



Amendment to Berrybank Wind Farm

Expert Evidence Statement of Hayden Burge

FINAL

0124589 RPT2FINAL

November 2017



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Approved by: Hayden Burge
Position: *Principal Landscape Architect*
Signed:

A handwritten signature in black ink, appearing to be 'HB' followed by a stylized flourish.

Date: 9 November 2017

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1 INTRODUCTION

Berrybank Development Pty Ltd (BDPL) seeks to amend the Permits and Endorsed Plans for the Berrybank Wind Farm to amongst other things remove turbines, increase the overall turbine height and micro-siting.

A Planning Permit was issued on the 24th August 2010 for the use and development of a wind energy facility comprising 99 wind turbines and associated facilities. This layout is referred to as the Approved Layout.

In 2013, the approved layout was altered by the removal of four turbines and to allow for micro-siting of the remaining 95 turbines. All micro-siting was conducted within the permissible micro-siting envelope within the Planning Permit. This layout formed the basis of the endorsed plans dated 19th August 2013. This layout is referred to as the Endorsed layout.

1.1 Summary of proposed amendments

The proposed amendments to the Endorsed layout for the Berrybank Wind Farm relevant to landscape and visual impacts include:

- Increase the overall wind turbine height from 131 m to 180 m.
- Removal of a further 16 turbines.
- Turbine micro-siting within the approved 100 m micro-siting envelope.
- Aviation Obstacle Lighting, and
- Adjustments to access tracks for turbine removal and micro-siting.

1.2 Expert Evidence – Practice Note

I acknowledge that I have read and complied with the Guide to Expert Evidence (dated April 2015). In compliance with this Guide I provide the following information.

1.2.1 Name & address

Hayden Burge
Environmental Resources Management Australia Pty Ltd (ERM)
Level 6, 99 King Street
Melbourne, Victoria 3000

1.2.2 Qualifications

I am a registered Landscape Architect with over 15 years' experience. I have a Bach. Applied Science (Landscape Architecture and Urban Design) from RMIT (2000) and I am a member of the Australian Institute of Landscape Architects and the Planning Institute of Australia.

A Curriculum Vita is attached in Annex A of this report.

1.2.3 The facts, matters and assumptions on which the opinions expressed in this report are based

The facts, matters and assumptions on which the opinions in this report are based, include turbine dimensions and wind farm layout (locations and deletions).

These were provided by Berrybank Development Pty Ltd.

I have received a copy of the submissions received in relation to the proposed amendment.

1.2.4 Site Inspections

I have visited the site and surrounding districts on several occasions. The most recent prior to preparing this evidence was on Thursday 5th October, 2017.

1.2.5 Instructions

I have been instructed by Herbert Smith Freehills acting on behalf of Berrybank Development Pty Ltd to:

- review the Amendment Application as relevant to visual impacts for the Berrybank Wind Farm;
- respond to submissions which raise issues concerning landscape and / or visual impact; and
- prepare this Expert Witness Statement.

My instructions are attached to the Statement in Annex B.

1.2.6 People assisting with this report

Photomontages on which part of this evidenced is based was prepared by Mr Madhu Lakshmanan of ERM and Mrs Alexandra Elliott. The photomontages have been prepared in accordance with ERM's photomontage methodology. I was involved in the development of the methodology and have applied it to many projects. For clarity, the photomontage methodology is described in section 5.4 **Photomontage preparation**.

1.2.7 Declaration

I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel.

Corrections from LVIA March 2017:

- Co-ordinates for VP BB04 stated incorrectly, however they were correct on the photomontage set.
- Figure 7.9 Turbine Height for BB04 should be 180m not 117m (hub height).

2 PROPOSED AMENDMENTS

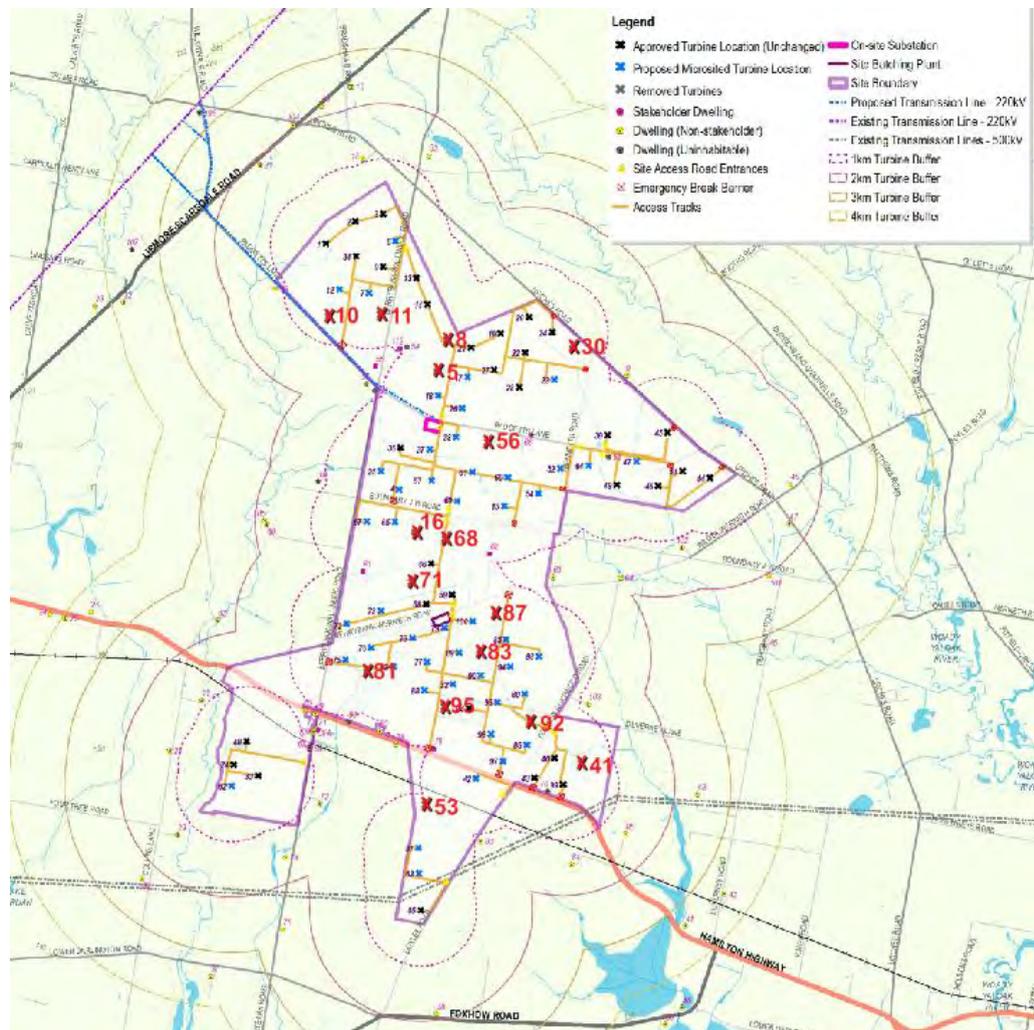
This section describes the proposed amendments to Berrybank Wind Farm that were assessed by the Landscape and Visual Impact Assessment (LVIA) in the amendment application.

As mentioned above, the proposed amendments seek to remove up to 16 turbines, increase the overall turbine height and micro-site several of the remaining turbines.

2.1 Turbine Removal

Sixteen turbines are proposed to be removed by the Amended Layout (Turbines 5, 8, 10, 11, 16, 30, 41, 53, 56, 68, 71, 81, 83, 87, 92 and 95). The location of deleted turbines is shown in Figure 2.1.

Figure 2.1 Deleted turbines



2.2 Turbine Micro-siting

Table 2-1 shows the co-ordinates of the turbines for the 2010 Approved Layout (left), the 2013 Endorsed Layout (centre) and the co-ordinates of those turbines that are proposed to be micro sited by this amendment. The 19 turbines deleted in 2013 and by this amendment are shown in dark blue.

The right hand columns show the distance in meters of the proposed turbine micro-siting and direction of travel. All micro-siting is within the allowable 100 m micro-siting buffer of the 2010 approved turbine layout.

Table 2-1 Turbine amendments

Turbine ID	Approved Locations 24th August 2010		Endorsed Locations 30th April 2013		Amendment		Movement From Permitted Layout (m)	Comments (Direction From Original)
	Eastings GDA94 (m)	Northings GDA94 (m)	Eastings GDA94 (m)	Northings GDA94 (m)	Eastings GDA94 (m)	Northings GDA94 (m)		
1	718652	5802179	718723	5802176	718723	5802176	71	East
2	719235	5802626	719252	5802580	719252	5802580	49	South-East
3	719733	5802777	719751	5802721	719751	5802721	59	South-East
4	719936	5797730	720024	5797726	720031	5797730	95	East
5								REMOVED 2015
6	719874	5802200	719878	5802241	719967	5802221	95	North-East
7	719492	5801285	719461	5801353	719492	5801285	0	~
8								REMOVED 2015
9	719732	5801689	719747	5801765	719747	5801765	77	North
10								REMOVED 2015
11								REMOVED 2015
12	718962	5801349	718972	5801428	718962	5801349	0	~
13	720348	5801559	720348	5801559	720348	5801559	0	~
14	720538	5801008	720545	5801081	720545	5801081	73	North
15	721874	5797354	721790	5797395	721921	5797435	94	North-East
16								REMOVED 2015
17	721257	5799665	721257	5799665	721258	5799760	95	North
18	720639	5799429	720639	5799429	720733	5799429	94	East
19	721859	5800552	721859	5800552	721859	5800552	0	~
20	722425	5800859	722364	5800847	722364	5800847	62	West
21	721248	5800291	721322	5800299	721322	5800299	74	East
22	722296	5800211	722296	5800211	722296	5800211	0	~
23	722885	5799651	722795	5799662	722817	5799718	95	North-West
24	722859	5800594	722780	5800575	722780	5800575	81	West
25	719616	5798063	719616	5798063	719710	5798063	94	East
26	721074	5799204	721074	5799204	721169	5799204	95	East
27	721740	5799891	721740	5799891	721740	5799891	0	~
28	722189	5799497	722175	5799582	722189	5799582	85	North
29								REMOVED 2013
30								REMOVED 2015
31	720422	5791181	720387	5791193	720387	5791255	82	North-West
32	721000	5794218	720956	5794268	721000	5794218	0	~
33	717508	5792561	717508	5792561	717508	5792561	0	~
34	719266	5801952	719239	5802012	719266	5801952	0	~
35								REMOVED 2013
36	719980	5798538	720052	5798486	720062	5798490	95	South-East
37	720501	5798512	720560	5798451	720583	5798464	95	South-East
38	720993	5798686	721050	5798620	721057	5798686	64	East
39	723772	5798807	723772	5798717	723772	5798717	90	South
40	722821	5792881	722821	5792881	722821	5792881	0	~
41								REMOVED 2015
42	721414	5792432	721339	5792470	721414	5792516	84	North
43	722465	5792519	722465	5792519	722465	5792519	0	~
44	725612	5797947	725612	5797947	725612	5797947	0	~
45	724851	5798766	724851	5798766	724851	5798766	0	~
46	724753	5797738	724684	5797804	724683	5797804	96	North-West
47	724224	5798169	724303	5798164	724291	5798236	95	North-East
48	717298	5793181	717298	5793181	717298	5793181	0	~
49	724010	5797749	723949	5797815	723942	5797816	95	North-West
51	725119	5798064	725119	5798064	725119	5798064	0	~
52	722855	5798177	722857	5798109	722922	5798109	95	South-East
53								REMOVED 2015
54	722629	5797663	722575	5797699	722535	5797663	94	West

	Approved Locations 24th August 2010		Endorsed Locations 30th April 2013		Amendment			
55	720424	5790132	720424	5790132	720424	5790132	0	~
56								REMOVED 2015
57	720523	5797897	720523	5797897	720523	5797897	0	~
58	720571	5795722	720518	5795662	720518	5795662	80	South-West
59	721034	5795908	720996	5795836	720985	5795834	89	South-West
60	721985	5798032	721916	5797989	721985	5797957	75	South
61	721349	5797952	721359	5797985	721349	5798047	95	North
62	717031	5792289	717035	5792325	717031	5792379	90	North
63	720447	5790715	720366	5790697	720391	5790792	95	North-West
64	723429	5798264	723517	5798249	723429	5798169	95	South
65	719881	5797190	719881	5797190	719954	5797147	85	South-East
66	720654	5796315	720611	5796396	720611	5796396	92	North-West
67	719389	5797117	719389	5797117	719453	5797154	74	North-East
68								REMOVED 2015
69	720991	5797527	720991	5797527	721076	5797527	85	East
70								REMOVED 2013
71								REMOVED 2015
72	719092	5795312	719083	5795244	719092	5795312	0	~
73	719643	5795613	719681	5795538	719710	5795545	95	South-East
74	717068	5792757	717068	5792757	717068	5792757	0	~
75	719009	5794594	719007	5794682	719076	5794661	95	North-East
76	719471	5794946	719471	5794946	719538	5794878	95	South-East
77	720541	5794620	720499	5794664	720541	5794620	0	~
78	720275	5795050	720210	5795076	720275	5795050	0	~
79	720870	5795207	720783	5795235	720845	5795231	35	North-West
80	722317	5794011	722250	5794038	722289	5794039	40	North-West
81								REMOVED 2015
82	719846	5794581	719910	5794638	719929	5794535	95	South-East
83								REMOVED 2015
84	721290	5793778	721336	5793795	721290	5793778	0	~
85	721955	5795028	721919	5794981	721955	5795028	0	~
86	722325	5793119	722299	5793079	722325	5793119	0	~
87								REMOVED 2015
88	720398	5794077	720459	5794148	720489	5794103	95	North-East
89	721028	5794742	720989	5794775	721109	5794788	93	North-East
90	721490	5794283	721490	5794283	721503	5794377	95	North
91								REMOVED 2013
92								REMOVED 2015
93	722543	5794720	722499	5794676	722543	5794720	0	~
94	722107	5794470	722012	5794479	722034	5794531	95	North-West
95								REMOVED 2015
96	721796	5793825	721820	5793754	721796	5793893	68	North
97	721975	5792779	721932	5792792	721893	5792827	95	North-West
98	721749	5793249	721749	5793249	721681	5793316	95	North-West
99	722975	5792402	722975	5792402	722975	5792402	0	~
100	721359	5795356	721274	5795359	721359	5795356	0	~

2.3 Turbine Dimensions

The proposed amendment seeks to increase the overall height of the 79 retained turbines from the approved height of 131m to 180m. Figure 2.2 shows a typical turbine labelled to show the proposed changes to the approved turbine dimensions.

