4 May 2016

Mr David Kitto
Director
Department of Planning and Environment
GPO Box 39
Sydney NSW 2001

david.kitto@planning.nsw.gov.au

Dear David,

MP/09_0093 MOD 1
Sapphire Wind Farm - Modification No. 1 – Response to Submissions

Sapphire Wind Farm Pty Ltd (the Proponent) is submitting this letter to the Department of Planning and Environment in response to the submissions received during the exhibition of the Modification Application (MP 09_0093 MOD 1).

This Response to Submissions includes:

- A summary of the consultation activity undertaken preceding and during the proposed Modification Application; and
- A response to all aspects raised by government agencies and the general public during the exhibition period.

Yours sincerely,

Edward Mounsey
Chief Operating Officer
CWP Renewables Pty Ltd

Introduction

The Sapphire Wind Farm Modification Application is for a reduction in the number of wind turbines from an approved 159 to up to 109 wind turbines, an increase in blade tip height from 157 m to 200 m, and associated ancillary infrastructure at the Project site, located between Glen Innes and Inverell in northern New South Wales (NSW). The Project is being developed by CWP Renewables Pty Ltd, on behalf of Sapphire Wind Farm Pty Ltd (the Proponent).

Submissions that were made by members of the public, government and other agencies were provided to the Proponent by the DPE. The DPE have sought a response to the issues raised within those submissions in accordance with Section 75H of the NSW Environmental and Planning Assessment Act 1979.

This Response to Submissions report considers and responds to the issues raised in the submissions that were made to the Modification Application.

Stakeholder Consultation

Extensive stakeholder consultation was undertaken regarding the Modification Application in the period from December 2015 to March 2016. This consultation built on the ongoing consultation that had been undertaken during the original development phase of the Project, from 2008 at Project inception to 2013, when the Project was approved and on to 2015 when the need for a modification was identified.

Consultation was undertaken through a range of means including:

- Conversations:
    - One-to-one meetings;
    - Phone conversations and emails;
    - Door-knocking where required; and
    - Two Community Consultative Committee meetings.
- General notifications:
    - Website updates;
    - Newspaper articles; and
    - Radio interviews.

Conversations

Efforts were made to contact and meet with all landowners within 5 km of the modified layout to describe the modification, provide an update regarding the Project, and discuss potential impacts from the Project. Involved, previously involved and non-involved landowners were approached, and a series of conversations, emails, letters and meetings were had over the period from December 2015.

A number of meetings were also held with representatives of various government agencies over the same period. This included the two local Councils (Glen Innes Severn Council and Inverell Shire Council), DPE, the New South Wales Office of Environment and Heritage (OEH) and the Commonwealth Department of the Environment (DoE) to discuss the modification and Project timelines.

Community Consultative Committee

CCC meetings were held on 15 December 2015 and 22 March 2016 to discuss the Project Modification. On both occasions a presentation was made by the Proponent regarding the change in Project layout, potential impacts and a timeline for the modification.

Representatives of the CCC provide for a wide cross section of the community and comprise of the following:

- Glen Innes Severn Council;
- Inverell Shire Council;
- One host landowner and four neighbouring landowners (including one representative from the Wellingrove community and two from the Swan Vale community); and
- Other regional community representation.

General notifications

Broader stakeholder consultation was also undertaken to ensure a wider audience was reached. This included a presentation to the Glen Innes Rotary Club, newspaper articles, ABC New England North West radio interviews and regular updates on the Sapphire Wind Farm website (www.sapphirewindfarm.com.au).

