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Crookwell 3 Wind Farm Amendment

VISUAL IMPACT ASSESSMENT

Prepared for:

UNION FENOSA WIND AUSTRALIA

gasNatural fenosa

Prepared by:

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Table 1 Glossary

Term	Definition
Cumulative effects	The summation of effects that result from changes caused by a development in conjunction with other past, present or reasonably foreseeable actions.
Magnitude	A combination of the scale, extent and duration of an effect.
Visual effect	Observable difference between the approved Crookwell 2 Wind Farm project and the proposed Crookwell 2 Modification 2 amendments.
Sensitivity	Susceptibility of a receiver to a specific type of change.
Swept area	Circular area defined by the rotational path of the rotor blades.
Visibility	A relative determination at which the proposal can be clearly discerned and described.
Visual Impact Assessment	A process of applied professional and methodical techniques to assess and determine the extent and nature of change to the composition of existing views that may result from a development.
View location	A place or situation from which a proposed development may be visible.
Visual receiver	Individual and/or defined groups of people who have the potential to be affected by a proposal.
Visual significance	A measure of the importance or gravity of the visual effect culminating from the degree of magnitude and receiver sensitivity.
Zone of Theoretical Visibility (ZTV; sometimes Zone of Visual Influence)	A map, usually digitally produced, showing areas of land within which a development is theoretically visible.

Executive summary

Green Bean Design Pty Ltd (GBD) has been commissioned by Union Fenosa Wind Australia Pty Ltd on behalf of Crookwell Development Pty Ltd (the Proponent) to prepare an Amended Visual Impact Assessment (Amended VIA) report for the Crookwell 3 Wind Farm (C3WF).

This Amended VIA also addresses visual effects in association with the Crookwell 2 Wind Farm Modification 2 (C2WF Mod-2) application. Whilst the C3WF Amended VIA has been written as a standalone report, there are tangible visual effects between both projects, which should be reviewed as a whole rather than in parts.

This Amended VIA has been prepared to review the magnitude of visual effects that could result from a rotor diameter increase to a maximum 130 metres (m) length. This increase in rotor diameter would not result in a change to the original C3WF LVIA 2012 wind turbine tip height at 157m. This tip height would be maintained by reducing the wind turbine tower. The Amended C3WF would also reduce the total number of C3WF wind turbines from thirty (assessed in the Crookwell 3 Wind Farm Landscape and Visual Impact Assessment) to twenty three.

The preparation and assessment of Zone of Theoretical Visibility Diagrams (**Figures 2** and **3**) illustrate that the area of land within which the Amended C3WF would be theoretically visible (as well as number of wind turbines being visible), would be very similar in extent to the original C3WF.

This Amended VIA included a review of seventy four residential dwellings within 5 kilometres (km) of the Amended C3WF wind turbines. The overall assessment of amended visual effects is summarised as Negligible to Low. The Amended C3WF wind turbine is not considered to be of a magnitude that would significantly increase visual effects associated with the proposed C3WF Project that was assessed and recommended for approval by the NSW Department of Planning and Environment report in February 2015. Key differences in the Amended C3WF and original C3WF are illustrated in **Figure 4**.

This Amended VIA incorporates a summary of the Shadow Flicker assessment included in the Addendum Environmental Impact Assessment main report. The summary Shadow Flicker assessment determined that one non-associated residential dwelling would experience shadow flicker at more than 30 hours per year. This assessment also determined that blade glint would not be an issue subject to the correct surface treatment of wind turbine structures.

Eight photomontages have been prepared to illustrate the location and extent of wind turbines within the Amended C3WF. The photomontages also illustrate the approved C2WF Mod-1 and proposed C2WF Mod-2 wind turbines. The C3WF photomontages have been prepared to reflect locations presented in the Crookwell 3 Wind Farm Landscape and Visual Impact Assessment 2012.

The Amended C3WF is considered to result in a range of low level visual effects, and introduce elements which are neither prominent or out of character with the original C3WF, the potential for the Amended C3WF wind turbines to result in any additional significant cumulative visual effects is considered to be low. Cumulative visual effects are illustrated in **Figure 5**.

The overall area from which the Amended C3WF obstacle lighting may visible is not expected to extend beyond the influence of obstacle lighting associated with the C3WF LVIA 2012 Project.

1 Introduction

1.1 Introduction and VIA chronology

This Amended VIA has been prepared to accompany an Addendum to the Environmental Impact Statement (Addendum EIS) for the Crookwell 3 Wind Farm application. The Addendum EIS has been prepared to address various amendments to the C3WF wind farm design following the preparation and lodgement of the Preferred Project and Response to Submissions Report (March 2014). The following information outlines the landscape and visual impact assessment works and reports prepared by GBD with regard to the C3WF applications:

- Crookwell 3 Wind Farm Landscape and Visual Impact Assessment, GBD July 2012 (Crookwell 3 Wind Farm LVIA)
- Crookwell 3 Wind Farm Addendum A Residential Dwelling R107 (Quinton) reposition, GBD October 2012
- Landscape & Visual Impact Assessment Supplementary Report - Response to Independent Expert Review, GBD August 2013 (LVIA Supplementary Report)
- Crookwell 2 Wind Farm Modification 2 Visual Impact Assessment, GBD May 2016 and
- Crookwell 3 Wind Farm Amendment Visual Impact Assessment, GBD June 2016.

1.2 Purpose of Amended VIA

The purpose of this Amended VIA is to:

- Identify potential visual effects associated with amendments to the original C3WF
- Assess and determine the potential magnitude of visual effects associated with the C3WF amendments and
- Assess the potential magnitude of visual effects on visual impact ratings determined in the C3WF LVIA 2012.

1.3 Amended VIA structure

This Amended VIA report been structured into eleven parts as follows:

Table 2 – Report structure

Report section	Description
Section 1 Introduction and report structure	This section provides an introductory section that describes the intent and purpose of the Amended VIA and description of the report structure
Section 2 Project information provided to GBD	Identifies the information provided to, or sourced by, GBD in order to undertake the Amended VIA
Section 3 Methodology	This section sets out the methodology employed in the Amended VIA preparation

Table 2 – Report structure

Report section	Description
Section 4 C3WF LVIA 2012 and Amended C3WF descriptions	This section describes the key differences in wind turbine layout and design criteria between the C3WF LVIA 2012 and Amended C3WF
Section 5 Zone of Theoretical Visibility (ZTV) diagrams	This section identifies the area of land surrounding the wind farm from which wind turbines, or portions of wind turbine structures, may be theoretically visible
Section 6 Ancillary structures	This section describes infrastructure associated with the wind farm other than the wind turbines, including the new C2WF TransGrid transmission line tower
Section 7 Assessment of visual effects	This section describes the assessment and determination of visual effects between C3WF LVIA 2012 and the Amended C3WF
Section 8 Shadow flicker and blade glint	This section describes potential shadow flicker effects and summarises the Shadow Flicker letter report included in the Addendum EIS
Section 9 Photomontages	This section describes and presents the photomontages prepared for the Amended VIA.
Section 10 Conclusions	Conclusions are drawn on the overall impact of the Amended C3WF within the surrounding viewshed

2 Project information provided to GBD

GBD confirm the following information has been provided by the Proponent, or procured by GBD, for consideration and/or incorporation into this Amended VIA:

- an amended wind turbine layout (including the original C3WF LVIA 2012 wind turbines to be deleted)
- location and description of Amended C3WF wind turbines
- ZTV diagrams and
- amended photomontages illustrating the original C3WF LVIA 2012 and Amended C3WF wind turbines, in addition to the approved C2WF Mod-1 wind turbines and the proposed C2WF Mod-2 wind turbines.

Additionally the Proponent has provided copies of the following reports by others, which have been reviewed and summarised as necessary into this Amended VIA:

- AECOM Australia Pty Ltd (2012) Crookwell 2 Wind Farm New Transmission Line Tower Visual Impact Assessment
- Aviation Projects Pty Ltd (2016) Aeronautical Impact Assessment Crookwell 3 Wind Farm
- DNV-GL Energy Renewables Advisory Pty Ltd (2016) Crookwell 3 Wind Farm Shadow Flicker and Blade Glint Assessment.

3 Methodology

3.1 Introduction

The Amended C3WF VIA methodology included the following activities:

- desktop study reviewing the original C3WF LVIA application, and the C3WF amendments
- site inspections and photography
- preparation of ZTV diagrams
- assessment of significance of visual effects and
- preparation of photomontages and illustrative figures.

3.2 Desktop study

A desktop study was carried out to review the original C3WF LVIA application and associated viewshed. This was carried out by reference to topographic maps as well as aerial photographs of the surrounding landscape.

A preliminary ZTV diagram for the amended C3WF wind turbine layout was produced prior to the commencement of fieldwork to inform the likely extent and nature of residual visual effects within a 5km viewshed of the approved wind turbines.

Topographic maps and aerial photographs were also used to identify the locations and categories of potential view locations that could be verified during the fieldwork component of the assessment.

3.3 ZTV diagrams

ZTV Diagrams were prepared to illustrate and confirm the theoretical visibility of the original C3WF LVIA 2012 wind turbines (tip height at 157 metres) and the Amended C3WF wind turbines (tip height at 157 metres). The ZTV Diagrams are illustrated in **Figures 2** and **3**.

3.4 Fieldwork and photography

GBD undertook fieldwork for the Amended C3WF project. The fieldwork included:

- a site inspection to determine and confirm the extent of residual effects between the C3WF LVIA 2012 and Amended C3WF wind turbines and ancillary project structures and
- photography for the C3WF photomontages from residential and public view locations.

3.5 Visual effects

The visual effects on surrounding receiver locations would result from a combination of the Amended C3WF wind turbine visibility and the characteristics of the landscape between, and surrounding, the receiver locations and the wind farm. The potential degree of visibility and resultant visual effect would be partly determined by a combination of factors such as:

- category and type of situation from which people could view the wind farm (examples of view location categories include residents or motorists)
- visual sensitivity of view locations surrounding the wind farm
- distance of visual effect (between view locations and the wind farm) and
- duration of time people could view the wind farm from any particular static or dynamic view location.

3.6 Photomontages

Eight photomontages have been prepared from residential dwellings and public road corridors. The photomontages illustrate and contrast the original C3WF LVIA 2012 and the Amended C3WF wind turbines, in addition to the approved C2WF Mod-1 and the proposed Mod-2 wind turbines. The photomontages locations are illustrated in **Figure 7** and the photomontages in **Figures 8a** to **15b**.

3.7 Shadow flicker & blade glint

A summary Shadow Flicker Assessment has been prepared for the Amended C3WF and is included in the Addendum EIS. An overview of the summary Shadow Flicker Assessment and consideration of potential blade glint impacts are included in this Amended VIA.

4 C3WF LVIA 2012 and Amended C3WF wind turbine descriptions

The C3WF LVIA 2012 design includes:

- a tower height of 105 metres AHD
- rotor diameter up to 104 metres and
- a blade tip height up to a maximum 157 metres.

The Amended C3WF design would include:

- tower height of 95 metres AHD
- an increase in rotor diameter up to 130 metres and
- a blade tip height up to a maximum 157 metres.

Tables 3 and **4** outline the differences between the C3WF LVIA 2012 and Amended C3WF wind turbines.

Table 3: C3WF LVIA 2012 and Amended C3WF wind turbine descriptions

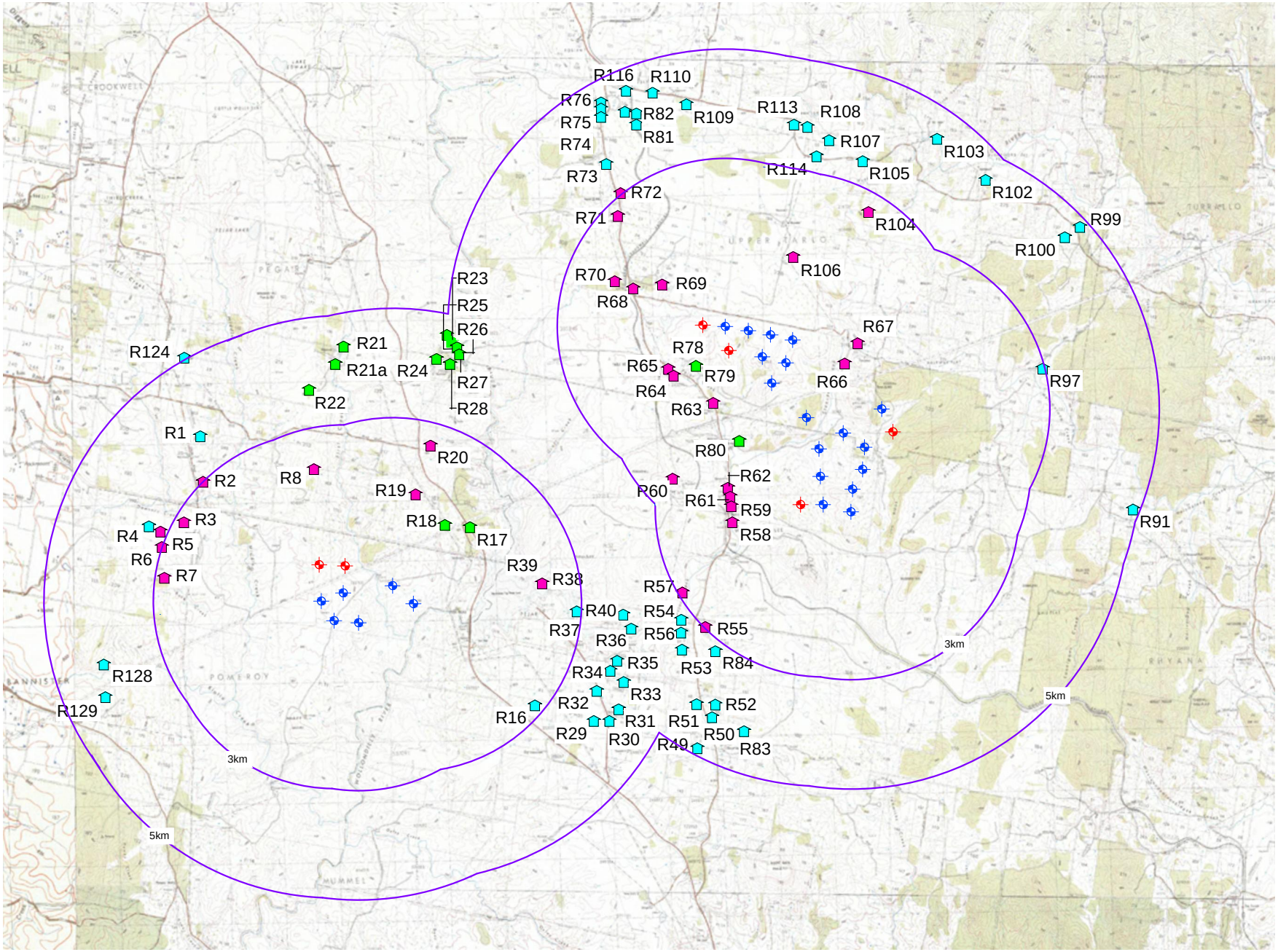
	Tower height	Rotor diameter	Tip height	Maximum number of wind turbines
C3WF LVIA 2012 wind turbine	105 m	104 m	157 m	30
Amended C3WF wind turbine	95 m	130 m	157 m	23
Difference	-10 m	+26 m	0 m	-7
Percentage difference	-9.5%	+25%	0%	-23%