Figure 2.2 Turbine components



The proposed amendments are seeking a turbine envelope to allow for flexibility in selection of turbine models. The turbine envelope is therefore seeking a prescriptive overall height to the tip of blade and a minimum clearance to ground level, and to remove a prescriptive height for the level of the hub or nacelle.

The maximum hub height will be 117 m above ground level. This maximum height is based on a minimum blade length of 63 m. The hub height is relevant to night time lighting as the aviation obstacle lights are mounted to the top of the nacelle.

The assessment of aviation obstacle lighting and photomontages are based on a hub height 117 m.

2.3.1 Transmission line

At the time the LVIA review was written, no changes to the transmission line alignment and specifications were envisaged and therefore they were not assessed within the review.

2.3.2 Turbine alterations

A summary of the proposed changes to the turbine layout and dimensions between the 2010 Approved Layout, the 2013 Endorsed Layout and this amendment are shown in Table 2-1.

Table 2-1 Turbine Height Change

	Hub Height	Rotor dia.	Overall Height	Turbine No
Approved Layout	80m	101m	131m	99
Endorsed Layout	80m	101m	131m	95
Amended Layout	115m*	130m	180m	79

* Maximum hub height will be 117 m. In order to make a conservative assessment, that is based on the maximum rotor diameter; a 115 m hub height has been used in this assessment

3

SUBMISSIONS

Eleven submissions were received in relation to the proposed amendment. Concerns relevant to visual impact are summarised below.

- Turbines moving closer to residential dwellings
- Increase in visual impact brought about by the larger turbines
- Timeframes for landscape mitigation to be effective
- Ability for landscape mitigation to screen the taller turbines
- Aviation obstacle lighting.

The LVIA of the proposed amendments determined that although fewer turbines would be visible, the change in visual impact would not reduce, nor would the visual impact increase as a result of the larger turbines.

The comparative photomontage demonstrated that although the turbines would appear slightly larger, in reality the increase in turbine height will be imperceptible.

It is not the overall height increase turbine height that is relevant to visual change or impact; it is the associated change in viewing angle brought about by the proposed increase to turbine height, the distance of the viewing location to a turbine and the change in views from sensitive viewing locations. For sensitive viewing locations, this also includes the continued relevance of mitigation measures recommended by the Panel in approving the project.

This change in viewing angle underpins the response to submitter concerns particularly in relation to overall visual impact, landscape mitigation, night lighting and cumulative impacts.

4 CHANGE IN VIEWING ANGLE

Viewing angle will change over distance and is relative to turbine height. The greater the distance between a viewing location and a turbine the smaller the turbine will appear, similarly the closer the viewing location the larger the turbine will appear.

It is the perception of the proposed increase in turbine height over a range of distances that is important to visual impact, landscape mitigation and night lighting. Perception is best demonstrated through photomontages. However it is important to understand that the change in viewing angle is also relevant to landscape mitigation as considered by the Panel in their recommendation to grant a Permit.

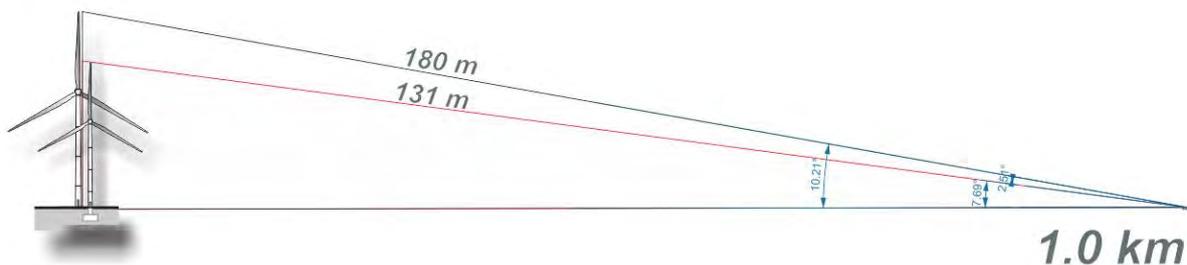
4.1 View Angle

Dwellings with the greatest potential to be impacted by any wind farm development are nearest to 1.0 km from a turbine. This is because dwelling owners are required to provide consent to turbines within this distance (the turbine exclusion zone). The turbine exclusion zone for the Berrybank Wind Farm is 1.0 km from a turbine.

For this reason, the following empirical assessment of the change in view angles will be based on a distance of 1.0 km from a turbine.

Figure 4.1 shows the change in view angle between the approved 131 m high turbine and the proposed height increase to 180 m at a distance of 1.0 km.

Figure 4.1 View angles for a 131 m and 180 m high turbine at 1.0 km



The viewing angle for a 131 m high turbine is 7.69° when viewed from a distance of 1.0 km. The view angle for a 180 m high turbine at the same distance is 10.21° . The net increase in the vertical view angle is 2.51° .

4.2 Landscape mitigation

Several submissions have queried the ability for landscape mitigation to screen a 180 m high turbine.

The 2010 Panel recommended that “screen planting be offered to all non-stakeholder residents within 3km of the nearest turbine and considering:

- Fire management planning;
- The use of advanced plantings and tubestock to ensure screening is effective in the short term and has good survival rates;
- Placement of new screening to accommodate mature trees that are nearly at the end of their life;
- Species appropriate for the local conditions at the site (possibly a mix of indigenous and exotic species) with low combustibility; and
- Appropriate maintenance and replacement.

As mentioned above, the change in visual impact between the approved project and the proposed increase in turbine heights being sought by this amendment will in part be determined by the ability to screen the taller turbines from residential dwellings.

Table 4.1 summarises the change in viewing angles between the approved turbine height of 131 m and the proposed amended height of 180 m. The relative height for landscape mitigation to screen the approved and proposed amended turbines are also provided.

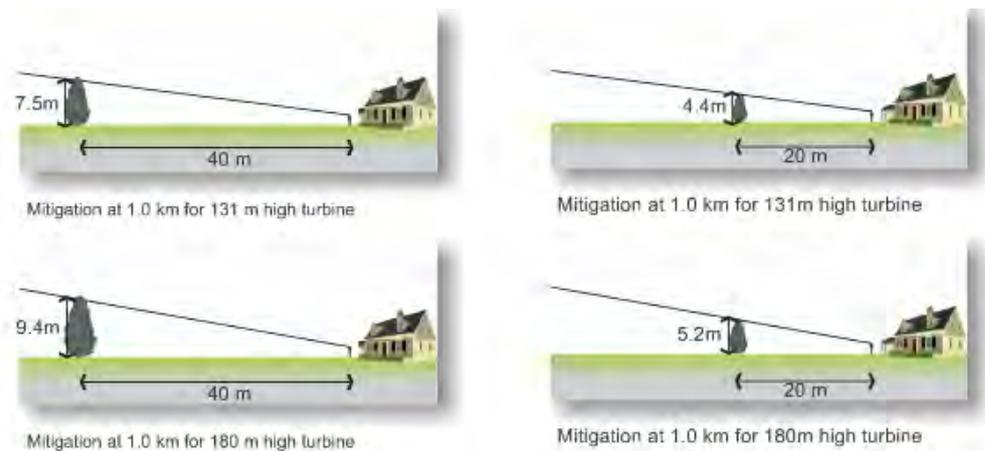
Vegetation heights have been provided at distances of 40 m and 20 m setbacks from dwellings. A height of 1.6 m has been assumed as a standing eye level and is that same utilised in the preparation of photomontages. These distances recognising that landscape setting will vary from dwelling to dwelling, and a desire to set vegetation back from dwellings for either clutter or fire.

Table 4.1 *Change in viewing angles and landscape mitigation*

Turbine Height	View angle at 1.0 km Distance	Vegetation height at 40 m from dwelling	Vegetation height at 20 m from dwelling
131 m (Approved)	7.69	7.5 m	4.4 m
180 m (Proposed)	10.2	9.4 m	5.2 m
Net Change	2.51	1.9 m	0.8 m

The change in viewing angles and landscape mitigation requirements is provided at 1.0 km.

Figure 4.2 *Change in vegetation height at 1.0 km*



Vegetation in the region is capable of exceeding the height required to screen the increased vegetation heights to achieve the landscape screening objectives recommended by the panel.

It is logical that with greater the distance between turbines and the viewing location, the viewing angle becomes shallower and height of screening vegetation would also reduce. Similarly the closer the vegetation to the viewing location, the height of vegetation required to screen views of the turbines would be reduced. The latter is relevant to those locations where shadowing of private spaces or gardens may be an issue or for locations with limited gardens.

For even the most affected dwellings, the increase in viewing angle does not significantly alter the landscape height required to filter views to the proposed turbine height of 180 m.

4.3 Change to the view shed

The area that may potentially be visually affected by development is the project view shed. The view shed is also the study area for visual impact.

The view shed is not the same as the extent of visibility as it may be possible to see the turbines from areas outside the view shed. The view shed is rather, the area within which the turbines may cause impact.

Zones of Visual Influence define areas within the view shed that assist to describe the effect that distance has on visual impact of the turbines.

The proposed increased height of the turbines will redefine the extent of the view shed and the Zones of Visual Influence. The changes between the Approved and Amended turbine heights are outlined in Table 4.2.

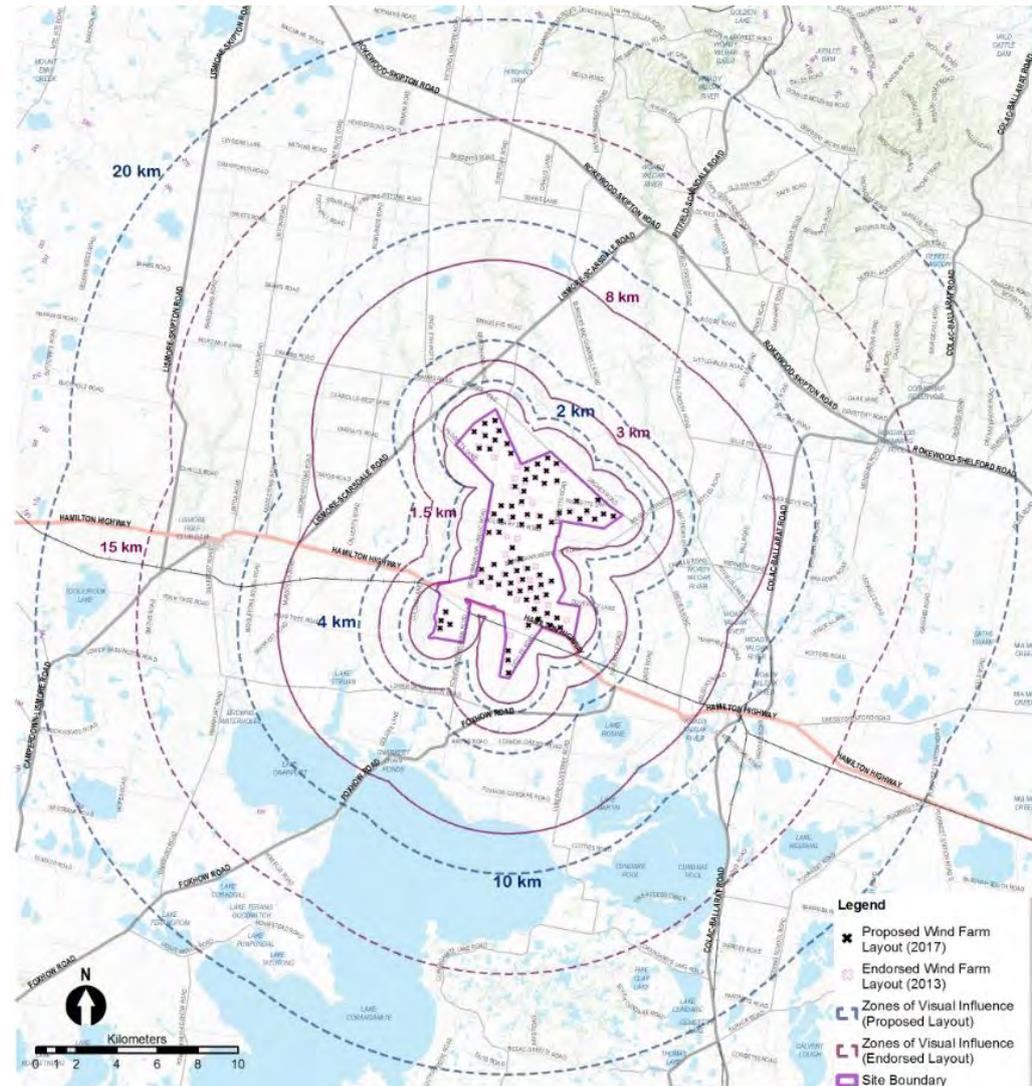
Table 4.2 *Changes to Zones of Visual Influence*

