SILVERTON WIND FARM
STAGES 1 AND 2

LANDSCAPE AND VISUAL IMPACT ASSESSMENT

Prepared for

SILVERTON WIND FARM DEVELOPMENTS P/L

30th July 2008

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Introduction

SECTION 1

1.1 Introduction

A Landscape and Visual Impact Assessment (LVIA) has been prepared by URS Australia Pty Ltd (URS) and Green Bean Design on behalf of Silverton Wind Farm Developments Pty Ltd. The LVIA has been prepared as part of the requirements for the preparation of an Environmental Assessment for the proposed Silverton Wind Farm situated in the Unincorporated Far West area of New South Wales.

The LVIA addresses applications for Stage 1 Project Approval and Stage 2 Concept Approval for the whole development.

The LVIA involved a comprehensive evaluation of the visual character of the landscape in which the Silverton Wind Farm and associated structures will be located, and an assessment of the potential visual impacts that may result from the construction and operation of the Silverton Wind Farm, taking account of appropriate mitigation measures.

The primary objective of the LVIA was to determine the potential visual impact of the Silverton Wind Farm, transmission lines and associated infrastructure on people living and working, or visiting and travelling through the area surrounding the Silverton Wind Farm.

The overall methodology adopted by URS and Green Bean Design for the LVIA has been applied to similar projects, including wind farms and large infrastructure developments, and is cognisant of the Australian Wind Energy Association and Australian Council of National Trust's publication Wind Farms and Landscape Values National Assessment Framework, June 2007.

The LVIA is based on technical and design information relating to the Silverton Wind Farm and associated infrastructure provided to URS and Green Bean Design by Silverton Wind Farm Developments Pty Ltd.

The proposed Silverton Wind Farm, including the construction and installation of up to 600 wind turbines, will be undertaken in two stages over approximately five years, and will generally comprise:

1.2 Stage 1 Silverton Wind Farm

- Up to 120 wind turbines;
- Electrical switchyard including control building, operations and maintenance building and car park;
- Around 27km of a 220kV transmission line between the Stage 1 Silverton Wind Farm and the Broken Hill substation; and
- Site access tracks for construction and maintenance operations.

1.3 Stage 2 Silverton Wind Farm

- Up to 480 wind turbines;
- Additional substations and electrical facilities;
- Duplication of the Stage 1 220kV transmission line to the Broken Hill substation;
- Duplication of the existing 220kV transmission line between the Broken Hill and the terminal station at Red Cliffs in Victoria; and
- Additional site access tracks for construction and maintenance operations.

Methodology

SECTION 2

2.1 Methodology

The general methodology adopted for the LVIA included the following activities:

- Desktop study addressing visual character and receptor locations within the surrounding area;
- Fieldwork and photography;
- Assessment of landscape impact;
- Assessment of visual impact; and
- Preparation of photomontages and illustrative figures.

2.2 Desktop study

A desktop study was carried out to identify an indicative view catchment for Stage 1 and Stage 2 of the proposed Silverton Wind Farm and associated structures. This was carried out by reference to 1:100,000 scale topographic maps as well as aerial photographs and satellite images of the development site and surrounding area. The topographic maps and aerial photographs were also used to identify the locations and categories of potential receptors that could be verified during the fieldwork component of the assessment.

The desktop study also outlined the visual character of the surrounding landscape including features such as the site context, landform and elevation.

2.3 Fieldwork

The fieldwork involved:

- Eight days of site inspection to determine the potential extent of visibility of the Silverton Wind Farm and associated structures;
- Determination of the various receptor locations from which the Silverton Wind Farm and associated structures could potentially be visible; and
- Preparation of a written and photographic record for each receptor location inspected.

2.4 Assessment of Landscape Impact

The potential impact of the Silverton Wind Farm on the character of the surrounding landscape will result primarily from the ability of the landscape to integrate with, or to absorb the Silverton Wind Farm development.

The capability of the landscape to integrate with, or to absorb, the Silverton Wind Farm development will result primarily from the combination of two factors:

- the degree of potential screening that could be provided by the existing physical characteristics of the landscape, i.e. landform, rockform or vegetative cover; and
- the nature and degree of perceptual factors that may influence interpretation and appreciation of the landscape, i.e. scale, line, pattern and colour.

2.5 Assessment of Visibility

The potential visibility of the wind farm from surrounding receptor locations would result primarily from the extent to which any particular structure of the wind farm may be visible and may be determined by from a combination of factors including:

- The category and type of situation from which receptors may view the wind farm (examples of receptor categories include residents, tourists and motorists);
- The potential number of receptors with a view toward the proposed wind farm from any one view location;
- The distance between the receptor and the proposed wind farm; and
- The duration of time the receiver may view the proposed wind farm from any static or dynamic view location.

The overall potential Visual Impact of the wind farm development at individual receptor locations would result primarily from a combination of the potential visibility of the wind farm and the visual absorption capability of the landscape between, and surrounding the receptor and the wind farm.

The underpinning rationale for the visual assessment is that if receptors are not normally present at a particular location, such as scrub pasture or semi arid desert areas, then there is likely to be a nil visual impact at that location.

If, on the other hand, a small number of receptors are present for a short period of time at a particular location then there is likely to be a low visual impact at that location, and conversely if a high number of receptors are present then the visual impact is likely to be higher. Although this rationale can be applied on a broad scale, the LVIA also considers, and has determined, the potential visual impact for individual receptor locations that may have a higher degree of sensitivity to the wind farm development, including the potential impact on individual residential dwellings.

The determination of a visual impact is also subject to a number of other factors which are considered in more detail in the LVIA.

Whilst the overall visual assessment addresses a number of static elements associated with the Silverton Wind Farm, the assessment acknowledges and considers the potential visual impact associated with the movement of the turbine blades.

2.6 Photomontages

A series of photomontages have been prepared by Garrad Hassan Pacific Pty Ltd to illustrate the visibility of the wind turbines following construction.

A total of eight receptor locations have been selected for the photomontages and include a range of receptor categories, including views from the vicinity of residential properties, streetscapes, lookouts and road corridors. Photomontages have been prepared for Stage 1 and Stage 2 turbine locations.

2.7 Shadow Flicker and Blade Glint

Garrad Hassan Pacific Pty Ltd have advised that a shadow flicker and blade glint assessment is not appropriate for the Silverton Wind Farm as there are no residential receptors located within a 1km radius of the development site which may be impacted by the effect of shadow flicker and blade glint.

Location

SECTION 3

3.1 Location

The Silverton Wind Farm will be located on the southern portion of the Barrier Ranges, a roughly triangular block of ancient metamorphic and sedimentary rocks in far west New South Wales. The South Australian border is approximately 18km to the west of the site. The locality of the Silverton Wind Farm is illustrated in **Figure 1**.

The Stage 1 and Stage 2 Silverton Wind Farm will cover an area of approximately 450 square kilometres, and will be located within the Unincorporated Area of New South Wales, an area of around 93,000 square kilometres administered by the New South Wales State Government.

The desktop study undertaken for the Silverton Wind Farm indicated that the pastoral lands within South Australia, with a potential view toward the proposed Silverton Wind Farm development, were predominantly unoccupied semi arid desert landscapes, and therefore no assessment from areas within South Australia have been included or documented in the LVIA report.

The southern extent of the Stage 1 Silverton Wind Farm area is located approximately 3.5km north of Silverton, a former mining settlement, now variously described as a 'ghost town' in local tourism brochures and historical texts. Silverton is accessed via a sealed road approximately 23km to the west north west of Broken Hill. The proposed Stage 1 wind turbine locations are illustrated in **Figures 4 and 9**, and the combined Stage 1 and Stage 2 wind turbine locations are illustrated in **Figures 4 and 10**.

The site of the Stage 1 Silverton Wind Farm can be accessed via a number of informal unpaved tracks from various points surrounding the lower slopes of the Mundi Mundi Range. Access to the Stage 1 site area is generally restricted to private access for farm maintenance and management.

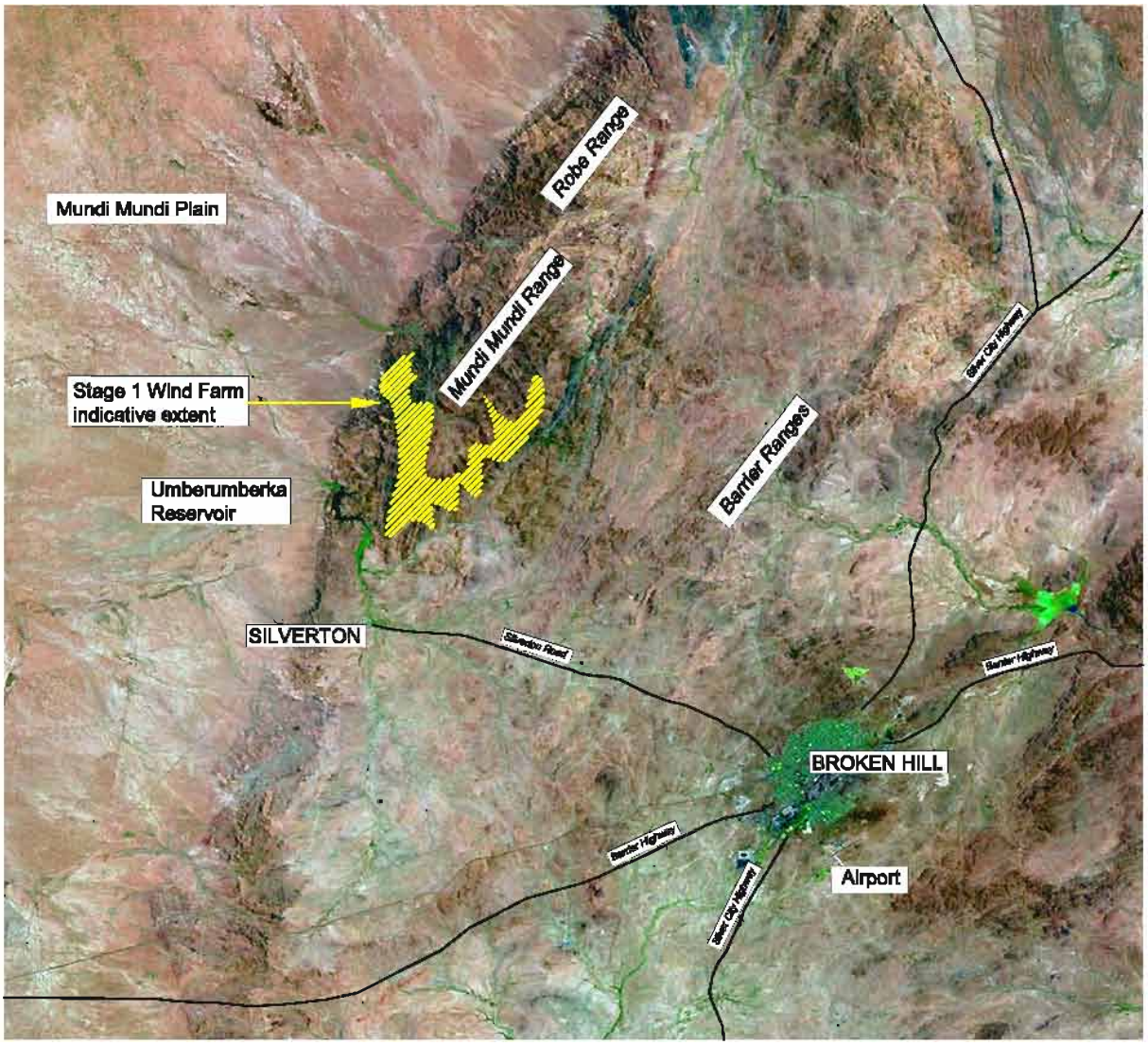
The Stage 2 Silverton Wind Farm would occupy areas to the north, south and east of the Stage 1 Silverton Wind Farm area, with the majority of Stage 2 turbines extending north from Stage 1 across the Robe Range.

3.2 Silverton

Silverton was the main township in the Barrier Range region at the height of mining exploration and mineral extraction in the 1880's with a population peaking at around 3,000 people. Silverton underwent a general exodus following the establishment of the Broken Hill Proprietary Company Limited in 1885, and included the relocation of a number of residential and commercial buildings to Broken Hill. Silverton ceased to be a Municipality in 1907, following which the population steadily declined to the present day number of around 60.

Silverton contains a small number of diverse buildings and structures which, for the most part, are physically disconnected from each other by the previous removal or demolition of earlier structures.

NEW SOUTH WALES



BROKEN HILL AND SILVERTON LOCATION

Not to Scale

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT	Title: LOCALITY PLAN
URS / Green Bean Design	Drawn: AH | Approved: WB | Date: 25/03/08	Figure: 1
	Job No: | File No: 07-116-1	

The main buildings remaining in, and around, Silverton include:

- Residential structures;
- Silverton Hotel;
- Municipal Chambers;
- War Memorial Youth Camp;
- Silverton Gaol Museum;
- Churches and Masonic Temple (vacant); and
- Silverton Public School (closed in 1970).

A small number of tourist orientated businesses operate in, and around, Silverton and include:

- Art galleries;
- Coin Carvery and Opal Shop;
- Tea Rooms and Silverton Hotel;
- Barrier Ranges Camel Safaris; and
- Day Dream Mine.

Recreational areas within the vicinity of Silverton include Penrose Park and the Umberumberka Reservoir picnic area. Penrose Park contains a number of camping and visitor facilities and hosts the annual St Pats Races Recovery picnic day.

The Silverton heritage walking track takes in sections of Silverton and extends west, looping up toward the abandoned Umberumberka mine, crossing the former railway line and returning to Silverton. The walking track reaches a highpoint around 260m AHD. A number of designated rest points and lookouts along the route of the walking track have views toward the southern end of the Mundi Mundi Range. The walking track is also used by the Broken Hill Mountain Bike Club for occasional racing events.

There are two dedicated lookout areas within the vicinity of the Silverton Wind Farm, the Mundi Mundi lookout and a small lookout platform to the side of the exit road from the Umberumberka reservoir visitor area. Both lookouts have extensive views to the west over the Mundi Mundi Plain. The Mundi Mundi lookout has no restricted access, and visitation occurs all year round, including evening visitation for sunset views across the Mundi Mundi Plain. Access to the Umberumberka reservoir lookout is restricted between the hours of 8.30am and 3.30pm.

Silverton is registered as an historic place on the Register of the National Estate, and generally incorporates an area bounded by Farnell Street to the west, Bray Street to the south, Adelaide Street to the north and to the east by a north south line at the intersection of the roads leading to Purnamoota and Menindee, although these roads appear to intersect within Broken Hill around 23km to the south east of Silverton.

The Register of the National Estate lists the general criteria applied to the registration of Silverton, and includes a number of aesthetic qualities relating to existing architectural

structures and presence of ruins, and ‘large areas of open space evocative of the past’ and the decline of Silverton.

Although some Stage 1 and 2 wind turbines will be visible from locations within the general area described in the Register, as well as more extensive views toward the Silverton Wind Farm from areas around Silverton heights, it is considered that the Silverton Wind Farm will not have a direct impact on the immediate aesthetic qualities contained within the area defined by the Register of the National Estate.

3.3 Climate and Atmospheric Conditions

Climate and atmospheric conditions have the potential to impact on the visibility of the Silverton Wind Farm from a number of surrounding receptor locations, and more significantly, from distant receptor locations to the east of the Silverton Wind Farm site.

The Silverton and Broken Hill climate is generally hot and dry and lies within the NSW semi arid zone. Dust in the atmosphere has the potential to impact on the visibility of the Silverton Wind Farm.

The Bureau of Meteorology has collected meteorological data over the past ten years at Broken Hill airport which indicates that there are:

- 151 clear days (annual mean average)
- 68 cloudy days,(annual mean average)
- 27 days of rain (annual mean average)

Rain will reduce the level of visibility toward the Silverton Wind Farm from the majority of surrounding receptor locations, with the degree of visibility tending to decrease over distance. Rain periods may also reduce the number of visitors travelling to Silverton, or areas around Silverton, from which the Silverton Wind Farm may be visible, and potentially decrease the duration of time spent at a particular receptor location with a view toward the Silverton Wind Farm site.

Cloud cover will also reduce the level of visibility of the Silverton Wind Farm and lessen the degree of contrast between the wind turbine structures and the background against which the wind turbines are visible.

On clear or partly cloudy days, the position of the sun will also have an impact on the degree of visibility of the Silverton Wind Farm. The degree of impact will be largely dependent on the relationship between the position and angle of the sun relative to the receptor location. Late afternoon and early evening views toward the west will result in the wind turbines silhouetted above the horizon line, and with increasing distance will tend to reduce the contrast between the wind turbine structures and landform mass of the Barrier Ranges.

3.4 Topography

The Stage 1 Silverton Wind Farm will generally be located on the Mundi Mundi Range, which extends along a number of visually contiguous ridgelines aligned approximately north and north east from Silverton. The key aspects of the local topography are illustrated in **Figure 2**.

Stage 1 will generally extend to the north over the Mundi Mundi Range generally following ridgelines between several topographic features including:

- Mount Mundi Mundi (around 413m AHD)
- Mount Umberumberka (around 438m AHD)
- Lakes Knob (around 417m AHD)

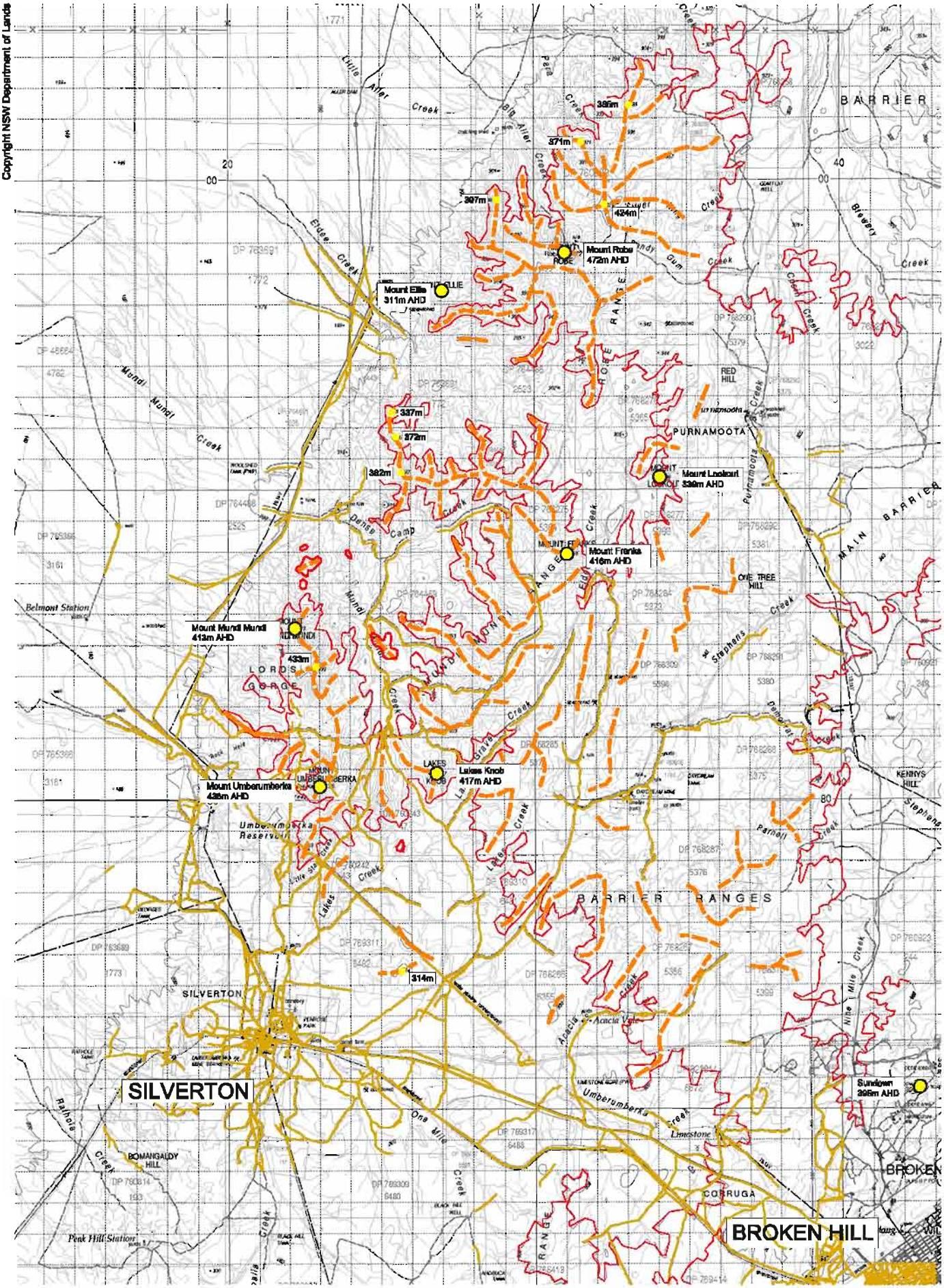
Visually prominent ridgelines within the Stage 1 Silverton Wind Farm area connect between Mount Umberumberka and Mount Mundi Mundi on the western edge of the Mundi Mundi Range, Lakes Knob to the east, and then extending northward to Mount Franks.

The Stage 1 Silverton Wind Farm development generally occurs along ridgelines that are above the 300m AHD contour line. The base of the tallest wind turbine in the Stage 1 development occurs at around 436m AHD contour line, and the lowest at around the 260m AHD contour line.

The Stage 2 Silverton Wind Farm will be located across a number of ridgelines to the south, east and north of the Stage 1 Silverton Wind Farm development area; and will generally follow ridgelines between several topographic features including:

- Mt Umberumberka (around 438m AHD)
- Mt Lookout (around 339m AHD)
- Mt Franks (around 416m AHD)
- Mt Robe (around 472m AHD)
- Mount Ellie (around 311m AHD)

The base of the highest Stage 2 wind turbine will be located at around the 472m AHD contour line, and the lowest at around the 260m AHD contour line.



LEGEND

- MAIN RIDGELINES
- LOCAL ROADS AND TRACKS
- 300m AHD CONTOUR LINE

0 1 2 3 4 5km

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT		Title: TOPOGRAPHY
URS / Green Bean Design	Drawn: AH	Approved: WB	Date: 25/03/08
	Job No:	File No: 07-116-2	Figure: 2

Project Description

SECTION 4

4.1 Stage 1 Project description

The main visual components of the Stage 1 Silverton Wind Farm will comprise:

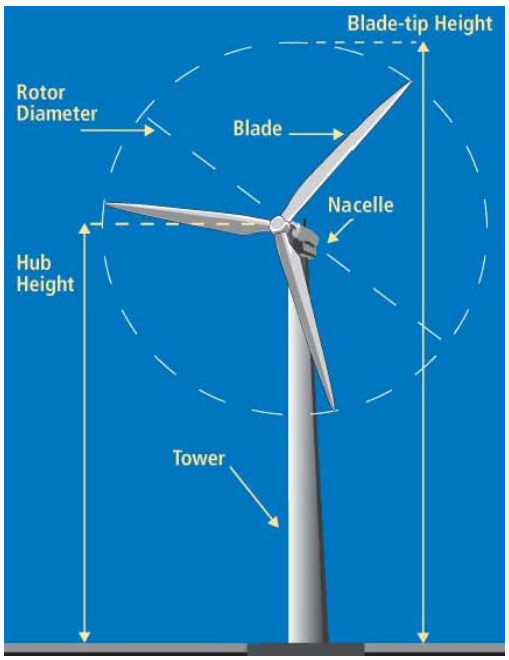
- Wind turbines and wind monitoring masts;
- On site access tracks for construction and operation;
- Control and facilities building;
- Electrical works (underground and overhead cabling);
- A 220kV transformer substation ; and
- A 220kV transmission line (connecting between the Silverton Wind Farm transformer substation and the 220kV substation on the western fringe of Broken Hill).

4.2 Wind turbines

Silverton Wind Farm Developments has advised the dimensions of the turbines as 100m high (to top of nacelle) with a 110m maximum rotor diameter. The final wind turbine model will be selected following detail design, and is not expected to exceed the dimensions provided.

The specific elements of the wind turbine comprise:

- Concrete slab foundations;
- Tubular tapering steel towers, with a total tower height around 100m;
- Nacelles at the top of the tower housing the gearbox and electrical generator;
- Rotors comprising a hub (attached to the nacelle) with three blades; and
- Three fibreglass blades approximately 55m long attached to each hub.



Configuration and components of a typical wind turbine.

4.3 Wind Monitoring Masts

A number of permanent wind monitoring masts will be installed and generally comprise:

- A concrete slab foundation; and
- A triangular lattice tower to a height around 100m above ground level.

4.4 Access Tracks

Site access tracks will be constructed to provide access to each turbine location across the site during construction and operation, as well as access to the control building and substation. The access tracks will be approximately 6m wide.

The final design of the access tracks will be developed on a number of environmental grounds, including the need to minimise the potential visual impact of the access tracks:

- to minimise the length and extent;
- to minimise the need for clearing vegetation;
- to minimise the potential for erosion;
- to minimise the extent of cut and fill; and
- to maximise the potential for rehabilitation at the completion of the construction phase.

4.5 Control Building

A control building will be constructed in a low lying area of the Stage 1 site to the south of Lakes Knob. This will comprise a single story building. The final design and location is subject to detail design, however it is likely that the control building will not be visible from surrounding receptor locations.

4.6 Electrical cabling

The majority of cabling works, including the installation of control cables linking the turbines to the control building, and cables linking the turbines to the substation, will be installed underground. For electrical reasons cabling may be required to be installed on medium voltage overhead transmission lines supported by single low profile tubular poles.

4.7 Transformer Substation

Subject to detail design the substation will be located in the south east portion of the Stage 1 Silverton Wind Farm development area and will not be generally visible from potential receptor locations assessed in this report.

4.8 220kV Transmission Line

Electricity generated by the Stage 1 Silverton Wind Farm development will be connected to the Broken Hill substation via a 220kV transmission line. The proposed transmission line

route is illustrated in **Figure 21**. Subject to detail electrical design; the conductors will be supported on either a pylon structure or a single concrete pole structure.

The proposed route and potential visibility of the Stage 1 220kV Transmission Line is discussed in more detail in **Section 9** of the LVIA report.

4.9 Stage 2 Project description

The main visual components of the proposed Stage 2 Silverton Wind Farm development will generally comprise a duplication of the Stage 1 elements including:

- Wind turbines and wind monitoring masts;
- On site access tracks for construction and operation;
- Control/facilities building;
- Electrical works (underground and overhead cabling);
- Up to 6 additional 220kV transformer substations ;
- Duplication of the Stage 1 220kV transmission line (connecting the Silverton Wind Farm and the 220kV Broken Hill substation); and
- Duplication of the existing 220kV transmission line between Broken Hill and the terminal station at Red Cliffs in Victoria.

Electricity generated by the Stage 2 Silverton Wind Farm will be conducted to the terminal station at Red Cliffs in Victoria, approximately 15km south east of Mildura and 293km south of Broken Hill.

Subject to detail electrical design; the conductors will be supported on either a pylon structure or a single concrete pole structure.

For the purpose of the Concept Approval it is assumed that the proposed transmission line will follow a similar alignment to the existing 220kV transmission line between Broken Hill and Red Cliffs.

Panoramic Photographs

5.1 Panoramic Photographs

A series of photographs were taken during the course of the fieldwork to illustrate views from a number of potential receptor locations, which were inspected and assessed as part of the landscape and visual assessment process.

The photographs were taken with a tripod mounted digital SLR camera with the lens calibrated to provide an image with a view angle equivalent to a 35mm format SLR camera with a 50mm lens attachment.

There is no agreed professional consensus or guidance as to which camera focal length may produce an image with a view angle most representative of normal human vision; however the majority of landscape and visual impact assessments undertaken for large scale infrastructure projects, including wind farms, generally use a camera lens with a focal length between 50mm and 70mm.

Individual photographs were digitally stitched together to form a segmented panoramic image to provide a visual illustration of the existing view from each potential receptor location.

Most panoramic images contain a degree of distortion, which occurs when the original curved perspective image viewed through the camera is viewed flat on paper; however despite the distortion the image is correct and accurate.

The panoramic images presented in this report have been annotated to identify key features or structures located within the existing view.

The real world coordinate location for each photograph was recorded with a hand held GPS unit to an accuracy of around plus or minus two meters. Additional information including the bearing, or direction of each photograph, time of day and prevailing weather conditions were also recorded.

The location of photographs taken from potential receptor locations are illustrated in **Figure 9 and 10**, and panoramic images illustrated in **Figures 11** to **20**.

Landscape Units

SECTION 6

6.1 Landscape Units

As part of the LVIA process, the landscape surrounding the Silverton Wind Farm has been divided into nine broad Landscape Units, which generally occur within a 23km radius of the Silverton Wind Farm site. The Landscape Units have been identified as:

- *Landscape Unit 1* - The Mundi Mundi Plain;
- *Landscape Unit 2* - Mundi Mundi and Robe Ranges;
- *Landscape Unit 3* - Umberumberka reservoir;
- *Landscape Unit 4* - Silverton;
- *Landscape Unit 5* - One Mile & Umberumberka Creek catchments;
- *Landscape Unit 6* - Day Dream Mine and Purnamoota;
- *Landscape Unit 7* - Nine Mile Creek;
- *Landscape Unit 8* - Broken Hill urban development; and
- *Landscape Unit 9* - Broken Hill industrial fringe.

The Landscape Units, which are illustrated in **Figure 3**, represent areas that are relatively consistent in terms of their key landscape elements and physical attributes; which may include a combination of landform, vegetation, land use and built structures.

There is potential for variation of physical attributes within each Landscape Unit. For the purpose of this LVIA the intent is to provide an overall description of common features and characteristics for each of the Landscape Units, that can be assessed to determine the level of sensitivity and degree to which the landscape can accommodate change arising from the Silverton Wind Farm. The Landscape Units are, in part, described and recorded by reference to:

- **Scale**

This can be described as the proportionate scale of the landscape elements relative to the location of the receptor and resulting degree of enclosure.

- **Line**

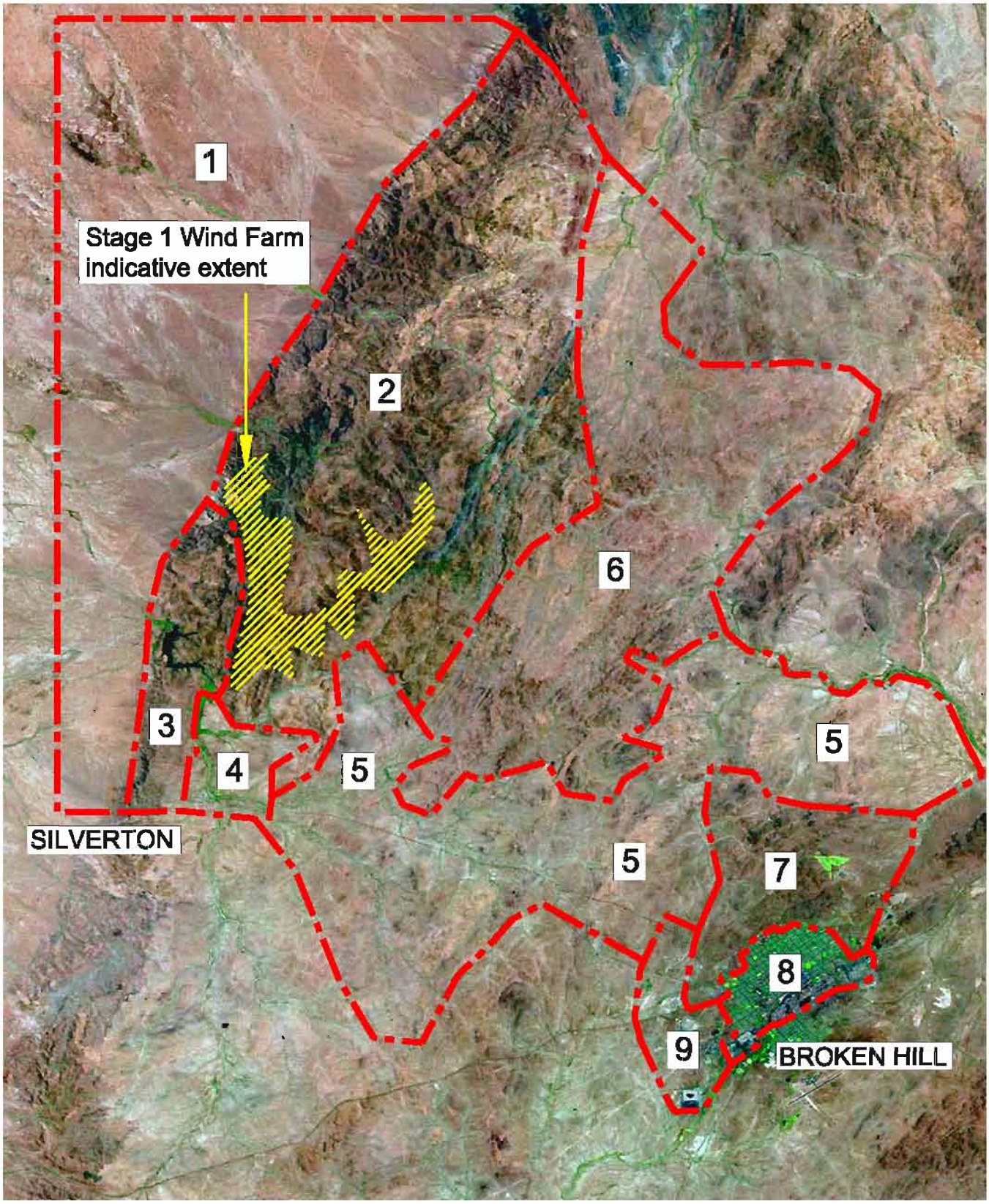
This can be described as the path that the eye follows when perceiving abrupt differences in the landscape.