Table 4: C3WF LVIA 2012 and Amended C3WF wind turbine swept area

	Rotor diameter	Swept area
C3WF LVIA 2012 wind turbine	104 m	8,490 m^2
Amended C3WF wind turbine	130 m	13,266 m^2
Difference	+26 m	+6,035 m^2
Percentage difference	+25%	+56%

The C3WF LVIA 2012 and Amended C3WF wind turbines, including location of wind turbines to be deleted are illustrated in **Figure 1**.

It should be noted that **Figure 1** illustrates six C3WF LVIA 2012 wind turbines to be removed, including wind turbines A1, A6, A18, A23, A26 and A27. The Amended VIA has not illustrated wind turbine A19 which was deleted following completion of the C3WF LVIA 2012 and did not form part of the Preferred Project and Response to Submissions Report (March 2014).



Legend

- C3WF LVIA 2012 wind turbine subject to amendment (indicative location)
- C3WF LVIA 2012 wind turbine to be removed (indicative location)
- Associated C3WF and C2WF residential dwelling
- Non associated residential dwelling within 3km of Amended C3WF wind turbine
- Non associated residential dwelling between 3km and 5km of Amended C3WF wind turbine

Note: All house locations are indicative only

Figure 1 - C3WF LVIA 2012 and Amended C3WF wind turbine layout

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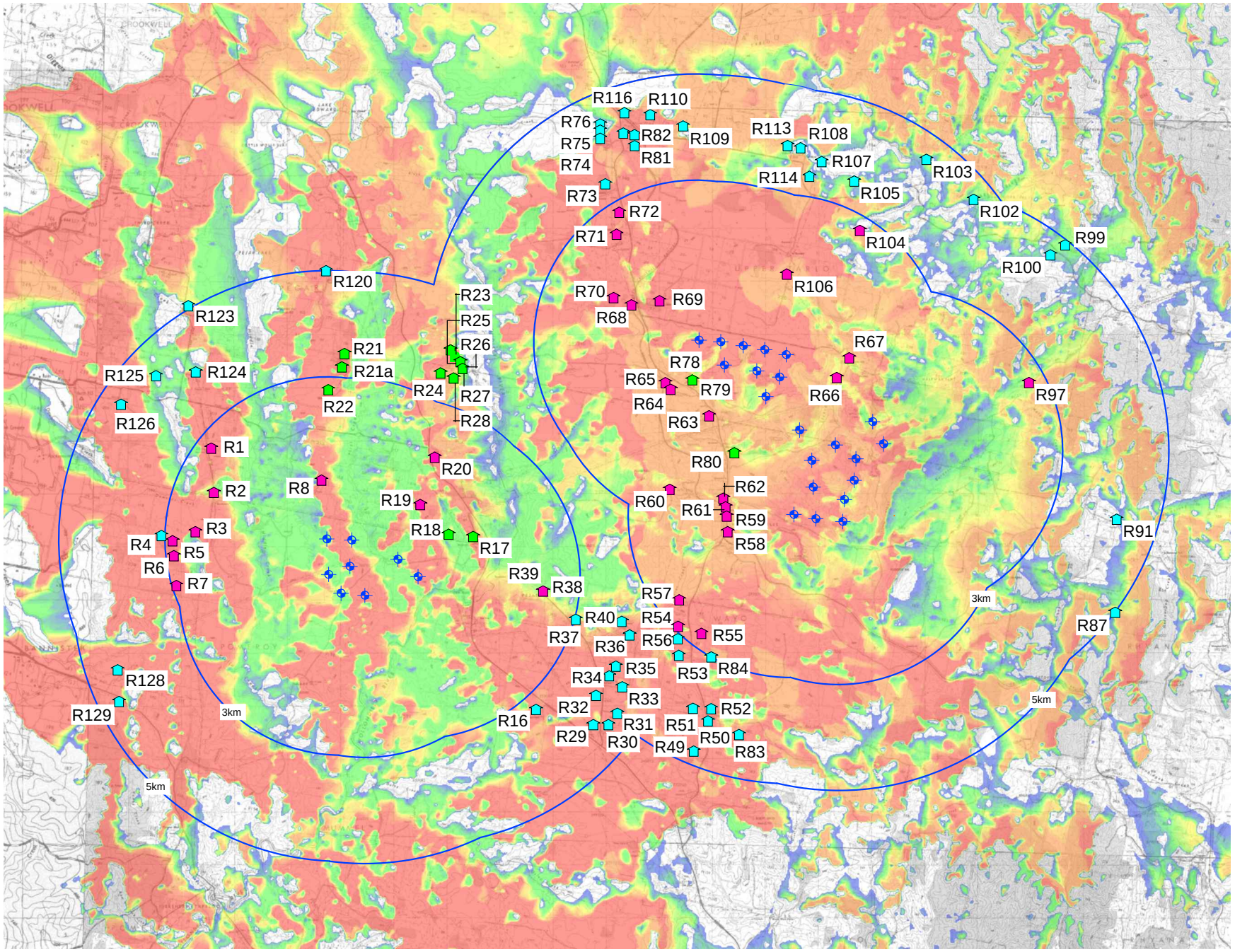
5 Zone of Theoretical Visibility Diagrams

5.1 Introduction

Within the recognised limitations of Zone of Theoretical Visibility (ZTV) diagrams, the overall extent of the C3WF LVIA 2012 and Amended C3WF wind turbine visibility covers a very similar extent within and beyond 5km of the landscape surrounding the C3WF project. **Figures 2** and **3** illustrate the theoretical visibility of the original C3WF LVIA 2012 (at 157m tip height) and Amended C3WF (at 157m tip height) wind turbines.

The similarity in theoretical wind turbine visibility demonstrates the influence of local topographical features on views toward wind turbines within both C3WF layouts. The ZTV diagrams also illustrate that the Amended C3WF wind turbines would have very little difference in visual effects across the surrounding viewshed.

Given there is no change to the C3WF LVIA 2012 wind turbine tip height there would be no increase in wind turbine visibility.



Legend (ZTV Tips visible)

30
25
20
15
10
5

Legend

- C3WF LVIA 2012 wind turbine subject to Amendment (indicative location)
- Approximate distance from C3WF LVIA 2012 wind turbine
- Associated C2WF and C3WF residential dwelling
- Non associated residential dwelling within 3km of C3WF LVIA 2012 wind turbine
- Non associated residential dwelling between 3km and 5km of C3WF LVIA 2012 wind turbine
- Potential future dwelling location without DA lodged
- Non residential structure

Note Residential dwelling locations are indicative only

0km 1.5km

Figure 2 -
C3WF LVIA 2012 ZTV Diagram
Tip of blade

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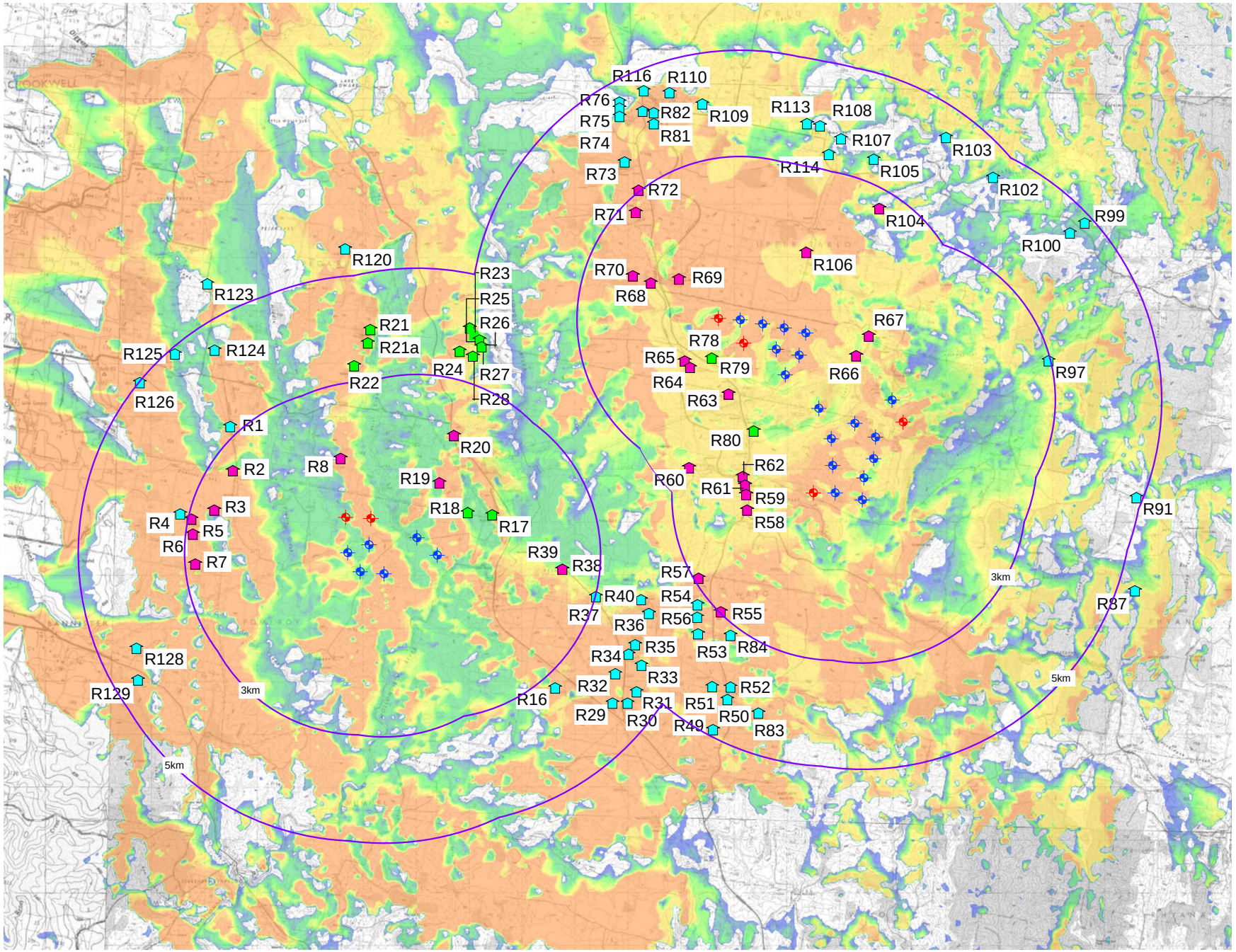

Legend (ZTV Tips visible)

30
25
20
15
10
5

Legend

- Amended C3WF wind turbine (indicative location)
- C3WF LVIA 2012 wind turbine to be removed (indicative location)
- Approximate distance from Amended C3WF wind turbine
- Associated C2WF and C3WF residential dwelling
- Non associated residential dwelling within 3km of Amended C3WF wind turbine
- Non associated residential dwelling between 3km and 5km of Amended C3WF wind turbine
- Potential future dwelling location without DA lodged
- Non residential structure

Note Residential dwelling locations are indicative only

0km 1.5km

Figure 3
Amended C3WF ZTV Diagram
Tip of blade

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6 Ancillary structures

6.1 Introduction

The C3WF incorporates a limited range of ancillary structures which include:

- wind monitoring masts and
- on-site access tracks.

The C3WF would utilise infrastructure associated with the C2WF. Electrical connections between the C3WF and the grid would extend underground to the C2WF substation facility. The Amended C3WF would not result in any fundamental change to the original C3WF ancillary structures and would not result in additional visual impacts to those outlined in the original Crookwell 3 Wind Farm LVIA.

6.2 New transmission line tower (associated with the C2WF Mod-2)

The Proponent commissioned AECOM Australia Pty Ltd to prepare a visual impact assessment detailing the potential visual impact that would arise from the change in grid connection configuration (requirement of TransGrid) of the C2WF to the TransGrid network. The AECOM visual impact assessment identified five receiver locations as being representative of key views toward the new transmission line tower. The receiver locations included:

- Crookwell-Goulburn Road
- Pejar Dam picnic area
- Woodhouselee Road (north)
- Woodhouselee Road (south)
- Valdarman Hill.

