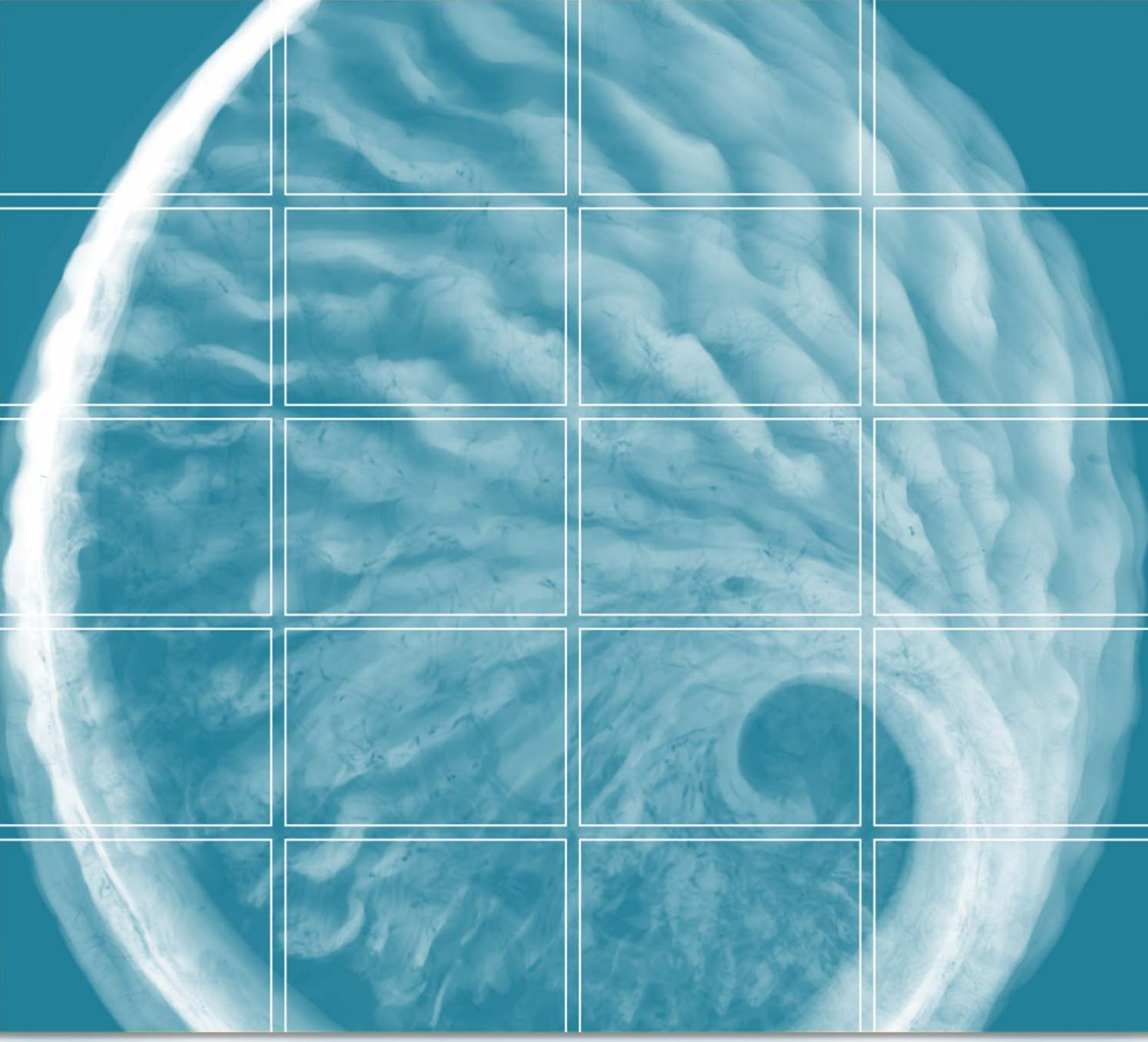

Amendments to the Hawkesdale and Ryan Corner Wind Farm

Expert Evidence Statement of Hayden Burge

For: Ryan Corner Development Pty Ltd

0105123 FINAL

August 2017

ERM

FINAL

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Expert Evidence Statement of Hayden Burge

For: Ryan Corner Development

0105123

August 2017

Author Hayden Burge

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1 INTRODUCTION

Ryan Corner Development Pty Ltd (RDPL) seeks to amend the Approved permit for the Hawkesdale and Ryan Corner Wind Farms to allow for an increase in wind turbine height from 126.3m to 180m.

ERM prepared the following assessments in relation to both wind farms:

- Preliminary Landscape and Visual Impact Assessment's as part of the Notification to the Minister, May 2005
- Hawkesdale Wind Farm Final Landscape and Visual Impact Assessment, Submitted with the Planning Permit Application Report (PPAR), September 2006
- Hawkesdale Wind Farm Supplementary Report February 2008 – Night Time Lighting
- Chapter 20 of the Ryan Corner LVIA.

1.1.1 Aviation Obstacle Lighting

For the Hawkesdale Wind Farm, CASA had advised that aviation obstacle lighting would not be required to be installed. For this reason, aviation obstacle lighting was not assessed in the Preliminary LVIA or Final LVIA.

In April 2007, CASA advised RDPL that aviation obstacle lighting would be required at the Hawkesdale Wind Farm. At the request of the Panel, ERM prepared a supplementary report dated February 2008 which assessed the potential visual impacts associated with the new requirement for aviation obstacle lighting.

The Supplementary Panel Report – Aviation Safety, dated 17th April 2008 determined *that the overall impact can be managed due to:*

- *The relatively low intensity of the medium intensity obstacle lighting (as viewed by the Panel Chairman at Wonthaggi);*
- *The relatively low number of turbines to be lit;*
- *The use of shielding of the lights to provide a maximum beam intensity in a narrow range;*
- *The finishing of the backs of blades in a non-reflective material to minimise any strobing effects; and*
- *Landscaping to reduce impacts on properties within 1.5 km.*

The finding was made with knowledge of the aviation lighting at the Woolsthorpe Wind Farm.

Revised permit conditions were prepared by the Panel to include mitigation measures for aviation obstacle lighting. Mitigation measures for aviation obstacle lighting are described in chapter 9 of this report.

In relation to Ryan Corner Wind Farm, The original LVIA for the assessed project did not require aviation obstacle lighting. This requirement changed on amended advice from CASA requiring 26 turbines lit.

> *….the Inquiry is satisfied that whilst it will have some visual impact, this impact can be mitigated to acceptable levels by landscaping at non-stakeholder properties and shielding to the maximum extent allowed under the CASA Advisory Circular and Manual of Standards.*

1.2 Summary of the proposed amendments

Proposed amendments at both Hawkesdale and Ryan Corner Wind Farms that are relevant to visual impacts include:

- Removal of turbines;
- Increase the permitted turbine height from 126.5 to 160 m and 180 m; and
- Realign access tracks in accordance with the reduced turbine layout; and

Retained turbines would be micro-sited within the approved envelope for micro-siting. The proposed changes will herein be referred to as the Amended Layout.

1.3 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.

1.3.1 Name & address

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

1.3.2 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.

1.3.3 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 Ryan Corner Development Pty Ltd.

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

1.3.4 Site inspections

I have visited the site and surrounding districts on several occasions. The most recent prior to preparing this evidence was on Wednesday 19th July, 2017.

1.3.5 Instructions

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

- review the Amendment Application as relevant to visual impacts for the Hawkesdale 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.

1.3.6 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 ERMs photomontage methodology. I was involved in the development of the methodology and have applied it to many project. For clarity, the photomontage methodology is described in section 5.4 Photomontage preparation.

1.3.7 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.

2 PROPOSED AMENDMENTS

This section describes the proposed amendments to Hawkesdale and Ryan Corner Wind Farms that were assessed by the landscape and visual impact assessments in the amendment application.

The amended layout seeks to remove turbines, increase the Layout to allow for increased turbine heights of 160 m and 180 m. The location of several turbines are also proposed to altered by the proposed amendment. Although this is permitted under the current permit under the conditions of the permit, the change in impacts was assessed in the Amendment Application documentation for the sake of completeness.

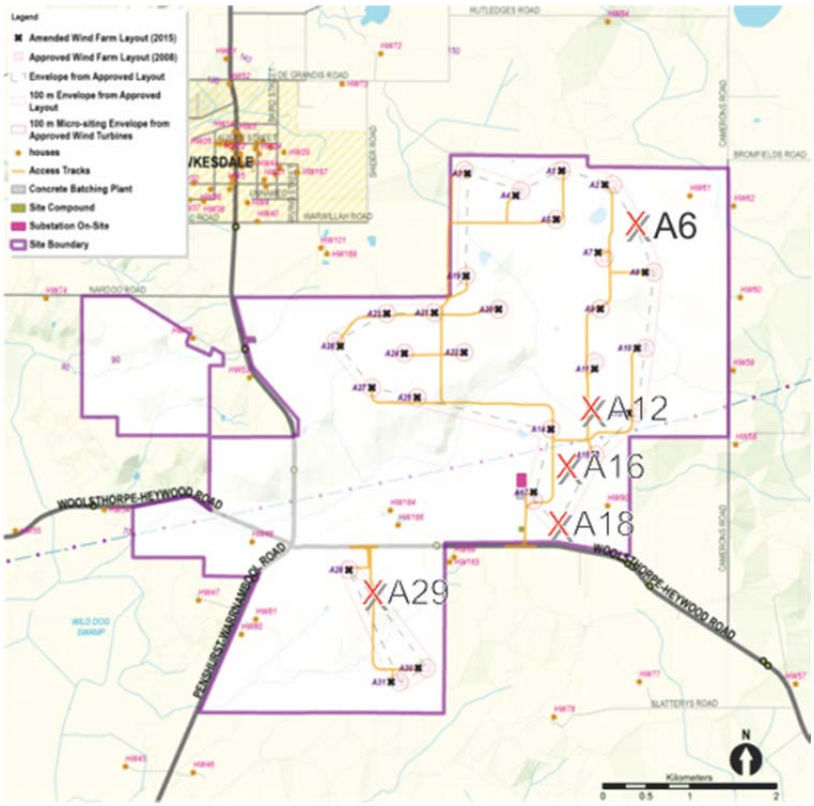
2.1 Hawkesdale Wind Farm Amendments

The approved HWF comprises 31 turbines with an overall maximum height of 126.3 m (Approved Layout) and grid connecting infrastructure.

2.1.1 Turbine Removal

Turbines A6, A12, A16, A18 and A29 are proposed to be removed by the Amended Layout. The location of each turbine is shown in Figure 2.1.

Figure 2.1 Deleted turbines



The proposed turbines identified for removal are located along the eastern and southern edge of the turbine array.

2.1.2 Turbine micro-siting

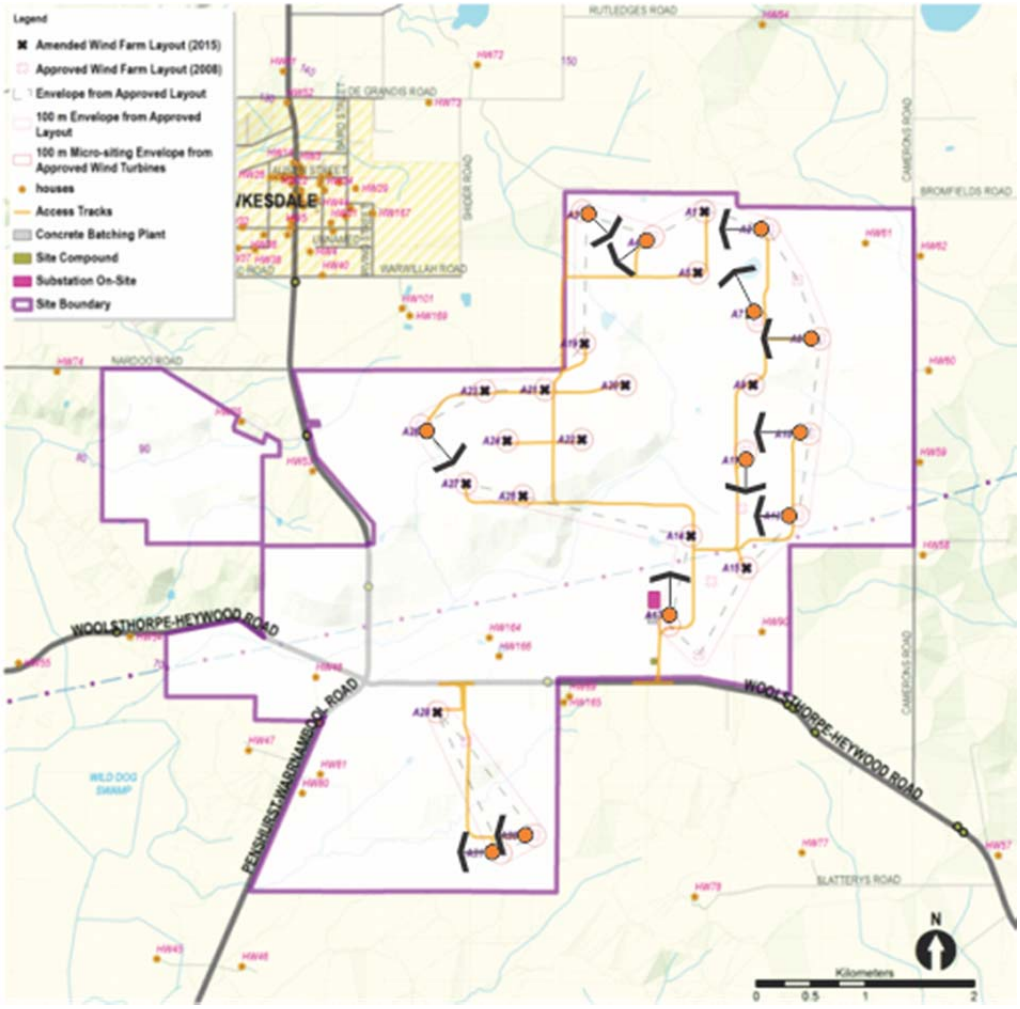
Twelve turbines are proposed to be altered by the proposed amendments. All turbine movements will be within the approved 100 m micro-siting buffer. The co-ordinates for proposed location. The distance moved and direction of turbine movement are also described in Table 2.1

Table 2.1 ***Turbine amendments (Supplied by GPG)***

Turbine ID	Eastings AGD66 (m)	Northings AGD66 (m)	Height of base (m)	Eastings AGD66 (m)	Northings AGD66 (m)	Movement From Original (m)	Comments (From Original)
A1	619551	5780999	151	619551	5780999	0	~
A2	620142	5780838	146	620052	5780838	90	West
A3	618431	5781005	147	618466	5780969	50	South-East
A4	619080	5780769	149	619026	5780716	75	South-West
A5	619489	5780437	148	619489	5780437	0	~
A6	620407	5780368	147				REMOVED
A7	620041	5779992	147	619974	5780059	95	North-West
A8	620613	5779829	146	620518	5779829	95	West
A9	619999	5779406	145	619999	5779406	0	~
A10	620517	5778955	141	620423	5778955	94	West
A11	619933	5778794	143	619933	5778714	80	South
A12	619892	5778268	142				REMOVED
A13	620414	5778204	142	620319	5778204	95	West
A14	619427	5778019	142	619427	5778019	0	~
A15	619939	5777722	142	619939	5777722	0	~
A16	619615	5777601	142				REMOVED
A17	619230	5777197	133	619230	5777292	95	North
A18	619500	5776923	133				REMOVED
A19	618450	5779788	141	618450	5779788	0	~
A20	618826	5779402	138	618826	5779402	0	~
A21	618085	5779362	137	618085	5779362	0	~
A22	618427	5778904	133	618427	5778904	0	~
A23	617535	5779352	131	617535	5779352	0	~
A24	617739	5778894	133	617739	5778894	0	~
A25	617885	5778384	130	617885	5778384	0	~
A26	616947	5779031	128	617000	5778978	75	South-East
A27	617363	5778498	130	617363	5778498	0	~
A28	617098	5776397	112	617098	5776397	0	~
A29	617363	5776122	113				REMOVED
A30	617995	5775264	114	617900	5775264	95	West
A31	617682	5775103	108	617587	5775103	95	West

Figure 2.2 shows the proximity and direction of movement for those turbines that are proposed to be altered by the Amended Layout. The arrows show the direction of travel only. They do not reflect distance.