Distance to nearest turbine		Zones of visual influence
Approved Layout	Amended Layout	
> 15 km	>20 km	Visually insignificant – Extent of the project view shed A very small element in the view shed, which is difficult to discern and will be invisible in some lighting or weather circumstances.
8 - 15 km	10 - 20 km	Potentially noticeable, but will not dominate the landscape The degree of visual intrusion will depend on the landscape sensitivity and the sensitivity of the viewer; however, the wind turbines do not dominate the landscape.
3 - 8 km	4 - 10 km	Potentially noticeable and can dominate the landscape The degree of visual intrusion will depend on the landscape sensitivity and the sensitivity of the viewer
1.5 - 3 km	2 - 4 km	Highly visible and will usually dominate the landscape The degree of visual intrusion will depend on the wind turbines' placement within the landscape and factors such as foreground screening.
< 1.5 km	< 2 km	Will always be visually dominant in the landscape Dominates the landscape in which they are sited.

The area with the greatest potential for visual impact of a 131 m high turbine was 3.0 km of a wind turbine. Within this distance a 131 m high wind turbine would be highly noticeable and will usually dominate the landscape. This area would increase to 4.0 km for the proposed turbine height of 180 m.

The view shed extent, or the distance at which the turbines would no longer be a noticeable element in views would increase from 15 km's to 20 km's. Figure 4.3 shows the changes to the ZVI of the Berrybank Wind Farm.

Figure 4.3

Berrybank Wind Farm Comparative viewshed and ZVI of Approved and Amended Layout

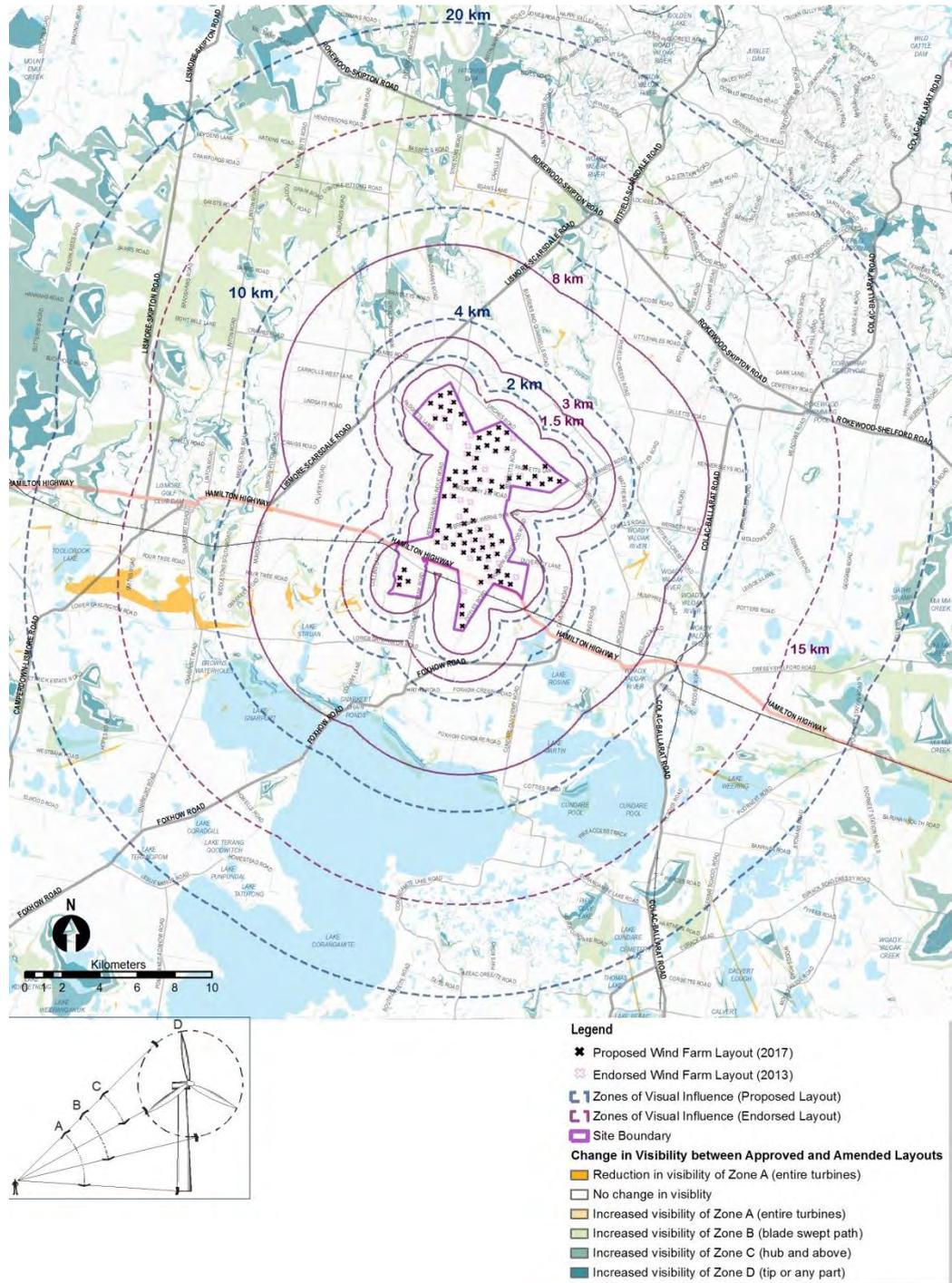
The panel recommended voluntary landscape mitigation is offered to all residential dwellings within 3km of the nearest 131m high turbine.

To be consistent with more recent projects, it was recommended in the LVIA for the proposed increase in turbine height of 180 m this distance be increased to 4.0 km from a wind turbine.

4.4 Change to Seen Area Analysis

A comparative assessment of the change in visibility was undertaken to determine the locations of potential change in turbine visibility from areas surrounding the project. The assessment was based on a GIS analysis of the visible components of the turbines and considered both the increase in turbine heights and reduction in turbine numbers. The areas of visual change brought about by the proposed amendments to the Berrybank Wind Farm can be seen in Figure 4.4.

Figure 4.4 Net change in turbine visibility



The areas in orange show a reduction in overall turbine visibility between the approved turbine layout and height and the proposed amendments to the project. The areas in green show an increase in turbine visibility.

The areas of greatest change are beyond 10 km. At these distances the change in view angle discussed in section 4.1 would be less than 1° in the vertical field of view.

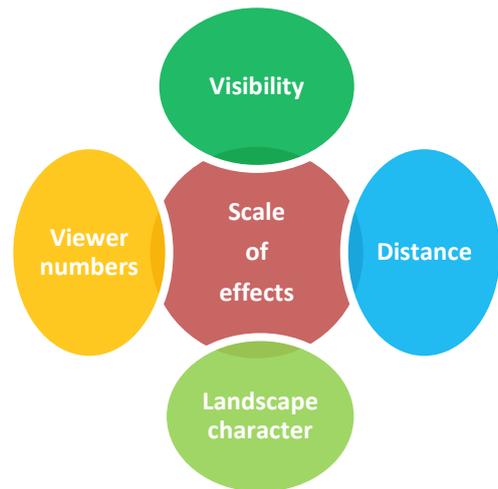
5 METHODOLOGY

The explanation of the LVIA methodology has been clarified in response to Panel queries on past projects and to the issues raised within Guidelines since the initial LVIA was prepared by Urbis in 2009. The methodology used within this assessment is set out in the following section.

5.1 Public viewpoints

For public viewpoints the associated scale of effects are primarily based on the assessment of the following four criteria:

- **Visibility:** The visibility of a development which can be affected by intervening topography, vegetation and buildings;
- **Distance:** The distance of the viewer from the proposed telecommunication facility. The level of visual impact decreases as distance increases.
- **Landscape character and viewer sensitivity:** The character of the surrounding landscape, both around the site and adjacent to the viewing location, must be considered. Generally, a man-modified landscape is considered of low sensitivity and a pristine landscape is considered highly sensitive.
- **Number of viewers:** The level of visual impact decreases where there are fewer people able to view the telecommunication facility. Alternatively, the level of visual impact increases where views are from a recognised vantage point.



These four criteria need to be considered in the assessment of each viewpoint. However the ratings of each criterion are not numerically based and cannot be simply added together and averaged to arrive at an overall rating.

For example:

- If the distances to the wind turbines are great then even if the viewer numbers and the landscape sensitivity were high, the overall visual impact would be minor because the wind turbines are only just visible in the landscape.
- If viewer numbers were low (i.e. few people can see the wind turbines from the publicly accessible viewpoint), then even if the wind turbines were near the nominated viewpoint and the landscape sensitivity was high, the overall visual impact would be minor because the change to the landscape is not visible to many viewers.
- If landscape sensitivity was low (i.e. within a highly man-modified landscape) then even if the wind turbines were near the viewpoint and were visible to a large number of viewers, the overall visual impact would be low because the viewpoint is not in a landscape of such sensitivity that further change would be unacceptable.

Therefore, the assessment of the overall visual impact needs to be informed by these criteria and a balanced judgement made as to the overall visual impact.

5.2 Scale of Effects

The scale of effects for assessing the overall visual impact of the wind turbines from a publicly accessible viewpoint ranges from negligible to high visual impact.

5.2.1 Negligible visual impact

Negligible – minute level of effect that is barely discernible over ordinary day-to-day effects. The assessment of a “negligible” level of visual impact is usually based on distance. That is, the wind turbines are at such a distance that, when visible in good weather, it would be a minute element in the view within a man-modified landscape or will be predominantly screened by intervening topography and vegetation.

5.2.2 Low visual impact

Low – visual impacts that are noticeable but that will not cause any significant adverse impacts. The assessment of a “low” level of visual impact can be derived if the rating of any one of four criteria, that is visibility, distance, viewer numbers and landscape sensitivity, is assessed as low. Therefore, an additional piece of infrastructure in a landscape which is man-modified and which already contains many examples of existing infrastructure may be rated as a low level of visual impact.

5.2.3 Medium visual impact

Medium – visual impact occurs when significant effects may be able to be mitigated / remedied. The assessment of a “**medium**” visual impact will depend upon all four-assessment criteria being assessed as higher than “low.”

5.2.4 High visual impact

High or unacceptable adverse effect – extensive adverse effects that cannot be avoided, remedied or mitigated. The assessment of a “**high or unacceptable adverse effect**” from a publicly accessible viewpoint requires the assessment of all these elements to be high. For example, a highly sensitive landscape, viewed by many people, with the wind turbines in close proximity and largely visible would lead to an assessment of an unacceptable adverse effect.

5.3 Residential viewpoints

The greatest potential for visual impact is to neighbouring, non-participating residential dwellings within 1.0 km from a turbine.

For the increased turbine height, the ability for landscape mitigation to screen the increased turbine heights as intended by the Panel’s recommendation is important to determine the impacts to residential properties.

This can be determined by analysing the change in the viewing angles between the approved and modified turbine heights and the ability for landscape to accommodate this change.

The assessment of visual impact from residential properties is different to publicly accessible viewpoints.

An assessment of viewer numbers is not applicable and the landscape sensitivity is always rated as “high”, as it must be recognised that people feel most strongly about the view from their house and from their outdoor living spaces.

Therefore, the visibility of a development and the distance between the residential location and the development are the two criteria that are used to assess a visual impact from a residential property.

5.3.1 Mitigation Measures for Residential Viewpoints

Mitigation measures may also include landscape treatments, both on the subject site and specifically targeted at residential dwellings.

5.4 Photomontage preparation

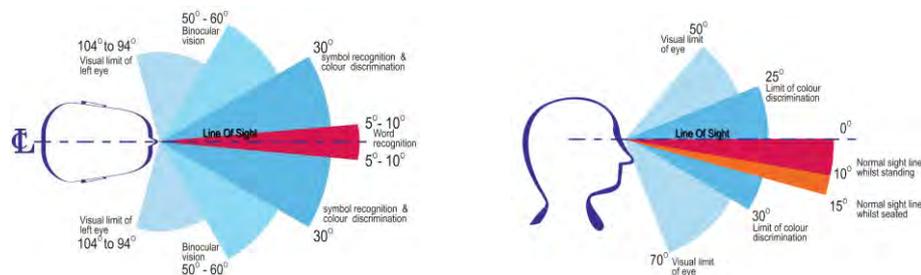
Photomontages are used within the report to show the scale and location of the proposed wind turbines.