Agency Submissions

Airservices Australia (AsA)	**1.0**	**No matters raised.**
		Noted.
Department of Resources and Energy (DRE)	**2.0**	**Mineral Title:** *With regard to WTG 94 (located in the Swan Vale Cluster), sited within Mining Lease (ML) 1374 held by Bond Resources Pty Ltd. Request that the proponent supply the DPE with correspondence between project and Bond Resources Pty Ltd.*
		Response: The Proponent has advised the DRE that consultation did occur with the holder of ML 1374, however that the entity was not Blue Resources Pty Ltd but Eastern Feeder Holdings Pty Ltd (as outlined in the project Environmental Assessment). The correspondence between the Proponent and Eastern Feeder Holdings Pty Ltd has been shared with the DRE and as a consequence the DRE have advised that they are satisfied with the genuine efforts made by the Proponent in this regard. A copy of the response provided by the DRE has been provided to the DPE.
Environmental Protection Authority (EPA)	**3.1**	**Noise Assessment:** *Provide Tabulated criteria for each integer wind speed, at either 10m or hub height, for each receiver*
		Response: Please refer to Appendix 1 – Revised Noise Impact Assessment Report and associated tabulated criteria.
EPA	**3.2**	**Noise Assessment:** *Provide tabulated predicted wind farm noise levels for each integer wind speed, at either 10m or hub height, for each receiver, each assessed wind turbine model and each assessed operating mode.*
		Response: Refer to response 3.1.
Glen Innes Severn Council (GISC)	**4.0**	**Aviation:** *Amend the Aviation report so as to reflect any potential impacts on the proposed Aviation Training College at the Glen Innes Airport.*
		Response: Please refer to Appendix 2 - Supplementary Aviation Report.
Inverell Shire Council (ISC)	**5.0**	**No matters raised.**
		Noted.
Office of Environment and Heritage (OEH)	**6.1**	**Biodiversity:** *The OEH does not support the proposed modification to the timing of biodiversity offset provision. The appropriate biodiversity credits should be retired prior to construction commencing onsite as such work will cause immediate impacts on biodiversity values.*
		Response: The Proponent notes this concern, however, considers that a requirement to retire credits prior to commencement of construction is unattainable. The establishment of an environmental offset requires considerable capital outlay (>$3 million including land and lifetime management costs) which cannot be undertaken prior to financial close of the Project - i.e. the point in time at which all contracts and all finances are in

		place and a commitment to the build of the Project is made. To make such a commitment to an environmental offset earlier would not be commercially prudent. That said the Proponent does have an Option Agreement with a neighbouring landowner to acquire their property for the purpose of using that land as an environmental offset. This land (under the Option Agreement) satisfies the NSW BioBanking obligations. Therefore, this Option Agreement, in parallel with a condition which requires the Proponent to set the land aside under an environmental offset prior to the commencement of operation, should provide the OEH comfort that biodiversity values will be conserved effectively.
OEH	6.2	**Biodiversity:** *The OEH supports a pro rata extrapolation of the existing BioBanking calculations as this will provide a suitable offset for the proposed impacts.*
		Response: The Proponent welcomes this response from the OEH. For the avoidance of doubt the pro-rata credit calculations are based on the initial version of the BioBanking credit calculator tool (version 1.2 Credit Report dated 4/4/2011) which produced 2,410 ecosystem credits, and the associated credit profile included in the BioBanking Credit Report (Appendix 4 of the Indicative Sapphire BioBanking Assessment (Appendix I of the Part 3A Sapphire Wind Farm Ecological Assessment by Eco Logical Australia, 2011)).
OEH	6.4	**Heritage:** *A full and complete recording of all known Aboriginal objects within the project area should be provided to the OEH Heritage Division for entry into the Aboriginal Heritage Information Management System as a matter of urgency.*
		Response: NSW Archaeology have advised the Proponent that the site cards for the sites found during the Project study were sent to OEH on 14 June 2011 and it would appear that they have not been entered on AHIMS by OEH. For completeness, the site cards will be forwarded to AHIMS to resolve the matter.
OEH	6.5	**Heritage:** *A condition of approval should be included requiring that all known Aboriginal objects likely to be harmed as a result of the proposed works be collected prior to works commencing and that consultation with all Registered Aboriginal Parties for the project be carried out in order to determine an appropriate long term management strategy for those objects.*
		Response: NSW Archaeology have advised that a strategy of collection cannot be justified and is not warranted for six artefacts which were found in three sites. No rationale is given for this requirement in the letter and, further, it is contrary to the recommendations in the NSW Archaeology report. From an archaeological perspective NSW Archaeology have advised that there is no reason why the objects should be collected, a position supported when considering the RAPs did not recommend collection. Finally, and contradictory to OEH's request, paragraph six of their Heritage submission indicates concurrence with the NSW Archaeology assessment of 'low significance' and the subsequent recommendations provided in their report.
Roads and Maritime Services (RMS)	7.1	**Transport:** *The supporting Traffic Impact Assessment (TIA) has proposed works on the Gwydir Highway to accommodate additional vehicle movements generated by the major project. The TIA has not identified the scope of works*