Figure 2.2 *Turbine movement*



Micro-siting of turbines is generally along the eastern edge of the site and away from boundaries. Overall, the turbine micro-siting would increase the distance between surrounding residential dwellings.

2.2 Ryan Corner Wind Farm Amendments

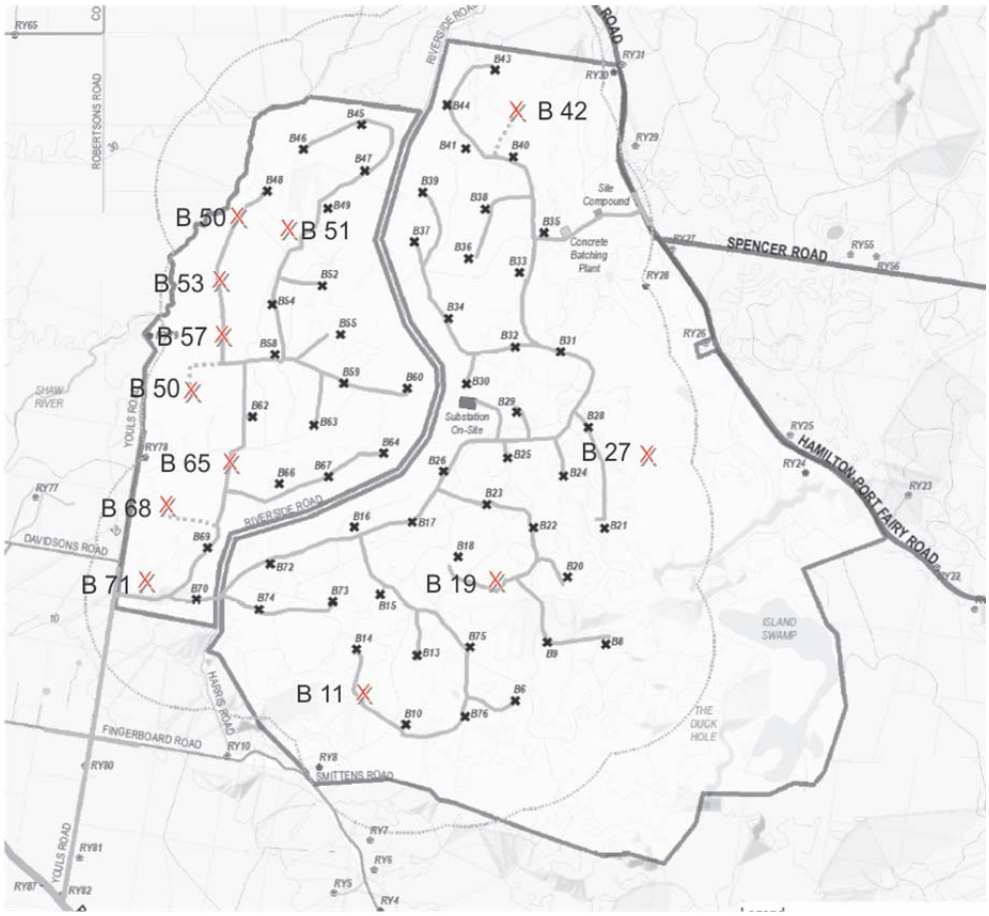
The approved RCWF comprises 68 wind turbines with a maximum height of 126.3 m above ground level (Approved Layout) and grid connecting infrastructure.

The amended layout seeks to remove turbines, increase the approved turbines heights to 160 m and 180 m and for micro-siting of several turbines.

2.2.1 Turbine Removal

Twelve turbines (B11, B19, B27, B42, B50, B51, B53, B57, B61, B65, B68 and B71) would be deleted by the Amended Layout. The location of deleted turbines are shown in Figure 2.3

Figure 2.3 *Deleted turbines*



The majority of deleted turbines are located along the western edge of the turbine array.

2.2.2 Turbine micro-siting

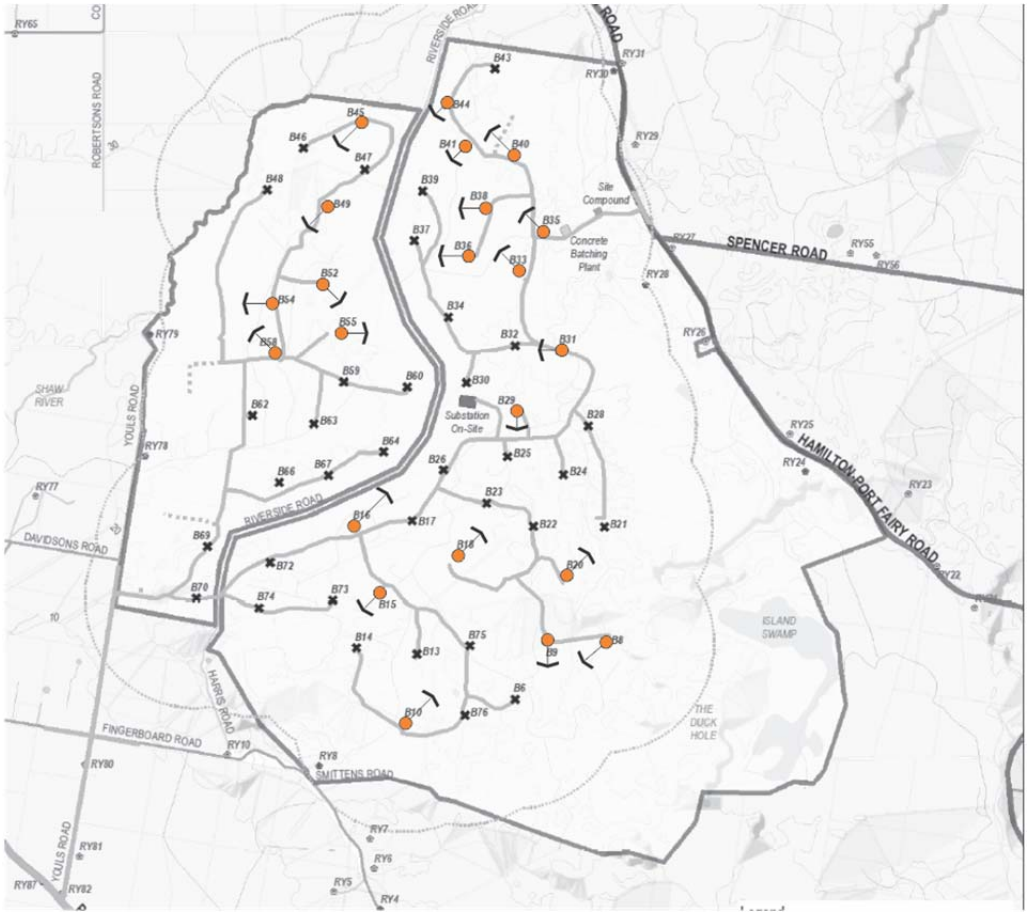
Twenty-four turbines are proposed to alter by micro-siting. All movements will be within the approved micro-siting buffer. The co-ordinates for proposed location, distance moved and direction of movement are shown in Table 2.2

Table 2.2 Turbine amendments (Supplied by GPG)

	RCWF Approved Locations August 2008			RCWF Microsited Locations 20 December 2016			
Turbine ID	Eastings AGD66 (m)	Northings AGD66 (m)	Height of base (m)	Eastings AGD66 (m)	Northings AGD66 (m)	Movement From Original (m)	Comments (From Original)
B6	598757	5758884	32	598757	5758884	0	~
B8	599028	5759481	30	599580	5759399	95	South-West
B9	599046	5759451	30	599046	5759421	30	South
B10	597733	5758581	25	597757	5758672	94	North-East
B11	597388	5758879	28				REMOVED
B13	597858	5759298	31	597858	5759298	0	~
B14	597305	5759354	31	597305	5759354	0	~
B15	597565	5759924	28	597523	5759851	85	South-West
B16	597266	5760376	30	597291	5760468	95	North-East
B17	597818	5760511	28	597818	5760511	0	~
B18	598165	5760125	35	598232	5760192	95	North-East
B19	598587	5759805	34				REMOVED
B20	599214	5759950	40	599229	5760008	60	North-East
B21	599568	5760455	40	599568	5760455	0	~
B22	598922	5760458	37	598922	5760458	0	~
B23	598493	5760673	34	598493	5760673	0	~
B24	599196	5760931	41	599196	5760931	0	~
B25	598687	5761099	32	598687	5761099	0	~
B26	598099	5760974	34	598099	5760974	0	~
B27	599375	5761062	40				REMOVED
B28	599422	5761378	40	599422	5761378	0	~
B29	598768	5761563	37	598768	5761513	50	South
B30	598310	5761771	36	598310	5761771	0	~
B31	599265	5762065	40	599170	5762065	95	West
B32	598757	5762109	39	598757	5762109	0	~
B33	598834	5762722	38	598794	5762791	80	North-West
B34	598143	5762373	35	598143	5762373	0	~
B35	599085	5763085	37	599017	5763152	95	North-West
B36	598412	5762921	35	598332	5762921	80	West
B37	597836	5763071	36	597836	5763071	0	~
B38	598559	5763372	35	598479	5763372	80	West
B39	597911	5763523	37	597911	5763523	0	~
B40	598802	5763777	42	598734	5763844	95	North-West
B41	598384	5763969	36	598302	5763921	95	South-West
B42	598787	5764236	39				REMOVED
B43	598572	5764634	41	598572	5764634	0	~
B44	598189	5764373	36	598133	5764316	80	South-West
B45	597410	5764195	39	597353	5764138	81	South-West
B46	596825	5763915	39	596825	5763915	0	~
B47	597384	5763720	34	597384	5763720	0	~
B48	596493	5763534	34	596493	5763534	0	~
B49	596942	5763442	31	597048	5763375	95	South-East
B50	596205	5763246	25				REMOVED
B51	596673	5763159	27				REMOVED
B52	596964	5762705	28	596999	5762670	50	South-East
B53	596023	5762696	24				REMOVED
B54	596563	5762502	23	596538	5762502	25	West
B55	597067	5762224	31	597162	5762223	95	East
B57	596069	5762181	22				REMOVED
B58	596630	5761976	22	596563	5762043	95	North-West
B59	597195	5761778	26	597195	5761778	0	~
B60	597771	5761728	34	597771	5761728	0	~
B61	596799	5761627	20				REMOVED
B62	596360	5761472	21	596360	5761472	0	~
B63	596923	5761397	20	596923	5761397	0	~
B64	597556	5761138	33	597556	5761138	0	~
B65	596145	5760977	25				REMOVED
B66	596605	5760764	28	596605	5760859	95	~
B67	597053	5760926	28	597053	5760926	0	~
B68	596545	5760840	25				REMOVED
B69	596953	5760299	31	596852	5760279	20	South
B70	596849	5759805	25	596849	5759805	0	~
B71	596355	5759895	22				REMOVED
B72	596570	5760211	32	596522	5760128	95	South-West
B73	597094	5759789	28	597094	5759789	0	~
B74	596421	5759720	26	596421	5759720	0	~
B75	596345	5759377	26	596345	5759377	0	~
B76	596296	5758739	30	596296	5758739	0	~

Figure 2.4 shows the turbines and direction of movement for turbines that would be altered through micro-siting. The arrows show direction of movement only and not the distance.

Figure 2.4 ***Turbine movement***



Micro-siting will generally move turbines away from site boundaries therefore increasing the distance between the majority of neighbouring dwellings and turbines.

2.3 Turbine dimensions

Both the Hawkesdale and Ryan Corner Wind Farms are seeking to increase the permitted overall turbine heights.

2.3.1 Ryan Corner Wind Farm – Turbine height increase

The proposed amendments seek to increase the overall height for the 56 turbines retained by the project.

With the exception of turbine B35, all turbines would increase in height to 180 m to the tip of the turbine blades.

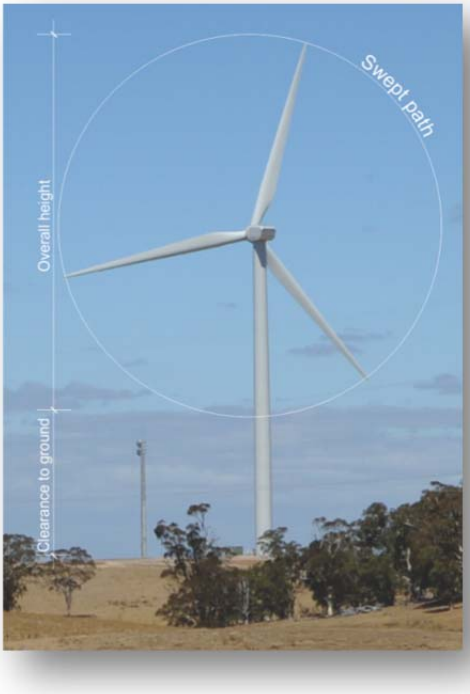
A summary of the proposed amendments to turbine dimensions are made in Table 2.3

Table 2.3 ***Turbine Height Change***

	Min blade clearance to ground level	Overall height (m)	No of turbines
Approved Layout	36.3	126.3	68
Turbine B35	30	160	1
All other turbines	40	180	55

Figure 2.5 shows a typical turbine labelled to show the proposed changes to the approved turbine dimensions.