- **Structure and Pattern**

This can be described as the spatial distribution of landscape elements, visible landuse or components within the landscape.

- **Colour**

This can be described as the result of light reflection from a surface at a particular intensity and wavelength to which the eye is sensitive. Intensity and colour hue can be influenced by a



Landscape Units

1. The Mundi Mundi Plain
2. Mundi Mundi and Robe Ranges
3. Umberumberka Reservoir
4. Silverton
5. One Mile & Umberumberka Creek catchments
6. Day Dream Mine and Purnamoota
7. Nine Mile Creek
8. Broken Hill Urban Development
9. Broken Hill Industrial Fringe

Not to Scale

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT		Title: LANDSCAPE UNITS
URS Green Basin Design	Drawn: AH	Approved: WB	Date: 25/03/08
	Job No:	File No: 07-116-3	Figure: 3

number of atmospheric and seasonal variations as well as the time of day. Summertime can produce a strong violet blue heat haze, with greater subtle variations in the winter.

The Landscape Units were inspected during the fieldwork to confirm their visual character and physical attributes. A field sheet was used to record descriptive information about the Landscape Unit, and to record qualitative information based on professional value judgments.

The assessment of qualitative data involved ranking each Landscape Unit on a scale of one to five for a number of defined criteria. These criteria include visual integrity, diversity/contrast, balance/harmony, distinctiveness, adjacent scenery, rarity, ability to accept change and visual amenity, and are defined below:

- **Visual Integrity**

This is a measure of the extent to which the various natural and cultural components of the landscape are integrated in terms of form, colour and texture.

- **Diversity/Contrast**

This is a measure of range of landscape elements (landform, vegetation, water, structures) present and the extent of visual contrast they exhibit.

- **Balance/Harmony**

This is a measure of the extent to which the various landscape elements are visually balanced or integrated into an overall pattern.

- **Distinctiveness**

This reflects the extent to which a particular Landscape Unit is distinctive compared to all other Landscape Units.

- **Adjacent Scenery**

This is a measure of the extent to which adjacent landscape areas contribute to the visual quality of the Landscape Unit being assessed.

- **Rarity**

This is an assessment of how rare the Landscape Unit is within the context of the regional area.

- **Visual Amenity**

This overall rating is based on results of assessing the other criteria defined above. It reflects the condition of the various components that make up the Landscape Unit. It also reflects the extent to which the visual character of the Unit is well defined, in the sense that landscape components that are present are not fragmented, and landscape that contains visual diversity is also a visually integrated whole.

- **Visual Absorption Capability**

This is an assessment of the capability of the Landscape Unit to maintain its key visual values while changes occur to either the existing visual elements or through the introduction of new visual elements.

The primary characteristics of each Landscape Unit are described and evaluated below, with typical photographs that illustrate the visual character presented on the following pages.

6.1.1 Landscape Unit 1 – Mundi Mundi Plain

Plate 1 *– Landscape Unit 1*

Plate 2 *– Landscape Unit 1*

Landscape Unit 1, Narrative description:

- **Scale** across the Landscape Unit is large with an open landscape occasionally bisected by creek lines flowing generally east from within the Barrier Ranges to outwash areas on the Mundi Mundi Plain.
- **Line** within the landscape is predominantly horizontal with a simple and continuous form extending across the open plain. Occasional vertical lines of trees along the Eldee and Mundi Mundi creek provide some interruption to distant views.
- **Structure or Pattern** is generally uniform across the landscape unit.
- **Colour** varies from subtle desert tones to stronger and vibrant red soils around clay pans. Distant views to dark lines of vegetation contrasting with dominant soil foreground.
- Long distance views are generally available throughout the Landscape Unit toward the west, with some local screening along tree lined creeks flowing from the Barrier Ranges out onto the Mundi Mundi Plain.

Table 1 - Landscape Unit 1, Landscape Unit Evaluation:

		1	2	3	4	5	
Integrity	Complete		■				Incomplete
Diversity	High				■		Low
Balance/Harmony	Harmonious			■			Discordant
Distinctiveness	Bold		■				Indistinct

Adjacent Scenery	Major contribution		■				Minor contribution
Rarity	Rare				■		Common
Visual Amenity	High		■				Low
Visual Absorption Capability	High					■	Low

6.1.2 Landscape Unit 2 – Mundi Mundi and Robe Ranges

Plate 3 *– Landscape Unit 2*

Plate 4 *– Landscape Unit 2*

Landscape Unit 2, Narrative description:

- **Scale** across the Landscape Unit is large and defined by ridgelines of varying length and height that create a series of enclosed spaces within the Mundi Mundi and Robe Ranges. Scale of the landscape within the ranges, and below the ridgelines, is more intimate and closely defined by steep sloping land above creek lines.
- **Lines** at a distance are generally horizontal, but from closer receptor locations appear angular and generally complex crossing numerous ridgelines. Lines within the Mundi Mundi and Robe Ranges contrast strongly with the adjoining Mundi Mundi Plain.
- **Structure and Pattern** is generally uniform across the Landscape Unit.
- **Colour** is generally subtle defined by rocky outcrops, scree and sparse scrub vegetation.
- Long distance views are available from the upper slopes and ridgelines of the Mundi Mundi and Robe Range. Depending on relative position within the unit, views may extend for a long distance to areas surrounding the Silverton Wind Farm area.

Table 2 - Landscape Unit 2, Landscape Unit Evaluation:

		1	2	3	4	5	
Integrity	Complete		■				Incomplete
Diversity	High			■			Low
Balance/Harmony	Harmonious			■			Discordant
Distinctiveness	Bold		■				Indistinct
Adjacent Scenery	Major contribution		■				Minor contribution
Rarity	Rare				■		Common
Visual Amenity	High		■				Low
Visual Absorption Capability	High				■		Low

6.1.3 Landscape Unit 3 – Umberumberka Reservoir

Plate 5 *– Landscape Unit 3*

Plate 6 *– Landscape Unit 3*

Landscape Unit 3, Narrative description:

- **Scale** across the Landscape Unit is medium to large and generally defined by low hills and ridgelines that create a series of enclosed spaces within, and to the south, of the reservoir. Scale is slightly smaller within the immediate vicinity of the reservoir where space is defined by rising landform around the water body and a number of built structures.
- **Lines** within the reservoir area are a combination of strong horizontal lines following built structures, including the dam wall and line around the water body, with a softer undulating line following ridgelines along low hills to the north west and south west of the reservoir.

- **Structure and Pattern** is generally uniform in areas beyond the reservoir, with few constructed elements. The landscape pattern is more varied within the immediate area of the reservoir, with a combination of structurally engineered and natural elements giving rise to a designed landscape for recreational use.
- **Colour** beyond the immediate area of the reservoir is generally subtle and defined by the physical characteristics of soil, rocky outcrops, scree and sparse vegetation.
- Views within the reservoir visitor area are generally restricted by landform rising to the east and south of the reservoir water body. Limited views from the lower car park area afford distant views north toward Eldee Station, although the extent of view is restricted to a reasonably narrow corridor by rising landform to the east and west of the reservoir. Views from the BBQ picnic area toward the reservoir are partially screened by trees.

Table 3 - Landscape Unit 3, Landscape Unit Evaluation

		1	2	3	4	5	
Integrity	Complete						Incomplete
Diversity	High						Low
Balance/Harmony	Harmonious						Discordant
Distinctiveness	Bold						Indistinct
Adjacent Scenery	Major contribution						Minor contribution
Rarity	Rare						Common
Visual Amenity	High						Low
Visual Absorption Capability	High						Low

6.1.4 Landscape Unit 4 - Silverton

Plate 7 *– Landscape Unit 4*

Plate 8 *– Landscape Unit 4*

Landscape Unit 4, Narrative description:

- **Scale** across the Landscape Unit varies from small to medium around buildings and structures along and leading off the main street of Silverton.
- **Line** tends to follow the predominant horizontal and vertical form of built structures and streetscapes within Silverton, together with the more irregular lines of vegetation following Black and Umberumberka Creek. Beyond the main streets, line tends to be defined by distant landform undulating over low hills as well as more sharply rising land over the south portion of the Mundi Mundi Range.
- **Structure and Pattern** is varied and generally reflects the existing, and remnants of the former, urban fabric. A diverse range of building materials and structural forms are situated amongst scattered tree and scrub vegetation, although vegetation is sparser to the south of the Silverton landscape unit.
- **Colour** within the landscape unit is variable with contrast between subtle tones of soil material throughout the landscape unit and occasional vibrant colours exhibited in building materials.
- The extent of views from within and around the main streets of Silverton, including the northern end of Layard Street and along Burke Street, are dependant on receptor location relative to surrounding buildings and vegetation. There are opportunities for both medium and long distance views along the main street corridors to horizons beyond the Landscape Unit. Long distance views across Silverton toward the south portion of the Mundi Mundi Range are available from areas of elevated ground (Silverton heights) around the church and gallery locations to the south of Silverton.

Table 4 - Landscape Unit 4, Landscape Unit Evaluation

		1	2	3	4	5	
Integrity	Complete				■		Incomplete
Diversity	High		■				Low
Balance/Harmony	Harmonious				■		Discordant
Distinctiveness	Bold		■				Indistinct
Adjacent Scenery	Major contribution				■		Minor contribution
Rarity	Rare			■			Common
Visual Amenity	High			■			Low
Visual Absorption Capability	High		■				Low

6.1.5 Landscape Unit 5 – One Mile & Umberumberka Creek catchments

Plate 9 *– Landscape Unit 5*

Plate 10 *– Landscape Unit 5*

Landscape Unit 5, Narrative description:

- **Scale** across the Landscape Unit is large and open over the majority of the landscape, including areas along most of the Silverton Road corridor.
- **Line** is generally horizontal and level toward the horizon line with low undulation along distant hills and ranges. Some localised areas of undulation occur throughout the Landscape Unit, alongside the Silverton Road corridor and the Limestone property. Verical lines through the landscape are accentuated by tree growth along the main creek lines.

- **Structure and Pattern** mostly consistent through Landscape Unit with limited diversity in material or texture.
- **Colour** is a mixture of red and brown tones defined largely by exposed soil and rock outcrop areas, interspersed with grouped and scattered areas of blue to grey vegetation across dry pasture. Lines of darker green occur along the main creek lines within the Landscape Unit.
- Views from elevated locations extend to the distant horizon, although some landform undulation occurs in areas north and south of the Silverton Road corridor, which may restrict some views from sections of the road.

Table 5 - Landscape Unit 5, Landscape Unit Evaluation:

		1	2	3	4	5	
Integrity	Complete			■			Incomplete
Diversity	High				■		Low
Balance/Harmony	Harmonious				■		Discordant
Distinctiveness	Bold			■			Indistinct
Adjacent Scenery	Major contribution			■			Minor contribution
Rarity	Rare				■		Common
Visual Amenity	High			■			Low
Visual Absorption Capability	High			■			Low

6.1.6 Landscape Unit 6 – Day Dream Mine and Purnamoota

Plate 11 *– Landscape Unit 6*

Plate 12 *– Landscape Unit 6*

Landscape Unit 6, Narrative description:

- **Scale** across Landscape Unit is medium to large throughout most of the Landscape Unit with generally more open and larger scale landscape across areas of drainage lines. There is some potential for more intimate scale around areas of undulating landform in the southern portion of the landscape unit.
- **Line** is a combination of simple, horizontal form along and between creek lines; and an undulating line following a system of low hills and ridgelines in the southern portion of the Landscape Unit.
- **Structure and Pattern** is generally uniform over both areas of undulating landform and creek line.
- **Colour** is predominantly defined by red to orange soils and blue to grey scrub vegetation. Areas around creek lines tend to have a deeper clay red colouring, with areas of undulating low hills defined by paler rock scree and outcropping.
- Views to the south of the Landscape Unit are partially contained by undulating landform around the Day Dream Mine area, extending up to Mount Lookout. Views around the vicinity of creek lines, including portions of Stephens Creek and Purnamoota Creek are generally more open.

Table 6 - Landscape Unit 6, Landscape Unit Evaluation:

		1	2	3	4	5	
Integrity	Complete			■			Incomplete
Diversity	High				■		Low
Balance/Harmony	Harmonious				■		Discordant
Distinctiveness	Bold			■			Indistinct

Adjacent Scenery	Major contribution			■			Minor contribution
Rarity	Rare				■		Common
Visual Amenity	High			■			Low
Visual Absorption Capability	High			■			Low

6.1.7 Landscape Unit 7 – Nine Mile Creek

Plate 13 *– Landscape Unit 7*

Plate 14 *– Landscape Unit 7*

Landscape Unit 7, Narrative description:

- **Scale** across the Landscape Unit is large, with open views across the majority of the landscape unit, including most of the Silverton Road corridor.
- **Line** is generally horizontal and level toward distant horizon line.
- **Structure and Pattern** largely consistent through landscape unit will little overall diversity in material or texture.
- **Colour** is a mixture of red and brown tones defined largely by exposed soil and rock outcrop areas interspersed with grouped and scattered areas of blue to grey vegetation across dry pasture. Lines of darker green occur along the main drainage lines within the Landscape Unit.
- Views from elevated locations extend to distant horizon, although some undulation occurs in areas north and south of Silverton Road, which may restrict some views from some portions of the road corridor.

Table 7 - Landscape Unit 7, Landscape Unit Evaluation

		1	2	3	4	5	
Integrity	Complete			■			Incomplete
Diversity	High				■		Low
Balance/Harmony	Harmonious			■			Discordant
Distinctiveness	Bold			■			Indistinct
Adjacent Scenery	Major contribution			■			Minor contribution
Rarity	Rare				■		Common
Visual Amenity	High				■		Low
Visual Absorption Capability	High			■			Low

6.1.8 Landscape Unit 8 – Broken Hill

Plate 15 *– Landscape Unit 8*

Plate 16 *– Landscape Unit 8*

Landscape Unit 8, Narrative description:

- **Scale** across the Landscape Unit is medium to small within the urban development of Broken Hill and is largely defined by the mass and form of surrounding buildings and associated streetscapes.
- **Line** is a combination of horizontal and vertical built form, which is reinforced by strong linear elements including the railway line and mullock heap dividing Broken Hill. Distant views to the skyline include a series of gently and moderately undulating hills.
- **Structure and Pattern** is complex and reflected by the diversity of built form and land use within the Unit.
- **Colour** is varied and reflected in a combination of built urban development and distant views to the landscape surrounding Broken Hill.

- Views are generally short and contained by areas of urban development. There are some opportunities to gain more extensive views from elevated locations within and surrounding Broken Hill, including a number of small reserves as well as the top of the mullock heap. Views from elevated locations have the potential to offer extensive views to distant horizon lines.

Table 8 - Landscape Unit 8, Landscape Unit Evaluation

		1	2	3	4	5	
Integrity	Complete				■		Incomplete
Diversity	High	■					Low
Balance/Harmony	Harmonious			■			Discordant
Distinctiveness	Bold		■				Indistinct
Adjacent Scenery	Major contribution			■			Minor contribution
Rarity	Rare				■		Common
Visual Amenity	High			■			Low
Visual Absorption Capability	High		■				Low

6.1.9 Landscape Unit 9 – Broken Hill industrial fringe

Plate 17 *– Landscape Unit 9*

Plate 18 *– Landscape Unit 9*

Landscape Unit 9, Narrative description:

- **Scale** is medium to large and defined by large open spaces with occasional built structures. Structures vary in scale from residential dwellings to large industrial structures including the Broken Hill substation

- **Line** is defined by a generally horizontal landform punctuated by vertical built structures
- **Structure and Pattern** is complex and reflected by a combination of built form, land use and vegetation within the Unit.
- **Colour** is varied and reflected in a combination of built elements and distant views to the landscape surrounding Broken Hill.
- Views within the unit are generally short to medium and contained by areas of urban and industrial development.

Table 9 - Landscape Unit 9, Landscape Unit Evaluation:

		1	2	3	4	5	
Integrity	Complete				■		Incomplete
Diversity	High			■			Low
Balance/Harmony	Harmonious				■		Discordant
Distinctiveness	Bold		■				Indistinct
Adjacent Scenery	Major contribution				■		Minor contribution
Rarity	Rare				■		Common
Visual Amenity	High				■		Low
Visual Absorption Capability	High		■				Low

6.2 Summary of Landscape Units

The majority of the Landscape Units are generally medium to large in scale, offering distant and open views in a number of directions toward and beyond the Silverton Wind Farm site.

Some areas within the landscape exhibit a smaller and more intimate scale and generally occur within the undulating landform of the Barrier Ranges where steep hill sides and hidden gullies reduce landscape scale and offer varying degrees of enclosure.

The majority of the Landscape Units have a simple pattern and structure which is exhibited over a broad area of the landscape, and largely defined by pastoral grazing and agricultural landuse, although complexity in structure and pattern increases around urban and industrial areas.

Beyond the main urban areas, where colour is defined by various built structures, colour is largely determined by exposed rock outcrops, soils and vegetation found in the surrounding landscape. On a broad scale, dominant colours in the landscape reflect the semi arid desert tones of red and orange soils together with a mixed colour of minerals and rocks. Surrounding

vegetation provides a range of colours including various hues of green, grey, blue and purple. The clarity and intensity of colours can vary with the quality of light.

6.3 Summary of Visual Amenity

The landscape that surrounds the Silverton Wind Farm site has the general appearance of a natural and ancient landscape; however much of what appears to be a relatively untouched or unmodified landscape has been subject to a number of human modifications prior to, and throughout the development of mining and settlement in the region. Whilst human modifications have been made to the landscape, it is acknowledged that not all human modifications will necessarily result in negative or adverse impacts on landscape character.

The landscape contains a number of visual elements related to the development and construction of:

- Mines;
- Buildings and urban development;
- Roads and tracks; and
- Reservoirs.

Some of these visual elements are distinct features in the contemporary landscape, whilst a number are remnants of earlier periods and can be interpreted through remains of derelict buildings or earthworks, spoil heaps and stockpiles.

The landscape has also been significantly modified by pastoralists. Sheep grazing occurs throughout and around the Silverton Wind Farm site, and has had a direct impact on the abundance and distribution of plant species. Feral goats and rabbits are also common throughout the surrounding area.

Overall the visual amenity of the landscape character surrounding the Silverton Wind Farm is considered to be moderate. There are some areas that exhibit higher degrees of visual amenity, notably when viewed from elevated receptor locations such as the Mundi Mundi lookout and the Sculpture Park, and relates largely to the spatial relationship and visual opportunities presented by the extent of large scale open spaces against rising and undulating landforms.

6.4 Summary of Visual Absorption Capability

Visual absorption capability is a classification system used to describe the relative ability of the landscape to accept human modifications and alterations without the loss of landscape character or deterioration of visual amenity. Visual absorption capability generally relates to physical characteristics of the landscape that are often inherent and often quite static in the long term.

For the purposes of this LVIA, visual absorption capability ratings have been determined between a range of High to Low classifications where High indicates that the landscape can generally absorb development through the physical characteristics of surrounding landform or presence of vegetation or built structures, through to Low, which indicates that the landscape

may not readily absorb development due to the lack of potential screening opportunities or absence of human modifications to the landscape.

Overall the landscape surrounding the Silverton Wind Farm development has been determined to have a moderate visual absorption capability, which tends to slightly increase around areas of more concentrated modifications to the landscape, such as the urban areas of Broken Hill and within Silverton. Landscape Unit 1 – The Mundi Mundi Plain, and Landscape Unit 2 – Mundi Mundi and Robe Ranges tend to have a low visual absorption capability, which generally results from the inherent large scale and open characteristics of the landscape combined with the general absence of vegetation to provide potential screening opportunities.

Visibility and Potential View Catchment SECTION 7

7.1 Introduction

The potential visual impact of the Silverton Wind Farm development will result primarily from the combination of two factors:

The level of visibility or extent to which the proposed wind farm structures will be visible from surrounding areas; and

The degree of visual contrast between the wind farm structures and the capability of the surrounding landscape to visually absorb the wind farm.

The potential visual impact from particular receptor locations is strongly dependant on the level of visibility from that location, which in turn is dependant on a number of criteria which are defined in Table 10.

7.2 Visibility

Visibility is a measure of the extent to which particular structures of the Silverton Wind Farm will be visible from surrounding areas, the relative number of viewers, the period of the view, view distance and context of the view.

The underlying rationale for this component of the visual assessment is that, if a part of the Silverton Wind Farm is not visible from a particular area then the potential visual impact will be nil. Similarly, if the number of people who will potentially see the Silverton Wind Farm is low, then the visual impact will be low compared to a situation in which a large number of people have the same view.

Distance is a strong influence on potential visual impact as the proportion of the total view occupied by the Silverton Wind Farm decreases with distance, and atmospheric effects may reduce the visual contrast between the Silverton Wind Farm and the surrounding landscape.

7.2 Category of Receptor

The visibility of the wind turbines will vary between static and dynamic view types. In the case of static views the relationship between a wind turbines and the landscape will not tend to vary greatly. The cone of vision is relatively wide and the receptor tends to scan back and forth across the landscape. In contrast views from a moving vehicle are dynamic as the visual relationship between wind turbine structures is constantly changing as well as the visual relationship between the wind turbines and the landscape in which they are seen.

7.3 View Elevation

In situations where the receptor is located at a lower elevation than the wind turbine structure most of it will be viewed against the sky. The degree of visual contrast between a white coloured turbine and the sky will depend on the presence of clouds and their colour. Dark grey clouds will contrast more strongly with white turbines than a background of white

clouds. The level of contrast is also influenced by the position of the sun relative to the individual wind turbines and the receptor. Where the sun is located in front of the viewer, the visible portion of the wind turbine will be seen in shadow. If the background to the wind turbine is dark toned the contrast will be reduced.

Where the sun is located behind the receptor then the visible portion of the wind turbine will be in full sun. If the background is also light toned, such as white clouds, then the contrast is less when compared to a dark background.

7.4 Category and number of receptors

As the Silverton Wind Farm will be visible from a number of potential receptor locations around Silverton and from a small number of rural residential areas there is potential for a number of viewers in static view situations.

Similarly there will also be potential for a moderate number of viewers from dynamic view situations, including the Silverton Road corridor.

7.5 View Distance

The view distance between the Silverton Wind Farm and the potential receptors has been illustrated as a series of concentric band widths extending out from the Silverton Wind Farm across the landscape. Individual receptor locations can be identified and assessed in relation to their distance and the degree of potential visual impact.

The influence of distance on visibility results primarily from two factors:

- With increasing distance the proportion of the horizontal and vertical view cone occupied by a visible turbine structure, or group of turbine structures, will decline.
- As the view distance increases so does the atmospheric effects resulting from dust and moisture in the atmosphere, which makes the turbines appear to be grey thus reducing the contrast between turbines and the background against which they are viewed.

For the purposes of the LVIA, distance assumptions for the Silverton Wind Farm are as follows:

Distance	Comment
>12km	Wind turbines less distinct and tending to become indistinct with increasing distance. Some blade movement visible but less discernable with increasing distance.
8km – 12km	Wind turbines visible but tending to become less distinct depending on the overall extent of view available from the potential receptor location. Movement of blades still discernable.
4 – 8km	Wind turbines clearly visible in the landscape but tending to become less dominant with increasing distance. Movement of

	blades still discernable.
1 – 4km	Wind turbines will generally dominate the landscape in which the wind turbine is situated. Potential for high visibility depending on the category of receptor, their location, sensitivity and subject to other visibility factors.
<1km	Wind turbines will dominate the landscape in which they are situated due to large scale, movement and proximity.

The view distance relationship between the Silverton Wind Farm and potential receptor locations is illustrated in **Figure 4** with view distance also included in **Figures 5 to 8**.

7.6 Potential Zone of Visual Influence

The potential Zone of Visual Influence (ZVI) diagrams are used to identify theoretical areas from which a defined number of wind turbines, or portions of turbines, may be visible and are useful for providing an overview of the extent to which the Silverton Wind Farm may be visible.

Four ZVI thematic maps have been prepared by Garrad Hassan Pacific Pty Ltd including:

- Stage 1 height to wind turbine hub (RL100m);
- Stage 1 height to tip of blade (RL155m);
- Stage 1 and 2 height to wind turbine hub (RL100m); and
- Stage 1 and 2 height to tip of blade (RL155m)

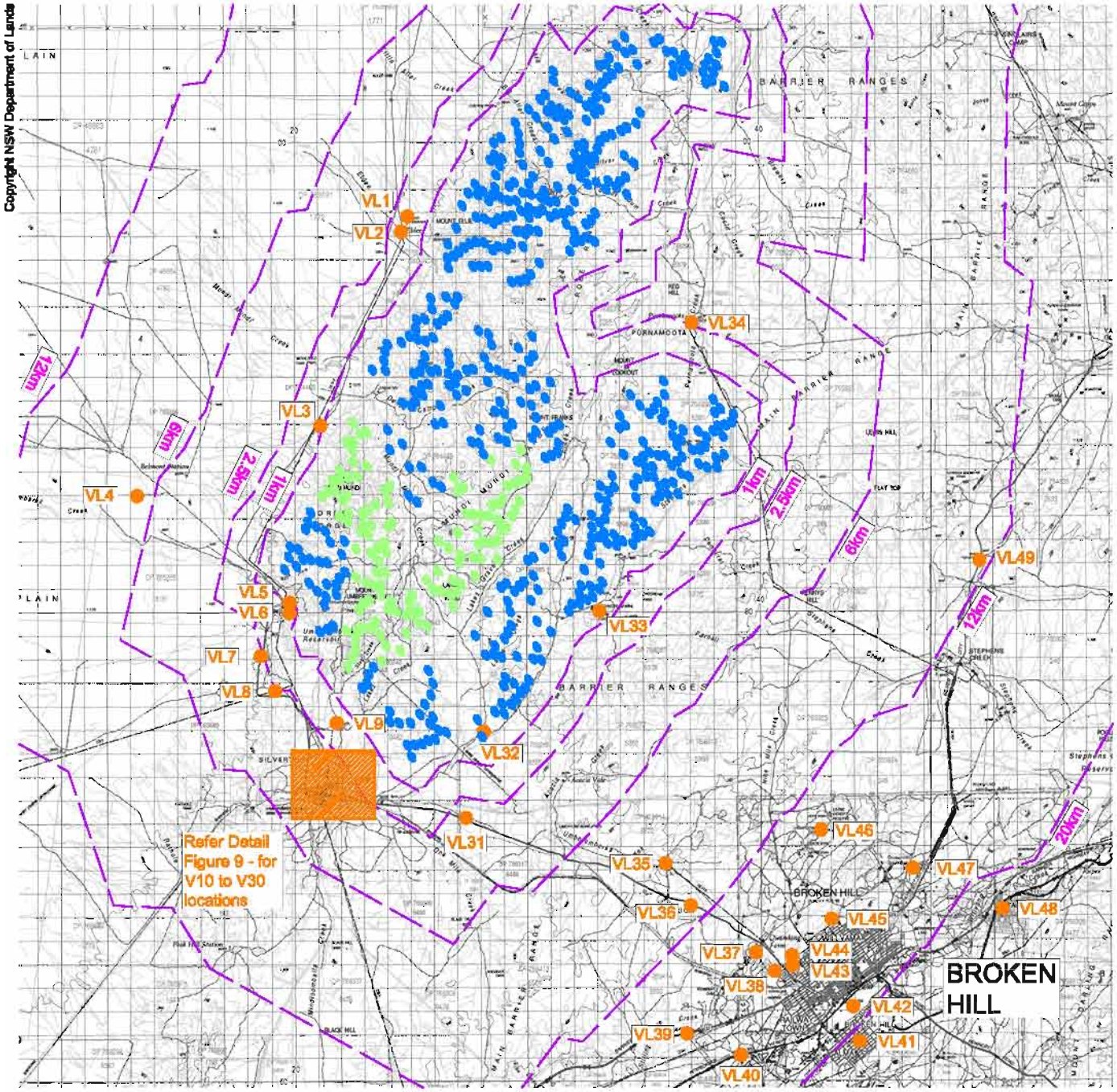
7.6.1 Methodology

The methodology adopted by Garrad Hassan Pacific Pty Ltd is a purely geometric assessment where the visibility of the proposed Silverton Wind Farm is determined from carrying out calculations based on a digital terrain model of the site and the surrounding terrain.

Calculations have been made to determine the visibility of the wind turbine blade hubs and tips at the top of the travel path, taking into account the terrain relief and earth curvature.

This assessment methodology is assumed to be conservative as the screening affects of any structures and vegetation above ground level are not considered in any way. Therefore the wind farm may not visible at many of the locations indicated on the ZVI maps due to the local presence of trees, vegetation or other screening. While the ZVI maps are a useful visualisation tool, they are very conservative in nature.

Additionally, the number of turbines visible at any one time is also affected by the weather condition at the time. Inclement or cloudy weather tends to mask the visibility of the proposed wind project.