		required at the Waterloo Road and Gwydir Highway intersection or the access to the proposed substation off the Gwydir Highway.
		Response: All works on the Gwydir Highway will be designed and constructed in accordance with the current Austroads Guidelines, Australian Standards and RMS Supplements with works to be undertaken under the controls of a Works Authorisation Deed (WAD).
RMS	7.2	**Transport:** *All works on the Gwydir Highway are to be designed and constructed in accordance with the current Austroads Guidelines, Australian Standards and RMS Supplements.*
		Response: Please refer to Response 7.1.
RMS	7.3	**Transport:** *For all works on the Gwydir Highway the Developer will be required to enter into a Works Authorisation Deed (WAD) with Roads and Maritime prior to commencement of the project construction phase. The developer is to obtain written confirmation from Roads and Maritime prior to the commencement of any works on the classified road. All works under the WAD are to be completed to the satisfaction of Roads and Maritime in accordance with the WAD. The Developer will be responsible for all costs associated with the works and administration of the WAD process.* *It is recommended that developers familiarise themselves with the requirements of the WAD process and contact our office to obtain further advice where necessary. Further information on undertaking private developments adjacent to classified roads can be accessed at:* *http://www.rms.nsw.gov.au/projects/planning-principles/index.html*
		Response: Please refer to Response 7.1.
RMS	7.4	**Transport:** *The supporting TIA has not addressed the cumulative road safety and traffic efficiency impacts of other major project approvals in the subject locality that could be constructed concurrently. The consent authority should consider the timing of approved major projects and the potential for any cumulative impacts on the safety and efficiency of the classified road network. Any Transport Management Plan (TMP) should be responsive to such impacts and include ongoing consultation the relevant local council and Roads and Maritime Services.*
		Response: As noted in Appendix B4 of the Modification Application (Traffic and Transport Assessment Report), with the reduced number of turbines proposed, the impacts on traffic operations and road safety would generally reduce in line with the reduction of wind turbine numbers. Therefore, it can be said that the cumulative impacts considered in the original project approval will be reduced as a consequence. Nonetheless, the Proponent will continue to consult with the RMS and Council in the preparation of the Transport Management Plan. Furthermore, the Proponent is in discussions with the proponents of the other major projects in the region to manage cumulative transport aspects associated with the projects.

Public Submissions

Anonymous 1	**8.1**	**Visual:** *… the proposed height [of the wind turbines] of 200m is 10 times the height of a very large eucalypt tree which makes the suggested thought of screening the wind farm out of view with tree plantations quite stupid!*
		Response: Tree screening can provide a suitable visual mitigation measure, either in isolation or with other measures in many circumstances. Where tree plantations cannot provide an effective mitigant, reasonable and feasible alternatives will be considered in the form of a Neighbour Agreement.
Anonymous 1	**8.2**	**Noise:** *And then there is noise… being compared to things like traffic carriage ways which are not constant like the wind turbines will relentlessly be in our face and ears forever!*
		Response: Comparisons with regular everyday sounds in the natural, semi-rural and urban environments are often used to describe noise levels in the absence of an operating wind farm. Nonetheless, the Proponent commits to ensuring the Project is compliant with the noise criteria applied to wind farms in NSW, and with the criteria licensed and regulated by the Environment Protection Authority.
Anonymous 1	**8.3**	**Property Values:** *Quite a number of people who live in Swan Vale will most probably be left with little or no choice but to own land which is worthless and uninhabitable thanks to this so called great project which is of no benefit to individuals or the community in which it is being imposed.*
		Response: As with any property and land holding there are many factors which can influence perceived and actual property values, including prevailing and permitted land uses, economic conditions, access / proximity to markets / workplaces and lifestyle considerations. In most agricultural areas the main determinant of property and land values is the productivity of the land for agricultural or livestock purposes. It is common for landholders in the vicinity of proposed wind farms to raise the fear that the wind farm will reduce the value of their properties. This fear has been further promoted by negative media coverage of the matter. Despite this, there is no conclusive evidence that wind farms affect property value to any greater extent than many other variables, including those listed above.
Anonymous 2	**9.1**	**Community:** *The company was keen to get the community involved when the original plan was 178 turbines and engaged with us satisfactorily. As the plan has changed with turbines now reduced to 109 and the height increased to 200m there is an inequity in the Swan Vale and Kings Plains community and cause for angst within this normally peaceful community. Less landowners are now involved and the company has overlooked the importance of engaging those on the borders of the wind farm, such as my family.*
		Response: The Proponent has consistently sought to engage with Project neighbours, including undertaking a thorough the engagement period between December 2015 and March 2016. This has included contacting residents directly within a 5 km radius of the Project, where the Visual Impact Assessment concluded residences may experience high or moderate visual impacts. In addition to that direct consultation, one-to-one meetings, two Community Consultative Committee (CCC) meetings in December 2015