Figure 2.5 ***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.

It is understood that the maximum hub height will be 117 m above ground level. This maximum height is based on a minim blade length of 63 m * Maximum hub height will be 117 m. The hub height is most relevant to submissions received in relation to night time lighting. This is because the aviation obstacle lights are mounted to the top of the nacelle.

To conservative, the assessment of aviation obstacle lighting and photomontages are based on a hub height 117 m.

2.3.2 Transmission line

The LVIA for the both wind farms Approved Layout's considered several options to connect the projects to the National Electricity Grid. This option's assessed in the LVIA for both projects are unchanged.

3 SUBMISSIONS

Submissions raised in relation to visual concerns were received for both the Hawkesdale and Ryan Corner Wind Farms. The concerns for both wind farms are summarised below.

3.1 Hawkesdale Wind Farm

Specific concerns raised by submitters for the Hawkesdale Wind Farm include:

- *…Visual affect on me as I work in my vegetable garden and also as I walk or ride my bike around town….*
- *Turbines at 180m high will dwarf the township…. The turbines will be in their face every time they put their head out the door.*
- *There will be three wind turbines to the west and eight wind turbines on the north. Our property will also be impacts on the eastern boundary with the erection of three wind turbines as part of the approved Woolsthorpe Wind Farm….. There are two occupied dwellings on our farm. In relation to the proximity of the proposed wind turbines to these dwellings, four wind turbines will be location just outside the one kilometre exclusion zone (A30, A31, A28 and A17)…. There will be a significant visual impact from the occupied dwellings on our property.*
- *I think this height so close to a town or a house is appalling.*

3.2 Ryan Corner Wind Farm

Several submissions were received in relation to the proposed amendment. The submissions that mention visual amenity as an issue are summarised below.

- *I believe the proposed amendment (increase in turbine height) will have an increased adverse affect on the visual amenity of my property;*
- *My home (residence RY10 in the documents) is less than 1.5km from several turbine sites. There will be a high level of visual impact to both my dwelling (including from our living room and front verandah) and the ornamental fruit garden/outdoor area we have established around the home from the northeast/north/northwest/east of our property (particularly from turbines within 2km - BX10,BX14,BX73,BX74,BX70,BX76,BX13). The visual impacts assessment report did not adequately address impact in my opinion as it did not consider impacts on many dwellings (such as ours) in very close proximity which are not stakeholder properties.*
- *Our property is a lifestyle property and we chose to live in this location outside of a township in part because of the rural beauty of the area, open skyline and dark night skies.*
- *While I support renewables (such as solar), I find the proposed wind farm with a large number of turbines to be intrusive on the natural and cultural landscape of this area (open farmland mixed with shelterbelt plantings). I also find the constant motion of turbine blades (within 2km) to be distracting visually.*
- *The draft National Guidelines recommends community input into visual impact assessment. The LVA provides only reference to studies in other geographic areas and communities does not equate to community input in my opinion. My enquiry to Union Fenosa by phone regarding status of the project was also referred in the LVA to as part of the stakeholder consultation process around visual impacts assessments. I was never asked what I thought/felt regarding visual impacts.*
- *Landscaping is being offered to residences within 4 km as mitigation of visual impacts however I estimate under the proposed amendment this would require a row of trees over 30+m in height to be established around our dwelling and ornamental garden areas and this would not completely screen regardless. This would take (at best) 30-40 years to effectively grow using fast growing, wind hardy species (eg. Blue gum, cypress) and which is probably outside my lifetime. The original permit application for smaller turbines would in contrast require (estimate) a 20 metre tree which has a shorter timeframe to be grown.*

- *The increased height of the turbine (as I understand it) places the wind farm in a different category regarding potential aviation hazards and may require night time lighting if CASA requests. The original amendment had a lesser aviation risk and less likely to require night time lighting.*
- *I feel night lighting on the turbines will create an industrial appearance and feel to this locality.*
- *Our property will be adversely affected by the construction of this wind farm whether it be with an amended permit or not;*
- *Shadows and shadow flicker;*
- *Negative visual impact on the natural landscape;*
- *We object to the increase in overall height and the removal of restrictions on maximum height and the removal of restriction on blade length;*
- *We object also to the removal of restrictions on future micro siting of turbines , the change in noise conditions and the change of flicker and shadow conditions;*
- *The proposal to increase the overall height of the turbines to 180m is extreme, considering the proximity to over 111 rural properties and the nearby thriving tourist township of Port Fairy;*
- *We have no doubt that increasing the turbine size will have a detrimental effect on the landscape and the amenity of our closely settled rural community;*
- *We oppose strongly to the increase of the height of the turbines which will have an increased effect on the visual amenity of our property*
- *Our family the "Martins" have resided on our property since 1900 and we feel that our visual landscape will be severely compromised for our future generations*
- *The increased height of the turbine places it in a different category requiring aviation lighting. This will mean that even though we cannot see the actual turbine during night hours the night lighting on the turbines will create another visual impact. With the increased height , there should be a 2km setback from residences.*
- *The landscaping mitigation amendment that is being proposed is an insult.*
  a. How long would it take for a native species tree to screen a 180m turbine tower?
  b. Regarding the Fire Plan overlays – we are encouraged to remove vegetation however with this amendment we are offered vegetation to screen for our visual amenity.
- *Is there any consideration of amenity impacts due to the severe impact on the use and enjoyment of our properties due to the visual impact of such a project of this scale?*
- *Is there any consideration of amenity impacts due to the severe impact on the use and enjoyment of our properties due to the visual impact of such a project of this scale?*
- *Due to extra height aviation requirements obstacle lighting will be necessary, this also contributes to a lack of the enjoyment of the night time skyline which is a part of rural lifestyle living.*

Moyne Shire Council's Submission made the following comments for the Panel to consider. Comments are common to both wind farms:

- *…the proposed maximum height increase of 53.7m, which is approximately a 30% increase in height….*
- *…lacking of a detailed assessment or photomontages to represent the expected changes and effects at nearby dwellings within 1km or 2km of the wind farm site. …..*
- *All photomontages and visualisations prepared by the applicant are taken from road reserves and intersections, which makes the assessment of visual impacts to existing dwellings considerably difficult.*
- *The LVIAs assessment of cumulative visual impacts of the project is largely dismissive of the adjoining WWF, and has not adequately assessed the recent amendment approval for that project to install wind turbines to a maximum height of 168m.*

The concerns of submitters relevant to visual impact relate to the increase in turbine heights and the potential:

- Increase is visual impact from public areas within Hawkesdale
- Visual impact of aviation obstacle lighting
- Ability for landscape mitigation to screen a 180 m high tower
- Increase in visual impacts at residential dwellings; and
- Cumulative Impacts

The issue that underpins the submissions received in relation to visual impacts is the proposed change in turbine height being approximately 30% larger than the approved turbines.

4 CHANGE IN VIEWING ANGLE

It is not the overall height increase that is relevant to determine the level of change in visual impact; it is the associated change in viewing angle bought about by the proposed increase to turbine height, the change in views from sensitive viewing locations and the 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.

4.1 View Angle

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. This is best demonstrated through photomontages. However is important to understand the change in viewing angle with respects to height for landscape mitigation.

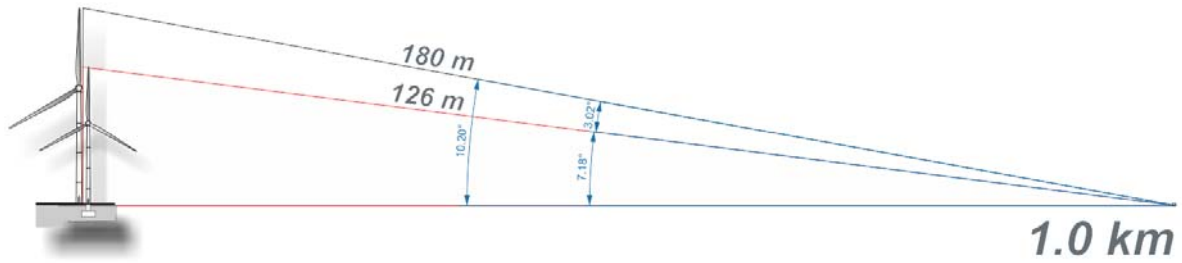
Viewing angle will change with distance and turbine height. The greater the distance between a viewing location and a turbine the smaller the turbine will appear, similarly the closer the viewing location the larger the turbine will appear.

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 s within this distance (the turbine exclusion zone). The turbine exclusion zone for the both the Hawkesdale and Ryan Corner Wind Farms 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 126 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 126 m and 180 m high turbine at 1.0 km



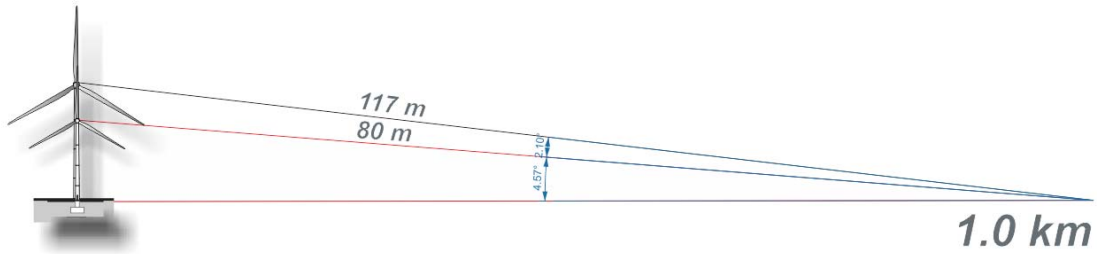
The viewing angle for a 126 m high turbine is 7.18° when viewed from a distance of 1.0 km. The view angle for a 180 m high turbine at the same distance is 10.20°. The net increase is in the vertical view angle is 3.02°.

Aviation obstacle lights are mounted to the top of the nacelle. Therefore the change in viewing angle of the nacelle or hub is relevant for the proposed turbine height increase and impacts to night lighting.

Figure 4.2 shows the relative increase in view angle between the approved hub height of 80 m and the maximum hub height of 117 m. This height (117 m) is the most conservative in that this

is the maximum height the hub will be allowing for sufficient blade length within the proposed maximum height being sought by this amendment.

Figure 4.2 View angles for a 80 m and 117 m high hub at 1.0 km



The change in viewing angle between the approved hub height of 80 m and the maximum height that may be constructed within the constraints of the proposed amendments is 2.1°.

It is understood that the change in viewing angle to both the overall turbine height and nacelle height are based on the relative elevation between the viewing location and turbines. In some instances the relative level may exacerbate turbine visibility, while in others turbine visibility may improve. The change in viewing angle however will be consistent across the entire view shed between the approved and proposed turbine heights.

4.2 Landscape mitigation

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

The 2006 LVIA's for both the Hawkesdale and Ryan Corner Wind Farms recommend that Planting be undertaken on residential properties within 3 km of the wind farm, after consultation and agreement with affected landowners.

For Hawkesdale, the Panel recommended that … *a condition be included to require the provision of landscaping to all properties within 1.5 km of the nearest turbine and to Dwellings Nos 40 and 47.*

For Ryan Corner, that Panel's recommendations were similar requiring …*Off-site landscaping should be offered to properties within 1.5km of the nearest turbine, to dwellings numbers 4, 5, 104 and 105 in Figure 20.46 of the EES and the Collins property at 800 Fingerboard Road Yambuk….*

This position was reached on the basis that *The Panel accepts the general proposition that visual amenity is not an issue to which significant weight should be attached in a Farming Zone and that there is no accepted right to a view unless specific consideration is required under a planning scheme. However, the Panel believes that there is a case for supplementary planting to be carried out in those non stakeholder dwellings, where the wind farm will be a permanent and highly visible part of their lives.*

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 126 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
126 m (Approved)	*7.18*	*8.1 m*	*4.1*
180 m (Proposed)	*10.2*	*10.4 m*	*5.2*
Net Change	***3.02***	***2.3m***	***1.1***

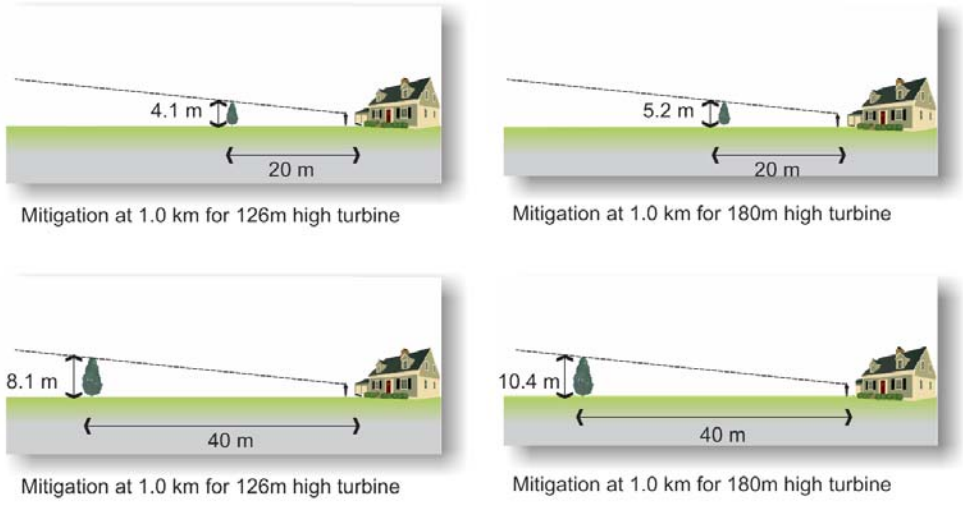
Table 4.2 ***Change in viewing angles for aviation lighting***

Nacelle Height	View angle at 1.0 km Distance	Vegetation height at 40 m from dwelling	Vegetation height at 20 m from dwelling
80 m (Approved)	*4.57*	*4.8 m*	*3.2*
117 m (Theoretical Max)	*6.68*	*6.2 m*	*3.87*
Net Change	***2.10***	***1.4 m***	***700 mm***

The theoretical maximum hub height of 117 m proposed by these amendments remains lower than approved overall turbine height of 126 m to the tip of blade. For this reason, the landscape mitigation recommend by the panel would be continue to screen views to the aviation obstacle lights for the proposed taller turbines.