LEGEND

STAGE 1 WIND TURBINE LOCATIONS

STAGE 2 WIND TURBINE LOCATIONS

DISTANCE MARKER

VL35 POTENTIAL RECEPTOR LOCATION

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT		Title: STAGE 1 AND 2 WIND TURBINE LOCATIONS AND VIEW DISTANCES
URS / Green Bean Design landscape architecture	Drawn: AH	Approved: WB	Date: 25/03/08
	Job No:	File No: 07-116-4	Figure: 4

7.6.2 ZVI Diagrams (Prepared by Garrad Hassan Pacific Pty Ltd)

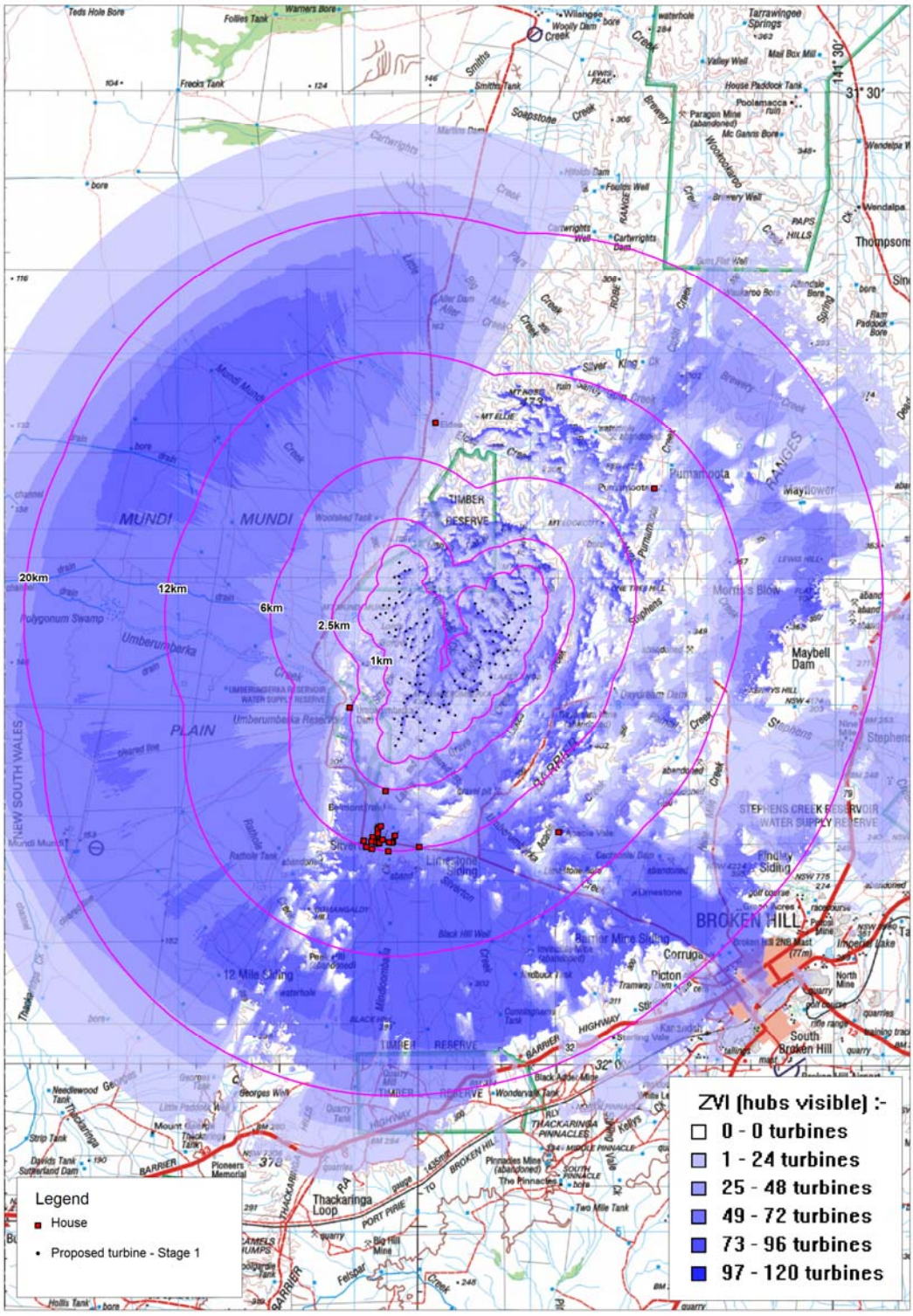


Figure 5, Stage 1 ZVI Diagram (from hub height)

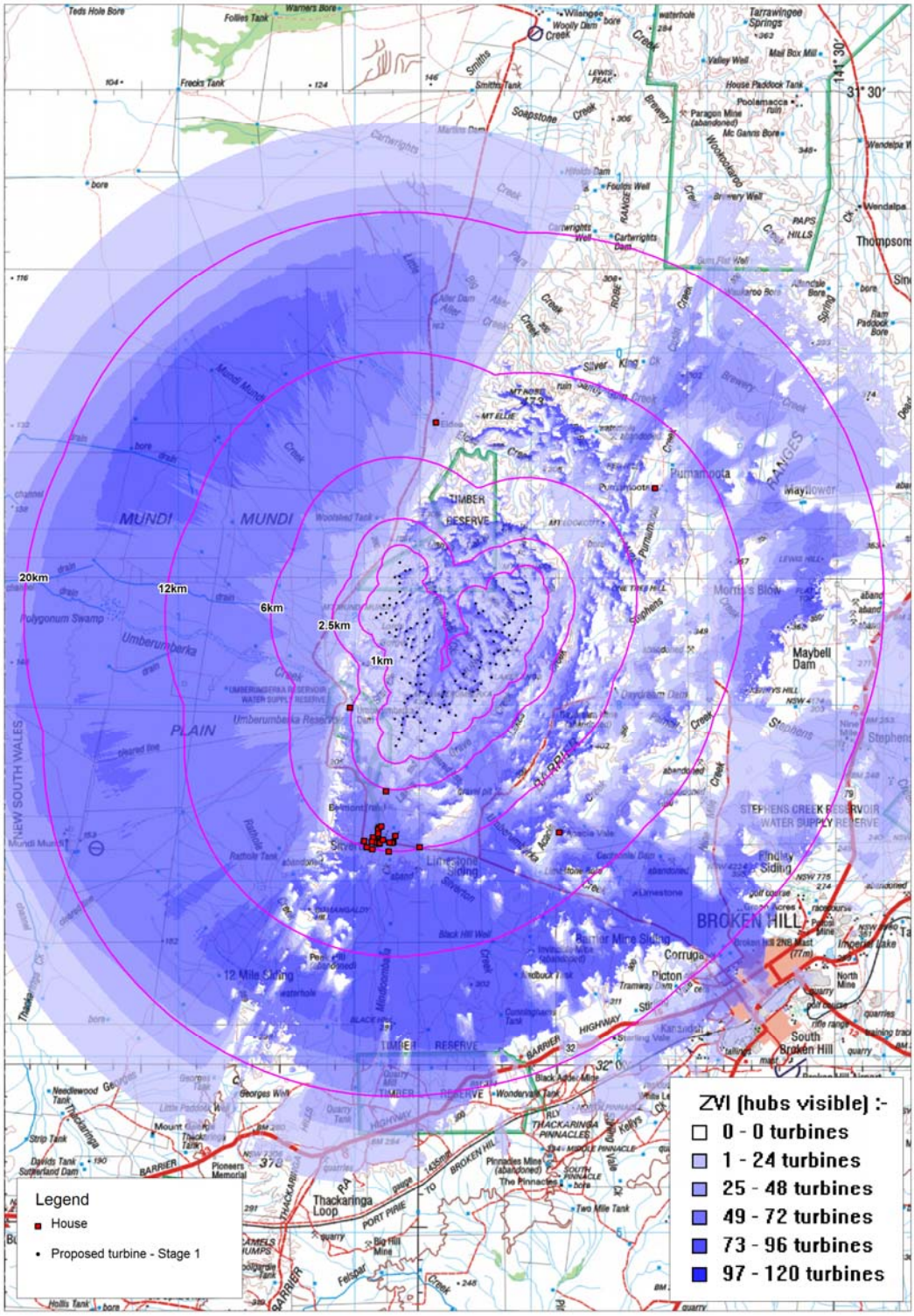


Figure 6, Stage 1 ZVI Diagram (from tip of blade)

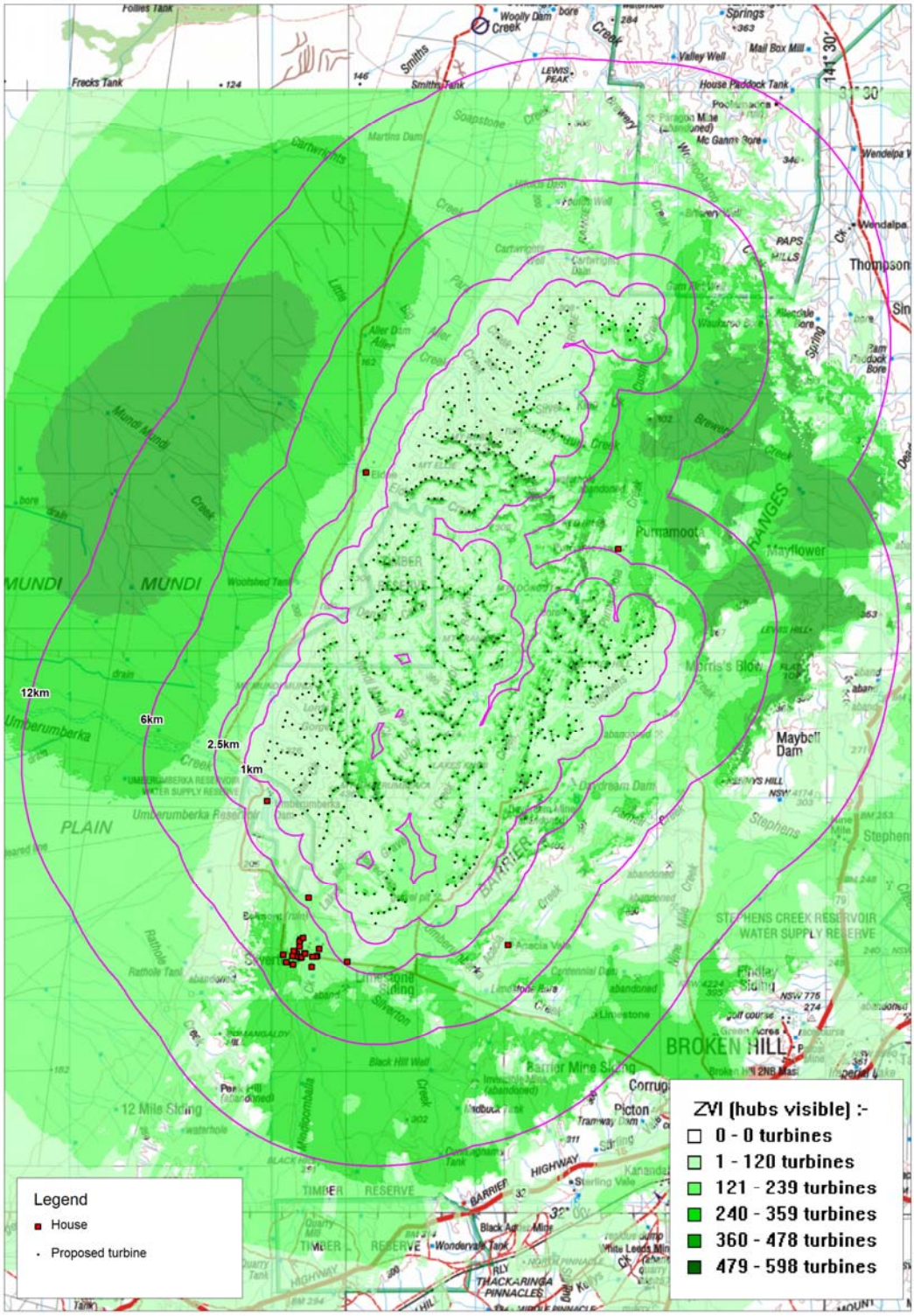


Figure 7, Stage 1 and 2 ZVI Diagram (from hub height)

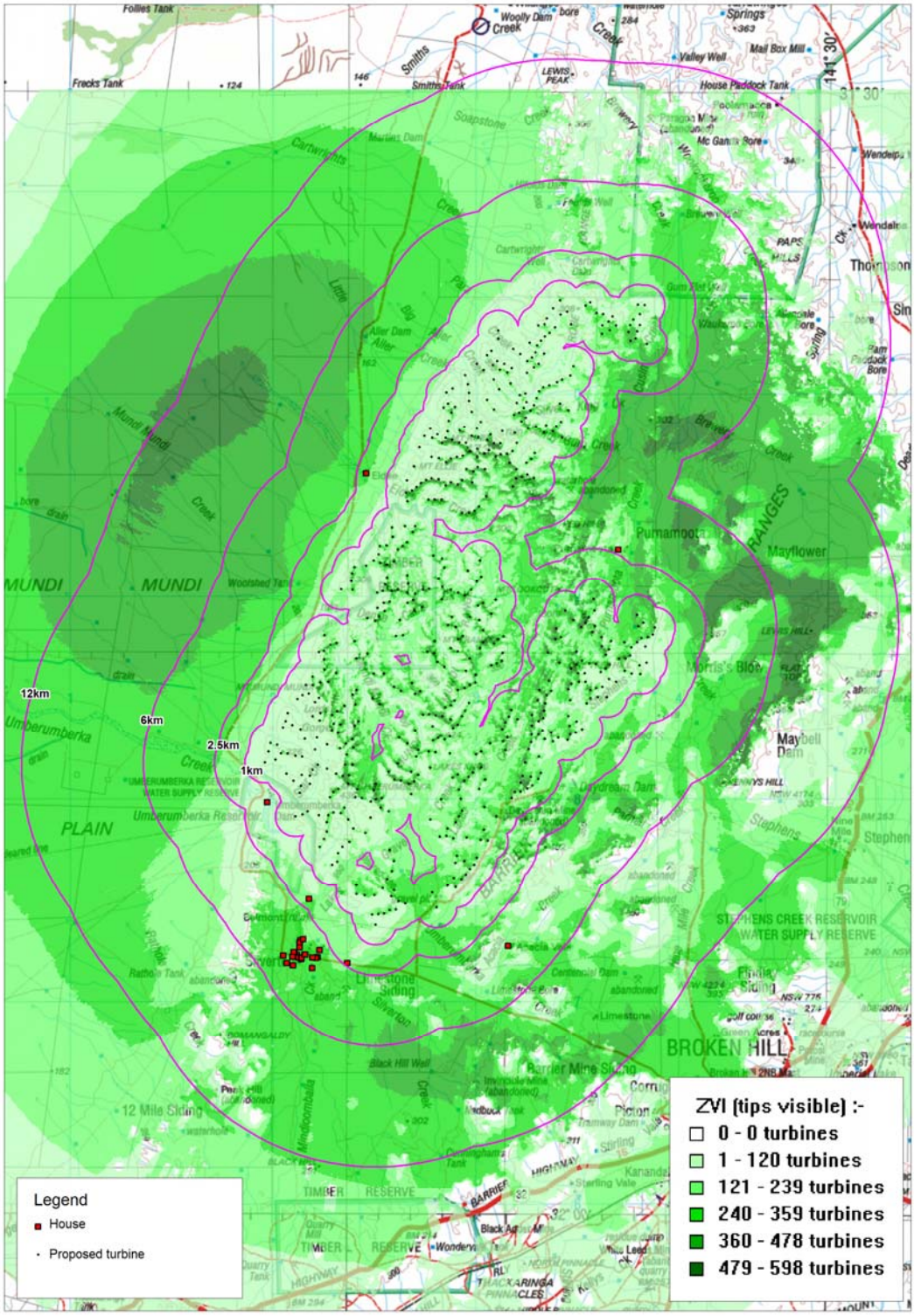


Figure 8, Stage 1 and 2 ZVI Diagram (from tip of blade)

7.6.2 Summary

The key aspects of the Silverton Wind Farm's potential ZVI are described and summarised below:

Figures 5 and 6, Stage 1

- The most extensive and continuous area of visibility toward the Stage 1 wind turbines will generally occur to the south and west of the Silverton Wind Farm, across largely unpopulated areas including the Mundi Mundi Plain.
- The Stage 1 wind turbines will also be visible from large areas of unpopulated landscape extending to the northeast and east of the Silverton Wind Farm site, although the extent of visibility will be heavily influenced by the undulating nature of the landform throughout these areas.
- A line of low hills extending south from an area around the Umberumberka Reservoir toward the Pinnacles provides varying degrees of screening, but again through generally unpopulated area.
- The Stage 1 ZVI, which extends southeast toward Broken Hill, is largely contained by land rising to, and above, the 300m AHD contour. Although the Stage 1 ZVI diagrams indicate that visibility extends to the south and south east of the Barrier Highway, it is likely that a number of built structures and modified landform (including mine spoil heaps) will provide some potential screening toward the Silverton Wind Farm.
- The Stage 1 ZVI for hub height and tip of blade covers a similar area of the surrounding landscape; however the number of wind turbines visible from potential receptor locations is likely to increase when viewed to the tip of blade. It is possible that the extent of visibility also includes partial views toward turbine structures where landform, vegetation or built structures block views toward portions of the wind turbines.
- Although the Stage 1 ZVI diagram illustrates that areas within Silverton and to the west of Broken Hill fall within the ZVI, the Garrad Hassan model used to calculate the extent of the ZVI does not include the location or height of any built structures, vegetation or other screening elements that may partially or completely block views toward the Silverton Wind Farm. The Stage 1 ZVI diagrams therefore present a very conservative and likely worse case scenario for the extent of visibility.

Figures 7 and 8, Stage 1 and 2

- The most extensive and continuous area of visibility toward the Stage 1 and 2 wind turbines will generally occur to the west and east of the Silverton Wind Farm, across unpopulated areas, including the Mundi Mundi Plain.
- The Stage 1 and 2 ZVI diagrams also illustrate the extent to which visibility will be influenced by the position of the receptor relative to the undulating nature of the surrounding landform,
- The Stage 1 and 2 ZVI, which extends southeast toward Broken Hill, is largely contained by land rising to, and above, the 300m AHD contour. Although the Stage 1 ZVI diagrams indicate that visibility extends to the south and south east of the Barrier Highway, it is likely that a number of built structures and modified landform (including

mine spoil heaps) will provide some potential screening toward the Silverton Wind Farm.

- The Stage 1 and 2 ZVI for hub height and tip of blade cover a similar area of the surrounding landscape; however the number of wind turbines visible from potential receptor locations is likely to increase when viewed to the tip of blade. It is possible that the extent of visibility also includes partial views toward turbine structures where landform, vegetation or built structures block views toward portions of the wind turbines.
- Although the Stage 1 and 2 ZVI diagram illustrates that areas within Silverton and to the northwest and southwest of Broken Hill are within the ZVI, the Garrad Hassan model used to calculate the extent of the ZVI does not allow for the location or height of any built structures, vegetation or other screening elements that may partially or completely block views toward the Silverton Wind Farm. The Stage 1 and ZVI diagrams therefore present a very conservative and likely worse case scenario for the extent of visibility.

Visual Assessment Criteria and Matrix SECTION 8

8.1 Visual Assessment Criteria

The potential visual impact of the proposed Silverton Wind Farm development has been assessed from key receptor locations against the criteria outlined in **Table 10.**

Table 10 Receptor Location Assessment Criteria

Criteria	Definition
Category of Viewer	
Static	Residence, picnic area or lookout point
Dynamic	Travelling along public road
View Elevation	
Above	Higher elevation than object turbine viewed
Level	Level with object turbine viewed
Below	Lower elevation than object turbine viewed
Number of Viewers	
High	>500 people per day
Moderate	250 - 500 people per day
Low	100 - 250 people per day
Very Low	<100 people per day
View Distance	
Distant	>12km
Long	8km – 12km
Medium	4 – 8km
Short	1 – 4km
Very short	<1km
Period of View	
Long term	> 2 hours
Moderate term	30 - 120 minutes
Short term	10 – 30 minutes
Very Short Term	< 10 minutes

An indicative level of visibility resulting from various combinations of the above criteria is listed in **Table 11**.

Table 11 Visibility Criteria Matrix

	Distant and Long Distance			Medium Distance			Short Distance			Very Short Distance		
Period of View	**L/M**	**S**	**VS**	**L/M**	**S**	**VS**	**L/M**	**S**	**VS**	**L/M**	**S**	**VS**
High No. of Viewers	M	L	L	H	M	M	H	H	M	H	H	H
Moderate No. of Viewers	L	L	L	M	M	L	H	M	M	H	H	M
Low No. of Viewers	L	L	L	M	L	L	M	M	L	H	M	L
Very Low No. of Viewers	L	L	L	L	L	L	M	L	L	M	M	L

- **Period of View** L/M=Long to Moderate term, S=Short term , VS=Very Short term
- **Levels of visibility** L=low, M=medium and H=high

The visibility criteria matrix is used as a guide to determine a potential level of visibility. The visual impact for each receptor location is also considered against other factors, which include the sensitivity of the receptor type and the elevation of the receptor relative to the locations of the turbines. The general relationship between receptor category and their potential level of sensitivity is outlined below:

Receptor Category	Sensitivity
Residential Properties	Highest Sensitivity
Pedestrians (recreational)	▽
Public Recreational Space	▽
Pedestrians (non-recreational)	▽
Motorists	▽
Business (commercial)	▽
Industry	Lower Sensitivity

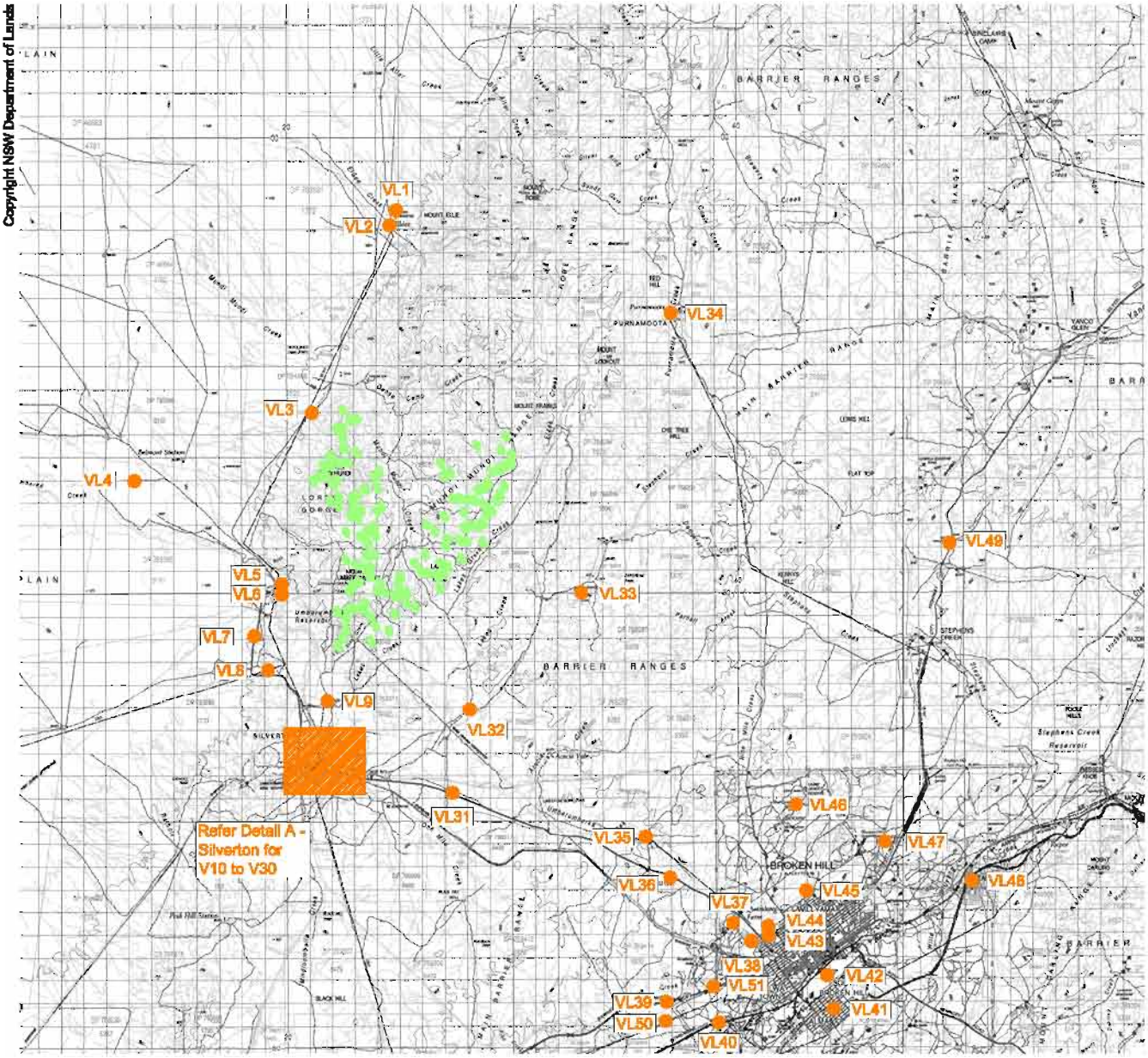
8.2 Visibility Matrix

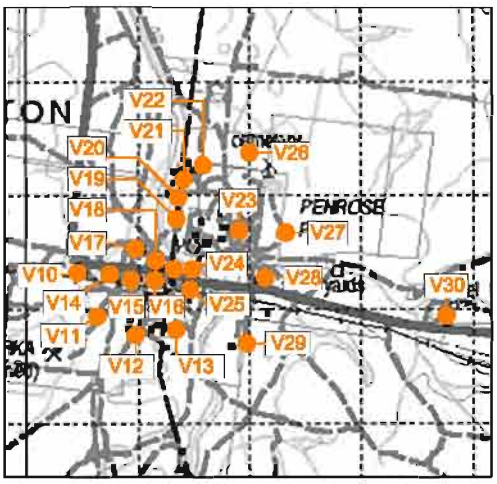
Table 12 presents the Visibility Matrix for Stages 1 and 2 of the Silverton Wind Farm development.

The matrix lists the potential receptor locations together with the:

- Category of receptor;
- Context of view;
- Approximate distance between the receptor and the Silverton Wind Farm;
- Relative numbers of receptors;
- Period of view; and
- View elevation.

The location of the potential receptors is illustrated in **Figures 9 and 10**.





Detail A - Silverton

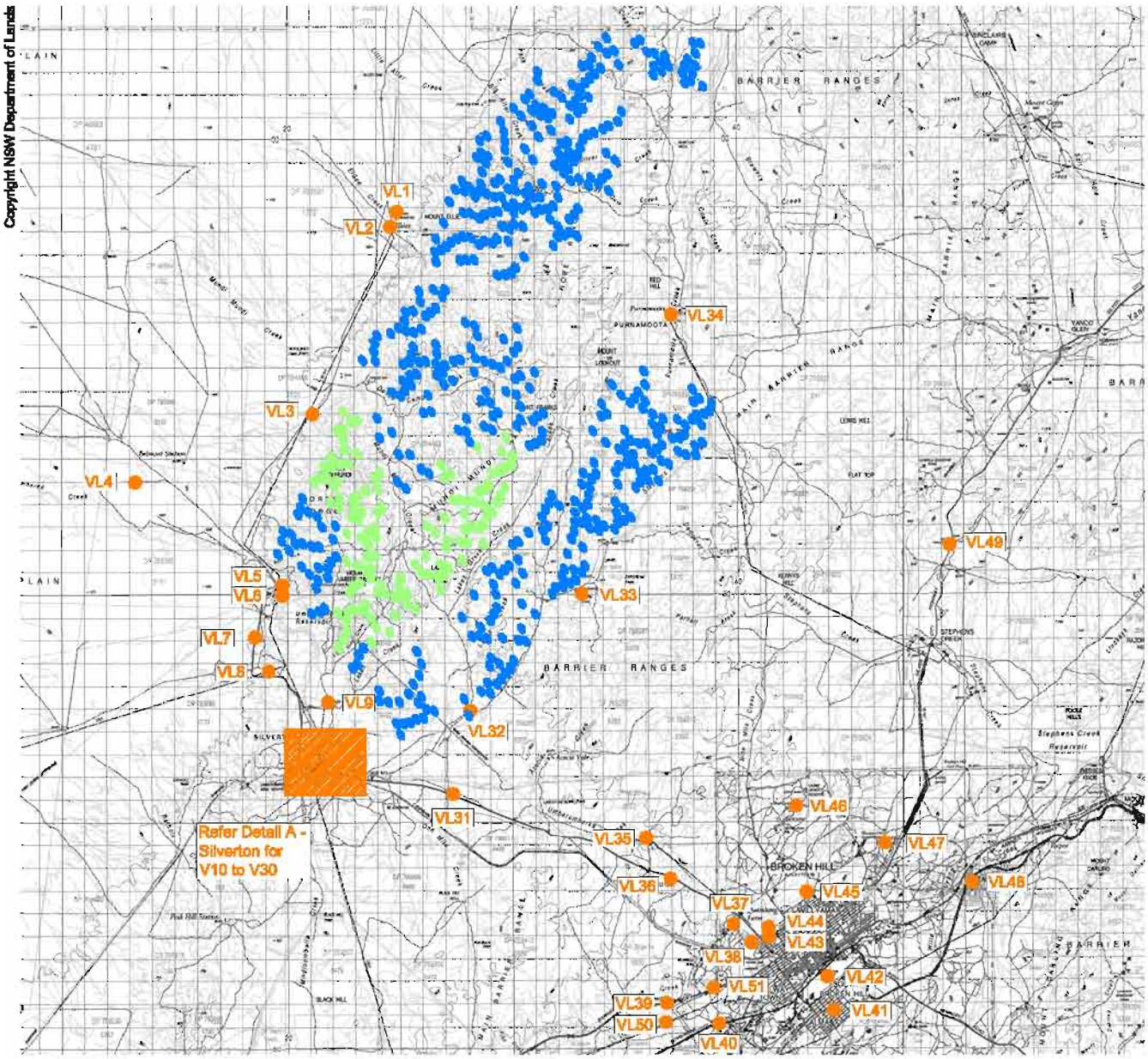
0 1 2km

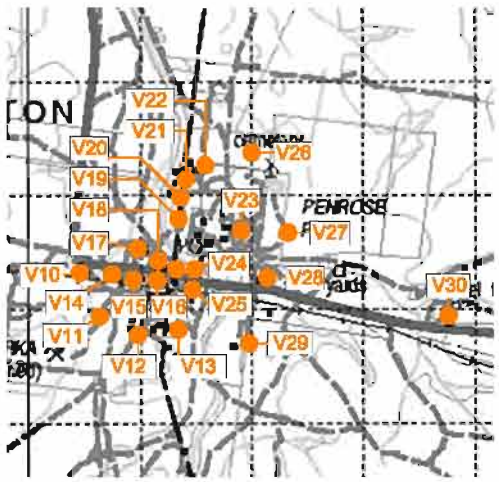
LEGEND

STAGE 1 WIND TURBINE LOCATIONS

VL3 POTENTIAL RECEPTOR LOCATION

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT		Title: POTENTIAL RECEPTOR AND STAGE 1 TURBINE LOCATIONS
URS / Green Bean Design	Drawn: AH	Approved: WB	Date: 25/03/08
	Job No:	File No: 07-116-9	Figure: 9





Detail A - Silverton

0 1 2km

LEGEND

STAGE 1 WIND TURBINE LOCATIONS

STAGE 2 WIND TURBINE LOCATIONS

VL3 POTENTIAL RECEPTOR LOCATION

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT		Title: POTENTIAL RECEPTOR AND STAGE 2 TURBINE LOCATIONS
URS / Green Bean Design	Drawn: AH	Approved: WB	Date: 25/03/08
	Job No:	File No: 07-116-10	Figure: 10

Table 12 Visibility Matrix

Potential Receptor Location	Category of Potential Receptor	Direction and Context of view toward the Silverton Wind Farm	Approx View Distance to Stage 1	Approx View Distance to Stage 2	Relative Number of Viewers	Period of View	View Elevation	Stage 1 Visual Impact	Stage 2 Visual Impact
1	Occasional film location and working woolshed.	Open and extensive views from exterior areas surrounding Eldee woolshed toward series of hills along western edge of Barrier Range. Views take in Eldee Station buildings and tree lines along Eldee Creek.	9.2 km (Long)	2.1km (Short)	Very Low	Stage 1 n/a Stage 2 Moderate to Long Term	Below	Nil	Low
2	Residents, employees and guests	View east from homestead and guest accommodation toward series of hills along the west edge of the Barrier Range.	8.4km (Long)	2.0km (Short)	Very Low	Stage 1 n/a Stage 2 Long Term	Below	Nil	High*
2a	Employees and visitors	Views from various areas within the Eldee Station property that extend along the west edge of the Mundi Mundi Plain and within the Barrier Ranges.	Varies depending on location within property.	Varies depending on location within property boundary.	Very Low	Moderate to Long Term	Below	Low*	Medium
3	Motorist	View north east or south west from vehicles travelling to, or beyond, Eldee Station on section of unsealed road for approximately 10km north of the Umberumberka Reservoir. Road corridor takes in views along the west edge of the Barrier Range and across the	1.1km (Short)	0.9km (Very Short)	Very Low	Very Short Term	Below	Low	Low

