyneton community consultation, both Sedan Hill Road and Pine Hut Road were seen as locations of high scenic value.
- 4.5.6 In relation to the cultural value of the landscape, members of the community identified the stone walls as having a particular value relative to the landscape context.
- 4.5.7 Generally, the landscape of the entire area was experienced as a rural landscape, reflecting the productive land uses of the plains and Eastern Mount Lofty Escarpment. Refer to figure 21 for the mapping that identifies the perceived rural and cultural values of the landscape

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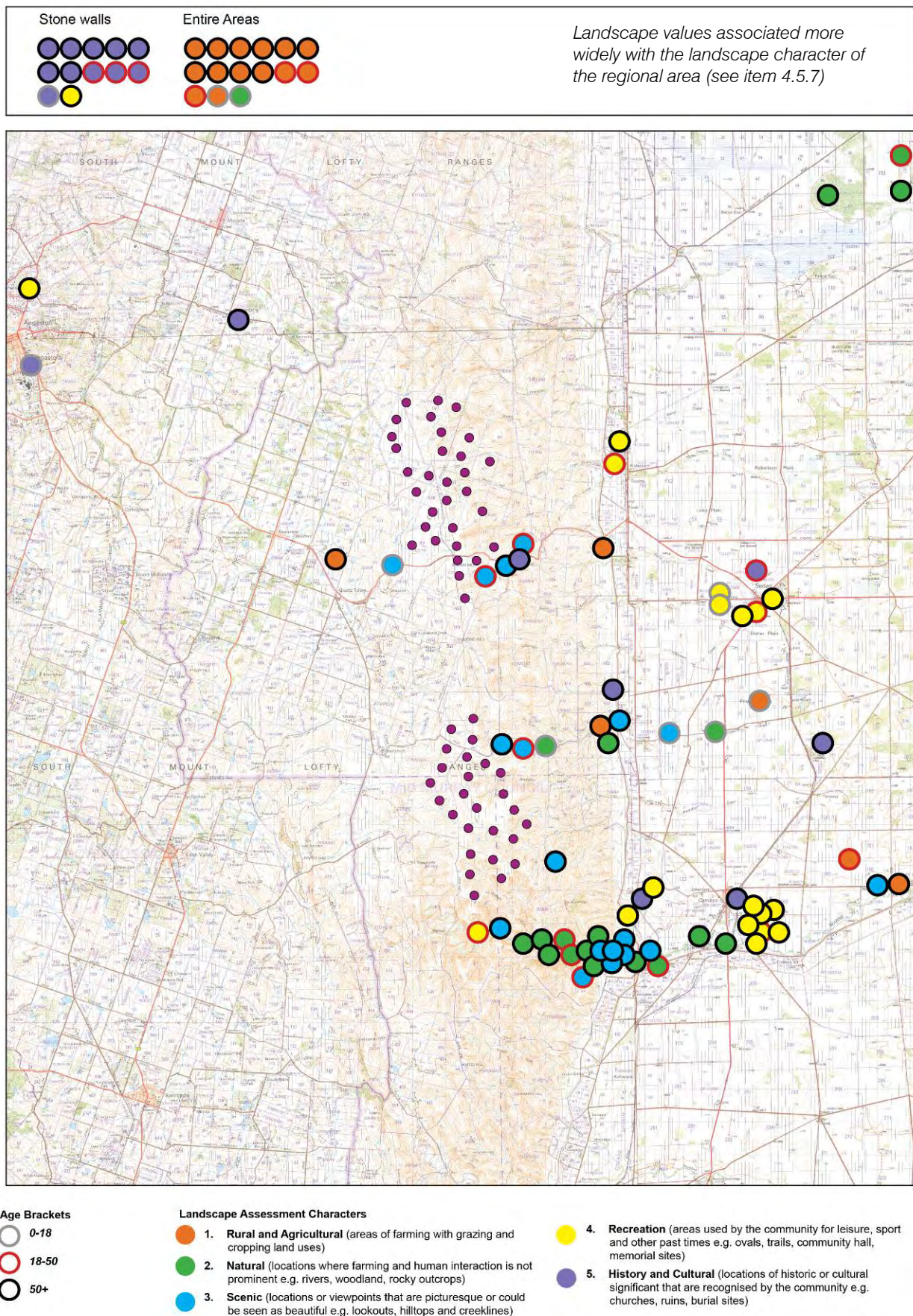


Figure 21 Cambrai community cognitive map

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4.6 Eden Valley Cognitive Mapping Session (held on the 13 September 2011)

- 4.6.1 Of the people who attended the Eden Valley community consultation approximately 23 people provided feedback in relation to the cognitive mapping exercise.
- 4.6.2 The Eden Valley community consultation identified significant landscape values associated with the township itself, the natural landforms of Keynes Gap and the attractive rural character of the Rhine Valley. Within these areas, a combination of rural, natural, scenic and recreation values were expressed.
- 4.6.3 As with the Keyneton and Cambrai consultation, Sedan Hill Road and Pine Hut Road were acknowledged as having scenic value.
- 4.6.4 When considering the wider landscape, the community recognised the values of a number of landscape character units (refer to Section 3), particularly the Eastern Mount Lofty Escarpment and the Murray Plains. These landscape areas were seen as having a variety of qualities. The escarpment was considered to have a natural landscape value due to the topography and perceived ruggedness associated with the exposed rock outcrops and lack of vegetation cover. By contrast, the plains are seen as a rural, productive landscape with few natural qualities.
- 4.6.5 A large proportion of the community felt that the entire area around the wind farm development possessed the full range of the landscape values identified as part of the cognitive mapping assessment. There was however a perceived bias towards the rural, scenic and cultural values of the landscape, with less focus on the recreational and natural landscape values (these values are illustrated in the box at the top of figure 23).
- 4.6.6 As with other sessions, members of the community who attended the Eden Valley consultation identified the cultural value of the stone walls as an important feature in the landscape.
- 4.6.7 The consultation also identified a number of specific values and locations that individual members of the community felt were important. These included two Wedge Tail Eagle nesting sites and the Eden Valley Lookout on the Lavender Federation Walking Trail. The information relating to the nesting locations will be reviewed as part of Flora and Fauna assessments. The natural values of these sites have been considered as part of the overall landscape assessment of the development and the wider landscape.
- 4.6.8 In addition to the mapping and surveys, a wireframe representation of the wind farm was produced from the intersection of the Mount Pleasant-Keyneton Road and Mathews Road, on the north eastern corner of the Eden Valley township. This wireframe representation illustrated the screening effect of the local ridgelines that run to the northwest and prevent views to proposed wind farm



Figure 22 Wireline produces on the outskirts of Eden Valley township.

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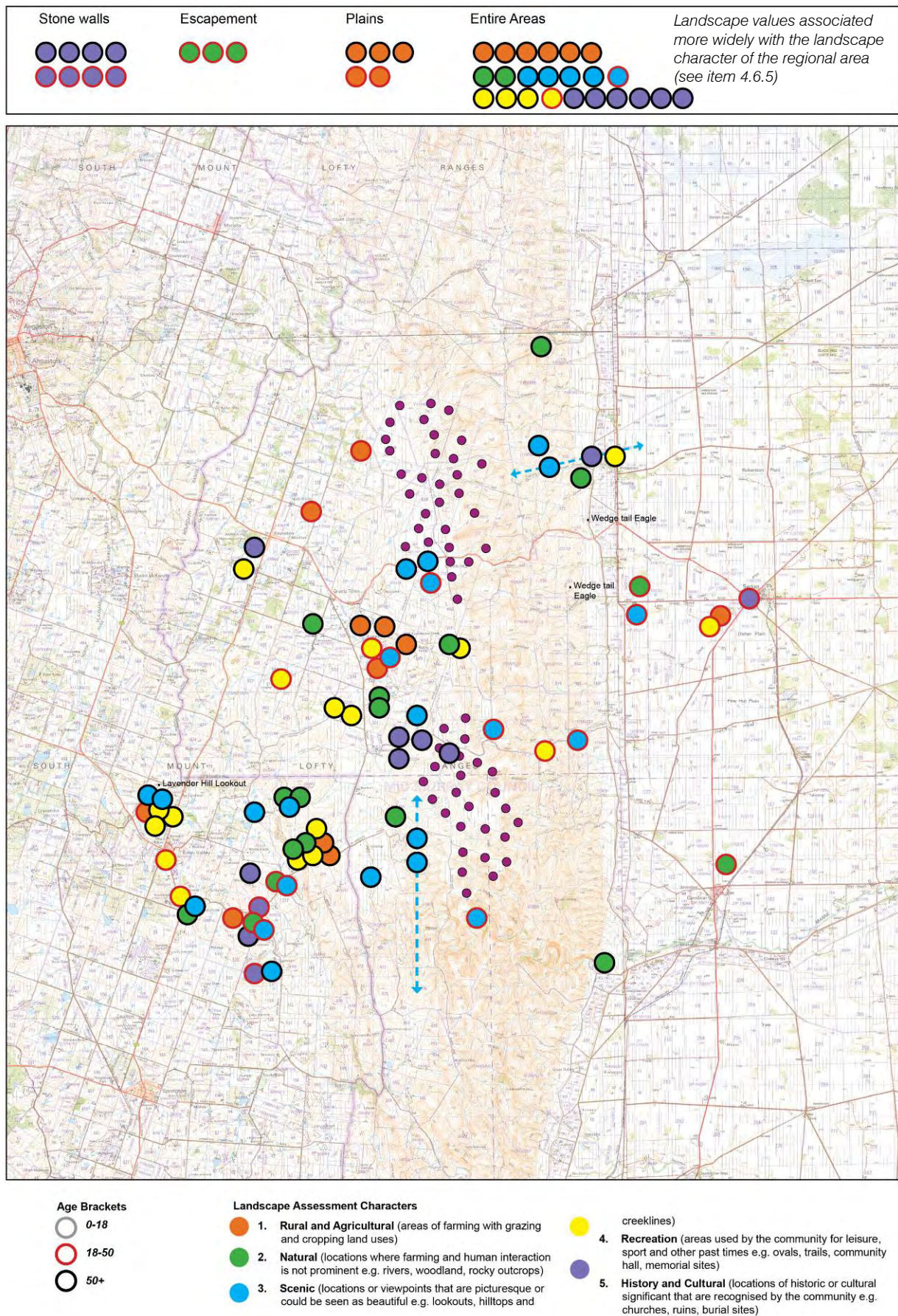


Figure 23 Eden Valley community cognitive map

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4.7 Community Survey Responses (from all sessions)

4.7.1 The Landscape Value Survey asked five questions relating to the importance of features and potential qualities within the landscape. The following questions were asked;

1. Please list and mark on the attached map the landmarks, areas or landscape features that are important to you in the local area (e.g. hills, waterways, forested areas, recreation areas)?
2. Please list and mark on the attached map locations where you enjoy the scenic qualities of the area around Keyneton.
3. From which roads do you enjoy views of the area?
4. Describe the qualities, features and characteristics that best represent the landscape in and around the proposed Keyneton Wind Farm location? (e.g. rolling hills, open fields, woodland areas, escarpment, and rocky outcrops).
5. Do you have any other comments with regards to the visual amenity of your local area and the potential visual effects of wind turbines?

Over the three information sessions a total of 13 responses were received. While the number of completed surveys was relatively small compared to the number of attendants at the information sessions, the answers provided a range of responses that reinforced the findings from the cognitive mapping, further amplifying the significance of certain areas and features surrounding the proposed Keyneton Wind Farm.

Question one asked respondents to describe the landmarks and landscape feature of the local area. The survey responses identified a number of locations including (number of responses shown in brackets);

- Marne River and associated landscape areas (Meldanda) (3)
- Sedan Hill (2)
- Pine Hut Road
- All areas important as a whole (4)
- Scenic view from my property'
- Land in the family - used for recreation for many years
- Forested areas
- Land around Jutland
- Cambrai Sportsground

Question two considered the scenic qualities of the local area. The responses were less diverse and of the 13 responses only eight answers were provided. However, the answers reinforced the qualities of Sedan Hill Road and Pine Hut Road as areas of significant scenic value to members of the community. These included;

- Sedan Hill Road and Sedan Township
- Pine Hut Road (2)
- The whole area has its own unique special spots
- The views are fantastic all around. It's like an arena of hills changing with the season
- Our home
- River Rhine Bridge area

04 Community Consultation and Landscape Values

Question three asked from where the landscape was appreciated. A number of specific locations were identified. These are;

- Sedan Hill Road (5)
- All roads going through the hills
- Pine Hut Road (4)
- Jutland Road (2)
- Pipeline Road
- Other road such as Sunnyview Road, Bundulla Road, Keynton Road, Eden Valley Murray Road, Netherford Road, Swan Reach Road, Yowitta Road and Ridley Road and Cooks Hill area

Question four allowed respondents to use their own words to describe the landscape. These descriptions reinforce the finding of the landscape character assessment and included the following;

- Hills, flats, open space, stone walls
- The stone walls
- Rolling hills with Red Gum lined creeks, gullies with thick woodland, rocky outcrops scattered throughout
- Rolling hills, escarpments along Marne Gorge and Pine Hut creek. Bushwalks around areas. Love driving up Pine Hut Creek with visitors who are always amazed at stone walls and vistas.
- Beautiful Red Gums, creeks and distant views
- Rolling hills, woodland areas, escarpments and many rocky outcrops'
- Mixed agricultural land and hilly grazing country to the east
- Rolling hills, rocky outcrops
- Uninterrupted natural views'
- Rolling hills, rocky outcrops, picturesque hills
- Hills, the Marne Gorge at Cambrai, changing fields with the seasons, Black Hill and Shell Hill.

Finally, question five asked for any other comments in relation to the potential visual effect of the wind turbines. Ten responses were recorded that related to the visual effect of the wind farm. These included;

- 'These non-natural lumps of metal stand out like dogs balls on the picturesque hills
- Visual effects seem minimal compared to uranium power. Noise could be more of an issue
- I bought my property 16 years ago, built 10 years ago on a particular site to enjoy the views. I've spent a lot of my money for this and feel that it will not only impact upon the view but the value of my property will be severely affected
- Colour for turbines. Too high, stand out too much
- Will never again look like the natural area. The turbines are not unattractive, but nevertheless intrude into the natural bearing of the landscape
- Not really – tourist attraction
- I have no particular objection, but it does alter the natural environment
- The turbines will spoil the beautiful hills
- I am an advocate for sustainable energy, our daily living reflects this as much as possible. I am very concerned however, about the large scale of this (and other) wind farm destroying the visual and many other aspects of life in Keynton and further region that is our home, lifestyle and livelihood
- It will significantly spoil the landscape we have known and appreciated for our lifetime of living in the district approximately 3 km from the proposed wind farm site

04 Community Consultation and Landscape Values

4.8 Key Findings and Potential Landscape Value

- 4.8.1 From the community consultation sessions at Keyneton, Cambrai and Eden Valley, approximately 75 people provided information in relation to the value of the regional landscape as they perceived it. This information enables this report to embed within its assessment a broad understanding of important landscape areas and features that community value.
- 4.8.2 These finding have been used as part of the Wind Farm Design Review (Section 05) to inform the development of the wind farm layout and ensure that the visual effect associated with the Keyneton Wind Farm is managed.
- 4.8.3 The community consultation sessions, cognitive mapping and surveys have identified a number of landscape qualities, areas and features that are recognised as important by the community and have local landscape values.
- 4.8.4 In relation to the regional landscape that surrounds the wind farm development, the community identified that the landscape has a rural landscape character. The experience of this rural landscape is modified by the topography and perceived ruggedness of the Eastern Mount Lofty Escarpment which is seen by many members of the community as natural.
- 4.8.5 A number of specific landscape areas were identified as having significant natural and scenic value. These included the North Rhine Valley, Keynes Gap and the Marne Valley. The combination of topography and vegetation reinforced the natural values of this landscape.
- 4.8.6 Both Sedan Hill Road and Pine Hut Road were identified as having high scenic value. This value was specifically applied to the elevated section of the road corridors and the panoramic views that occur to the east. Low section of both roads did not carry the same degree of the scenic value.
- 4.8.7 Generally, values associated with recreation and leisure were located within the towns and associated with sports clubs, ovals and open space. Additional recreational value was identified throughout the landscape particularly in relation to the Marne River and local ridgelines (the escarpment and Keynes Gap).
- 4.8.8 In relation to the cultural value of the landscape, overwhelmingly, the community saw the stone walls that exist in the regional landscape as representative of this value.
- 4.8.9 The information provided during the community consultation in relation to the character and value of the landscape was used to inform the Cultural and Landscape Values as part of the Landscape Character Assessment described in Section 6. Rather than making assumptions about how the community values the landscape, specific comments and value rating as informed by the cognitive mapping have been referenced in the detailed assessment.

05 Wind Farm Design Review and Management of Visual Effect

5.1 Introduction

- 5.1.1 Following the landscape character assessment, and having consideration to the findings of the community consultation, a preliminary visual assessment was undertaken to develop an understanding of the likely degree of visual change. This preliminary assessment was then used by WAX Design, BGLA and Pacific Hydro to identify opportunities to manage and in some instances mitigate the visual effect of the proposed development.
- 5.1.2 The design review considered the visual effect of the entire wind farm as well as focussing on the impact of certain wind turbines that had more significant visual effects on areas of higher sensitivity to landscape amenity. The potential relocation or removal of certain turbines was evaluated using wireframes, photomontages and a 3D model of the wind farm to ascertain what design modification would provide the most significant management of the visual effect.
- 5.1.3 The initial development proposal, presented to Wax Design & BGLA and the basis for the three community consultation sessions, was for 57 wind turbines, located in two defined clusters northeast and southeast of Keyneton. The preliminary assessment and design review identified a number of wind turbines that presented a noticeable visual effect when compared with the overall visual effect created by the wind farm. The review considered individual wind turbines assessing whether certain turbines increased the visual prominence of the wind farm, whether the location of turbines increased the visual complexity and contrast to the surrounding context or whether particular wind turbines impacted on more sensitive landscape areas as identified by the landscape character assessment and the community consultation.

05 Wind Farm Design Review and Management of Visual Effect

5.2 Design Assessment

- 5.2.1 The design review based on a preliminary visual assessment, alongside ecological and cultural heritage assessments, resulted in the removal of 15 wind turbines and relocation of a number of other turbines. The removal of the turbines resulted in an improvement in the overall visual effect and reduction in the visual complexity of the proposed development.
- 5.2.2 The following table and figure 24 represents a discussion on the management of the visual effect that resulted from the removal of the wind turbines and the reduction of the development from 57 to 42 wind turbines.

<i>Turbine No With reference to 57 turbine Layout</i>	<i>The following comments relate to the potential deletion and relocation of wind turbines in relation to the mitigation of the visual effect</i>
3	Potential to reduce visual complexity to northern edge of wind farm
9	Potential to reduce visual prominence of wind farm on escarpment
14	Potential to reduce visual prominence of wind farm on escarpment
24	Potential to reduce visual impact western edge of wind farm
25	Potential to reduce visual impact western edge of wind farm
27	Potential to reduce visual prominence of wind farm on escarpment
30	Potential to reduce outrigger location and create a defined visual break within the turbine clusters in effect reducing the horizontal visual mass
31	Potential to reduce outrigger location and create a defined visual break within the turbine clusters in effect reducing the horizontal visual mass
32	Potential to reduce outrigger location and create a defined visual break within the turbine clusters in effect reducing the horizontal visual mass
33	Potential to reduce outrigger location and create a defined visual break within the turbine clusters in effect reducing the horizontal visual mass
38	Potential to reduce visual prominence of individual turbine within the landscape
50	Part of outlying cluster that impacts on the character of Marne River
56	Part of outlying cluster that impacts on the character of Marne River
57	Part of outlying cluster that impacts on the character of Marne River

05 Wind Farm Design Review and Management of Visual Effect

5.3 Zone of Theoretical Visual Impact Assessment

- 5.3.1 Zone of Theoretical Visual Influence maps have been assessed for both the 57 and 42 turbine development proposals (figure 24 and 25). These maps provide illustrative depiction of the degree of visual modification and broad indication to the design development and management of visual sensitivities. These maps quantify the extent to which the wind turbines (excluding the height of blades) are seen within the wider landscape. The analysis provides a broad indication of where the wind turbines might be visible.
- 5.3.3 The analysis uses a digital terrain model and computer generated models of the turbines to understand how many individual turbines would be visible from any location around the wind farm. It should be noted that the ZTVI does not take into account the impact of vegetation, buildings or localised land forms. This means that the visual impact of the wind turbines are evaluated within a landscape devoid of any screening vegetation or other feature.
- 5.3.3 The assessment indicates a discernible reduction in the visual effect to the south of the proposed wind farm. The number of turbines and the locations from which turbines are visible from the Marne River is reduced; similarly the intensity of visible turbines from the Eden Valley Lookout is reduced. Generally, there is a reduction in the number of wind turbines that will be visible from many locations within the regional landscape context (as indicated by the pink, red and dark orange zones in figure 24 when compared with figure 25).
- 5.3.4 This assessment provides an overview of the visual effect that results from the modification of the wind farm design from 57 to 42 turbines.

5.4 Summary of Design Review

- 5.4.1 The design assessment and recommendations aim to manage the visual effect produced by the wind farm and respond in part to landscape values highlighted by the community consultation. The removal of the turbines as outlined above was recommended in order to provide a design response to the existing landscape amenity values and sensitivities as expressed by the community through the Landscape Values Survey. The resulting final layout has been assessed with these mitigation strategies in mind.