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

Figure 4.3 ***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 lower the viewing angle and height of screening vegetation would be required. Similarly the closer the vegetation to the viewing, vegetation can also be at a lower height to screen views to turbines. 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 4.3. Both Hawkesdale and Ryan Corner Wind Farms include turbines wind a proposed overall height of 160 m. These are few in number. To be conservative the view shed and zones of visual influence of the proposed Amended Layout are based on the 180 m high turbine. The changes are relevant to both wind farms.

Table 4.3 *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 126 m high turbine was 3.0 km of a wind turbine. Within this distance a 126 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. These distances for both wind farms. Figure 4.4 shows the ZVI of the Hawkesdale Wind Farm. The changes to Ryan Corner Wind Farm are shown in Figure 4.4.

Figure 4.4 ***Hawkesdale Wind Farm Comparative view shed and ZVI of Approved and Amended Layout***

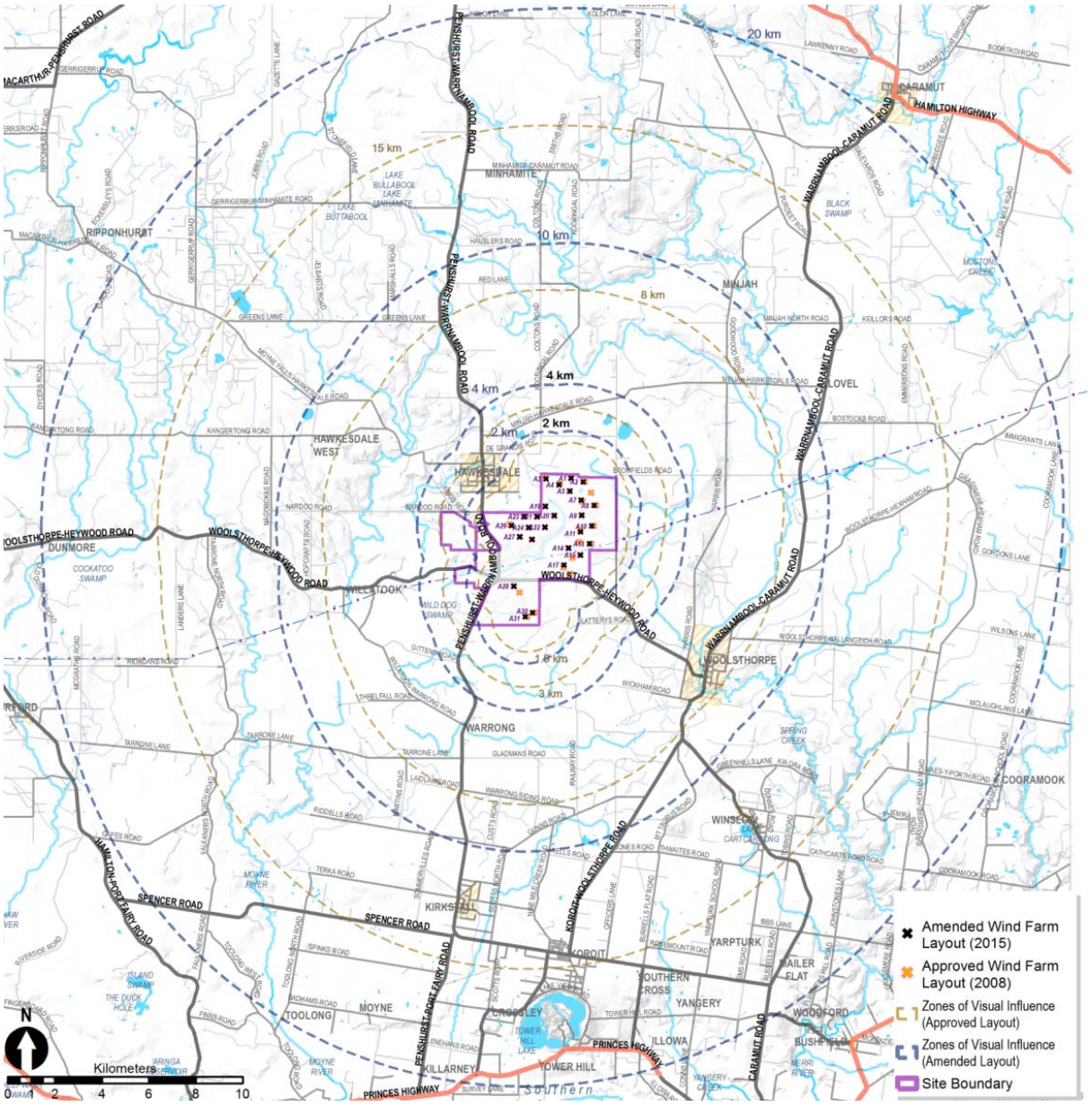
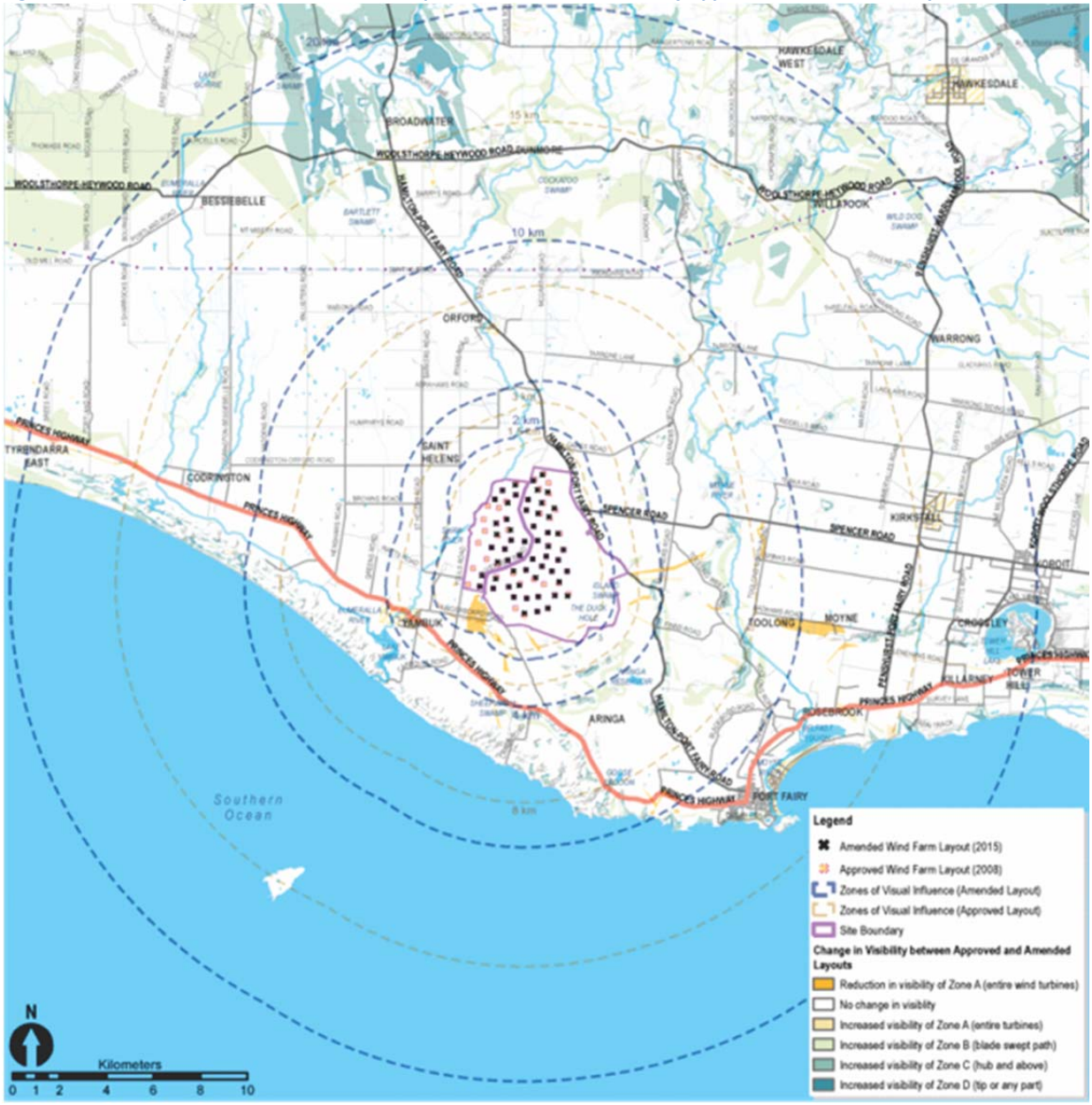


Figure 4.5 ***Ryan Corner Wind Farm Comparative view shed and ZVI of Approved and Amended Layout***



The Panel recommend voluntary offsite landscape mitigation is offered to all residential dwellings within 1.5 km of the nearest 126 m high turbine.

Table 4.3 shows this distance as being the area at which *"turbines will always be visually dominant in the landscape"*. Later decisions have increased the offering for voluntary off-site landscape mitigation to a distance at which turbines would be *"Highly Visible and will usually dominate the landscape"*. For the approved project, this would be 3.0 km from a 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 of 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 Hawkesdale Wind Farm can be seen in Figure 4.6. The areas of visual change for Ryan Corner are shown in Figure 4.7.

Figure 4.6 Net change in turbine visibility - Hawkesdale

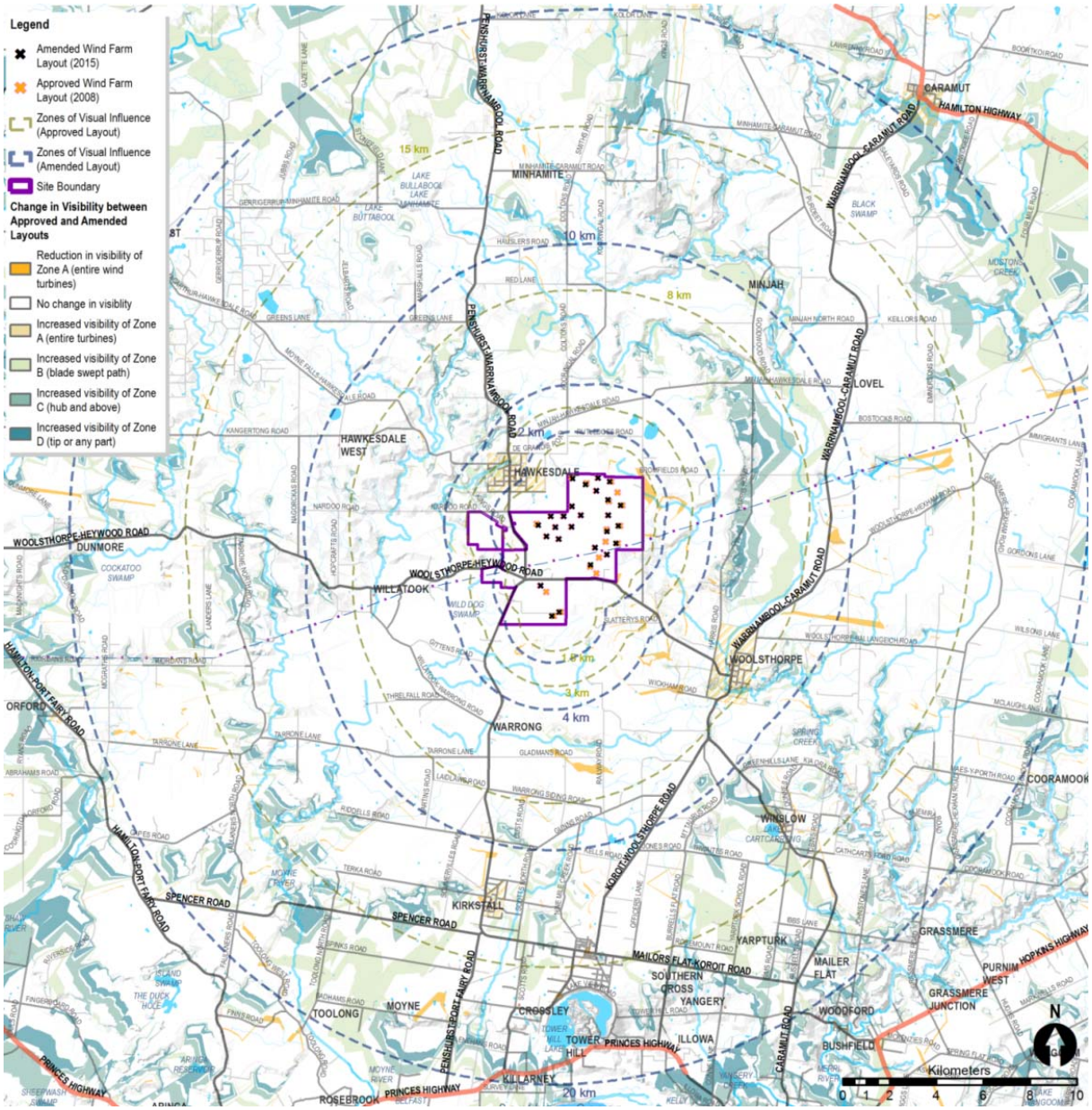
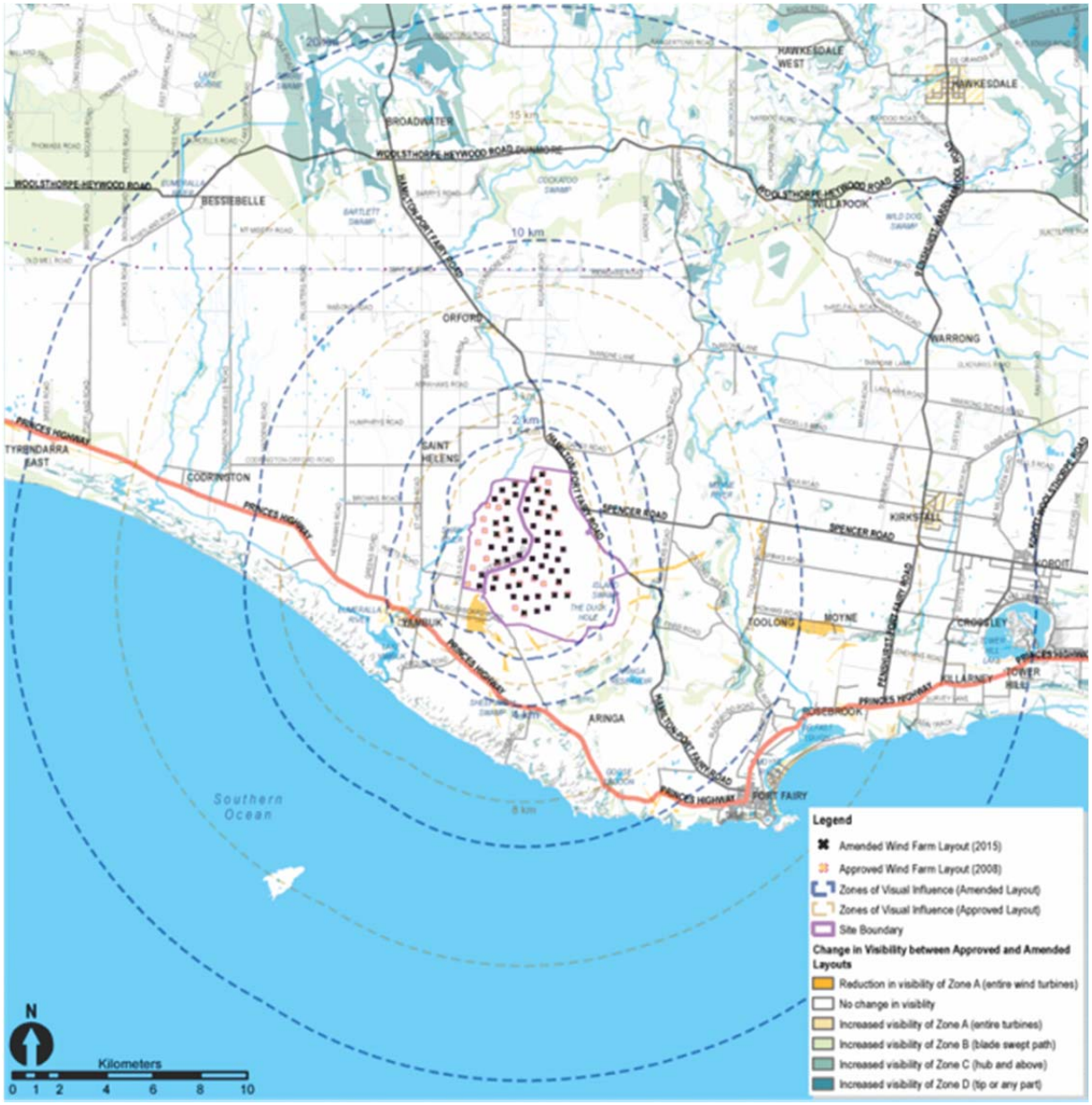