Potential Receptor Location	Category of Potential Receptor	Direction and Context of view toward the Silverton Wind Farm	Approx View Distance to Stage 1	Approx View Distance to Stage 2	Relative Number of Viewers	Period of View	View Elevation	Stage 1 Visual Impact	Stage 2 Visual Impact
		Mundi Mundi Plain.							
4	Occasional filming location.	Open and extensive views east from red clay pan surrounding film location across Mundi Mundi Plain toward west edge of Barrier Ranges.	7.9km (Long)	6.9km (Long)	Very Low	Moderate Term	Below	Low	Low
5	Visitors at Umberumberka reservoir car park and amenities building.	View north and east from lower car park and amenities building across portions of reservoir and dam. Views generally contained by landform rising to the east of the reservoir and by tree planting around the car park area.	2.5km (Medium)	1.3km (Short)	Low to Moderate (1)	Varies – likely Short to Moderate Term	Below	Low*	Low*
5a	Visitors to reservoir BBQ picnic area.	View south east from BBQ picnic area across water body toward hills beyond is partially screened by trees around the reservoir.	2.5km (Medium)	1.1km (Short)	Low to Moderate (1)	Varies – likely Short to Moderate term	Below	Low*	Low*
6	Residential	View south and east from residence across water body to hills fringing reservoir.	2.5km (Medium)	1.5km (Short)	Very Low	Moderate to Long	Below	Low	Medium
7	Motorist	View east to north east from road corridor toward hills south of reservoir, as well as views west to north west across the Mundi Mundi Plain.	3.7km (Medium)	2.7km (Medium)	Low to Moderate (1)	Very Short to Short term	Below	Low	Low
8	Visitor	Extensive and open views from	3.2km	3.2km	Low to	Short to	Below	Low	Medium

Potential Receptor Location	Category of Potential Receptor	Direction and Context of view toward the Silverton Wind Farm	Approx View Distance to Stage 1	Approx View Distance to Stage 2	Relative Number of Viewers	Period of View	View Elevation	Stage 1 Visual Impact	Stage 2 Visual Impact
		the Mundi Mundi lookout west across the Mundi Mundi Plain. Views to the north, north east and south of the lookout are generally contained by undulating hills in the south portion of the Mundi Mundi Range and low hills to the west and south of Silverton.	(Medium)	(Medium)	Moderate	Moderate term			
9	Residential	View north to north east from homestead generally contained within vicinity of homestead by undulating landform and vegetation.	2.5km (Short)	1.8km (Short)	Very Low	Moderate to Long term	Below	Low	Low
9a	Farm worker	Views from various locations within Belmont Station extend over Mundi Mundi Plain and Barrier Range pasture country.	Wide variance depending on location within property boundary.	Wide variance depending on location within property boundary.	Very Low	Moderate to Long Term	Below or Level	Low	Low
10	Residential	View north to north east from residence toward the south portion of the Mundi Mundi Range.	5.6km (Medium)	4.7km (Medium)	Very Low	Moderate to Long term	Below	Low	Medium
11	Residential	View north to north east from residence toward the south portion of the Mundi Mundi Range.	5.9km (Medium)	4.8km (Medium)	Very Low	Moderate to Long term	Below	Low	Medium

Potential Receptor Location	Category of Potential Receptor	Direction and Context of view toward the Silverton Wind Farm	Approx View Distance to Stage 1	Approx View Distance to Stage 2	Relative Number of Viewers	Period of View	View Elevation	Stage 1 Visual Impact	Stage 2 Visual Impact
12	Residential and galleries	View north from residential and gallery buildings on elevated ground to the south of Silverton. Views extend over Silverton toward the south portion of the Mundi Mundi Range.	6.0km (Long)	4.5km (Medium)	Low to Moderate	Short to Moderate term	Below	Medium*	Medium*
13	Residential and gallery	View north from residential and gallery buildings on elevated ground to the south of Silverton. Views extend over Silverton toward the south portion of the Mundi Mundi Range.	5.8km (Medium)	4.2km (Medium)	Low to Moderate	Moderate to Long term	Below	Medium*	Medium*
14	Residential	View north from residence toward south portion of the Silverton Wind Farm site.	5.5km (Medium)	4.5km (Medium)	Very Low	Moderate to Long term	Below	Low	Medium
15	Silverton Hotel	View north from building and courtyard generally screened by external fence and adjoining structures.	5.5km (Medium)	4.4km (Medium)	Low to Moderate	Short to Moderate term	Below	Low*	Low*
16	Shop and residential	View north from building is generally contained within the main street through Silverton. Views toward the proposed Silverton Wind Farm are partially obstructed by buildings on the opposite side of the road.	5.5km (Medium)	4.2km (Medium)	Very Low	Moderate	Below	Low*	Low*
17	Residential and	View from north of building and	5.2km	4.2km	Very Low	Moderate to	Below	Low	Medium

Potential Receptor Location	Category of Potential Receptor	Direction and Context of view toward the Silverton Wind Farm	Approx View Distance to Stage 1	Approx View Distance to Stage 2	Relative Number of Viewers	Period of View	View Elevation	Stage 1 Visual Impact	Stage 2 Visual Impact
	artist studio	studio toward south portion of the proposed Silverton Wind Farm.	(Medium)	(Medium)		Long term			
18	Gallery, shop and residence	Indirect view from shop frontage area, with no view toward the proposed Silverton Wind Farm site within gallery space.	5.3km (Medium)	4.1km (Medium)	Low to Moderate	Moderate to Long term	Below	Low*	Low*
19	Residential	View north to north east from residence toward Silverton Wind Farm generally blocked by a combination of vegetation and surrounding structures. Potential view north to north east toward Silverton Wind Farm from exterior residential areas including access track to residence.	4.9km (Medium)	3.7km (Medium)	Very Low	Moderate to Long term	Below	Low*	Medium*
20	Residential	View north to north east from residence toward Silverton Wind Farm generally blocked by a combination of vegetation and surrounding structures. Potential view north to north east toward Silverton Wind Farm from exterior residential areas including access track to residence.	4.7km (Medium)	3.6km (Medium)	Very Low	Moderate to Long term	Below	Low*	Medium*

Potential Receptor Location	Category of Potential Receptor	Direction and Context of view toward the Silverton Wind Farm	Approx View Distance to Stage 1	Approx View Distance to Stage 2	Relative Number of Viewers	Period of View	View Elevation	Stage 1 Visual Impact	Stage 2 Visual Impact
21	Residential	View north to north east from residence toward Silverton Wind Farm generally blocked by a combination of vegetation and surrounding structures. Potential view north to north east toward Silverton Wind Farm from exterior residential areas including access track to residence.	4.6km (Medium)	3.4km (Medium)	Very Low	Moderate to Long term	Below	Low*	Medium*
22	Residential	View north from residence toward Stage 1 partially screened by a combination of vegetation and surrounding structures.	4.4km (Medium)	3.2km (Medium)	Very Low	Moderate to Long term	Below	Low	Medium*
23	Visitor (camping or recreational) Resident - caretaker	View north from within most sections of Penrose Park are generally screened by internal tree planting and structures. Views from the north portion of Penrose Park toward Stage 1 and Stage 2 turbine locations.	4.9km (Medium)	3.3km (Medium)	Very Low to Low (with seasonal variation)	Moderate to Long term	Below	Low	Low
24	Visitor – community events, or camping and recreational	View toward the proposed Silverton Wind Farm from rear of buildings generally blocked by surrounding structures and vegetation along creek lines.	5.3km (Medium)	3.8km (Medium)	Very Low	Short to Long term (visitation varies)	Below	Nil	Nil

Potential Receptor Location	Category of Potential Receptor	Direction and Context of view toward the Silverton Wind Farm	Approx View Distance to Stage 1	Approx View Distance to Stage 2	Relative Number of Viewers	Period of View	View Elevation	Stage 1 Visual Impact	Stage 2 Visual Impact
25	Visitor or staff	View north from building and courtyard generally contained within the main streetscape area.	5.5 km (Medium)	3.9km (Medium)	Low to Moderate	Short to Moderate term	Below	Low	Low
26	Visitor	View north and north east from cemetery toward Stage 1 and Stage 2 turbine locations.	4.2km (Medium)	2.9km (Medium)	Very Low to Low	Very Short to Short term	Below	Low	Low
27	Residential	Generally extensive and open view north and north east from adjoining residences. Medium distance views extent to Stage 1 and Stage 2 wind turbine locations, with potential for views from residence. Residence to north offers some screening of views for residence to the south.	5.0km (Medium)	2.9km (Medium)	Very Low	Moderate to Long term	Below	Medium*	High*
28	Residential	View north from residence toward creek line and scrub pasture beyond. Potential intermittent views toward Silverton Wind Farm from north of residence.	5.4km (Medium)	3.2km (Medium)	Very Low	Moderate to Long term	Below	Low	Medium*
29	Residential	View north from residence toward south portion of Stage 1, with potential views to upper portions of some Stage 2 turbines.	6.0km (Medium)	3.7km (Medium)	Very Low	Moderate to Long term	Below	Low	Medium*

Potential Receptor Location	Category of Potential Receptor	Direction and Context of view toward the Silverton Wind Farm	Approx View Distance to Stage 1	Approx View Distance to Stage 2	Relative Number of Viewers	Period of View	View Elevation	Stage 1 Visual Impact	Stage 2 Visual Impact
30	Residential and Visitors to Camel Farm	View north from residence toward creek line and pasture. Potential views toward Stage 1 and Stage 2 turbines.	5.9km (Medium)	2.2km (Short)	Very Low	Moderate to Long term	Below	Low	Medium
31	Motorist	View north west from Silverton Road corridor for around a 10km section of road.	Distance varies 7.7km (Long)	Distance varies 2.2km (Short)	Low to Moderate (4)	Very Short term	Below	Low	Low
32	Motorist	Indirect view toward Stage 1 wind turbines from access track running north east toward Day Dream Mine. Very short distance view toward a small number of Stage 2 wind turbines located adjacent to the track to the Day Dream Mine.	5.0km (Medium)	0.2km (Very Short)	Low to Moderate (with seasonal visitation)	Very Short to Short term	Below	Low	Medium*
33	Visitor and staff	Views west to north west toward Stage 1 wind turbines from car park and mine surface areas are partially blocked by undulating landform. Generally direct and very short distance views to a small number of Stage 2 wind turbines located to the east of the Mundi Mundi Range.	5.2km (Medium)	0.7km (Very Short)	Very Low to Low (with seasonal visitation)	Short to Moderate term	Below	Low	Medium*
34	Residential	Views toward Stage 1 wind turbines from residence are	9.0km (Long)	2.8km (Medium)	Very Low	Moderate to Long term	Below	Nil	Medium*

Potential Receptor Location	Category of Potential Receptor	Direction and Context of view toward the Silverton Wind Farm	Approx View Distance to Stage 1	Approx View Distance to Stage 2	Relative Number of Viewers	Period of View	View Elevation	Stage 1 Visual Impact	Stage 2 Visual Impact
		generally screened by landform rising to the west of the residence. Indirect and medium distance views toward Stage 2 wind turbines to the south from exterior areas around the residence, as well as very short distance views from sections of the Purnamoota access track.							
34a	Property owner, farm worker	Views from various locations within Purnamoota Station extend over Barrier Range pasture country.	Wide variance depending on location within property boundary.	Wide variance depending on location within property boundary.	Very Low	Moderate to Long Term	Below or Level	Low	Low
35	Residential	Views north west from Limestone property are partially restricted by undulating landform to the west and north west of the residence. Distant to long distance views are available from various locations around the residence with some limited screening potential provided by existing trees surrounding compound area to the west of the residence.	14.3km (Distant)	9.5km (Long)	Very Low	Moderate to Long term	Below	Low	Low

Potential Receptor Location	Category of Potential Receptor	Direction and Context of view toward the Silverton Wind Farm	Approx View Distance to Stage 1	Approx View Distance to Stage 2	Relative Number of Viewers	Period of View	View Elevation	Stage 1 Visual Impact	Stage 2 Visual Impact
36	Motorist or visitor for sunset views	View north west from the Silverton Road corridor (west bound) to the south of the Limestone property.	16.4km (Distant)	11.5km (Long)	Low to Moderate (4)	Very Short to Short term	Below	Low	Low
37	Residential and employees	View north west from residence and commercial buildings generally screened by landform and vegetation.	19.7km (Distant)	15.0km (Distant)	Very Low	Moderate to Long term	Below	Nil	Nil
38	Residential	View from residences on Brown Street extend north to north west across scrub pasture and surrounding open landscape.	20.8km (Distant)	16km (Distant)	Very Low	Moderate to Long term	Below	Nil	Nil
39	Motorist	View north to north east along Barrier Highway road corridor toward Barrier Ranges. Distant views toward Silverton Wind Farm are generally indirect from road corridor and potentially blocked by areas of undulating landform.	21.1km (Distant)	15km (Distant)	High (2)	Very Short term	Below	Low	Low
40	Various	Indirect views north west toward the Silverton Wind Farm site from sections of the Broken Hill railway line and various areas within the industrial area to the west and south west of the Broken Hill town centre.	22.6km (Distant)	17.5km (Distant)	Low to Moderate	Moderate to Long term	Below	Nil	Nil

Potential Receptor Location	Category of Potential Receptor	Direction and Context of view toward the Silverton Wind Farm	Approx View Distance to Stage 1	Approx View Distance to Stage 2	Relative Number of Viewers	Period of View	View Elevation	Stage 1 Visual Impact	Stage 2 Visual Impact
		Views are generally screened by a combination of low undulating landform and structures within the industrial area.							
41	Various	Views within residential and commercial urban development south of the Broken Hill mullock heap. Views toward the Silverton Wind Farm are generally blocked by surrounding development and landform.	25.8km (Distant)	20.7km (Distant)	High	Moderate to Long term	Below	Nil	Nil
42	Visitors and staff	Open and extensive views from top of the central mullock heap (including restaurant and miners memorial) extending north west over Broken Hill to distant horizon. Very distant views toward the Silverton Wind Farm site are likely to be influenced by prevailing atmospheric conditions.	24.6km (Distant)	19.6km (Distant)	Low to Moderate	Moderate to Long term	Generally below but potentially level and higher to turbines beneath RL340m.	Low	Low
43	Visitors and employees	Extensive and open views north west from hilltop location around TV transmitter station toward distant horizon across low scrub	21.5km (Distant)	16.5km (Distant)	Very Low	Moderate to Long term	Below	Low	Low

Potential Receptor Location	Category of Potential Receptor	Direction and Context of view toward the Silverton Wind Farm	Approx View Distance to Stage 1	Approx View Distance to Stage 2	Relative Number of Viewers	Period of View	View Elevation	Stage 1 Visual Impact	Stage 2 Visual Impact
		and pasture landscape. The Pinnacles are visible to the south west.							
44	Residential	View north west from residence across open landscape toward Limestone property and beyond.	21.0km (Distant)	16.0km (Distant)	Very Low	Moderate to Long term	Below	Low	Low
45	Visitors	Views from the White Rocks Reserve extend north to north west across open and generally level scrub pasture. Immediate views to the south extend over buildings along the southern fringe of Broken Hill.	21.4km (Distant)	16.5km (Distant)	Very Low	Short to Moderate term	Below	Low	Low
46	Visitors	Extensive and open views across the landscape are available as a 360 degree panoramic from the Sculpture Park hill top location. Distant view to north west horizon line and Silverton Wind Farm site on the distant Mundi Mundi and Robe Ranges.	18.5km (Distant)	14.0km (Distant)	Very Low to Low (3)	Short to Moderate term	Below	Low	Low
47	Visitor	View north west from the top of Round Hill, located off the Silver City Highway north east of Broken Hill. Open and extensive views available as 360 degree	22.7km (Distant)	18.3km (Distant)	Very Low	Very Short to Short term	Below to Level	Low	Low

Potential Receptor Location	Category of Potential Receptor	Direction and Context of view toward the Silverton Wind Farm	Approx View Distance to Stage 1	Approx View Distance to Stage 2	Relative Number of Viewers	Period of View	View Elevation	Stage 1 Visual Impact	Stage 2 Visual Impact
		panorama over Broken Hill and surrounding landscape. View north west toward Silverton Wind Farm partially obscured by landform around Sculpture Park and Living Desert Reserve.							
48	Various	Residential and commercial areas with views toward the proposed Silverton Wind Farm blocked by surrounding development and landform.	26.8km (Distant)	22.7km (Distant)	Low to Moderate	Moderate to Long term	Below	Nil	Nil
49	Motorist	View north west to west from Silver City Highway corridor north of Broken Hill. Indirect views toward the Silverton Wind Farm site are generally blocked undulating landform between the road corridor and the proposed Silverton Wind Farm area.	Varies, generally >20km (Distant)	Varies, generally >12km (Distant)	Very Low to Low	Short to Moderate Term	Below	Nil	Low
50	Residential	Residential receptor south of the Barrier Highway road corridor.	21.2km (Distant)	16.1km (Distant)	Very Low	Moderate to Long term	Below	Nil	Nil
51	Residential	Residential receptor off Barrier Highway. Views toward proposed Silverton Wind Farm blocked by landform.	21.3km (Distant)	16.2km (Distant)	Very Low	Moderate to Long term	Below	Nil	Nil

Visibility Matrix Notes:

Annual Average Daily Traffic Count – (RTA 2005) have been referred to for the estimation of relative number of viewers along road corridors, and for potential visitation to Silverton and the Sculpture Park. Visitation numbers were requested from, but were not provided by, Broken Hill City Council.

(1) Unincorporated road west of Umberumberka Reservoir – Less than 50 (total in both directions).

(2) Barrier Highway west of Broken Hill – 999 (total in both directions).

(3) Nine Mile Road at Sculpture Park – 60 (total in both directions).

(4) Silverton Road – 210 (total in both directions).

* denotes visual impact adjusted from visibility matrix criteria to account for receptor sensitivity or magnitude of impact. Visual impacts may be adjusted to higher or lower visual impacts.

Relative number of viewers estimated per day.

8.3 Summary of Stage 1 Visibility Assessment

A total of 55 potential receptor locations were identified as part of the visual assessment process, and included views from:

- residences;
- lookout areas;
- previous film locations;
- tourist facilities and destinations;
- bbq and recreational areas; and
- road corridors.

An assessment of the visual impact for each potential receptor location indicated that for the Stage 1 Silverton Wind Farm:

- 12 of the 55 receptor locations have been determined to have a **NIL** visual impact;
- 40 of the 55 receptor locations have been determined to have a **LOW** visual impact;
- 3 of the 55 receptor locations has been determined to have a **MEDIUM** visual impact;
- 0 of the 55 receptor locations have been determined to have a **HIGH** visual impact.

The three receptor locations determined to have a Medium visual impact include receptor locations 12, 13 and 27, and comprise the galleries located on the high ground south of Silverton (Silverton Heights) and a residential properties to the east of Penrose Park.

Views from Silverton Heights extend across Silverton to the south portions of the Silverton Wind Farm development as well as extensive areas of landscape to the east and west of the wind farm site, including distant views north west to west toward and across the Mundi Mundi Plain. Although the wind farm is likely to be a prominent feature within the local view, the overall impact tends to be mitigated by the extent and scale of the available view.

The residential dwellings (receptor location 27) to the east of Penrose Park have limited existing screening opportunities and are likely to have direct views toward the south and east portions of the Stage 1 wind farm. As well as views from the immediate vicinity of the residences there may also be opportunities for views toward Stage 1 turbines from some areas within the residential dwellings, although exterior views from residential dwellings were not inspected or assessed during the fieldwork.

The majority of residential receptor locations within, and surrounding Silverton, were determined to have a Low visual impact, which resulted from a combination of existing screening opportunities between residences and the Stage 1 wind farm site, together with undulating landform of the Mundi Mundi and Barrier Ranges restricting the total number of turbines visible from any particular residential receptor location.

8.4 Summary of Stage 1 and 2 Visibility Assessment

A total of 55 potential receptor locations were identified as part of the visual assessment process, and included views from:

- residences;
- lookout areas;
- previous film locations;
- tourist facilities and destinations;
- BBQ and recreational areas; and
- road corridors.

An assessment of the visual impact for each potential receptor location indicated that for Stage 1 and 2 of the Silverton Wind Farm:

- 8 of the 55 receptor locations have been determined to have a **NIL** visual impact;
- 26 of the 55 receptor locations have been determined to have a **LOW** visual impact;
- 19 of the 55 receptor locations has been determined to have a **MEDIUM** visual impact;
- 2 of the 55 receptor locations have been determined to have a **HIGH** visual impact.

Receptor locations 2 and 27, determined to have a High visual impact within the Visibility Matrix (**Table 12**), include a homestead to the west of the Mundi Mundi Range (receptor location 2) and residential dwellings located to the east of Penrose Park (receptor location 27). Although each receptor location may experience a High visual impact, neither receptor will experience views toward all the Stage 1 and 2 turbines, with the majority of turbines screened by the rising landform along the east and west edge of the ranges.

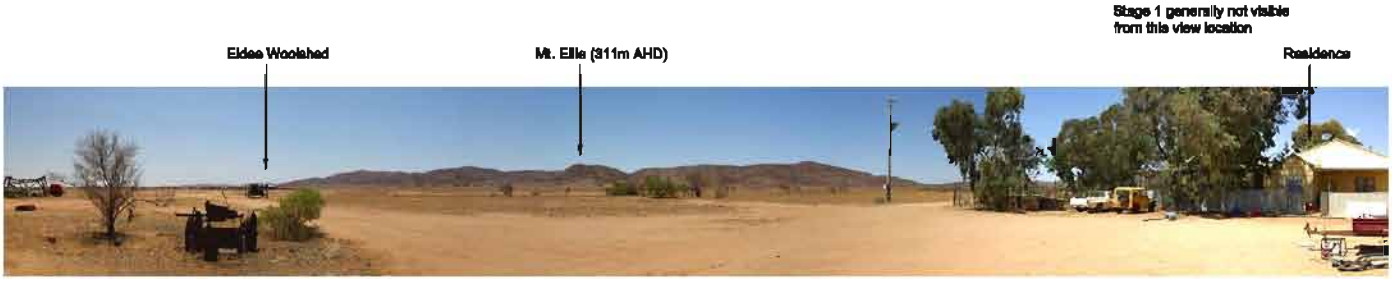
The residential dwellings (receptor location 27) to the east of Penrose Park have limited existing screening opportunities and are likely to have direct views toward turbines within the Stage 1 and Stage 2 wind farm. As well as views from the immediate vicinity of the residences there may also be opportunities for views toward Stage 1 and Stage 2 turbines from some areas within the residential dwellings, although exterior views from within residential dwellings were not inspected or assessed during the fieldwork.

The homestead, including visitor accommodation, to the west of the Mundi Mundi Range (receptor location 2) will experience short distance and direct views toward a number of turbines located along the west portion of the Stage 2 wind farm site. Views toward some of the Stage 2 turbines are likely to occur from areas within and immediately surrounding the residential dwellings. Refer Photomontage 1 **Figure 23** for an illustration of the Stage 2 turbines visible from this receptor location.

Although this receptor location has been determined High for Stage 2, views toward the majority of Stage 1 and Stage 2 turbines will not be visible from this receptor location.

A total of 13 residential receptor locations within, and surrounding Silverton, that were determined to have a Low visual impact resulting from the Stage 1 wind farm, have been determined to have a Medium visual impact following the Stage 2 development. The Medium visual impact generally results from an increase in the total number of turbines that may be visible from individual receptor locations together with the proximity of residences and a group of Stage 2 turbines located between the south portion of Stage 1 and the Day Dream Mine access road.

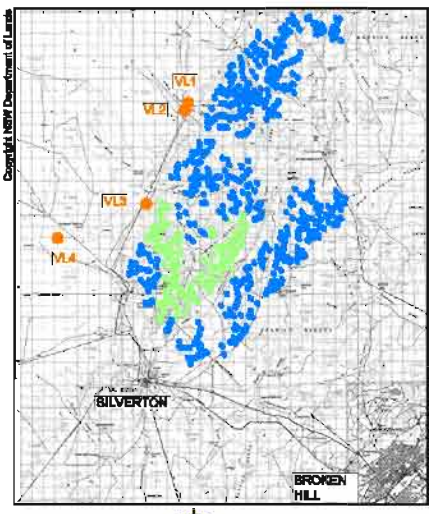
VIEW LOCATION 1 - ELDEE STATION (WEST OF WOOLSHED)



VIEW LOCATION 2 - ELDEE STATION HOMESTEAD

VIEW LOCATION 3 - ELDEE STATION ACCESS ROAD

VIEW LOCATION 4 - FILM LOCATION ON BELMONT STATION



General Location Plan
Not to scale

Legend

- Indicative location of Stage 1 wind turbines
- Indicative location of Stage 2 wind turbines
- Potential Receptor Location

General Information

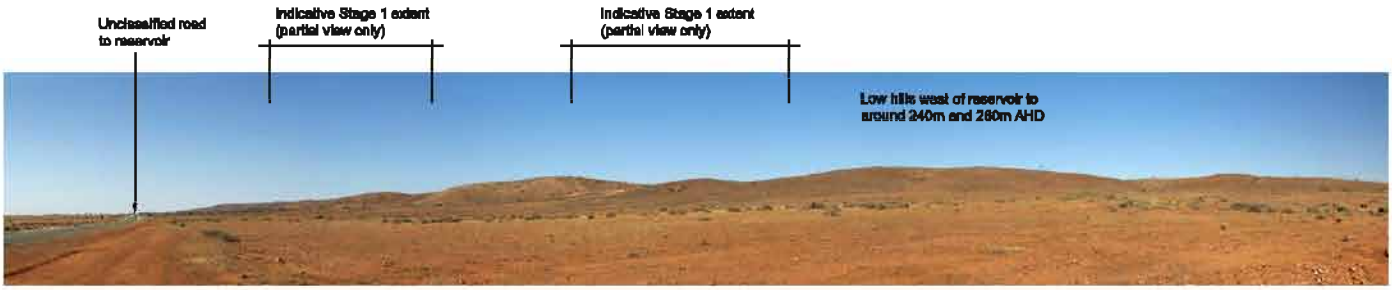
RECEPTOR LOCATION	PHOTOGRAPH LOCATION COORDINATES*	DISTANCE BETWEEN PHOTOGRAPH LOCATION AND NEAREST TURBINE	
		STAGE 1	STAGE 2
1	E: 624987.31 N: 6495617.16	9.2km	2.0km
2	E: 624814.6 N: 6495187.75	8.4km	2.0km
3	E: 624007.09 N: 6495178.82	1.1km	0.6km
4	E: 613195.09 N: 6488088.86	7.0km	6.0km

*Coordinate data stated as MGA with accuracy approximately +/-2m

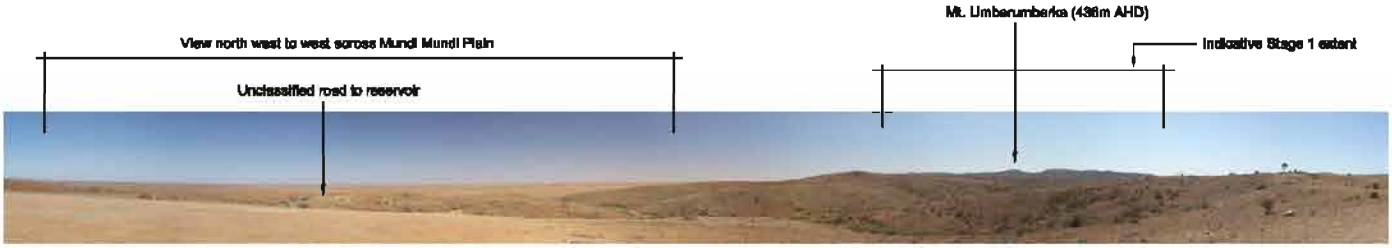
Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT		Title: PHOTO SHEET 1
URS / Green Bean Design	Drawn: AH	Approved: WB	Date: 25/03/09
	Job No:	File No: 07-116-11	Figure: 11

VIEW LOCATION 5a - UMBERUMBERKA RESERVOIR CAR PARK

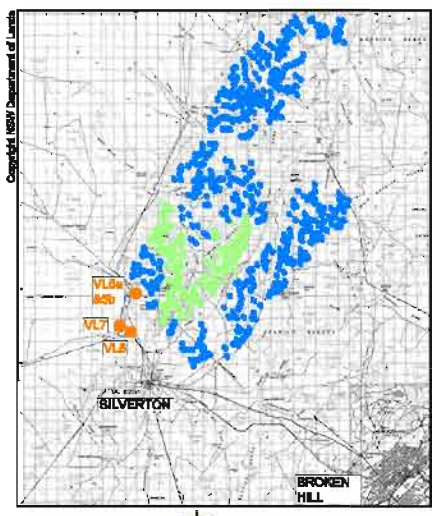
VIEW LOCATION 5b - UMBERUMBERKA RESERVOIR BBQ AREA



VIEW LOCATION 7 - UNCLASSIFIED ROAD TO UMBERUMBERKA RESERVOIR



VIEW LOCATION 8 - MUNDI MUNDI LOOKOUT (360° PANORAMIC)



General Location Plan
Not to scale

Legend

- Indicative location of Stage 1 wind turbines
- Indicative location of Stage 2 wind turbines
- Potential Receptor Location

NOTE: No photograph available for View Location 8

General Information

RECEPTOR LOCATION	PHOTOGRAPH LOCATION COORDINATES*	DISTANCE BETWEEN PHOTOGRAPH LOCATION AND NEAREST TURBINE	
		STAGE 1	STAGE 2
5	E: 518520.31 N: 6460113.81	2.6km	1.3km
5a	E: 518629.66 N: 6460090.75	2.6km	1.1km
7	E: 518481.31 N: 6477012.81	3.7km	2.7km
8	E: 518188.82 N: 6478457.09	5.2km	5.2km

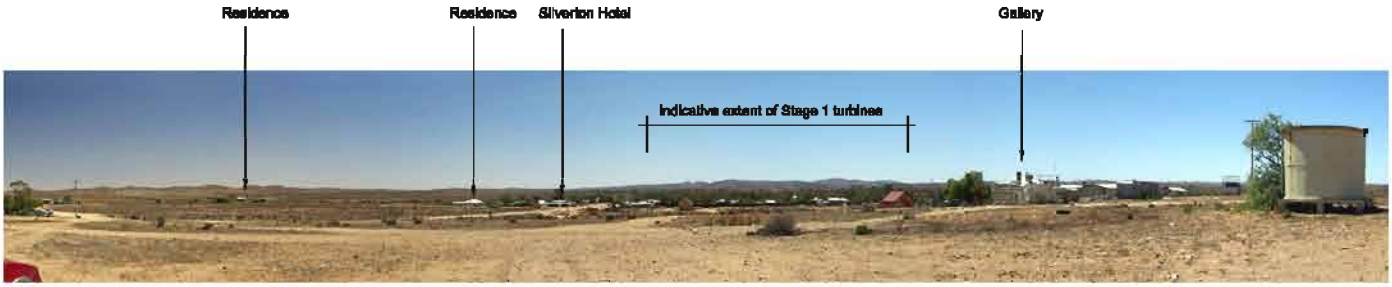
*Coordinate data stated as MGA with accuracy approximately +/-2m

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT		Title: PHOTO SHEET 2
URS / Green Bean Design	Drawn: AH	Approved: WB	Date: 25/03/09
	Job No:	File No: 07-116-12	Figure: 12

View from north of residence toward Stage 1 turbines
generally blocked by a combination of landform and vegetation

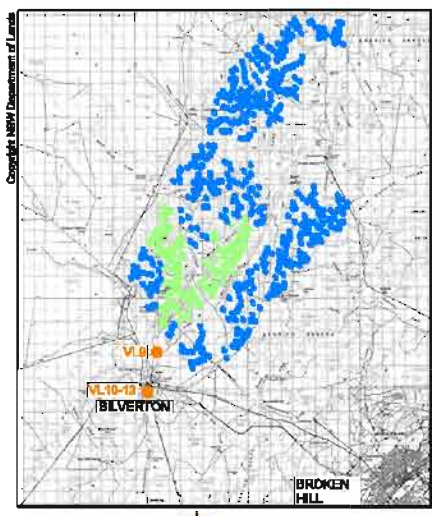
VIEW LOCATION 9 - RESIDENCE

VIEW LOCATION 10 - SILVERTON WEST



VIEW LOCATION 12 - SILVERTON SOUTH

VIEW LOCATION 13 - SILVERTON SOUTH



General Location Plan
Not to scale

Legend

- Indicative location of Stage 1 wind turbines
- Indicative location of Stage 2 wind turbines
- Potential Receptor Location