		and March 2016 (which include representatives from the Swan Vale community), newspaper articles, radio interviews and website updates have been implemented. Where Neighbour Agreements have been discussed with affected neighbouring residents, a consistent and standard approach has been made to all those approached. These consultations (phone conversations, letters, emails and one-to-one meetings) have included clear references to the existing Project approval and the operative conditions of approval, the proposed Project Modification Application and a voluntary commercial alternative to those conditions. As noted previously, the Project Modification Application has sought to reduce impacts where they were previously identified through the development phase, and as such, has responded to early phase (since 2008) community feedback. The Proponent will continue to consult with the local community, and seek input into the Project.
Anonymous 2	**9.2**	**Visual:** *We need more information on the exact placement of the turbines and hence the anticipated shadow cast from those turbines.*
		Response: Coordinates and a range of maps depicting the wind turbine locations relative to surrounding residences are provided in the Modification Application. The visual impact assessment undertaken for the Modification Application identifies the extent of shadow flicker at receptor locations.
Anonymous 2	**9.3**	**Visual:** *We do not receive any financial benefit from this wind farm however are fully impacted by the placement being directly in our view from our home.*
		Response: Any changes to impacts that will result from the Modification Application have been identified and assessed, and impacts have been mitigated where possible. Without knowing which receptor this submission relates to, it is impossible to provide a specific response.
Anonymous 3	**10.1**	**Consultation:** *I had no knowledge that there was an application to change the original approval.*
		Response: Please refer to Response 9.1.
Anonymous 3	**10.2**	**Neighbour Agreements:** *I have spoken with a local non hosting resident today about this application and I was shocked to find out that some neighbours had been offered token amounts of compensation by CWP. Because there has been no consultation with me regarding the development or its progress I had no idea this was happening. It isn't up to me to chase up information, I should be kept informed. Wasn't it a requirement to keep the neighbours informed? I like most local residents didn't know about the original application from CWP and we didn't lodge a submission.*
		Response: Neighbour Agreements have been offered to affected neighbours within a 5 km radius of the modified Project as presented in the Modification Application.
Anonymous 3	**10.3**	**CCC Representation:** *A local neighbour informed me today that the Department of Planning and Environment had required CWP to pick its own local representatives to liaise with CWP. One of these people is an ISC*