The AECOM visual impact assessment determined that the overall visual impact rating for the new transmission line tower would be minor to negligible. The minor to negligible visual impact rating was determined for the following reasons:

- The proposed transmission line tower '*is situated in a reasonably remote location, with no observers within a 1 km radius that have direct, detailed views of the structure*';
- Views of the proposed new transmission line tower '*are generally quite distant (on average from 2 km away) with the tower often difficult to see from this distance*';
- '*The closest residential viewers to the proposed stanchion are situated 1.4 km to the north east… and the proposed structure would tend to be visually recessive within the landscape*';
- The new transmission line tower '*will replace an existing similar structure, and although it will be approximately 16 m taller that the existing tower, the distances it would be viewed from (i.e. greater than 1 km) will diminish the perceived change from the existing height*';
- The new transmission line tower 'will be visually recessive due to the viewing distance and highly open structure'; and
- The proposed transmission line towers *'will comprise a relatively small change within a landscape which is subject to larger* (and approved) *changes*. *Any change in the stanchion height will be mitigated by the*

construction of the (approved) *wind farm turbines, which will be larger and in most cases closer all observer locations.*

GBD have reviewed the AECOM visual impact assessment and, following the GBD site inspection, concur with the findings presented in the AECOM report which determines the overall visual rating of the new transmission line tower is minor to negligible on surrounding receiver locations.

7 Visual effects

7.1 Introduction

The Amended C3WF wind turbines would extend to the same 157m tip height as the C3WF LVIA 2012 wind turbines. Consequently this Amended VIA has determined that the overall scale of the Amended C3WF wind turbines at a 5 kilometre (and over) view distance would be very unlikely to result in an order of visual magnitude that is significantly above the visual magnitude of the original C3WF LVIA 2012 wind turbines. A comparison of the C3WF LVIA 2012 and Amended C3WF wind turbines is illustrated in **Figure 4**.

It is also noted that the Amended C3WF wind turbines would be consistent with the C3WF LVIA 2012 wind turbines with regard to their visual form, design, pattern and colour. The extent of the magnitude of effect would also be partly reduced by the proposed deletion of 7 wind turbines included in the original C3WF LVIA 2012 assessment. The location of associated and non-associated residential dwellings within 5 kilometres of the proposed Mod-2 wind turbine layout is illustrated in **Figure 1**.

7.2 Magnitude of visual effects

The magnitude of visual effects resulting from the Amended C3WF wind turbines would result primarily from observable differences between the original C3WF LVIA 2012 and the Amended C3WF wind turbines. Observable differences may include:

- Views toward wind turbines where previously screened by landform or vegetation and
- Change in distance between a receiver location and wind turbine (note: a change in distance would only increase where wind turbines are removed, all other wind turbines remain in the C3WF LVIA 2012 location).

For the purpose of this Amended VIA the magnitude of visual effect takes account of the scale of the change in the view with respect to the loss or addition of features and changes in the composition or contrast with the landscape, including the proportion of the view occupied by the Amended C3WF wind turbine relative to the C3WF LVIA 2012 wind turbine.

For the purpose of this Amended VIA the following table sets out ratings and definitions associated with the magnitude of visual effects.

Table 5 – Magnitude of visual effect

Visual effect	Magnitude
The Amended C3WF wind turbine would result in a major and prominent visual effect and introduce elements that contrast, or are not in character with the C3WF LVIA 2012 wind turbine.	High
The Amended C3WF wind turbine would result in a partial visual effect and introduce elements which may be prominent, but not completely out of character with the	Medium

Table 5 – Magnitude of visual effect

Visual effect	Magnitude
C3WF LVIA 2012 wind turbine.	
The Amended C3WF wind turbine would result in minor visual effects and introduce elements which are not prominent or out of character with the C3WF LVIA 2012 wind turbine.	Low
There would likely be 'no change' to the original C3WF LVIA 2012 visual effect.	Negligible

7.3 Visual effect matrix

Table 6 sets out the assessment of visual effects from residential dwellings up to 5 km from the C3WF. The locations of residential dwellings included in this Amended VIA are illustrated in **Figure 1**.

The criteria set out in **Table 5** are noted against each dwelling, with a visual effect rating determined against the matrix in **Table 6**.

The professional judgement and determination of visual effects are also informed by the site inspection works, photographic records and figures prepared for this Amended VIA. **Table 6** identifies individual residential dwellings, as well as groups of dwellings, where the determination of visual effect is expected to be the same.

Residential dwellings associated with hosting wind turbines for either the approved C2WF or proposed C3WF have not been included in the Visual Effects Matrix.

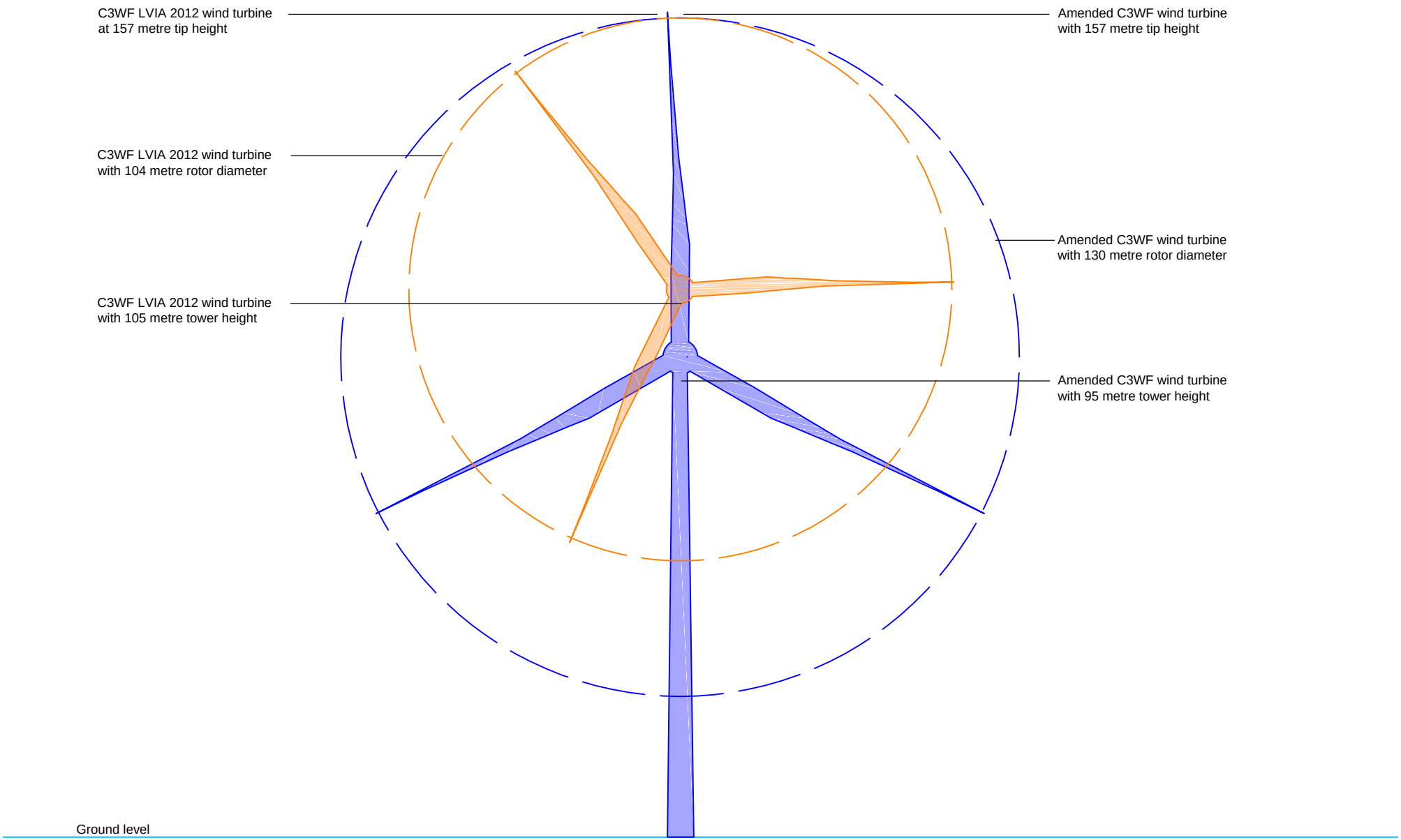

Figure 4 -
C3WF LVIA 2012 and Amended C3WF wind turbine comparison at 157 metre tip height

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Table 6 – Visual Effects Matrix (Refer **Figure 1** for residential receiver locations)

Receiver location/s	Category of receiver location	Approximate distance to closest amended C3WF wind turbine	Description and C3WF LVIA 2012 Rating	Potential change in magnitude of visual effects compared to visual impact rating of C3WF LVIA 2012
R1	Non associated residential dwelling	1.9 km	The observable scale of change would be partially limited by distance between the dwelling and closest Amended C3WF wind turbine. Views toward the C3WF LVIA 2012 wind turbines would be altered by the removal of two wind turbines (A26 and A27) within the C3WF south cluster closest to the dwelling. There would be very limited change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. **C3WF LVIA 2012 Rating: Moderate to High**	Low – resulting in no change to C3WF LVIA 2012 visual impact rating
Residential dwelling group R2 to R7	Non associated residential dwellings	2.5 km	The observable scale of change would be partially limited by distance between the dwelling and closest Amended C3WF wind turbine. Views toward the C3WF LVIA 2012 wind turbines would be altered by the removal of two wind turbines (A26 and A27) within the C3WF south cluster closest to the dwelling. There would be very limited change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. **C3WF LVIA 2012 Rating: Moderate to High**	Low – resulting in no change to C3WF LVIA 2012 visual impact rating

Table 6 – Visual Effects Matrix (Refer **Figure 1** for residential receiver locations)

Receiver location/s	Category of receiver location	Approximate distance to closest amended C3WF wind turbine	Description and C3WF LVIA 2012 Rating	Potential change in magnitude of visual effects compared to visual impact rating of C3WF LVIA 2012
R8 Narangi	Non associated residential dwelling	1.7 km	Any observable scale of change would be partially limited by distance between the dwelling and closest Amended C3WF wind turbine. Views toward the C3WF LVIA 2012 wind turbines would be altered by the removal of two wind turbines (A26 and A27) within the C3WF south cluster closest to the dwelling. There would be very limited change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. **C3WF LVIA 2012 Rating: High**	Low – resulting in no change to C3WF LVIA 2012 visual impact rating
R19 Wombat Hollow	Non associated residential dwelling	1.1 km	Any observable scale of change would be partially limited by distance between the dwelling and closest Amended C3WF wind turbine. Views toward the C3WF LVIA 2012 wind turbines would be altered by the removal of two wind turbines (A26 and A27) within the C3WF south cluster closest to the dwelling. There would be very limited change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. **C3WF LVIA 2012 Rating: High**	Low – resulting in no change to C3WF LVIA 2012 visual impact rating

Table 6 – Visual Effects Matrix (Refer **Figure 1** for residential receiver locations)

Receiver location/s	Category of receiver location	Approximate distance to closest amended C3WF wind turbine	Description and C3WF LVIA 2012 Rating	Potential change in magnitude of visual effects compared to visual impact rating of C3WF LVIA 2012
R20 Normaroo	Non associated residential dwelling	1.9 km	The observable scale of change would be limited by distance between the dwelling and closest Amended C3WF wind turbine. There would be very limited change in the composition or contrast between the Amended and LVIA 2012 wind turbines. Views toward the wind turbines would be largely screened and/or filtered by tree and shrub planting surrounding the dwelling. **C3WF LVIA 2012 Rating: Low to Moderate**	Low – resulting in no change to C3WF LVIA 2012 visual impact rating
R16 and Dwellings R20 to R40	Non associated residential dwellings	Around and in excess of 3.0 km	Any observable scale of change would be partially limited by distance between the dwelling and closest Amended C3WF wind turbine. There would be very limited change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. Views toward the C3WF wind turbines would be screened and/or filtered by tree and shrub planting surrounding a number of the dwellings. **C3WF LVIA 2012 Rating: Nil to Low and or Low to Moderate**	Low – resulting in no change to C3WF LVIA 2012 visual impact rating

Table 6 – Visual Effects Matrix (Refer **Figure 1** for residential receiver locations)

Receiver location/s	Category of receiver location	Approximate distance to closest amended C3WF wind turbine	Description and C3WF LVIA 2012 Rating	Potential change in magnitude of visual effects compared to visual impact rating of C3WF LVIA 2012
Residential dwelling group R49 to R52	Non associated residential dwellings	In excess of 4.0 km	Any observable scale of change would be partially limited by distance between the dwelling and closest Amended C3WF wind turbine. There would be very limited change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. Views toward the C3WF wind turbines would be screened and/or filtered by tree and shrub planting surrounding a number of the dwellings. **C3WF LVIA 2012 Rating: Low to Moderate**	Low – resulting in no change to C3WF LVIA 2012 visual impact rating
Residential dwellings R83, R84, R55 and R57	Non associated residential dwellings	Around and in excess of 3.0 km	Any observable scale of change would be partially limited by distance between the dwelling and closest Amended C3WF wind turbine. There would be very limited change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. Views toward the C3WF wind turbines would be screened and/or filtered by tree and shrub planting surrounding a number of the dwellings. **C3WF LVIA 2012 Rating: High**	Low – resulting in no change to C3WF LVIA 2012 visual impact rating

Table 6 – Visual Effects Matrix (Refer **Figure 1** for residential receiver locations)