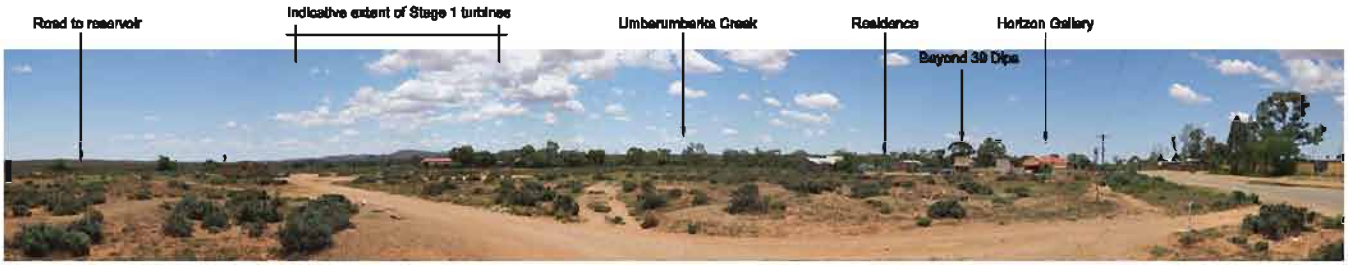
NOTE: No photograph available for View Location 11

General Information

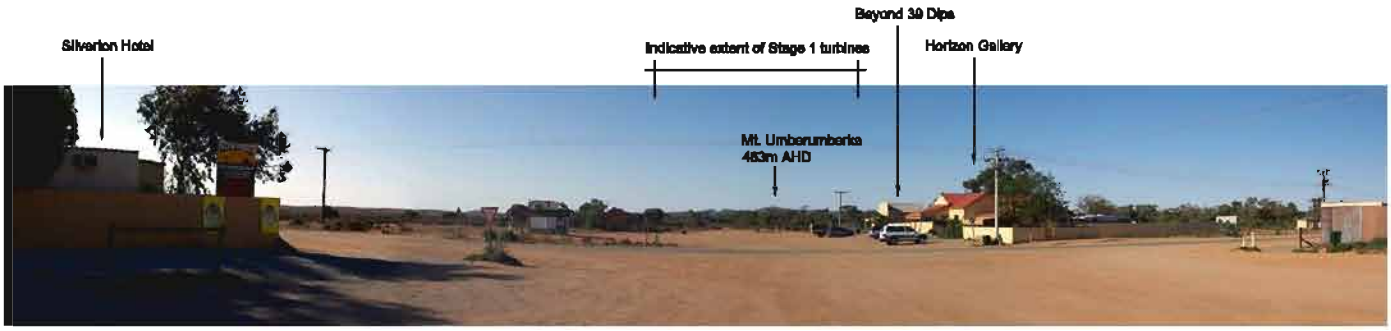
VIEW LOCATION	PHOTOGRAPH LOCATION COORDINATES*	DISTANCE BETWEEN PHOTOGRAPH LOCATION AND NEAREST TURBINE	
		STAGE 1	STAGE 2
9	E: 521784.61 N: 6479218.69	2.5 km	1.8km
10	E: 520483.45 N: 6478458.31	5.8 km	4.7km
12	E: 521122.05 N: 6471583.87	5.9 km	4.6km
13	E: 521265.87 N: 6471947.9	5.6 km	4.2km

*Coordinate data stated as MGA with accuracy approximately +/-3m

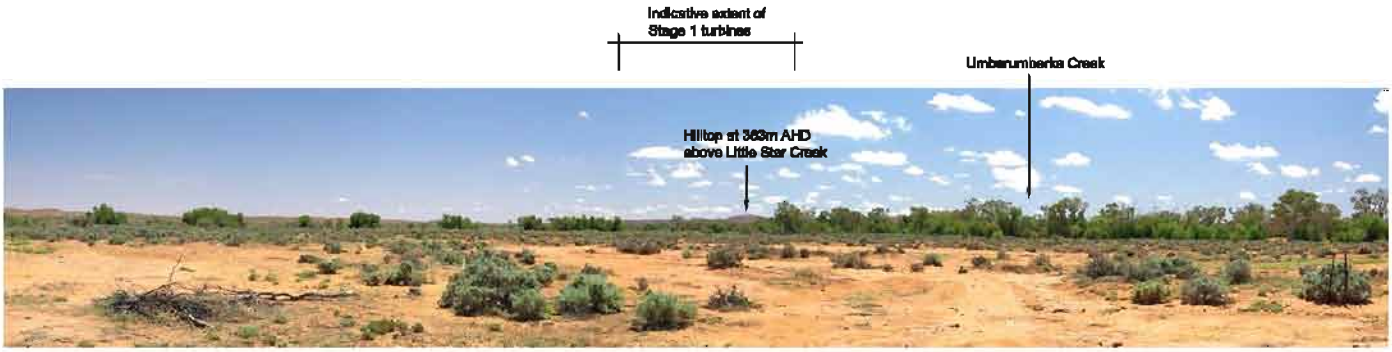
Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT		Title: PHOTO SHEET 3
URS / Green Bean Design	Drawn: AH	Approved: WB	Date: 25/03/08
	Job No:	File No: 07-118-13	Figure: 13



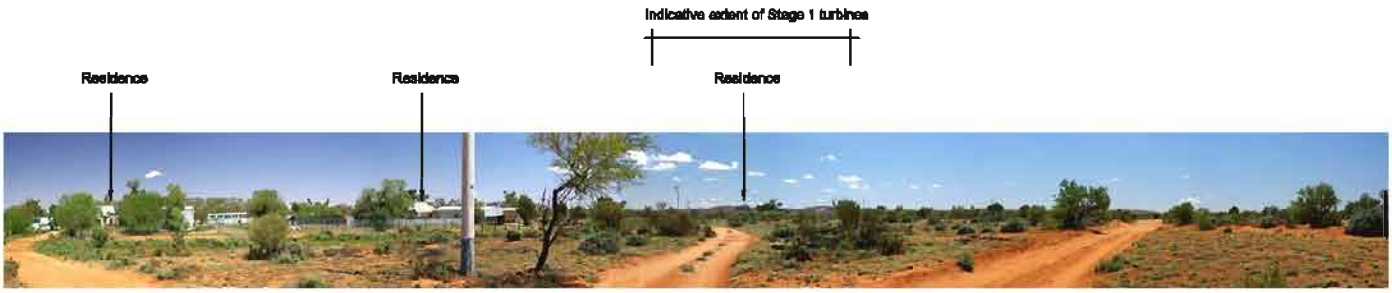
VIEW LOCATION 14 - RESIDENCE



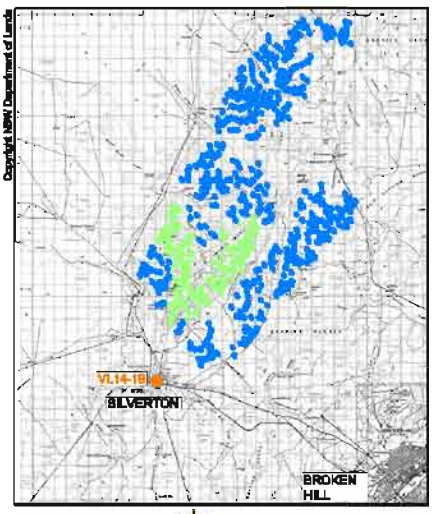
VIEW LOCATION 15, 16 and 18 - SILVERTON MAIN STREET



VIEW LOCATION 17 - RESIDENCE



VIEW LOCATION 19 - RESIDENCES (NORTH OF PENROSE PARK)



General Location Plan
Not to scale

Legend

- Indicative location of Stage 1 wind turbines
- Indicative location of Stage 2 wind turbines
- Potential Receptor Location

General Information

RECEPTOR LOCATION	PHOTOGRAPH LOCATION COORDINATES*	DISTANCE BETWEEN PHOTOGRAPH LOCATION AND NEAREST TURBINE	
		STAGE 1	STAGE 2
14	E: 320985.43 N: 6472370.9	5.6km	4.6km
16	E: 321072.54 N: 6472308.05	5.6km	4.4km
17	E: 321082.66 N: 6472576.55	5.2km	4.2km
18	E: 321431.78 N: 6473012.91	4.8km	3.7km

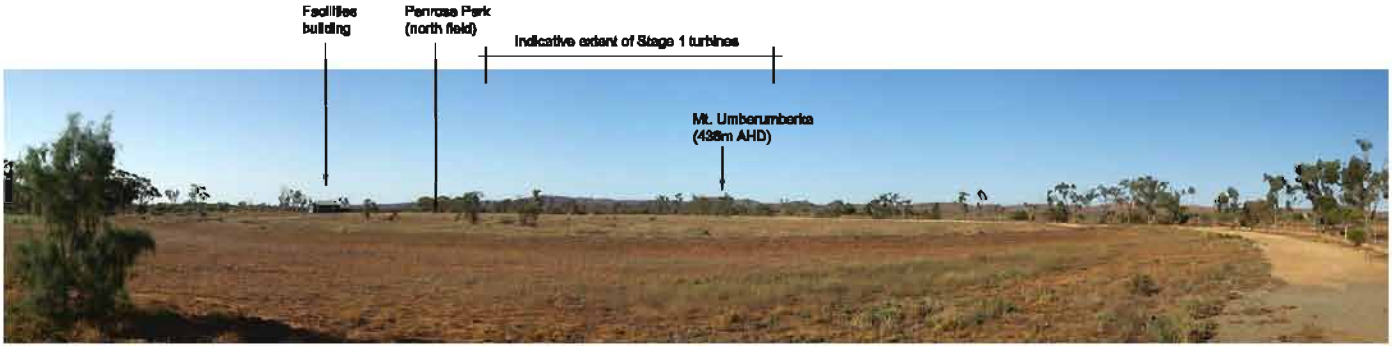
*Coordinate data stated as MGA with accuracy approximately +/-3m

Client	Project	Title
SILVERTON WIND FARM DEVELOPMENTS P/L	SILVERTON WIND FARM PROJECT	PHOTO SHEET 4

URS | Green Bean Design

Drawn: AH	Approved: WB	Date: 25/03/08	Figure: 14
Job No:	File No: 07-118-14		

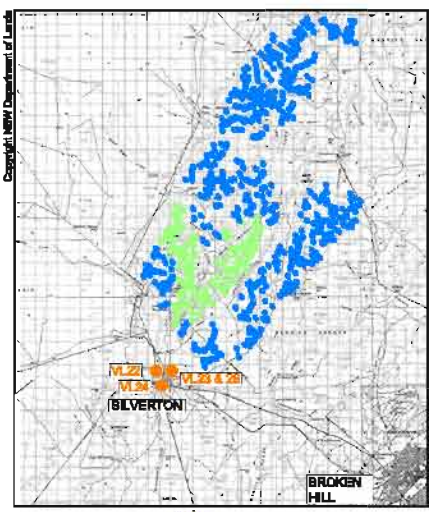
VIEW LOCATION 22 - RESIDENCE



VIEW LOCATION 23 - PENROSE PARK

VIEW LOCATION 24 and 25 - SILVERTON

VIEW LOCATION 26 - SILVERTON CEMETERY



General Location Plan
Not to scale

Legend

- Indicative location of Stage 1 wind turbines
- Indicative location of Stage 2 wind turbines
- Potential Receptor Location

General Information

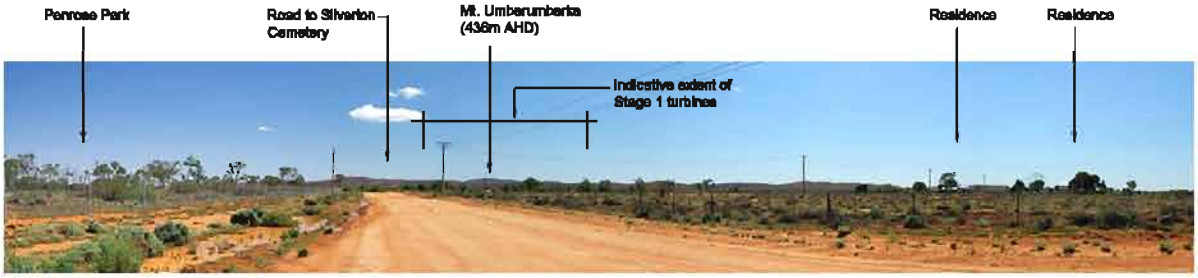
RECEPTOR LOCATION	PHOTOGRAPH LOCATION COORDINATES*	DISTANCE BETWEEN PHOTOGRAPH LOCATION AND NEAREST TURBINE	
		STAGE 1	STAGE 2
22	E: 621687.4 N: 6473049.55	4.4km	3.2km
23	E: 621614.76 N: 6472542.8	4.9km	3.2km
24	E: 638403.89 N: 6446167.65	5.2km	5.6km
26	E: 621881.57 N: 6478257.8	4.2km	2.0km

*Coordinate data stated as MGA with accuracy approximately +/-2m

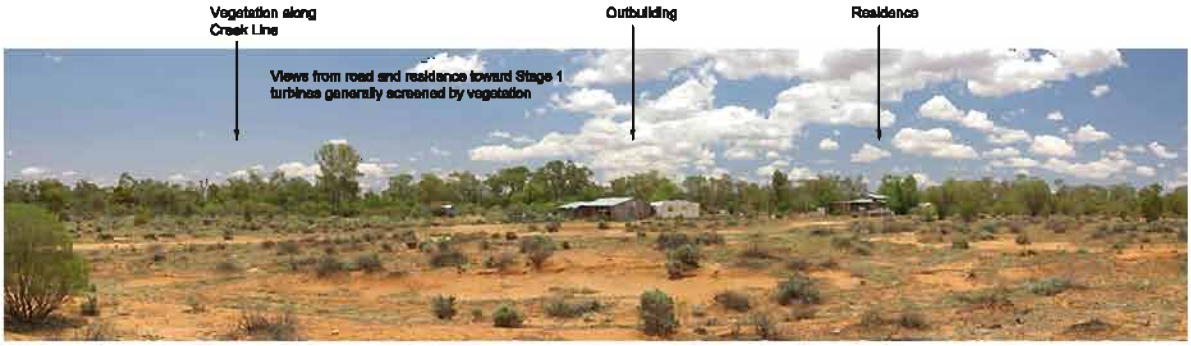
Client	Project	Title
SILVERTON WIND FARM DEVELOPMENTS P/L	SILVERTON WIND FARM PROJECT	PHOTO SHEET 5

URS | Green Bean Design

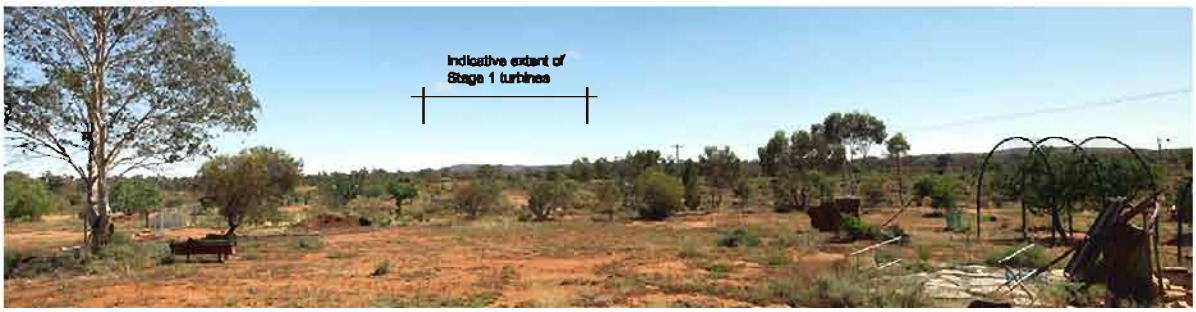
Drawn: AH	Approved: WB	Date: 25/03/09	Figure: 15
Job No:	File No: 07-116-15		



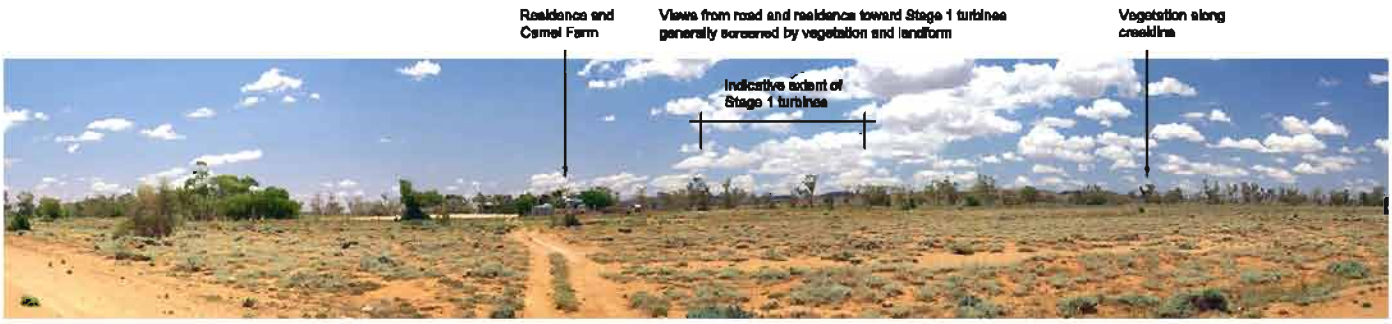
VIEW LOCATION 27 - RESIDENCE



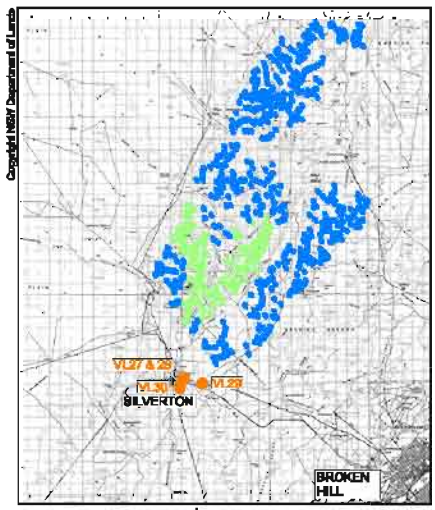
VIEW LOCATION 28 - RESIDENCE



VIEW LOCATION 29 - RESIDENCE



VIEW LOCATION 30 - RESIDENCE AND CAMEL FARM



General Location Plan
Not to scale

Legend

- Indicative location of Stage 1 wind turbines
- Indicative location of Stage 2 wind turbines
- Potential Receptor Location

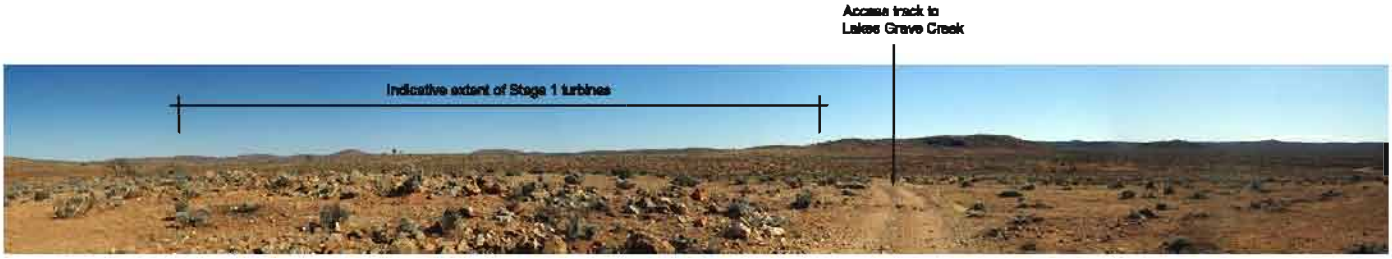
General Information

RECEPTOR LOCATION	PHOTOGRAPH LOCATION COORDINATES*	DISTANCE BETWEEN PHOTOGRAPH LOCATION AND NEAREST TURBINE	
		STAGE 1	STAGE 2
27	E: 522032.15 N: 6472854.23	4.8km	2.8km
28	E: 546564.63 N: 6418360.57	5.3km	5.3km
29	E: 521614.63 N: 6471777.9	8.0km	3.7km
30	E: 523746.26 N: 6471539.14	6.6km	2.2km

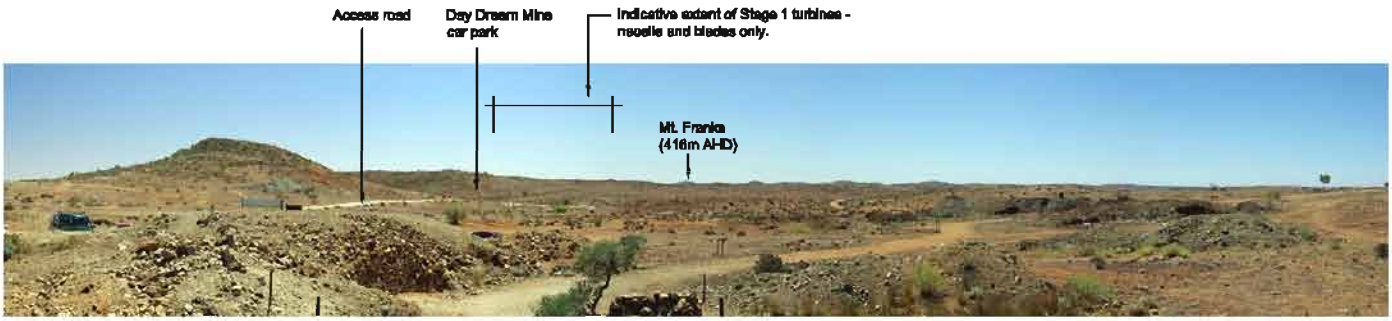
*Coordinate data stated as MGA with accuracy approximately +/-5m

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT		Title: PHOTO SHEET 8
URS / Green Bean Design Landscape Architects	Drawn: AH	Approved: WB	Date: 25/03/09
	Job No:	File No: 07-116-16	Figure: 16

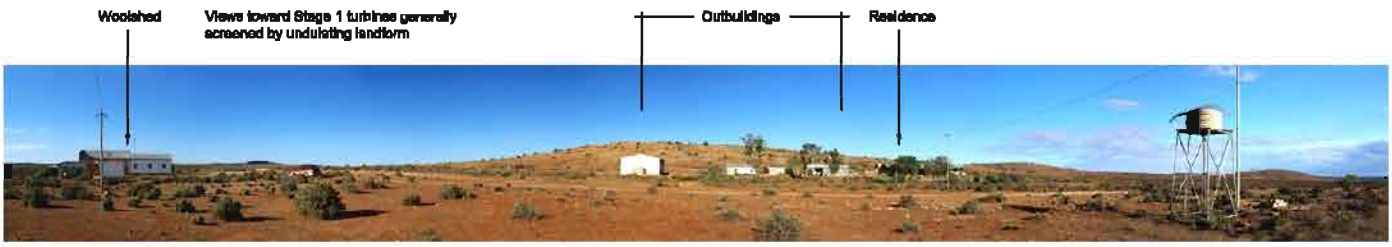
VIEW LOCATION 31 - SILVERTON ROAD



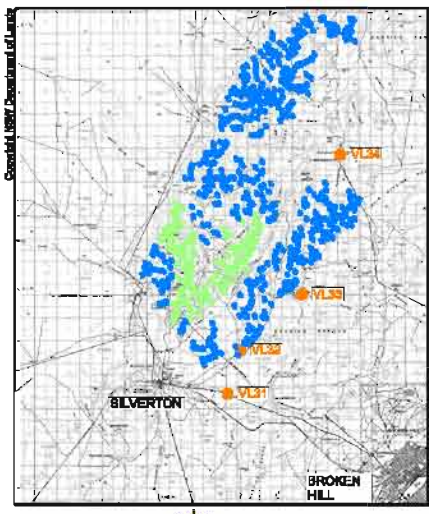
VIEW LOCATION 32 - DAY DREAM MINE ACCESS ROAD



VIEW LOCATION 33 - DAY DREAM MINE



VIEW LOCATION 34 - RESIDENCE



General Location Plan
Not to scale

Legend

- Indicative location of Stage 1 wind turbines
- Indicative location of Stage 2 wind turbines
- Potential Receptor Location

General Information

RECEPTOR LOCATION	PHOTOGRAPH LOCATION COORDINATES*	DISTANCE BETWEEN PHOTOGRAPH LOCATION AND NEAREST TURBINE	
		STAGE 1	STAGE 2
31	E: 527157.05 N: 6471238.55	7.7km	2.2km
32	E: 528054.73 N: 6474990.22	5.0km	0.2km
33	E: 533120.96 N: 6480023.86	5.2km	0.7km
34	E: 537146.76 N: 6482330.15	9.0km	2.6km

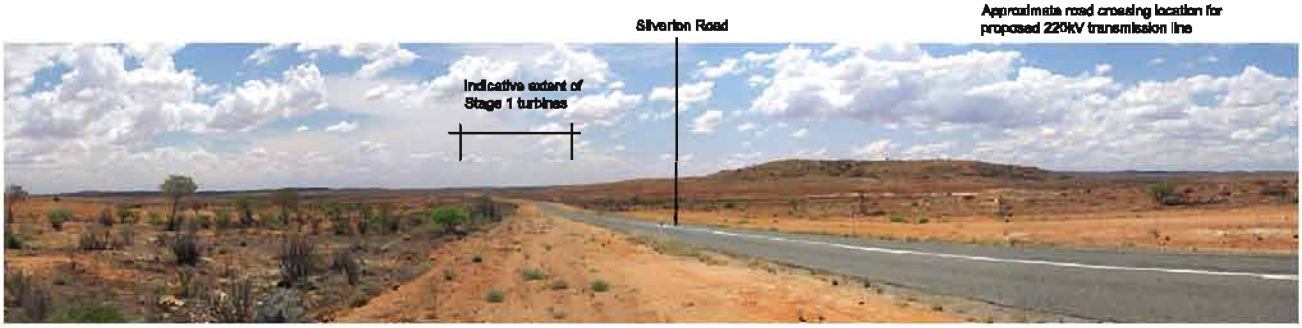
*Coordinates data stated as MGA with accuracy approximately +/-3m

Client	Project	Title
SILVERTON WIND FARM DEVELOPMENTS P/L	SILVERTON WIND FARM PROJECT	PHOTO SHEET 7

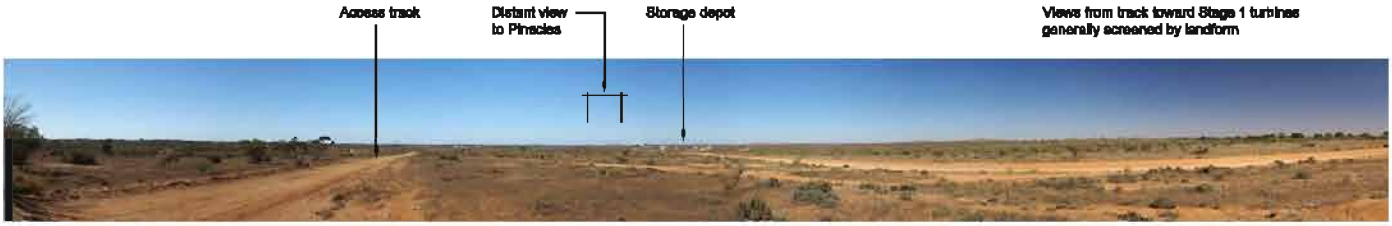
URS | Green Bean Design

Drawn: AH	Approved: WB	Date: 25/03/08	Figure: 17
Job No:	File No: 07-118-17		

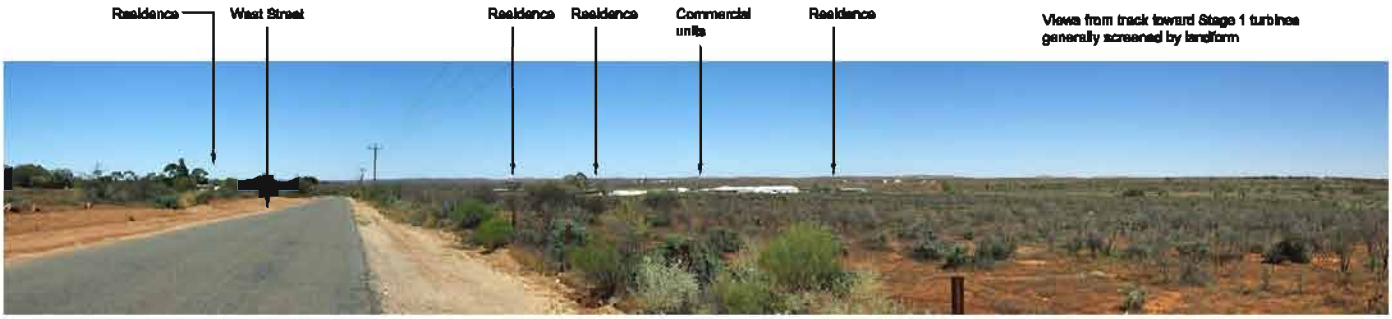
VIEW LOCATION 35 - RESIDENCE/WORKSHOP



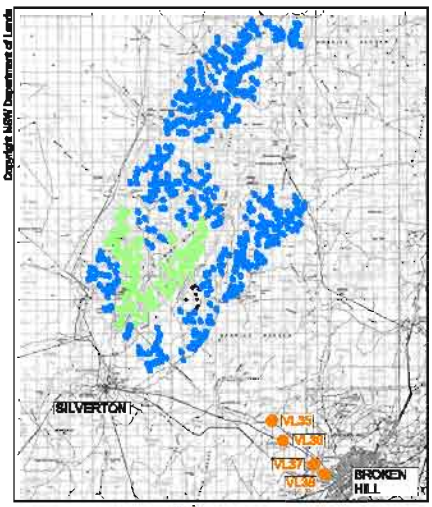
VIEW LOCATION 36 - SILVERTON ROAD



VIEW LOCATION 37 - ACCESS ROAD WEST OF QUANDONG FARM



VIEW LOCATION 38 - RESIDENCE AND ROAD (WEST STREET)



General Location Plan
Not to scale

Legend

- Indicative location of Stage 1 wind turbines
- Indicative location of Stage 2 wind turbines
- Potential Receptor Location

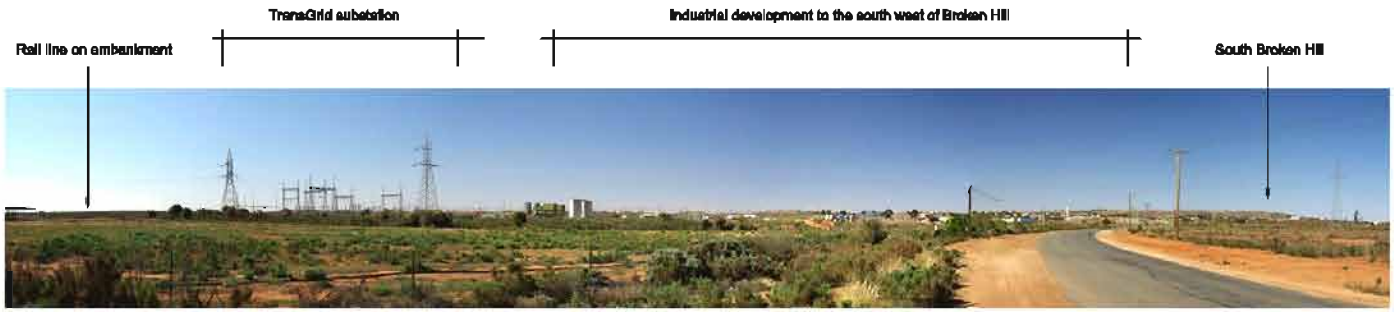
General Information

RECEPTOR LOCATION	PHOTOGRAPH LOCATION COORDINATES*	DISTANCE BETWEEN PHOTOGRAPH LOCATION AND NEAREST TURBINE	
		STAGE 1	STAGE 2
35	E: 535795.00 N: 6469030.00	14.3km	9.6km
36	E: 537131.09 N: 6467469.1	16.4km	11.6km
37	E: 538332.78 N: 6465922.83	18.7km	15.0km
38	E: 540808.24 N: 6464574.79	20.6km	16.0km