5.4.1 Lens size and photos used within the photomontages

Photomontages typically show the changes in a 60° horizontal field of view. The 60° horizontal field of view represents the central cone of view in which symbol recognition and colour discrimination can occur.

When defining vertical field of view, either 10° or 15° can represent the central field of view of human vision as shown in Figure 5.1.

Figure 5.1 *Horizontal and Vertical field of view (Human Dimension and Interior Space, Julius Panero & Martin Zelnik, Witney Library of Design, 1979)*



Similar data can be found in the more recent publication entitled *'The Measure of Man and Woman, Revised Edition'*, Henry Dreyfuss Associates, John Wiley & Sons, 2012.

The 60° horizontal field of view is important if the photomontage images represent the change in the landscape. The A3 photomontages, which are appended to this report in Annex C, include a 60° horizontal field of view. One of the sheets within the photomontage set shows a wireframe view of the computer model to illustrate how the photomontages were derived. Vertical 'poles' within this wireframe are merely points on the landscape such as a group of trees, a corner of an existing building etc., which allow the computer model (prepared in 3D Studio Max) and the photograph to be accurately aligned. This ensures that the proposed wind farm is accurately located within the photograph and then the rest of the model is removed and the turbines are rendered into the image.

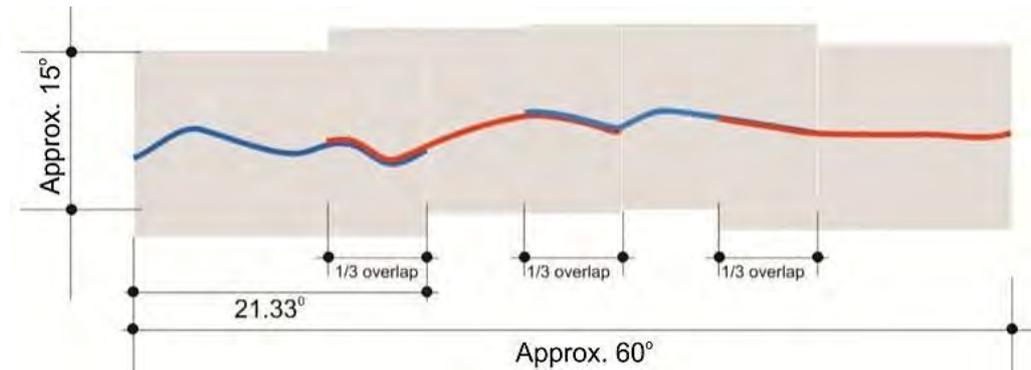
5.4.2 Photographs

A 70 mm lens on a Nikon D3 digital camera has a picture angle of 26.5° and a horizontal angle of view of approximately 21.3°.

http://nikonimaging.com/global/products/lens/af/micro/af_micro60_mmf_28d/.

The camera is held at eye level, approximately 1.65m above ground level. Four photographs overlapped 1/3 to create an image approximately the same as the central cone of view of human vision, i.e. 50-60° horizontal and 15° vertical. Figure 5.2 demonstrates this theory.

Figure 5.2

Photomontage layout**5.4.3 Computer modelling and the wireframe model**

Cadastral data as well as the proposed development are modelled within a computer program (3D Max). A virtual camera is set up in the model at the GPS coordinates for each of the photographs that are being used within the panorama.

The digital model or wireframe view is then overlaid on the photographic panorama. Known points within survey information such as topography, building locations or other infrastructure are registered into the base photographs (or other predetermined points). For technical accuracy, these points must align. This verifies the location and apparent height and scale of the proposed wind turbines.

After the background reference points have been aligned, the wireframe is removed, leaving only the proposed wind turbines, which are rendered, either to match the lighting conditions at the time the photographs were taken or, more typically, to maximise their visibility by increasing their contrast against the background sky.

5.4.4 GPS Coordinates

The Nikon D3 camera also records the GPS coordinates as part of the metadata. GPS coordinates are also taken based on a separate hand held GPS and the locations from which the photographs were taken is also marked on a digital map at the location of each photograph.

5.4.5 Photomontages

Photomontages were prepared to assist in a comparative analysis for the Berrybank Wind Farms. Viewpoints were selected to provide for varying distances and viewing angles to the wind turbines. It is recognised that they are indicative of the views from the road network within the viewshed and do not represent all possible views and viewing instances. All photomontages do however provide clear views to the project and allow for a suitable interpretation of the range of views towards the project.

It is recognised that the small photographs and the A3 photomontages included within this assessment are not indicative of the actual visual impact. The A3 images, which are appended to this report (Annex C), are clearer than the smaller images in the text. However, to view the photomontages in a way that they appear perceptually accurate, they need to be printed and viewed on A0 sized sheets and held at arms' length. When viewed at A0 the photomontages are representative of the level of visual alteration.

6 CHANGES IN PLANNING POLICY

The original LVIA for Berrybank Wind Farm was prepared in 2009. In this time, there have been several studies undertaken which comment on landscape character. Those studies that are relevant to this amendment include:

- Wind Farm Guidelines for Victoria, amended January 2016;
- The South West Victoria Landscape Assessment Study – Landscape Character of South West Victoria (DPCD & Planisphere, June 2013), (SWVLAS); and
- Kanawinka Geopark.

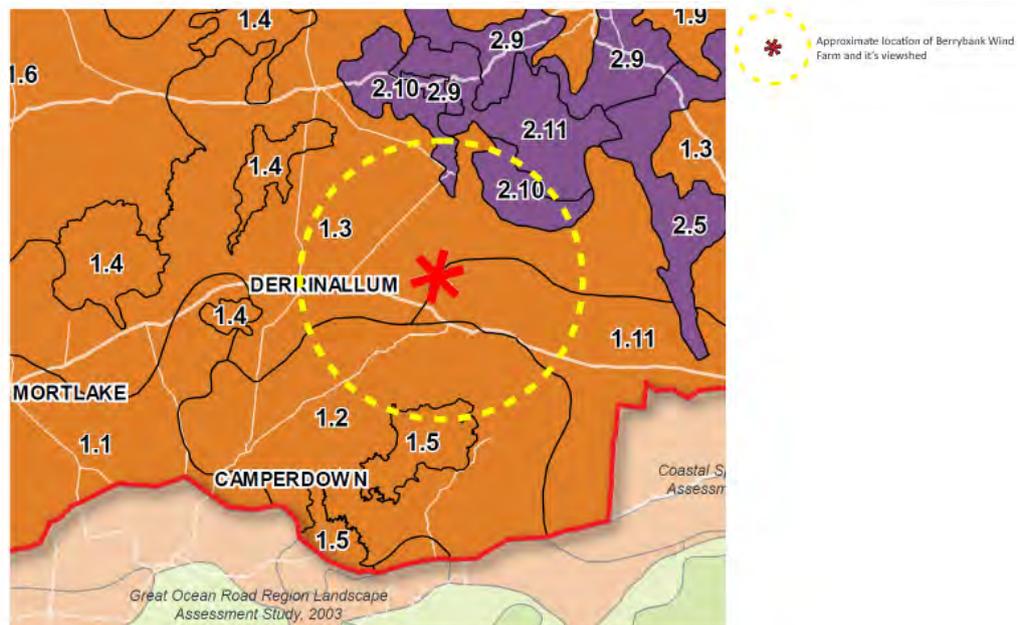
The original LVIA did not consider the impact to features identified by the Kanawinka Geopark. Kanawinka Incorporated was cancelled in February 2016 and therefore no longer exists. The Kanawinka Geopark identifies landscape features within the project view shed that were considered in the original LVIA.

6.1 South West Victoria Landscape Assessment Study

The South West Victoria Landscape Assessment Study – Landscape Character of South West Victoria (DPCD & Planisphere, June 2013), (SWVLAS) was released just prior to the August 2013 Endorsed Plans being approved. The SWVLAS identifies landscape types within the view shed of the BBWF. These are discussed in the following section.

The BBWF viewshed is within the Western Volcanic Plains region (Character Type 1) and the Uplands (Character Type 2) identified within the SWVLAS. The location of the character types within the indicative viewshed of the Amended BBWF is shown on Figure 6.1.

Figure 6.1 Character types and areas (Figure 1 - The Western Volcanic Plain Location)



6.1.1 Character Type 1 - Western Volcanic Plain Landscape

The Western Volcanic Plains Landscape Character Type is described as follows:

"The fertility and cleared nature of the Western Volcanic Plains were ideal for grazing. The region became very wealthy and was dominated by large pastoral properties. These large properties often had extensive exotic gardens as the new settlers aimed to recreate their familiar British landscapes.

The landscape that we see today represents a hybrid of generally undisturbed underlying topography with patchwork remnants of the natural landscape, which are protected by national,

and state parks. Intertwined with this lies the heavily modified landscape of exotic shelterbelts, dry stone walls, farming, infrastructure, rural development and wind farms."

The sensitivity of Western Volcanic Plains to change is described as below:

"The volcanic plain is highly sensitive to change, the flat nature of the plain offers long range views and thus creates a landscape on which there is 'nowhere to hide'. There is limited capacity for this character type to absorb development without it becoming prominent in the viewed landscape."

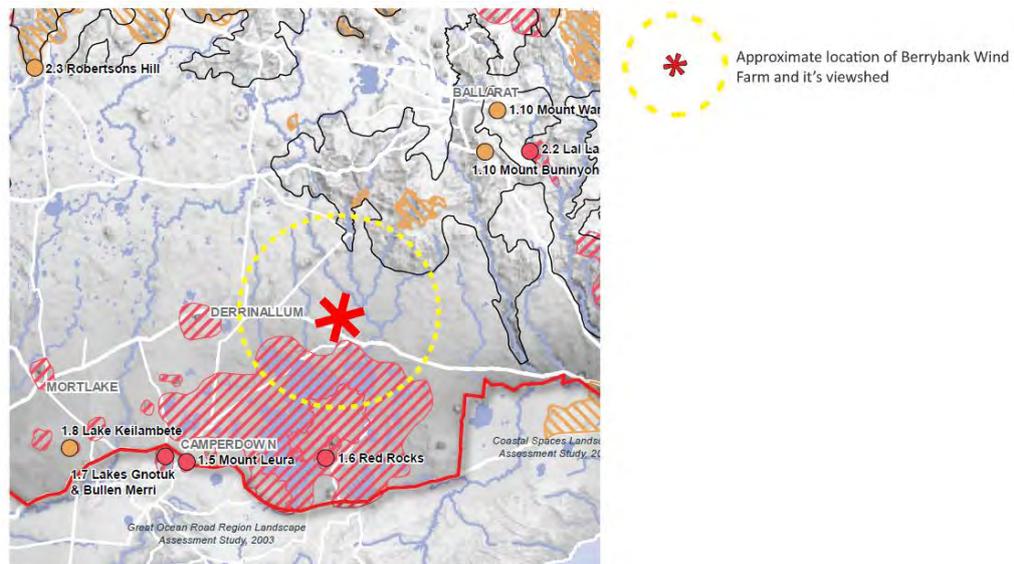
"However, balanced against this is the degree to which this landscape has been modified, shaped by man over generations."

The above narrative within the SWVLAS recognises the modifications for pastoral uses that have shaped the landscape of the Western Volcanic Plains. Although the landscape sensitivity is referred to as highly sensitive to visual change, it is understood that this is in reference to the long views afforded across the landscape due to limited topographical variation and limited vegetation rather than the rarity or presence of features such as parks and natural areas. The SWVLAS also anticipates landscape changes such as:

- The Volcanic Plain forms Australia's First UNESCO Global Geopark and as such, it is anticipated that there will be an increase in tourism within this character type;
- There is an increasing awareness from farmers as to the value of biodiversity, setting aside existing vegetation or native revegetation to create linked habitat corridors may change the aesthetics of this vast cleared plain.
- This area is subject to a number of wind farm developments and proposals.
- The State Governments planning zones review may lead to an increase in tourism, retail and accommodation uses in rural areas, a potential increase in rural living density and a potential increase in smaller lots and dwellings in the farming zone. (SWVLAS, The Western Volcanic Plain, p8).

Figure 6.2

View locations of State & Regional Significance as well as areas of Significant Landscapes (SWVLAS page 61) and the indicative viewshed of the Project



While there is greater consideration to the geological significance of the Volcanic Plains region, there is an acknowledgement of the change that the region is undergoing including developments such as wind farms.

Within the Volcanic Plains landscape character there are four distinct Character Areas that fall within the viewshed. These are useful in terms of informing landscape character types and landscape sensitivity on which to inform this LVIA. The landscape character types are as follows:

Character area 1.2 - Large Shallow & Deep Crater Lakes. Key features identified are:

Extensive water bodies cover the majority of the landscape such as the Lake Corangamite also characterised by with few roads.

Character area 1.3 - Volcanic agricultural. Key features identified are:

"Open pastoral landscape with long distance views; Exotic shelterbelts and Stands of remnant vegetation."