Receiver location/s	Category of receiver location	Approximate distance to closest amended C3WF wind turbine	Description and C3WF LVIA 2012 Rating	Potential change in magnitude of visual effects compared to visual impact rating of C3WF LVIA 2012
R58, R59, R61 and R62 Woodhouselee Road	Non associated residential dwellings	1.5 km	Any observable scale of change would be partially limited by distance between the dwellings and closest Amended C3WF wind turbine. Views toward the C3WF LVIA 2012 wind turbines would be altered by the removal of the A23 wind turbine within the C3WF east cluster closest to the dwelling; however, there would be an overall limited change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. Views toward the C3WF wind turbines would be screened and/or filtered by tree and shrub planting surrounding some of the dwellings. **C3WF LVIA 2012 Rating: Moderate to High and High**	Low – resulting in no change to C3WF LVIA 2012 visual impact rating
R60 Pejar Park	Non associated residential dwelling	2.6 km	Any observable scale of change would be partially limited by distance between the dwelling and closest Amended C3WF wind turbine. There would be very limited change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. Views toward the C3WF wind turbines would be screened and/or filtered by tree and shrub planting surrounding the dwelling.	Low – resulting in no change to C3WF LVIA 2012 visual impact rating

Table 6 – Visual Effects Matrix (Refer **Figure 1** for residential receiver locations)

Receiver location/s	Category of receiver location	Approximate distance to closest amended C3WF wind turbine	Description and C3WF LVIA 2012 Rating	Potential change in magnitude of visual effects compared to visual impact rating of C3WF LVIA 2012
			C3WF LVIA 2012 Rating: Moderate	
R63 Rocky Corner	Non associated residential dwelling	1.0 km	Any observable scale of change would be partially limited by distance between the dwelling and closest Amended C3WF wind turbine. There would be very limited change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. Views toward the C3WF wind turbines would be partially screened and/or filtered by tree and shrub planting surrounding the dwelling. **C3WF LVIA 2012 Rating: High**	Low – resulting in no change to C3WF LVIA 2012 visual impact rating
R64 and R65 Valdarman Hill and Windalee	Non associated residential dwellings	1.3 km	Views toward the C3WF LVIA 2012 wind turbines would be altered by the removal of two wind turbines (A1 and A6) within the C3WF east cluster closest to the dwelling. There would be very limited change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. **C3WF LVIA 2012 Rating: High**	Low – resulting in no change to C3WF LVIA 2012 visual impact rating
R66 and R67	Non associated	1.0 km	There would be very limited change in the composition or contrast	Low – resulting in no

Table 6 – Visual Effects Matrix (Refer **Figure 1** for residential receiver locations)

Receiver location/s	Category of receiver location	Approximate distance to closest amended C3WF wind turbine	Description and C3WF LVIA 2012 Rating	Potential change in magnitude of visual effects compared to visual impact rating of C3WF LVIA 2012
Little Vale	residential dwellings		between the Amended C3WF wind turbines and the surrounding landscape. **C3WF LVIA 2012 Rating: Moderate and High**	change to C3WF LVIA 2012 visual impact rating
R68 to R70	Non associated residential dwellings	1.4 km	Views toward the C3WF LVIA 2012 wind turbines would be altered by the removal of two wind turbines (A1 and A6) within the C3WF east cluster closest to the dwelling. There would be very limited change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. **C3WF LVIA 2012 Rating: Low, Moderate and High**	Low – resulting in no change to C3WF LVIA 2012 visual impact rating
R71 to R74	Non associated residential dwellings	2.3 km	There would be very limited, if any, change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. **C3WF LVIA 2012 Rating: Nil and Low**	Low – resulting in no change to C3WF LVIA 2012 visual impact rating
Residential dwellings R91	Non associated residential	2.6 km	There would be very limited, if any, change in the composition or contrast between the Amended C3WF wind turbines and the	Low – resulting in no change to C3WF LVIA

Table 6 – Visual Effects Matrix (Refer **Figure 1** for residential receiver locations)

Receiver location/s	Category of receiver location	Approximate distance to closest amended C3WF wind turbine	Description and C3WF LVIA 2012 Rating	Potential change in magnitude of visual effects compared to visual impact rating of C3WF LVIA 2012
and R97	dwellings		surrounding landscape. **C3WF LVIA 2012 Rating: Nil and Low to Moderate**	2012 visual impact rating
Residential dwelling group R75 to R76, R81, R82, R109, R110 and R116	Non associated residential dwellings	3.5 km	There would be very limited, if any, change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. **C3WF LVIA 2012 Rating: Nil and Low**	Low – resulting in no change to C3WF LVIA 2012 visual impact rating
R104 Highland Park	Non associated residential dwelling	2.7 km	There would be very limited, if any, change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. **C3WF LVIA 2012 Rating: Nil and Low**	Low – resulting in no change to C3WF LVIA 2012 visual impact rating
R106 Rosedale	Non associated residential dwelling	1.9 km	There would be very limited, if any, change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape.	Low – resulting in no change to C3WF LVIA 2012 visual impact rating

Table 6 – Visual Effects Matrix (Refer **Figure 1** for residential receiver locations)

Receiver location/s	Category of receiver location	Approximate distance to closest amended C3WF wind turbine	Description and C3WF LVIA 2012 Rating	Potential change in magnitude of visual effects compared to visual impact rating of C3WF LVIA 2012
			C3WF LVIA 2012 Rating: Low	
Residential dwellings R99 to R114	Non associated residential dwellings	3.2 km	There would be very limited, if any, change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. **C3WF LVIA 2012 Rating: Nil to Low**	Low – resulting in no change to C3WF LVIA 2012 visual impact rating
R124	Non associated residential dwelling	4.6 km	The observable scale of change would be limited by distance between the dwelling and closest Amended C3WF wind turbine. Views toward the C3WF LVIA 2012 wind turbines would be altered by the removal of two wind turbines (A26 and A27) within the C3WF south cluster closest to the dwelling. There would be very limited change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. **C3WF LVIA 2012 Rating: Low**	Low – resulting in no change to C3WF LVIA 2012 visual impact rating
R128 and R129	Non associated residential	4.4 km	The observable scale of change would be limited by distance between the dwelling and closest Amended C3WF wind turbine. Views toward	Low – resulting in no change to C3WF LVIA

Table 6 – Visual Effects Matrix (Refer **Figure 1** for residential receiver locations)

Receiver location/s	Category of receiver location	Approximate distance to closest amended C3WF wind turbine	Description and C3WF LVIA 2012 Rating	Potential change in magnitude of visual effects compared to visual impact rating of C3WF LVIA 2012
	dwellings		the C3WF LVIA 2012 wind turbines would be altered by the removal of two wind turbines (A26 and A27) within the C3WF south cluster closest to the dwelling. There would be very limited change in the composition or contrast between the Amended C3WF wind turbines and the surrounding landscape. **C3WF LVIA 2012 Rating: Low to Moderate**	2012 visual impact rating

7.4 Summary of visual effects

The Visual Effects Matrix includes seventy four non associated residential dwellings located up to 5 km from an Amended C3WF wind turbine. The overall assessment of visual effects associated with the Amended C3WF is summarised as Negligible to Low. The scale of change in the wind turbine structures, whilst noticeable from proximate residential view locations would not result in a degree of change significantly above the visibility of the C3WF LVIA 2012 wind turbine.

7.5 Cumulative visual effects

As the Amended C3WF wind turbines are considered to result in low level visual effects, and introduce elements which are not prominent or out of character with the original C3WF LVIA 2012, the potential for the amended wind turbines to result in any additional significant cumulative visual effect is considered to be low.

A consideration of potential cumulative visual effects has been included in the Crookwell 3 Wind Farm LVIA 2012. The LVIA concluded that *'overall the Crookwell 3 wind farm is not considered to significantly increase the magnitude of visual impact for the majority of residential view locations within the Crookwell 3 wind farm 10km viewshed. The potential for the occurrence of 'direct' and 'indirect' cumulative visual impact is mitigated to a degree by the screening or partial filtering of views toward approved and existing wind farms'.*

'Potential 'sequential' views will occur along various sections of local roads, including the Goulburn Crookwell Road whilst travelling in north and southbound directions. Sequential views from local roads would be mitigated to some extent by undulating landform and tree cover alongside road corridors'.

A detailed assessment of cumulative visual effects has been undertaken for the proposed Crookwell 3 Wind Farm project and is presented in the LVIA Supplementary Report. The cumulative visual assessment considers the potential for cumulative visual effects on residential dwellings located within 2 km of the C3WF project. The overall assessment of Negligible to Low visual effect that is associated with the Amended C3WF is unlikely to increase the level of cumulative visual effect determined in the Crookwell 3 LVIA or the LVIA Supplementary Report.

Areas of theoretical intervisibility between the C3WF and the C2WF wind turbines are illustrated in **Figure 5**. This cumulative ZTV Diagram also illustrates areas where views would be restricted to either the Amended C3WF or the proposed C2WF Mod-2 wind turbines through landform screening. The cumulative ZTV Diagram illustrates areas of visibility similar to those illustrated in the Crookwell 3 Wind Farm LVIA (Figure 22) for the cumulative visual effects between the C3WF LVIA 2012 and the approved C2WF Mod-1 wind turbine layouts.

7.6 Night time obstacle lighting

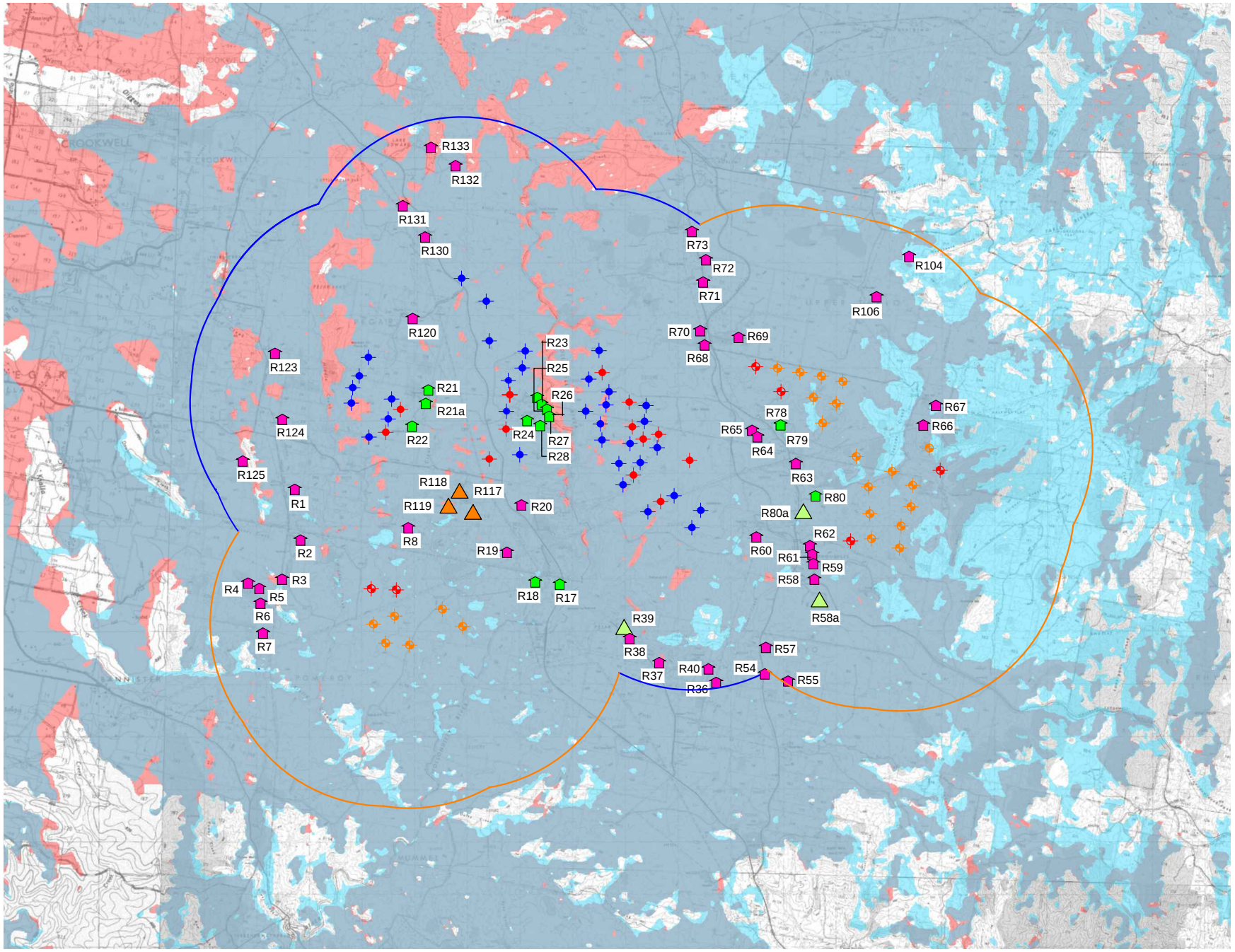
An Aeronautical Impact Assessment has been prepared for the Amended C3WF wind turbine layout. The assessment included a consideration of the need for hazard lighting and noted that the applicability of Civil Aviation Safety Authority (CASA) obstacle marking and lighting requirements '*is contingent on subsequent determination by CASA as to whether or not the wind farm constitutes a "hazard to aviation"* '.

The assessment has determined a wind turbine lighting design in the event that obstacle lighting is required. The lighting layout, illustrated in **Figure 6**, has recommended installation of obstacle lighting on twelve of the Amended C3WF wind turbines. The C3WF LVIA 2012 also recommended obstacle lighting on twelve of the proposed wind turbines.