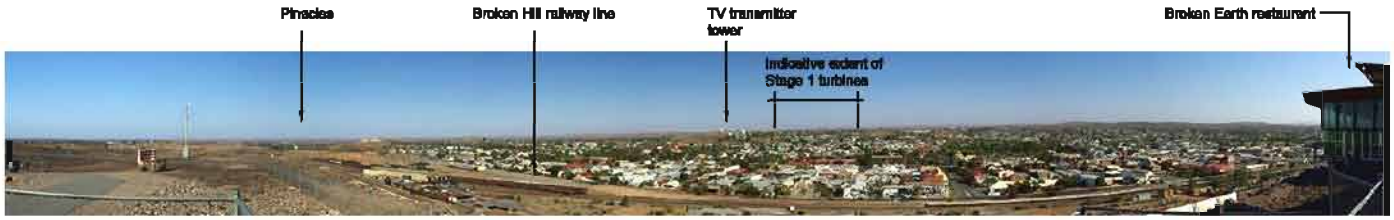
*Coordinate data stated as MGA with accuracy approximately +/-2m

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT		Title: PHOTO SHEET 8
URS / Green Bean Design Landscape Architects	Drawn: AH	Approved: WB	Date: 25/03/08
	Job No:	File No: 07-116-16	Figure: 18

VIEW LOCATION 39 - ROAD CORRIDOR (BARRIER HIGHWAY)

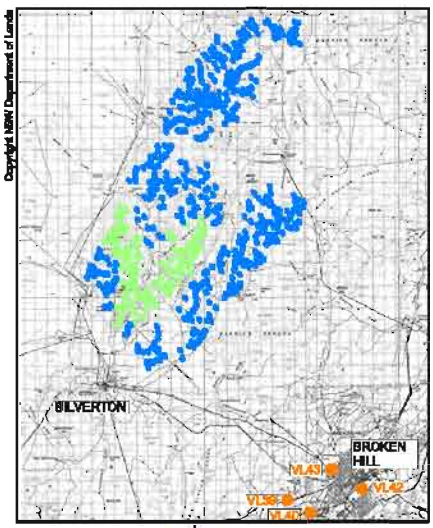


VIEW LOCATION 40 - INDUSTRIAL AREA AND SUBSTATION



VIEW LOCATION 42 - MULLOCK HEAP, BROKEN HILL

VIEW LOCATION 43 - TV TRANSMITTER HILLTOP



General Location Plan
Not to scale

Legend

- Indicative location of Stage 1 wind turbines
- Indicative location of Stage 2 wind turbines
- Potential Receptor Location

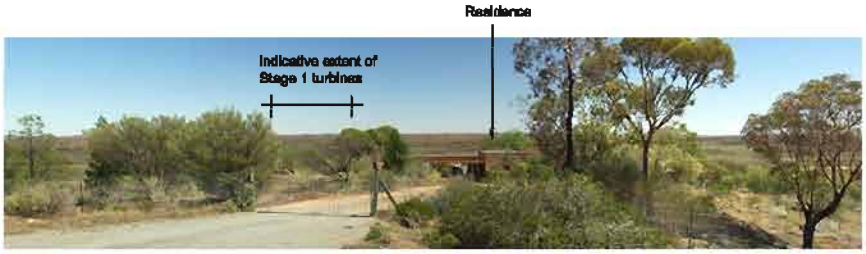
NOTE: No photograph available for View Location 41

General Information

RECEPTOR LOCATION	PHOTOGRAPH LOCATION COORDINATES*	DISTANCE BETWEEN PHOTOGRAPH LOCATION AND NEAREST TURBINE	
		STAGE 1	STAGE 2
39	E: 539823.79 N: 6483432.7	21.1km	15.0km
40	- -	22.6km	17.6km
42	E: 544055.64 N: 6483605.46	24.6km	19.6km
43	E: 541670.16 N: 6484936.95	21.8km	16.8km

*Coordinate data stated as MGA with accuracy approximately 4-5m

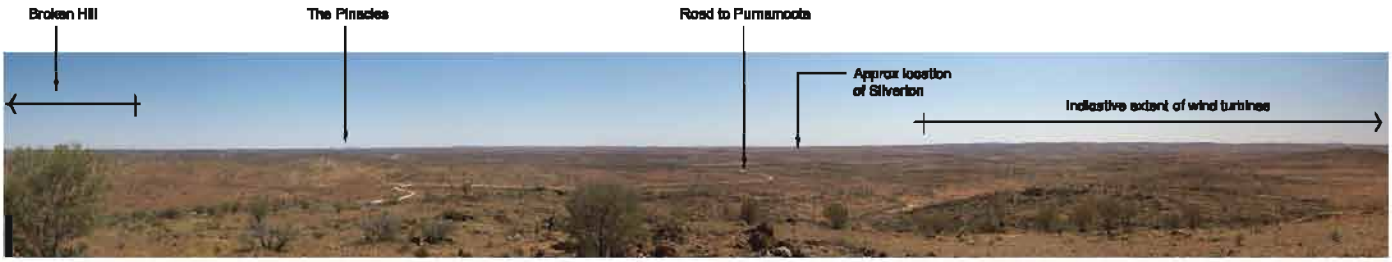
Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT		Title: PHOTO SHEET 9
URS / Green Bean Design	Drawn: AH	Approved: WB	Date: 25/03/08
	Job No:	File No: 07-116-19	Figure: 19



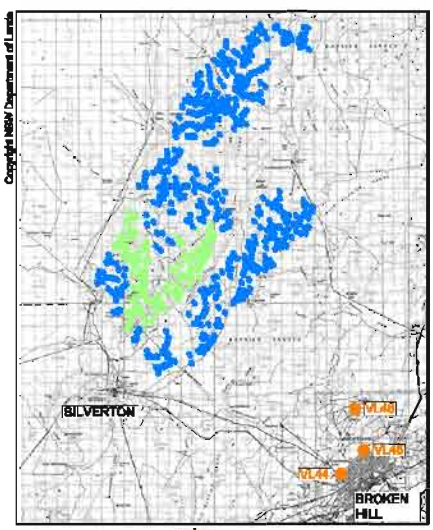
VIEW LOCATION 44 - RESIDENCE

Distant views toward Stage 1 and 2 turbines generally screened by landform

VIEW LOCATION 45 - WHITE ROCKS RESERVE



VIEW LOCATION 46 - SCULPTURE PARK AND LIVING DESERT



General Location Plan
Not to scale

Legend

Indicative location of Stage 1 wind turbines

Indicative location of Stage 2 wind turbines

Potential Receptor Location

NOTE: No photograph available for View Locations 47, 48 and 49

General Information

RECEPTOR LOCATION	PHOTOGRAPH LOCATION COORDINATES*	DISTANCE BETWEEN PHOTOGRAPH LOCATION AND NEAREST TURBINE	
		STAGE 1	STAGE 2
44	E: 541570.15 N: 6464624.95	21.0km	15.0km
46	E: 542366.57 N: 6469193.7	21.4km	15.6km
48	E: 542504.14 N: 6470618.44	19.6km	14.0km

*Coordinate data stated as MGA with accuracy approximately +/-2m

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT		Title: PHOTO SHEET 10
URS / Green Bean Design Landscape Architects	Drawn: AH	Approved: WB	Date: 25/03/08
	Job No:	File No: 07-116-20	Figure: 20

Stage 1 Transmission Line Assessment SECTION 9

9.1 Description

Stage 1 of the Silverton Wind Farm will be connected to the Broken Hill substation by an approximate 27 km length of 220kV transmission line. The transmission line will follow a south east to south alignment from a substation in a central location to Stage 1. The substation and associated control and facilities buildings, generally comprising standard electrical infrastructure together with a single storey brick control room, is likely to be visually contained by the surrounding undulating landform within the ranges and will not be visible from surrounding residential or road receptor locations.

- The final components of the transmission line are subject to detail electrical design and approvals from regulatory bodies; however the transmission line is likely to comprise of a lattice steel pylon structure around 30-35m high and would be similar in form to the existing 220kV line extending south from the Broken Hill substation.

The main visible components of the transmission line will include:

- A supporting lattice pylon structure;
- Insulators; and
- Conductors.

***Plate 19**, View south toward existing 220kV transmission line crossing Silver City Highway around 16 km south of Broken Hill.*

Plate 19 illustrates the existing 220kV transmission line extending from Broken Hill to a switching station at Buronga, as viewed when travelling south on the Silver City Highway between Broken Hill and Mildura. The panorama illustrates a single line of pylons visible above a generally horizontal horizon line with little or no undulation in foreground on background views.

***Plate 20**, View north to north west from Silverton Road around 9km from Broken Hill within Landscape Unit 5.*

Plate 20 illustrates the landscape viewed toward the general area where the transmission line will cross the Silverton Road corridor, and illustrates the gently undulating nature of the landscape which continues toward the more elevated sections of the Mundi Mundi and Robe

Ranges. The undulating landscape will tend to disrupt views toward portions of the pylons and screen potential long distance views along the length of the transmission line.

The majority of the proposed Stage 1 220kV transmission line will occur within Landscape Units 5 (One Mile & Umberumberka Creek catchments) and 9 (Industrial Fringe). Both Landscape Units contain elements of low undulating landform and built structures that will potentially reduce the visibility of the transmission line compared to the situation illustrated in ***Plate 19***.

Plate 21*, View north toward existing Broken Hill substation within Landscape Unit 9.*

The south portion of Landscape Unit 5 contains a number of large scale industrial structures including the existing substation.

9.2 Proposed Alignment

The indicative alignment for the Stage 1 220kV transmission line is illustrated in **Figure 21**, and described below.

The Stage 1 substation will be located in a relatively level area above the Mundi Mundi Creek line at around 300 to 320m AHD, and will be approximately central to the Stage 1 turbine locations. A switchyard will be located on a relatively level area south east of the Stage 1 turbines and on the route of the transmission line to the Broken Hill substation.

The transmission line will extend in a straight line for around 8.5 km to the south east of the substation crossing Lakes Grave Creek, following relatively level ground at around 280m AHD before changing direction around 1km south east of the Day Dream Mine access road.

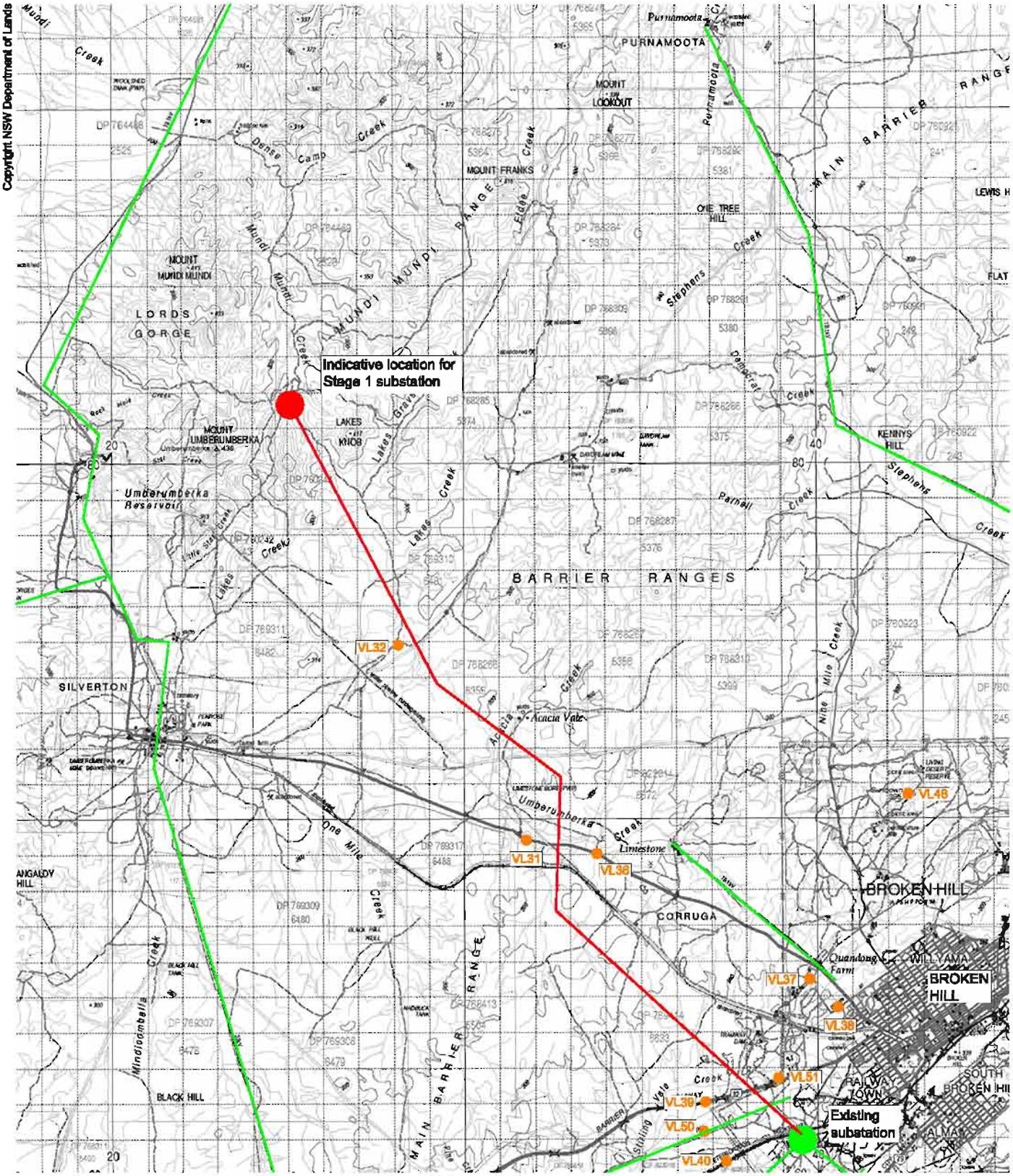
From the south west of the Day Dream Mine access road, the transmission line will extend for around 4 km in a straight line to the south of Acacia. The residence on the Acacia Vale property was destroyed by fire around 10 years ago and is no longer inhabited, although agricultural storage sheds around the former residential area are still in use.

From this point the transmission line extends approximately due south for around 3.5km crossing the Silverton Road and abandoned railway line before changing direction south east and continuing in a straight line for around 9km, crossing the Barrier Highway and Broken Hill railway line to connect to the Broken Hill substation.

9.3 Visibility Assessment

The methodology to establish the potential visibility of the Stage 1 transmission line generally followed the same methodology employed for the wind turbines and included:

- Identification of potential receptor locations from which the transmission line could be visible;



LEGEND

VL46 — POTENTIAL RECEPTOR LOCATION

INDICATIVE STAGE 1 220kV TRANSMISSION LINE ROUTE

EXISTING OVERHEAD POWERLINE (Various voltage)

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT		Title: INDICATIVE STAGE 1 TRANSMISSION LINE CORRIDOR
URS / Green Bean Design	Drawn: AH	Approved: WB	Date: 25/03/08
	Job No:	File No: 07-116-21	Figure: 21

- Categorisation of receptor type;
- Determination of receptor numbers; and
- View distance between receptor and the transmission line.

9.4 Visual Assessment Criteria

The potential visual impact of the proposed Stage 1 transmission line has been assessed from receptor locations against the criteria outlined in **Table 13.**

Table 13 Receptor Location Assessment Criteria

Criteria	Definition
Number of Viewers	
High	>500 people per day
Moderate	250 - 500 people per day
Low	100 - 250 people per day
Very Low	<100 people per day
View Distance	
Distant	>5km
Long	3km – 5km
Medium	2.5 – 3km
Short	1 – 2.5km
Very short	<1km
Period of View	
Long term	> 2 hours
Moderate term	30 - 120 minutes
Short term	10 – 30 minutes
Very Short Term	< 10 minutes

The levels of potential visibility resulting from various combinations of the above criteria are listed in **Table 14**.

Table 14 Visibility Criteria Matrix

	Distant and Long Distance			Medium Distance			Short Distance			Very Short Distance		
Period of View	**L/M**	**S**	**VS**	**L/M**	**S**	**VS**	**L/M**	**S**	**VS**	**L/M**	**S**	**VS**
High No. of Viewers	M	L	L	H	M	M	H	H	M	H	H	H
Moderate No. of Viewers	L	L	L	M	M	L	H	M	M	H	H	M
Low No. of Viewers	L	L	L	M	L	L	M	M	L	H	M	L
Very Low No. of Viewers	L	L	L	L	L	L	M	L	L	M	M	L

- **Period of View** L/M=Long to Moderate term, S=Short term , VS=Very Short term
- **Levels of visibility** L=low, M=medium and H=high

The visibility criteria matrix is used as a guide to determine a potential visual impact. The visual impact for each receptor location is also considered against other factors, which include the sensitivity of the receptor type.

9.5 Stage 1 Transmission Line Visibility Matrix

Table 15 lists the potential receptor locations together with the category of viewer, context of view, relative numbers of viewers and approximate distance of from the view situation to the proposed transmission line. The receptor locations are shown in **Figure 9**.

Table 15 Stage 1 Transmission Line Visibility Matrix

Potential Receptor Location	Category of potential receptor	Direction and context of receptor view	Approx. distance to line	Relative number of receptors	Period of view	Visual impact
32	Motorist	Open and extensive views from vehicles across surrounding landscape travelling to and from Day Dream Mine. View south from access road is contained by ridgelines on both sides creating a view corridor. Direct view toward line travelling to and from Day Dream Mine, passing beneath line around 5km from Silverton Road.	Varies along length of access road – road passes beneath line	Low to Moderate	Very Short Term	Low
31	Motorist travelling east to south east (Silverton to Broken Hill)	Views along road corridor offer a variety of open and distant views, with shorter restricted views where undulating landform blocks views from road corridor south of Acacia Vale. Indirect and partial views from portions of the road corridor north east along Silverton Road corridor for around 7km, with some local screening provided by low undulating landform. Direct view toward transmission line as it converges with, and crosses the Silverton road corridor, although extent of	Varies along length of road corridor (Long to Short) - Silverton Road passes beneath line.	Low to Moderate	Very Short Term	Low

Potential Receptor Location	Category of potential receptor	Direction and context of receptor view	Approx. distance to line	Relative number of receptors	Period of view	Visual impact
		visible transmission line partially restricted by undulating landform adjacent to road corridor.				
36	Motorist travelling west to north west (Broken Hill to Silverton)	Views toward the transmission line from the Silverton road corridor between Broken Hill and a section of the Silverton road to the south of the Limestone property will generally be blocked by surrounding undulating landform. Views along the Silverton Road corridor between Broken Hill and the Limestone property (approximately 5km length) are generally contained by a series of low ridgelines either side of the road. Direct view as transmission line approaches and crosses the road from east and west directions along road corridor.	Varies – Silverton Road Road passes beneath line	Low to Moderate	Very Short Term	Low
37	Motorist	Elevated and distant views west across open landscape including views toward transmission line	Varies along sections of the unsealed road, but generally up to 3km from main elevated section.	Very Low	Very Short Term	Low
38	Residents	Views from residences along, and to the north west, of Brown Street	3km (Long)	Very Low	Moderate to Long Term	Low
39	Motorist	Generally open views along road corridor and across open	Varies – Barrier	High	Very Short	Low

Potential Receptor Location	Category of potential receptor	Direction and context of receptor view	Approx. distance to line	Relative number of receptors	Period of view	Visual impact
		landscape to the north and south of the road. Direct view to transmission line as line approaches and crosses Barrier Highway road corridor.	Highway passes beneath line		Term	
40	Railway passenger	Localised views from passenger trains through industrial area west of Broken Hill as train passes to the north of the existing substation and below proposed transmission line.	Railway line passes beneath transmission line corridor	Low to Moderate	Very Short Term	Low
46	Visitor	Open and extensive views through 360 degrees from Sculpture Park hill top location, including distant view (24km+) to skyline above the Barrier Ranges, and medium distant view toward Broken Hill. Portions of the transmission line will be visible from the Sculpture Park; however the majority of pylon structures are unlikely to present above the skyline, with most viewed against the backdrop of the surrounding semi-desert landscape. Overall the transmission line will form a relatively small component of the available view from this location.	9km (Distant)	Low to Moderate	Short to Moderate Term	Low
50	Resident	View east from areas surrounding residence contained by industrial development to the west of Broken Hill, and Barrier Highway and rail line corridors to the north and south.	2km (Short)	Very Low	Moderate to Long Term	Low

Potential Receptor Location	Category of potential receptor	Direction and context of receptor view	Approx. distance to line	Relative number of receptors	Period of view	Visual impact
		View east from areas surrounding residence toward transmission line will be seen in visual context of surrounding industrial development and transport corridors.				
51	Resident	View from residence contained within general vicinity of the Barrier Highway to the south and likely to be partially obscured by surrounding buildings and structures within property to the north and west.	<1km (Short)	Very Low	Moderate to Long Term	Low

9.6 Summary of Stage 1 Transmission Line Assessment

A total of 11 receptor locations were identified as part of the Stage 1 transmission line visual assessment process, and included views from:

- residences;
- tourist facilities and destinations; and
- road corridors.

An assessment of the visual impact for each receptor location indicated that for the Stage 1 transmission line route:

- 0 of the 11 receptor locations have been determined to have a **NIL** visual impact;
- 11 of the 11 receptor locations have been determined to have a **LOW** visual impact;
- 0 of the 11 receptor locations has been determined to have a **MEDIUM** visual impact;
- 0 of the 11 receptor locations have been determined to have a **HIGH** visual impact.

Around 22km of the Stage 1 220kV transmission line will not be directly visible from receptor locations around Silverton or from the Silverton Road.

The transmission line visibility will increase as the line approaches and crosses over road corridors, including Silverton Road and the Barrier Highway, although the duration of view from motor vehicles travelling along these roads is likely to be very short term and the resulting visual impact low.

Potential views toward the transmission line may occur from a small number of residences on the urban fringe west to north west of Broken Hill but will generally be within the context of the industrial nature of the local area.

The potential extent and level of transmission line visibility will also be determined by the final layout and location of support structures; however the majority of the pylons are unlikely to be viewed wholly above the skyline from the majority of receptor locations, including elevated locations such as the Sculpture Park.

Stage 2 Transmission Line Assessment SECTION 10

10.1 Description

The Stage 2 220kV transmission line assessment has been based on the alignment of the existing 220kV transmission line. The final Stage 2 220kV transmission line route may vary from the existing route and may not be visible within the same viewshed as the existing transmission line.

The Stage 2 Silverton Wind Farm will include:

- A duplication of the 220kV transmission line between the Stage 2 Silverton Wind Farm and the Broken Hill substation; and
- A duplication of an existing 220kV transmission line between the Broken Hill substation and the terminal station at Red Cliffs in Victoria.

The final components of the proposed transmission line are subject to detail electrical design and approvals from regulatory bodies; however the design options include:

- A steel pylon structure around 30-35m high, or
- A single low profile tubular pole around 35m high.

The main visible components will include:

- A supporting structure (pylon or tubular pole);
- Insulators; and
- Conductors.

The cumulative visual impact of the Stage 2 transmission line will depend on the final alignment and the type of structures (pylons or poles) to be installed.

Plate 22 *Typical view toward existing 220kV transmission line (view south from the Anna Branch Mail Road).*

10.2 Indicative alignment – Stage 2 Silverton Wind Farm to Broken Hill substation

The final alignment for this section of the Stage 2 transmission line is subject to further detail design, however it is assumed that the majority of the Stage 2 route will duplicate Stage 1 alignment between the Silverton Wind Farm and the Broken Hill substation. The Stage 1 alignment is described in **Section 9.2** of this report.

The Stage 2 transmission line will also extend to the proposed Stage 2 substations, and are unlikely to be visible from surrounding residential or public road areas.

10.3 Indicative alignment – Broken Hill substation to Red Cliffs terminal station

The final alignment for this section of the Stage 2 transmission line is subject to further detail design and environmental studies, however it is assumed that the majority of the Stage 2 transmission line will duplicate the existing alignment between the Broken Hill substation and the terminal station at Red Cliffs in Victoria.

Plate 23 *View toward existing terminal station and 220kV transmission line (far left) in Red Cliffs, Victoria*

The existing transmission line is approximately 293km long and extends in a general south to south east direction following the Silver City Highway between Broken Hill and Buronga.

The categories of potential receptors within the view catchment of the proposed transmission line include:

- Residential
- Motorists
- Tourists and Recreational users

Other significant crossing locations, travelling south from Broken Hill include:

- The Darling River;
- The Murray River; and
- Kings Billabong Nature Reserve (managed by Parks Victoria).

10.4 Residential Views

For the purposes of the Concept Approval, residential views have been considered in a number of discrete groups relative to their position in the landscape along the existing transmission line route, and broadly consist of residences:

- To the south west of Broken Hill;
- Off the Silver City Highway (including pastoralist homesteads);
- Either side of the Darling River corridor;
- To the north and east of Gol Gol; and
- To the south of the Red Cliffs terminal station.

Table 16 below lists the general occurrences of residences together with the context of view and preliminary comments relating to the potential nature and extent of cumulative landscape and visual impacts.

Residential Location	View Context	Comments
Residences around south west Broken Hill	Very low number of potential residential receptors to the south west of Broken Hill around existing industrial area and Silver City Highway corridor. Existing views generally extend across large scale open spaces. Potential for generally distant views toward existing transmission line.	Views toward the existing transmission line generally occur within a large scale and open landscape offering distant and extensive views. Views within the locality include the industrial area to the south and west Broken Hill including views to mining operations and existing electrical infrastructure. It is likely that the cumulative impact of an additional transmission line would not be significant for these residential locations.
Homesteads off Silver City Highway	Very low number of potential residential receptors from around twenty homesteads/farms set back from the east and west of the Silver City Highway corridor. Existing transmission line extends over scrub and pasture areas but does not appear to pass over, or within a close (less than 1km) distance to homestead or residences.	A preliminary assessment has been carried out as a desktop study and series of field inspections. Homesteads and residences are generally not visible from the Silver City Highway. Potential for short distance views for a very low number of viewers from within properties toward the existing transmission line from general pasture areas or access tracks.

Residential Location	View Context	Comments
		It is likely that the cumulative impact of an additional transmission line would not be significant for these residential locations.
Darling River	Very low number of potential residential receptors located on both sides of the Darling River in the vicinity of the transmission line crossing. Views generally contained within and along the river corridor, but occasionally extending north and south across agricultural land.	A preliminary assessment has been carried out as a desktop exercise as residences are generally not visible from local roads. The existing transmission line will potentially be visible from a small number of residences on either side of the river, and the final level of visibility will be subject to the final alignment adopted.
North and east Gol Gol	Very low number of potential residential receptors with views from the edge of Gol Gol across agricultural, orchard and vineyard areas.	Medium distance views across generally open agricultural landscape, with occasional individual and grouped trees. It is likely that the cumulative impact of an additional transmission line would not be significant for these residential locations.
Red Cliffs terminal station	Very low number of potential residential receptors west of Red Cliffs township (along Wonega, Woorlong and Woomera Avenues) to the south of the terminal station with local views across Kings Billabong Wildlife Reserve.	Views toward the proposed transmission line would be within the context of the electrical infrastructure of the Red Cliffs terminal station. It is likely that the cumulative impact of an additional transmission line would not be significant for these residential locations.

10.5 Motorists

The existing 220kV transmission line crosses a number of roads including:

- Silver City Highway (three crossing points between Broken Hill and Mildura);
- High Darling Road (one crossing point);
- Low Darling Road (one crossing point);

- Wentworth to Pooncarie Road (one crossing point);
- Arumpo Road – TransGrid Switching Station (one crossing point); and
- Sturt Highway (one crossing point).

There are five designated rest areas on the Silver City Highway between Broken Hill and Mildura, including the roadhouse located at Coombah.

The Seven Tree rest area, approximately 200km south of Broken Hill, is the only rest area with a potential distant view (around 3km) west toward the existing 220kV transmission line.

Plate 24 *Typical view south around 20km south of Broken Hill illustrating pylons above horizon on generally level ground.*

The majority of views toward the existing transmission line from the Silver City Highway corridor are distant and indirect, although the transmission line converges toward the highway and crosses at three locations. As the majority of views are from moving vehicles the cumulative visual impact of an additional 220kV transmission line is not likely to be significant.

Plate 25 *View east as existing 220kV transmission line crosses Sturt Highway around 2km west of Gol Gol.*

Similarly, views toward the existing transmission line from the Sturt Highway corridor are generally distant and indirect, although the transmission line converges toward the highway and crosses at a single location. As the majority of views are from moving vehicles the likely cumulative visual impact of an additional 220kV transmission line is not likely to be significant for motorists.

Plate 26 *View west along Arumpo Road with view toward Buronga switching station. Existing 220kV transmission line extends north and south from switching station. There are no residences on the Arumpo Road with a view toward the existing transmission line.*

The Stage 2 220kV transmission line will also cross a number of minor roads, including the Upper and Lower Darling Roads and the Arumpo Road, as well as many access tracks over private property and farms.

Plate 27 *View west along the Lower Darling Road with transmission line extending across agricultural fields.*

In the context of the generally open and rural/agricultural nature of views, the cumulative impact of an additional transmission line will be unlikely to have a significant impact on the potentially very low number of motorists travelling along minor roads.

10.6 Recreational users

The existing 220kV transmission line extends over the Murray River as it approaches the terminal station at Red Cliffs in Victoria, and passes through the southern portion of the Kings Billabong Nature Reserve.

The Kings Billabong Nature Reserve, managed by Parks Victoria, offers opportunities for bush walking, mountain bike treks, fishing and canoeing/kayaking. The nature reserve also provides a number of marked trails with formal picnic facilities at designated locations.

Although there is a boat ramp facility located in the general vicinity of the existing power line as it crosses the river, the majority of public facilities and activities within the nature reserve appear to be located 3 to 4km north of the existing transmission line corridor, and depending on the final alignment, the transmission line is unlikely to be visible from existing designated picnic or walking tracks. The site of the historic pumping station (the Psyche Pumps) is approximately 4km north of the existing 220kV transmission line.

Plate 28 *View north toward existing transmission line crossing the Murray River from Victoria to New South Wales.*

Recreational use also includes charter boat trips along the Murray River and boat use in general for other recreational purposes. The Murray River floodplain, extending either side of the existing transmission line corridor, is predominantly tree covered, and tends to restrict views toward the transmission line to around a 300 to 500m length from sections of the river as it passes by the existing transmission line.

Photomontages

11.1 Photomontages

A series or photomontages have been prepared by Garrad Hassan Pacific Pty Ltd to illustrate the Silverton Wind Farm post construction. Eight photomontages locations have been selected to illustrate the Silverton Wind Farm from surrounding areas.

The photomontages locations are illustrated in **Figure 22**, and include:

- Receptor Location 2 from Eldee Station Homestead (Stage 2 only)
- Receptor Location 4 from clay pan film location on Belmont Station (Stage 2 only)
- Receptor Location 7 from road to Umberumberka Reservoir (Stage 2 only)
- Receptor Location 8 from Mundi Mundi Lookout (Stage 1 and Stage 2)
- Receptor Location 15 from Layard Street, Silverton (Stage 1 and Stage 2)
- Receptor Location 19 from east of residences, north Silverton (Stage 1 only)
- Receptor Location 31 from Silverton Road (Stage 1 and Stage 2)
- Receptor Location 46 from Sculpture Park, north of Broken Hill (Stage 2 only)

The photomontages were generated through the following steps:

- A digital terrain model (DTM) of the Silverton Wind Farm site is created from a terrain model of the surrounding area (usually digital contours);
- The site DTM is loaded in the Garrad Hassan Pacific Pty Ltd WindFarmer software package;
- The layout of the wind farm, and 3 dimensional representation of the wind turbine is configured in WindFarmer;
- The location of each viewpoint (photo location) is configured in WindFarmer – the sun position for each viewpoint is configured by using the time and date of the photographs from that viewpoint;
- The view from each photomontage location is then assessed in WindFarmer. This process requires accurate mapping of the terrain as modelled, to that as seen in the photographs. The photographs, provided by Green Bean Design, taken from each photomontage location are loaded into WindFarmer, and the visible turbines superimposed on the photographs;
- Adjustments are made to the combined image for fogging due to haze or distance, as well as screening by vegetation or obstacles;
- The final image is converted to JPG format and imported to the final figure.