Character area 1.5 - Lakeside Stony Rises. Key features identified are:

Located to the east and south of Lake Corangamite, Mount Porndon and Red Rocks Complex have exposed rocky outcrops and sinkholes and contrast with adjacent paddocks.

Character type 1.11 - Winchelsea Western Plains. Key features identified are

"...generally flat topography with occasional low, volcanic rises and stony rises....Power infrastructure becomes a prominent feature on the landscape near Geelong..."

"in some locations roadside vegetation filters views...The flat, cleared landscape allows direct and open views..."

Most significant features within the Western Volcanic Plain are geological formations that remain intact even after extensive modifications such as farming and development of infrastructure such as power lines, wind farms and the built environment.

6.1.2

Character Type 2 – The Uplands

The Uplands occupy a small section to the north east in the viewshed of BBWF. The Uplands has been described to have the following sensitivity to change:

"The undulating to hilly topography and vegetation cover of the area allows development to be absorbed without undue visual interference. Development on hillsides or ridges however, has the potential to be highly visible."

One landscape character areas that fall within the viewshed are:

Character area 2.10 – Valley views. Key features identified are:

"A vegetated horizon line is common when adjacent to State Parks or reserves, and the distinctive humped shape of Mount Emu is visible on the horizon to the north of the area. Development is fairly sparse and consists of modest farm houses and associated outbuildings"

Character Type 2 is nearing the northern edge of the BBWF view shed and at such a distance that this area is unlikely to be affected by the project.

SWVLAS significant landscapes

Within the Volcanic Plains, the Lakeside Stony Rises (1.2) as well as Inland Lakes (1.4) associated with Lake Corangamite and adjoining stony rises to the south. Both are identified within the State level significant landscape.

Lakeside Stony Rises are described as:

"There is a distinctive contrast between the rough, lumpy landscape and the smooth, flat waters of Lake Corangamite that are visible at high points"

Inland Lakes are described as:

"The flat surfaces of the lakes stand out in stark contrast with the surrounding pastoral land"

SWVLAS significant views

The SWVLAS does not identify any views of state or regional significance located within the view shed of the Berrybank Wind Farm.

6.1.3

Implications of SWVLAS

The SWVLAS is not a reference document. The SWVLAS does however recognise geological formations and landscapes that occur within the Western Volcanic Plains and therefore increasing the landscape sensitivity. The SWVLAS also recognises the change brought about by European settlement and the anticipated increased level of development suggesting lower landscape sensitivity.

6.1.4 Landscape units and sensitivity within the LVIA

The comparative assessment will use the following landscape units to assess the potentially for change in impacts brought about by the proposed increase in turbine heights.

Table 6.1 *Landscape Units and sensitivity for the Berrybank Wind Farm*

Landscape unit	Sensitivity
Unit 1 Flat Farmland	Low - This unit is obviously modified and contains infrastructure, is not topographically dramatic and does not contain areas of water. It is a common landscape type in this area of Victoria.
Unit 2 Rural Townships and Communities	Medium - The presence of a greater number of residences increases the sensitivity; however, abundance of built forms and other visual elements has the effect of lessening the sensitivity of these areas.
Unit 3 Lakes and Craters	Medium - Extensive water bodies cover the majority of the landscape such as the Lake Corangamite. These areas are used for recreational purposes.

The Panel in its original recommendation to approve the project considered the landscape as one that can accommodate wind turbines within views. I also share this view.

7 COMPARATIVE ASSESSMENT

Four locations were selected from which to demonstrate the proposed changes brought about by this amendment to Berrybank Wind Farm. The locations were selected to demonstrate the range of viewing angles, distances and landscape settings for views towards the wind farm.

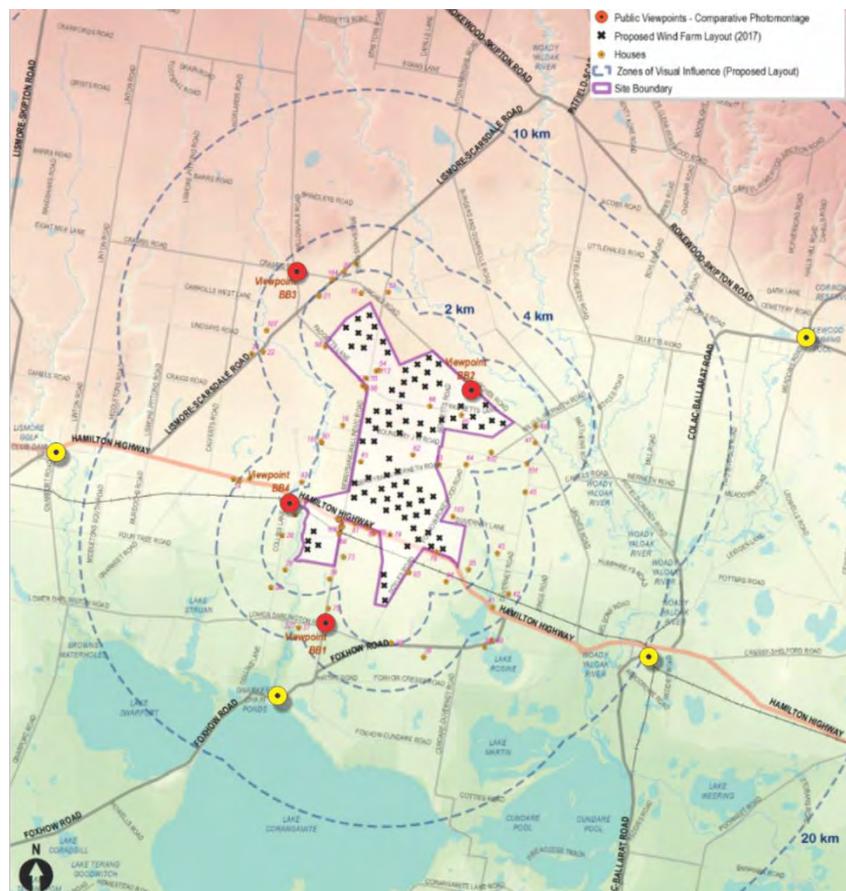
Each of the following locations were assessed in the Amendment Application.

7.1.1 Comparative Viewpoint Locations

- Viewpoint BB01 – Lower Darlington Road;
- Viewpoint BB02 – Urchs Road;
- Viewpoint BB03 – Roberts Road and Willowvale Road intersection;
- Viewpoint BB04 – Collins Lane and Hamilton Highway intersection.

The proximity of the selected photomontage locations is shown in red in Figure 7.1. The yellow dots represent other viewpoints assessed within the Amendment LVIA Report.

Figure 7.1 Viewpoint Locations



Photomontages prepared from each viewpoint were discussed within the Amendment Application documentation and were taken from locations where there is likely to be clear views to the turbines and include a range of viewing distances.

It is recognised that many locations may have views towards the turbines. It is not the intention to suggest that the photomontages and viewpoints represented in the LVIA for the proposed amendments captured all potential viewing locations, rather the selected photomontages provide for a useful guide to understand the likely change in turbine visibility from the landscape surrounding the project. It is stressed that the perceptual recognition of the change in visibility is best made from the 60° viewing angle, reproduced at A0.

7.2 Viewpoint BB01 – Lower Darlington Road

Viewpoint BB01 is located on Lower Darlington Road, near the intersection with Berrybank-Wallinduc Road. The nearest endorsed and amended wind turbine (T55) will be located approximately 2.8km to the north east.

Figure 7.2 shows the view looking north to north east with the approved 131m turbines superimposed in the view.

Figure 7.2 *Photomontage – Approved*



Figure 7.3 shows the view looking north to north east with the proposed 180m turbines superimposed into the view.

Figure 7.3 *Photomontage – Proposed*



The farmland landscape unit is evident at this location as are existing infrastructure such as transmission line pylons.

Hedgerows and other vegetation along property boundaries filter views to some of the wind turbines as seen in the photomontages of endorsed and amended layouts in the comparative photomontages.

Given the landscape sensitivity and the low viewer numbers, the overall visual impact of the wind farm is assessed as **Low**.

While the amended wind turbines are larger, the level of visual impact remains low given the low landscape sensitivity of the farmland. On balance, the net change to the level of visual impact due to the amendments is **Negligible**.

7.3 Viewpoint BB02 – Urchs Road

Viewpoint BB02 is located on Urchs Road, just north of the wind farm. The nearest endorsed and amended wind turbine (T39) will be located approximately 1km to the south.

Figure 7.4 shows the view looking north to north east with the approved 131m turbines superimposed into the view.

Figure 7.4 *Photomontage – Approved*



Figure 7.5 shows the view looking north to north east with the proposed 180m turbines superimposed into the view.

Figure 7.5 *Photomontage – Proposed*



Existing vegetation and hedgerows along property boundaries will filter views towards some of the wind turbines as seen in the photomontages of endorsed and amended layouts. Given the landscape sensitivity and the low viewer numbers, the overall visual impact of the wind farm is assessed as **Low**.

While the amended wind turbines are larger, the level of visual impact remains low given the low landscape sensitivity of the farmland. On balance, the net change to the level of visual impact due to the amendments is **Negligible**.

7.4 Viewpoint BB03 – Intersection of Roberts (Crambs Road) and Willowvale Roads

Viewpoint BB03 is located on Roberts Road (Crambs Road), near the Willowvale Road intersection. The nearest endorsed and amended wind turbine (T01) is located approximately 3.3km to the south east.

Figure 7.6 shows the view looking north to north east with the approved 131m turbines superimposed in the view.

Figure 7.6 *Photomontage – Approved*



Figure 7.7 shows the view looking north to north east with the proposed 180m turbines superimposed into the view.

Figure 7.7 *Photomontage – Proposed*



Views are over rural plains. The overall visual impact of the Endorsed Layout and Amended Layout is assessed as **Low**.

The comparative photomontages show that although the amended wind turbines are larger, the net change in the impact level of visual impact will be **Negligible**. For most viewers the level of change in the overall height of wind turbines will be imperceptible, as will be the net reduction in the number of wind turbines.

7.5 Viewpoint BB04 – Intersection of Collins Lane and Hamilton Highway

Viewpoint BB04 is located on Collins Lane near the intersection of Hamilton Highway. The nearest endorsed and amended wind turbine (T48) will be located approximately 1.8km to the south east.

Figure 7.8 shows the view looking north to north east with the approved 131m turbines superimposed in the view.

Figure 7.8 *Photomontage – Approved*



Figure 7.9 shows the view looking north to north east with the proposed 180m turbines superimposed into the view.

Figure 7.9 *Photomontage – Proposed*



The view is to the rural plains with low landscape sensitivity. Therefore, the overall visual impact of the Endorsed Layout and Amended Layout is assessed as **Low**.

The comparative photomontages illustrate that although the amended wind turbines are larger, the net change in the impact level of visual impact will be **Negligible**. For most viewers the level of change in the overall height of wind turbines will be imperceptible, as will be the net reduction in the number of wind turbines.

7.5.1 Visual Impact Review

The photomontages discussed in the above comparative assessment provided a basis on which to assist in illustrating the level of visual change as a result of the proposed variation to the wind turbine heights for the Berrybank Wind Farm.

The four (4) viewpoints from which photomontages were prepared are within 4km of the nearest wind turbine. Locations this distance have the greatest potential visual impact. These same viewpoints also provided for the range of viewing angles and indicative of several landscape unit types within the view shed.

These photomontages allow a benchmarking of the range visual impacts of the proposed modifications to the permitted layout and provide a reference for the assessment of other viewpoints for which no photomontages are prepared.

8 IMPACTS TO RESIDENTIAL LOCATIONS

The preceding chapter assessed the visual impact of the modified layout from publicly accessible locations. This assessment was based on a qualitative assessment through the use of comparative photomontages and a quantitative assessment which allowed for an assessment based on distance and landscape sensitivity to determine the overall visual impact of the proposed amendments.

The comparative photomontages demonstrated that there would be a visual change brought about by the proposed increase in turbine height. However the change in overall visual impact brought about by the proposed increase in turbine heights would be negligible. The negligible change is because criteria such as viewer numbers and landscape sensitivity are constant for both the endorsed and proposed modified turbine layouts.

Based on the conclusions reached for the visual impact at public accessible locations, there seems to be no reason why the impacts at residential dwellings would alter providing that the mitigation measures required by the permit for the endorsed layout are applicable. This can be determined by firstly determining the change in the viewing angles between the approved and modified turbines heights and the change in landscape mitigation would be required to screen the turbines.

This approach recognises that the turbines within the endorsed layout have been considered an acceptable inclusion in views subject to appropriate mitigation measures.

The planning permit required landscape mitigation to be offered to all non-host residential dwellings within 3.0 km of the nearest wind turbine. Clause 52.32 Wind Energy Facility within the Victorian Planning Provisions (VPP) requires landowner consent for all dwellings within 1.0 km of wind turbine. Given that dwellings beyond 1.0 km are not required to consent to turbines, they are the nearest and potentially most affected dwellings. For these reason, the review of landscape mitigation will be assessed at a distance of one kilometre.