05 Wind Farm Design Review and Management of Visual Effect

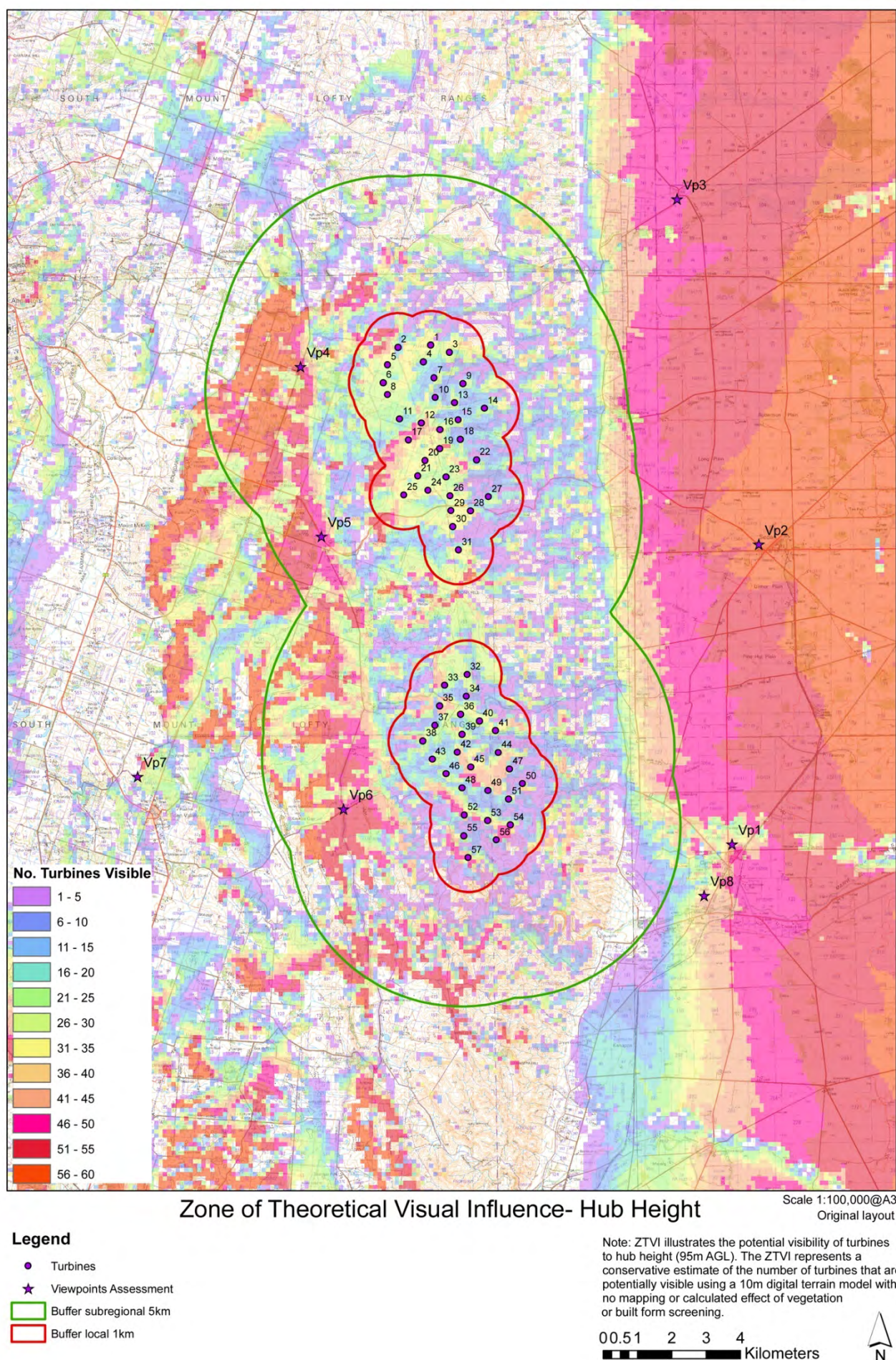


Figure 24 Proposed 57 turbine layout ZTVI

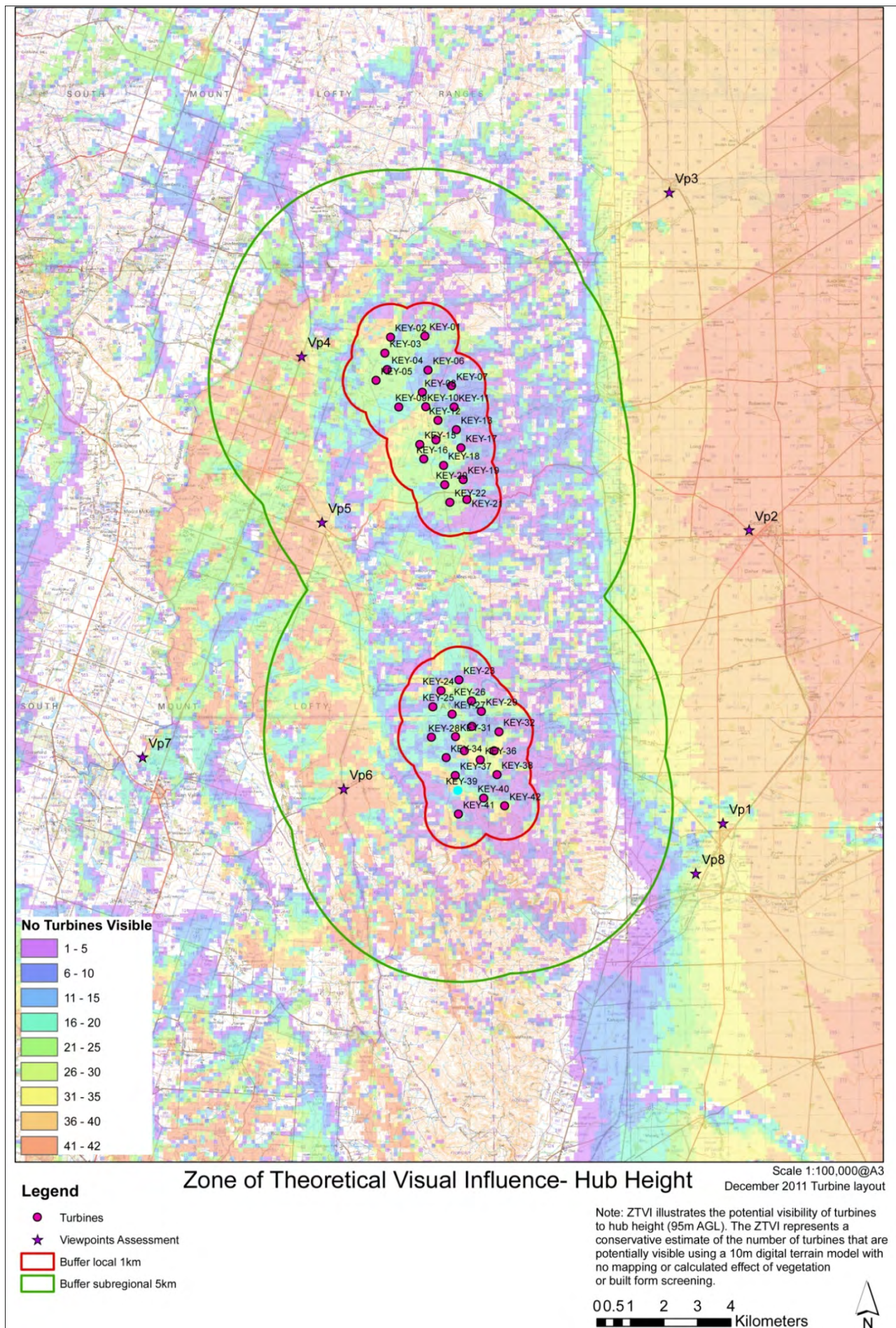


Figure 25 Proposed 42 turbine layout ZTVI

06 Visual Effect Assessment

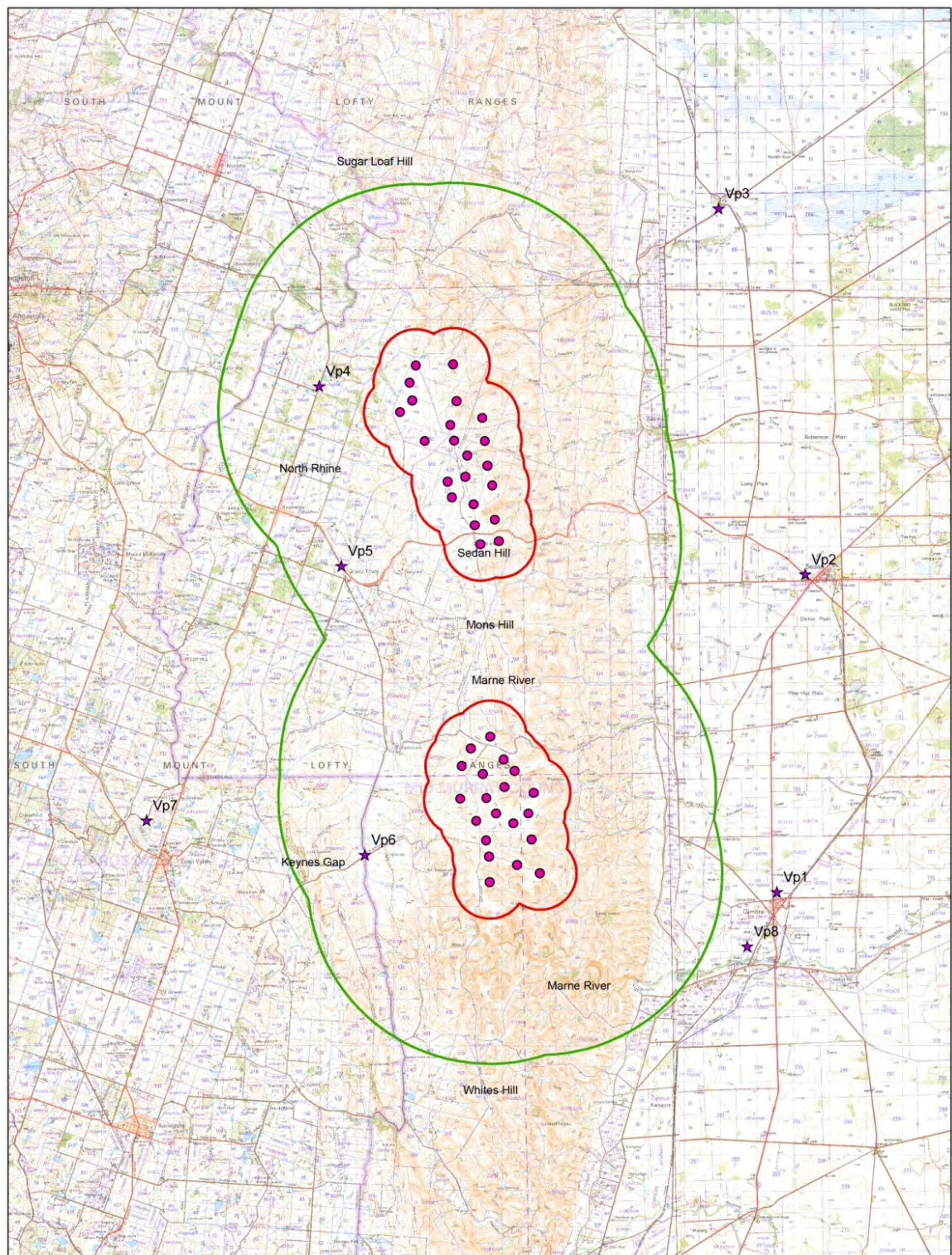
6.1 Introduction

- 6.1.1 The final wind farm proposal consists of 42 turbines located in two clusters on elevated ridgelines and escarpment of the Eastern Mount Lofty Ranges. The site transitions from well-vegetated and topographically varied landscapes to the west of the proposed development site to an undulating plateau and defined escarpment to the east.
- 6.1.2 Eight viewpoints were selected for the detailed visual assessment and photomontages have been produced to illustrate the likely visual change that will be experienced in the surrounding landscape character units. These viewpoints were selected with reference to the Zone of Theoretical Visual Influence mapping, on site investigation, discussions with Pacific Hydro and some of the findings from the Community consultation mapping sessions.
- 6.1.3 The viewpoints identified represent a range of locations and landscape characters around the proposed development. Each viewpoint has been selected to illustrate locations that are publicly accessible, representing typical views of landscape character units and where a large number of wind turbines will be visible in the landscape. In this regard, they generally represent the greatest degree of visual change that will be experienced as a result of the proposed development within the LCU.
- 6.1.3 The following eight viewpoints were assessed using the GrimKe matrix. The matrix has been used to quantify the visual effect of the development from a number of locations. Refer to Appendix C for photomontages and detailed maps in Appendix A locating viewpoints and GPS geographic coordinates.
- 6.1.4 The matrix considers key aspects of the existing landscape such as relief, vegetation, built form and infrastructure; as well as cultural and landscape value. These aspects are each scored out of 5 to produce an assessment value out of 20. This provides a baseline measurement of the landscape from which the degree of visual change can be assessed and considers the degree to which the introduction of the wind farm will alter the existing landscape character. The matrix assesses this degree of change using a framework by which the aspects that affect visual change such as landscape absorption, horizontal and vertical effect and distance are quantified.
- 6.1.5 The visual assessment is then combined with the landscape value to produce a measurement that represents the degree of visual change, that is to say, the extent to which the development will alter the existing landscape. This is measured as a percentage change (see below) and is accompanied by a descriptive reference to qualify the visual effect.

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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 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. 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 underlying landscape visual 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.

- 6.1.6 The following paragraphs and images graphically illustrate the landscape character assessment and visual effect resulting from the Keyneton Wind Farm (more detailed information regarding the GrimKe Matrix is provided in Appendix D).



Legend

- Turbines
- ★ Viewpoints Assessment
- Buffer local 1km
- Buffer subregional 5km

Viewpoint Locations for Montage & Detailed Assessment

Scale 1:100,000@A3
December 2011 Turbine layout

0.5 1 2 3 4 Kilometers

N

Figure 26 Viewpoint location (based on 42 turbine layout)

6.2 Viewpoint 1: North of Cambrai at the intersection of the Ridley Road and Black Hill Road (regional – southeast)

- 6.2.1 The viewpoint illustrates the potential visual effect that will be experienced by the proposed wind farm development from the northern outskirts of the Cambrai township and in relation to culturally significant features such as the cemetery and local area primary school.
- 6.2.2 From the viewpoint, the ridgeline and escarpment of the Eastern Mount Lofty Ranges is clearly visible defining the western visual envelope of the viewpoint. The topography associated with the escarpment of the Ranges provides an elevated grazed landscape character that is punctuated by a complex patchwork of undulating ridges and gullies that traverse the escarpment.
- 6.2.3 The surrounding landscape character, which is formed by the foothill of the escarpment, creates a low-lying agricultural cropping landscape that contrasts the denuded elevated landscape character of the escarpment.
- 6.2.4 The landscape character of the viewpoint is dominated by the agricultural land use of the wider landscape. Belts of vegetation are visible along field boundaries as well as local creek lines. The visual character is formed by two distinct elements – the foreground of the agricultural landscape and the defined visual envelope of the escarpment. Within this landscape character, the turbines of the southern cluster will be seen as a defined visual elements located on the ridgeline.
- 6.2.5 Due to the extent of vegetation and the presence of local ridgelines which form the notable landscape features in the locality, the vertical prominence of the escarpment is diminished. This reduction in topographic prominence has the potential to increase the visual notability of the wind turbines which become the most prominent vertical element in the landscape surrounding Viewpoint 1. In contrast other viewpoints to the east of the wind farm (such as Viewpoints 2 and 3); the escarpment remains visually dominant offsetting the introduction of large vertical elements such as the wind turbines within the landscape.

Visual Assessment

- 6.2.6 The layered arrangement of the turbines when viewed from Viewpoint 1 creates a visual complexity and increased visual density within the wind turbine clustering. This complexity adds to the degree of visual change and the southern cluster of turbines appears as a series of randomly grouped turbines arranged in clusters of two and three along the ridgeline. This creates a visual contrast and reduces the legibility of the wind turbines in relation to the underlying topography and visual character.
- 6.2.7 While the southern cluster does provide a distinct visual effect, this is largely due to the framing of the landscape view created by the viewpoint. The dynamic quality of viewpoint that is created by the local screening of tree and landforms and throughout the Murray Plains Landscape Zone will change and mitigate the visual effect. However, the turbines are likely to be seen as prominent visual elements in the landscape due to the closer proximity of the viewpoint, framing and visual complexity that occurs to the southeast.
- 6.2.8 The most prominent visual effect is caused by wind turbines 23, 26, 29, 32, 35, 36, 28 and 42. Other turbines will be seen as recessive visual elements partially screened by the prominent ridgeline and local topography. The turbines further to the west are not visible in the view and this significantly reduces the potential visual effect and visual complexity that might be created by consecutive layers of turbines set one behind the other.
- 6.2.9 By contrast the northern cluster of wind turbines will be seen as distant recessive elements. While the oblique nature of the viewpoint provides opportunities for overlapping of turbines, the distance reduces the visual effect and the existence of vegetation groups within the local area helps to mitigate the visual prominence.
- 6.2.10 To the northwest the more distant cluster of turbines 7 to 21 produces a recessive visual element, seen as a separate and less dominant visual element within the landscape. Local variations in landforms, adjacent and within the foreground of the viewpoint, and belts of vegetation, across the lower lying plains, provide localised screening, again substantially mitigating the visual effect.

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6.2.11 Similar to other aspects of the turbine layout, more distant turbines to the western side to the development are not visible due to the setback on the ridgeline as well as the local landform screening that is provided.



Figure 27 Viewpoint 1

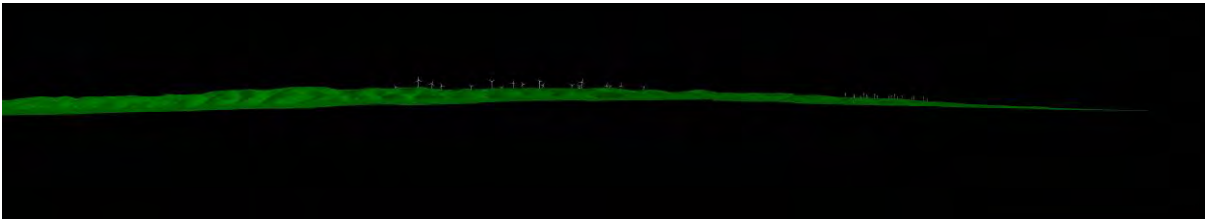


Figure 28 Wire line Viewpoint 1

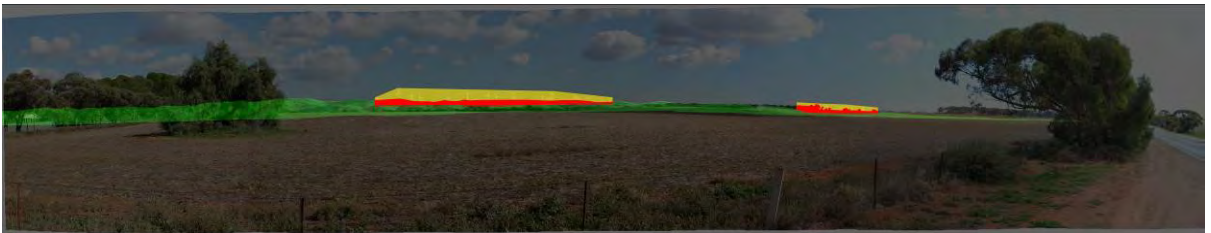


Figure 29 Absorption capacity calculations

Assessment	Value	Description
Relief	3	The foreground to mid ground has limited to no variation in topographic form which enhances the visual impact of the Eastern Mount Lofty Ranges upon which the proposed development is located. This ridgeline which is located at a distance (ie closest turbine is 6.5km) defined as subregional to regional within the context of the viewpoint and is classified as having a high vertical visual effect. The overall topographic complexity and visual interest is described as moderate.
Vegetation Coverage	2	The vegetation patterning is limited in the foreground to mid ground with the majority localised on the outskirts of the township of Cambrai - specifically property boundaries and roadway verge treatments. The degree of vegetation is classified as being approximately 25% within the context of the viewpoint.
Infrastructure and Built Form	4	There is limited visual presence of existing infrastructure that contrasts with the predominant agricultural landscape. The presence of a transmission line, outskirts of the township and road corridor present a visual contrast of approximately 35%.

Assessment	Value	Description
Cultural and Landscape Value	2	The cultural attachment or association of this view is considered slight to moderate with reference to the community consultation mapping and the predicted frequency of the view being slightly more elevated due to its location on the outskirts of Cambrai, located on the main road between Cambrai and Sedan. Furthermore the view to the ridgeline defines the field of view at a distance of approximately 6 km with the turbines located on top which amplifies the presence of the turbines within this locality. The cultural value surrounding the viewpoint is considered to be 25-40%.

Landscape Character	11	
Landscape Absorption	4	The visual effect of the development is screened to the north by vegetation on the ridgeline. To the south within closer proximity to the viewpoint the turbine array is partially screened by the ridge itself with the western most turbines concealed. The landscape absorption capacity is calculated to be 37%. Total pixels (972602) / Screening pixels (365736) = 37% (limited absorption).
Horizontal	3	The horizontal visual effect is created by turbines 42 and turbine 7 (northern cluster). The degree of visual effect is 267° to 321° which equates to 54° which is 45% of the horizontal field of view.
Vertical	2	The vertical visual effect is calculated as a proportionate change in visual effect with reference to the scale of the existing vertical landscape within the field of view, The existing landscape vertical scale is equated to be 282 m above the viewpoint elevation of 108 m at a distance of 6.514km. The vertical scale of the maximum turbine height to tip of blade (538m ASL) from the viewpoint is 430 m at a distance of 6.514km. The angle of view for the existing landscape is calculated to be 2.47° whereas the turbine with greatest elevation to tip of blade from this viewpoint creates an angle of 3.77°. The reciprocal of the turbine scale to existing landscape is the derived to be the proportionate vertical visual change. The proportionate vertical visual effect is 35% increase in effect.
Distance	4	The closest turbine visible to the viewpoint is 42 at a distance of 6.5 km

Visual Effect	13	
<i>Landscape visual change coefficient</i>	<i>0.65</i>	
Landscape visual effect		
11 x 0.65=7.15		
7.15/20 x 100	36%	

Assessment	Value	Description
<p>Visual Assessment: The visual effect experienced from this viewpoint and surrounding locality is described as moderate. Due to the relatively moderate landscape amenity value attributed to the agricultural landscape with limited areas of scenic value, the introduction of the turbines will have limited impact. The separation of the two distinctive clusters provides sufficient landscape absorption capacity whilst reducing the visual mass of the development array. The development is seen as a legible form with limited scope for further mitigation. From this viewpoint the development will not alter the underlying landscape visual character.</p>		

6.3 Viewpoint 2: West of Sedan on Banks Road (regional –east)

- 6.3.1 Viewpoint 2 is located on the outskirts of Sedan near to the Pilgrims of Zion Lutheran Church. The viewpoint is located on Banks Road and is typical of the visual character that will be experienced to the western edge of the township as well as from other locations in and around the Murray Plains to the northwest of the proposed wind farm site. The viewpoint is also typical of the potential visual effect that will be experienced from Sedan's oval and other public spaces within the town where views out of town towards the west are present.
- 6.3.2 The township itself is located further to the east and has an internalised road network with views onto the main street intersection. This settlement pattern is typical of towns within the local area with buildings facing onto the main street.
- 6.3.3 The viewpoint is defined by the low lying landscape of the Murray Plains and the defined visual envelope to the west of the Eastern Mount Lofty escarpment. The landscape character is predominantly agricultural. This is reinforced by the cropping and open fields that occur around the viewpoint with sporadic tree cover following cadastral boundaries and isolated creek lines that run across the landscape.
- 6.3.4 The rising topography of the Eastern Mount Lofty Ranges ridgeline forms the dominant visual character of the area, providing a defined visual envelope to the west. Local topographic features such as White Hill, Mons Hill, Sedan Hill and Sugarloaf Hill are not visible from the viewpoint. Instead the escarpment appears as a single undulating element, rather than a more defined serrated ridgeline punctuated with larger more identifiable landforms. This landscape form reinforces the horizontal character of the escarpment.
- 6.3.5 The rural land use character is reinforced by the field boundary patterns as well as storage areas for agricultural machinery, products and services. The land use and existing visual character reinforces the working or productive context of the land.

Visual Assessment

- 6.3.6 The visual effect of the turbines is experienced as two defined clusters. These clusters appear with similar visual prominence and notability in the landscape. The visual separation provided by the layout of the wind turbines fragments the development reducing the potential intensity of infrastructure within the landscape and enabling the underlying topography and landscape character to interrupt the visual effect of the wind farm.
- 6.3.7 Variation in the form and visual complexity of the wind farm will be created due to the location and siting of individual wind turbines in response to the underlying topography. These irregularities in layout reinforce the relationship of the turbines both physically (relative to their location) and visually to the surrounding landscape character.
- 6.3.8 Further to the south the lower elevation of the ridgeline and the increased intensity of vegetation surrounding the oval provide substantial screening of the development. This fragmentation of visual effect due to local vegetation is typical within the towns to the east of the proposed wind farm site as well as road corridors that run throughout the Murray Plains.



Figure 30 Viewpoint 2



Figure 31 Wire line Viewpoint 2



Figure 32 Absorption capacity calculations

Assessment	Value	Description
Relief	3	The topographic variance is limited within the foreground to mid ground comprising of low lying agricultural pastoral fields. The background is formed by the ridgeline Mount Lofty Ranges escarpment which defines the field of view and presents a moderate visual element not dissimilar to viewpoint 1.
Vegetation Coverage	2	The predominant vegetation coverage to the foreground is contained to the lower lying areas surrounding the outskirts of Sedan. Within the field of view the vegetation coverage is described as 20%
Infrastructure and Built Form	3	There is limited visual presence of existing infrastructure that contrasts with the predominant agricultural landscape. The presence of a transmission line, outskirts of the township and road corridor present a visual contrast of approximately 40%.
Cultural and Landscape Value	2	The cultural attachment or association of this view is considered slight reflecting the community consultation mapping and the likelihood of frequency of view being slightly more elevated due to its location on the outskirts of Sedan near the Church on a tertiary road. Due to the view not representing those witnessed within the township which is internalised, the cultural value is only slight. The cultural value is described as 20-30%.

Assessment	Value	Description
Landscape Character	10	
Landscape Absorption	4	<p>The visual effect of the development is predominantly to the north with limited vegetation and topographic screening. To the south the cluster is partially screened by the vegetation in the foreground/ mid-ground which surrounds the township of Sedan. The landscape absorption capacity is calculated to be 30%.</p> <p>Total pixels (1020375) / Screening pixels (313027) = 30% (limited absorption).</p>
Horizontal	4	The horizontal visual effect is created by turbines 40 and turbine 1. The degree of visual effect is 217° to 294° which equates to 77° which is 64% of the horizontal field of view.
Vertical	1	<p>The vertical visual effect is calculated as a proportionate change in visual effect with reference to the scale of the existing vertical landscape within the field of view, The existing landscape vertical scale is equated to be 369 m above the viewpoint elevation of 101 m at a distance of 8.477km. The vertical scale of the maximum turbine height to tip of blade (581m ASL) from the viewpoint is 480 m at a distance of 8.959km. The angle of view for the existing landscape is calculated to be 2.49° whereas the turbine with greatest elevation to tip of blade from this viewpoint creates an angle of 3.067°. The reciprocal of the turbine scale to existing landscape is the derived to be the proportionate vertical visual change.</p> <p>The proportionate vertical visual effect is 19% increase in effect</p>
Distance	3	The closest turbine visible to the viewpoint is No 21 at a distance of 8.4 km
Visual Effect	12	
<i>Landscape visual change coefficient</i>	<i>0.60</i>	
Landscape visual effect		
10 x 0.60 = 6		
6 / 20 x 100	30%	
<p>Visual Assessment: The visual effect from this viewpoint and surrounding locality is described as moderate. Due to the relatively moderate landscape amenity value associated with the agricultural landscape with limited unique scenic qualities, the visual integration of the turbines is suggested to have minimal impact. The ability of the landscape to absorb the southern cluster and the presence of the existing landscape vertical scale provides a proportionate reference to limit the degree of contrast in scale. Hence the existing landscape scale is sufficient to limit the overall presence of the turbines within the field of view. Hence from this viewpoint the development is seen to be within keeping of the underlying landscape visual character, no further mitigation is required.</p>		

6.4 Viewpoint 3: Towitta Road and Chain Road (regional – northeast)

- 6.4.1 Viewpoint 3 is located on the Towitta Road and represents the potential visual effects that will be experienced from the north eastern extent as a result of the proposed wind farm development. The location is also selected to demonstrate the potential visual effect that will be experienced along the Sturt Highway, approximately 16 kilometres further to the north.
- 6.4.2 The landscape character surrounding the viewpoint is predominantly agricultural with large areas of grazing and arable cropping. To the north east are areas of Mallee scrub and pockets of native vegetation that increase in frequency, providing a more fragmented visual character. While these pockets of vegetation provide more significant areas of screening, the landscape character remains open with panoramic views between the vegetation groups across a low-lying landscape.
- 6.4.3 The rising topography of the escarpment continues to define the visual envelope to the west creating a dominant visible landscape element.
- 6.4.4 The denuded landscape character of the escarpment typical of the landscape to the south of Sedan Hill, changes to the north with areas of remnant vegetation, particularly along creek lines and valleys extending east/west across the escarpment and plains. This provides a patchwork visual quality, increasing the texture, amenity and colouration of the escarpment as well as introducing visual concepts such as naturalness and increased levels of scenic amenity.
- 6.4.5 Of note is the prominence of Sugarloaf Hill which forms a notable visual feature on the ridgeline of the escarpment. This enhances the topographic variation, adding to the visual diversity of the landscape from Viewpoint 3. To the south, the escarpment remains a single linear feature with some land form variations but uniform in land cover and visual character.
- 6.4.6 A number of existing infrastructure elements produces a series of visual effects including the introduction of road corridors across the escarpment, pipelines and transmission lines. The introduction of these elements offsets slightly the amenity provided by the introduction of vegetation across the escarpment to the north.
- 6.4.7 The water pipeline provides a distinct division between these two landscape character zones.

Visual Assessment

- 6.4.8 The low lying landscape of the Murray Plains surrounds Viewpoint 3 with numerous local ridgelines and vegetation belts along roads, creek lines and fields creating a fragmented visual character. Larger panoramic views occur occasionally but are frequently screened by local roadside vegetation and ridgelines. This dynamic visual landscape fragments views, which in turn reduces the extent of visual effect that occurs within the landscape.
- 6.4.9 The ZTVI illustrates that from the Murray Plains the majority of the turbines are visible throughout the landscape. However, this visibility is mitigated by local landforms and vegetation, which provide screening and framing of views. Consequently, the visibility of the wind farm will be mitigated to a certain degree by the existing landscape character of the Murray Plains.
- 6.4.10 The wind farm will be visible as a series of vertical pieces of infrastructure that traverse the undulating horizon line of the escarpment. The wind turbines will be positioned in a relatively uniform cluster along the ridgeline.
- 6.4.11 The wind farm is visible as two distinct clusters that The separation between the two clusters of approximately 5.25 km reduces the potential visual impact that would occur if a continuous development was located along the top of the ridgeline. The visual separation provided by the proposed layout appears to reflect the breaks that occur in the vegetation topography and landforms of the region.
- 6.4.12 To the south, the turbine cluster represented by turbines 23 to 42 is seen as a group of more distantly located objects extending away from the viewpoint up to a distance of 20 kilometres. At this distance

06 Visual Effect Assessment

local vegetation belts provide substantial screening of the turbines and the southern cluster is seen as a background element partially screened.