Figure 4.7 *Net change in turbine visibility – Ryan Corner*



The areas in orange show the locations of change in visibility between the approved turbine layout and height and the proposed amendments to the project.

The assessment submitted as part of the planning documentation as supporting documentation for the proposed amendments showed these locations to be an increase in turbine visibility. These areas are actually locations where a reduction in turbine visibility would occur resulting from the turbine removal.

These areas of decreased visibility are on the margins or areas where turbines would theoretically be visible in the approved layout.

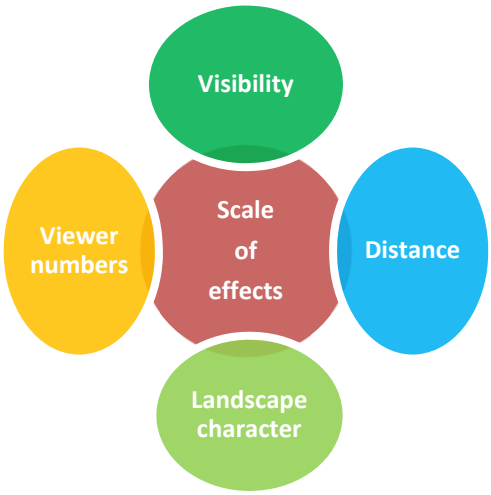
5 METHODOLOGY

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 in 2006. 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 Panel's recommendations 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 turbines 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

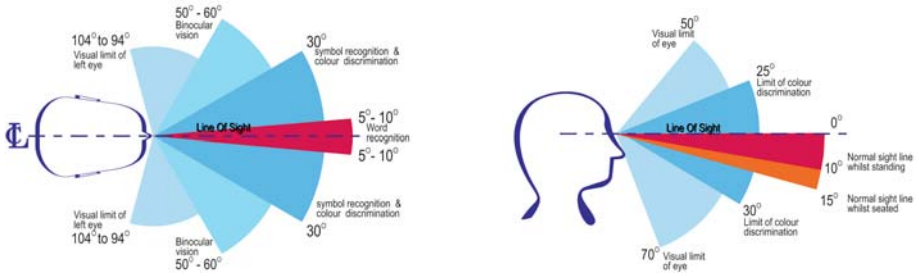
Photomontages are used within the report to show the scale and location of the proposed wind turbines.

5.4.1 Lens size and photos used within the photomontages

Photomontages typically show the changes in a 60O horizontal field of view. The 60O 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 10O or 15O 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 Zellnik, 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 Whiley & Sons, 2012.

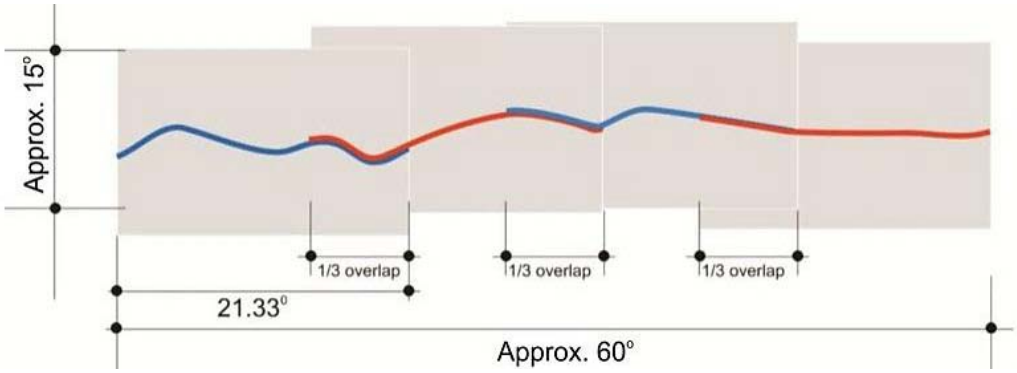
The 60O horizontal field of view is important if the photomontage images represent the change in the landscape. The A3 photomontages, which are appended to this report in Annex C, include a 60O horizontal field of view. One of the sheets within the photomontage set shows a wireframe view of the computer 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 26.5O and a horizontal angle of view of approximately 21.3O. *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^{O} horizontal and 15^{O} 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 both the Hawkesdale and Ryan Corner 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 posibble views and viewing instances. All photomotnages do however provide clear views to both projects and allow for a suitable interpretatibn of the range of views towards the projects.

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 TO PLANNING POLICY

The original LVIA's for both wind farms were prepared in 2006. 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 Coastal Spaces Landscape Assessment Study – Protection and Management of Victoria's Coastal Landscapes (DSE, VCC and Planisphere, September 2006) (CSLAS).
- The South West Victoria Landscape Assessment Study – Landscape Character of South West Victoria (DPCD & Planisphere, June 2013), (SWVLAS); and
- Kanawinka Geopark.

The original LVIA considered 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.

Councils submission for the Ryan Corner Wind Farm was critical of the amendment applications consideration of the **proposed** *……Significant Landscape Overlay – Lava Flows and Mount Eccles Surrounds, recommended by the South West Victoria Landscape Assessment Study (2102) (SWVLAS).*
Although the SWVLAS is not an adopted strategy of Council, nor does it fall within the Moyne Planning Scheme, this is an important recommendation, which warrants a level of consideration through the planning assessment process. For interest sake, there has been an issue in the Southern Grampians Shire regarding works within the Harmans Valley Lava Flow, which led to a Ministerial Amendment to introduce an interim Significant Landscape Overlay.

The implication of the SWVLAS at section 5.2.2 of the amendment application.

The SWVLAS is not a referral document. The SWVLAS recognises and values the geological formations that occur within the landscape of the Western Volcanic Plains and therefore increasing the landscape sensitivity. The SWVLAS recognises the change that this landscape has undergone since European settlement and the anticipated increased level of development suggesting lower landscape sensitivity.

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. As well, the SWVLAS does not identify any views of state or regional significance located within the viewshed of the Ryan Corner Wind Farm.

The above notwithstanding and in direct response to the SWVLAS, the Landscape and visual assessment methodology was modified to include and additional landscape character type. This was discussed at section 5.4.1 Unit 1 Rural Plains.

The Stony Rises, while discussed within the LVIA, were not classified as a separate landscape unit. The CSLAS and SWVLAS, as well as more recent studies undertaken by ERM, have further analysed this landscape unit.
This assessment has retained the Unit1 – Rural Plains Landscape Character Type and separated the Plains Landscape from the Stony Rises as sub-character types. This is appropriate as the Stony Rises are not typically dramatic changes in the Rural Plains with clear boundaries, but merge with and are contiguous with the surrounding plain. These two sub-units are:

- *Landscape Unit 1 – Rural Plains, Sub-unit 1a –Plains*
  This landscape sub-unit is characterised by gently sloping farmland that is largely cleared.
- *Landscape Unit 1 – Rural Plains, Sub-unit 1b -Stony Rises.*
  This landscape sub-unit is characterised by gently sloping farmland that is largely cleared where exposed rocky outcrops and sinkholes are visible and these are in contrast with adjacent paddocks.

This assessment will be based on an assessment that gives the Stony Rises a greater sensitivity than that identified in the LVIA. The sensitivity rating of Sub-unit 1a – Plains, will remain as low and the sensitivity rating for Sub-unit 1b – Stony Rises will be increased to low – medium. The reason for the rating sometimes being low is that the stony rises can sometimes be indistinguishable from the surrounding Plains Sub-unit. A visual assessment rating is based on perception, not geological testing and where the Stony Rises appear to be part of the Plains landscape, then their sensitivity is assessed as low. Where they are a visually different element, they have a sensitivity of medium.

The addition of the landscape unit also altered the visual impact at three viewing locations (VP6, VP12 and VP13) where the overall visual impact increased from **Low** to **Medium to Low**.

The change in visual impact was not brought about by either the change in turbine height, reduction in turbine numbers nor the proposed micro siting.

7 COMPARITIVE ASSESSMENT

Three locations were selected from which to demonstrate the proposed changes brought about by this amendment for both the Hawkesdale and Ryan Corner Wind Farms. The locations were selected to demonstrate the range of viewing angles distances and landscape settings for views towards the wind farms.

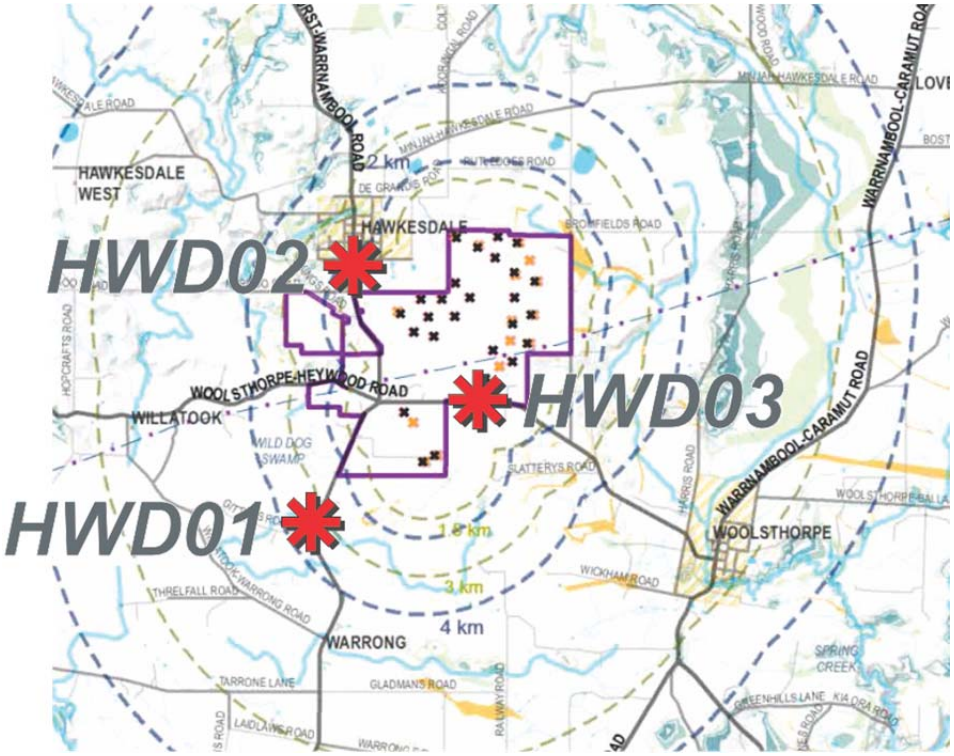
Each of the following locations were assessed in the Amendment Application.

7.1.1 Hawkesdale Viewing locations

- Viewpoint HD01 – Penshurst-Warrnambool Road near Gittens Road intersection
- Viewpoint HD02 - Penshurst-Warrnambool Road near Warwillah Road intersection;
- Viewpoint HD03 – Woolsthorpe-Heywood Road

The proximity of the selected photomontage locations are show in Figure 7.1.

Figure 7.1 ***Hawkesdale Viewpoint Locations***

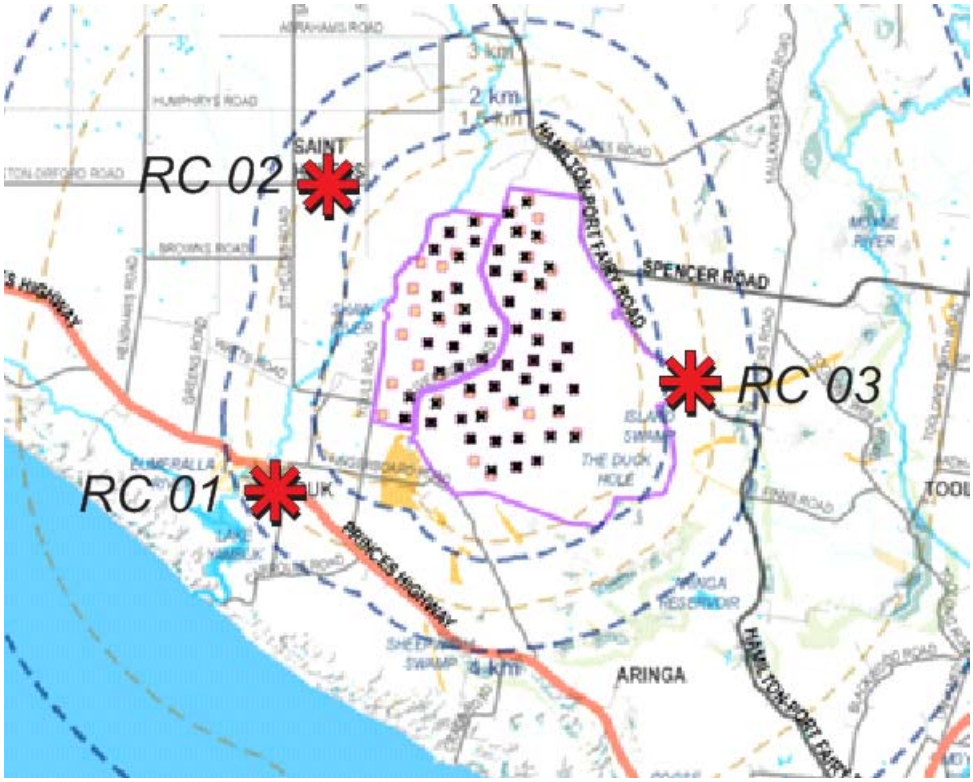


7.1.2 Ryan Corner Viewing locations

- Viewpoint RC01 – Monck Street, Yambuk
- Viewpoint RC02 - Codrington-Orford Road, St Helens
- Viewpoint RC03 - Hamilton-Port Fairy Rd, Spencer Rd intersection

The proximity of the selected photomontage locations are show in Figure 7.2.