The obstacle lights would be installed on the Amended C3WF wind turbine nacelles at the similar height as the C3WF LVIA 2012 wind turbine nacelles. The assessment also outlined generally accepted considerations regarding minimisation of visual impact associated with night time obstacle lighting. These are included as follows:

- To minimise the visual impact on the environment, some shielding of the obstacle lights is permitted, provided it does not compromise their operational effectiveness.
- Shielding may be provided to restrict the downward component of light to either, or both, of the following:
    - such that no more than 5% of the nominal intensity is emitted at or below 5 degrees below horizontal, and
    - such that no light is emitted at or below 10 degrees below horizontal.
- Where two lights are mounted on a nacelle, dynamic shielding or light extinction of one light at a time, for the period that a blade is passing in front of the light, is permissible, providing that at all times at least one light can be seen, without interruption, from every angle of azimuth.
- All obstacle lights on a wind farm should be synchronised so that they flash simultaneously.
- A relatively small area on the back of each blade near the rotor hub may be treated with a different colour or surface treatment, to reduce reflection from the rotor blades of light from the obstacle lights, without comprising the daytime conspicuity of the overall turbine.

As the Amended C3WF obstacle lighting would be located on the same number of wind turbines, and at the C3WF LVIA 2012 similar height, the overall potential for lighting to be visible at alternative locations would be limited.



Legend (ZTV Tips visible)

Theoretical areas from which an approved C2WF wind turbine may be visible to tip of blade

Theorectial area from which an Amended C3WF wind turbine may be visible to tip of blade

Theorectial area from which an approved C2WF and an Amended C3WF wind turbine may be visible to tip of blade

Legend

- Approved C2WF Mod-1 wind turbine subject to proposed Mod-2 (indicative location)
- C3WF LVIA 2012 wind turbine subject to Amendment (indicative location)
- Approved C2WF Mod-1or C3WF LVIA 2012 wind turbine to be removed (indicative location)
- Approximate 3km distance from proposed C2WF Mod-2 wind turbine
- Approximate 3km distance from Amended C3WF wind turbine
- C2WF or C3WF associated residential dwelling
- Non associated residential dwelling within 3km of Amended C3WF or proposed C2WF Mod-2 wind turbine
- Potential future dwelling location without DA lodged
- Non residential structure

Note Residential dwelling location are indicative only

0km 1.5km

Figure 5 - Cumulative ZTV Diagram

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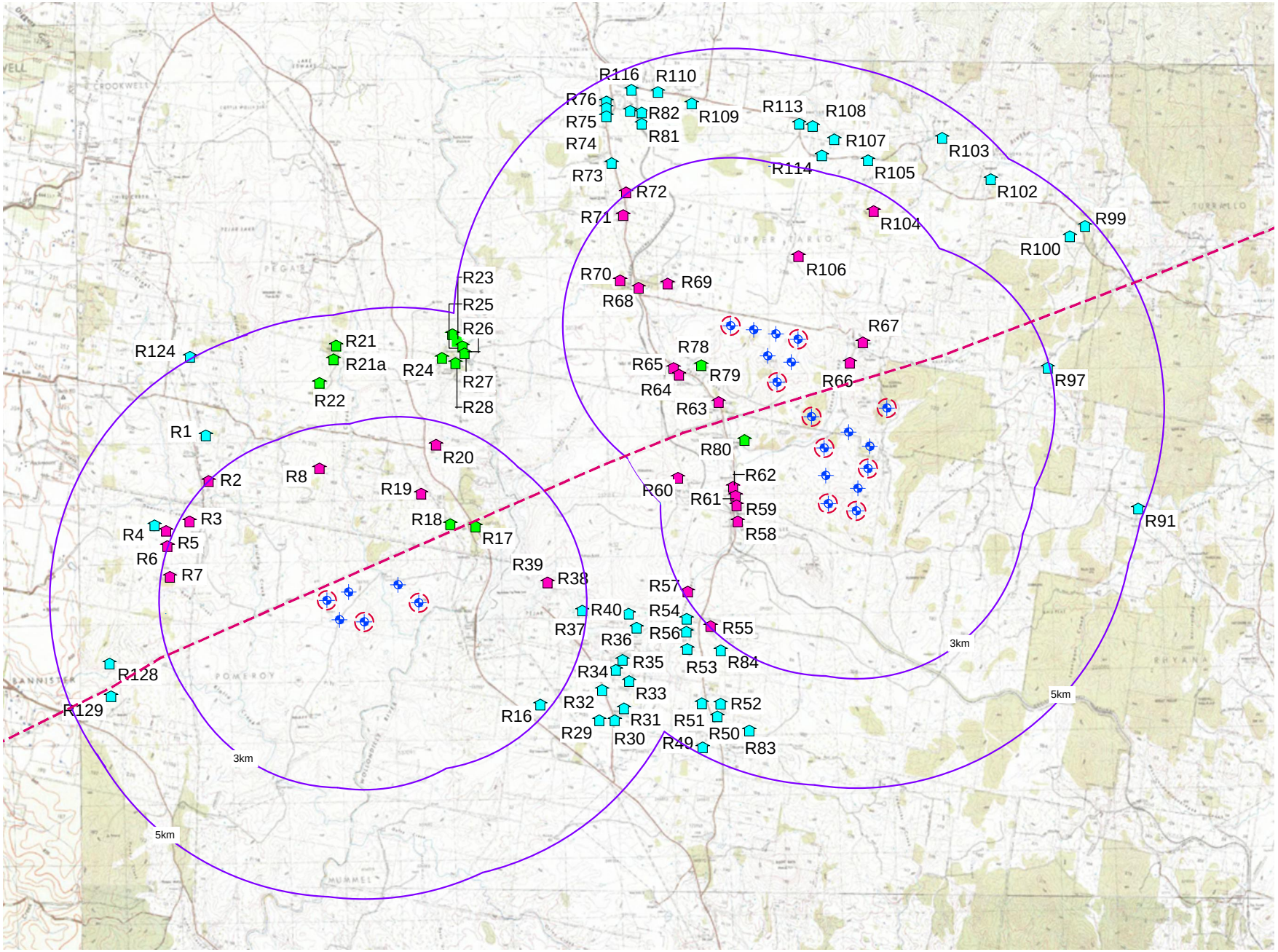

Legend

- Amended C3WF wind turbine with lighting (indicative location)
- Amended C3WF wind turbine layout (indicative location)
- C3WF LVIA 2012 wind turbine to be removed (indicative location)
- Associated C2WF and C3WF residential dwelling
- Non associated residential dwelling within 3km of Amended C3WF wind turbine
- Non associated residential dwelling between 3km and 5km of Amended C3WF wind turbine
- Existing 330kV transmission line

Note: All house locations are indicative only

0km 2km

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Figure 6 - C3WF Amended obstacle lighting

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8 Shadow flicker and blade glint

8.1 Shadow flicker

Due to their height, wind turbines can cast shadows on surrounding areas at a significant distance from the base of the wind turbine tower. Coupled with this, the moving blades create moving shadows. When viewed from a stationary position, the moving shadows appear as a flicker giving rise to the phenomenon of 'shadow flicker'. When the sun is low in the sky the length of the shadows increases, increasing the shadow flicker affected area around the wind turbine. A shadow flicker assessment may over estimate the actual number of annual hours of shadow flicker at a particular location due to a number of reasons including:

- the probability that the wind turbines would not face into or away from the sun all of the time
- the occurrence of cloud cover
- the amount of particulate matter in the atmosphere (moisture, dust, smoke etc…) which may diffuse sunlight
- the presence of vegetation and
- periods where the wind turbine may not be in operation due to low winds, or high winds or for operational or maintenance reasons.

The Amended C3WF Shadow Flicker Assessment determined that one non-associated residential dwelling (R66) would experience shadow flicker in excess of 30 hours per year.

The shadow flicker assessment also identified one associated residential dwelling within the site boundary would experience shadow flicker in excess of 30 hours per year.

Details of the shadow flicker assessment are included in the Addendum EIS main report.

8.2 Blade glint

The C2WF proposed Mod-2 Blade Glint Assessment determined that '*blade glint is not generally a problem for modern wind turbines, provided the blades are coated with a non-reflective paint*'.

9 Photomontages

9.1 Introduction

The photomontage locations have been selected to illustrate a range of key viewpoints from public road and residential dwellings with views toward the proposed C3WF project and other wind farm developments including the operational Crookwell 1 Wind Farm, the Gullen Wind Farm, the approved C2WF Mod-1 and proposed C2WF Mod-2.

The eight photomontage locations are illustrated in **Figure 7**, and the photomontages presented in **Figures 8a** to **15b**. In order to demonstrate potential cumulative visual effects, the C3WF photomontages also illustrate the approved C2WF Mod-1 and proposed Mod-2 wind turbines (including the approved Mod-1 wind turbines to be removed). Where visible the operational Crookwell 1 and Gullen Range wind turbines have also been captured in the photomontage photographs.

The photomontages illustrate the wind turbines with their individual identification numbers and include the C3WF and approved C2WF wind turbines to be removed, as well as those subject to the proposed Mod-2 amendments. A duplicate copy of each photomontage has also been provided without labels for clarity.

The photomontage locations include:

- Photomontage 1 (Figures 8a and 8b) from the Pejar Dam picnic area
- Photomontage 2 (Figures 9a and 9b) from Narangi residential dwelling
- Photomontage 3 (Figures 10a and 10b) from Dawson's Creek Road
- Photomontage 4 (Figures 11a and 11b) from Crookwell 1 Wind Farm lookout
- Photomontage 5 (Figures 12a and 12b) from Wombat Hollow residential dwelling
- Photomontage 6 (Figures 13a and 13b) from Valdarman Hill residential dwelling
- Photomontage 7 (Figures 14a and 14b) from Woodhouselee Road (south).
- Photomontage 8 (Figures 15a and 15b) from Woodhouselee Road (north).

9.2 Photomontage preparation

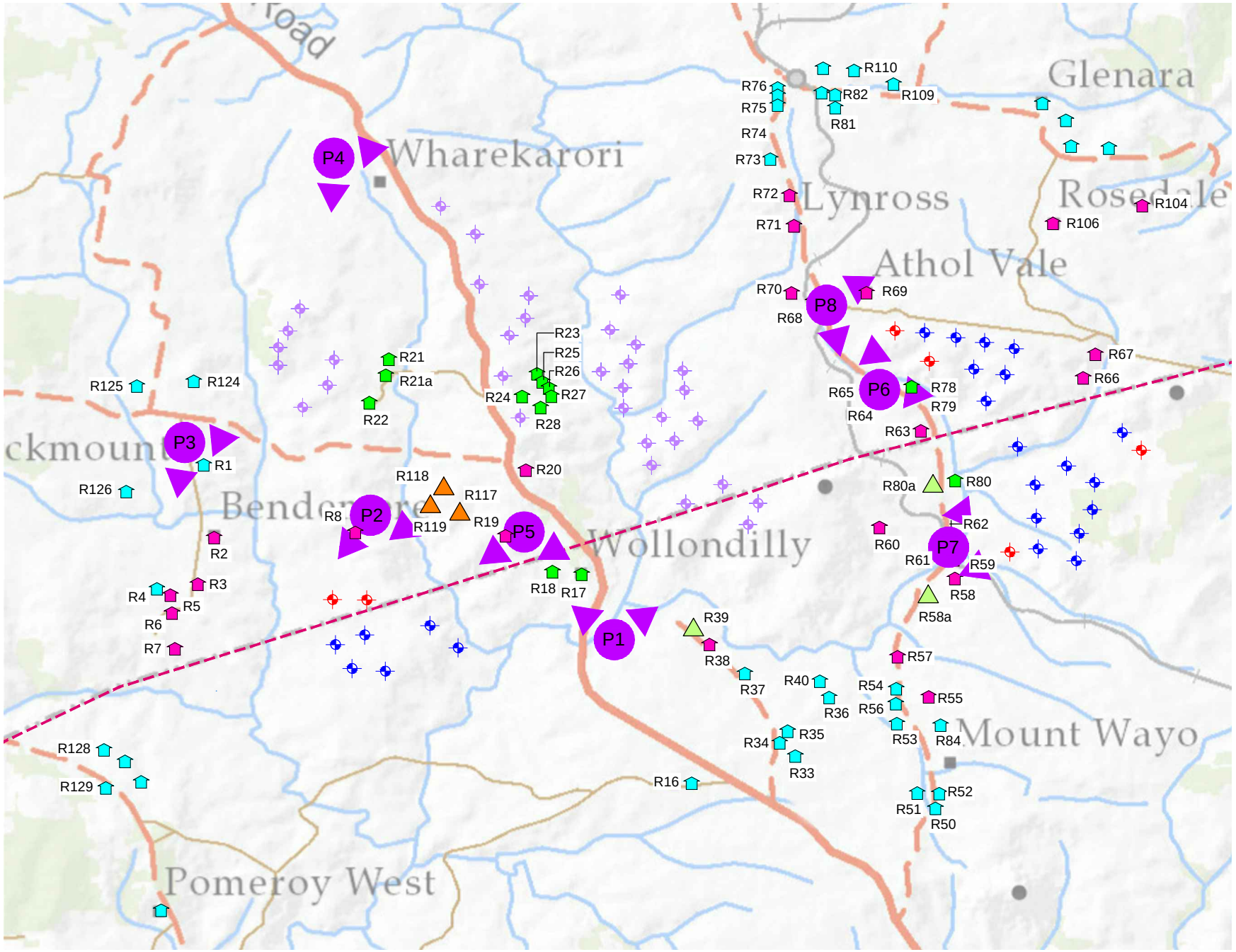
The photomontages have been prepared with regard to the general guidelines set out in the Scottish Natural Heritage (2006) Visual representation of windfarms: good practice guidance and British Landscape Institute Advice Note 01/11 (March 2011) Photography and photomontage in landscape and visual impact assessment.

Photography for the photomontages was undertaken by GBD using tripod mounted Nikon D700 a digital single-lens reflex (SLR) full frame sensor camera. A 50 mm focal length prime lens was attached to the Nikon D700 SLR camera.