Figure 33 Viewpoint 3

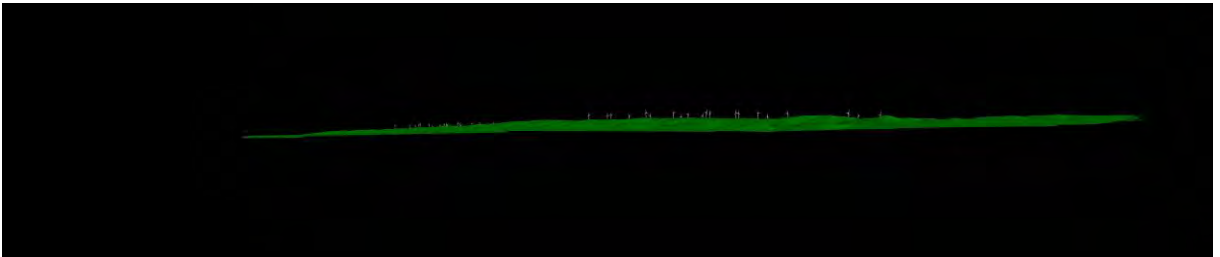


Figure 34 Wire line Viewpoint 3

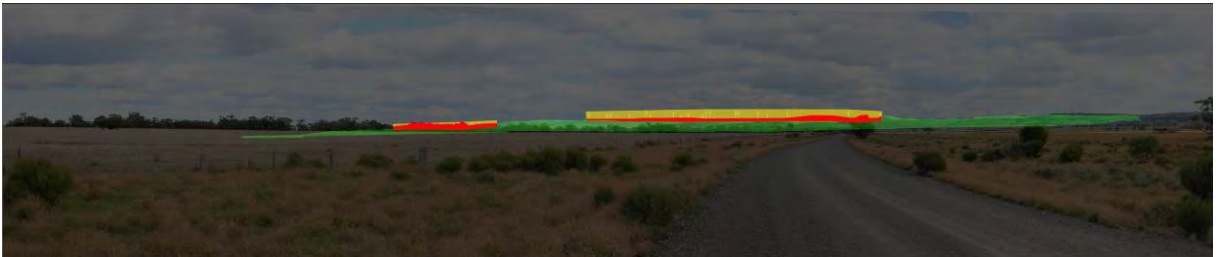


Figure 35 Absorption capacity calculations

Assessment	Value	Description
Relief	2	The foreground and mid-ground have limited to no variation in topography which pronounces the Eastern Mount Lofty Ranges ridgeline also defining the field of view. However due to the distance from the ridgeline the perceived change in elevation is only moderate.
Vegetation Coverage	2	The presence of vegetation, associated with Red Creek and various other localised drainage lines that traverse perpendicular to the ridgeline, enhances the visual amenity within the mid ground. The foreground is predominantly cleared land whilst the background ridgeline is predominantly denuded of vegetation. Consequently the extent of vegetation is described as 25-30%
Infrastructure and Built Form	4	Within the field of view there is limited visual effect of built form infrastructure. The presence of a pipeline which is relatively low lying still provides a stark contrast due to the colouration and linear nature of this form. In addition the presence of a transmission line also has a pronounced effect however is isolated to the towers which seem to be

Assessment	Value	Description
		subdued against the sky.
Cultural and Landscape Value	1	Consideration of the cognitive mapping conducted as part of the community engagement has informed that there is little cultural association or value placed on this local area.
Landscape Character	9	
Landscape Absorption	3	<p>To the south the cluster is predominantly screened by vegetation in the mid ground. In addition the eastern edge of the ridgeline's higher topography provides some mitigation/screening of the most western side of the northern cluster reducing the number of visible turbines. However due to the pronounced vertical scale of the leading eastern edge array of turbines, there is limited absorption capacity to the northern cluster. The landscape absorption capacity is calculated to be 40% (moderate).</p> <p>Total pixels (705885) / Screening pixels (280858) = 40% (limited absorption).</p>
Horizontal	2	The horizontal visual effect is created by turbines 23 and turbine 2. The degree of visual effect is 196° to 235° which equates to 39° which is 33% of the horizontal field of view.
Vertical	1	<p>The vertical visual effect is calculated as a proportionate change in visual effect with reference to the scale of the existing vertical landscape within the field of view, The existing landscape vertical scale is equated to be 302 m above the viewpoint elevation of 101 m at a distance of 7.517km. The vertical scale of the maximum turbine height to tip of blade (590m ASL) from the viewpoint is 462 m at a distance of 2.67km. The angle of view for the existing landscape is calculated to be 2.3° whereas the turbine with greatest elevation to tip of blade from this viewpoint creates an angle of 2.67°. The reciprocal of the turbine scale to existing landscape is the derived to be the proportionate vertical visual change.</p> <p>The proportionate vertical visual effect is a 14% increase.</p>
Distance	3	The closest turbine visible to the viewpoint is turbine 1 at a distance of 8.5 km.
Visual Effect	9	
<i>Landscape visual change coefficient</i>	<i>0.45</i>	
0.45 x 9 = 4.05		
4.05/20 x 100 =	20%	

Visual Assessment: The visual effect from this viewpoint and surrounding locality is described as slight to moderate. Due to the relatively moderate landscape amenity value associated with the agricultural landscape, coupled with the mid ground vegetation associated with Red Creek, there will be proportional integration of the turbines from this perspective. On the other hand the northern cluster will be visually

Assessment	Value	Description
		prominent, but with limited visual layering of turbines. This enhances legibility, enabling comprehension of the development, reducing the overall visual mass and complexity, which is beneficial to the preservation of the underlying landscape visual character. No further mitigation is required.

6.5 Viewpoint 4: South of Henschke Winery on the Eden Valley-Moculta Road (sub-regional – northwest)

- 6.5.1 Viewpoint 4 is located adjacent to the Henschke Winery on the Eden Valley-Moculta Road. The viewpoint, approximately 400m south of the Winery's entrance, represents the visual effect that will potentially be experienced when travelling to or this tourist destination and within scenic landscape character on the eastern edge of the Barossa Valley, subject to topographic and vegetation variance which fragments and screens the majority of views towards the development site. Views from the Henschke cellar door itself will be substantially screened by topography and vegetation.
- 6.5.2 The viewpoint is dominated by vineyards and extensive belts of vegetation associated with the transition landscape between the rural woodland of the Eastern Mount Lofty Ranges and the denuded agricultural landscape of the Eastern Mount Lofty Ranges escarpment. The surrounding visual character is defined by a series of prominent ridgelines that restrict long distance views to the east. This visual enclosure is reinforced by extensive belts of vegetation that exist throughout the landscape. The combination of vineyards and Eucalypt woodlands provide significant degrees of visual amenity and scenic value. The existing visual character has a strong productive quality with a defined natural edge formed by the existing vegetation.
- 6.5.3 From the viewpoint and surrounding areas to the northwest the landscape and visual character appears as a patchwork of landscapes essentially rural in character but possessing higher degrees of visual amenity in relation to vegetation cover and the cultural and tourist associations of the vineyard.
- 6.5.4 The visual effect experienced from viewpoint 4 is typical of the degree of visual change that will be experienced from various locations throughout the east edge of the Eastern Mount Lofty Ranges.

Visual Assessment

- 6.5.5 The development of the proposed wind farm will introduce a series of new large vertical elements within the landscape that do not reflect either the rural or the natural characteristics of the landscape from this viewpoint. In this regard, the visual effect will be more prominent than from other viewpoints where the existence of existing infrastructure such as the transmission line impacts on the existing visual character of the landscape.
- 6.5.6 Within the view wind turbines 2, 3, 4, 5 and 9 will be visually prominent, seen as large pieces of infrastructure within the landscape located just over 2 kilometres east of the viewpoint. However while appearing prominent, their spacing and distribution across the ridgeline does not create adverse visual clutter in terms of the overlapping of the wind turbines and the turbines will be seen as identifiable elements prominent but legible within the landscape.
- 6.5.7 The capacity of the landscape to absorb the turbines increases to the north and south with turbines 23 to 42 being completely screened by local vegetation and other wind turbines appearing more recessive, fragmented or screened by adjacent vegetation and land form.
- 6.5.8 The southern cluster is completely screened by local land forms and vegetation which mitigates the visual effect of the entire wind farm creating a segmentation of the visual effect.
- 6.5.9 Rather than being clearly visible within the landscape from a variety of locations, the individual clusters appear fragmented and dissected, depending on the viewpoint. Areas to the north, northeast and northwest are affected by the northern wind turbine cluster with this visual effect being decreased in the south.

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6.5.10 The degree of visual amenity surrounding the viewpoint appears more significant when compared with the agricultural landscapes region due to the presence of vineyards, belts of remnant vegetation and tourist value of the landscape sub regional area. The local viewpoint is considered as being attractive rather than having significant degrees of outstanding natural beauty, ruggedness or naturalness. Although, the introduction of the wind turbines provides a substantial degree of visual change, the visual contrast is lessened by the landscape modified qualities of the vineyard, when compared to a natural landscape.



Figure 36 Viewpoint 4



Figure 37 Wire line Viewpoint 4



Figure 38 Absorption capacity calculations

Assessment	Value	Description
Relief	4	The complexity and variance in topography is more profound in this locality with undulation and layered ridgelines creating a depth of field. The topographic relief is described as moderate.
Vegetation Coverage	4	The viewpoint is dominated by vegetation with vines in the foreground and Eucalypt woodland in the mid ground and background. The vegetation coverage is described as 60-65%
Infrastructure and Built Form	2	The vineyards create a managed regimented development form which contrasts with the natural character and patterning of native vegetation. Consequently this is assessed to be a form of infrastructure or built form to which a small value of impact is valued. In addition the locality has the Henschke winery and associated infrastructure.

Assessment	Value	Description
Cultural and Landscape Value	4	The relationship of the Henschke winery, its vineyards, cellar door and processing plant has cultural attachment to the Barossa Valley and the wine making region. This cultural value is valued greatly both locally and nationally with tourism of international stature.
Landscape Character	14	
Landscape Absorption	3	<p>The extensive vegetation surrounding the viewpoint provides absorption and integration of the development to some degree. However due to the close proximity and vertical scale of the development there will be only moderate capacity to reduce the wind farm presence. The landscape absorption capacity is calculated to be 40% moderate.</p> <p>Total pixels (3471746) / Screening pixels (1376120) = 40% (limited absorption).</p>
Horizontal	3	The horizontal visual effect is created by turbines 15 and turbine 2. The degree of visual effect is 120° to 71° which equates to 49° which is 40% of the horizontal field of view.
Vertical	4	<p>The vertical visual effect is calculated as a proportionate change in visual effect with reference to the scale of the existing vertical landscape within the field of view. The existing landscape vertical scale is equated to be 21 m above the viewpoint elevation of 399m at a distance of 1.038km. The vertical scale of the maximum turbine height to tip of blade (562m ASL) from the viewpoint is 163 m at a distance of 2.473km. The angle of view for the existing landscape is calculated to be 1.16° whereas the turbine with greatest elevation to tip of blade from this viewpoint creates an angle of 3.77°. The reciprocal of the turbine scale to existing landscape is the derived to be the proportionate vertical visual change.</p> <p>The proportionate vertical visual effect is 69% increase in effect.</p>
Distance	5	The closest turbine visible to the viewpoint is turbine 5 at a distance of 2.3 km
Visual Effect	15	
<i>Landscape visual change coefficient</i>	<i>0.75</i>	
$0.75 \times 14 = 10.5$		
$10.5/20 =$	53%	
<p>Visual Assessment: The visual effect from this viewpoint is described as substantial. Due to the close proximity and visual sky lining of the turbines the degree of contrast is accentuated with reduced scope to integrate the development to the existing landscape character. However the extent of this experience is confined to a small section of the road leading to the Henschke winery from the south, with the winery itself internalised with cadastral planting limiting views to the east towards the proposed wind farm. Consequently the degree of visual presence of the wind farm within this sub regional locality can be</p>		

Assessment	Value	Description
		argued to be at worst substantial with the majority of potential visual effects moderate to slight due to extensive vegetation screening limiting potential views of the proposed development

6.6 Viewpoint 5: Sedan Hill Road between Angaston and Sedan (sub-regional –west)

- 6.6.1 Viewpoint 5 is located on Sedan Hill Road between Angaston and Sedan. The location was selected due to the prominence of the main arterial road as well as the local properties that exist in and around Ram's Head Corner which is approximately 300 metres to the south east of the viewpoint. The viewpoint is representative of the visual effect that will be experienced within the sub-regional area to the west and from main roads and other dwellings within the locality.
- 6.6.2 The viewpoint is dominated by the rural land use with significant areas of grazing extending across the undulating topography of the landscape. More elevated ridgelines contain extensive vegetation which provides increased degrees of amenity to the ridgeline. The landscape character is typical of the sub-regional area to the west of the proposed development with open paddocks punctuated and contained by extensive belts of vegetation. The viewpoint represents the visual effect that will be experienced within the transitional landscape character between the Eastern Mount Lofty Ranges and Eastern Mount Lofty Ranges Plateau.

Visual Assessment

- 6.6.3 The visual effect of the proposed development will be significantly fragmented by the existing vegetation and surrounding topography. While a number of wind turbines from the northern cluster of the wind farm will be visually prominent within the landscape; a larger number of turbines remain screened by the existing landscape. This is particularly true of the southern cluster which is completely screened by existing vegetation.
- 6.6.4 Within the view 22 wind turbines will be visible however their visual impact is limited by the surrounding topography and vegetation and perspective of view as experienced by moving through the landscape in this sub regional area. While individual turbines such as 19, 20, 21 and 22 will be visually prominent, the screening provided by the existing vegetation significantly mitigates the visual effect of the proposed wind farm. When moving through the landscape wind turbines will appear and disappear with the visual effect continually altering depending on the viewpoint, the viewer location and the visual fragmentation created by topography and vegetation.
- 6.6.5 Travelling north between Keyneton and Henschke Winery, the visual effect that is experienced is similar to Viewpoint 5. The northern cluster remains the dominant visual element with the southern cluster screened from view except for elevated locations where glimpsed views may occur.



Figure 39 Viewpoint 5

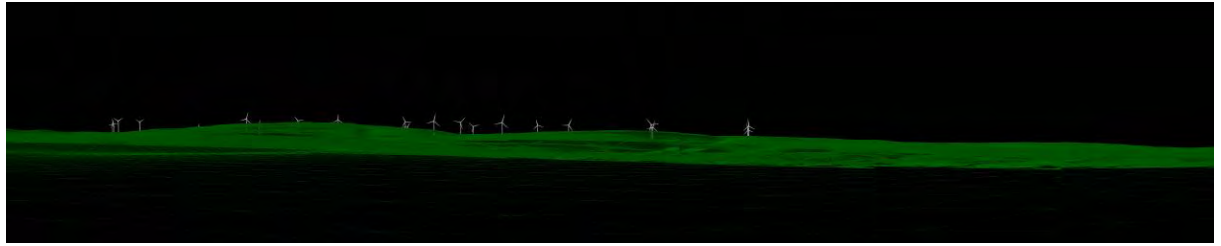


Figure 40 Wire line Viewpoint 5

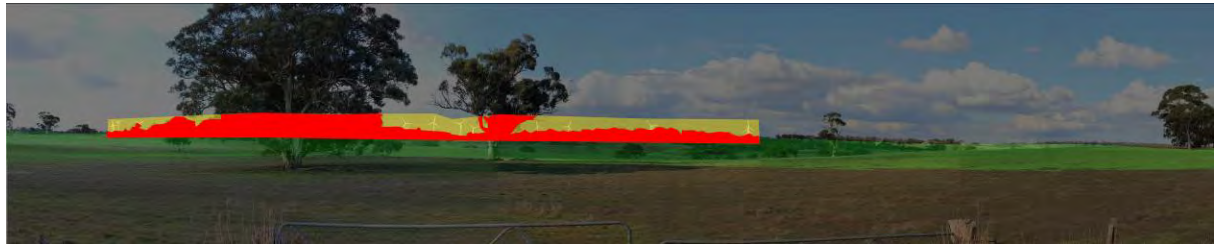


Figure 41 Absorption capacity calculations

Assessment	Value	Description
Relief	3	The topography has limited low lying rolling undulations to the foreground with moderate elevation to the mid ground and background. This pattern and variation in topography provides a layered visual effect which provides a defined depth of field to the view.
Vegetation Coverage	2	Vegetation pattern and extent is isolated to woodland plantings with understory comprising agricultural land use. The remnant Eucalypts in the foreground provide a pronounced vertical scale to the view and enhance the visual character.
Infrastructure and Built Form	4	There is limited presence of infrastructure built form within the field of view. This is isolated to fencing and glimpses of dwellings behind shelter belt plantings
Cultural and Landscape Value	1	With reference to the community engagement process there was little concern or association of landscape amenity in this sub regional area. Furthermore the majority of experiences of this perspective will be transient limiting the significance of any change to cultural associations of place.
Landscape Character	10	
Landscape Absorption	2	<p>The foreground vegetation surrounding the viewpoint provides absorption and integration of the development. The scale of the isolated Eucalypts will limit the visibility of the development. The landscape absorption capacity is calculated to be 61% which is described as increasing capacity</p> <p>Total pixels (2565804) / Screening pixels (1667795) = 65%</p>

Assessment	Value	Description
Horizontal	3	The horizontal visual effect is created by turbines 2 and turbine 21. The degree of visual effect is 13° to 74° which equates to 61° which is 51% of the horizontal field of view.
Vertical	3	The vertical visual effect is calculated as a proportionate change in visual effect with reference to the scale of the existing vertical landscape within the field of view, The existing landscape vertical scale is equated to be 57.5 m above the viewpoint elevation of 372.5 m at a distance of 1.985km. The vertical scale of the maximum turbine height to tip of blade (580m ASL) from the viewpoint is 207.5m at a distance of 4.235km. The angle of view for the existing landscape is calculated to be 1.66° whereas the turbine with greatest elevation to tip of blade from this viewpoint creates an angle of 2.81°. The reciprocal of the turbine scale to existing landscape is derived to be the proportionate vertical visual change. The proportionate vertical visual effect is a 41% increase.
Distance	5	The closest turbine visible to the viewpoint is turbine16 at a distance of 3.6 km
Visual Effect	13	
<i>Landscape visual change coefficient</i>	<i>0.65</i>	
$10 \times 0.65 = 6.5$		
$6.5/20 \times 100 =$	33%	
<p>Visual Assessment: The visual effect is described as moderate from this perspective. Due to the separation of the northern and southern cluster, there will be no view of the southern cluster which is screened behind vegetation and the local ridgeline. Hence the degree of visual change is limited to the northern cluster, which is also fragmented, with glimpsed views through vegetation canopies. From this local to sub regional area there is limited scope or need for additional mitigation.</p>		

6.7 Viewpoint 6: Intersection of Jutland Road and Rhine Park Road (sub-regional – southwest)

- 6.7.1 Viewpoint 6 is located at the intersection of Jutland Road and Rhine Park Road. The viewpoint has been selected to demonstrate the potential visual effect that will occur to the southwest particularly in relation to Keynes Gap, properties along Jutland Road and the surrounding agricultural landscape. While it is recognised that the more elevated views from Keynes Gap will increase the potential visual effect from that location, the context and likely character of this effect will be similar from the more accessible road network represented by Viewpoint 6.
- 6.7.2 The landscape character surrounding the viewpoint is predominantly agricultural representing the transitional zone between the undulating rural landscape to the west and the denuded grazed plateau of the Eastern Mount Lofty Ranges. The landscape is punctuated by isolated eucalypts and more distant belts of vegetation set amongst a defined field structure of grazing land. The extent of vegetation cover creates a fragmented visual context with isolated vegetation screens occurring sporadically within the wider landscape.

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- 6.7.3 The topography surrounding the viewpoint undulates, rising significantly to the east and west in response to Keynes Gap and the eastern edge of the Mount Lofty Ranges escarpment. The viewpoint itself is located in the lower lying basin that is formed between these two landforms.
- 6.7.4 The rocky ridgeline which defines Keynes Gap provides significant visual screening of the proposed development within the lower lying valley east of viewpoint 6.
- 6.7.5 The existing transmission line along the Eastern Mount Lofty Ranges ridgeline is visible as a prominent infrastructure element that traverses across the viewpoint and wider landscape character. This reinforces the productive characteristics of the agricultural landscape.

Visual Assessment

- 6.7.6 The turbines will be visible as two defined clusters to the north and south. The individual turbines appear visually fragmented within the landscape due to the presence of large trees and belts of vegetation. This represents the typical visual effect that will occur as individual turbines appear and disappear behind local landforms and trees.
- 6.7.7 The visual impact would be created by a small number of turbines within the landscape and the wind farm is not seen as a large collection of infrastructure elements traversing the horizon line, rather as distinct clusters of several turbines interspersed with vegetation and topography. Turbine cluster (21 to 5) is seen further to the north and becomes a recessive element partially screened by local vegetation with limited visual impact when compared against the southern turbines closer to the viewpoint as well as the height and scale of the transmission line which is seen as another visual element to the north.
- 6.7.8 The existing transmission line is located between the two proposed turbine clusters and where visible produces a visual effect that connects the two groups of turbines to create a continuous view of infrastructure across the landscape.
- 6.7.9 The visual effect produced by the proposed development results in two distinct visual characteristics. The southern cluster associated with turbines 23 to 42 are seen as a collection of prominent visual elements within the landscape. To the north are turbines 1 to 22 which form a second more distant cluster of turbines which are linked by the visual presence of the existing transmission line.
- 6.7.10 As described, the southern cluster appears visually prominent from the location and surrounding landscape. Turbines 27, 28, 31, 34, 33, 42 and 41 will appear as prominent visual elements surrounded by other large vertical pieces of infrastructure. While the existence of large belts of vegetation provide significant mitigation, the vertical height of the turbines means that turbine hubs and blades will be visible above the trees and surrounding topography. Although prominent, the landscape does provide significant absorption and this continues throughout the landscape as local ridgelines and large trees provide intermittent screening of the turbine cluster.
- 6.7.11 By contrast the northern cluster is seen as distant visual elements. While their vertical scale can be recognised within the landscape, the visual effect of the existing transmission line within the fore and mid-ground helps to offset the visual prominence. Individual trees in the foreground and local topographic features will also be able to provide screening, fragmenting the visual effect further and reducing wind farms overall impact.
- 6.7.12 Further to the north and south along Jutland Road the visual effect of the turbines diminishes due to the separation between the turbine clusters and the local ridgelines that increase in frequency and elevation to provide a screen or partial screening of the turbines. It is recognised that the turbines will be seen within the landscape however the visual effect will result from isolated elements or glimpsed views of parts of the turbine rather than a larger, more prominent, visual cluster resulting from a significant number of turbines within the landscape.



Figure 42 Viewpoint 6



Figure 43 Wire line Viewpoint 6



Figure 44 Absorption capacity calculations

Assessment	Value	Description
Relief	3	The variance in topography is limited to the foreground and mid ground with more defined changes in elevation associated with the Eastern Mount Lofty Ranges in the background.
Vegetation Coverage	2	The vegetation coverage and patterning is sporadic with clusters of vegetation in the foreground, mid ground and background. This coverage provides relief to the lower lying agricultural fields and surrounds the periphery of residential properties.
Infrastructure and Built Form	4	There is limited presence of built form, with exceptions being the residential property in the foreground which is surrounded by vegetation and the existing transmission line which runs perpendicular to the view.
Cultural and Landscape Value	3	With reference to the community engagement process this viewpoint is adjacent to Keynes Gap which has local cultural amenity value.
Landscape Character	12	
Landscape Absorption	2	The foreground vegetation surrounding the viewpoint provides absorption and integration of the development. The density and scale of Eucalypts to the mid ground limits the visibility of the development. The

Assessment	Value	Description
		landscape absorption capacity is calculated to be 62% which is described as substantial. Total pixels (2960231) / Screening pixels (1832844) = 62%
Horizontal	4	The horizontal visual effect is created by turbines 20 and turbine 41. The degree of visual effect is 15° to 95° which equates to 80° which is 67% of the horizontal field of view.
Vertical	4	The vertical visual effect is calculated as a proportionate change in visual effect with reference to the scale of the existing vertical landscape within the field of view, The existing landscape vertical scale is equated to be 52 m above the viewpoint elevation of 338 m at a distance of 2.791km. The vertical scale of the maximum turbine height to tip of blade (543.9m ASL) from the viewpoint is 205.9 m at a distance of 3.685km. The angle of view for the existing landscape is calculated to be 1.18° whereas the turbine with greatest elevation to tip of blade from this viewpoint creates an angle of 3.55°. The reciprocal of the turbine scale to existing landscape is derived to be the proportionate vertical visual change. The proportionate vertical visual effect is a 67% increase.
Distance	5	The closest turbine visible to the viewpoint is turbine 28 at 3 km.
Visual Effect	15	
Landscape visual change coefficient	0.75	
$12 \times 0.75 = 9$		
$9 / 20 \times 100 =$		
45%		

Visual Assessment: The visual effect experienced from this viewpoint is described as substantial. The proximity and vertical scale of the turbines as pronounced visual elements defines the view. However the vegetation coverage in this area is able to fragment the visual presence of the development which will provide differing views of the southern cluster. Similar to viewpoint 4 the separation of the two clusters, and predominate screening of the northern cluster, enables the landscape to absorb and mitigate the extent and degree of visual change and thus retain the underlying landscape character. Importantly views will not be seen from the western side of the ridge that defines Keynes Gap. No further mitigation treatments are required from this viewpoint.

6.8 Viewpoint 7: Eden Valley Scenic Lookout (regional – southwest)

- 6.8.1 Viewpoint 7 is located at the Eden Valley Scenic Lookout. The viewpoint represents a well-known tourist destination for both locals and regionally within South Australia. The viewpoint provides almost 270 degree views of the Eden Valley to the west, south and east. To the south and east views extend across the rural landscape of the Barossa Valley characterised by local undulating topography and well-vegetated landscape, as well as prominent rocky outcrops and ridgelines (associated Keynes Gap). Further to the backdrop of this view is the more distant undulating horizon line of the Eastern Mount Lofty Ranges escarpment. The lookout is also located on the Lavender Federation Walking Trail (which connects Murray Bridge to Truro).

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6.8.2 The panoramic qualities of the viewpoint provide numerous opportunities from which to see a diverse range of landscapes ranging from well-vegetated areas of remnant vegetation, across vineyards, grazed pastures and distant ridgelines. The landscape character is punctuated by settlements, church spires and buildings. This combination of elements creates an attractive landscape setting which reinforces the significance of the viewpoint.

6.8.3 The Eden Valley scenic lookout provides a vantage point from which to see the southern cluster of the proposed wind farm.

Visual Assessment

6.8.4 Viewpoint 7 is located at the Eden Valley Scenic Lookout. This location is a recognised community viewpoint in relation to its elevated aspect and panoramic qualities. The viewpoint provides almost 270 degree views of the surrounding landscape character and provides opportunities to understand the context of the regional character in relation to the rolling rural and vegetated landscapes to the west, the significance of the Eden Valley area to the south and the rugged and denuded landscape character of Keynes Gap and the Eastern Mount Lofty Ranges escarpment to the east. To the north views are more enclosed due to local topographic variations however this visual character rapidly changes as the topography decreases in height, providing panoramic views to the south and east.

6.8.5 From the viewpoint a total of 19 turbines (representing the southern cluster) are visible. These turbines form a continuous visual element within the landscape extending across the Eastern Mount Lofty Ranges Plateau that is located beyond the rock formations of Keynes Gap.

6.8.6 The introduction of the turbines has the potential to alter the perceived natural qualities of the Keynes Gap rocky outcrops to the east. While the topography and geology expressed by Keynes Gap remains a prominent landscape feature, the existing visual context will be altered and the sense of naturalness that the rock formations currently express will be altered by the introduction of large pieces of infrastructure in the landscape.

6.8.7 Whilst this alteration increases the potential visual effect, the scale and character of the topography is not physically altered, rather the visual contrast between the natural forms of Keynes Gap and the introduced form of the wind turbines increases. In addition, the wind turbines will not be seen as a visual elements located above the rocky outcrops of Keynes Gap. Instead they are positioned slightly to the northeast from this viewpoint which assists in mitigating the degree of potential visual contrast.

6.8.8 The visual modification of the landscape character associated with Keynes Gap must also be considered within the wider context of the panoramic views that are experienced from Viewpoint 7. The views continue to the south, west and north and these areas remain unaffected. Also the screening provided by the undulating land forms and extensive vegetation screens the potential visual effect of the northern wind turbine cluster represented by Turbines 1 to 21.

6.8.9 The relationship of topography and wind turbine layout has the potential to effectively halve the visual effect that would be experienced if the entire wind farm was visible.

6.8.10 At a distance of over eight kilometres from the wind farm, the wind turbines will be seen as distant visual elements within the landscape. While the vertical scale and spread across the edge of the Eastern Mount Lofty Ranges Plateau will be prominent within the landscape and, particularly due to the orientation of the viewpoint directly towards the turbines, the wider panoramic quality of the landscape does provide a degree of mitigation in relation to the open visual character of the viewpoint.