		employee that is in favour of the development and has never consulted with me or anyone else I know. I have no idea who the other so called local members of this CWP handpicked group are. They certainly have not been representing the community or keeping us informed on any changes or progress. I find the fact that the Department made CWP choose its own locals extremely distasteful and has resulted in extreme anger towards the Department heads and CWP by local residents.
		Response: Community Consultative Committee representation was determined through election of interested individuals who nominated for their position in accordance with the guidelines regulating their establishment. CWP Renewables did not select the representation.
Anonymous 3	**10.4**	**Property Values:** *This power station has destroyed our property value. Our property has unobstructed views for 180 degrees looking east towards the development. This means that it is directly in the line of fire for flicker, and noise and the destruction of our spectacular views of the natural landscape. Being a smaller property the location and lifestyle benefits it currently enjoys means, that once they are gone so is the majority of its value.*
		Response: Please refer to Response 8.3.
Anonymous 3	**10.5**	**Visual:** *The CWP took photos and added towers for the original application from a further two properties (at Danthonia) to the west of [our residence] to show how the towers would look once built. Did the Department know that they were not taken from the nearest neighbour being I? It was also stated that the CWP had meetings with the owners of Danthonia and nearby neighbours. I am between the development and Danthonia and as stated previously have never spoken or had a meeting with CWP or any of its contractors or employees.*
		Response: Without knowing which residence this submission relates to, it is impossible to provide a specific response. However, please refer to 9.1 for details of the consultation and awareness raising that was undertaken for this Modification Application.
Anonymous 3	**10.6**	**Neighbour Agreements:** *If the towers are going to be increased in size, the negative effects will also be increased and for a larger distance. If the towers are increased, more should be removed from the western edge of the Swan Vale area. They should only be allowed on flat land so they don't tower over neighbouring properties. A reasonable amount of compensation should be paid to surrounding landowners that WILL suffer from this development. The distance from the towers that this compensation is paid, needs to increase on the current approved DA and increase measurably if the towers size is to increase further.*
		Response: The Modification Application has identified and assessed the changes in impacts from the approved Project to the proposed modification. Generally, the impact assessment has demonstrated that the impacts from the modification are equal to or lesser than those already approved. Neighbour Agreements are being discussed with relevant residents within a 5 km radius of the Project as per the Modification Application.
Anonymous 3	**10.7**	**Assessment Process:** *From what the Department and CWP have written in the past, one can only assume that both organisations believe that farmers*

		spend all day in their homes, never going outside or working on other areas of their properties. I can assure you all that we find it offensive that both entities measure the distance from towers only to landowners' homes and not their property boundaries nearest the towers. This measurement method needs to change because we do actually and will actually work on other areas of our properties closer to the proposed towers. In working in these areas we will also suffer the negative effects from the towers. We will be subjected to them day and night without a break.
		Response: Planning assessment guidelines are a matter for the Department of Planning and Environment and policy makers to consider, and not the domain of this Project.
Anonymous 3	**10.8**	**Assessment Process:** *The Department needs to take the shattered lives of landowners in our area seriously; most farmers do not earn very much income and rely upon the capital gains in their land for their super. Some families have been caring for their land for their whole lives, only to have all the value they have worked for taken away from them by a swipe of a pen. I believe we deserve more respect than we have received so far. We have been treated like second class citizens by both the Department and CWP. You would swear we lived in China not Australia they way the Department has handled this development so far. You have a chance to right the wrongs committed against myself and my neighbours with this amendment.*
		Response: The Proponent cannot comment on references to the Department of Planning and Environment. The perceived impacts on property values are considered in Response 8.3.
Anonymous 3	**10.9**	**Assessment Process:** *I hope the situation will improve for our local community and the Department starts to show some ethical and moral leadership moving forward from this point. The developer has been shown it cannot be trusted to liaise and consult with the community and the Department has done nothing to correct this.*
		Response: The Proponent cannot comment on references to the Department of Planning and Environment. Please refer to response 9.1 for details of the consultation undertaken regarding the Project modification. This consultation builds on the extensive consultation that has been undertaken by the Proponent since Project inception in 2008, detailed in the Sapphire Wind Farm Environmental Assessment 2011.
Thompson	**11.1**	**Visual:** *Not enough consideration has been given to the massive increase of significant visual impact on our residence and the overall increased impact to our scenic views of our farm and our other adjoining farm at Oaklea, Gwydir Highway, Swan Vale.*
		Response: The Modification Assessment considered key changes in impacts at neighbouring residences surrounding the Project. The visual impact assessment concluded that the impact at residence R44 (2.9 km from the nearest wind turbine) was unchanged. Unless any new Conditions of Approval deem otherwise, the Proponent will offer to undertake visual mitigation measures at the residence in accordance with Condition C23 of the current approval. However, it should be noted that the Proponent has