Figure 8.1 View angles and mitigation at 1.0km

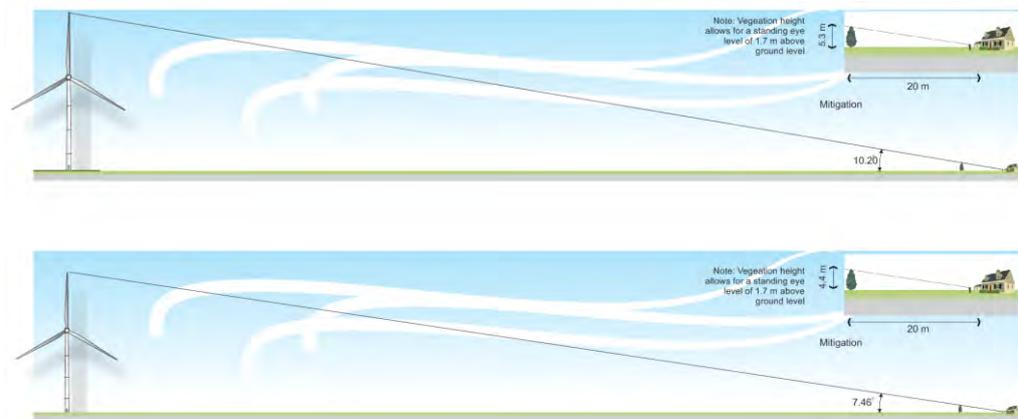


Figure 8.1 shows the sightlines, view angles and vegetation heights calculated for wind turbines at the endorsed height 131 m and the proposed amended height of 180 m at a distance of one kilometre. The view angle for a 131 m high turbine at one kilometre is 7.46°. The view angle for a 180 m high turbine at the same distance increases to 10.20°, a difference of 2.74° in the vertical field of view.

8.1

Mitigation Measures

For landscape mitigation to be effective, Figure 9.2 shows that for landscape mitigation to be effective at 1.0 km distance, landscape plantings would need to achieve a height of approximately 4.4 m to screen a 131 m high wind turbine and 5.3 m for a turbine at 180 m in height. These heights are based on a standing eye level of 1.7 m and screening installed approximately 20 m from a dwelling.

The photographs and photomontages in Section 7 demonstrate that vegetation is more than capable of achieving heights in excess of the 5.3 m required to screen turbines from views. Planting would be more effective and could be lower in height when installed closer to the dwelling. Similarly for dwellings beyond one kilometre the height that vegetation would need to achieved would decrease with distance.

Based on the above, it is considered that landscape mitigation measures set-out in the Planning Permit will be effective at screening available views to turbines for a 180 m high turbine.

9 AVIATION OBSTACLE LIGHTING

The Berrybank Wind Farm is located away from major population centres. With the exception of the Hamilton Highway, there are few roads. There are also few dwellings within the area surrounding the project.

Some seasonal lighting does occur during cropping and harvesting, however the primary contributor to night lighting in the area are from the Hamilton Highway.

Aviation lighting has been considered at all stages of the approvals process, however aviation lighting is not currently endorsed for the project.

Aviation Project has undertaken an assessment of the requirements for Aviation Obstacle Lighting for the proposed amendments. This assessment determined that there will be an acceptable level of aviation safety risk without obstacle lighting on the turbines of the Project. This finding is similar to the original aviation assessment for the Project considered by the Panel in 2010.

CASA has recommended that the wind farm is lit with steady red low intensity lighting in accordance with Section 9.4 of the CASA Manual of Standards (MOS) Part 139.

There are no operating wind farms in Victoria with operational aviation obstacle lighting. There are no wind farms in Australia with low intensity lighting installed currently recommended by CASA on which to make a direct comparison.

9.1 Previous Aviation Obstacle Lighting Proposal

The Project outlined in the 2010 PAR included Aviation Obstacle lighting for up to 52 turbines.

Key components of the Aviation Obstacle Lighting required by CASA for at the time of the Approved layout comprised the following:

- *Two flashing red medium intensity obstacle lights should be provided per turbine where required.*
- *The light fixtures should be mounted sufficiently above the surface of the nacelle so that the lights are not obscured by the rotor hub, and are at a horizontal separation to ensure an unobstructed view of at least one of the lights by a pilot approaching from any direction.*
- *All lights should flash simultaneously.*
- *The interval between obstacle lighted turbines should not exceed 900m, which is the most prominent (highest for the terrain) turbine(s) should be lit.*

Submissions received at the 2010 Panel hearing raised visual concerns in relation the night lighting from residential dwellings and users of the Hamilton Highway.

On the issue of visual impact of the proposal for night lighting from residential dwellings,

.....The Panel believes there is a high correlation between submitter's concerns about daytime visual impact and concerns about night time impact of obstacle lighting.

For road users, including those of the Hamilton Highway, the Panel did

...not consider it is an issue that should require anything of drivers other than a normal sense of alertness to road conditions. Warning signage could be placed on the Hamilton Highway if this was considered necessary as part of the Traffic Management Plan...

The Panel in their conclusions recommended that

.... Full time obstacle lighting is unnecessary and not acceptable from a visual amenity and impact point of view. If aviation obstacle lighting is required then it must be lit only on an 'as required' basis and be baffled and directed to the maximum extent allowed by CASA.

The following section will briefly describe the key components the proposed Aviation Obstacle Lighting for the amended layout, should it be required.

9.2 Proposed Aviation Obstacle Lighting – These amendments

Aviation Projects reviewed the aviation obstacle lighting requirements of the proposed amendments to the Endorsed project. The findings of this assessment are detailed in the *Berrybank Wind Farm Aeronautical Assessment*, 22 February 2016.

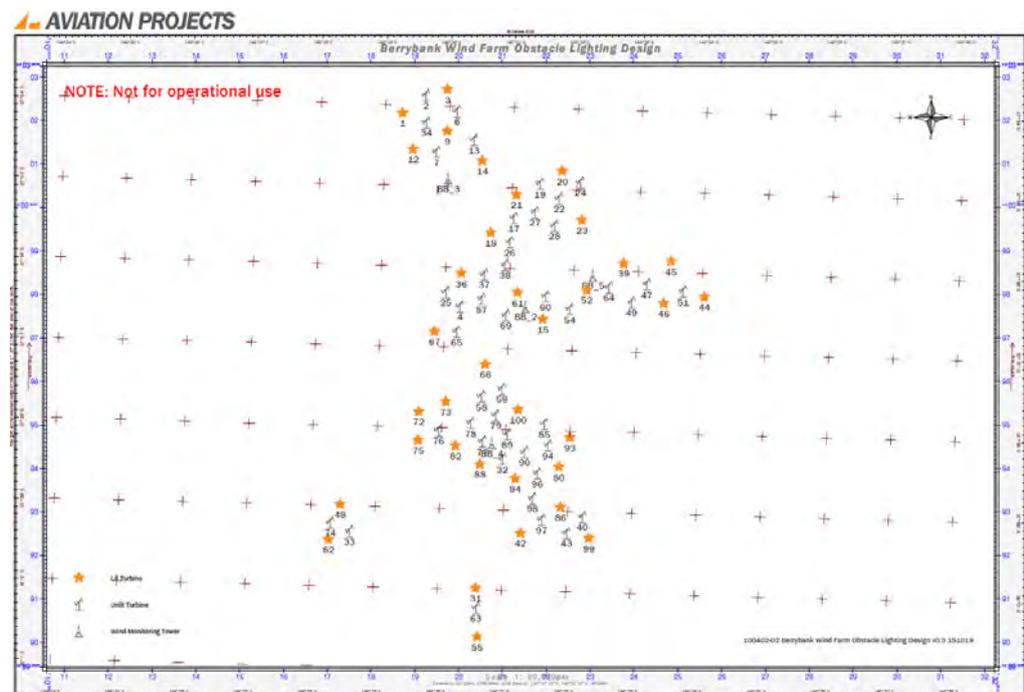
The assessment determined that there would be an acceptable level of aviation risk without obstacle lighting. However should lighting be required, *obstacle lighting to be installed on 35 turbines: (1, 3, 9, 12, 14, 15, 18, 20, 21, 23, 31, 36, 39, 42, 44, 45, 46, 48, 52, 55, 61, 62, 66, 67, 72, 73, 75, 80, 82, 84, 86, 88, 93, 99 and 100)*, a reduction of 17 lit turbines.

In addition to a reduction in lit turbines, CASA have also altered the technical specifications to allow for two steady red low intensity obstacle lights for each lit turbine in place of medium intensity, flashing lights.

The characteristics of the obstacle lights should be in accordance with the applicable standards in CASA Manual of Standards (MOS) 139.

The turbine obstacle lighting layout is show in in Figure 9.1.

Figure 9.1 Turbine Lighting Plan – Berrybank Wind Farm Aeronautical Assessment, 22 February 2016



Key changes between the lighting proposal considered in the 2010 application and these proposed amendment include:

- A reduction in turbines requiring aviation obstacle lighting from 52 to 35;
- A change from medium to low intensity lighting; and
- Removal of the requirement for flashing lights.

The reduction in the number of turbines with lighting, will improve night time lighting impacts.

MOS 139 also allows for directional shielding of lighting to be installed *such that no more than 5% of the nominal intensity is emitted at or below 5 degrees below horizontal and that no light is emitted at or below 10 degrees below horizontal.*

Shielding is also a mitigation measure described within the Aviation Projects report and a requirement of the Hawkesdale and Ryan Corner Wind Farms.

Although there may be a slight benefit in having lights permanently on rather than flashing, this would not significantly change the level of visual impact. Where vegetation permits views to turbines, lighting would still be visible. Observations of projects in NSW suggest that a strobing effect would still be visible along the back of the turbine blades as they pass through the area of unshielded light.

9.3 Visual Assessment of Aviation Obstacle Lighting

The current aviation obstacle lighting proposed for the Berrybank wind farm will:

- Reduce the number of lit turbines,
- Including shield or directional baffling of lighting;
- Reduce and reduce the intensity from medium to low; and
- Be of a constant, therefore non-flashing light source.

The above design changes will assist to reduce the visual impact of the proposed Aviation Obstacle Lighting considered by the original Panel for the Berrybank Wind Farm in 2010.

Further, the aviation obstacle lighting would be located at the top of the nacelle at a height of approximately 117 m above ground level. This height is below the original approved maximum turbine height of 131 m for which landscape mitigation was recommended to mitigate visual impacts from nearby residential dwellings. For these reasons, I am of the view that the landscape mitigation recommended for daytime views, can also be successful at mitigation impacts of the proposed aviation obstacle lighting.

10 CUMULATIVE VISUAL IMPACT

The nearest existing wind farms to the BBWF Farm are the Mount Mercer and Chepstowe Wind Farms. Cumulative visual impact can occur either by:

- Sequential and simultaneous views to WTGs from publicly accessible viewpoints or from private viewing locations; or
- Changes to community or visitor perception of a region due to the presence of multiple wind farms in an area.

Several wind farms in the area have become operational as shown in Figure 10.1 and listed in Table 10.1. Further wind farms are proposed in this region.