Figure 45 Viewpoint 7



Figure 46 Wire line Viewpoint 7

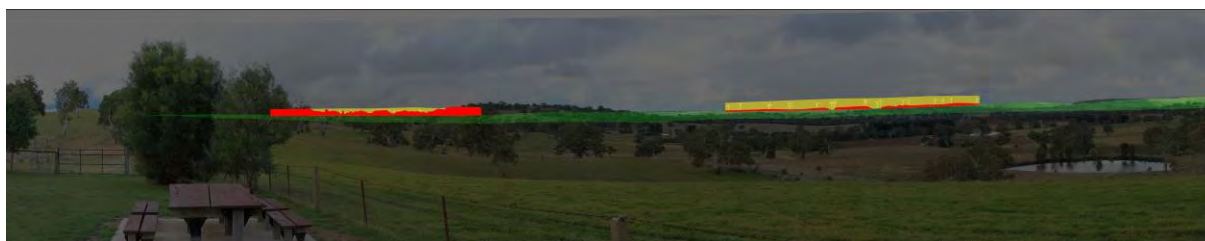


Figure 47 Absorption capacity calculations

Assessment	Value	Description
Relief	4	Form this elevated scenic lookout the variance in topography is one of the main qualities and amenities. The scale of the variance is described as moderate within the local, sub regional and regional. landscape context
Vegetation Coverage	3	The amount of vegetation is significant to the lower lying foreground and mid ground with vines, coupled with areas of remnant vegetation around Eden Valley.
Infrastructure and Built Form	3	Eden Valley township itself provides a visual presence of built form infrastructure to the south of the viewpoint/lookout as well as the agricultural growing vineyards which have a defined regimented patterning to the foreground.
Cultural and Landscape Value	4	With reference to the community engagement process this viewpoint and sub regional areas has high cultural values. Eden Valley has picturesque qualities as a local and tourist experience.
Landscape Character	14	

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Assessment	Value	Description
Landscape Absorption	4	<p>The localised ridgelines and their remnant vegetation to the mid ground north east absorb the vast majority of the northern cluster of the development. In addition there is some vegetation and topographic screening of the southern cluster however this is minor. The landscape absorption capacity is calculated to be 39%</p> <p>Total pixels (707025) / Screening pixels (272957) = 39%</p>
Horizontal	3	The horizontal visual effect is created by turbines 6 and turbine 41. The degree of visual effect is 29° to 93° which equates to 64° which is 53% of the horizontal field of view
Vertical	1	<p>The vertical visual effect is calculated as a proportionate visual effect with reference to the scale of the existing vertical landscape within the field of view. The viewpoint elevation is 482 m. The existing landscape vertical scale is equated to be 18m above the viewpoint elevation and 52 below at a distance of 1.935km. The vertical scale of the maximum turbine height to tip of blade from the viewpoint is 56.1m above the horizontal viewpoint elevation at a distance of 10.869km in addition to the variance below the viewpoint of 18m at a distance of 1.935km. The angle of view for the existing landscape is calculated to be 2.07° whereas the turbine with greatest elevation to tip of blade (538.1m ASL) from this viewpoint creates an angle of 1.83°.</p> <p>The proportionate vertical visual effect is 88% of the existing vertical scale or 12% less than the existing vertical scale.</p>
Distance	3	The closest turbine visible to the viewpoint is turbine 28 at a distance of 8.6 km.
Visual Effect	11	
<i>Landscape visual change coefficient</i>	<i>0.55</i>	
$14 \times 0.55 = 7.7$		
$7.7/20 \times 100 =$	39%	

Visual Assessment: Due to the distance of the visual effect being sub regional to regional the visual change to the landscape is considered to be moderate. The orientation of the view which is affected by the development is confined and does not overlay the backdrop of the high scenic qualities of the township of Eden Valley or Keynes Gap which are further to the south and south-east. Hence there is limited scope or need for further mitigation.

6.9 Viewpoint 8: River Marne Campground (regional – southeast)

- 6.9.1 The River Marne and campground is a viewpoint location that was identified by the community as having significant value and thus specifically included in this assessment. This value relates to scenic and natural qualities of the River Marne as well as the recreational opportunities provided by the river corridor and associated facilities.
- 6.9.2 The landscape character of the river corridor is defined by significant belts of vegetation consisting of mature eucalypts. The river is one of only a handful that runs west-east from the Mount Lofty Ranges. The incised and eroded character of the river corridor as it traverses through the Eastern Mount Lofty Ranges creates significant areas of scenic value that is recognised by the community.
- 6.9.3 The landscape character surrounding the river remains agricultural to the north and south with large areas of cropping, grazing, as well as specific land use operations such as turf cultivation and horticulture. These land uses are contrasted by the natural characteristics of the River Marne.
- 6.9.4 The topography and scenic value increases to the west where the river traverses the topography of the escarpment flowing east from the Mount Lofty Ranges. The incised landforms of the river create a defined visual enclosure. This visual enclosure is contrasted by the open and panoramic qualities that occur to the surrounding ridgelines and edges of the river corridor.
- 6.9.5 While the river represents a natural corridor within the landscape, its natural characteristics remain isolated, contrasting the surrounding agricultural land uses. Although these surrounding land uses do not significantly detract from the landscape character, neither do they enhance the amenity, context or scenic value of the landscape.

Visual Assessment

- 6.9.6 The introduction of the turbines will result in large infrastructure elements being seen within the context of the natural floodplain and river corridor of the Marne River. The height and scale of the existing eucalypts are seen as large visual elements dominating the foothills of the escarpment. The rising vertical form and incised nature of the Marne River corridor adds to the ruggedness and visual amenity of the area. However, this steep relief and the mature eucalypts also limit the visibility of the turbines from locations in the Marne River corridor.
- 6.9.7 The separation of the turbines to the north and the revised design layout which excludes initially proposed turbines (ie within the 57 turbine layout) closer to the south has in effect reduced the degree of visual contrast between the natural qualities of the river corridor and modified landscapes of agricultural and wind farm development. Ultimately, the visual effect of the development will be seen in a similar context as the agricultural land use and not an overlay of the scenic quality associated to the river corridor.



Figure 48 Viewpoint 8

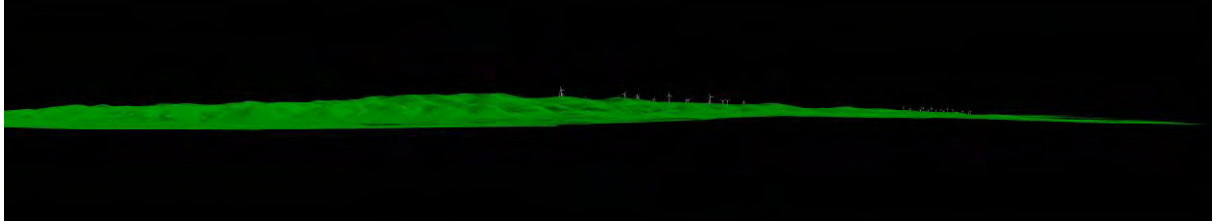


Figure 49 Wire line Viewpoint 8

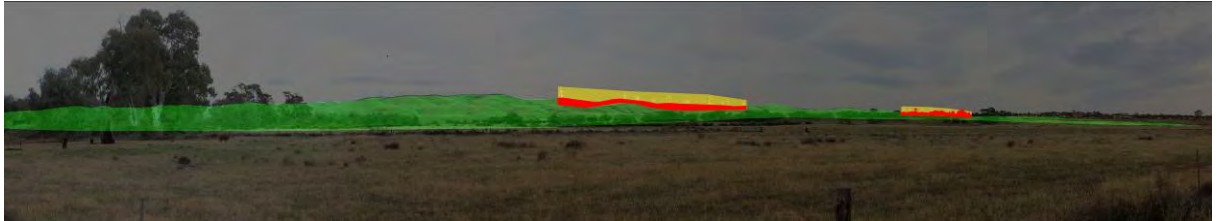


Figure 50 Absorption capacity calculations

Assessment	Value	Description
Relief	4	The vertical scale of the ridgeline to the mid ground is substantial defining the extent of the field of view. This is enhanced by the limited variation to the foreground comprising of agricultural paddocks.
Vegetation Coverage	2	To the south of the view and eastern side of the Marne River the extent of vegetation is substantial. This remnant vegetation follows the Marne River corridor dissecting the lower lying valley agricultural landscape. It is a significant belt of vegetation that enhances the local amenity value. The views towards the development and north of the Marne River are denuded of vegetation. Hence the vegetation coverage is considered to be 35%
Infrastructure and Built Form	4	Adjacent to the view is a school campsite which comprises of small buildings for accommodation which are surrounded by vegetation. In addition the view is occupied by small outbuildings associated to farming and the existing transmission line which traverses along the ridgeline. The effect of these built elements is minimal.
Cultural and Landscape Value	4	With reference to the community engagement process this subregional area has significant cultural value associated with the scenic quality of the Marne River.

Landscape Character

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Landscape Absorption	4	<p>From this viewpoint there is limited capacity for the landscape to absorb the development, with the leading eastern edge of the turbine array being elevated on the defined horizon edge. However the other hand the western side of the turbine array is to a degree screened by the ridgeline's eastern extent. The landscape absorption capacity is calculated to be 39%</p> <p>Total pixels (662105) / Screening pixels (257053) = 39%</p>
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Assessment	Value	Description
Horizontal	2	The horizontal visual effect is created by turbines 42 and turbine 7. The degree of visual effect is 282° to 326° which equates to 44° which is 36% of the horizontal field of view
Vertical	2	<p>The vertical visual effect is calculated as a proportionate visual effect with reference to the scale of the existing vertical landscape within the field of view. The existing landscape vertical scale is equated to be 257 m above the viewpoint elevation of 93 m at a distance of 5.17km. The vertical scale of the maximum turbine height to tip of blade (538.1m ASL) from the viewpoint is 445.1 m above the horizontal viewpoint elevation at a distance of 6.035km. The angle of view for the existing landscape is calculated to be 2.85° whereas the turbine with greatest elevation to tip of blade from this viewpoint creates an angle of 4.21°. The reciprocal of the turbine scale to existing landscape is derived to be the proportionate vertical visual change.</p> <p>The proportionate vertical visual effect is 32% increase.</p>
Distance	4	The closest turbine visible to the viewpoint is turbine 42 at a distance of 6 km
Visual Effect	12	
<i>Landscape visual change coefficient</i>	<i>0.6</i>	
$14 \times 0.6 = 8.4$		
$8.4/20 \times 100 =$	42%	

Visual Assessment: The visual effect of the development is described as substantial being pronounced on the leading eastern edge of the ridgeline which is an elevated defining landform. However, the visual effect created by the southern cluster is visually separated from the Marne River corridor, mitigating visual intrusion on the natural qualities of this defined corridor.

The development is seen in a modified landscape which is characterised by agricultural paddocks. The separation of the development and the natural characteristics of the Marne River help preserve the amenity and qualities of the Marne River, whilst there will be partial visual alteration experienced to the agricultural landscape character to the north.

6.10 Substation and Control building

- 6.10.1 The proposed Keyneton Wind Farm will require a single substation including a switching yard, associated electrical infrastructure, control building, staff facilities and small car park.
- 6.10.2 The sub-station /switching yard will be located in the northern half of the site. The sub-station has been relocated in the design process further to the north than was initially proposed, in a lower lying area of landscape to reduce its proximity and visibility from Sedan Hill Road and surrounding areas.
- 6.10.3 The substation / switching yard compound will comprise of the following;
- One permanent 33kV / 275kV grid connection
 - Grid Connection within a total compound area of **approximately 285m x 80m (also includes control room, staff facilities and small car park).**
 - Maximum height of 22.625 m (for gantry)
 - One control building (33.7 m length x 7.9 m width x 6.35 m height)
 - Workshop, store room, staff facilities and small car park
- 6.10.4 The substation will be located approximately 600-700m north of Sedan Hill Road . Where visible, the substation will create a visual contrast to the rural character of the landscape reinforcing the perceived land use changes that will occur with the introduction of the wind farm across the wider landscape.
- 6.10.5 The vertical scale of the substation (maximum height of 22.625 m for the gantry) will potentially provide extended areas of visibility. Figure 50 illustrates the zone of theoretical visibility for the substation. This map provides illustration of the potential visibility of the tallest visual element (lattice gantry). However, visual assessment has limitations in that the data is representing a 10 m digital terrain; does not take into account existing buildings or vegetation screening (i.e. it provides a worst case bare ground scenario) and assumes a solid construction form. While the lattice gantry construction will not remove the visual effect completely, this visually permeable form of construction does mitigate to a certain degree the potential visual impact of the infrastructure associated with the substation.
- 6.10.6 Based on the ZTVI and the limitations associated with desktop assessment, the general visual effect associated with the substation will be more prominent from local areas along the ridgeline of the escarpment. However the profile and lattice work construction of the gantry will limit its visual effect over greater distance in relation to the sub-regional and regional context. Having said this, it is anticipated that this visual effect will be seen from a number of locations as illustrated in the ZTVI mapping in Figure 50.

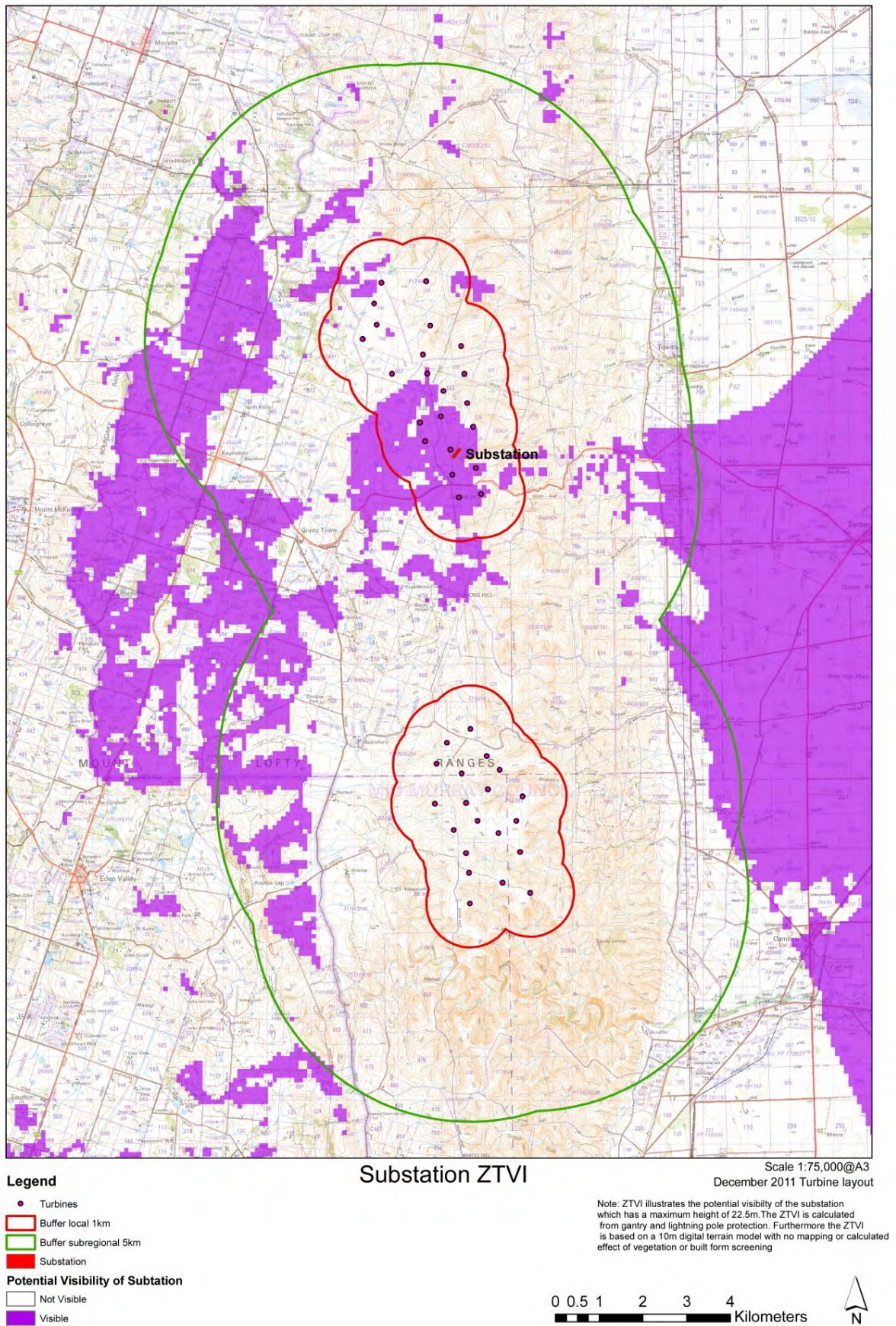


Figure 51 ZTVI of Substation

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6.11 Access tracks

- 6.11.1 As part of the proposed development a series of 5 to 10 m wide gravel tracks will be required depending on entry point and passing bay requirements, a typical width of 5m will be required to provide access to individual wind turbine locations during construction. The access tracks correspond with the alignment of the turbines and are located on the local profile of the ridges that form the Eastern Mount Lofty Ranges Plateau and the western edge of the escarpment.
- 6.11.2 The proposed incline of the access tracks will be between 2 and 6%, increasing to 10% (1 in 10) in a few isolated locations. The slope profile closely follows the existing topography of the Ranges and would require limited cut and fill, which in turn will limit the extent of visual impact associated with access tracks.
- 6.11.3 Wherever possible the proposal will utilise existing access track and road connections. In addition, the form, materiality and colour of the new tracks will be in keeping with other tracks and roads in the area. While the proposed tracks will appear as new development post construction, they do not appear out of character with the wider rural landscape. The track surface will be crushed rock sourced either on site or from a local supplier. Overtime, the track material is likely to dull and weather naturally which will reduce the associated visual effect.
- 6.11.5 Finally, the visibility of the tracks needs to be assessed relative to the other development forms associated with the wind farm proposal. The proportional effect of the tracks will always be a secondary or partial visual element when considered against the degree of visual change produced by wind turbines. In this regard, the visual effect of the track is described as negligible and will progressively diminish over time.

6.12 Underground cable routes

- 6.12.1 The undergrounding of cable as part of the proposal limits visual impact. Trenching is typically 0.45 m wide by 1 m deep. All trenches will be backfilled to meet existing surface levels limiting associated visual impacts and should be considered in context with the access tracks and overall visual effect of the entire development. Cable trenches will predominantly be located immediately adjacent to access tracks thereby avoiding additional site and visual impacts associated with separate trenching.

6.13 Overhead transmission line

- 6.13.1 As part of the infrastructure provision of the Keyneton Wind Farm approximately 6 kilometres of overhead transmission line will be required. This 33kV line will extend between the two turbine clusters and will be supported by a series of support poles between 20 to 25 metres in height.
- 6.13.2 The visual effect associated with this infrastructure will be limited due to scale of the poles and extent of existing infrastructure in the locality. At a height of 20 to 25 metres the proposed pole are half the height of the existing transmission line and lattice tower

6.14 Summary of Visual Effects

- 6.14.1 The visual assessment demonstrates that a variety of visual effects will be experienced with the local, sub-regional and regional landscapes that surround the proposed Keyneton Wind Farm. Typically, the visual effects will occur within an already highly modified pastoral landscape.
- 6.14.2 The following table illustrates the degree of visual change recorded at each of the viewpoints. Of note are the key factors that will affect the visual impact that occurs at each viewpoint and in the wider landscape. They include:
- Existing landscape character value and the presence or absence of significant vegetation
 - The degree of landscape absorption provided by the existing landscape character
 - Panoramic qualities of the landscape
 - Horizontal and vertical visual effect produced by the proposed wind farm

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6.14.3 Overall there is only a moderate variation in the degree of visual change experienced to the northwest and southwest with a slightly greater degree of visual effect to the west. This reflects the uniformity in the existing landscape character in terms of land use, vegetation and topography.

Viewpoints (VP)	Relief	Vegetation Coverage	Infrastructure	Cultural/Landscape Value	Landscape Character	Landscape Absorption	Horizontal	Vertical	Distance	Visual Effect	Degree of Visual Change	
Viewpoint 1	3	2	4	2	11	4	3	2	4	13	36 %	Moderate
Viewpoint 2	3	2	3	2	10	4	4	1	3	12	30 %	Moderate
Viewpoint 3	2	2	4	1	9	3	2	1	3	9	20 %	Slight to moderate
Viewpoint 4	4	4	2	4	14	3	3	4	5	15	53 %	Substantial
Viewpoint 5	3	2	4	1	10	2	3	3	5	13	33 %	Moderate
Viewpoint 6	3	2	4	3	12	2	4	4	5	15	45 %	Substantial
Viewpoint 7	4	3	3	4	14	4	3	1	3	11	39 %	Moderate
Viewpoint 8	4	2	4	4	14	4	2	2	4	12	42 %	Substantial

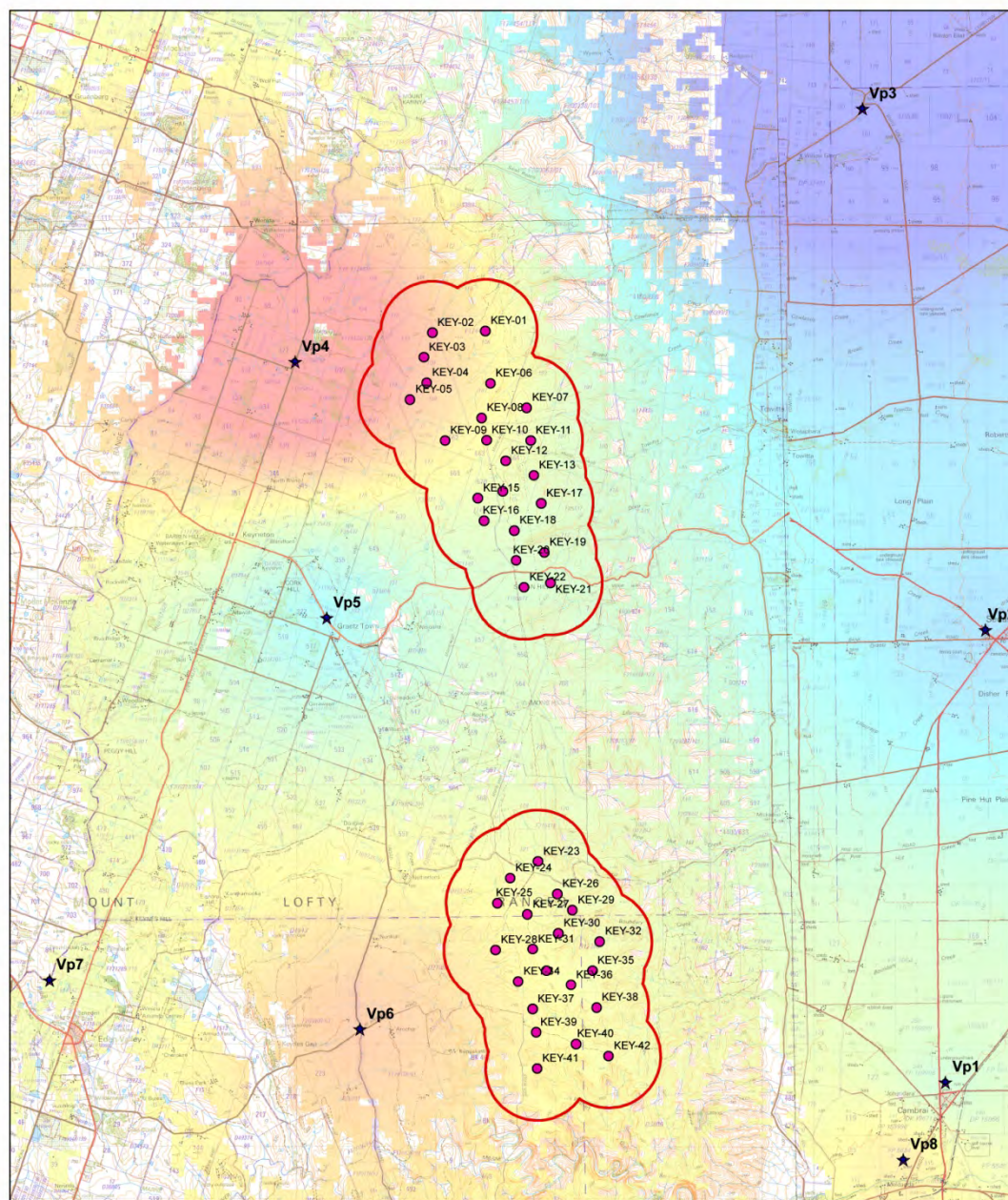
6.14.4 Based on the detailed viewpoint assessment and the degree of visual change analysis, a geographic interpolation of visual effect has been calculated with reference to distance within ArcGIS and the ZTVI for the development. The following figure 51 illustrates the degree of visual effect as assessed using the GrimKe methodology. The mapping indicates areas and regions surrounding the proposed wind farm that will experience differing degree of visual effect.

6.14.5 While the mapping shows the underlying degree of visual change, it does not represent the actual visual effect that will be experienced traversing through the regional landscape. It is a relative evaluation of the predicted visual effect from viewpoints and locations where the wind farm is visible and does not take into account local landforms and vegetation which may provide partial or complete screening.

6.14.6 The assessment of the visual effect demonstrates that the degree of visibility with reference to ZTVI will be experienced predominantly on the eastern side of the escarpment with the majority of effect moderate, with localised areas of substantial visual effect. Isolated areas associated with greater cultural or scenic values as assessed by WAX Design, BGLA and as indicated by members of the community during the consultation session have elevated the potential visual effect to sub regional areas such as the Marne River.

06 Visual Effect Assessment

- 6.14.7 While the western landscape areas associated with Viewpoints 4, 5, 6 and 7 demonstrate a Moderate to Substantial degree of visual change, the topography and vegetation of the area significantly reduces the potential for this degree of visual effect to be experienced, particularly in relation to sub-regional and regional locations. Figure 51 illustrates that the visual envelope of the development does not extend to areas such as Angaston and the Barossa Range.
- 6.14.8 Those areas described as having substantial visual effect to the west are isolated to small pockets. The landscape character of these areas is typically heavily vegetated or has defined local ridgelines which fragment and screen views and the resulting visual effect.
- 6.14.9 In summary, the proposed wind farm will be more visible to the eastern side of the escarpment than west. However, the degree of visual change is generally moderate, increasing and decreasing in response to local landscape characters. By contrast, to the west the assessment has recorded varying levels of substantial visual effect. While the assessment of the degree of visual change is more pronounced, the amount of screening and visual mitigation offered by the surrounding landscape limits the overall visual effect.



Visual Effect Interpolation

Scale 1:75000@A3
December 2011 Turbine layout

Legend

- ★ Viewpoints Assessment
- Turbines

Buffer local 1km

Visual Effect % Change

- Substantial
- Moderate
- Slight

This figure illustrates the regional visual effect calculated within GIS as a distance weighted interpolation between the 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 relative visual effect of the potential transient experience of the regional landscape. This does not take into account vegetation screening which would reduce the potential effect in some localities.