The Nikon D700 has a full frame image censor (36 x 23.9 mm Nikon FX format), and when mounted with a 50mm lens results in a single photographic image with a view angle equivalent to a 35 mm SLR camera with a 50 mm lens. The 50 mm lens is commonly utilised, and cited in landscape and visual assessment manuals and

guidelines, for the preparation of landscape and visual assessment photomontages. Following site photography the photomontages were generated through the following steps:

- a digital terrain model (DTM) of the project site was created from a terrain model of the surrounding area using digital contours
- the site DTM was loaded in the DNV-GL 'WindFarmer' software package
- the layout of the wind farm and 3D representation of the wind turbine was configured in WindFarmer
- the location of each viewpoint (photo location) was configured in WindFarmer – the sun position for each viewpoint was configured by using the time and date of the photographs from that viewpoint
- the view from each photomontage location was then assessed in WindFarmer. This process requires accurate mapping of the terrain as modelled, with that as seen in the photographs. The photographs, taken from each photomontage location were loaded into WindFarmer and the visible turbines superimposed on the photographs
- the photomontage were adjusted using Photoshop CS3 to compensate for fogging due to haze or distance, as well as screening by vegetation or obstacles and
- the final image was converted to JPG format and imported and annotated as the final figure.



Legend

- Indicative photomontage location
- Amended C3WF wind turbine layout (indicative location)
- C3WF LVIA 2012 wind turbine to be removed (indicative location)
- Approved C2WF Mod-1 wind turbine subject to Mod-2 (indicative layout)
- Associated C2WF and C3WF residential dwelling
- Non associated residential dwelling within 3km of an Amended C3WF wind turbine
- Non associated residential dwelling between 3km and 5km of an Amended C3WF wind turbine
- Potential future dwelling location without DA lodged
- Non residential structure
- Existing 330kV transmission line

Note Residential dwelling location are indicative only

0km 1.5km

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Figure 7 Amended C3WF photomontage location

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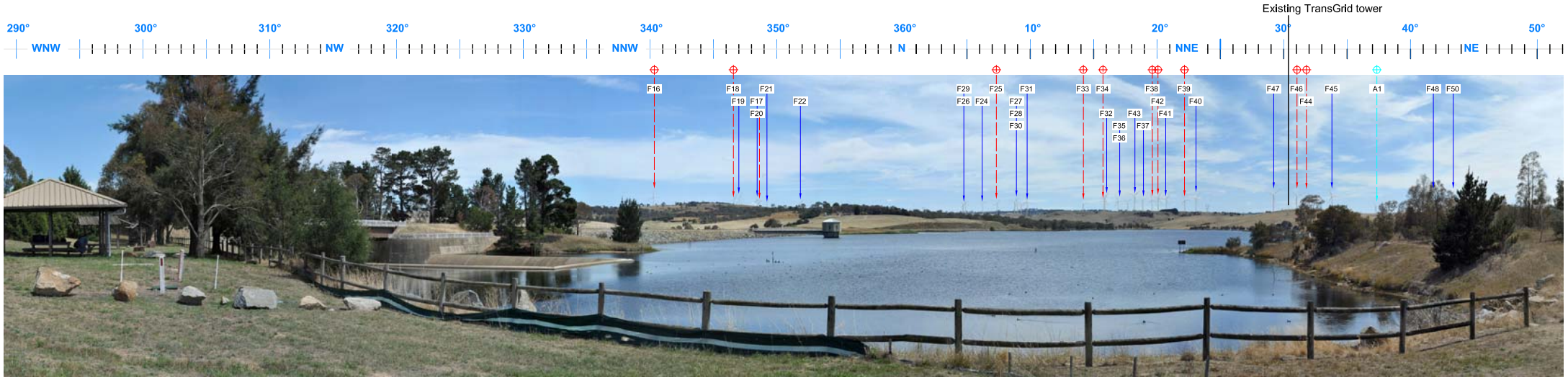
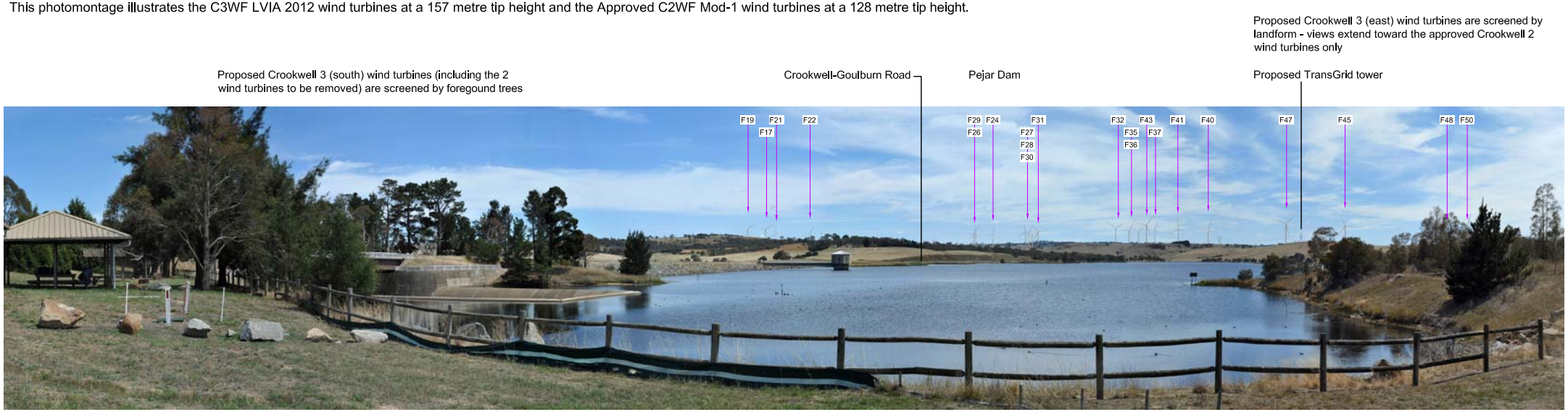


Photomontage 1a Pejar Dam picnic area - View looking west north west from the Pejar Dam picnic area toward the C3WF LVIA 2012 and Approved C2WF Mod-1 wind turbines.
This photomontage illustrates the C3WF LVIA 2012 wind turbines at a 157 metre tip height and the Approved C2WF Mod-1 wind turbines at a 128 metre tip height.



Photomontage 1b Pejar Dam picnic area - View looking west north west from the Pejar Dam picnic area toward the Amended C3WF and the proposed C2WF Mod-2 wind turbines.
This photomontage illustrates the Amended C3WF wind turbines at a 157 metre tip height.

C3WF LVIA 2012 and Amended wind turbine

C3WF LVIA 2012 wind turbine to be removed

Approved C2WF Mod-1 wind turbine

Approved C2WF Mod-1 wind turbine to be removed

Approved C2WF wind turbine subject to Mod-2

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Figure 8a - Photomontage 1
Pejar Dam picnic area including wind turbine identification labels

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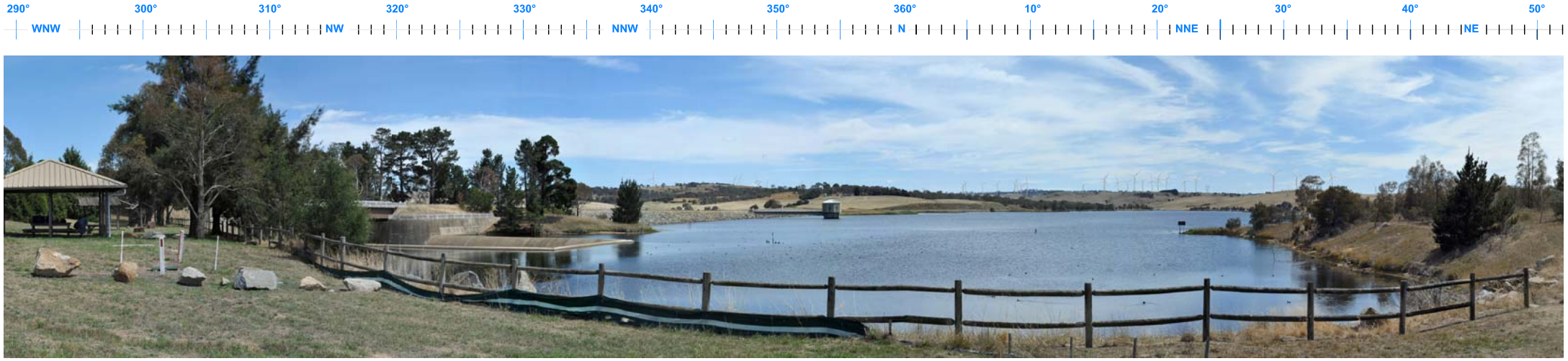

Photomontage 1c Pejar Dam picnic area - View looking west north west from the Pejar Dam picnic area toward the C3WF LVIA 2012 and Approved C2WF Mod-1 wind turbines.
This photomontage illustrates the C3WF wind turbines at a 157 metre tip height.

Photomontage 1d Pejar Dam picnic area - View looking west north west from the Pejar Dam picnic area toward the Amended C3WF and the proposed C2WF Mod-2 wind turbines.
This photomontage illustrates the Amended C3WF wind turbines at a 157 metre tip height.

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Figure 8b - Photomontage 1
Pejar Dam picnic area without
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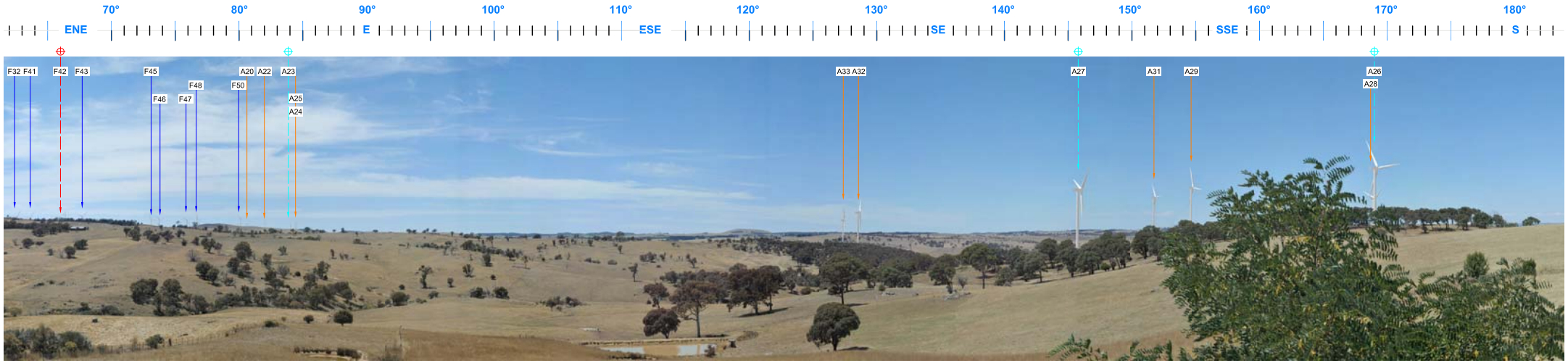
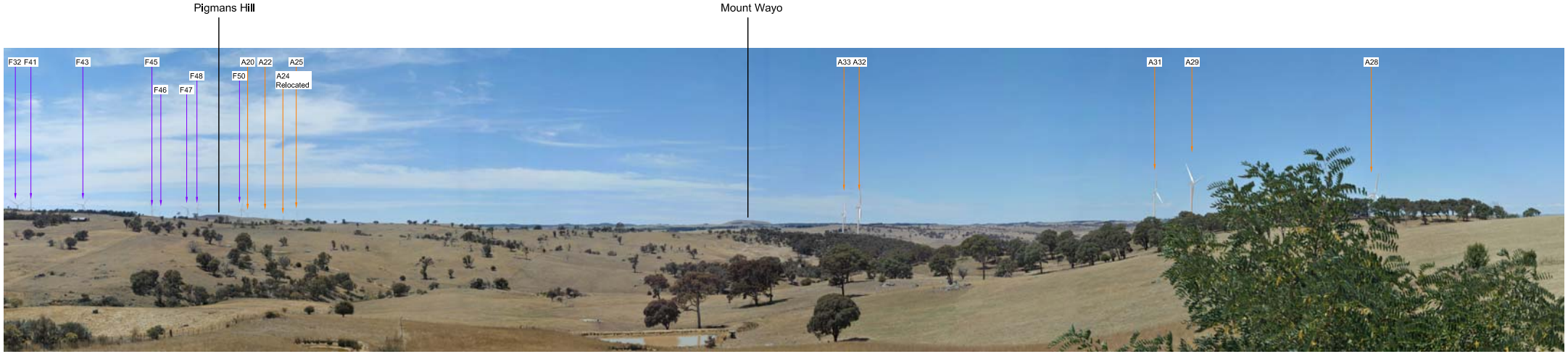


Photomontage 2a Nerangi dwelling - View looking east north east to south from Narangi dwelling toward the C3WF LVIA 2012 and Approved C2WF Mod-1wind turbines.
This photomontage illustrates the C3WF wind turbines at a 157 metre tip height and the Approved C2WF Mod-1 wind turbine layout at a 128 metre tip height.



Photomontage 2b Nerangi dwelling - View looking east north east to south from the Narangi dwelling toward the Amended C3WF and the proposed C2WF Mod-2 wind turbines.
This photomontage illustrates the Amended C3WF wind turbines at a 157 metre tip height.