Figure 7.2 ***Ryan Corner Photomontage locations***



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

Recognising that there are many locations that may have views towards the turbines, and that it is not possible to capture all potential viewing locations, the selected photomontages are a useful guide to understand the likely change in turbine visibility from other locations in the landscape surrounding the project. It is stressed that a perceptual recognition of the change in visibility is best made from the 60° viewing angle, reproduced at A0.

The locations of the comparative viewpoints and photomontages are shown in Figure 7.1 and Figure 7.2. To be conservative, all turbines are shown with a tip height of 180 m.

7.2 Comparative assessment - Hawkesdale Wind Farm

The three locations included in the Amendment documentation for the Hawkesdale Wind Farm have been re-assessed.

7.2.1 Viewpoint HD01 – Penshurst-Warrnambool Road near Gittens Road intersection

Viewpoint HD01 is located at Penshurst-Warrnambool Road near Gittens Road intersection. The nearest approved wind turbine (A31) will be located approximately 3.5 km north east. The nearest wind turbine (A31) in the amended layout will be located approximately 3.4 km to the north east.

This viewing location is near to Viewpoint 4 included in the assessment of the approved wind farm. Figure 7.3 shows the approved turbine layout. The proposed amendments are shown in Figure 7.4.

Figure 7.3 Photomontage – Approved View

Figure 7.4 Photomontage – Proposed View

When the two photomontages are compared one above other, it is clear that there will be a visual change bought about by the proposed amendments to the turbine layout and height.

The 2006 LVIA assessed the visual impact at this location as Low. This low assessment was based in part on landscape character or landscape sensitivity, viewer numbers and distance to the then proposed turbines.

Although the proposed increase in turbine height will be visually noticeable, the visual change between the approved view which contains turbines and the change in view brought about by the proposed amendments is insignificant. This is because the main change in the view is due to the presence of the approved turbines rather than the amendments.

For the same reasons, the reduction of turbines which are also noticeable in the comparative photomontages will not reduce visual impact.

The proposed amendments do not alter the level of visual impact from low.

7.2.2 Viewpoint HD02 - Penshurst-Warrnambool Road near Warwillah Road intersection

Submissions were received regarding the impact of the proposed variations on Hawkesdale Township. One submission (Submission 1) included residential impacts at 17 Austin Street Hawkesdale.

Hawkesdale is approximately 2.0 km north west of the HWF. The town is clustered around (east and west) the Penshurst – Hawkesdale Road. The road network and town layout is defined by an axial grid oriented roughly north-south east-west.

The northern part of Hawkesdale including the town centre falls to the north and away from a local ridge which runs roughly east-west through town. Southern areas fall from the centre of town towards the south and the turbines.

The town centre which comprises shops, hotel (pub), post office, churches and other community infrastructure are located generally towards the northern end of the town. The location, distance and viewing direction of these features are shown in Figure 7.5

Figure 7.5 Hawkesdale township

Roads within Hawkesdale comprise generous road reserves with many mature trees and other plantings. Private allotments, reserves, parks and the golf course also feature many mature existing trees. The patterns and distribution of canopy vegetation can be seen in Figure 7.5.

Similar to most towns, night time views from many areas within Hawkesdale include streetlights, lights associated with residential dwellings and road users. In some weather conditions such as low cloud or sea spray along coastal areas, the glow from Warrnambool is noticeable from southern areas of town such as Warwillah Road.

Viewpoint HD02 – Penshurst-Warrnambool Road shows a view from the southern edge of Hawkesdale near its intersection with Warwillah Road. The viewing location is shown in Figure 7.5.

This view was taken where a break in roadside vegetation permits. The nearest approved wind turbine (A26) will be located approximately 1.7 km south east. The nearest amended wind turbine (A26) will be located approximately 1.8 km to the south east.

Being closer to the turbines than other areas within town and clear of vegetation and buildings within the town, this location provides a conservative basis on which to consider the visual impact from locations within Hawkesdale.

Figure 7.6 ***Photomontage - Approved Layout***

Figure 7.7 ***Photomontage - Amended Layout***

The 2006 Landscape and visual assessment from areas within Hawkesdale concluded that:

…the wind turbines at Hawkesdale may be visible and will usually dominate the landscape, the existing vegetation and buildings will screen or filter views to the wind farm. The overall visual impact from the township is assessed as low.

The Panel's in their discussion on pp32 of the July 2007 Panel Report agreed with the assessment of a low visual impact from areas within in Hawkesdale stating that:

… There is a substantial tree planting both within and around the township and together with the undulating nature of the topography means that the impact will vary greatly between individual dwellings. The Panel believes it would be more appropriate to describe the impact as 'potentially noticeable – can dominate'. It agrees that the overall impact should remain as 'low'.

The comparative photomontages demonstrate that the proposed amendments would be noticeable; however even at 1.7 km the changes would not alter the view such that it would change the visual impact from low.

7.2.3 Other areas within Hawkesdale

While the amended turbines would appear larger, for many areas within Hawkesdale the larger turbines would not be visible.

Views to the turbines from the north of the town will be screened by topography, roadside planting and vegetation within private allotments and intervening buildings and structures within the town.

Areas south of the ridge line and Hawkesdale are predominantly residential allotments of varying size and scale. As noted by the Panel in 2007, these areas typically enjoy established gardens comprising large mature trees. Further views from areas to the south of Hawkesdale would be largely screened or filtered by existing vegetation within road reserves and on private allotments.

The level of visual impact for many areas within Hawkesdale the visual impact would be negligible. For locations where turbines might be visible, they would be filtered through existing vegetation or between buildings. Where turbines are visible, the visual impact would be low.

7.2.4 Viewpoint HD03 - Woolsthorpe-Heywood Road

Viewpoint HD03 is located on Woolsthorpe-Heywood Road. Views from this location take in turbines at range of distances from 1.0 km to over 4.0 km. The location was selected for the comparative assessment as turbines would be visible through approximately 270° for both the approved and amended layout.

The photomontage for both turbine layouts are presented over the next pages. The montages are provided in 60°views looking south west through to northeast in a clockwise direction.

The nearest approved wind turbine (A29) is approximately 0.9 km to the north east. This turbine would be deleted should the amendments be approved. The nearest amended turbine (A28) would be approximately 1.0 km to the west.

Figure 7.8 Photomontage - Approved Layout looking south west

Figure 7.9 Photomontage - Amended Layout looking south west

Figure 7.10 Photomontage - Approved Layout looking west

Figure 7.11 Photomontage - Amended Layout looking west

Figure 7.12 Photomontage - Approved Layout looking north west

Figure 7.13 Photomontage - Amended Layout looking north west

Figure 7.14 Photomontage - Approved Layout looking north

Figure 7.15 Photomontage - Amended Layout looking north

Figure 7.16 Photomontage - Approved Layout looking north east

Figure 7.17 Photomontage - Amended Layout looking north east

The panoramic views from this location allow for an interrogation of the change in viewing angles of the proposed amendments for turbines over a range of distances and viewing angles.

- Photomontage seen in Figure 7.9 shows the proposed increase in turbine height and micro-siting for turbines at a distance of approximately 1.0 km.
- Photomontage seen in Figure 7.11 shows the change in view including an increase in turbine height, and removal of turbine A29
- Photomontage seen in Figure 7.15 shows the change brought about by the proposed increase in turbine height and micro-siting particularly turbine A17. Turbines in this direction are approximately 1.7 km to the north.
- Figure 7.17 shows the change in views bought about by the proposed increase in turbine height, removal of turbines A12, A16, and A18. This view also shows turbines at 180 m in height rather that the height of 160 being sought by this amendment.

Similar to comparative photomontages at HD01 and HD02, these views show that the main change in views is brought about by the presence of the approved turbines. The change in views that will result from the proposed changes made by the Amendment will be noticeable however for most viewers, this change would be imperceptible.

The Panel Report for the Hawkesdale Wind Farm Concluded That:

> *The Panel finds that this is a highly modified landscape where agricultural activity is the dominating factor in driving any change. Most roads carry relatively low traffic levels and the turbines are generally well set back from major view points. Accordingly, subject to our comments above in relation to the substation/switchyard, the Panel believes that overall visual impact of the wind farm on the regional landscape is low.*

The comparative photomontages have demostrated that the main changes in views towards the wind farm will be from the presence of the approved turbines. The proposed increase in turbine height will not alter the finding of the Panel in relation to visual impacts.

7.3 Comparative assessment – Ryan Corner Wind Farm

The three locations included in the Amendment documentation for the Ryan Corner Wind Farm have been re-assessed.

7.3.1 Viewpoint RC01 – Monck Street, Yambuck

Viewpoint RC01 is located at Monck Street at the outskirts of Yambuk. The nearest approved wind turbine (B71) is approximately 2.3 km north east. Figure 7.18 shows the approved view from this location.

Figure 7.18 Approved View

Several approved turbines removed by the proposed amendment are at the western edge of the approved turbine layout and within views from this location. Turbine B70 would be

approximately 2.7 km to the north east and would be the closest turbine should the amendments be approved. Figure 7.19 shows the same view with proposed amendments to the approved turbine layout.

Figure 7.19 Proposed View

The vegetation behind the house is approximately 150 m from this location. For the purposes of illustrating the effectiveness of landscape mitigation, it is clear that even when set back approximately 150 m from a dwelling that landscape mitigation can screen or filter views of a 180 m high turbine.

Although the proposed increase in turbine height will be visually noticeable from the approved height, the visual change is attributed to the introductions of turbines to the landscape rather that the overall height. The change in views for the proposed taller turbines is not one that would alter the overall visual impact.

Similarly, the reduction of turbines is also noticeable in the comparative photomontages. For the same reasons of the initial change to views would be through the construction of the approved turbines, this visual impact bought about by the reduction in turbines will not reduce visual impact

7.3.2 Viewpoint RC02 – Codrington-Orford Road, St Helens

Viewpoint RC02 is located at Codrington-Orford Road near St Helens. The nearest approved wind turbine (B50) is approximately 2.5 km east. Figure 7.20 shows the approved view from this location.

Figure 7.20 Approved view

The proposed amendments would remove turbines B50, B51, B53, B 57, B65 and B68 from this view. The nearest amended turbine (B48) will be located approximately 2.6 km to the east. Figure 7.21 shows the proposed changes to this view.

Figure 7.21 ***Proposed view***

The proposed change in turbine height albeit noticeable, does not alter the view approved by the Panel such that a change in visual impact would occur.

7.3.3 Viewpoint RC03 - Hamilton-Port Fairy Rd, Spencer Rd intersection

Viewpoint RC03 is located at Hamilton-Port Fairy Road near Spencer Road intersection. The nearest approved wind turbine (B35) is approximately 0.9 km north east. This location has panoramic views of the approved turbine from the south west to north west. Figure 7.22 shows the approved view.

The area affected by SWVLAS and raised in Councils submission is also visible from this location.

Figure 7.22 Approved view

Turbine B35 would still be closest wind turbine to the location. The locations of turbine B35 would be adjusted by the proposed micro-siting and would be approximately 1.0 km to the north east. Turbine B35 is also proposed to be 160 m in height. To be conservative, the turbine height for B35 is shown at 180 m.

Figure 7.23 Proposed view

This location takes in the regionally significant Stoney Rises landscape unit as described within the SWVLAS.

The comparative visual assessment of Ryan Corner Wind Farm Amendment documentation also recognised this new landscape character for this viewing location where the landscape sensitivity and the overall visual assessment of the approved turbine layout was rated as Medium. This same level of visual impact was assigned to the taller proposed turbines of 180 m.

This higher than low level of visual impact was attributed to distance, viewer numbers and landscape sensitivity being greater than low rather than the height of the turbines.

The Panel's findings were that:

> *In relation to landscape and visual impact more broadly, the Inquiry believes that the wind farm will be a highly visual element in the Ryan Corner landscape, but in assessing this against identified landscape values and State policy, considers that this impact is acceptable.*

The change in height between the view containing the approved turbines and the proposed amended views does not alter Panels findings.

The turbines shown within the proposed amended turbine layout will still be a highly visual element in the landscape.

For this reason, there is would be no change in visual impact brought about by the proposed increase in turbine height.

8 IMPACTS TO RESIDENTIAL LOCATIONS

Council raised in their submission their concern regarding a:

> *…lacking of a detailed assessment or photomontages to represent the expected changes and effects at nearby dwellings within 1km or 2km of the wind farm site. ….*

Several independent submissions received for both projects raised the same concern. There were no triggers in the proposed alterations to either project that required the re-assessment of impacts to residential dwellings in the amendment application.

Chapter 2 of this report described the proposed changes to both projects. Changes included turbines that have been deleted, turbine movements and the proposed increase in turbine height.

The altered locations of all turbines were within the permitted micro-buffers allowed for under the current permits. To my knowledge no turbines are proposed to be moved closer to nearby residential dwellings and both projects are proposing to remove several turbines.

As a result of these changes there will overall be an increase in the distance between the permitted turbine layout and nearby residential dwellings.

8.1 Hawkesdale

Two submissions were received from individual submitters in relation to visual impact from residential dwellings.

Submitter #1, raised concerns regarding impacts to their dwelling located in Hawkesdale. These concerns are addressed in the discussion at Viewpoint HD02.