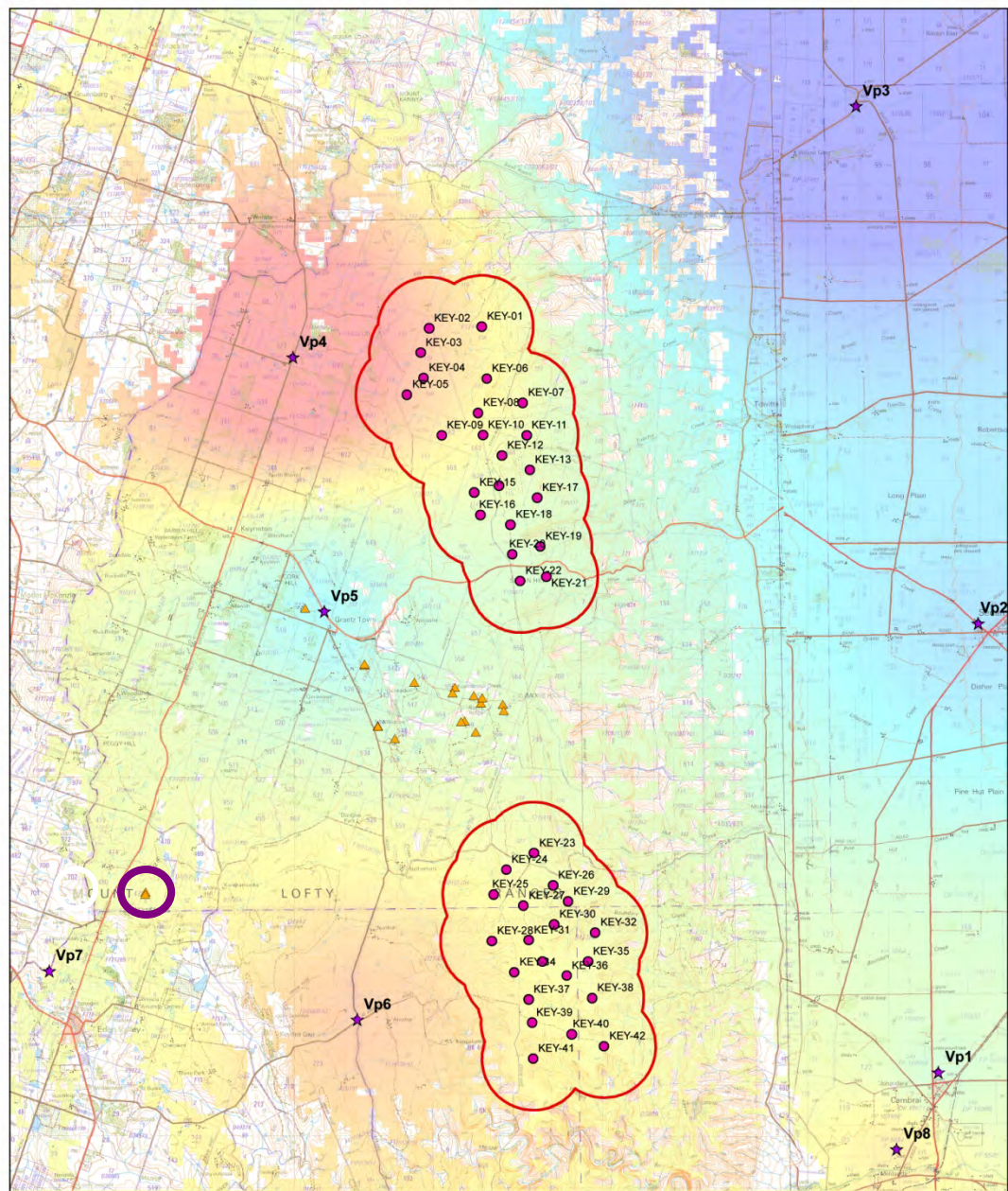
0 0.5 1 2 3 4 Kilometers



Figure 52 Theoretic Zones of Visual Effect based on Visual Assessment

6.14 Review of Visual Effects from Private Properties and Dwelling

- 6.14.1 During the course of the landscape and visual assessment a total of 19 photomontages from 10 private properties (i.e. multiple montages were completed at several properties) were produced in order to provide members of the community with an understanding of the potential visual effect from private dwellings, specifically locations that were selected by the residents either from their dwelling or adjacent sites within their property grounds.
- 6.14.2 For the purposes of the visual assessment report, a detailed analysis of the degree of visual change associated with these locations has not been calculated as the sites represented private locations and did not meet the criteria of the GrimKe Assessment Matrix in terms of being publicly accessible, typical of the landscape character and where the majority of the wind farm was visible. As the focus of the assessment is public accessible locations it is not recognised practice to assess individual properties.
- 6.14.3 While a detailed assessment for each viewpoint has not been conducted, Figure 52 illustrates the location of each private photomontage. These locations have been overlaid over the Visual Effect Interpolation mapping to illustrate the possible visual effect of the wind farm associated with each viewpoint.
- 6.14.3 The applied degree of visual change value that results from the mapping and associated viewpoints remains an indication of the potential visual effect, particularly as the effect of local topographic variations and screening vegetation have not been considered as part of the evaluation process. For this reason, the mapping is illustrative and relative to the sub regional effect only and is included for purposed of completeness in relation to information produced in support of this development application.
- 6.14.4 Of the 19 photomontages that were produced for members of the community, an interpolation of the visual effect concluded that 18 locations near or adjacent to private residences would experience a moderate degree of visual effect and that one property (identified by the purple circle on Figure 52) would potentially experience a substantial visual effect.
- 6.14.5 While a moderate degree of visual effect is likely to experience by the majority of the properties that received photomontages of the proposed wind farm, the actual degree of visual change will vary depending on the location of each property and the surrounding local landscape character.
- 6.14.6 In addition, Pacific Hydro have recognised the potential visual effect that may occur from certain properties and anticipate that a landscape vegetation screening programme will be offered to eligible properties in order to provide local visual mitigation.



Residential Photomontage Viewpoints
(Visual effect interpolation based on detailed assessment viewpoints)

Scale 1:75000@A3
December 2011 Turbine layout

Legend

- ★ Viewpoints Assessment
- Turbines

Buffer local 1km

Visual Effect % Change

- Substantial
- Moderate
- Slight

▲ Resident viewpoints

This figure illustrates the regional visual effect calculated within GIS as a distance weighted interpolation between the 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 relative visual effect of the potential transient experience of the regional landscape. This does not take into account vegetation screening which would reduce the potential effect in some localities.

0 0.5 1 2 3 4 Kilometers



Figure 53 Residential photomontage viewpoints overlaid on Detailed Assessment Visual Effect Interpolation

07 Review of Development Plan (including State Wide Wind Farms DPA)

7.7.1 Assessment of Visual Effect of Proposed Development against Development Plan

- 7.1.1 The Mid Murray District Council Development Plan (Consolidated – 19 April 2012) has been used to assess the suitability of the Keyneton Wind Farm in relation to the anticipated effect on the landscape and visual character of the Rural Zone – Policy Area Number 13 – Marne Watercourse and Rural Zone – Policy Area Number 14 – Hills Policy Area Policy Zones. Consideration has also been given to Council Wide Objectives, Principles of Development Control (PDC) and Renewable Energy Facilities.

7.2 Council Wide Objectives

Rural Development

Objective 48: Retention of rural areas for agricultural and pastoral purposes.

Objective 49: Maintenance of the character of rural areas.

Rural areas should be retained primarily for agricultural and pastoral purposes and horticultural use where natural resources such as groundwater supplies and surface catchments are not adversely affected. Conservation of bushland and wildlife are also important considerations. The design and siting of buildings in rural areas should be compatible with the object of conserving rural character, accepting that wind farms and ancillary development may need to be located within the rural areas and that the visual impact of the development will need to be managed.

The use of rural land for residential use should be discouraged because it diminishes rural character; makes the provision of public services uneconomic; increases land values with consequential upward pressure on rates and taxes; and contributes to land use conflicts which has the affect of limiting the right to farm.

The removal of primary production from rural areas also places greater dependence upon the diminishing fertile areas. It is in the community interest therefore as much agricultural land as possible be retained in primary production and without residential incursions other than where residential use is required to manage land.

- 7.2.1 The proposed wind farm produces a relatively small development footprint on the rural landscape of the Mid Murray District Council area when considering the size of each wind turbine. In this regard, the physical impact of the wind farm on the rural landscape is limited and the productive qualities of the landscape remain as defined in Objective 48.
- 7.2.2 While the overall size of an individual wind turbine is large when compared with other infrastructure in the area, the spread of the wind farm and the approximate 400 to 1000 m separation of the turbines means that the underlying rural character of the landscape remains. That is to say, when viewing the wind farm from the surrounding regional landscape, the rural and pastoral qualities of the landscape are still seen and experienced in and around the wind turbines.
- 7.2.3 Consequently, when considering the landscape character from locations around the proposed wind farm development both Objectives 48 and 49 are maintained and while the visual character of the landscape is changed (as demonstrated in Section 6) the agricultural purpose of the land is retained and the rural character continues.

7.3 Principles of Development Control (PDC)

Design and Appearance

54 Development, including alterations and additions to buildings, should not be undertaken unless it involves a high standard of design with regard to external appearance, building materials, colours, siting and landscaping, so as to preserve and enhance the character of the locality or desired future character of an Area, accepting that wind farms and ancillary development may need to be located within such areas and that the visual impact of the development will need to be managed.

- 7.3.1 The wind turbines are designed to deliver a maximum output performance in relation to the transfer of wind energy into electrical energy. Excessive detailing, embellishment or adornments is not included as part of the functional design of the wind turbines as such a simple yet highly efficient design is created. This results in a high standard of design resolution which in turn assists achievement of the requirements of PDC 54.
- 7.3.2 PDC54 recognises that a wind farm will cause a visual impact and requires that this be managed. The simple design, neutral colour, use of a single material limits the visual complexity that the wind turbines will produce. This coupled with alterations to the layout demonstrated in Section 05 reduce the overall visual impact and respond to the community values that exist within the landscape, demonstrating that a process of visual management has been applied to the development of the Keyneton Wind Farm.

7.4 Renewable Energy

402 Wind farms and ancillary development such as substations, maintenance sheds, access roads, wind monitoring masts and connecting power-lines (including to the National Electricity Grid), should be sited, designed and operated to:

- (a) manage the visual impact of the development by achieving the following:
 - (i) a setback of at least 1 kilometre of a wind turbine from a dwelling that is not associated with the development;
 - (ii) vegetated buffers to mitigate short to medium range visual impacts;
 - (iii) regular spacing of wind turbines in open/flat landscapes where vegetation is orderly;
 - (iv) irregular spacing in hilly/rugged landscapes where vegetation is varied;
 - (v) ensure that blades on wind turbines rotate in the same direction;
 - (vi) ensure that all wind turbines have uniformity in terms of colour, size and shape;

- 7.4.2 Regarding visual impact, Renewable Energy Principle 402 requires a number of specific undertakings be considered. In relation to the Keyneton Wind Farm, items a (i, ii, iv, v and vi) are applicable to respond to the existing landscape context.
- 7.4.3 Item a (i) is fulfilled as all dwellings within the vicinity of the wind farm are located at a distance greater than 1 kilometre from individual wind turbines (i.e. the closest dwelling not associated with the development is over 1.5km from the nearest turbine)
- 7.4.4 It is anticipated that Item a (ii) will be addressed in part by local screen planting around the proposed substation and through the retention of existing road vegetation which will continue to provide isolated pockets of screening in certain locations throughout the regional landscape context that surround the site, particularly to the west.

07 Review of Development Plan (including State Wide Wind Farms DPA)

- 7.4.5 The undulating topography and local ridgelines across the site has resulted in an irregular layout which responds directly to the underlying landforms. This creates variety in the layout and the resulting appearance of the wind farm which meets the requirements of Principle 402 (a) (iii).

7.5 Rural Zone

DESIRED CHARACTER

The zone is the location of the majority of dryland agricultural production within the Council area but it also includes irrigated orchards, vegetables, vineyards and pasture where there is access to water supplies for irrigation. The processing of agricultural product is envisaged which, subject to compliance with environmental criteria, could include value-adding enterprises such as packing and processing works and wineries. Other forms of small-scale industry may be appropriate in association with existing residential development, on allotments which are not suited to primary production, or as an adjunct to an existing primary production operation.

Wind farms and ancillary development are an envisaged form of development within the zone. Such facilities may be of a large scale, comprise a number of components and require an extended and/or dispersed development pattern. These facilities will need to be located in areas where they can take advantage of the natural resource upon which they rely and, as a consequence, may be located in visually prominent locations.

The Zone adjoins the River Murray and agricultural uses in the vicinity of the River must be managed to ensure that the River's water quality does not further deteriorate through accelerated groundwater inflows, irrigation run-off, chemical over-spray, erosion and siltation and other impacts. Due to the potential for adverse impacts on areas of native vegetation, olive production should be sufficiently separated from environmentally sensitive areas such as the Murray River and Conservation Zones.

The Zone encompasses the eastern face of the Mount Lofty Ranges which contributes significantly to the district's visual qualities. The location and design of development on the hills face is therefore a matter of importance, as is the retention of remnant bushland and native vegetation for aesthetic and conservation purposes. New landscaping or agro-forestry plantings should not change the bold and exposed character of the Hills Face. The use of local native species should be used in preference to introduced species for these purposes.

The zone's rural and natural character lends itself to tourism activities, such as the interpretation of the natural environment, the sale or sampling of produce and on-farm tourism which will enhance the value of local production and add to the quality and range of experiences available to the visitor in the region. These value-added activities however should not be undertaken in a way which would prejudice the long-term operation of primary production.

07 Review of Development Plan (including State Wide Wind Farms DPA)

Scenic vehicular routes transverse and define the zone. Land adjoining a defined scenic route or which can be viewed from the routes, should only be developed to enhance their function, accepting that wind farms and ancillary development may need to be located within landscape areas or areas of scenic amenity and that the visual impact of the development will need to be managed.

Other than where qualified by the provisions for the Policy Areas, the following forms of development are **acceptable** in the Rural Zone:

- farming and farm buildings;
- horticulture particularly viticulture, vegetable and fruit production and associated storage and processing buildings;
- irrigated pasture;
- residential use providing it is associated with farming, horticulture, viticulture;
- infrastructure to support acceptable uses;
- tourist accommodation associated with existing farm dwellings;
- tourism development associated with the natural environment;
- uses which aid interpretation of natural areas and the region's natural heritage;
- intensive animal keeping providing specified separation distances can be achieved;
- land-based aquaculture providing specified separation distance can be achieved;
- land extensive uses to support urban areas such as waste disposal or waste treatment; and
- wind farms and ancillary development.

7.5.1 The desired character of the Rural Zone recognises that wind farm may be located within the Policy Area and states that wind farms and ancillary development is acceptable. While the Policy Area envisages wind farms, the design review discussed in Section 5 and final development layout of Keyneton Wind Farm attempts to respond to the scenic and natural values of the landscape, including those identified by the community, to ensure that the visual effect on the rural landscape is managed.

OBJECTIVES

Sustainable Industry

- Objective 1:** Long-term operation and sustainability of rural production and primary industries.
- Objective 2:** Wind farms and ancillary development located in the zone, accepting that they may need to be sited in visually prominent locations to take advantage of natural resources such as wind.

Vegetation and Landscape Character

- Objective 5:** Retention and maintenance of wetlands and existing native vegetation for its conservation, biodiversity, and habitat value and environmental management function.
- Objective 6:** Maintenance and enhancement of the landscape character, accepting that wind farms and ancillary development may need to be located within landscape areas or areas of scenic amenity and that the visual impact of the development will need to be managed.

Built Form and Design

Objective 20: Rural dwellings or value-adding enterprises which does not preclude horticulture, irrigated pasture, and dairying development.

Objective 21: Buildings and structures compatible with the environmental qualities, built form and character of the surrounding area and landscape, accepting that wind farms and ancillary development may need to be located within landscape areas or areas of scenic amenity and that the visual impact of the development will need to be managed.

- 7.5.2 The Objectives relating to Sustainable Industry, Vegetation and Landscape Character and Built Form and Design recognise and accept that wind farms will produce a degree of visual impact within the landscape and that there is a need for the degree of visual change to be managed.
- 7.5.3 As described previously, the development of the wind farm has considered the qualities of the regional landscape and the community values associated with this landscape. The final layout that is now being assessed as part of this report has been modified through an iterative process of analysis, consultation and redesign to take account of these qualities and values to ensure that the visual effect is managed.
- 7.5.4 The impact of wind turbines on locations, features and regions of recognised landscape or cultural value have been considered during the design evaluation. The findings from three community engagement sessions and this Design Assessment have also been used to inform the redesign of Keyneton Wind Farm to ensure that the revised 42 (reduced from 57) turbine layout manages the degree of visual effect within the landscape

Principles of Development Control

Landscape

- 4** Development should be designed and sited to respect and maintain the landscape character of an area which is of:
- (a) historical (including archaeological) significance;
 - (b) scientific interest;
 - (c) scenic value or natural beauty, accepting that wind farms and ancillary development may need to be located within landscape areas or areas of scenic amenity and that the visual impact of the development will need to be managed;
 - (d) other heritage significance; or
 - (e) conservation significance.

Built Form and Design

- 17 Outdoor lighting should not cause nuisance.

Design Techniques (ONE WAY of meeting requirements of the principle of development control)

17.1 *Outside lighting to be directed downwards and towards the site to prevent light spilling onto surrounding properties.*

- 18 Buildings and structures which have:

- (a) a design scale, appearance and site to enhance the positive environmental qualities, built form and character of the locality;
- (b) a site which is unobtrusive and screened from public roads and adjoining properties by:
 - (i) natural landforms;
 - (ii) existing vegetation,
 - (iii) planting of appropriate vegetation;
- (c) a requirement for minimal excavation or filling of land;
- (d) a requirements for minimal removal of existing vegetation; and
- (e) sites which are grouped together;

accepting that wind farms and ancillary development may be of a large scale, comprise a number of components and require an extended and/or dispersed development pattern. These facilities will need to be located in areas where they can take advantage of the natural resource upon which they rely and, as a consequence, may be located in visually prominent locations.

- 21 The visual impact of wind farms and ancillary development should be managed in accordance with the Renewable Energy policies contained in the Council-Wide section.

- 7.5.5 The Principles of Development Control also acknowledge the visual effect of wind farms in the landscape in relation to the scale and number of components and dispersed nature of wind farm developments. However, the planning and development of the project has recognised the need to manage the visual effect and the need to reduce the visual impact of the wind turbines on certain locations. In particular the removal of 15 turbines from the Keyneton Wind Farm proposal has helped to reduce overall visual impact with deletion of turbines 50, 56, and 57 specifically assisting in reducing the visual effect on both the Marne River Eden Valley Lookout (viewpoint 7).
- 7.5.6 PDC 4 required that development should be designed and sited to respect and maintain areas of scenic beauty. Within the regional landscape context of the Keyneton Wind Farm there are a number of scenic areas, particularly the Marne River and Keynes Gap. The design review discussed in Section 5 illustrates the modifications to the layout that were made in order to limit the visual effect on these areas and as such manage the visual impact on recognised areas of scenic value.

7.6 Rural Zone – Policy Area Number 13 – Marne Watercourse

DESIRED CHARACTER

Apart from the hills face see [Figs HF\(MWPA\)/1 to 5](#) and associated gorge, the Policy Area is suitable for a range of agricultural and horticultural uses.

The hills face is unsuitable to intensive agricultural uses that would change the existing open and exposed character of the landform. Low intensity uses like grazing of sheep should continue. Tree plantations on the hills face should be confined to gullies and watercourses and building development should, in addition to meeting design criteria, be limited to very large holdings. Local species should be used such as Sheoaks (*Allocasuarina verticillata*).

Water harvesting and use to support agricultural development is appropriate within sustainable limits.

The following forms of development are **unacceptable** in that part of the Marne Watercourse Policy Area that comprises the hills face and gorge as defined in [Figs HF\(MWPA\)/1 to 5](#) (additional to unacceptable use for the Rural Zone):

- horticulture, particularly viticulture and olive production;
- forestry;
- buildings on allotments less than 200ha in size.

OBJECTIVES

Objective 1: The character, aesthetic appearance, scenic beauty and amenity of the River Marne and River Somme and its environs are preserved and enhanced in order to:

- (a) undertake sustainable primary production;
- (b) protect water systems;
- (c) provide recreation areas, particularly passive recreation areas;
- (d) provide for native flora and fauna habitats; and
- (e) protect areas of scientific, archaeological or cultural significance

Objective 4: Protection of the open rural character of the hills face of gorge

PRINCIPLES OF DEVELOPMENT CONTROL

- 1 Development should not be undertaken unless it is consistent with the desired character for the policy area.
- 2 Development should preserve and enhance the character and amenity of the River Marne and River Somme and its environs, accepting that wind farms and ancillary development may need to be located within such areas and that the visual impact of the development will need to be managed.
- 4 Buildings should be located unobtrusively and should be constructed of materials that blend with the riverine landscape, accepting that wind farms and ancillary development may need to be located within such areas and that the visual impact of the development will need to be managed.
- 5 No buildings should be developed on the eastern face of the ranges as defined in Marne Watercourse Policy Area [Figures HF\(MWPA\)/1 to 5](#).

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- 10 Development should maintain and enhance the natural character and beauty of land within the locality, accepting that wind farms and ancillary development may need to be located within landscape areas or areas of scenic amenity and that the visual impact of the development will need to be managed.
- 11 Buildings should not be sited on prominent ridgelines or in locations that would detract from views obtained from any primary or secondary arterial roads or scenic routes, or in locations requiring unnecessary removal of natural vegetation or excessive amounts of excavation, accepting that wind farms and ancillary development may need to be located within landscape areas or areas of scenic amenity and that the visual impact of the development will need to be managed.

7.6.1 Policy Area Number 13 – Marne Watercourse and the associated Objectives and PDCs recognises the scenic beauty of the Policy Area. The Policy also acknowledges and accepts the potential visual impact of wind farms and the need to manage the resulting visual effect. In this regards, the proposed 1.7 kilometre off-set of the wind turbines from the Marne River helps to reduce the direct visual impact on the river.

7.6.2 In addition the incised topography of the river corridor across the eastern escarpment of the Mount Lofty Ranges provides a local visual envelope that reinforces the natural and scenic values of the river while limiting the potential visual impact of individual wind turbines.

7.7 Rural Zone – Policy Area Number 14 – Hill Policy Area

DESIRED CHARACTER

Open grazing of the eastern hills face see [Figures HF\(HPA\)/1 to 5](#) and very limited or no built form to preserve the eastern backdrop of the Murray Plains. The hills face is unsuitable to intensive agricultural uses which would change the existing open and exposed character of the land form. Low intensity uses like grazing of sheep should continue. These plantations on the hills face should be confined to gullies and water courses and building development should, in addition to meeting design criteria, be limited to very large holdings.

Behind the eastern face of the range a wider range of agricultural and horticultural uses are appropriate where builtform, providing it relates to primary production, will be evident, but at low densities. These uses include grazing and animal keeping, cropping, viticultural and dairying.

OBJECTIVES

- Objective 1:** Retention of the open rural character as derived from large land holdings used for primary production and dispersed isolated built form, accepting that wind farms and ancillary development may need to be located within such areas and that the visual impact of the development will need to be managed.
- Objective 2:** No building development on the eastern face of the Mount Lofty Ranges, unless required to facilitate the development of wind farms and ancillary development.
- Objective 3:** Conservation and enhancement of the importance of the area for Aboriginal heritage.

PRINCIPLES OF DEVELOPMENT CONTROL

- 1 Development should not be undertaken unless it is consistent with the desired character for the policy area.

07 Review of Development Plan (including State Wide Wind Farms DPA)

- 3 Dwellings and non-rural buildings shall not be located where they are prominently visible from a public road without extensive screening first established, accepting that wind farms and ancillary development may be of a large scale, comprise a number of components and require an extended and/or dispersed development pattern. These facilities will need to be located in areas where they can take advantage of the natural resource upon which they rely and, as a consequence, may be located in visually prominent locations.

- 7.7.1 Policy Area Number 14 – Hills Policy Area seeks to maintain a grazed rural backdrop to the Murray Plains, and Objectives 1 and 2 reinforce this intent, while recognising that wind farms are anticipated within the Rural Zone Policy Area.
- 7.7.2 The development form of the wind farm within the landscape will result in a series of large structures that sit within the rural landscape and agricultural land use character of the zone. While the wind farm will produce a moderate to substantial degree of visual change, the rural nature of the landscape will remain. That is to say, there is no significant alteration of the land and existing agricultural land use is preserved. Consequently, the existing activities will be able to continue around the wind turbines.

08 State Wide Landscape Scenic Quality Values

8.1 Review of State Wide Landscape Scenic Quality Values

- 8.1.1 In order to present a wider understanding of the landscape value associated with the existing landscape and impact of the proposed development, a review has been undertaken of a research study conducted by Dr Andrew Lothian in relation to landscape character, landscape value and the potential visual change created by wind farms.
- 8.1.2 Lothian (2000) measured and illustrated the scenic quality of South Australian landscapes. The study represents an objective based assessment of scenic beauty perceptions toward the State's various landscapes. The statistical analysis provides a foundation to scenic quality evaluation of different South Australian landscape typologies and the potential effect of any development forms (including wind farms) will have on them.
- 8.1.3 Referring to Lothian (2000), the biophysical landscape character of Eastern Mount Lofty Ranges, Murray Plains and surrounding region has been classified as Agricultural plains, low ranges/ hills and Main Ranges, (Figure 53).
- 8.1.4 The assessment process conducted by Lothian (2000) measured public scenic beauty perception values of South Australian Landscapes. Scenes were rated out of 10.
- 8.1.5 The mean ratings for scenes within the Southern Agricultural Province were;
- *Main Ranges* **6**
 - *Agricultural Hills and low ranges* **4**
 - *Coastal Plain* **5**
- 8.1.6 In addition, scenes were assessed with regards to land use and physical characteristics such as vegetation type and coverage, topographic variance, presence of water. Crops and pastures occupy the majority of the southern agricultural province. The mean of these scenes was 4.36. To be more specific, scenes of crops and pastures with ridgelines had a mean of 4.53 whereas flat terrain recorded a mean 3.97 and coastal areas had a median range of 6-6.99.
- 8.1.7 The pastoral landscape of the Mid North received the lowest ranking in South Australia in terms of scenic quality with exception of the Gibber Plains. Figure 54 illustrates the landscape quality variance of South Australia.
- 8.1.8 A subsequent study was conducted by Lothian (2008), the objectives of which were to measure the scenic perceptions and visual effects of wind farms in the landscape. Using the South Australian landscape quality assessment as a baseline reference, the potential sensitivity of wind farms in particular geographic localities was interpolated in the study.
- 8.1.9 The findings of the 2008 study reported that inland scenes with a scenic quality of less than 5.1 would be improved by the presence of a wind farm. The trend correlation between existing landscape quality and visual sensitivity to wind farm developments is derived by an existing landscape quality rating of 5.1 at which point a lower valued landscape will not be devalued by the presence of a wind farm. In fact the development has the potential to add qualities such as scale, form and/or a dynamic visual element within a modified and often denuded landscape. Consequently, scenic landscape ratings of less than 5.1 may be improved by the presence of a wind farm.