C3WF LVIA 2012 and Amended wind turbine

C3WF LVIA 2012 wind turbine to be removed

Approved C2WF Mod-1 wind turbine

Approved C2WF Mod-1 wind turbine to be removed

Approved C2WF wind turbine subject to Mod-2

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Figure 9a - Photomontage 2
Narangi dwelling including
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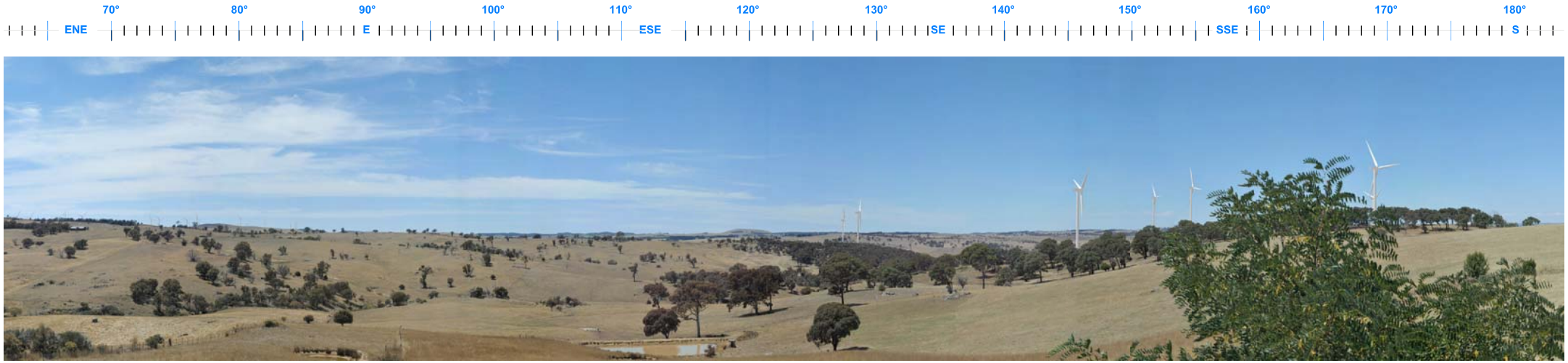

Photomontage 2c Nerangi dwelling - View looking east north east to south from Narangi dwelling toward the C3WF LVIA 2012 and Approved C2WF Mod-1 wind turbines.
This photomontage illustrates the C3WF LVIA 2012 wind turbines at a 157 metre tip height.

Photomontage 2d Nerangi dwelling - View looking east north east to south from the Narangi dwelling toward the Amended C3WF and the proposed C2WF Mod-2 wind turbines.
This photomontage illustrates the Amended C3WF wind turbines at a 157 metre tip height.

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Figure 9b - Photomontage 2
Narangi dwelling without
wind turbine identification labels

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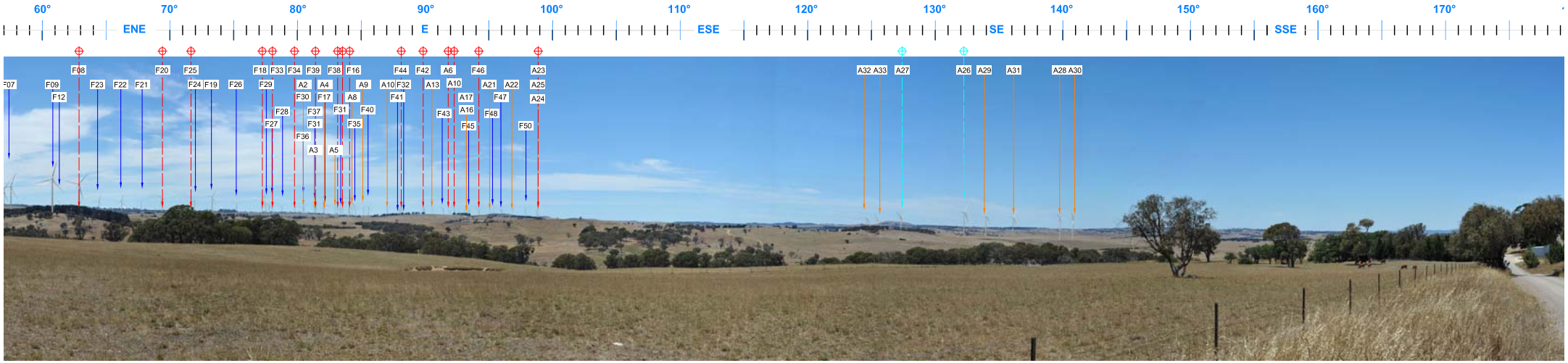

Photomontage 3a Dawsons Creek Road - View looking east north east to south from Dawsons Creek Road toward the C3WF LVIA 2012 and the Approved C2WF Mod-1 wind turbines.
This photomontage illustrates the C3WF LVIA 2012 wind turbines at a 157 metre tip height and the Approved C2WF Mod-1 wind turbines at 128 metre tip height.

Photomontage 3b Dawsons Creek Road - View looking east north east to south from Dawsons Creek Road toward the Amended C3WF and proposed C2WF Mod-2 wind turbines.
This photomontage illustrates the Amended C3WF wind turbines at a157 metre tip height.

C3WF LVIA 2012 and Amended wind turbine

C3WF LVIA 2012 wind turbine to be removed

Approved C2WF Mod-1 wind turbine

Approved C2WF Mod-1 wind turbine to be removed

Approved C2WF wind turbine subject to Mod-2

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Figure 10a - Photomontage 3
Dawsons Creek Road including wind turbine identification labels

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Photomontage 3c Dawsons Creek Road - View looking east north east to south from Dawsons Creek Road toward the C3WF LVIA 2012 and the Approved C2WF Mod-1 wind turbines.
This photomontage illustrates the C3WF LVIA 2012 wind turbines at a 157 metre tip height.

Photomontage 3d Dawsons Creek Road - View looking east north east to south from Dawsons Creek Road toward the Amended C3WF and the proposed C2WF Mod-2 wind turbines.
This photomontage illustrates the Amended C3WF wind turbine layout at a157 metre tip height.

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Figure 10b - Photomontage 3
Dawsons Creek Road without
wind turbine identification labels

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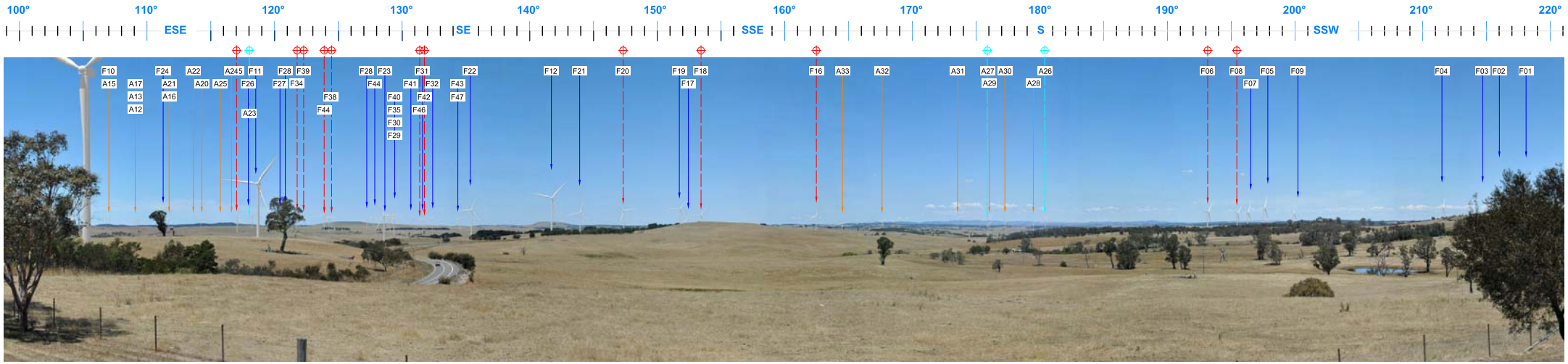
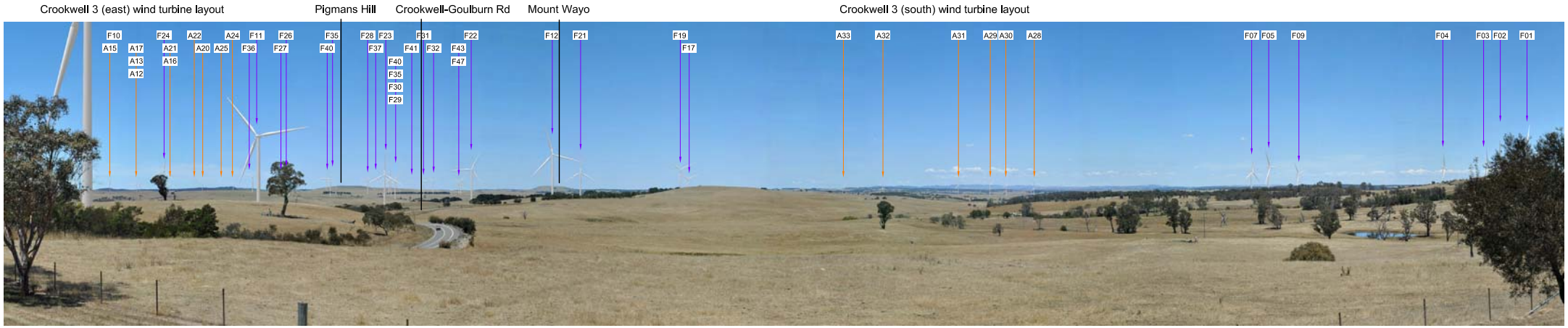


Photomontage 4a Crookwell 1 Wind Farm lookout - View east south east to south south west from Crookwell 1 Wind Farm lookout toward the C3WF LVIA 2012 and the Approved C2WF Mod-1 wind turbines.
This photomontage illustrates the C3WF LVIA 2012 wind turbines at a 157 metre tip height.



Photomontage 4b Crookwell 1 Wind Farm lookout - View east south east to south south west from Crookwell 1 Wind Farm lookout toward the Amended C3WF and proposed C2WF Mod-2 wind turbines.
This photomontage illustrates the Amended C3WF wind turbines at a 157 metre tip height.

C3WF LVIA 2012 and Amended wind turbine

C3WF LVIA 2012 wind turbine to be removed

Approved C2WF Mod-1 wind turbine

Approved C2WF Mod-1 wind turbine to be removed

Approved C2WF wind turbine subject to Mod-2

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Figure 11a - Photomontage 4 Crookwell 1 Wind Farm lookout area including wind turbine identification labels

Photomontage 4c Crookwell 1 Wind Farm lookout - View east south east to south south west from Crookwell 1 Wind Farm lookout toward the C3WF LVIA 2012 and the Approved C2WF Mod-1 wind turbines.
This photomontage illustrates the C3WF LVIA 2012 wind turbines at a 157 metre tip height.

Photomontage 4d Crookwell 1 Wind Farm lookout - View east south east to south south west from Crookwell 1 Wind Farm lookout toward the Amended C3WF and proposed C2WF Mod-2 wind turbines.
This photomontage illustrates the Amended C3WF wind turbines at a 157 metre tip height.

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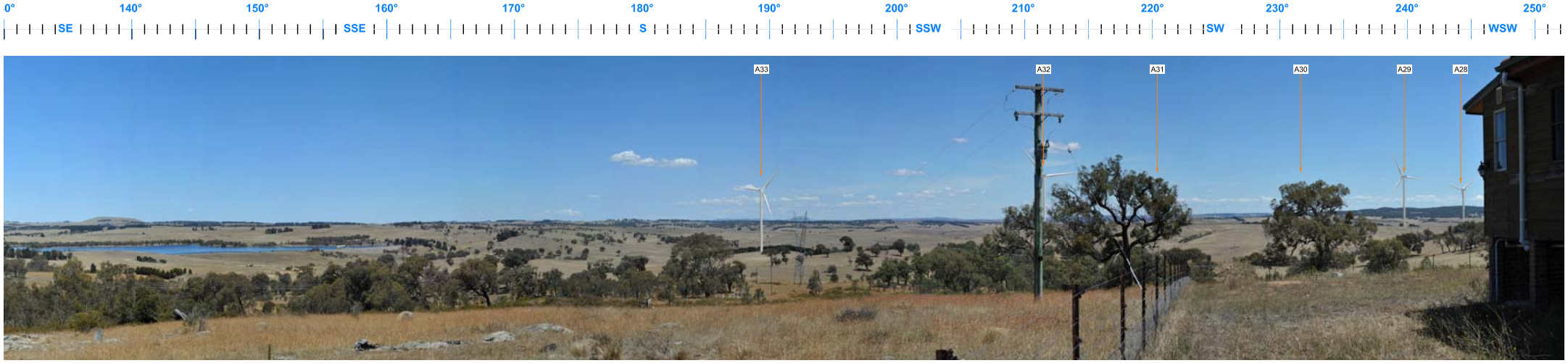
Figure 11b - Photomontage 4
Crookwell 1 Wind Farm lookout area
without wind turbine identification
labels



Photomontage 5a Wombat Hollow dwelling - View south east to west south west from Wombat Hollow dwelling toward the C3WF LVIA 2012 (south) wind turbines.
This photomontage illustrates the C3WF LVIA 2012 (south) wind turbines at a 157 metre tip height.

Photomontage 5b Wombat Hollow dwelling - View south east to west south west from Wombat Hollow dwelling toward the Amended C3WF (south) wind turbines.
This photomontage illustrates the Amended C3WF (south) wind turbines at a 157 metre tip height.