#3 raised concerns for two occupied dwellings located at 859 Woolsthorpe – Heywood Road. Visual impacts at this location are discussed at section 8.1.

8.2 Ryan Corner

Five individual submissions were received in relation to visual impact from residential dwellings in relation to the proposed amendments to the Ryan Corner Wind Farm. A summary of the concerns relevant to visual impact and the proposed amendments to the Ryan Corner wind farm are summarised below.

Submitter #2 518 Fingerboard Road, Yambuck

> *I believe the proposed amendment (increase in turbine height) will have an increased adverse affect on the visual amenity of my property for the following reasons:*
> - *My home (residence RY10 in the documents) is less than 1.5km from several turbine sites. There will be a high level of visual impact to both my dwelling (including from our living room and front verandah) and the ornamental fruit garden/outdoor area we have established around the home from the northeast/north/northwest/east of our property (particularly from turbines within 2km - BX10,BX14,BX73,BX74,BX70, BX76,BX13). The visual impacts assessment report did not adequately address impact in my opinion as it did not consider impacts on many dwellings (such as ours) in very close proximity which are not stakeholder properties.*
> - *Our property is a lifestyle property and we chose to live in this location outside of a township in part because of the rural beauty of the area, open skyline and dark night skies.*

- *While I support renewables (such as solar), I find the proposed wind farm with a large number of turbines to be intrusive on the natural and cultural landscape of this area (open farmland mixed with shelterbelt plantings). I also find the constant motion of turbine blades (within 2km) to be distracting visually.*
- *Landscaping is being offered to residences within 4 km as mitigation of visual impacts however I estimate under the proposed amendment this would require a row of trees over 30+m in height to be established around our dwelling and ornamental garden areas and this would not completely screen regardless. This would take (at best) 30-40 years to effectively grow using fast growing, wind hardy species (eg. Blue gum, cypress) and which is probably outside my lifetime. The original permit application for smaller turbines would in contrast require (estimate) a 20 metre tree which has a shorter timeframe to be grown.*
- *The increased height of the turbine (as I understand it) places the wind farm in a different category regarding potential aviation hazards and may require night time lighting if CASA requests. The original amendment had a lesser aviation risk and less likely to require night time lighting.*
- *I feel night lighting on the turbines will create an industrial appearance and feel to this locality.*

Submitter #3 1708 Hamilton-Port Fairy Road, Port Fairy. **This dwelling was assessed was assessed as Residential Viewpoint 4 #RY29 in the 2006 LVIA.**

……We own a property at 1708 Hamilton-Port Fairy Road, Port Fairy and will be adversely affected by the construction of this wind farm whether it be with an amended planning permit or not……

We wish to register our opposition to the Ryans Comer Wind Farm on the land that neighbours our property on the grounds of:

- *…..Negative visual impact on the natural landscape.*

Submitter #9 192 Fingerboard Road, Yambuk

Our property is situated @ 192 Fingerboard Road, Yambuk. Our family has lived on & owned our property since early 1900's.

We wish to raise our concerns regarding the above planning permit amendments for the following reasons:

1. We oppose strongly to the increase of the height of the turbines which will have an increased effect on the visual amenity of our property.

2. Our family the ……. (My Edit) *have resided on our property since 1900 and we feel that our visual landscape will be severely compromised for our future generations.*

3.The increased height of the turbine places it in a different category requiring aviation lighting. This will mean that even though we cannot see the actual turbine during night hours the night lighting on the turbines will create another visual impact. With the increased height , there should be a 2km setback from residences.

4. The landscaping mitigation amendment that is being proposed is an insult.

a. How long would it take for a native species tree to screen a 180m turbine tower?

b. Regarding the Fire Plan overlays – we are encouraged to remove vegetation however with this amendment we are offered vegetation to screen for our visual amenity.

Submitter #10 - 236 Fingerboard Road, Yambuk.

….Due to extra height aviation requirements obstacle lighting will be necessary, this also contributes to a lack of the enjoyment of the night time skyline which is a part of rural lifestyle living.

Submitter 11 354 Fingerboard Road, Yambuk. **This dwelling was assessed at Residential Viewpoint 1 #RY07 in the 2006 LVIA.**

I write to outline my objections to the changes in the proposed Wind Farm at known as the Ryan Corner Wind Farm.
I would like to make it clear that I support the Wind Farm proposal however make this application to endeavour to secure improvements to the proposed impacts upon my personal space and upon my community.
I believe that impact of 180 metre wind towers, the potential night lighting of same……upon the rural amenity of my property will be significant and will negatively affect the viability and continued success of my business.
I note also that the proposal gives a visual impact illustration taken from the Yambuk perspective however does not give one taken from the perspective of any of the properties in Fingerboard Road, all of which will be impacted more than any properties in Yambuk and at least half of which are in fact Lifestyle Properties Not Viable agricultural properties.
A photomontage of the visibility from my property and several others in Fingerboard Road would give a far more disturbing picture of the visual impacts upon my business. It is also salient to note that while the proposed increase in planting around the wind tower will be positive in the very long term for properties further from the facility, once again those immediately adjacent such as my own will derive no short term or long term benefit.

The concerns relating to visual impacts from residential dwellings can be summarised as follows:

- Ability for Landscape mitigation to screen the proposed taller turbines;
- A requirement for Aviation Obstacle lighting; and
- Lack of target assessment from individual dwellings.

Section 4 of this report described the change in viewing angle for the proposed taller turbines and the resulting changes in vegetation heights required to screen a 180 m high turbine. This assessment included the required vegetation heights for landscape mitigation installed at both 20 m and 40 m distance from a dwelling.

Several submissions raised concerns regarding aviation obstacle lighting as being new visual elements to the projects that would be triggered by the proposed increase in turbine height. This is not correct. Aviation obstacle lighting was a requirement of the approved project and was assessed by the original LVIA in 2006. This is discussed in Section 9 of this report.

Submissions are correct in that specific or targeted residential assessments were not made as part of the LVIA for the proposed amendments.

8.3 Residential Impacts

The 2006 LVIA assessed the visual impact from nine residential dwellings for the Hawkesdale Wind Farm and six residential dwellings for the Ryan Corner Wind Farm.

Residential viewpoints were selected in consultation with landholders or based on proximity to turbines. Table 8.1. Summarises the visual impact for Residential dwellings assessed in the 2006 LVIA.

Table 8.1 Residential Assessment Hawkesdale Wind Farm - ERM 2006

VIEWPOINTS	Description	Distance Approved	Distance Proposed	Assessment
RVP01 - HW40	Views to nearest wind turbines are filtered due to intervening garden vegetation.	1.7 km SE (A26)	1.7 km SE (A26)	**Low - from areas facing north High - from areas facing south with no screening**
RVP02 - HW101	Views to nearest wind turbines are filtered due to intervening garden vegetation.	1 km SE (A23)	1 km SE (A23)	**High for studio and derelict farmhouse without screening. High to medium for occupied residence, depending upon view availability.**
RVP03 - HW53	Views to nearest wind turbines are screened from view due to intervening hedgerow vegetation.	1.1 km NE (A26)	1.1 km NE (A26)	**Medium (Moderate) - existing vegetation screening Low – with additional screening**
RVP04 - HW47	Views to nearest wind turbines are filtered due to intervening garden vegetation.	1.8 km E (A28)	1.8 km E (A28)	**Medium - existing vegetation screening Low – with additional screening**
RVP05 - HW45	Views to nearest wind turbines are filtered due to intervening garden vegetation.	3.3 km E (A31)	3.2 km E (A31)	**Medium (Moderate) - existing vegetation screening Low – with additional planting**
RVP06 - HW89	Views to nearest wind turbines are filtered due to intervening garden vegetation.	1.1 km SW (A29)	1.2 km NE (A17)	**High (from kitchen garden) - without screening Low (from kitchen garden) – with additional screening**
RVP07 - HW77	Views to wind turbines are screened due to intervening garden vegetation.	2.3 km NW (A18)	2.3 km NW (A18)	**Low - existing screening**
RVP08 - HW58	Views to wind turbines are screened due to intervening garden vegetation.	1.2 km W (A13)	1.2 km W (A13)	**Low - existing screening**
RVP09- HW64	Views to wind turbines are screened due to intervening garden vegetation.	1.8 km S (A1)	1.8 km S (A1)	**Low - existing screening**

VIEWPOINTS	Description	Distance Approved	Distance Proposed	Assessment
RVP01 –RY07	Nearest wind turbines are screened from view due to intervening vegetation.	1.0 km NE (B10)	1.1 km NE (B10)	**High – without screening** **Low – within living areas**
RVP02 –RY77	Nearest approved wind turbines have been removed in the amended layout.	1.1 km E (B68)	1.6 km E (B69)	**Medium – without screening** **Low – within living areas**
RVP03–RY22	Some wind turbines are screened from view due to intervening vegetation.	3.0 km W (B8)	3.1 km W (B21)	**Medium – without screening** **Low – within living areas**
RVP04 – RY29	Living areas look away from the wind farm.	1.0 m W (B40)	1.1 km W (B40)	**Medium – without screening**
RVP05 –RY11	Existing vegetation screen views from living areas	1.0 km SE (B44)	1.0 km SE (B44)	**Low – dependent on existing screening**
RVP06 - RY64	Existing vegetation screen views from living areas	3.0 km SE (B46)	3.1 km SE (B46)	**Low**

The Panel in their findings on residential impacts for both wind farms:

…accepted that the general proposition that visual amenity is not an issue to which significant weight should be attached in a Farming Zone and that there is no accepted right to a view unless specific consideration is required under a planning scheme. The Panel believes that there is a case for supplementary planting to be carried out in those non-stakeholder dwellings, where the wind farm will be a permanent and highly visible part of their lives.

The discussion at Section 4 of this report describes the relative change in viewing angle between the approved turbine height of 126 m and the proposed increase in turbine height of 180 m. The resultant change in vegetation height required to screen a 180 high turbine at a distance on 1.0 km which is the minimum turbine exclusion zone is also discussed.

It was determined that although the proposed turbine height of 180 m would be approximately 30% taller, landscape mitigation recommended by the Panel in approving the wind farms would still be effective for the taller turbines.

Additional photomontages from residential dwellings may be useful to assist in planning landscape mitigation; which is already a requirement of the permits for both wind farms, they will be of limited benefit to assessing visual impact at residential dwellings.

As mentioned earlier, altered turbines locations were all within the permitted micro-buffers allowed for under the current permits. To my knowledge no turbines are proposed to be moved closer to nearby residential dwellings and both projects are proposing to remove several turbines.

8.4 Submitter dwellings

One submitter for the Hawkesdale Wind Farm provided a submission relating to visual impacts at their dwelling that was assessed in the 2006 LVIA. Two submitters for the Ryan Corner Wind Farm have also provided submissions from locations that were assessed in 2006.

It is stressed that I have not visited the dwelling at these locations. Given the time that has elapsed between 2006 and now, there may have also been changes in the landscape surrounding these dwellings.

The observations are therefore based on site visits to the project and familiarity with the surrounding landscape.

8.4.1 Hawkesdale Submitter #3 859 Woolsthorpe – Heywood Road - Residential Viewpoint 6 ERM 2006

Concerns relevant to my areas of expertise are:

> *There are two occupied dwellings on our farm. In relation to the proximity of the proposed wind turbines to these dwellings, four wind turbines will be located just outside the one kilometre exclusion zone (A30, A31, A28 and A17).*
> *….There will be significant visual impact of the surrounding wind turbines from the occupied dwellings on our property.*

The discussion of visual impacts at RVP 6 Visual impact from the 2006 LVIA states that:

> *….. The house is setback from the Woolsthorpe-Heywood Road with the living areas facing north. The driveway to the house passes through a garden with mature tree planting that would screen views to the wind turbines to the north of the site.*
>
> *The nearest wind turbine will be 1.0 km south west of this viewpoint. It is chosen to address the concerns raised by the resident regarding the visual impact of the wind farm, in particular from the kitchen window.*

The photomontage on which the visual assessment was made is reproduced in Figure 8.1.

Figure 8.1 View south from House HW89 near the kitchen window

The discussion of visual impacts at RVP 6 Visual impact from the 2006 LVIA concluded that:

> *….the distance to the nearest wind turbine from this location, the wind turbines will dominate the view. However, as seen in the photomontage, the existing vegetation screens some of the wind turbines. Further planting to the garden edge could be an effective in mitigating visual impact of the wind turbines from kitchen garden. The overall visual impact is assessed as low.*

The Panel's assessment of the visual impacts at this proposed agreed with this assessment stating that:

> *….The house is set well back from the road and the front garden and driveway approach contains a substantial amount of mature trees and shrubs, which will almost entirely screen the living areas – which face north from the turbines on the north side of the road.*
>
> The owners (my edit) *are more concerned about the impact on their kitchen and living areas at the rear of the dwelling, due to the location of turbines A30 and A31 about 1 km to the south. There is no doubt that these turbines will be in direct line of sight from these rear rooms and from the kitchen garden area nearby*
>
> *While, under the present arrangements, turbine A30 will always be visible, it is over 1 km away and does not dominate the near views. In our view, careful additional landscaping at the rear of the ……property could assist in partially screening turbine A30 but also in refocussing a long distance view from the rear rooms.*
>
> *The Panel does not consider it necessary to require the relocation of turbine A30, but recommends that a landscaping plan be developed for the …… property in consultation with the residents to mitigate any impact. This is allowed for under condition 5 of the draft planning permit.*

The comparative photomontages discussed earlier in this report demonstrated the change in turbine visibility of turbines over a range of distance. This analysis also provided for views of turbine at a distance of 1.0 km which is the nearest and most visible turbine to both dwellings at this location.

The assessment of view angles described in Section 4 of this report also described the change in view angles and the requisite vegetation height to screen of filter views for the proposed increase in turbine height being sought by this application.

Further, the photographs on which the original assessment and photomontages prepared at this dwelling clearly show that vegetation at this dwelling has the potential to exceed any height required to filter views of a 126 m high turbine. When considered by the change in viewing angle and comparative photomontages over a similar distance, it is clear that landscape mitigation will continue to be effective.