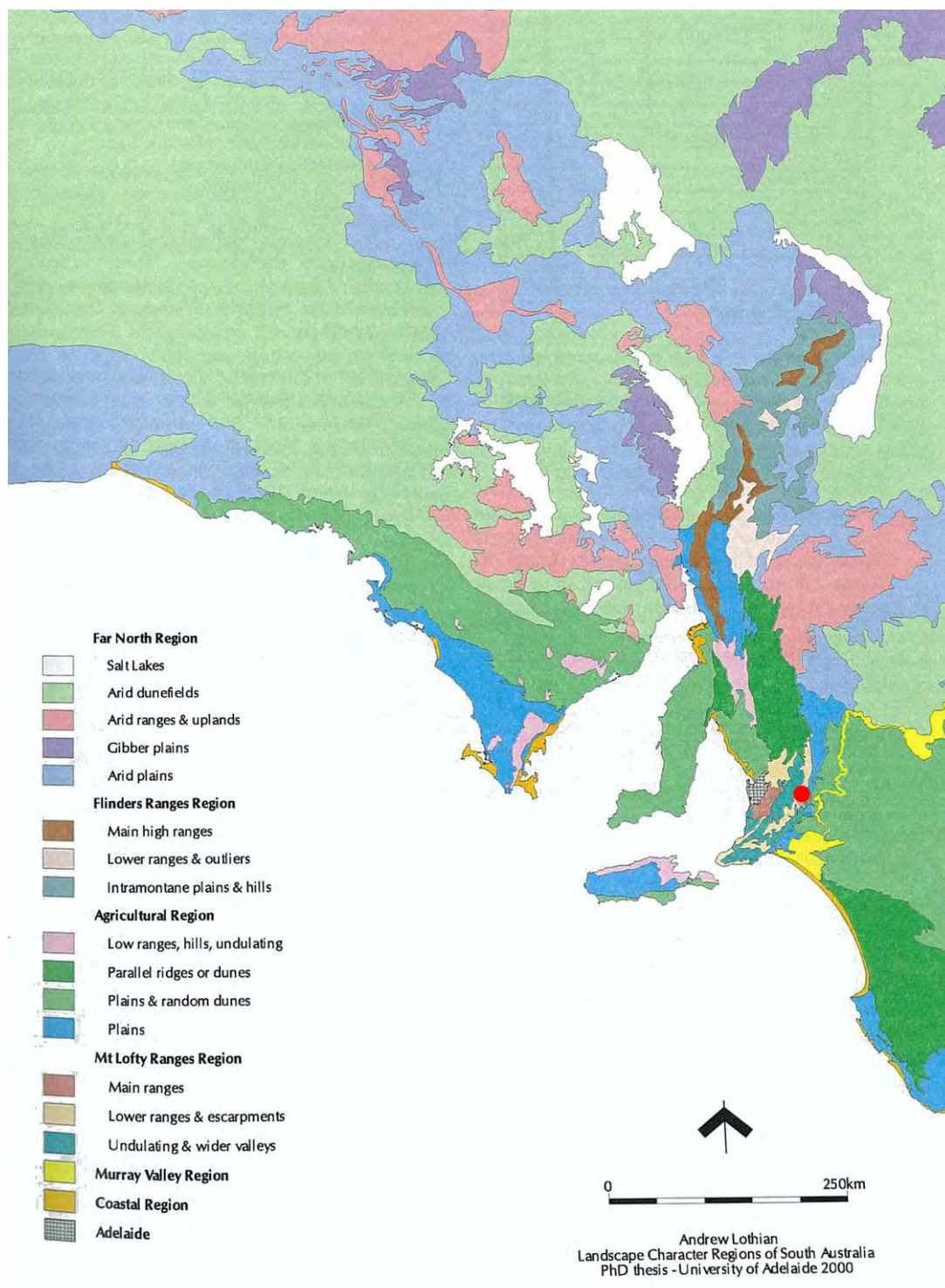


Figure 54 Landscape Character Regions of South Australia (Lothian, 2000) with red dot indicating wind farm location

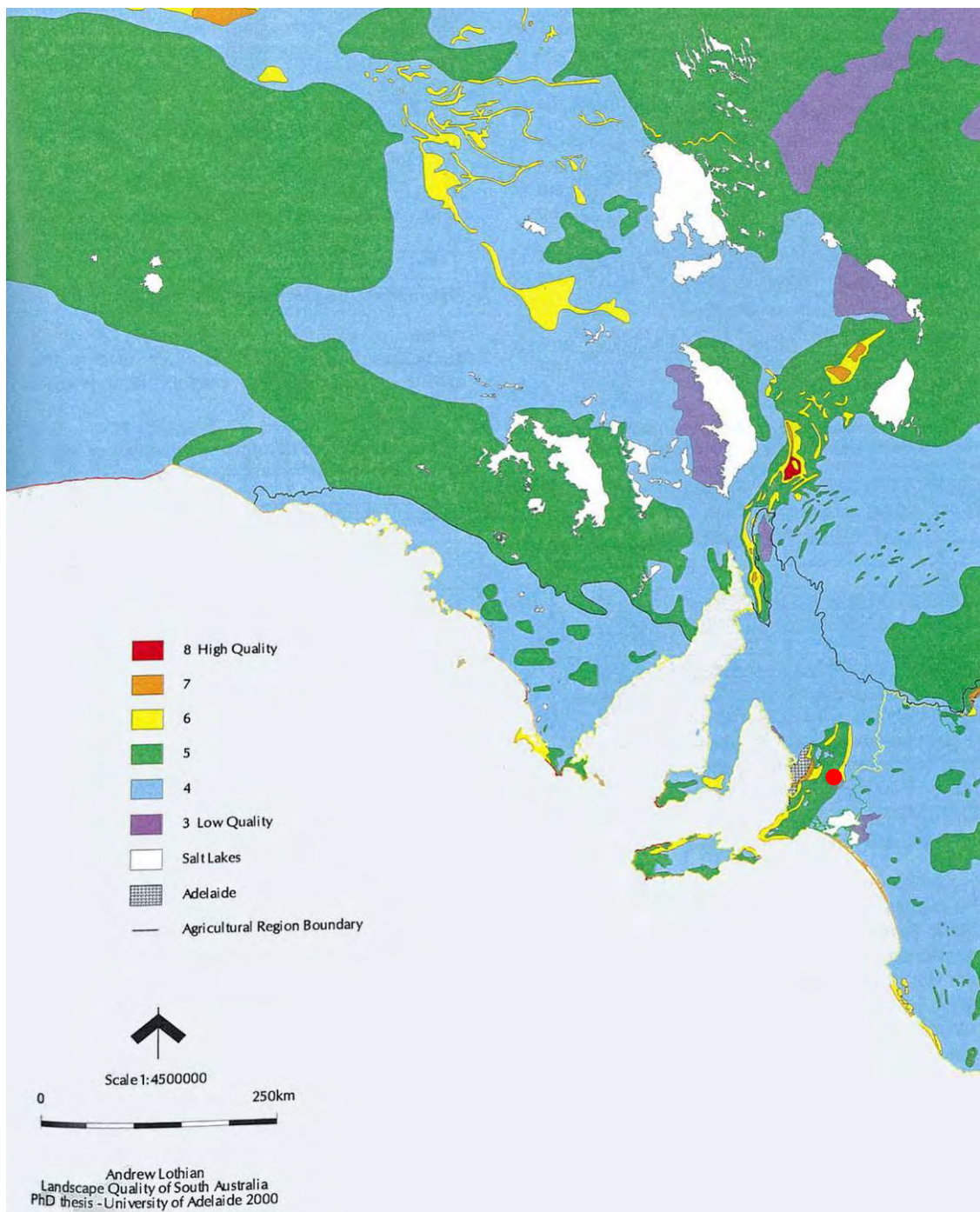


Figure 55 Landscape Quality of South Australia (Lothian, 2000 with red dot indicating location of wind farm)

8.1.10 An additional report dating from 2005, looked specifically at the landscape value of the Barossa Region. While the assessment did not include the wind farm site or subregional area, there are significant areas and features throughout the regional landscape to the west of the proposed wind farm site that have a high scenic amenity and associated landscape value. In fact the areas adjacent to the wind farm generally were not recognised as having high degrees of scenic value (figure 55). The research undertaken by Lothian recognises that bare landscapes devoid of trees do not rate highly with values ranging between 4 and 5.

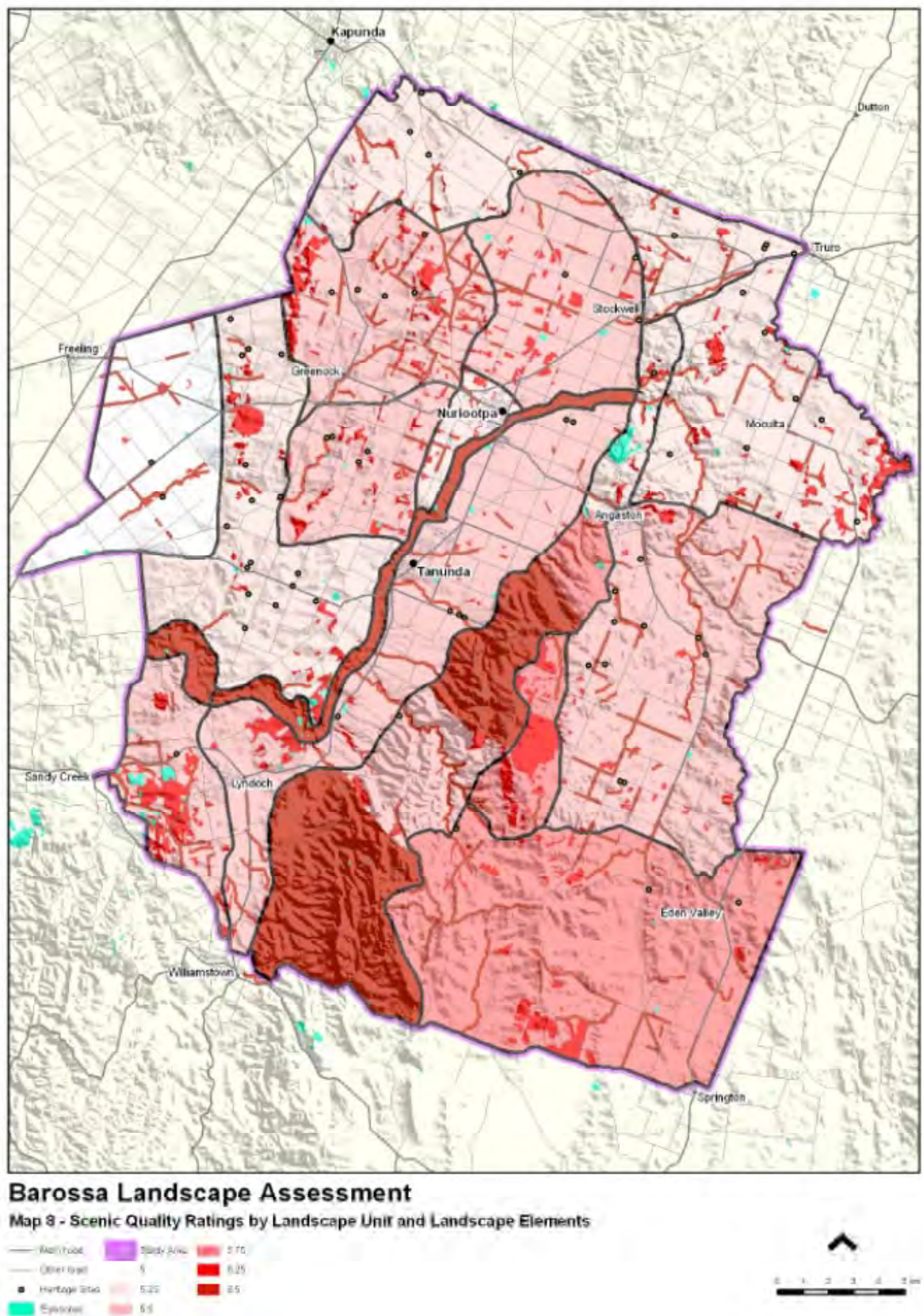


Figure 56 Barossa and Light Region Landscape Assessment Study (Lothian, 2005)

08 State Wide Landscape Scenic Quality Values

- 8.1.11 While the Marne River was identified as an area of higher scenic value this value was confined to the river corridor and did not influence the value of the wider landscape character.
- 8.1.12 It is worth noting that the study scope assessed the regional area to the west of the proposed development wind farm and did not review the defined sub regional area of the proposed wind farm site to which the majority of potential visual effect will occur.

9.1 Discussion on Viewer Sensitivity

- 9.1.1 The preceding assessment considers the visual effect of the wind farm from various locations having regard to the existing landscape quality and the degree of visual change on 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.
- 9.1.2 The Planning Bulletin, Planning SA (2002) identifies potential viewers and the possible sensitivity that may be experienced by the public, ranging from the eco-tourist, who may experience a devaluing of the landscape, to members of the local community, who might stand to benefit from the development. However, the Planning Bulletin also concedes that, "Given the potential impact on the visual amenity of an area, a diverse range of public response can be expected".
- 9.1.3 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. It is evident that many people like the look of turbines considering them sculptural and majestic or positive signs of climate change action, while some view them as an industrial blight.
- 9.1.4 By contrast, the majority of tourists may perceive no change and see the wind farm as part of the existing visual environment.
- 9.1.5 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 visual appeal of turbines and renewable energy itself. 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.

10 Conclusion

10.1 Conclusion

- 10.1.1 The visual assessment process has considered the existing landscape character value coupled with an overlay of local community sensitivities and cultural associations to places of scenic amenity as identified through a detailed community engagement process. These base line landscape character values have enabled the detailed evaluation of viewpoints to consider the predicted degree of visual change that will occur in the landscape as well as the potential visual sensitivity of certain landscape areas.
- 10.1.2 The landscape that surrounds the Keyneton Wind Farm is defined by a series of landscape character units that relate to the underlying topography and vegetation of the region. To the west, the Eastern Mount Lofty Ranges form from an undulating topography with extensive areas of remnant woodland cover that provide a moderate to high degree of landscape amenity as well as significant localised visual screening.
- 10.1.3 By contrast the landscapes character of the Eastern Mount Lofty Ranges Plateaux has an open visual character with little or no vegetation. This creates an exposed rural landscape punctuated by rocky outcrops and smaller areas of vegetation (particularly around the North Rhine Valley and Marne River).
- 10.1.4 The Eastern Escarpment also forms an exposed agricultural landscape devoid of vegetation. The elevated topography produces a prominent landscape feature within the regional context of the wind farm development. From the ridgeline of the escarpment there are panoramic views across the Murray Plains.
- 10.1.5 To the east are the Murray Plains, a low lying agricultural landscape punctuated by belts of vegetation associated with the underlying creeks and the field pattern of the area. The Eastern Mount Lofty Escarpment is the prominent visual element in the landscape to the west. The elevated topography of the escarpment produces a defined visual envelope with an un-vegetated landscape character. Other views around the plains to the east are screened by vegetation and local ridgelines.
- 10.1.6 The visual effect of the proposed development will vary from slight to moderate on the eastern side of the escarpment with higher degrees of visual change generally to the west and a localised area of substantial visual change associated with areas of increased landscape and tourist value.
- 10.1.7 The wind farm extends across the ridgeline formed by the eastern edge of the Mount Lofty Ranges with the resulting visual effect marked by the inter-relationship between the underlying landscape character and the development form of the wind farm. The variation in the degree of visual change is demonstrated in the visual assessment undertaken in Section 4. Viewpoints to the west, which contain areas of both agricultural and natural landscape features associated with remnant vegetation result in higher degrees of visual change, ranging from 33% to 53%, based on a landscape character value of between 10 and 14. To the east where the modified agricultural escarpment and low lying Murray Plains dominate the landscape character associated with the viewpoints, the value drops to 9 to 11 and the degree of visual change decreases to a range of 20% to 36%. Refer to Figure 51 for illustration of degree of visual change.
- 10.1.8 The visual assessment demonstrates the relative visual effect of the wind farm within the landscape from a sub-regional and regional context. From locations to the east, the agricultural land use, lack of landscape amenity (absence of natural vegetation cover) and prominent topographic form of the Eastern Mount Lofty Ranges off-sets the potential visual impact of the wind turbines. While the wind farm is visible, its overall scale is mitigated by the landscape character, underlying topography and panoramic visual qualities of the regional landscape areas

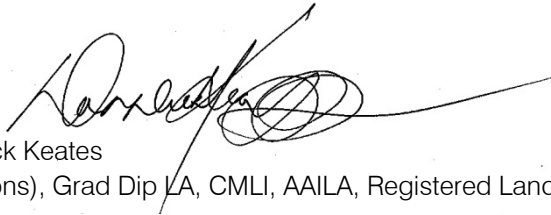
10 Conclusion

to the east. The wind farm is described as producing a slight to moderate degree of visual change within a modified rural landscape.

- 10.1.9 To the west, the amount of vegetation cover and undulating topography provides significant screening and framing of views throughout the landscape. While the degree of visual change is described as moderate increasing to substantial, the actual visual effect is mitigated by the surrounding landscape context which limits both the number of locations from where the wind farm is visible and the amount of visual effect that will be experienced. By contrast, from the east the visibility of the wind farm increases, due to elevated position of the wind farm. However, the majority of the proposed wind turbines are located within the transitional and agricultural landscapes of the Eastern Mount Lofty Ranges Plateau and Escarpment. The associated modified agricultural landscape value and increased topographic variations of the escarpment reduce the potential degree of visual change. Through the iterative design process the visual effect has been further reduced by the deletion of certain wind turbines (reducing the wind turbine number from 57 to 42).
- 10.1.10 The landscape assessment and community consultation identified areas of local sensitivity including the Marne River, Keynes Gap, North Rhine Valley and the viticulture near the Henschke winery. The landscape values identified during community consultation were then incorporated into the assessment process which formed the basis of the landscape character and the degree of visual change.
- 10.1.11 This community landscape value assessment also influenced the design review process as described in Section 5 which outlines how the 57 turbine layout was modified to limit the visual effect of certain wind turbines on areas of more significant visual or cultural value.
- 10.1.13 During the design development process, the visual effect of the proposal was reduced by either removing or reviewing turbines for their individual and collective degree of visual impact. The turbines that were considered to have more elevated visual effects were located to the southern tip of the southern cluster. Turbines 50, 56 and 57, impacted more significantly on the Marne River corridor and Eden Valley Lookout (viewpoint 7) which have higher degrees of landscape amenity and also community value. By managing the visual effect in this locality as a priority (and deleting these turbines), the development is seen to respond to the existing landscape values. The potential visual change decreases to the northeast.
- 10.1.14 The final 42 wind turbine layout and separation of the wind farm into two clusters provides additional visual mitigation which moderates the degree of visual effect within sub-regional and regional landscape. That is to say, the extent to which the entire wind farm of 42 turbines is seen, is significantly reduced due to the interrelation of the topography and vegetation contained within the surrounding landscape. Typically, a large number of wind turbines are screened from many locations and viewpoints in the landscape. In this regard the degree of total visual effect that may be experience is limited due to the absorption capacity of the landscape and the layout response of the 42 turbine proposal.
- 10.1.15 While this fragmentation of the visibility of the wind farm affects the degree of visual change, the visual effect to the west does increase to moderate/substantial. However in these areas the visual effect will be more localised due to the amount of vegetation coverage and defined topographic screening which limits the frequency of views towards the wind farm.

10 Conclusion

- 10.1.16 In conclusion, the proposed Keyneton Wind Farm will for the majority of regional landscape be experienced as a moderate visual effect. Although areas of substantial effect were recorded to the west, these visual effected locations are contained within a well vegetated and topographically varied landscape where views of the wind farm are often partially or fully screened.
- 10.1.17 Based on the visual assessment, this report concludes that the degree of visual change that will result from the development of a Keyneton Wind Farm will not cause a significant adverse visual impact and that the existing landscape character can accommodate the proposed development. It is our interpretation and evaluation that while the visual effect will be moderate/ substantial, that the underlying rural/ agricultural regional landscape character will be preserved.



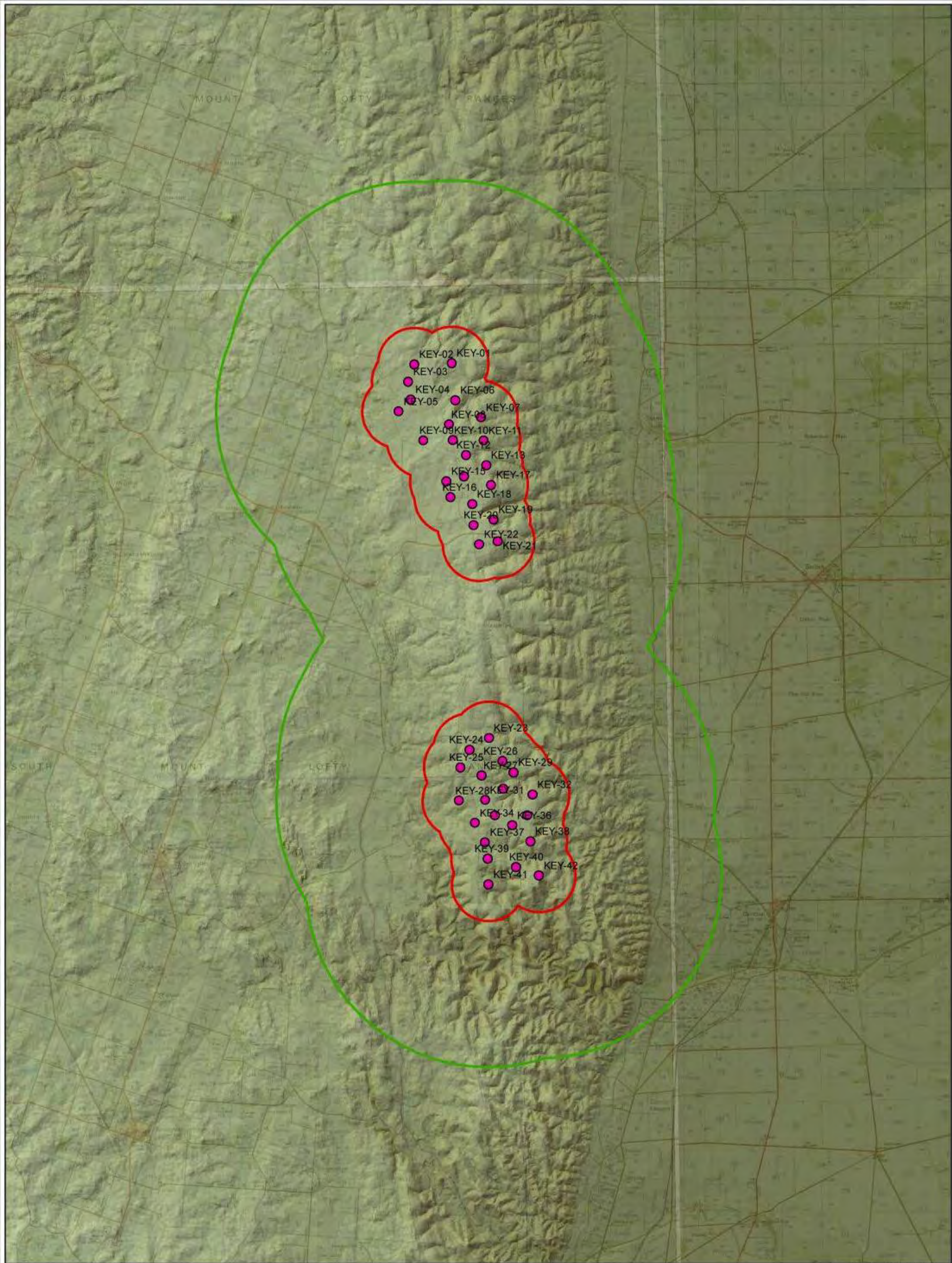
Warwick Keates
BA (Hons), Grad Dip LA, CMLI, AAILA, Registered Landscape Architect



Dr Brett Grimm
PhD, BLarch, BDest, AILA Registered Landscape Architect

Appendix A

Assessment Mapping



Topography

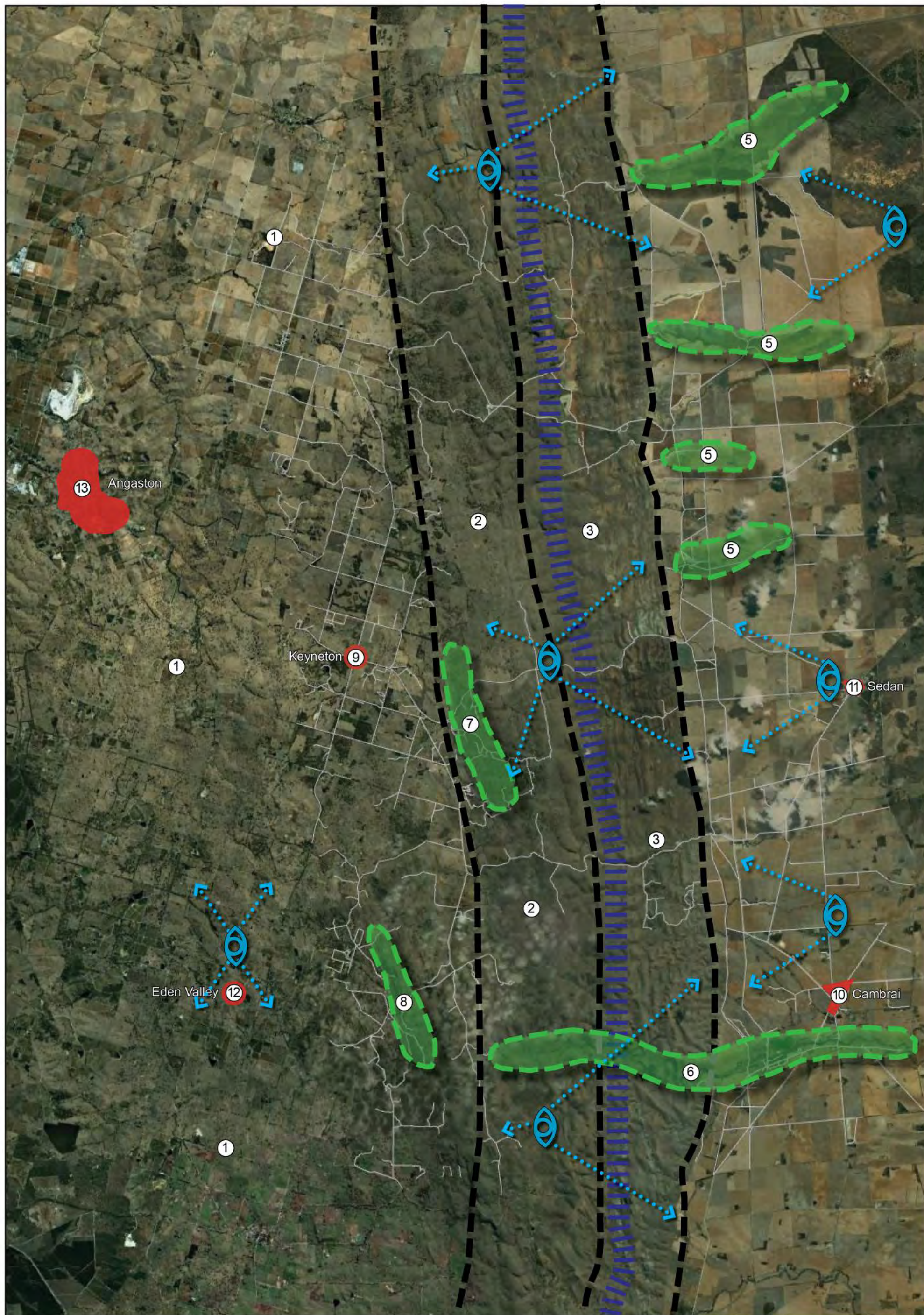
Scale 1:100,000@A3
December 2011 Turbine layout

Legend

- Turbines
- Buffer local 1km
- Buffer subregional 5km

0 0.5 1 2 3 4
Kilometers





— Landscape Character Units

○ Landscape Features (woodlands, valleys and rocky outcrops)