C3WF LVIA 2012 and Amended wind turbine

C3WF LVIA 2012 wind turbine to be removed

Approved C2WF Mod-1 wind turbine

Approved C2WF Mod-1 wind turbine to be removed

Approved C2WF wind turbine subject to Mod-2

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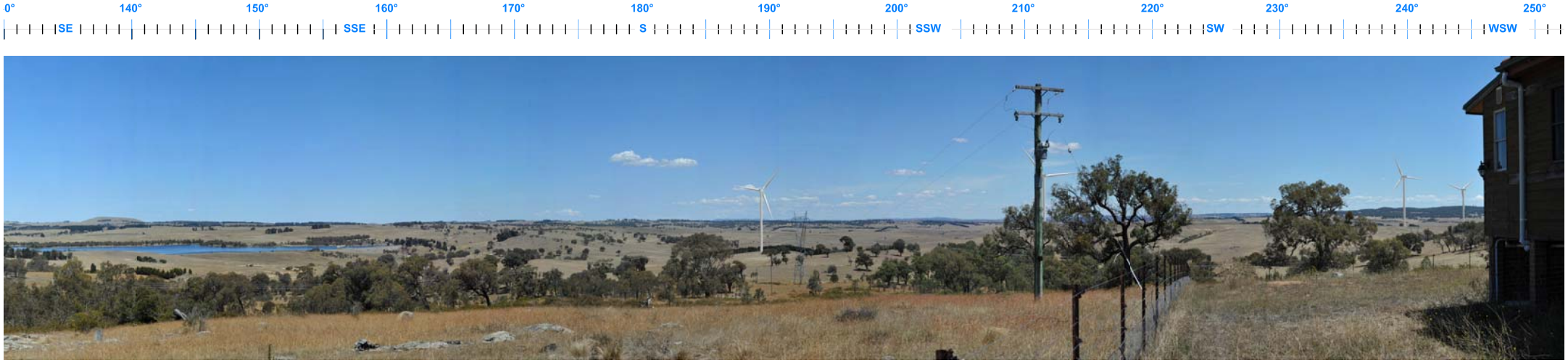
Figure 12a - Photomontage 5
Wombat Hollow dwelling including wind turbine identification labels



Photomontage 5c Wombat Hollow dwelling - View south east to west south west from Wombat Hollow dwelling toward the C3WF LVIA 2012 (south) wind turbines.
This photomontage illustrates the C3WF LVIA 2012 (south) wind turbines at a 157 metre tip height.

Photomontage 5d Wombat Hollow dwelling - View south east to west south west from Wombat Hollow dwelling toward the Amended C3WF (south) wind turbines.
This photomontage illustrates the Amended C3WF (south) wind turbines at a 157 metre tip height.

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Figure 12b - Photomontage 5
Wombat Hollow dwelling without
wind turbine identification labels

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Photomontage 6a Valdarman Hill dwelling - View north north east to south east from Valdarman Hill dwelling toward the C3WF LVIA 2012 (east) wind turbines.
This photomontage illustrates the C3WF LVIA 2012 (east) wind turbines at a 157 metre tip height and the C3WF LVIA 2012 wind turbines to be removed.

Photomontage 6b Valdarman Hill dwelling - View north north east to south east from Valdarman Hill dwelling toward the amended C3WF (east) wind turbine layout.
This photomontage illustrates the ameded C3WF wind turbine layout at the 157 metre tip height.

C3WF LVIA 2012 and Amended wind turbine

C3WF LVIA 2012 wind turbine to be removed

Approved C2WF Mod-1 wind turbine

Approved C2WF Mod-1 wind turbine to be removed

Approved C2WF wind turbine subject to Mod-2

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Figure 13a - Photomontage 6 Valdarman Hill dwelling including wind turbine identification labels

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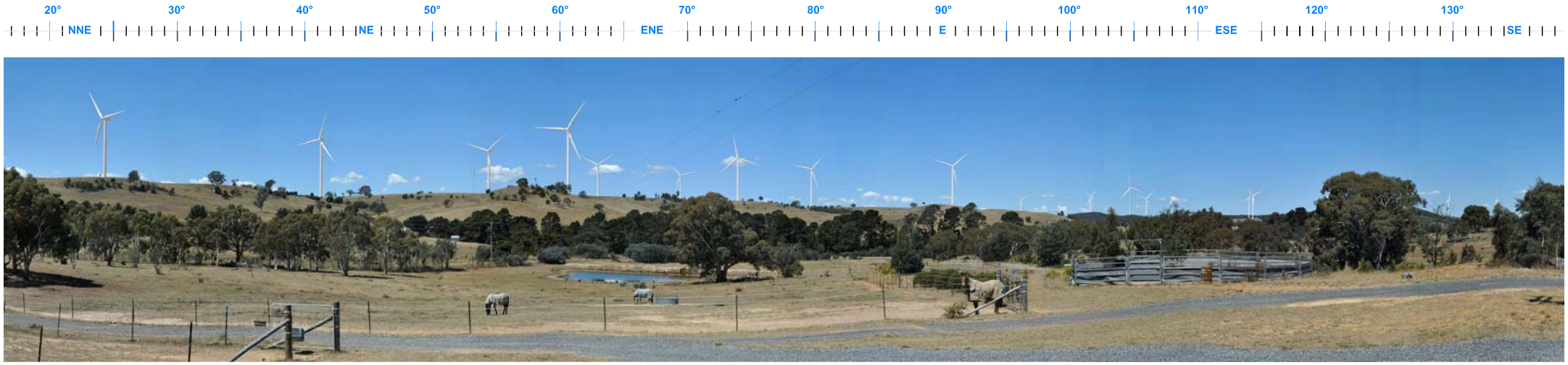

Photomontage 6c Valdarman Hill dwelling - View north north east to south east from Valdarman Hill dwelling toward the C3WF LVIA 2012 (east) wind turbines.
This photomontage illustrates the C3WF LVIA 2012 (east) wind turbines at the 157 metre tip height and the C3WF LVIA 2012 wind turbines to be removed.

Photomontage 6d Valdarman Hill dwelling - View north north east to south east from Valdarman Hill dwelling toward the Amended C3WF (east) wind turbines.
This photomontage illustrates the C3WF wind turbines at a 157 metre tip height.

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Figure 13b - Photomontage 6
Valdarman Hill dwelling without
wind turbine identification labels

Photomontage 7a Woodhouselee Road - View north north west to east from Woodhouselee Road toward the C3WF LVIA 2012 (east) wind turbines.
This photomontage illustrates the C3WF LVIA 2012 (east) wind turbines at a157 metre tip height and the C3WF LVIA 2012 (east) wind turbines to be removed.

Photomontage 7b Woodhouselee Road - View north north west to east from Woodhouselee Road toward the Amended C3WF (east) wind turbines.
This photomontage illustrates the Amended C3WF (east) wind turbines at a 157 metre tip height.

C3WF LVIA 2012 and Amended wind turbine

C3WF LVIA 2012 wind turbine to be removed

Approved C2WF Mod-1 wind turbine

Approved C2WF Mod-1 wind turbine to be removed

Approved C2WF wind turbine subject to Mod-2

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Figure 14a - Photomontage 7 Woodhouselee Road including wind turbine identification labels

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Photomontage 7c Woodhouselee Road - View north north west to east from Woodhouselee Road toward the C3WF LVIA 2012 (east) wind turbines.
This photomontage illustrates the C3WF LVIA 2012 (east) wind turbines at a 157 metre tip height and the C3WF LVIA 2012 (east) wind turbines to be removed.

Photomontage 7d Woodhouselee Road - View north north west to east from Woodhouselee Road toward the Amended C3WF (east) wind turbines.
This photomontage illustrates the Amended C3WF wind turbine layout at a 157 metre tip height.

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Figure 14b - Photomontage 7
Woodhouselee Road without wind
turbine identification labels

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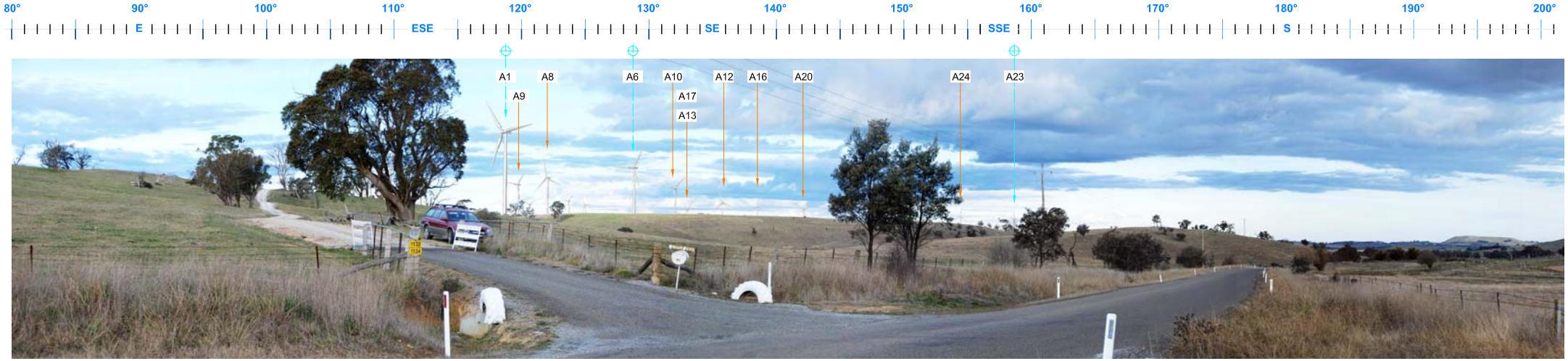
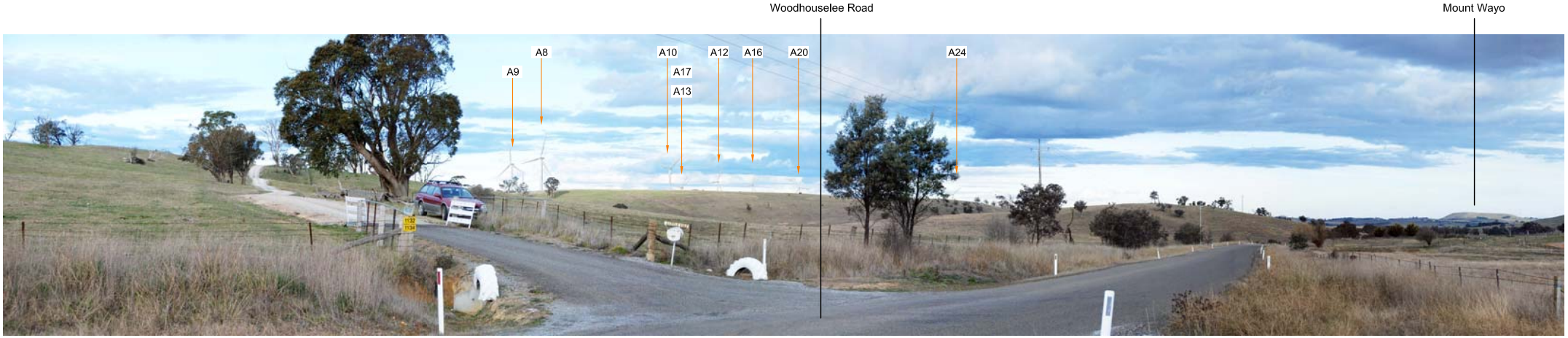


Photomontage 8a Woodhouselee Road - View east to south south west from Woodhouselee Road toward the C3WF LVIA 2012 (east) wind turbine layout.
This photomontage illustrates the C3WF LVIA 2012 (east) wind turbine layout at a 157 metre tip height.



Photomontage 8b Woodhouselee Road - View east to south south west from Woodhouselee Road toward the Amended C3WF (east) wind turbines.
This photomontage illustrates the Amended C3WF (east) wind turbines at a 157 metre tip height.

C3WF LVIA 2012 and Amended wind turbine

C3WF LVIA 2012 wind turbine to be removed

Approved C2WF Mod-1 wind turbine

Approved C2WF Mod-1 wind turbine to be removed

Approved C2WF wind turbine subject to Mod-2

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Figure 15a - Photomontage 8
Woodhouselee Road including
wind turbine identification labels

Photomontage 8c Woodhouselee Road - View east to south south west from Woodhouselee Road toward the C3WF LVIA 2012 (east) wind turbines.
This photomontage illustrates the C3WF LVIA 2012 (east) wind turbines at a 157 metre tip height.

Photomontage 8d Woodhouselee Road - View east to south south west from Woodhouselee Road toward the Amended C3WF (east) wind turbines.
This photomontage illustrates the Amended C3WF (east) wind turbines at a 157 metre tip height.

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Figure 15b - Photomontage 8
Woodhouselee Road without
wind turbine identification labels

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10 Conclusion

The determination for a potential change to visual effects associated with the amended C3WF has been based upon a professional judgement in consideration of:

- the proposed amendments to the wind turbine layout
- the removal of up to seven C3WF LVIA 2012 wind turbines
- the overall visibility and visual scale of the Amended C3WF wind turbines and
- the amended C3WF wind turbine magnitude of visual effect compared to the C3WF LVIA 2012 wind turbines.

This Amended VIA has illustrated the C3WF LVIA 2012 against the Amended C3WF wind turbine design and concludes that the removal of up to seven C3WF LVIA 2012 wind turbines, including wind turbines within proximity to residential dwellings adjoining the Woodhouselee Road corridor, would not result in any significant reduction in overall wind turbine visibility for key non associated residential dwellings surrounding the C3WF development and for motorists travelling along local roads.

Whilst the removal of up to the seven wind turbines would reduce the proximity of wind turbines to residential dwellings, and in some areas has removed the wind turbine that dominated part of the view, the remaining wind turbines would tend to dominate views from a small number of residential dwelling locations.

Given that the C3WF LVIA 2012 wind turbine tip height at 157m is not proposed to be changed by the Amended C3WF wind turbines, the majority of people at residential dwellings surrounding the Amended C3WF project would experience no significant change in visual effect between the C3WF LVIA 2012 and the Amended C3WF wind turbines.