Figure 10.1 Wind Farms in South West Victoria

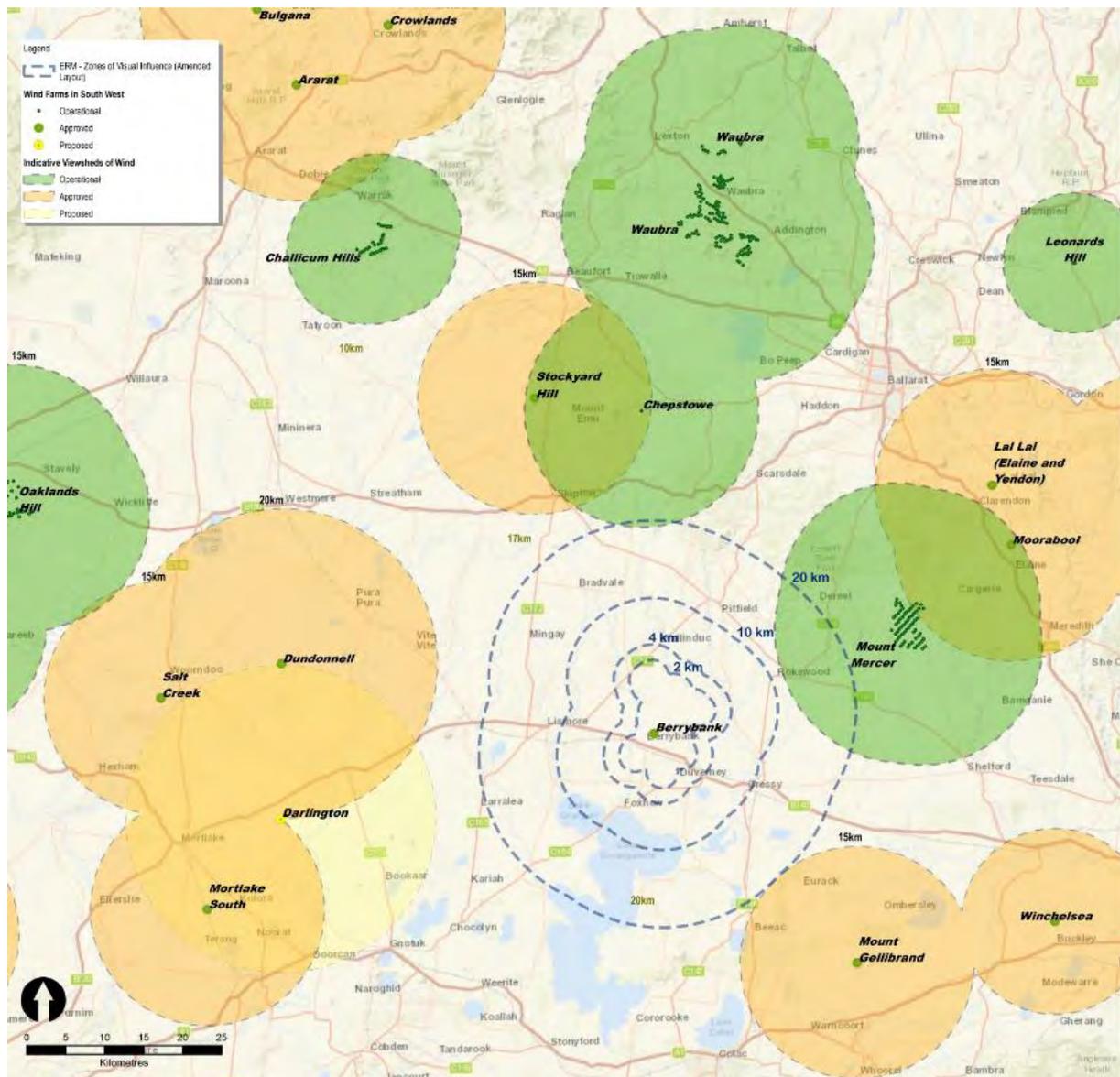


Table 10.1

Wind Farms in the vicinity of the Project

Location	No. of Turbines	Distance and Direction (approx.)	Status
Mt Mercer	64	30 km north east	Operating
Chepstowe	3	35 km north	Operating
Challicum Hills	35	65 km north west	Operating
Waubra	128	55 km north	Operating
Leonards Hill/ Hepburn	3	75 km north east	Operating
Oaklands Hill	32	85 km north west	Operating
Ararat	75	90 km north west	Operating
Stockyard Hill	157	35 km north west	Approved
Lal Lal	64	50 km north east	Approved
Moorabool	107	50 km east	Approved
Salt Creek	15	60 km north west	Approved
Mortlake South	51	55 km south west	Approved
Mount Gellibrand	115	30 km south east	Approved/Construction
Winchelsea	16	50 km south east	Approved
Dundonnell	104	45 km north west	Approved
Darlington*	80	45 km west	Proposed

There are now several operating wind farms in the region contributing to a rural landscape with wind turbines.

Berrybank Wind Farm has been endorsed. The Amended Layout will extend the viewshed of the BBWF further. However, an increase in wind turbine heights will not create any appreciable increase in the cumulative visual impact over and above that of the endorsed wind farm. The change in cumulative impact brought about by the Amended Layout will be **negligible**.

11 CONCLUSION

This assessment has demonstrated that the visual impact assessment of the amendments to the Berrybank WF would not alter the visual impact of the original 2010 Approved layout or the changes made to the project which formed the 2013 Endorsed Layout.

11.1 Changes to the wind turbine numbers

Even though there is a reduction of 19 turbines from the approved layout and 15 from the Endorsed Layout, there would be a negligible change in visual impact from the reduced turbine numbers, turbines would still be a visible element in the landscape. Further, the landscape sensitivity, which the Panel considered one that can accommodate turbines, has not changed, nor has the viewer numbers in any appreciable way.

11.2 Changes to the wind turbine heights

This assessment has also shown that although the increased turbine heights may marginally increase areas in which wind turbines can be potentially be seen.

The comparative Seen Area Analysis shows that overall the visibility of the Amended Layout is similar to that of the Approved Layout. Additionally, the areas where there is a change in turbine visibility are from areas of farmland where there are few viewers.

There is a minor change to the visibility of the turbines at the edge of the view shed, however at such a distance where the wind turbines will not be dominant in the landscape.

Photomontages from all four locations show that the change in turbine visibility between the approved height of 131 m and the proposed amended height of 180 m high will appear similar, albeit slight larger in appearance. The overall change to the visual impact however will be negligible.

11.3 Mitigation measures

Given the increased height of the wind turbines, it is acknowledged that the amended wind turbines may be *“Highly visible and will usually dominate the landscape”* up to 4 km of the nearest wind turbines.

The landscape mitigation measures set-out in the Planning permit will be effective at screening available views to turbines for a 180 m high turbine.

In summary, the landscape and visual impact assessment supports the planning amendment proposed for Berrybank Wind Farm.

Annex A - HAYDEN BURGE'S CV

Hayden Burge

Principal, Melbourne



Hayden Burge is ERM's Visual Impact, Landscape and Urban Design Practice lead for New Zealand and Australia.

With extensive experience in Visual Impact Assessment, rehabilitation, construction, master planning, landscape architecture and urban design, Hayden brings a great depth of experience, creativity and practical solutions to a variety of projects.

Project sector experience includes:

- Renewables
- Oil and Gas
- Road, Rail and Port Infrastructure
- Defence
- Mining and Quarrying
- Property and Development

Clients include local and state government, Defence, Treasury and Finance, mining corporations and private and listed companies.

Hayden also regularly appears before appellant bodies and independent planning panels as an expert witness in urban design, visual impact assessment and landscape architecture.

Employment History

2016 to Current

Environmental Resources Management Pty Ltd
Principal Landscape Architect

2014 to 2016

Planned Constructions
Business Development, Construction Manager

2003 to 2014

Environmental Resources Management Pty Ltd
Principal Landscape Architect

1998 to 2003

Chris Dance Land Design Pty Ltd
Landscape Architect

Professional Affiliations and Registrations

- Registered Landscape Architect, Australian Institute of Landscape Architects
- Planning Institute of Australia

Fields of Competence

- Visual Impact Assessment
- Landscape Architecture
- Master Planning
- Urban Design
- Rehabilitation
- Construction

Education

- Bapp Sci Landscape Architecture and Urban Design, RMIT 2000

Languages

- English, native speaker

Publications

- *Mining as a scar on the landscape* - ACG Global Mine Closure Conference, Brisbane 2012
- *Visual Impact Assessment* - Presentation to the Victorian Planning and Environmental Law Association

Expert Evidence

Carlton Housing Precincts-Development Plan, Dec 2006
Former Rusden Campus, Blackburn, March, 2007
Wallace Avenue Toorak, July, 2007
10 Queens Road, South Melbourne, August, 2007
Serpells Road, Templestowe, July 2008
Carlisle Street St Kilda, June 2012
Seville Telstra Tower, 2013
87 Stewart Street Brunswick, October 2014

Key Projects

The projects listed below provide examples of the range of projects and project support Hayden has provided.

Various Wind Farm Projects

Hayden has prepared the landscape and visual impact Assessment for a range of wind Farms throughout Australia. A full list of these projects can be made available on request.

Victorian Desalination Project, Wonthaggi, Victoria

(Victorian Government, 2007)

Hayden was the project director for the LVIA of the Victorian Desalination Project. The project required the preparation of Visual Impact Assessments and of performance guidelines Plant Site, 80 km water transmission pipeline and new transmission line. .

Urban Design Framework, East West Link, Melbourne (Linking Melbourne Authority, 2013)

Undertake a study to inform tenderers on this project of the standard expected in the final urban design outcomes.

These included key objectives for new 'gateways' to Melbourne, as well as for open space and wetland redesign as well as future bike and pedestrian linkages.

Confidential Solar Project - Current

ERM have been engaged to review the visual and solar glare component of a proposed new project west of Rockhampton.

Confidential Solar Project - Current

ERM have been engaged to review the visual and solar glare component of a proposed new project north west of Rockhampton.

Confidential Wind and Solar - Current

ERM have been engaged to prepare the landscape and visual impacts and solar glare assessment of a new combined wind and solar facility in New South Wales.

Queensland Curtis LNG Plant

ERM's Visual impact Assessment team was engaged to assess the visual impacts of the proposed LNG extraction field infrastructure in the Bowen Basin, 400 km transmission pipeline and processing plant located on Curtis Island. Part of the Visual Impact Assessment was to determine rehabilitation criteria for the transmission pipeline to assist with mitigation and operation.

Turitea Wind Farm (Mighty River Power / Chancery Green 2008 - 2011)

ERM prepared the landscape and visual impact assessment for the Resource Consent application for the Turitea Wind Farm and appeared at the public hearing. The project was granted consent in 2011.

Base Security Improvement Program Base Infrastructure Works (March 2012 - current)

ERM was commissioned in the role of Design Team Environment and Heritage advisor to Webb Group Australia

for the Base Security Improvement Project (BSIP) Base Infrastructure Works (BIW). Hayden was involved in the role of visual amenity and landscape historic heritage impact assessment as part of the 50% to 90% design stages. As part of this role Hayden had to prepare visual assessments (including photographic montages) for five key heritage sites including Victoria Barracks Melbourne, Victoria Barracks Sydney, Duntroon, Russell and HMAS CERBERUS.

Various Telstra and NBN appeals

Preparation of landscape and visual impact assessments for proposed Telstra and NBN facilities in Victoria and Tasmania. Hayden has also given evidence for several Victorian facilities.

Mine Closure Review (BHPB IO - 2014)

Natural landscape features such as natural slope angles, escarpments and valleys, drainage patterns and natural erosion armouring of gullies and water ways were reviewed to understand characteristics and features to compile a natural closure toolkit.

Ranger Uranium Mine - Heap Leach Expansion

ERM were engaged to work with the local indigenous community to understand the potential visibility/impact of a proposed project expansion from areas of indigenous Cultural and Ceremonial sensitivity. The process was facilitated by photomontage techniques to interpret proposed mine operations to traditional owners to facilitate negotiations and discussions surrounding project approvals.

Port Capacity Project, Port of Melbourne Corporation

ERM prepared the landscape and visual impact assessment to assist the Port with the stakeholder engagement and the planning approvals process to deliver the improved and more efficient port.

Hayden was ERM's project manager, overseeing the co-ordination, management and delivery of the visual impact assessment of the project.

Manly Wharf development, Sydney (TMG Developments Pty Ltd, 2013)

Offered visual assessment and urban design advice regarding a major redevelopment of one of Sydney's iconic destinations.

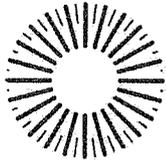
Burrup Nitrates

ERM were engaged to assess the Visual and Night Lighting Impacts of a proposed Nitrates Plant located on the Burrup Peninsula in Western Australia.

Chiltern Quarry - Cemex (Holcim)

ERM Prepared the Landscape and Visual Impact Assessment for the Chiltern Quarry Project. Part of the projects success was ERM's input to linking the progressive rehabilitation to the stages extraction program.

Annex B - INSTRUCTIONS



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Hayden Burge
Principal Landscape Architect
Environmental Resources Management
Level 6, 99 King Street Melbourne VIC 3000
PO Box 266 | South Melbourne Vic 3205
hayden.burge@erm.com

8 September 2017
Matter 82462501
By Email

Dear Mr Burge

Confidential and Privileged

Berrybank Wind Farm Engagement of Expert Witness

We are acting as legal advisors to Berrybank Development Pty Ltd in connection with the Berrybank Wind Farm, and specifically the following applications:

- application to amend the existing planning permit 20092821 relating to land within the Corangamite Shire; and
- application to amend the existing planning permit 20092820 relating to land within the Golden Plains Shire,

which make up the Berrybank wind farm, together, the **Amendment Applications**.

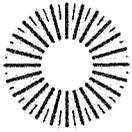
We are instructed that development of the wind farm has commenced under the relevant permit, in accordance with endorsed plans as required under the conditions of each permit.

1 Background

The Amendment Applications include a number of changes to the existing planning permits including:

- (a) Amend condition 2 of each permit to provide a more comprehensive secondary consent and micro-siting power;
- (b) Amend the specifications set out in condition 3 of each permit to:
 - (1) Limit the number of wind turbines;
 - (2) Provide that the overall maximum height of the wind turbines must not exceed 180 metres;
 - (3) Delete the maximum height of the tubular steel and/or concrete tower mount;
 - (4) Delete the maximum blade length requirement and replace it with a with the lowest point of a rotor blade sweep, being 40 metres.
- (c) In each permit, provide a new permit condition regarding aviation obstacle lighting;
- (d) In each permit, amend the conditions relating to noise limits and noise compliance and delete the requirement relating to noise within 20 metres of a dwelling; and

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- (e) In each permit, amend the condition relating to blade shadow flicker to allow an agreement with a landowner for blade shadow flicker to exceed 30 hours per annum.

Our client has applied to amend each of the Permits pursuant to section 97I of the *Planning and Environment Act 1987* (Vic) (**Act**), and has also applied for approval of amended endorsed plans as specified in the Amendment Applications, to give effect to the proposed changes to the layout and specifications of each wind farm.