● Townships

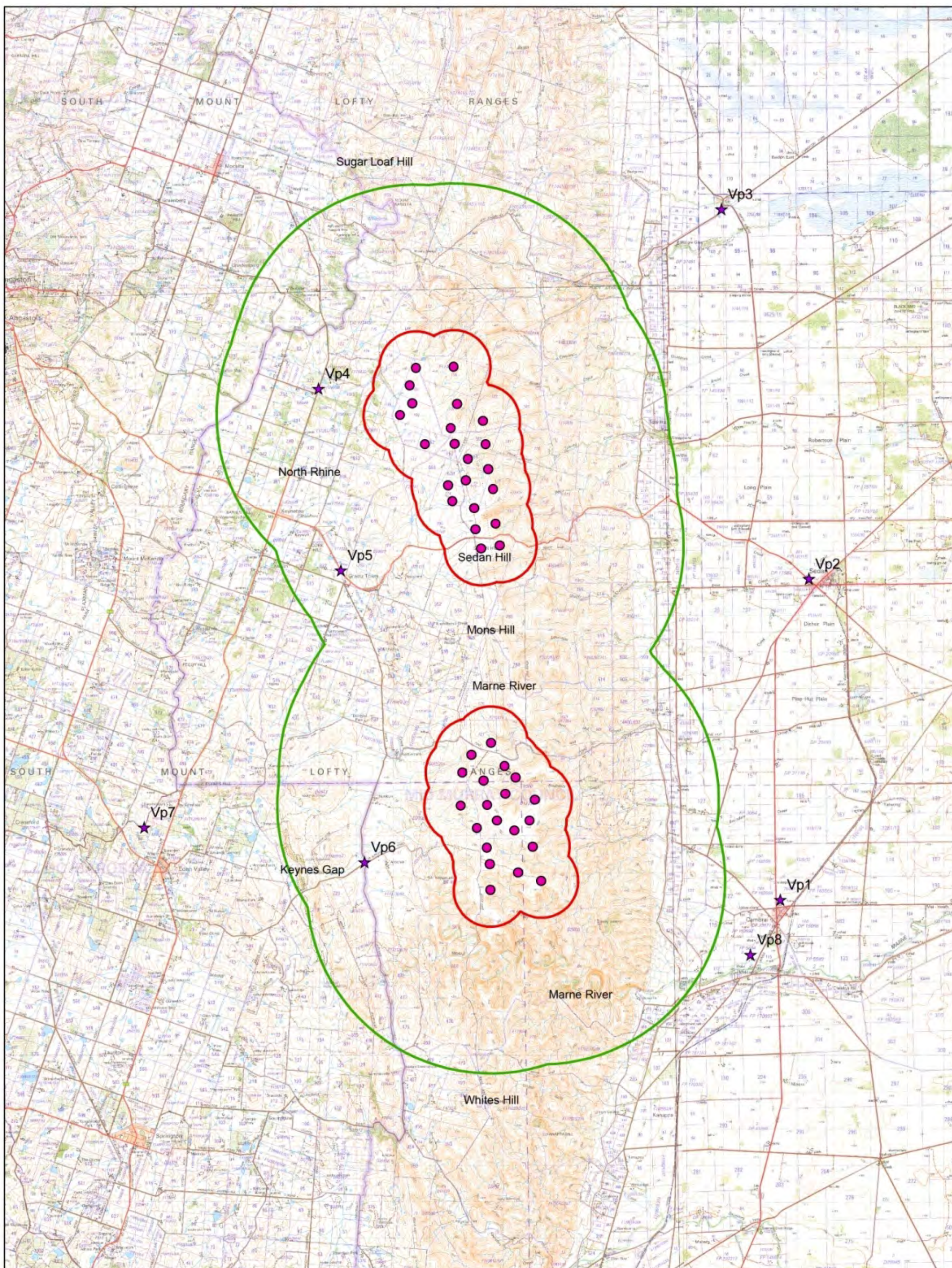
||||| Prominent Ridgelines



Open views (panoramic landscape character)

1. Eastern Mount Lofty Ranges
2. Eastern Mount Lofty Plateaux
3. Eastern Mount Lofty Escarpment
4. Murray Plains
5. Murray Creeks
6. River Marne

7. North Rhine Valley
8. Keynes Gap
9. Keyneton
10. Cambria
11. Sedan
12. Eden Valley
13. Angaston



Viewpoint Locations for Montage & Detailed Assessment

Legend

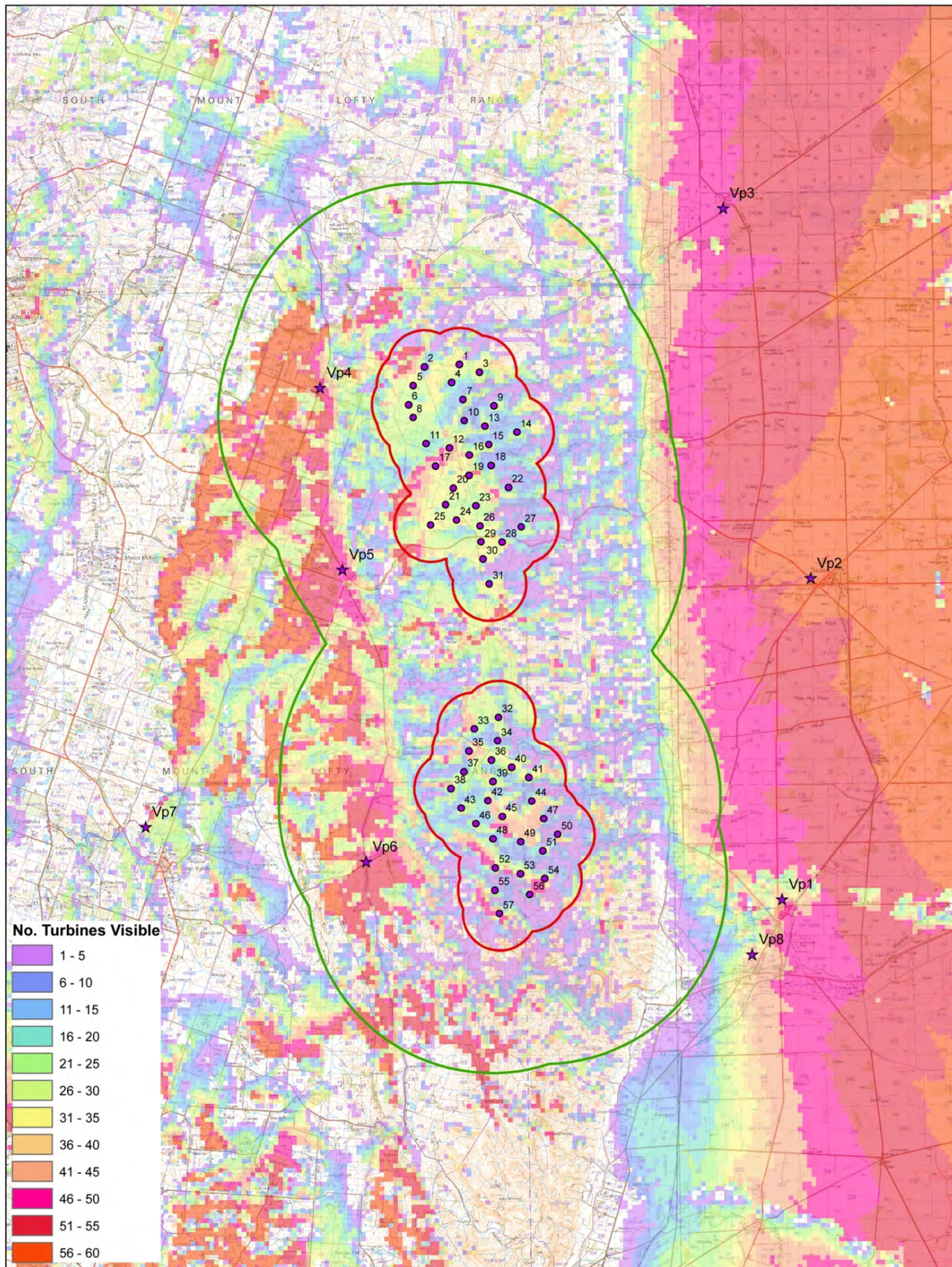
- Turbines
- ★ Viewpoints Assessment
- Buffer local 1km
- Buffer subregional 5km

Scale 1:100,000@A3

December 2011 Turbine layout

00.51 2 3 4
Kilometers





Zone of Theoretical Visual Influence- Hub Height

Scale 1:100,000@A3
Original layout

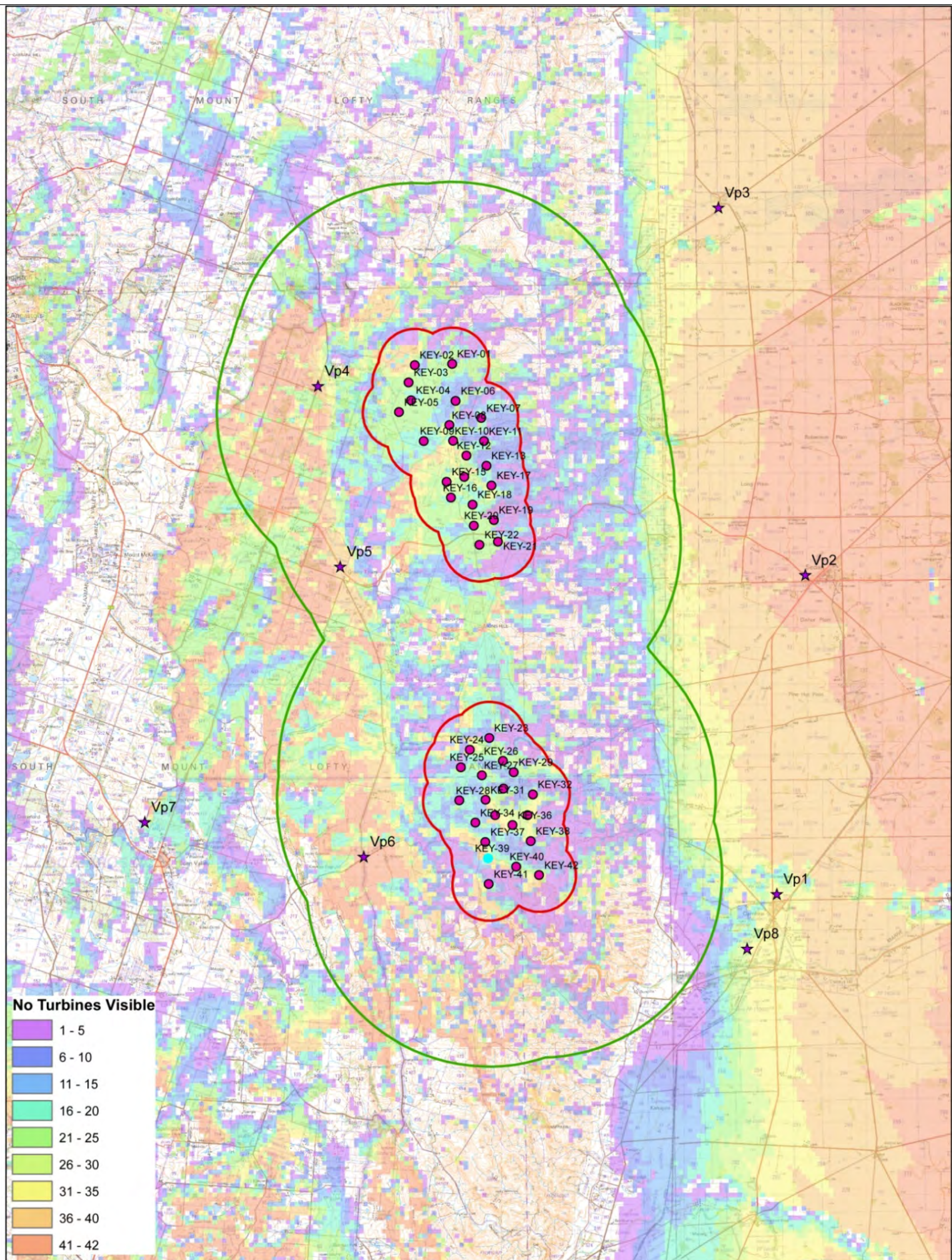
Legend

- Turbines
- ★ Viewpoints Assessment
- Buffer subregional 5km
- Buffer local 1km

Note: ZTVI illustrates the potential visibility of turbines to hub height (95m AGL). The ZTVI represents a conservative estimate of the number of turbines that are potentially visible using a 10m digital terrain model with no mapping or calculated effect of vegetation or built form screening.

0 0.5 1 2 3 4
Kilometers





Zone of Theoretical Visual Influence- Hub Height

Scale 1:100,000@A3
December 2011 Turbine layout

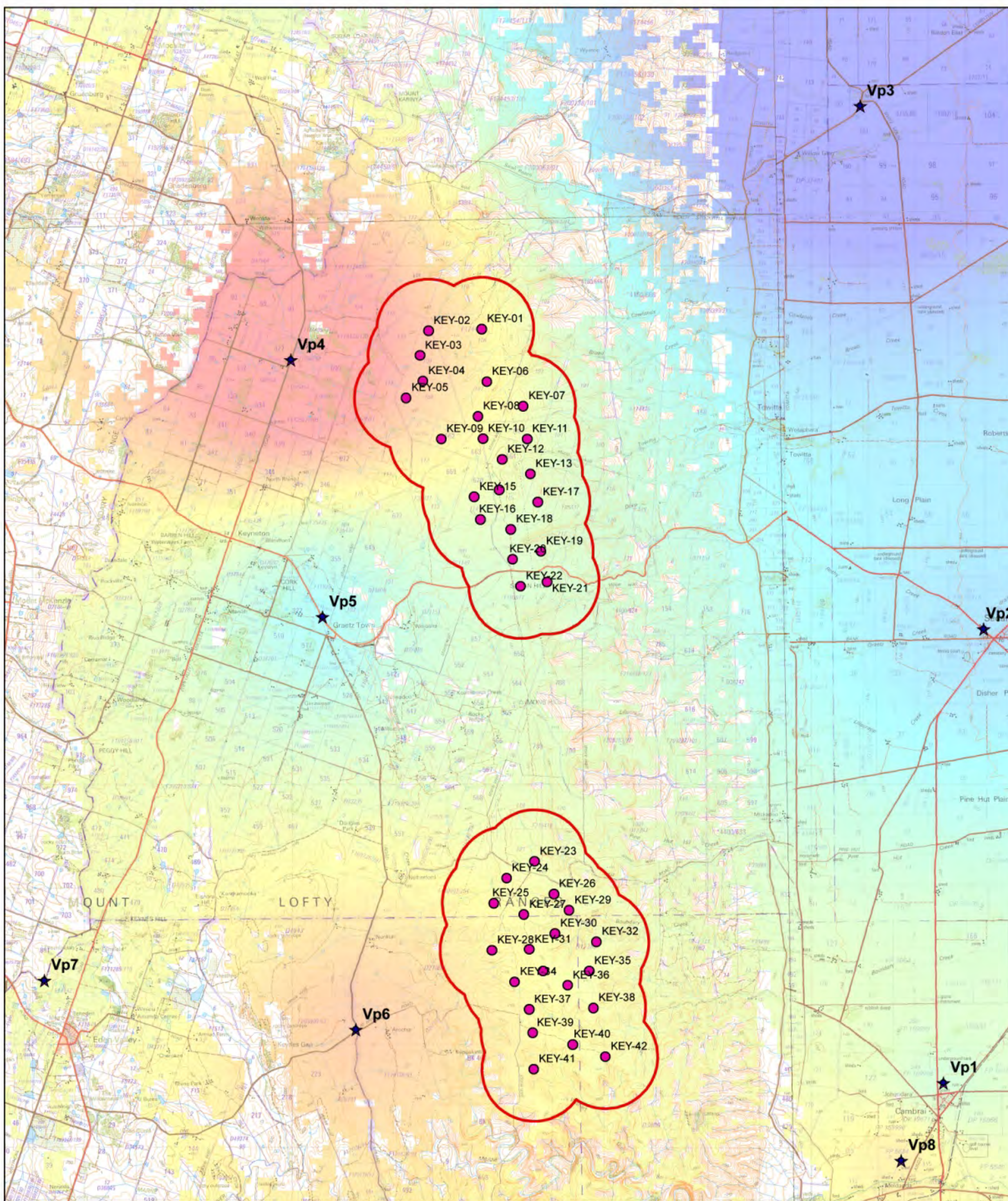
Legend

- Turbines
- ★ Viewpoints Assessment
- Buffer local 1km
- Buffer subregional 5km

Note: ZTVI illustrates the potential visibility of turbines to hub height (95m AGL). The ZTVI represents a conservative estimate of the number of turbines that are potentially visible using a 10m digital terrain model with no mapping or calculated effect of vegetation or built form screening.

0 0.5 1 2 3 4
Kilometers





Visual Effect Interpolation

Scale 1:75000@A3

December 2011 Turbine layout

Legend

- ★ Viewpoints Assessment
- Turbines
- Buffer local 1km

Visual Effect % Change

- Substantial
- Moderate
- Slight

This figure illustrates the regional visual effect calculated within GIS as a distance weighted interpolation between the 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 relative visual effect of the potential transient experience of the regional landscape. This does not take into account vegetation screening which would reduce the potential effect in some localities.

0 0.5 1 2 3 4 Kilometers



Appendix B

Photomontage Methodology

WAX Design and BGLA have developed a photomontage methodology based on world's best practice guidance. Using a combination of onsite assessment with GPS referencing and computer simulations, photographic representations of the proposed wind farm are produced with clarity and accuracy. The photomontages are modelled using wind farm development visualisation software Windfarmer™ and Adobe Photoshop™ both commonly used within the world wind farm development industry and visual assessment of wind farms. The field of view is consistent with the assessment procedure noted in the Grimke Matrix.

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.

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.

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

4. 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.

5. 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.

6. 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 thereof 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

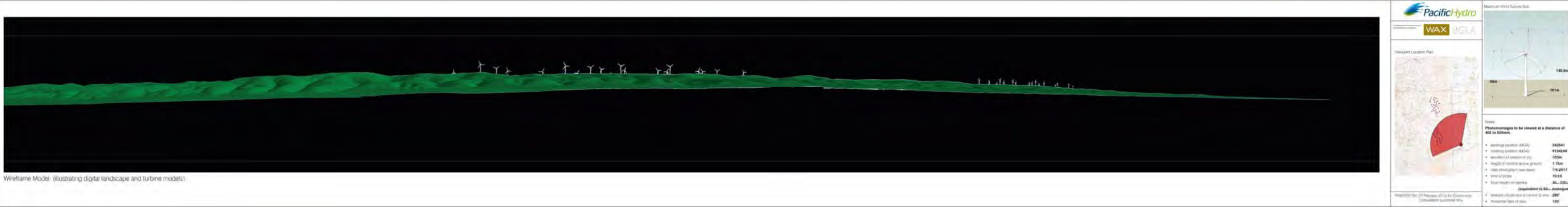
(A1 extended page format reduced to A3)



Photomontage 1: Outskirts of Cambrai, on the Mannum - Sedan Road, looking Northwest



Existing View:



Wireframe Model (illustrating digital landscape and turbine models)



Photomontage 2: Outskirts of Sedan, West of Church



Existing View



Wireframe Model: (illustrating digital landscape and turbine models)

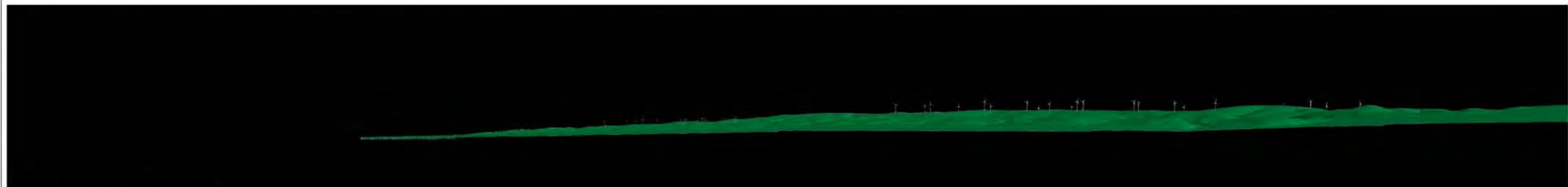




Photomontage 3, Towitta Road South



Existing View:



Wireframe Model (illustrating digital landscape and turbine models)





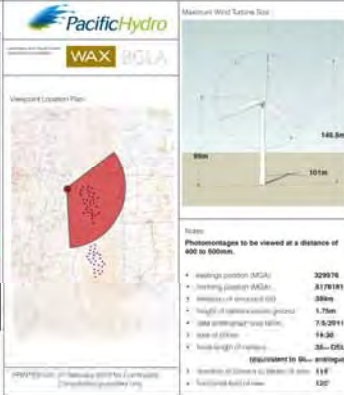
Photomontage 4: Near Henschke winery



Existing View



Wireframe Model (illustrating digital landscape and turbine models)





Photomontage 5: Sedan Hill Road, just Southwest of Jutland Road intersection, looking Northeast



Existing View:



Wireframe Model: (illustrating digital landscape and turbine models)

WAX RGLA
Windfarm Location Plan

Maximum Wind Turbine Size

Turbine
Photomontages to be viewed at a distance of 400 to 600m.

• existing position (MGA)	330166
• existing position (MGA)	817329
• elevation of viewpoint (m)	371m
• height of construction ground	1.7m
• slope and distance from road	7-8.25%
• view angle (m)	10/0
• total length of camera	35.25m
• elevation of camera (m) (m) (m)	307
• horizontal field of view	120°



Photomontage 6: Intersection of Sulfand Road and Med Wrights Road, Eden Hills



Existing View:



Wireframe Model: (illustrating digital landscape and turbine models)

Viewpoint Location Plan

Maximum Wind Turbine Size

Notes

Photomontages to be viewed at a distance of 400 to 500m.

- existing position (MGA) 331226
- existing position (MGA) 6180271
- elevation of landscape (m) 320m
- height of turbine above ground 1.75m
- tower (centre) from ridge centre 7.5/2611
- tower of tower 16.25
- tower length of tower 35-100m

(equivalent to 60-100m)

- direction of tower to centre of view 40°
- perspective map of view 120°

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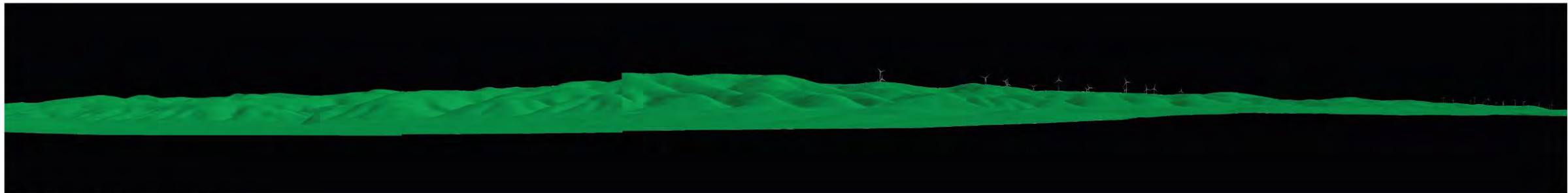







Photomontage 8: Marne River campsite



Existing View:

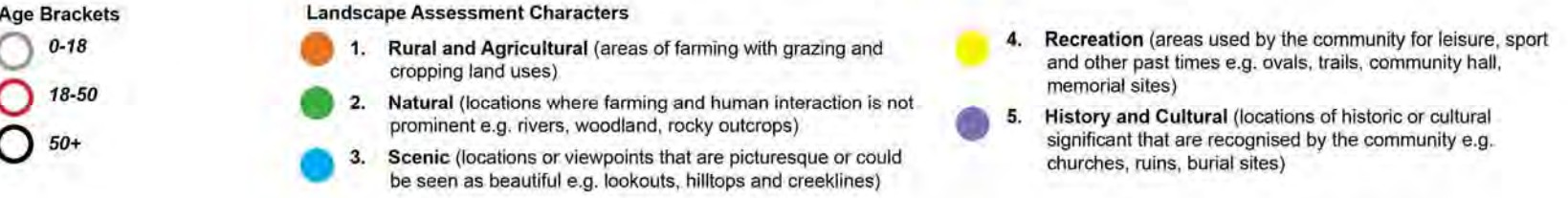
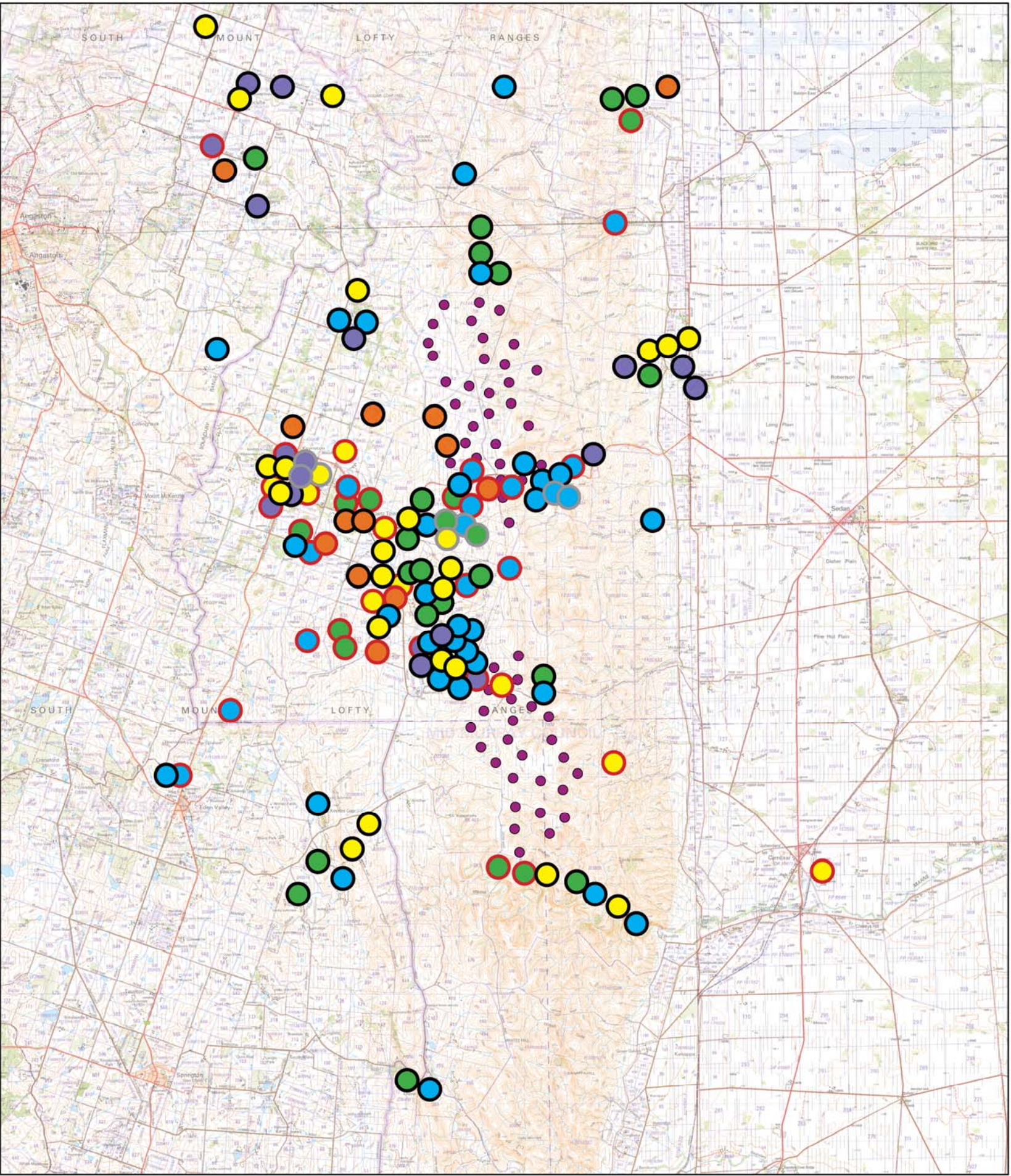
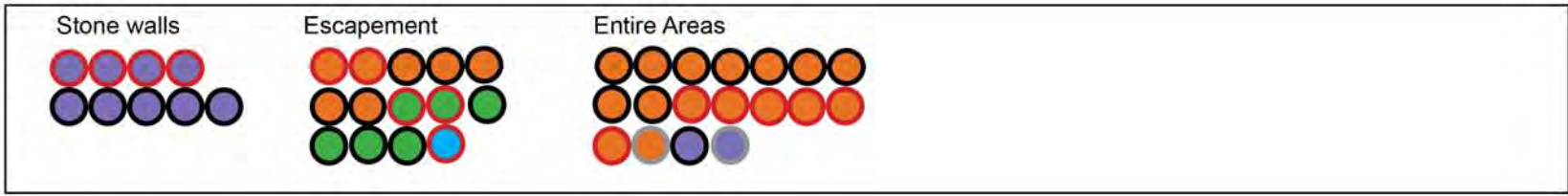