8.4.2 Ryan Corner Submitter #3 1708 Hamilton-Port Fairy Road, Port Fairy - Residential Viewpoint 4 #RY29 ERM 2006

Concerns relevant to my areas of expertise are:

> *……We own a property at 1708 Hamilton-Port Fairy Road, Port Fairy and will be adversely affected by the construction of this wind farm whether it be with an amended planning permit or not……*
> *We wish to register our opposition to the Ryans Corner Wind Farm on the land that neighbours our property on the grounds of:*
> - *…..Negative visual impact on the natural landscape.*

The discussion of visual impacts at RVP 4 Visual impact from the 2006 LVIA states that:

> *House RY22 is located 1.0 km north east of the wind farm along Hamilton-Port Fairy Road…….The house is set back from the Hamilton- Port Fairy Road and has vegetation limited to the garden areas in the east. The living areas face north and west.*
>
> *A photomontage was not prepared for this dwelling. Figure 20.58 in the report illustrates the view south west towards the site. This figure is reproduced in* Figure 8.2*below*

Figure 8.2 *View south west from House RY29*

The discussion regarding the visual impact from this dwelling read:

> *There is little vegetation to the south and west of this house allowing unimpeded views to the wind farm. At this distance the wind turbines can dominate the landscape, however living areas look north and west, away from the wind farm. Therefore the overall visual impact would not be assessed as high, rather it would be medium. Planting to the south and west could act as a wind break and would further reduce the visual impact.*

The level of visual impact assessed at this dwelling nor the recommendations for landscape mitigation would alter as a result of the proposed amendments to the project.

8.4.3 Ryan Corner Submitter 11 354 Fingerboard Road, Yambuk - Residential Viewpoint 1 #RY07 ERM 2006

Concerns relevant to my areas of expertise are:

> *I write to outline my objections to the changes in the proposed Wind Farm at known as the Ryan's Corner Wind Farm.*
> *I would like to make it clear that I support the Wind Farm proposal however make this application to endeavour to secure improvements to the proposed impacts upon my personal space and upon my community.*
> *I believe that impact of 180 metre wind towers, the potential night lighting of same……upon the rural amenity of my property will be significant and will negatively affect the viability and continued success of my business.*
> *I note also that the proposal gives a visual impact illustration taken from the Yambuk perspective however does not give one taken from the perspective of any of the properties in Fingerboard Road, all of which will be impacted more than any properties in Yambuk and at least half of which are in fact Lifestyle Properties Not Viable agricultural properties.*
> *A photomontage of the visibility from my property and several others in Fingerboard Road would give a far more disturbing picture of the visual impacts upon my business. It is also salient to note that while the proposed increase in planting around the wind tower will be positive in the very long term for properties further from the facility, once again those immediately adjacent such as my own will derive no short term or long term benefit.*

The discussion of visual impacts at RVP 1 Visual impact from the 2006 LVIA states that:

> *This location was selected to address the concerns expressed by the resident regarding the visual impact of the proposed wind farm. This house also serves indicative of those houses that lie to the south of the wind farm.*
> *House RY07 is located along Fingerboard Road approximately 3 km from the nearest wind turbine. The land adjoining this property is gently sloping and cleared for farming. Scattered vegetation is found on the farm areas that would partially screen views to the proposed wind turbines from all locations; however this vegetation is more common on the southern and western boundaries.*
> *Partial views of the proposed wind turbines will be availed from this location.*

The nearest approved turbine to the dwelling is B10 which is approximately 1.0 km to the north. The nearest modified turbine would be B10 now approximately 1.1 m to the north

The photomontage on which the visual assessment was made is reproduced in Figure 8.1.

Figure 8.3 Photomontage - Submitter 11

These photomontages show the nearest visible turbines at this break in the vegetation along the boundary. The nearest wind turbine in the photomontage is approximately 3 km from this vantage point. Closer turbines are screened by existing vegetation.

The Discussion within the 2006 LVIA regarding the visual impact and from this location read as follows:

> *At a distance of 3 km or less the wind turbines will dominate the landscape. Therefore the overall visual impact for the residents in this location will be high without some form of screening.*

The visual impact at this dwelling was assessed as high without screening or from locations that would have views to the turbines and low from within living areas due to existing landscape screening. This assessment nor the recommendation for landscape mitigation would not alter as a result of the proposed increase in turbine height.

9 AVIATION OBSTACLE LIGHTING

Several submissions raised concerns to a change in visibility and impact of night time lighting. These concerns related to the requirement for aviation lighting and the potential impacts that might be brought about by the proposed increase in turbine heights.

9.1.1 Approved lighting

Both the Hawkesdale and Ryan Corner Wind Farm have approvals which include aviation obstacle lighting.

The proposed aviation obstacle lighting for the Hawkesdale Wind Farm was for lighting to be installed on up to 16 Turbines. The Supplementary Panel report discusses lighting for up to 15 Turbines.

The aviation lighting plan provided to the Panel proposed lighting for up to 26 turbines.

The Panel assessed the proposal for lighting at both the Hawkesdale Wind Farm and Ryan Corner Wind Farm. For both wind farms the Panel concluded that:

> *In general terms, the Panel is thus satisfied that provided individual lighting installations (a set of two lights on each turbine nacelle) are installed and shielded to the maximum degree allowed under the relevant CASA Advisory Circular and Section 9.4.7 of the Manual of Standards Part 139, that the visual impact of any one lit turbine will be relatively low.*

And that the overall impact can be managed due to:

- *The relatively low intensity of the medium intensity obstacle lighting (as viewed by the Panel Chairman at Wonthaggi);*
- *The relatively low number of turbines to be lit;*
- *The use of shielding of the lights to provide a maximum beam intensity in a narrow range;*
- *The finishing of the backs of blades in a non-reflective material to minimise any strobing effects; and*
- *Landscaping to reduce impacts on properties within 1.5 km.*

The Panel also recognises that:

> *the lighting is only an issue in the proximity of houses, in that once inside the lights will be hidden by curtains or the reflection off the interior of windows. This seems logical and suggests that the impact will be noticed when people are outside their dwellings such as sitting on a verandah or taking an evening stroll admiring the night sky.*

The current Permit at Condition 9 for the Hawkesdale Wind Farm allows for:

> *Any obstacle lighting for aviation safety should be generally in accordance with the 'Alternative Obstacle Lighting Proposal' plan Revision 3 dated 30/01/08 prepared by the Ambidji Group and must be to the satisfaction of the Minister for Planning. In finalising any lighting plan:*
>
> *a) The applicant must consult with CASA;*
>
> *b) Advice must be sought from a suitably qualified wildlife ecologist to ensure the light flashing period minimises any impact on bats or night flying birds;*

c) The turbines to be lit must be selected in consultation with the owners of the adjacent Woolsthorpe Wind Farm with the objective of minimising the total number of lit turbines in the area;

d) Where turbines are to be lit, individual lighting installations must be in accordance with the CASA Advisory Circular 139-18(0) and the CASA Manual of Standards, particularly Chapter 9; and

e) The impact minimisation features to be incorporated in any installation must include, but are not limited to:

(i) Treatment of the rear of the blade to avoid reflection of aviation lights;

(ii) Shielding of the lights on top and bottom such that the maximum intensity of light is limited to a beam of 3 degrees, with only 0.5 degrees of this beam width below the horizon; and

(iii) All lights on the wind farm synchronised to flash in unison.

The current Permit for the Ryan Corner Wind Farm allows for:

Obstacle lighting for aviation safety must meet the following requirements, to the satisfaction of the Minister for Planning:

a) The number of lit turbines are kept to the minimum required, such that the wind farn is not declared a hazard to aviation.

b) The individual lighting installations must be in accordance with the CASA Advisory Circular 139-18(0) and the CASA Manual of Standards, particularly Chapter 9.

c) The impact minimisation features allowed under the documents in 9(b) must be installed including, but not limited to:

(i) Treatment of the rear of the blade to avoid reflection of aviation lights;

(ii) Shielding of the lights on the top and bottom such that the maximum intensity of light is limited to a beam of 3 degrees, with only 0.5 degrees of this beam width below the horizon; and

(iii) All lights on the wind farm synchronised to flash in unison.

d) Within the guidance of 9(b) above, advice must be sought from a suitably qualified wildlife ecologist to ensure the light flashing pe1iod minimises any impact on bats or night flying birds.

Section 9.4 of the CASA Manual of Standards currently require wind farm to be lit with steady red low intensity lighting at night.

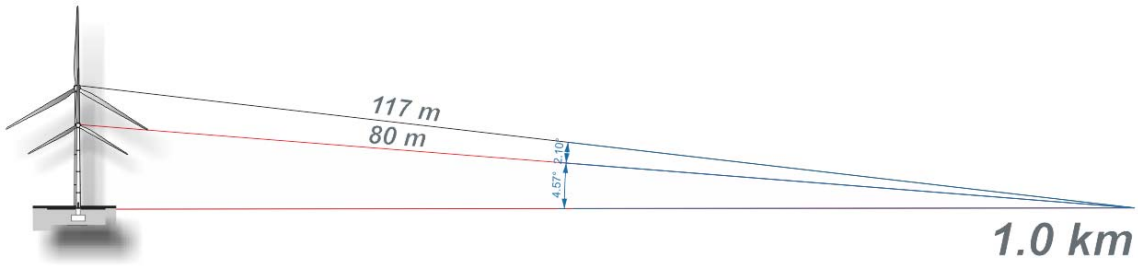
Although these updated requirements remove the need to provide flashing lights, it is apparent from previous trials referred to by the panel chairman at pg 8 of the Supplementary report, and from my own observations that the rear of the turbine blades would still be illuminated as the pass through the shielded light in effect resulting in a light strobing effect.

9.1.2 Changes Associated with turbine height increase

This can in part be determined by the change in nacelle height where the aviation obstacle light would be mounted and the resulting change in viewing angle. For residential dwellings, this impact is linked to landscape mitigation.

The maximum change in viewing angel for lights mounted atop the nacelle would be slightly greater than 2° in the vertical field of view.

Figure 9.1 View angles for a 80 m and 117 m high hub at 1.0 km



As determined previously, the most sensitive locations to aviation obstacle lighting are residential dwellings within 1.0 km of a turbine. For these locations the Panel concluded that landscape mitigation will be effective at filtering views to not only the turbines but the requirements for aviation obstacle lighting. For both projects …… *the Inquiry is satisfied that whilst it will have some visual impact, this impact can be mitigated to acceptable levels by landscaping at non-stakeholder properties and shielding to the maximum extent allowed under the CASA Advisory Circular and Manual of Standards.*

Preceding chapters have demonstrated that landscape mitigation can filter views of a 180 m high. Recognising that the nacelle would be approximately 60 m lower that the overall turbine height and lower that the currently approved turbine height.

It is my view that there will be a negligible change in the approved impacts for aviation obstacle lighting.

10 CUMULATIVE VISUAL IMPACT

Submissions have raised concerns regarding the potential change in cumulative impacts due to the proposed increase in turbine height. This concern was raised for both the HWF with respects to proximity to the Woolsthorpe Wind Farm and the proximity of RCWF in relation to the operational wind farms of Codrington and Yambuk.

Cumulative visual impact can occur through either Simultaneous or Sequential views to turbines from publicly accessible viewpoints or from private viewing locations. This is most likely to occur where there are multiple wind farms in close proximity and where wind farm view sheds overlap. Cumulative visual impact is due to the knowledge or presence of turbines in the landscape rather than the height or number.

For private viewing locations, the quantitative analysis which determined change in view angles from residential dwellings within 1.0 km of turbine as being approximately 3° in the vertical field of view. The change in view angle between the approved height of 126 m and the proposed height increase to high can be accommodated by landscape mitigation recommended by the panel to manage visual impacts at residential dwellings.

The qualitative change in turbine visibility was demonstrated through comparative photomontages for both the HWF and the RCWF as being of a noticeable by minor change in views and only when directly compared to a smaller turbine.

It is my view that the proposed increase in turbine height nor the reduction in turbine numbers will not alter the cumulative impact for either the HWF or the RCWF.

This is because turbines would be visible in the landscape whether they are at the approved height of 126 m or the proposed amended height of 180 m. It is the presence of turbines in the landscape whether they contribute to simultaneous views of one or more wind farms or are experienced as part of sequential views along a section of road.

11 CONCLUSION

This assessment has assessed the likely change in visual impact that might be attributed to the proposed turbine layout changes to the HWF. This assessment applied the same methodology to assess the potential for change as use used in the original LVIA for the Approved HWF.

This assessment has demonstrated that the visual impact assessment of the HWF would remain unchanged and are consistent with those discussed in the LVIA.

11.1 Changes to the wind turbine numbers

Even though there is a reduction in wind turbines proposed within the Amended Layout, the change in visual impact would be negligible. This is due in part to the landscape sensitivity to visual change and viewer numbers which have not changed.

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; this increased visibility would be in areas that would see wind turbines in the approved layout. Additionally, the areas of increased turbine visibility would be in 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 three locations show that the change to the visual impact based on 126.3 m wind turbines (approved) and 180 m high wind turbines (amended) will appear similar. The overall change to the visual impact will be negligible.

11.3 Policy changes and guidelines

Recent studies and more recent assessments by ERM have identified the Stony Rises as a Sub-unit within the Rural Plains Landscape Unit. Consequently the landscape sensitivity ratings for this landscape Sub-unit have been increased from **low** to **medium**.

The Stony Rises landscape subunit occurs and the edge of the HWF view shed, there are very few locations on the local road network from which the level of impact will be marginally greater. However, this is not because of the Amended Layout but rather because of the increased sensitivity attached to the Stony Rises Landscape Sub-unit.

11.4 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. Therefore, landscape mitigation should be extended to residents within 4 km of the wind farm.

In summary, the landscape and visual impact assessment supports the planning amendment proposed for HWF.

Annex A - Hayden Burge 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 Infrastructre
- 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 to2003

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 o prepare 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.

Lilyvale II Solar Project - Approved

ERM prepared the Development Application for the second stage extension of the Lilyvale Solar Project. Hayden prepared the visual and solar glare component of the project.

Bluff Solar Project - Approved

ERM prepared the Development Application for the for the Bluff Solar Project for Infigen Energy. Hayden undertook assessment of Solar Glare impacts of the project.

Confidential Solar Project - Current

ERM have prepared the Development Application for two solar projects in Isaac Shire, Queensland. Hayden prepared the Solar Glare Assessments for these projects.

Confidential Solar Project - Current

ERM have prepared the Development Application for a new solar project located within the Bowen Whitsundays Regional Council. Hayden prepared the Solar Glare Assessments for these projects.

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 the Design Team Environment and Heritage advisor for the Base Security Improvement Project (BSIP). Hayden undertook the visual amenity and landscape historic heritage impact assessment for the project. The visual assessments (including photographic montages) focused on 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.

Ranger Uranium Mine – Heap Leach Expansion

ERM worked with the local indigenous community to understand the potential impacts of a proposed project expansion from areas of cultural sensitivity. The methodology was led by photomontage techniques to interpret proposed project changes to facilitate 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 –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

Annex C - Photomontages

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