11.2 Summary of Photomontages

Figures 23 to **30** illustrate the location and general extent of turbines visible from each of the photomontage receptor locations. The key aspects of the photomontages are summarised below:

Receptor Location 2, Eldee Station Homestead.

Plate 29 *Receptor Location 2 from Eldee Station Homestead – Refer* ***Figure 23***

- It is unlikely that the Stage 1 wind turbines will be visible from this receptor location, including the homestead and guest accommodation.
- Views toward the Stage 1 wind turbines are potentially screened by a combination of undulating landform and vegetation along Eldee Creek. The Stage 1 wind turbines may be visible from areas south of Eldee Creek.
- Around 60 wind turbines within Stage 2 will be visible above ridgelines along the west edge of the Mundi Mundi and Robe Range. Views toward a number of the wind turbines will be restricted to upper portions of structures and tips of blades where ridgelines occur in foreground views. The majority of the Stage 1 and 2 wind turbines will not be visible from this receptor location.
- The number of wind turbines visible from areas surrounding this receptor location will vary and depend on the position of the receptor relative to the wind turbines. Views from areas closer to the screening influence of rising landform will tend to reduce the number of visible turbines, whereas views from areas west of the homestead, and further away from the Barrier Range, may include a greater number of wind turbines, although general level of visibility is likely to decrease with increasing distance.

Receptor Location 4, Clay pan film location on Belmont Station

Plate 30 *Receptor Location 4 from the clay pan film location – Refer* ***Figure 24***

- Around 250 wind turbines within Stage 1 and 2 will be visible along the west edge of the Mundi Mundi and Robe Range from this distant receptor location.
- Although some of the wind turbines will be visible above the Barrier Range skyline, views toward a number of the wind turbines will be restricted to upper portions of structures and tips of blades where ridgelines occur in foreground views.

- Views from this receptor location toward the majority of the wind turbines within Stage 1 and 2 in areas along the central and east sections of the Silverton Wind Farm will be blocked by undulating landform.

Receptor Location 7 Road to Umberumberka Reservoir

Plate 31 *Receptor Location 7 from road to Umberumberka Reservoir – Refer* ***Figure 25***

- Around 48 Stage 1 and 2 wind turbines will be visible from this receptor location, although the number of visible turbines will vary relative to the position of the receptor as they travel along the road corridor.
- Views toward the majority of the Stage 1 and 2 wind turbines will be blocked by undulating landform.
- Some of the wind turbines visible from this receptor location will be viewed above the skyline, although some views will be restricted to upper potions of the turbine structures or tips of blades where wind turbines are located beyond ridgelines located in foreground views.

Receptor Location 8 Mundi Mundi Lookout

Plate 32 *Receptor Location 8 from the Mundi Mundi lookout – Refer* ***Figure 26***

- Around 62 Stage 1 wind turbines will be visible from this receptor location, although the number of visible turbines will vary relative to the position of the receptor at the Mundi Mundi lookout and the Stage 1 turbines.
- Views toward a number of the Stage 1 wind turbines will be blocked by undulating landform.
- The majority of wind turbines visible from this receptor location will be viewed above the skyline, although some views will be restricted to upper potions of the turbine structures or tips of blades.
- Around 120 Stage 1 and Stage 2 wind turbines will be visible from this receptor location.

Receptor Location 15 Layard Street, Silverton

Plate 33 *Receptor Location 15 from Layard Street – Refer* ***Figure 27***

- Around 45 Stage 1 wind turbines will be visible from this receptor location, although the number of visible turbines will vary relative to the position between the receptor within Silverton and the Stage 1 turbines due to potential screening by buildings and vegetation.
- Views toward the majority of the Stage 1 wind turbines will be blocked by undulating landform.
- The majority of wind turbines visible from this receptor location will be viewed above the skyline, although some views will be restricted to upper potions of the turbine structures or tips of blades.
- Around 80 Stage 1 and Stage 2 wind turbines will be visible from this receptor location, although the number of visible turbines will vary relative to the position of the receptor within Silverton and the Stage 1 and 2 turbines.
- The majority of the Silverton Wind Farm turbines will not be visible from this receptor location.

Receptor Location 19 east of residences, north Silverton

Plate 34 *Receptor Location 19 from east of residences – Refer* ***Figure 28***

- Around 60 Stage 1 wind turbines will be visible from this receptor location, although the number of visible turbines will vary relative to the receptor position around residences and the Stage 1 turbines due to the presence of vegetation along the creek line.
- Views toward a number of the Stage 1 wind turbines will be blocked by undulating landform.
- The majority of wind turbines visible from this receptor location will be viewed above the skyline, although some views will be restricted to upper potions of the turbine structures or tips of blades.

Receptor Location 31 Silverton Road

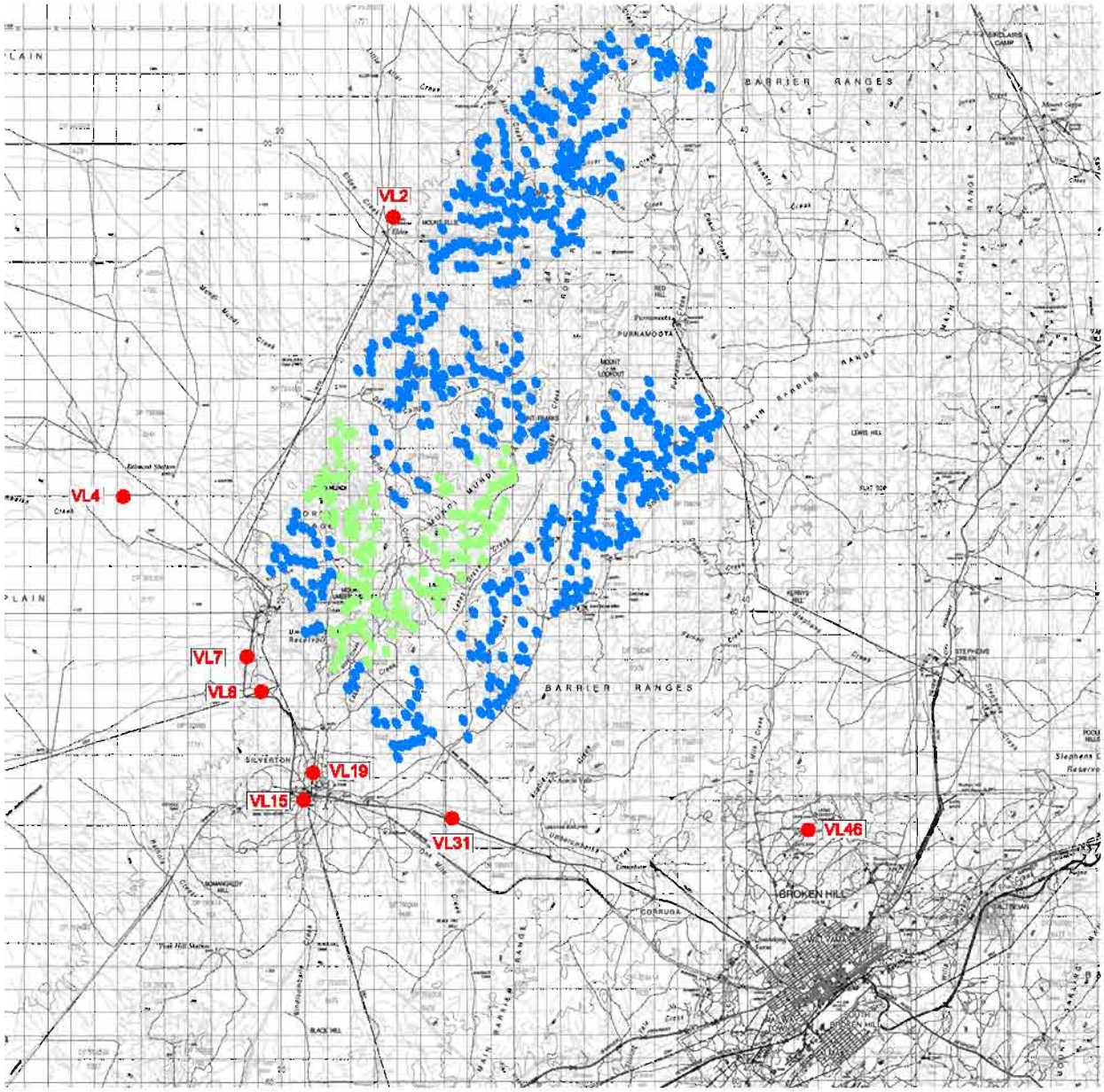
Plate 35 *Receptor Location 31 from the Silverton Road – Refer* ***Figure 29***

- Around 90 Stage 1 wind turbines will be visible from this receptor location, although the number of visible turbines will vary relative to the receptor position along the Silverton Road and the Stage 1 wind turbines.
- Views toward a number of the Stage 1 wind turbines will be blocked by undulating landform along some sections of the Silverton Road corridor.
- The majority of wind turbines visible from this receptor location will be viewed above the skyline, although some views will be restricted to upper potions of the wind turbine structures or to tips of blades.
- Around 190 Stage 1 and Stage 2 wind turbines will be visible from this receptor location.

Receptor Location 46 Sculpture Park, north of Broken Hill

Plate 33 *Receptor Location 46 from Sculpture Park – Refer* ***Figure 30***

- Around 320 Stage 1 and 2 wind turbines may be visible from this elevated receptor location, although views are very distant and partial upper sections or tips of blades may be generally indistinguishable in the background view.
- The majority of the Stage 1 and 2 wind turbines to the west of the Silverton Wind Farm site will generally not be visible due to a combination of distance and undulating landform.
- The majority of wind turbines visible from this receptor location will be viewed above the skyline, although some views will be restricted to upper potions of structures or tips of blades for turbines to the west of the Silverton Wind Farm site.



LEGEND

STAGE 1 TURBINE LOCATIONS

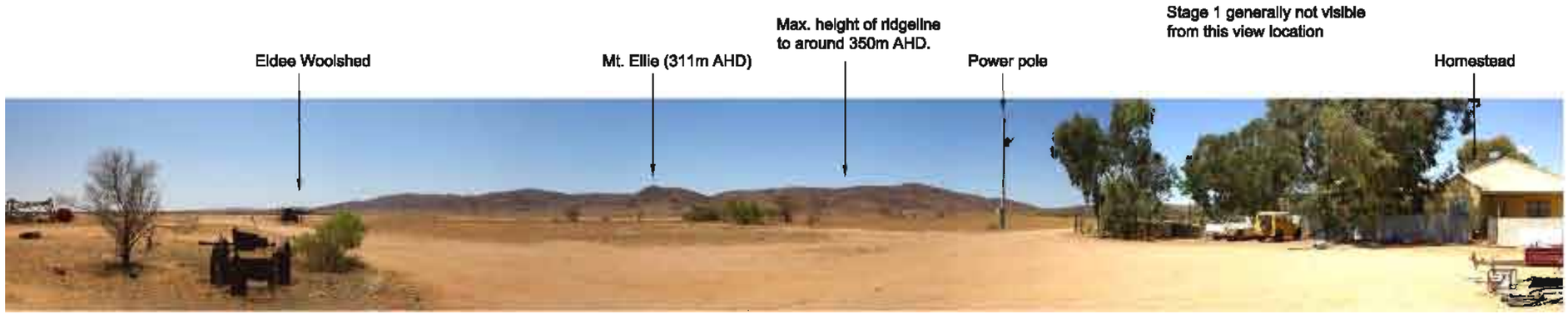
STAGE 2 TURBINE LOCATIONS

VISUAL SIMULATION LOCATION

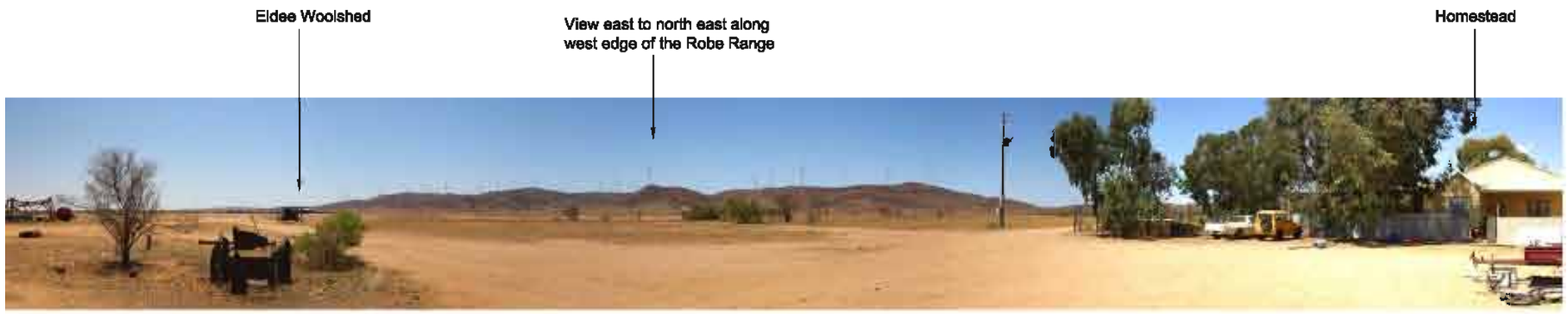
PHOTOMONTAGE LOCATION	PHOTOGRAPH LOCATION COORDINATES*	DISTANCE BETWEEN PHOTOGRAPH LOCATION AND NEAREST STAGE 1 TURBINE
VL2	E: 624557.91 N: 6498817.16	8.2km
VL4	E: 618196.08 N: 6455028.88	7.9km
VL7	E: 619401.91 N: 6477012.61	3.7km
VL8	E: 619155.52 N: 6476457.08	3.2km
VL15	E: 621072.54 N: 6472308.05	5.5km
VL19	E: 621451.79 N: 6473012.61	4.9km
VL31	E: 627157.05 N: 6471229.55	7.7km
VL46	E: 643504.14 N: 6470619.44	16.5km

*Coordinate data stated as MGA with accuracy approximately +-5m

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT		Title: PHOTOMONTAGE LOCATIONS
URS / Green Bean Design	Drawn: AH	Approved: WB	Date: 25/03/08
	Job No:	File No: 07-116-22	Figure: 22



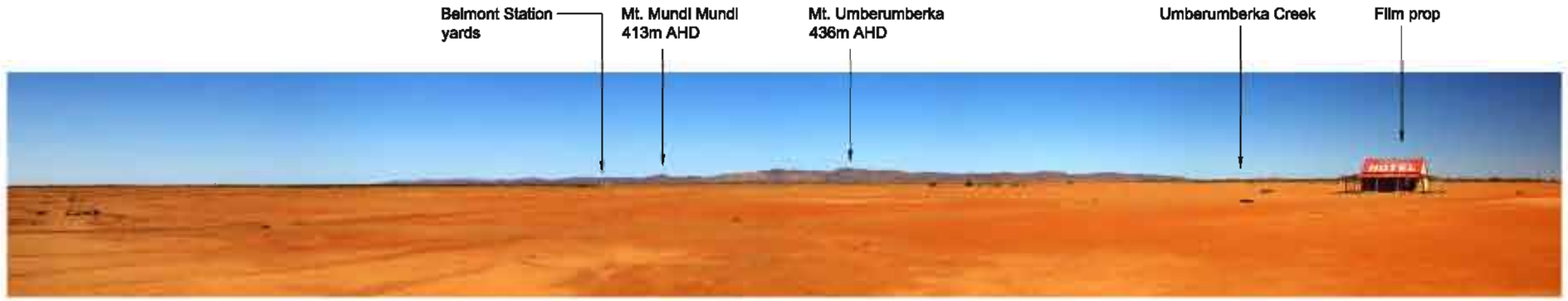
PHOTOMONTAGE 1 - ELDEE STATION HOMESTEAD
RECEPTOR LOCATION 2, EXISTING VIEW



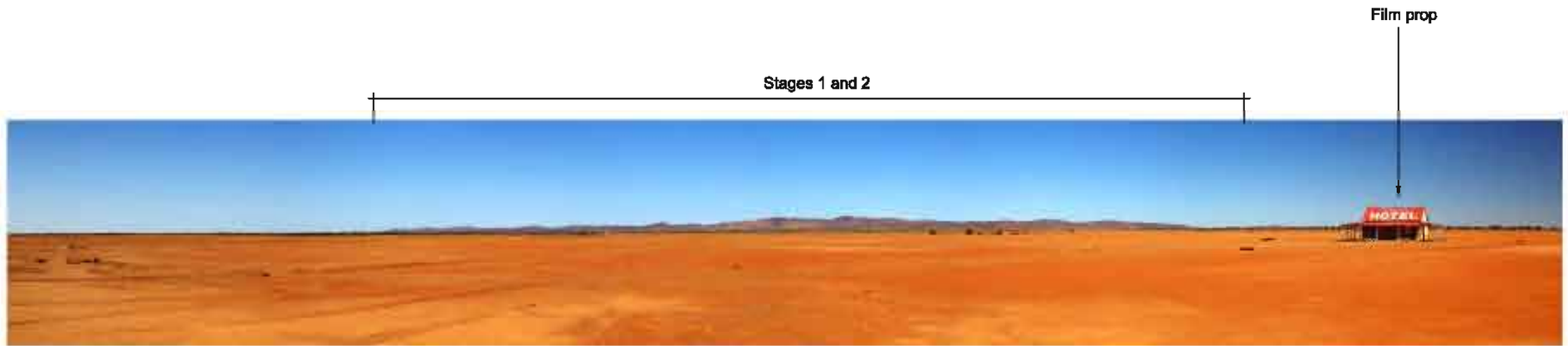
PHOTOMONTAGE 1 - ELDEE STATION HOMESTEAD
RECEPTOR LOCATION 2, STAGE 2

PHOTOMONTAGE 1 - ELDEE STATION HOMESTEAD
RECEPTOR LOCATION 2, STAGE 2

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT	Title: PHOTOMONTAGE 1 VIEW LOCATION 2
URS / Green Bean Design	Drawn: AH · Approved: WB · Date: 25/03/08 · Job No: · File No: 07-116-23	Figure: 23



PHOTOMONTAGE 4 - CLAY PAN FILM LOCATION ON BELMONT STATION
RECEPTOR LOCATION 2, EXISTING VIEW

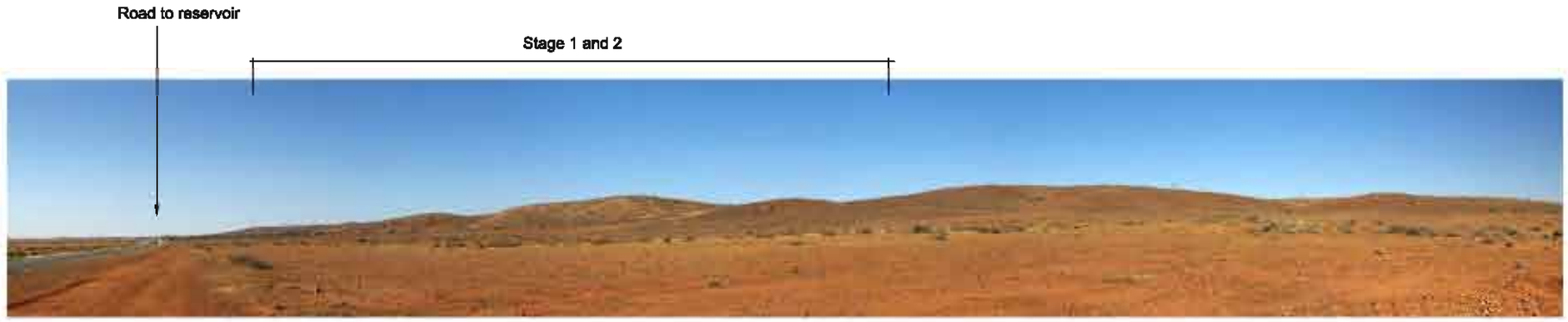


PHOTOMONTAGE 4 - CLAYPAN FILM LOCATION ON BELMONT STATION
RECEPTOR LOCATION 2 - STAGES 1 AND 2

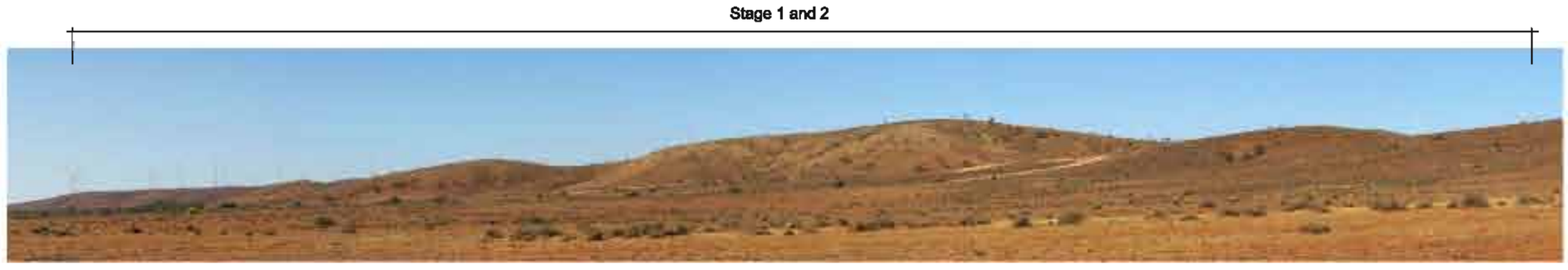
PHOTMONTAGE 4 - CLAYPAN FILM LOCATION ON BELMONT STATION
RECEPTOR LOCATION 2 - STAGES 1 AND 2 (ENLARGED VIEW)

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT	Title: PHOTOMONTAGE 2 VIEW LOCATION 4
URS Green Beam Design	Drawn: AH | Approved: WB | Date: 25/03/08	Figure: 24
	Job No: | File No: 07-118-24	

PHOTOMONTAGE 3 - ROAD TO UMBERUMBERKA RESERVOIR
RECEPTOR LOCATION 7, EXISTING VIEW



PHOTOMONTAGE 3 - ROAD TO UMBERUMBERKA RESERVOIR
RECEPTOR LOCATION 7 - STAGES 1 AND 2



PHOTOMONTAGE 3 - ROAD TO UMBERUMBERKA RESERVOIR
RECEPTOR LOCATION 7 - STAGES 1 AND 2 (ENLARGED VIEW)

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT	Title: PHOTOMONTAGE 3 VIEW LOCATION 7
URS Green Bean Design	Drawn: AH · Approved: WB · Date: 25/03/08 · Job No: · File No: 07-116-25	Figure: 25

PHOTOMONTAGE 4 - MUNDI MUNDI LOOKOUT
RECEPTOR LOCATION 8, EXISTING VIEW

PHOTOMONTAGE 4 - MUNDI MUNDI LOOKOUT
RECEPTOR LOCATION 8 - STAGE 1

PHOTOMONTAGE 4 - MUNDI MUNDI LOOKOUT
RECEPTOR LOCATION 8 - STAGES 1 AND 2

PHOTOMONTAGE 4 - MUNDI MUNDI LOOKOUT
RECEPTOR LOCATION 8 - STAGE 1 AND 2 (ENLARGED VIEW)

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT	Title: PHOTOMONTAGE 4 VIEW LOCATION 8
URS / Green Bean Design	Drawn: AH · Approved: WB · Date: 26/03/08 · Job No: · File No: 07-116-26	Figure: 26

PHOTOMONTAGE 5 - LAYARD STREET
RECEPTOR LOCATION 15, EXISTING VIEW

Stage 1

PHOTOMONTAGE 5 - LAYARD STREET
RECEPTOR LOCATION 15 - STAGE 1

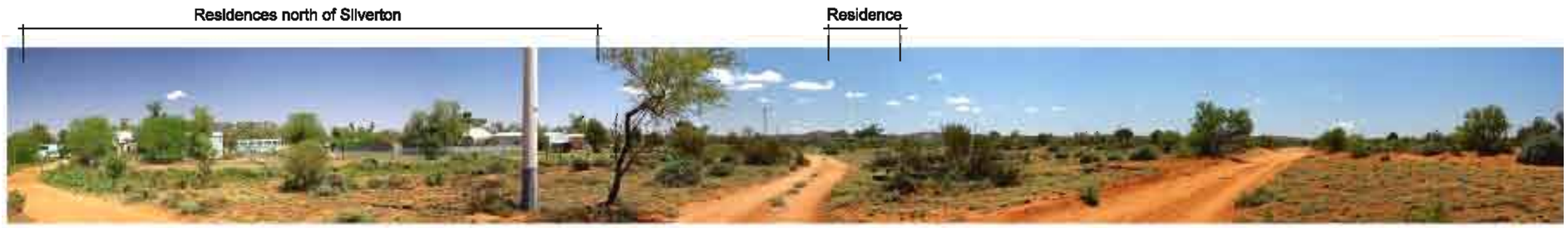
Stage 1 and 2

PHOTOMONTAGE 5 - LAYARD STREET
RECEPTOR LOCATION 15 - STAGES 1 AND 2

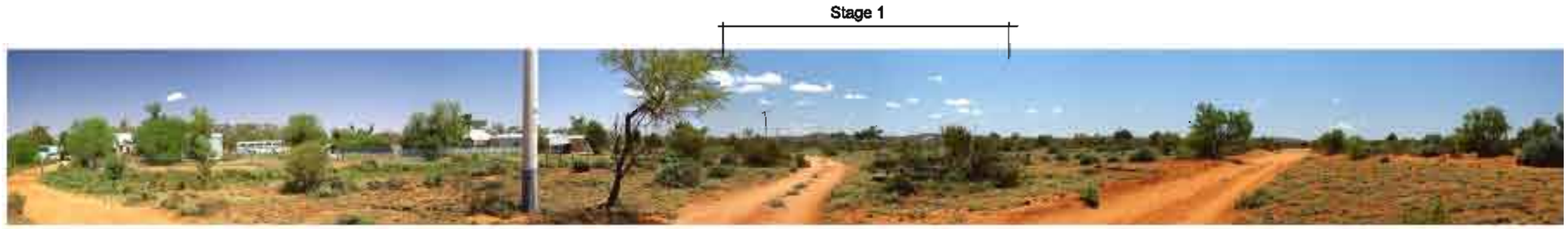
Stage 1 and 2

PHOTOMONTAGE 5 - LAYARD STREET
RECEPTOR LOCATION 15 - STAGE 1 AND 2 (ENLARGED VIEW)

Client: SILVERTON WIND FARM DEVELOPMENTS P/L		Project: SILVERTON WIND FARM PROJECT	Title: PHOTOMONTAGE 5 VIEW LOCATION 15
URS	Green Bean Design	Drawn: AH / Approved: WB / Date: 25/03/08	Figure: 27
		Job No: / File No: 07-116-27	



PHOTOMONTAGE 6 - NORTH SILVERTON
RECEPTOR LOCATION 19, EXISTING VIEW

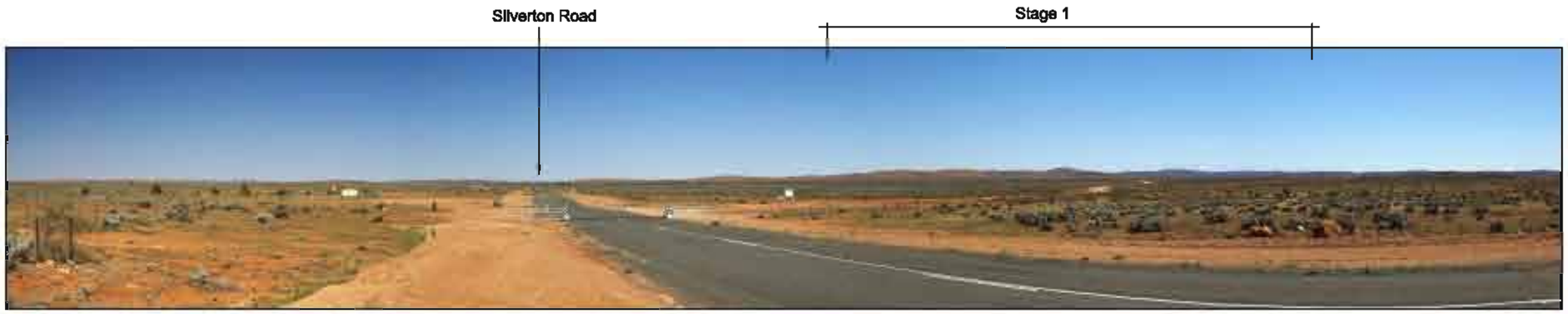


PHOTOMONTAGE 6 - NORTH SILVERTON
RECEPTOR LOCATION 19 - STAGE 1

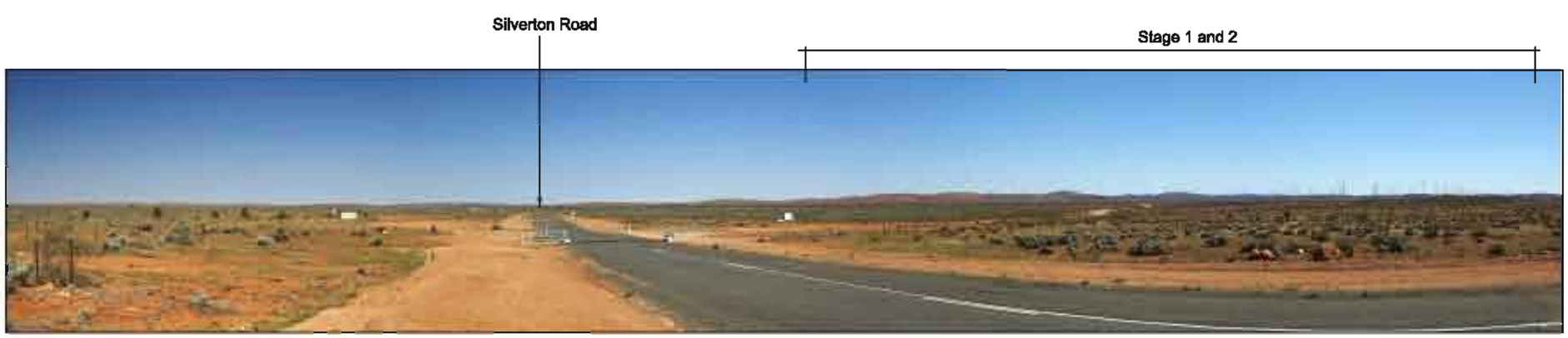
PHOTOMONTAGE 6 - NORTH SILVERTON
RECEPTOR LOCATION 19 - STAGE 1 (ENLARGED VIEW)

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT	Title: PHOTOMONTAGE 6 VIEW LOCATION 19
URS Green Bean Design	Drawn: AH Approved: WB Date: 25/03/08	Figure: 28
	Job No: File No: 07-116-28	

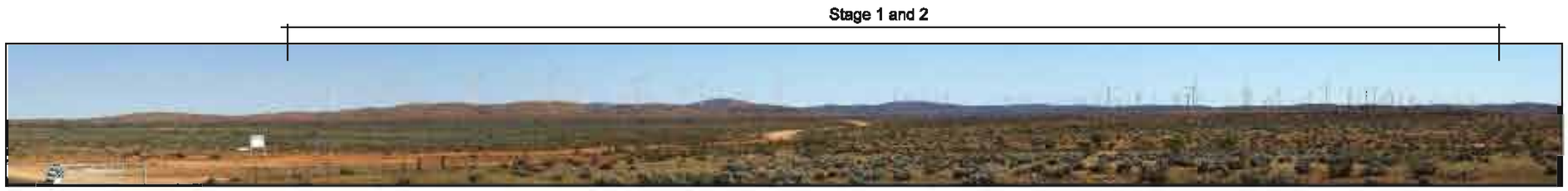
VIEW LOCATION 31 - SILVERTON ROAD
PHOTMONTAGE 7, EXISTING VIEW



VIEW LOCATION 31 - SILVERTON ROAD
PHOTOMONTAGE 7 - STAGE 1



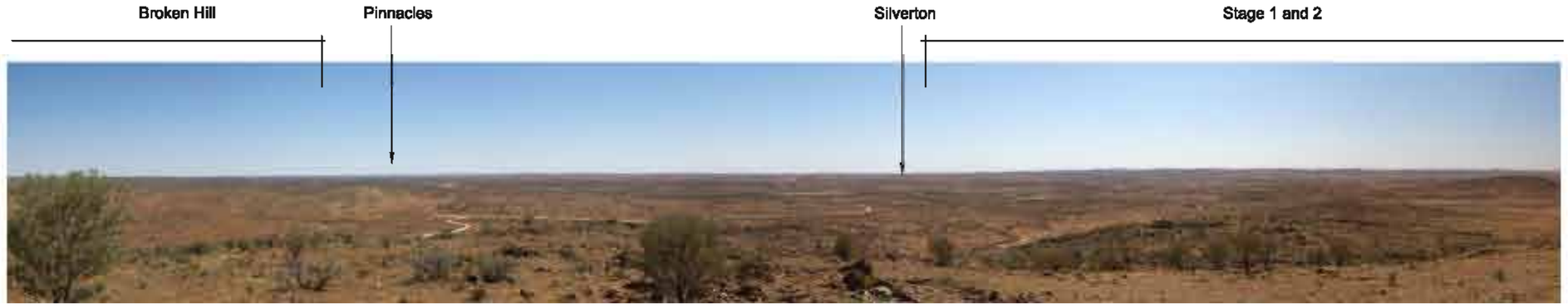
VIEW LOCATION 31 - SILVERTON ROAD
PHOTOMONTAGE 7 - STAGES 1 AND 2



VIEW LOCATION 31 - SILVERTON ROAD
PHOTOMONTAGE 7 - STAGE 1 AND 2 (ENLARGED VIEW)

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT	Title: PHOTOMONTAGE 7 VIEW LOCATION 31
URS Green Bean Design	Drawn: AH Approved: WB Date: 25/03/08	Figure: 29
	Job No: File No: 07-116-29	

PHOTOMOTAGE 8 - SCULPTURE PARK
RECEPTOR LOCATION 46, EXISTING VIEW



PHOTOMONTAGE 8 - SCULPTURE PARK
RECEPTOR LOCATION 46 - STAGE 1 AND 2

PHOTOMONTAGE 8 - SCULPTURE PARK
RECEPTOR LOCATION 46 - STAGE 1 AND 2 (ENLARGED VIEW)

Client: SILVERTON WIND FARM DEVELOPMENTS P/L	Project: SILVERTON WIND FARM PROJECT	Title: PHOTOMONTAGE 8 VIEW LOCATION 46
URS / Green Bean Design	Drawn: AH | Approved: WB | Date: 25/03/08	Figure: 30
	Job No: | File No: 07-116-30	

Film, Photography and Art SECTION12

12.1 Film and Photography

The landscape of far west New South Wales has appeared in a number of feature films and commercials, and is promoted to the local and international film industry as a unique combination of landscape and infrastructure.