The Amendment Applications have been referred a Panel pursuant to section 97E of the Act and will be heard together as follows:

Hearing	Date	Location
Panel directions	20 October 2017	TBC but likely in proximity to the town of Berrybank
Panel hearing	Week of 13 November 2017	TBC but likely in proximity to the town of Berrybank

2 Scope

2.1 Expert witness statement

Your report should address matters relating to visual amenity as it is relevant to the Amendment Applications, including:

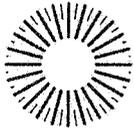
- the preparation of photomontages, including a detailed assessment of the visual impact from dwellings in the Berrybank Township Zone, including photographs;
- the impact (if any) of any requirement for night lighting, which may be required by the Civil Aviation and Safety Authority, noting that the original Permit does not have the benefit of endorsed plans approving night lighting and the comments of the Panel in 2010 (page 24 of the Panel report).

The Amendment Applications are currently on exhibition and we expect that a number of submissions will be received in respect of the Amendment Applications. We request that you progress your expert witness statement before the submissions have been received. Once received we will forward you those submissions and we request you consider those submissions and respond to any relevant matters in your witness statement.

We would like you to prepare a witness statement in accordance with Planning Panel Victoria's *Guide to Expert Evidence* (**Guide**) which prescribes the content and form of expert witness statements. We enclose a copy of the Guide for your reference. You are required to review and understand the Guide and to ensure your witness statement addresses all matters set out in the Guide, in particular those matters listed under the heading 'Content and Form of Experts Report'. Please contact us if there is anything in this Guide which you do not understand, or if you have questions in relation to it. Your witness statement should include matters required as set out in the Guide such as:

- (a) A reference to any technical report or reports that you rely upon;
- (b) A statement to the effect that you adopt the findings in reports you helped to prepare and were submitted as part of the Amendment Application and identifying any departure from the findings and opinions you express in those reports;
- (c) Any key assumptions made in preparing your witness statement.

We have prepared a template to assist you to prepare and order your expert witness statement. You should treat the template as an aid and should not consider yourself constrained by it if you would prefer to structure your statement differently.



3 Timing

We expect that the Panel hearing will be in the week of 13 November 2017. We understand it is most likely that at least part of the Panel hearing will be conducted in the vicinity of the Berrybank township.

We anticipate that we will be required to exchange expert witness statements a week prior to commencement of the hearing, although this will not be confirmed until the directions hearing. We are aware that the timeframes are reasonably short, and appreciate your effort in assisting us to prepare for hearing in accordance with the Panel schedule.

We accordingly request you to:

- prepare your draft expert witness statement by **mid-October 2017**;
- attend a meeting or phone conference with us and counsel **late October 2017** to consider the matter and any issues raised in the Panel directions hearing;
- update your draft expert witness statement to address any further submissions we send you after the date of this letter;
- finalise your expert witness statement by **early November 2017**;
- attend the Panel hearing as required to present your expert opinion in the week of 13 November 2017.

Any documents you prepare under this engagement should be marked '*Confidential and subject to legal professional privilege.*'

4 Fee estimate and invoicing

It is important to note that you will continue to be contractually engaged on behalf of/by our client. Our client will continue to be responsible for the payment of your fees and your accounts should be sent directly to the appropriate person nominated by our client.

Our client's contact details are as follows:

Shaq Mohajerani
Projects Development Manager
Email: shaq.mohajerani@unionfenosa.com.au
0400 403 282
Global Power Generation Australia Pty Ltd
Suite 4, Level 3, 24 Marcus Clarke Street
Canberra, ACT 2600
<http://www.globalpower-generation.com>

5 Confidentiality

Your expert report prepared in accordance with this retainer is confidential and is not to be copied or used for any purpose unrelated to the Panel hearing without our permission.

Material supplied by Herbert Smith Freehills is, unless it is already in the public domain, confidential and is not to be copied or used for any purpose unrelated to your retainer without our permission.

6 Conflict of interest

It is important that you are free from any possible conflict of interest in providing your advice. You should again ensure that you have no connection with any potential party to the panel hearing which could preclude you from providing your opinion in an objective and independent manner.



7 Your duties and responsibilities as an expert witness

As set out in the Guide, an expert witness has a duty to the Panel and not to the person engaging the expert. You are not an advocate for any party. Consequently, though you are retained by our client, you are retained as an expert to assist the Panel, and have an overriding duty to it. The Panel will expect you to be objective, professional and form an independent view as to the matters in respect to which your opinion is sought.

Until your report is in final form it should not be signed. You should, however, be aware that unsigned documents may need to be disclosed to other parties.

8 Communications

Unless advised otherwise, all communications, whether verbal or written, should be directed to our office so that we can coordinate, manage and integrate work activities with legal requirements and ensure legal professional privilege is maintained as appropriate.

If you have any questions about this letter, your role in the hearing, or the approval process, and would like to discuss your availability or the content of your report, please contact us.

Yours sincerely

Heidi Asten
Partner
Herbert Smith Freehills
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Herbert Smith Freehills LLP and its subsidiaries and Herbert Smith Freehills, an Australian Partnership ABN 98 773 882 646, are separate member firms of the international legal practice known as Herbert Smith Freehills.

Attached

- 1 Guide to Expert Evidence
- 2 Pro forma expert witness statement



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Attachment 1

Guide to Expert Evidence

Please see attached.



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Attachment 2

Pro forma Expert Witness Statement

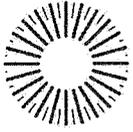
In the matter of the Berrybank Wind Farm

Planning Panels Victoria

Proponent: Berrybank Development Pty Ltd

**Expert Witness Statement of
[insert name]**

Expert of Berrybank Development Pty Ltd



1 Name and address

[insert]

2 Qualifications and experience

Appendix A contains a statement detailing my qualifications and expertise and addressing the matters set out within Planning Panels Victoria's Guide to Expert Evidence.

3 Scope

3.1 Role in Preparation of the Amendment Application

[Outline role in respect of the preparation of relevant reports submitted with the Amendment Application, if any].

An appropriate statement may be:

My firm ### was responsible for the preparation of the technical report titled "[##]" which was submitted by Berrybank Development Pty Ltd as part of its Amendment Application.

My role in the preparation of the [relevant report] was to [describe].

3.2 Instructions

My instructions to prepare this witness statement are set out in Appendix A.

3.3 Process and Methodology

[insert]

4 Findings

4.1 Summary of Opinions

I have reviewed the [relevant Amendment Application Report] in preparing this expert witness statement.

Save where otherwise indicated I adopt the [relevant Report] as the basis of my evidence before Planning Panels Victoria.

[Outline any changes (if necessary) to the initial report.]



4.2 Any Additional Work Undertaken Since Submission of Amendment Application

[Only if relevant]

4.3 Response to Submissions

I have reviewed the following submissions which raise issues concerning [relevant area of expertise]: [identify relevant submission numbers here.]

My detailed response to the matters raised in these submissions is set out in Appendix C.

[Insert]

4.4 Amended Planning Permit Conditions

I have reviewed the draft amended planning permit conditions relevant to [area of expertise].

[Outline any changes (if necessary) to the initial report.]

Proposed Condition	Recommended Condition	Reason for Modification
[text]	[text showing marked-up change]	

5 Declaration

I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel.

Signed

Dated 2017



Annexure A – Response to PPV Guide to Expert Evidence

Expert's Qualifications

[Insert]

Professional Associations

[Insert]

Employment History and Achievements

[Insert]

Expertise to Make Report

[Insert]

Other Significant Contributors to the Report (if any)

[Insert]

Instructions to Prepare Report

[Insert]

Identity of Persons who have Carried out Tests or Experiments upon which Reliance has been Placed (if any)

[Insert]

Reports Relied Upon to Prepare Expert Witness Statement

[Insert]



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Annexure B – Curriculum Vitae



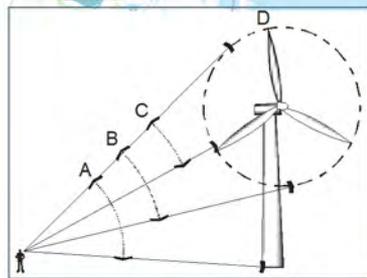
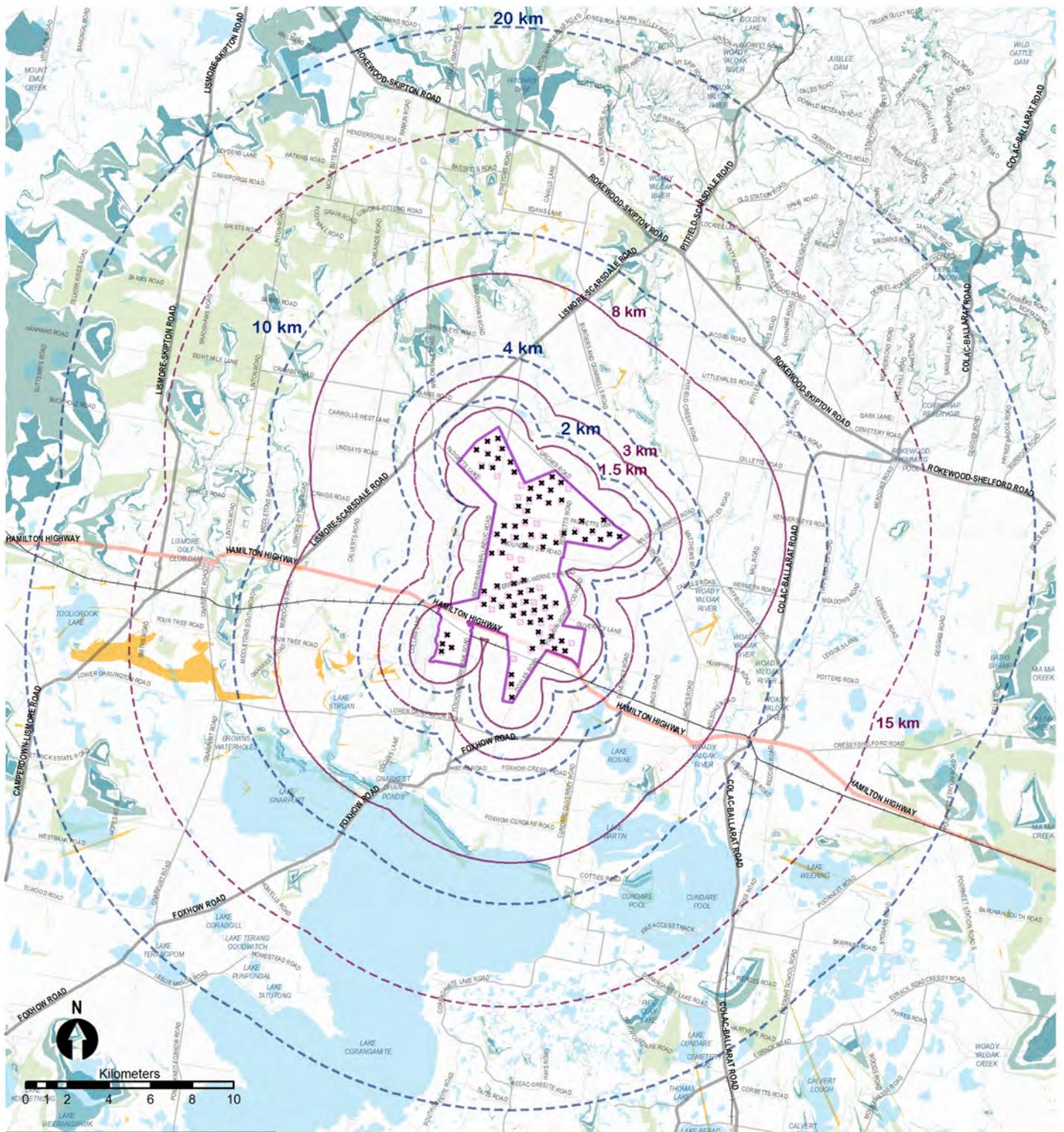
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Annexure C – Detailed Response to Submissions

Issue	Submission No.	Response	Any Recommended New or Modified Conditions

Annex C - PHOTOMONTAGES

Annex D - CHANGE IN TURBINE VISIBILITY



Legend

- ✕ Proposed Wind Farm Layout (2017)
- ✕ Endorsed Wind Farm Layout (2013)
- 1 Zones of Visual Influence (Proposed Layout)
- 1 Zones of Visual Influence (Endorsed Layout)
- Site Boundary

Change in Visibility between Approved and Amended Layouts

- Reduction in visibility of Zone A (entire turbines)
- No change in visibility
- Increased visibility of Zone A (entire turbines)
- Increased visibility of Zone B (blade swept path)
- Increased visibility of Zone C (hub and above)
- Increased visibility of Zone D (tip or any part)

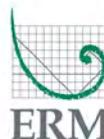
Client: RCDPL
 Drawing No: 0124589_BBWF_Visibility_Comb_Difference_170329.mxd
 Date: 31/03/2017 Drawing Size: A4
 Drawn By: ML / zgr Reviewed By: ML

Figure 3 - Zone C - Change in visibility of at least half of swept path of one or more of wind turbines - (Comparison between Amended Layout to Approved Layout)

Berrybank Windfarm

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

Environmental Resources Management ANZ
 Auckland, Brisbane, Canberra, Christchurch,
 Melbourne, Newcastle, Perth, Port Macquarie, Sydney





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