Wireframe Model: (illustrating digital landscape and turbine models)

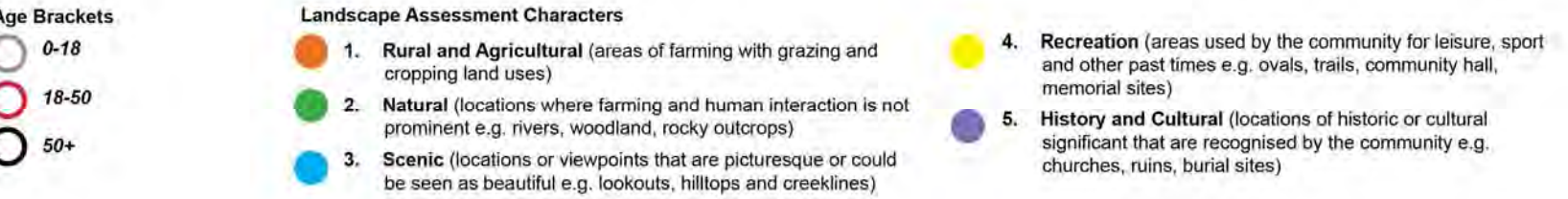
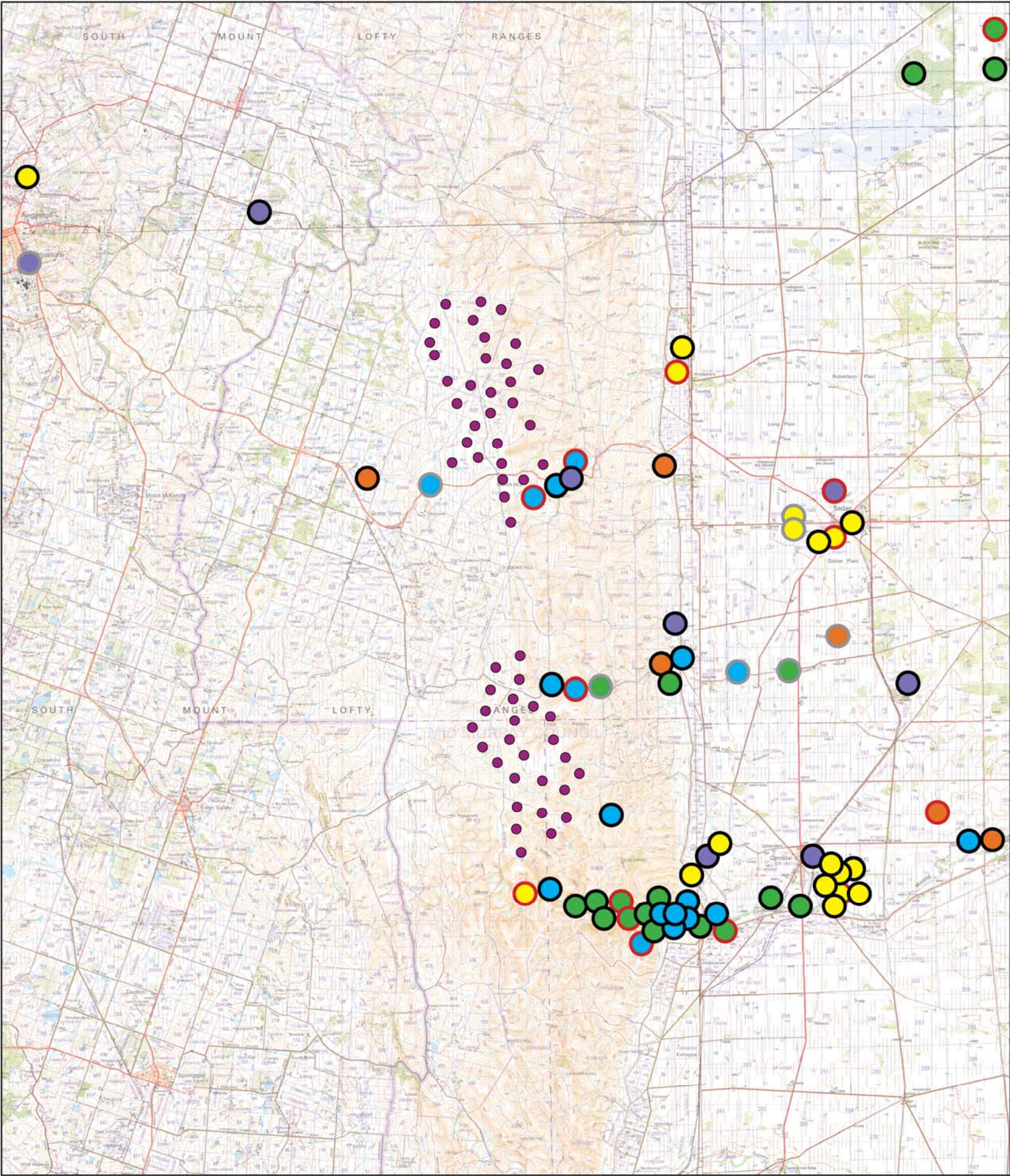
 Sustainable Energy WAX BGLA	Maximum Wind Turbine Size 
Viewpoint Location Plan 	Notes: Photomontages to be viewed at a distance of 400 to 500m. <ul style="list-style-type: none">• existing position (DGA): 341727• existing position (MGA): 6162747• elevation of existing (m): 677m• height of camera above ground: 1.75m• date photograph was taken: 28-10-2011• time of day: 11:30• focal length of camera: 35 - DSLR (equivalent to 88 - analog)• direction of camera to centre of view: 288°• horizontal field of view: 120°
PRINTED ON: 07 February 2012 for Community Consultation purposes only	

Appendix D

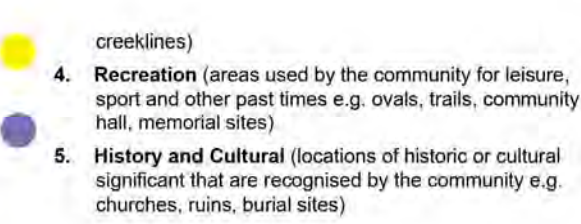
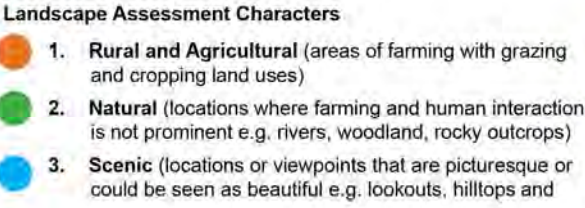
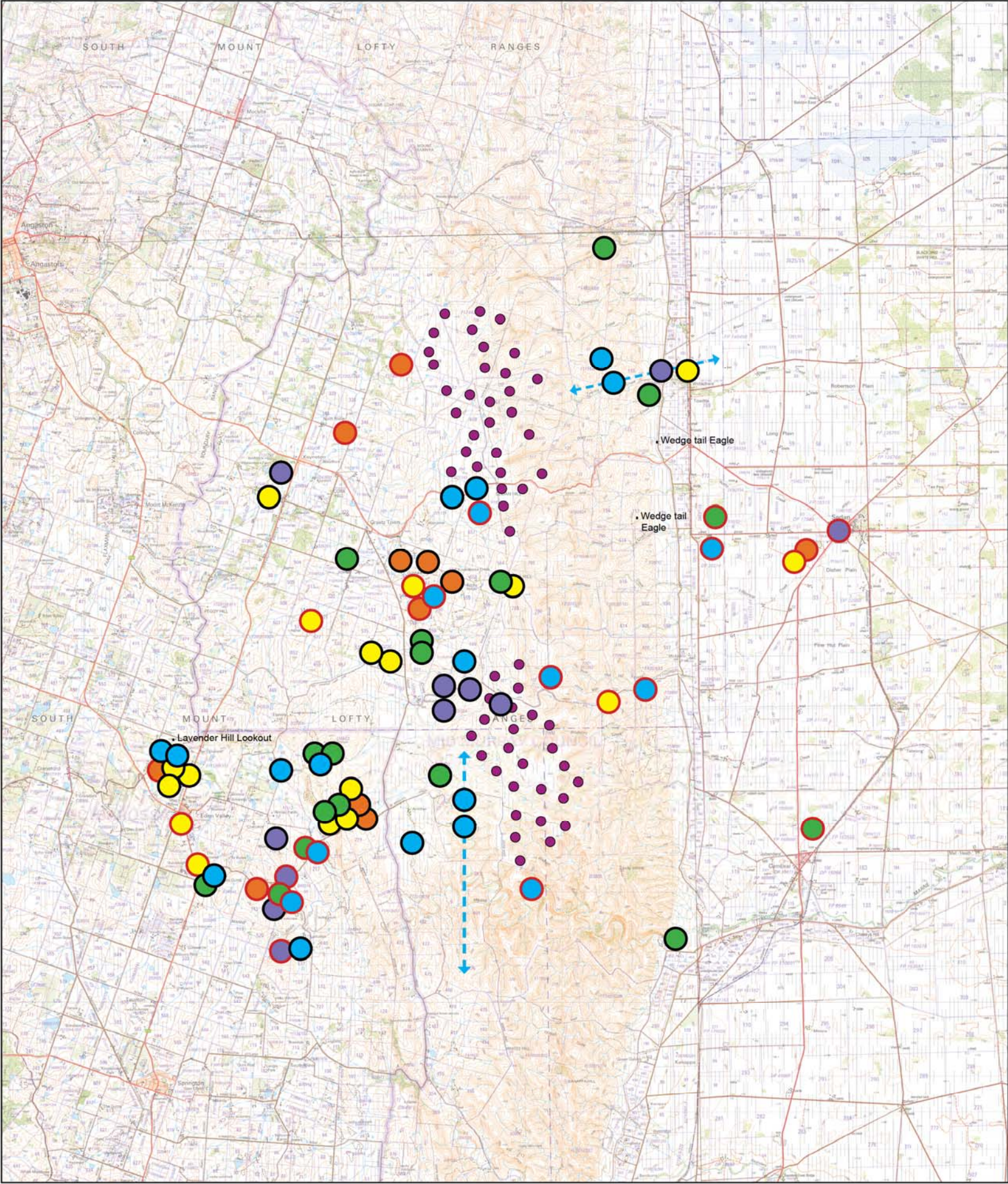
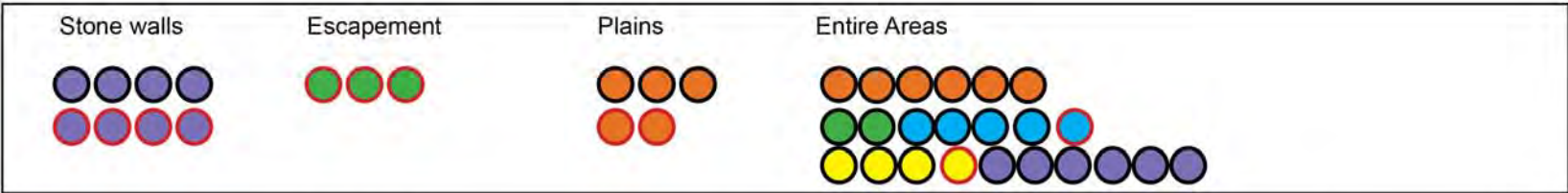
Community Landscape Values Mapping



Keyneton



Cambrai



Eden Valley

Appendix E

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.

¹ Daniel, T C & Vining, J (1980) p49

Landscape Assessment

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.

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.

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

Cultural and Landscape 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 is 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.
40-59%	3	Moderate impact from planning designations
20-39%	2	Limited effect
0-19%	1	None to negligible effect of planning designations

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 matrixⁱⁱⁱ formula, the development was quantified and aggregated to provide an assessment of the visual effect for each viewpoint.

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 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.

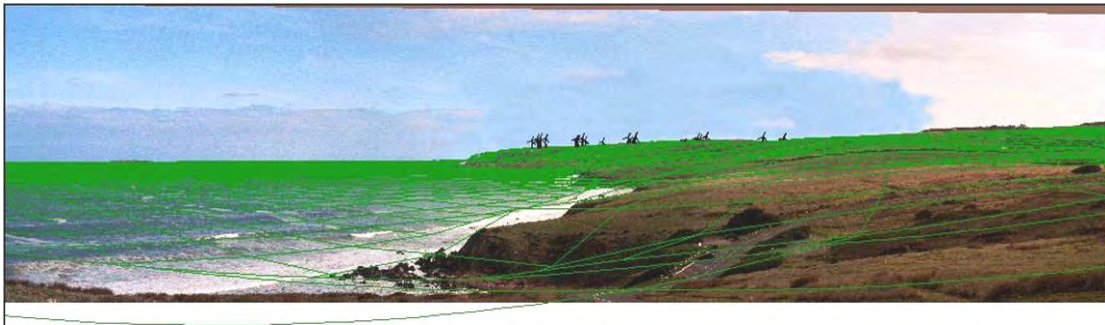


Figure 1 Photo with wire line model draped on top. Courtesy Wind Farm Developments (2004)

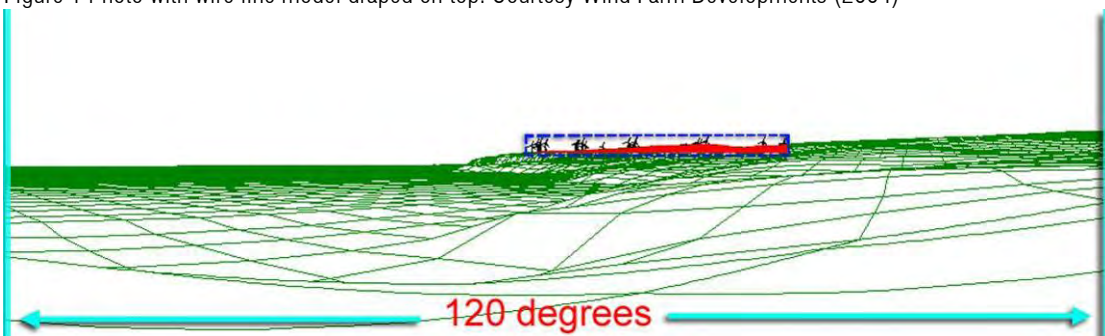


Figure 2 Wire line of showing extent of photomontage. Adapted from Wind Farm Development (2004)

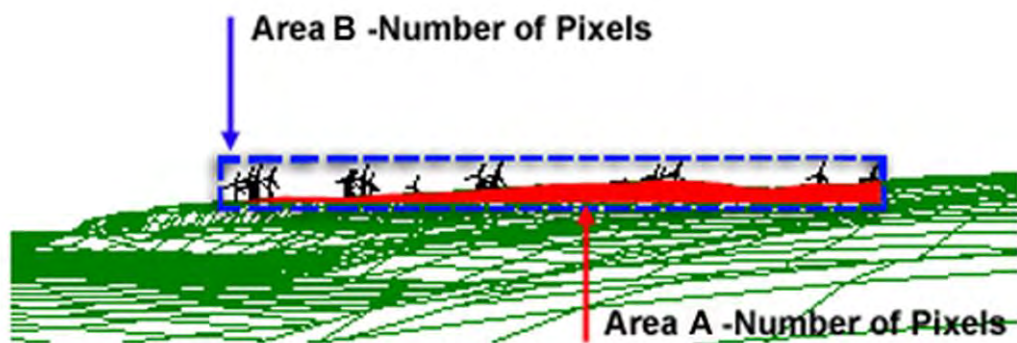


Figure 3 Detailed view of the landscape absorption (area A) and development extents (area B). Adapted from Wind Farm Development (2004)

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.

Horizontal Visual Effect (HVE)

The field of vision (FOV) experienced by the human eye is described as an angle of 200-208 degrees horizontally^{iv}. 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

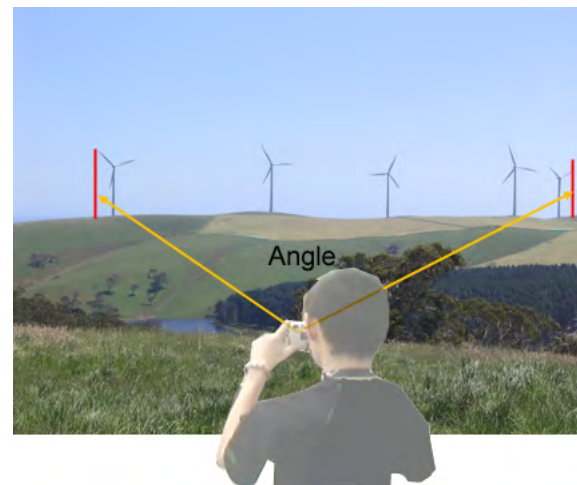
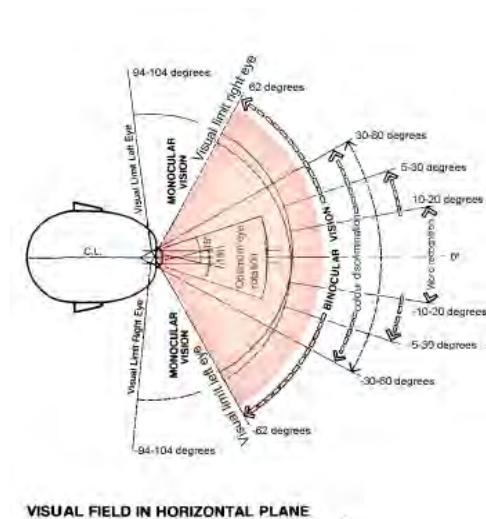


Figure 4 Active field of view is defined as the binocular field equating to 120-124 degrees. On the right is an illustration of horizontal measured angle as percent of active field 120 degrees. Photo Brett Grimm

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.

Vertical Visual Effect (VVE)

The vertical visual effect is measured with reference to a baseline landscape vertical elevation responding to the viewpoint elevation. The elevation of the observation point is recorded using a GPS with a supplementary 1.7m for human eye level. A second measurement is recorded of the highest topographic elevation point within the field of view which is used to calculate the existing landscape vertical character (this is achieved through desktop studies of contours) **(A)**.

Part B of the process is to calculate the height of the turbine elevation to tip of blade, which is recorded and calculated for its vertical height in relation to the viewpoint **(B)**.

Part C of the process is to determine the overall vertical visual change to the landscape by calculating a percentage change

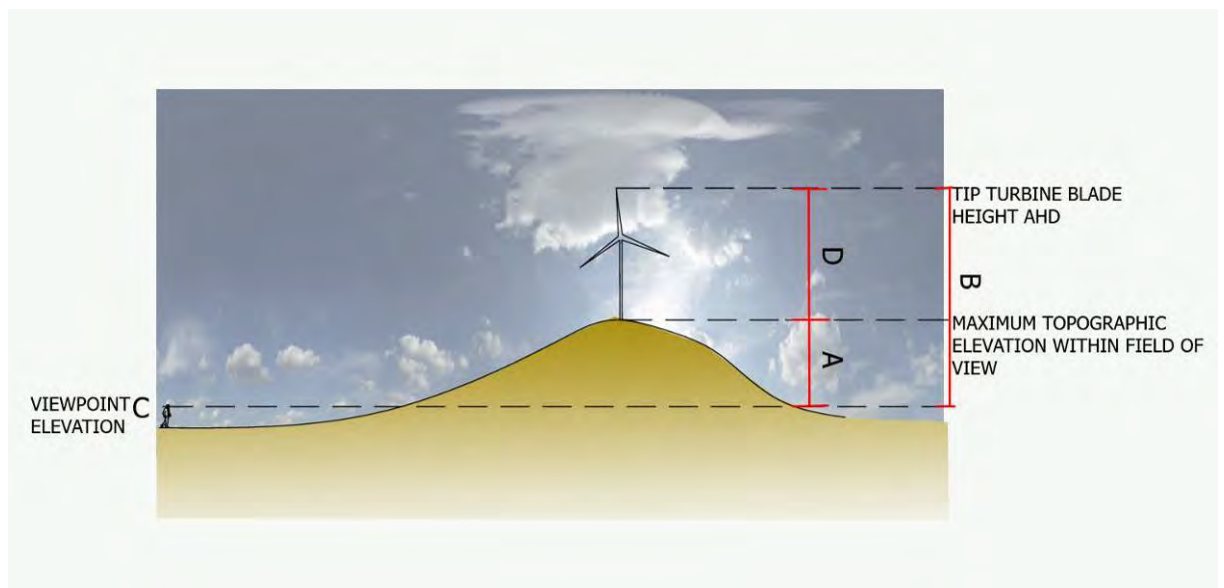


Figure 6



Figure 7



Figure 8

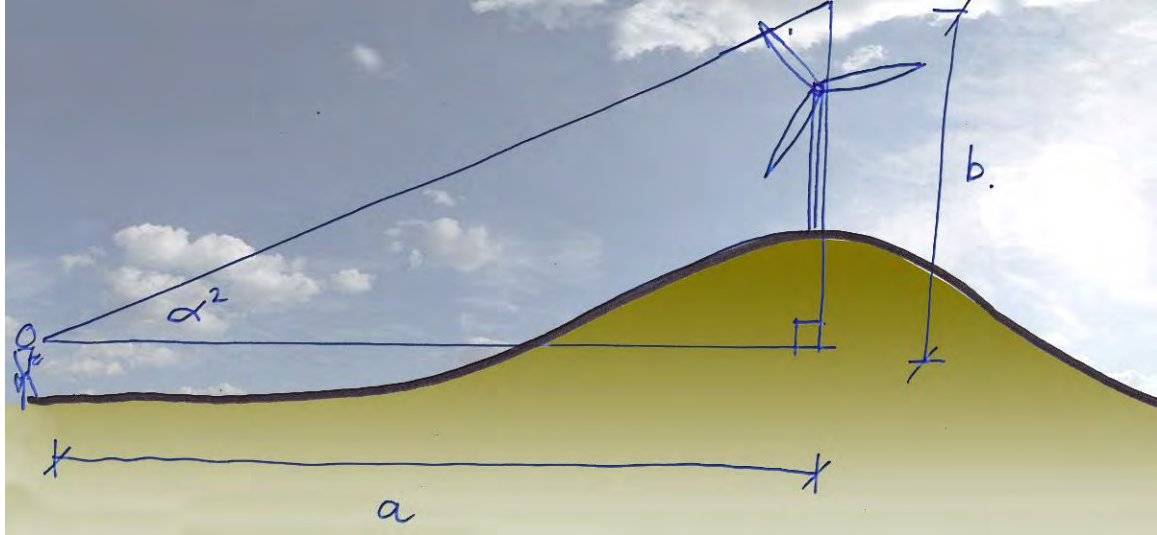


Figure 9

The vertical visual change is calculated as the proportional increase in visual effect with reference to the existing landscape vertical scale.

Two separate calculations are conducted using trigonometry. The equations take into account the distance of view to the existing landscape highest elevation landform to calculate the angle of eye sight. This same equation is used to evaluate the maximum height of the largest turbine within the field of view and the angle of eye sight to the tip of the maximum tip of blade. The measurements are based on the viewpoint AHD and photographic recordings which utilise GPS barometric readings.

1. Base line elevation (C) = viewpoint elevation (Figure 6 and 7)

2. Existing landscape vertical scale (Figure 8)

Distance (a) is defined by the maximum ridge line within the viewpoint photo and referenced to the contour data and viewpoint.

$$\tan \alpha 1 = a/b$$

$$\alpha 1 = d$$

3. Proposed maximum turbine height within the field of view (utilising photomontage to depict the greatest blade tip elevation (Figure 9))

Distance (a) is defined by the turbine which has the maximum height to tip of blade within the viewpoint photomontage relative to the viewpoint. Hence the distance for the maximum turbine may not be the same as the existing landscape vertical scale ridgeline.

$$\tan \alpha 2 = a/b$$

$$\alpha 2 = e$$

4. Proportional increase in vertical visual effect

$$d/e \times 100 = \text{percentage of vertical visual effect in relation to existing landscape vertical scale.}$$

Degree of Vertical Visual Impact (expressed as an angle of impact and percentage of change)	Value	Description of Visual Modification
80-100% proportional increase	5	Substantial visual impact.
60-80% proportional increase	4	Increasing visual impact
40-60% proportional increase	3	Moderate visual impact.
20-40% proportional increase	2	Limited impact
0-20% proportional increase	1	No or minor visual impact within the landscape

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).

T

Location of Development (from viewpoint)vi	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

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) $10 \times 0.45 = 4.5$

(d) $4.5/20 = 0.225$

(e) $0.225 \times 100 = 22.5\%$ Visual Change to the Landscape

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 underlying landscape visual character through the introduction of new elements.

Percentage Value of Visual Change	Descriptive Qualification of Visual Effect	Comments
		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 underlying landscape visual 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.

Mitigation

The final aggregated visual effect from each viewpoint is then assessed for potential mitigation techniques. The following table describes recommendations on whether mitigation should be considered to reduce the affect.

Degree of Visual Effect	Value (total of previous criteria)	Mitigation
Extreme	(80-100%)	Recommend mitigation scenarios, which may encompass the deletion of turbines to specific view corridors.
Severe	(60-80%)	Recommend opportunities to mitigate the visual effect with vegetation buffers and or relocation of turbines.
Substantial	(40-60%)	Consider opportunities for mitigation if feasible.
Moderate	(20-40%)	No mitigation required, however if there are any potential slight adjustments to the design layout these will be suggested.
Slight	(0-20%)	No mitigation required

Appendix F

Glossary²

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 development of Objective Base Assessment Criteria for measuring the visual impact of various developments, including Open Cast Mines, Wind Farms, Mobile Phone Towers, Significant Trees and Road Corridors. He has also been called as an expert witness at Planning and Parliamentary Hearings.

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
Environmental Impact Assessment
Expert Witness
Urban design
Large scale master planning

Previous Experience

WAX DESIGN

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
Berrimal Wind Farm VIC
Telstra Telephone Tower Visual
Assessment

HASSELL

Taralga Wind Farm Peer Review NSW
Naroghid Wind Farm Assessment VIC
Waitpinga Wind Farm VIA
Myponga Wind Farm VIA
IKEA Totem Visual Assessment
Hutchinson 3G Phone Tower Visual Impact
Assessment

ANTHONY WALKER & PARTNERS (UK)

Picton-Shipton Nation Grid Powerline EIS
A1/M1 Link Road EIA
M6 Widening Visual Assessment

Appendix H

Endnotes & References

References

- Australian Wind energy Association and Australian Council of National Trusts (2007) Wind Farms and Landscape Values: National Assessment Framework
- Best Practice Guidelines for the Implementation of Wind Energy Projects in Australia (2006);
- Grimm, B., 2009. Quantifying the Visual Effects of Wind Farms; A Theoretical Process in an Evolving Visual Australian Landscape. PhD Thesis Adelaide University
- Lothian, A., 2000. Landscape Quality Assessment of South Australia. PhD Thesis Adelaide University
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- Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria (2002);
- South Australian Wind Farms Planning Bulletin (2002).

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 $\pm 0.5^\circ$ from true magnetic course.

ⁱⁱⁱ The matrix outlined in this paper and techniques used to quantify the visual effect are copyright under the name GRIMKE Matrix.

^{iv} Pirenne, M.H. (1967). *Vision and the Eye*. London: Chapman and Hall

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

^{vi} 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.