The production of feature films in the region, including filming in and around Silverton, has taken place over the past 35 years and included a number of popular films as well as commercials. Some of the more immediately recognised films credited with locations in parts of Silverton include:

- Dirty Deeds;
- Adventures of Priscilla, Queen of the Desert; and
- Mad Max II.

According to the Film Broken Hill website, the last feature film to be shot on location in Silverton was over six years ago in 2000. An overall downturn in the national film industry has witnessed a reduction in feature film production within Australia.

Film Broken Hill (a joint initiative between government and private industry) provides a more detailed list of films and commercials shot in the region, and can be viewed on their website at (www.filmbrokenhill.com).

The Film Broken Hill website also provides a gallery of images to illustrate the extensive and varied nature of available film locations around the region. The gallery includes images around Silverton as well as surrounding locations that will include views to a number of the Stage 1 and Stage 2 turbines.

These include:

- The road to the Day Dream Mine;
- The clay pan film location on the Mundi Mundi Plain;
- Sections of the unincorporated road to the Mundi Mundi lookout; and
- A section of unsealed road toward the Eldee Station.

As well as the illustrated locations which will include views toward some of the wind turbines, the gallery also illustrates a number of locations that would not include views toward the wind turbines, which include:

- Various locations within Silverton;
- Various locations within Broken Hill;

- Areas around Menindee (including Menindee Lakes); and
- Views south from Broken Hill toward the Pinnacles.

The production of a feature film is a long and complicated process and involves a multitude of issues including the identification and selection of suitable filming locations. The identification of a suitable film location will consider a number of limitations including access and availability of services and communications.

The modern suite of post production editing technology provides the opportunity to enhance or remove features in both film and digital formats, and is a common and widespread practice employed in many areas of both film and photography. It would therefore be possible, if required, to remove individual or groups of turbines from film or photographic images.

12.2 Art

Both Broken Hill and Silverton currently support an established art community, with three commercial art galleries in Silverton as well as a number located in Broken Hill. The region has produced several well known Australian artists including Pro Hart and Jack Absalom.

A significant amount of art work is produced and sold locally for the tourist market and includes a wide range of styles and mediums; from traditional oils through to modern contemporary and the surreal.

Whilst a number of artists reproduce works based on scenes in and around Silverton, including views toward the Mundi Mundi and Robe Ranges, many artist's web based portfolios, and works displayed in individual galleries, demonstrate that none of the artists portfolios are based solely on views toward significant or smaller portions of the Silverton Wind Farm site.

Many landscape paintings in and around Silverton respond to the local scene and display gum trees, dry creek beds, desert dunes, and hills from broad visual perspectives to detail studies, however many of the artists, including those with galleries located in Silverton, also respond to the changing nature of the landscape and the modifications made by humans, and produce artworks that document the built environment as well as elements of the surrounding industrial and mining landscape.

Art, as a form of communication, is able to transmit emotional responses, either good or bad, between an individual and an object. The degree and range of emotional response largely comes down to each individual's perception and appreciation of the object in view.

12.3 Summary

Although the construction of the Silverton Wind Farm will change the physical appearance of the landscape, it is difficult to determine or quantify the degree of landscape or visual impact that the Silverton Wind Farm may have on future film production, photography and art.

The physical characteristics of the landscape surrounding the Silverton Wind Farm, resulting from a combination of attributes including topography, soils and vegetation will not be

significantly altered by the construction of the Silverton Wind Farm and therefore are still available as a background medium. Modern technology is available to erase the turbines from film and photographs if required, and is a practice already used to remove unwanted objects in commercial filming undertaken in the area.

The construction of the Silverton Wind Farm will present film makers and photographers with an opportunity to utilise the wind turbines for both feature films and commercial photography. It will be suited to a range of film genre or for commercial purposes related to renewable resources or environmental products. The Silverton Wind Farm will also have potential for educational or environmental documentary purposes.

Overall the construction of the Silverton Wind Farm is unlikely to preclude the inclusion of the existing landscape, together with the Silverton Wind Farm, in future film, photographic or artwork media.

Night time lighting

SECTION 13

13.1 Introduction

The Silverton Wind Farm may require obstacle marking and lighting at night time and during periods of reduced visibility to meet Civil Aviation Safety Regulations, and will be subject to the advice and endorsement of the Civil Aviation Safety Authority.

Lighting for tall structures generally comprises red lights flashing simultaneously in accordance with required standards. Shielding can be installed to restrict downward light to a level ten degrees below horizontal although this may not always restrict or block all potential light spill.

Lighting for aviation safety may also be required prior to, and during the construction period, including lighting for large equipment such as cranes.

Potential visual impacts associated with obstacle marking and lighting at night time have not been extensively researched or tested in New South Wales, although some investigations have been carried out at existing wind farms in Victoria.

Investigations have generally concluded that although night time lighting mounted on wind turbines may be visible for a number of kilometres from the wind farm site, the actual intensity of the lighting appears no greater than other sources of night time lighting, including vehicle head and tail lights.

Previous investigations have also suggested that replacing the more conventional incandescent lights with light emitting diodes (LED) may help to minimise the potential visual impact of the lights.

13.2 Existing light sources

A small number of existing night time light sources occur in the vicinity of the Silverton Wind Farm, and include a small number of street lights within Silverton together with various types of lighting around and within residences and commercial buildings. There are generally no existing visible night time sources of light across the Silverton Wind Farm site.

Limited and localised lighting is associated with a small number of homesteads, but lighting is unlikely to be visually prominent and does not emit any significant illumination beyond the immediate areas surrounding residential and storage buildings.

Lights from occasional vehicles travelling along the Silverton Road provide dynamic and temporary sources of light.

The urban area of Broken Hill contributes a more significant source of night time lighting within the regional area, including illumination of industrial and mining operations, sports grounds and areas around the railway line as it passes through Broken Hill. Despite the range of illumination within Broken Hill there is not a significant amount of light spill to surrounding areas.

13.3 Potential light sources

The main potential light sources associated with the Silverton Wind Farm will include:

- Control and auxiliary buildings;
- Substations; and
- Wind turbines and wind monitoring masts.

In addition to the standard level of lighting required for normal security and safety, lighting may also be required for scheduled or emergency maintenance around control buildings, substations and wind turbine areas.

As the visibility of the Stage 1 and 2 substations and control rooms will be largely contained by surrounding landform, it is unlikely that light spill from these light sources will be visible from the majority of surrounding receptor locations including surrounding residences within Silverton.

No lighting is likely to be required for the Stage 1 and 2 transmission line between the Silverton Wind Farm and the existing Broken Hill substation or for the duplication of the 220kV line between Broken Hill and the terminal station at Red Cliffs in Victoria.

13.4 Potential receptors and impact

The categories of potential receptors that may be impacted by night time lighting generally include residents and motorists, but may also include people visiting locations for sunset views including the Mundi Mundi Lookout and the Sculpture Park, although day time and night time visitation to the Sculpture Park is restricted.

The majority of residential receptors within, and around, Silverton will have views toward relatively small isolated groups of wind turbines generally along the south portion of the wind farm site in relation to the potential total number, and therefore are only likely to have views toward a small and discontinuous number of safety lights from any one location.

Residential receptors with generally unobstructed views toward larger extents of the Stage 1 and 2 wind farm are likely to view a greater number of safety lights, and may include receptor locations 2 and 27, previously identified as High visual impact receptor locations.

Irrespective of the total number of visible lights, safety lighting is more likely to be noticeable from exterior areas surrounding residences rather than from within residences where at night time room lights tend to reflect and mirror internal views in windows.

Whilst safety lighting will be visible to motorists, principally travelling northwest to west along the Silverton Road, the duration of visibility would tend to be very short and partially screened by undulating landform along some sections of the road corridor.

Night time lighting associated with the wind farm is unlikely to have a significant visual impact on the majority of receptor locations, including residential receptor locations in areas surrounding the proposed wind farm, and will be negligible for most receptor locations.

13.5 Sunset Views

The locality surrounding the Silverton Wind Farm includes a number of vantage points for sunset views for both visitors to, and residents of, Silverton and Broken Hill. The sunsets around Silverton can at times, provide an intense and dramatic landscape feature.

Although sunsets can be viewed from many surrounding areas, the principal view points include a section of the Silverton Road to the south of the Limestone property, the Sculpture Park and the Mundi Mundi lookout.

Sunset views from areas to the west and east of the wind farm site will incorporate full and partial views toward the Silverton Wind Farm from a range of distances; however it is unlikely that any potential lighting, including lighting for aviation safety, will have any significant negative impact on the appearance or appreciation of sunset views.

Views directly west from the Mundi Mundi lookout are unlikely to include a direct line of sight toward the Stage 1 and 2 wind turbines, although wind turbine structures may occur in peripheral vision for sunset views at this location.

Public Consultation, Community Perception and Tourism

SECTION 14

14.1 Public Consultation

Silverton Wind Farm Developments has held a number of meetings with stakeholders in Broken Hill and Silverton, including a meeting of the Silverton Village Committee in November 2007 and March 2008.

A public consultation open house for the Silverton Wind Farm was held on 28th November 2007 at the Municipal Chambers in Silverton. The open house was convened by *nghenvironmental* on behalf of Silverton Wind Farm Developments. During the open house, the community was given the opportunity to learn about the proposal, as well as providing a forum for the discussion of any issues that members of the community may have, including potential landscape and visual issues.

Project information sheets and a feedback form were provided for the community to have an opportunity to understand further some of the key issues regarding the proposal, and to provide comments on the Silverton Wind Farm. A brief summary of the community feedback forms is presented below.

14.2 Summary

nghenvironemtal received twelve community feedback forms as at 11th January 2008. Of the twelve community feedback forms received by nghenvironmental, eight indicated that visual impact will be the main impact as a result of the construction of the Silverton Wind Farm. Some excerpts from comments on the community feedback forms relating to visual impacts included:

- “As a tourist I wouldn’t want to see a wind farm”
- “Taking the lovely picturesque views of the range”
- “Ancient landscape”
- “Will impede on the natural views from a number prominent sites throughout Broken Hill and Silverton”
- “Once destroyed a ‘view’ can rarely be replaced”
- “It will wreck the best views in the world”
- “I don’t want to be able to see these things from anywhere in Silverton”
- “They are an absolute eyesore”
- “As an artist it will impact on my work environment”
- “Beautiful to see in action”

Although the majority of community feedback forms contain comments relating to perceived adverse visual impacts of the Silverton Wind Farm, it is possible that feedback is more likely to be received from concerned residents, rather than those with neutral or positive comments.

14.3 Silverton Village Committee Ballot

In an edition dated the 15th March 2008, the Barrier Daily Truth newspaper reported that the Silverton Village Committee, a trust comprised of three elected locals and two representatives from Local Government, conducted a secret ballot of Silverton's residents, who were asked if they were in favour of the Silverton Wind Farm going ahead.

From a total of 56 respondents, 64% voted in favour and 36% opposed the Silverton Wind Farm. Two ballot papers were not returned.

14.4 ABC Broken Hill straw poll

An informal on-line straw poll was carried out by ABC Broken Hill, which posed the question:

'Do you think building Australia's largest wind farm near Silverton will adversely affect tourism?'

From a total of 58 respondents, around 72% indicated that they did not think that the Silverton Wind Farm will adversely affect tourism; and around 28% indicated that the wind farm will adversely affect tourism.

14.5 Barrier Miner straw poll

An informal straw poll was carried out by the on-line version of the Barrier Miner Newspaper (11th October 2007), which posed the question:

'Do you agree with the proposed wind farm at Silverton?'

85% of respondents agreed with the proposed Silverton Wind Farm, and 15% of respondents disagreed with the proposed Silverton Wind Farm. No information was provided for the total number of respondents to the on-line poll.

14.6 Quantitative Research

Whilst published Australian research into the potential landscape and visual impacts of wind farms is limited, there are general corresponding results between the limited number that have been carried out when compared to those carried out overseas.

Auspoll research carried out in February 2002 on behalf of a wind farm developer for a wind farm project in Victoria that included just over 200 respondents. The results indicated that:

- *Over 92% of respondents agreed that wind farms can make a difference in reducing greenhouse emissions and mitigating the effects of global warming.*
- *Over 88% disagreed with the statement that wind farms are ugly.*

- *Over 93% of respondents identified 'interesting' as a good way to describe wind farms, over 73% nominating 'graceful' and over 55% selecting attractive.*
- *Over 79% of respondents thought that the wind farm would have a good impact of tourism, with 15% of respondents believing that the wind farm would make no difference.*
- *Over 40% of respondents believed that the impact of the wind farm on the visual amenity of the area would be good, with 40% believing that it would make no difference.*

A September 2002 MORI poll of 307 tourists conducted in Argyll (United Kingdom) indicated that:

- *43% maintained that the presence of wind farms had a positive impression of Argyll as a place to visit.*
- *43% maintained that the presence of wind farms had an equally positive or negative effect.*
- *Less than 8% maintained it had a negative effect.*
- *91% of tourists maintained that the presence of wind farms in Argyll made no difference to the likelihood of them visiting the area.*

There is no published Australian research on community attitudes to the impact of wind farms on landscape and visual issues before and after construction. However overseas research in the United Kingdom conducted by MORI in 2003 indicated that:

- *Prior to construction 27% of people polled thought problems may arise from wind farm impact on the landscape*
- *Following construction the number of people who thought the landscape has been spoiled was 12%.*

The majority of research carried out to date has focussed on public attitudes to wind farms and does not provide any indication for acceptable or agreed thresholds in relation to numbers and heights of turbines, and the potential impact of distance between turbines and receptors.

14.7 Tourism

New South Wales regional tourism, and in particular visitation to Broken Hill and Silverton, is viewed as an alternative to the mining industry. The Broken Hill Visitor Information Centre estimates annual visitation to Silverton is at 160,000 to 180,000 people.

This level of visitation equates to around 465 visitors per day, although this level of visitation was not observed during any of the period of fieldwork. It is likely that the pattern of tourist visitation will occur with seasonal variation and increase during traditional peak holiday periods.

Silverton is widely promoted as a tourist destination in association with Broken Hill through a number of mediums, including tourist literature, television commercials and numerous web sites.

The majority of businesses within Silverton are dependant on tourist visitation and include:

- Three art galleries;
- Beyond 39 Dips;
- Coin Carvery and Opal Shop;
- Tea Rooms and Silverton Hotel;
- Silverton Goal Museum
- Barrier Ranges Camel Safaris; and
- Day Dream Mine

Places of interest promoted in tourist literature include:

- The Mundi Mundi lookout;
- Umberumberka reservoir;
- Penrose Park; and
- Heritage Walk.

Research carried out in Australia and overseas indicates that tourist visitation is not necessarily influenced by the presence of wind farms, and that wind farms may also be regarded as having a positive influence on the landscape. There is no current published research to suggest that wind farms have a negative effect on tourist visitation.

A number of wind farms operating across mainland Australia and Tasmania are promoted as tourist destinations, and offer opportunities for four wheel drive guided tours, visits to interpretation centres or views from purpose built observation decks. The Australian Wind Energy Website lists a number of links for information on visiting wind farms, visitor centres and tourism operators and includes the following wind farm sites:

- Star Fish Hill Wind Farm in South Australia
- Windy Hill Wind Farm in Queensland
- Crookwell in New South Wales
- Codrington Wind Farm in Victoria
- Woolnorth in Tasmania

In Broken Hill and Silverton, where tourism is an important part of the local economy, any significant development that will alter the physical appearance of the landscape may be perceived as having a potential negative impact on tourism; however the results of research outlined above suggest that wind farms do not necessarily have a negative impact on tourist visitation and do not discourage people travelling to destinations that have wind turbines. This

does not suggest that every wind farm development will become a long term tourist attraction and guarantee a pattern of regular or return visitation.

The Silverton Wind Farm, one of the largest to be proposed in the southern hemisphere, will create a significant regional landmark, which will have the potential to draw additional tourist visitation including those with an interest in wind farms or alternative energy.

15.1 Mitigation Measures

The purpose of mitigation is to avoid, reduce, or where possible remedy or offset, any significant negative impact arising from the Silverton Wind Farm development.

Mitigation measures may reduce the potential visual impact of the Silverton Wind Farm in two ways.

- Firstly, by reducing the visual prominence of the turbines, access tracks and substations by reducing the visual contrast with the landscape in which they are viewed.
- Secondly, by screening views to the turbines from specific viewing situations.

In relation to the first form of mitigation, the design of the turbine structures has been highly refined over a number of years to maximise their efficiency. The height of the supporting tower, dimensions of the blades and the size of the generator are defined by engineering efficiency and industrial design criteria. Consequently, modification of the turbine design to mitigate potential visual impacts is not considered a realistic option.

Colour is one aspect of the design that does provide an opportunity to reduce visual contrast between the turbine structures and the background against which they are viewed. The white colour that is used on a majority of turbine structures provides the maximum level of visual contrast with the background.

This maximum level of visual contrast could be reduced through the use of a light grey colour for the turbines. The visual contrast would be reduced when portions of the turbine are viewed against the sky as well as for those portions viewed against a background of landscape.

The potential visual impact of the Silverton Wind Farm from specific receptor locations can be mitigated by vegetation planting close to the receptor location. For instance, tree planting close to a residence can screen potential views to specific, or groups, of turbines. Similarly roadside tree planting can screen potential views of turbines from particular sections of road provided the turbine is not located some distance from the road.

The location and design of screen planting used as a mitigation measure is very site specific and requires detailed analysis of potential views and consultation with receptors. Planting vegetation may not provide effective mitigation in all circumstances and can reduce the extent of existing views available from residences or other receptor locations.

The potential visual impact of tracks providing access for construction and maintenance can be mitigated by minimising the extent of cut and fill in the track construction. Re-vegetating disturbed soil areas immediately after completion of construction works and using local materials as much as possible in track construction to minimise colour contrasts also assist in mitigating potential impacts. All proposed substations to be constructed in association with the wind turbines will be relatively limited in size. Potential visual impacts would be mitigated by careful location away from direct views from major roads and residences.

15.2 Summary of Mitigation Measures

Table 17 Visual Assessment: Summary of Mitigation Measures

Safeguard	Implementation			
	Design	Site Preparation	Construction	Operation
Consider options for use of colour to reduce visual contrast between turbine structures and background, e.g. use of grey rather than white, and use matt finish to avoid reflected sunlight.	✓			
If necessary, design and construct site control building and facilities building sympathetically with nature of locality.	✓		✓	
If necessary, locate substations away from direct views from roads and residences, to minimise additional line needed, and to 'blend in' with existing transmission infrastructure.	✓		✓	
Enforce safeguards to control and minimise fugitive dust emissions.			✓	
Restrict the height of stockpiles to minimise visibility from outside the site.			✓	
Minimise activities that may require night time lighting, and if necessary use low lux (intensity) lighting designed to be mounted with the light projecting inwards to the site to minimise glare at night.			✓	✓
Minimise cut and fill for site tracks and revegetate disturbed soils as soon as possible after construction.			✓	
Maintain revegetation of disturbed areas to ensure effective cover is achieved.				✓
Consider options for planting screening vegetation in vicinity of nearby residences and along roadsides to screen potential views of turbines. Such works to be considered in consultation with local residents and authorities.	✓			
Undertake revegetation and off-set planting at areas around the site in consultation and agreement with landholders.	✓		✓	✓

Conclusions

SECTION 16

16.1 Stage 1 Silverton Wind Farm

Overall, the LVIA concludes that the Stage 1 Silverton Wind Farm development, with around 120 turbines will have a:

- **Low to medium** impact on the landscape character; and a
- **Low** visual impact on people travelling through, visiting or residing in areas surrounding the proposed Silverton Wind Farm development.
- Although the overall assessment of potential visual impact is **Low**, there will be a small number of receptor locations where the potential visual impact will rise to **Medium** as a result of factors that relate to the sensitivity of particular receptor locations.
- The Stage 1 visibility assessment indicates that 52 of the 55 receptor locations that were assessed will experience a **Nil** or **Low** impact.
- The Stage 1 visibility assessment indicates that 3 of the 55 receptor locations assessed will experience a **Medium** impact.
- The Stage 1 visibility assessment indicates that none of the 55 receptor locations assessed are expected to experience a **High** impact.
- Although a number of wind turbines will be visible around the Silverton locality, and will have the potential to alter the physical characteristics of the landscape, the proposed Stage 1 Silverton Wind Farm site is surrounded by a very large scale and open landscape that will have the ability visually accommodate a large wind farm development from a number of receptor locations.
- The majority of potential residential receptors within Silverton are unlikely to have a direct view toward the Stage 1 Silverton Wind Farm site from within dwellings, although some residential receptors will have views toward turbines from areas surrounding their residences.
- The potential extent of visibility identified by the ZVI study illustrates that the majority of views toward the Stage 1 wind turbines occur from unpopulated areas of semi arid dessert pasture.
- It is unlikely that all of the Stage 1 wind turbines will be visible within the same view shed from any single receptor location beyond the immediate site area within, or on top of, the Mundi Mundi Range, including views from residential properties.
- Views from elevated areas surrounding the site, including Silverton Heights, will offer views toward the majority of turbines, although some mutual screening of wind turbines is likely to occur.

- Views west from the Mundi Mundi lookout, out across the Mundi Mundi Plain, will generally not include direct views toward the location of the Stage 1 wind turbines. The Stage 1 turbines are generally set back around 1km beyond a notational north south line extended through the lookout area. Some of the Stage 1 turbines will be visible in peripheral vision and as receptors rotate their field of view from the west toward the north and north east along the edge of the Barrier Range.

- Views from the Sculpture Park and adjoining areas toward the Stage 1 Silverton Wind Farm are distant and extensive. The Silverton Wind Farm will only account for a small portion of the overall available view from this location, and visibility is also more likely to be influenced by atmospheric conditions from this distant receptor location.

- Results of Australian and overseas research suggest that the visibility of the Stage 1 Silverton Wind Farm is unlikely to have a significant impact on the current level of tourist visitation to Silverton and Broken Hill.

- Although some negative comments were received in response to an open house feedback form, a ballot conducted by the Silverton Village Committee indicated that 64% of Silverton residents were in favour of the Silverton Wind Farm.

- Informal polls conducted by local media organisations indicate the majority of people in the region, including Silverton and Broken Hill, support the Silverton Wind Farm.

- The potential visual impact of obstacle marking and lighting at night time is unlikely to be significant for the majority of potential receptors including residences located within and around Silverton. Subject to final design, only a small number of lights are likely to be visible from a small number of residences located around the south portion of the Stage 1 wind farm area.

- Mitigation, including the final surface treatment of the main structural components and selective planting for a small number of the receptor locations may help to reduce the overall level of visibility.

16.2 Stage 1 and 2 Silverton Wind Farm

The cumulative impact of the Stage 1 and Stage 2 Silverton Wind Farm development, with up to 600 turbines will have a:

- **Medium** impact on the landscape character; and a

- **Medium** visual impact on people travelling through, visiting and residing in areas surrounding the proposed Silverton Wind Farm development.

- Although the overall assessment of potential visual impact is **Medium**, there will be a small number of locations where the potential visual impact will rise to **High** as a result of the sensitivity of particular receptor locations.

- The Stage 1 and 2 visibility assessment indicates that 34 of the 55 receptor locations that were assessed will experience a **Nil** or **Low** impact.

- The Stage 1 and 2 visibility assessment indicates that 19 of the 55 receptor locations assessed will experience a **Medium** impact.

- The Stage 1 and 2 visibility assessment indicates that 2 of the 55 receptor locations assessed are expected to experience a **High** impact.

- Although a number of wind turbines will be visible from around the Silverton locality, and will have the potential to alter the physical characteristics of the landscape, the proposed Silverton Wind Farm site is surrounded by a very large scale and open landscape that will have the ability visually accommodate a large wind farm development from a number of receptor locations.

- The majority of the residential receptor locations within Silverton are unlikely to have a direct view toward the Stage 1 and 2 Silverton Wind Farm development, and it is unlikely that all turbines will be visible from any one receptor location due to the distance across, and topography of, the site.

- The extent of visibility identified by the ZVI study illustrates that the majority of views toward the Stage 1 and 2 wind turbines occur from unpopulated areas of semi arid dessert pasture.

- Views west from the Mundi Mundi lookout, out across the Mundi Mundi Plain, will generally not include direct views toward the wind turbine locations. The wind turbines will be visible in peripheral vision and as receptors rotate their view from the west toward the north and north east along the edge of the Barrier Range.

- Views from the Sculpture Park toward the Silverton Wind Farm are distant and extensive. The Silverton Wind Farm will only account for a small portion of the overall available view from this location. Visibility is also more likely to be influenced by atmospheric conditions for this distant receptor location.

- Results of various polls conducted around Broken Hill and Silverton indicate that the majority of residents support the Silverton Wind Farm development.

- Results of Australian and overseas research suggest that wind farms do not generally have a significant impact on levels of tourist visitation.

- It is unlikely that all the Stage 1 and Stage 2 wind turbines will be visible from any one receptor location beyond the immediate area within, or on top of, the Mundi Mundi or Robe Range.

- The potential visual impact of safety lighting at night time is unlikely to be significant for the majority of potential receptors including residences located within and around Silverton. Subject to final design, only a small number of safety lights are likely to be visible for the majority of residential receptors located toward the south portion of the Silverton Wind Farm Development.

- Receptor locations that may have views toward more extensive sections of the wind farm are likely to view a greater number of lights, including those identified as having a potentially high visual impact.

- Mitigation, including the final surface treatment of the main structural components and selective planting for a small number of the receptor locations may reduce the overall level of visibility.

16.3 Stage 1 220kV Transmission Line, Silverton Wind Farm to Broken Hill

The Stage 1 220kV transmission line between the Silverton Wind Farm and Broken Hill will have a:

- **Low** impact on the landscape character; and a

- **Low** visual impact on people travelling through and residing in areas surrounding the proposed Silverton Wind Farm development.

- The Stage 1 visibility assessment indicates that 11 of the 11 receptor locations that were assessed will experience a **Low** impact.

- Indirect views from the Silverton Road toward the transmission line corridor will be partially screened by undulating landform to the north of the road corridor.

- The transmission line will only form a small element in the overall viewshed from elevated locations including areas around the Sculpture Park and Living Desert Reserve, from the same elevated receptor locations, the main structural components of the transmission line, including the pylons; will not generally be viewed above the skyline.

- The visibility of the support structures may be reduced if a low profile tubular pole is installed in place of a lattice pylon structure.

- Mitigation, including the final surface treatment of the main structural components and selective planting may reduce the level of visibility.

16.4 Stage 2 220kV Transmission Line duplication, Silverton Wind Farm to Broken Hill

The Stage 2 220kV duplication between the wind farm and Broken Hill will have a:

- **Low** cumulative impact on the landscape character; and a

- **Low** cumulative impact on people travelling through and residing in areas surrounding the proposed Silverton Wind Farm development.

- The Stage 2 transmission line will have a low cumulative impact on the majority of receptor locations.

- Indirect views from Silverton Road toward the transmission line will be partially screened by undulating landform to the north of the Silverton Road corridor.
- The final level of visibility may be reduced if a low profile tubular pole is installed in place of a lattice pylon structure.
- Mitigation, including the final surface treatment of the main structural components and selective planting may reduce the level of visibility.

16.5 Stage 2 220kV Transmission Line duplication, Broken Hill to Red Cliffs, Victoria

The Stage 2 220kV duplication between the Broken Hill substation and the terminal station at Red Cliffs in Victoria will have a:

- **Low** cumulative impact on the landscape character along the existing transmission line route; and a
- **Low** cumulative impact on people travelling through or residing in areas surrounding the proposed Silverton Wind Farm development.
- The greater extent (around 80%) of the Stage 2 transmission line will be located through a generally undeveloped rural landscape area with a very low population density.
- Depending on final design and alignment, the proposed transmission line is unlikely to be directly visible from a majority of the residences located within the vicinity of the existing transmission line corridor.
- Depending on final design and alignment, the Stage 2 transmission line may cross the Silver City Highway at around three locations, with the greater extent of the transmission line screened by roadside vegetation and low undulating landform either side of the road corridor.
- The existing transmission line route crosses a number of minor roads and tracks which are likely to carry a very low to low number of vehicles per day. The additional transmission line is unlikely to have a significant visual impact on motorists travelling along minor roads and tracks within the vicinity of the proposed transmission line.
- Areas around the Broken Hill substation and the terminal station at Red Cliffs contain various elements of electrical infrastructure which would tend to visually absorb the structures associated with an additional transmission line.
- Depending on final design and alignment, views from recreational areas, including the Kings Billabong Nature Reserve and the Murray River corridor are not likely to be significantly impacted by the proposed transmission line. The final alignment will need to carefully consider the requirement for tree removal to minimise opening views into the floodplain from the river corridor.

Limitations

URS Australia Pty Ltd (URS) and Green Bean Design have prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Silverton Wind Farm Developments Pty Ltd and only those third parties who have been authorised in writing by URS to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the URS Proposal dated 4th October 2007.

The methodology adopted and sources of information used are outlined in this report. URS and Green Bean Design have made no independent verification of this information beyond the agreed scope of works and URS and Green Bean Design assume no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS and Green Bean Design was false.

This report was prepared between October 2007 and March 2008 and is based on the conditions encountered and information reviewed at the time of preparation. URS and Green Bean Design disclaim responsibility for any changes that may have occurred after this time.

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