		considered the nature of the change in impact to R44 and as such has corresponded and met with the respondent between December 2015 and March 2016 (in addition to correspondence undertaken during the initial Project development and assessment from 2008 (detailed in Chapter 6 of the Sapphire Wind Farm Environmental Assessment, 2011) and offered an alternative to C23 in the form of a Neighbour Agreement. With regard to the adjoining farm at Oaklea, the respondent advised the Proponent at a meeting on 23 March 2016 that there is currently no dwelling located on that farm.
Thompson	**11.2**	**Visual:** *Towers 117, 115, 116, 111 are of incredible visual impact to our home, and scenic impact… we have had little communication on how the proponent is going to minimise this impact… other than…… Not much we can do about it!!!!!*
		Response: The identified wind turbines are located in the south eastern extent of the Project and are approximately 3 km north east of R44. These wind turbine locations were visible under the approved layout as they are under the Modification Application. As discussed in response 9.1, consultation has occurred with the respondent with regard to the Project, and notably resulted in the removal of six [6] wind turbine locations from the original Preliminary Environmental Assessment layout which were in closer proximity than those identified here.
Thompson	**11.3**	**Property Values:** *Reduced property value is of major concern to our family. Our property will be totally surrounded by both Sapphire wind farms and Goldwind, wind farms. Due to the high visual impact to our residence we would loose significant interest in prospective purchasers to the property. We believe that there would be undue loss to the value of our property in comparison to others in the Swan Vale District. We note that significant financial compensation is affordable by the proponent. We believe compensation should be considered by the proponent for the reduction in property values that will be imposed on our property [R44], Gwydir Highway, Swan Vale.*
		Response: Please refer to response 8.3.
Burnham	**12.1**	**Scale:** *We feel that [the larger wind turbines] will be noisier and make larger shadows and flickering even though the assessments that were provided we find them hard to believe.*
		Response: The Modification Application noise and visual impact assessments were undertaken in accordance with appropriate technical guidelines as applied or adopted by the NSW DPE. Nine [9] WTGs have been removed from the approved Project layout in the vicinity of the respondent's residence [R29] in recognition of concerns previously raised by the respondent (refer to pages 16 to 19 of the Modification Application main document). The closest wind turbine is now 2.8 km from that residence, an increased separation of 1 km from 1.8 km previously. As a consequence, the impacts assessed at this residence are considered to be less (noise and shadow flicker) or equal to (visual impact rating) those of the approved Project.
Burnham	**12.2**	**Alternatives:** *We are wondering if the 6 closest turbine cluster to us could be converted to solar power rather than turbines as there would still be*

		electricity being generated but less impact on our property and our son, as we know CWP [Renewables] are looking for landowners interested in installing solar farms in our area.
		Response: Any solar development in the area will be considered in addition to Sapphire Wind Farm and undertaken with consideration of any associated cumulative impacts. The modified layout has been optimised for contemporary wind turbine technology, and further wind turbine removal is considered unfeasible. It is considered that, given that 50 wind turbine locations have been removed, and as noted in response 6.1, nine [9] of these 50 wind turbines were removed to address earlier concerns raised by the respondent, the impacts at the residence are less than or equal to the impacts previously approved, and as such, fulfil this request.
Burnham	**12.3**	**Scale:** *The other turbines in the new layout we would like to see kept the same size as the first layout, this would be less on our visual, noise, shadowing and flickering impact compared to the size looking for approval now*
		Response: This is not an option the proponent can consider at this stage of the development, nor is it supported by the assessments undertaken and included within the Modification Application.
Burnham	**12.4**	**Visual:** *We feel it is up to CWP [Renewables] to provide appropriate landscaping on the property the turbines are being install on as this should NOT be our responsibility or cost for us to hide their turbines!*
		Response: Unless any new Conditions of Approval deem otherwise, the Proponent will offer to undertake visual mitigation measures at the residence in accordance with Condition C23 of the current approval.
Crawford	**13.1**	**Visual:** *I oppose the proposal which will involve massive change to what was originally approved and will have great impact on the community.*
		Response: Any changes that will result from the Modification Application have been identified and assessed. With regard to the wider community, the Proponent recognises that all impacts associated with the Project cannot be mitigated. As such the Proponent has offered a Community Fund which is aimed at supporting local initiatives put forward by the local community.
Crawford	**13.2**	**Visual:** *The [Visual Impact] Assessment submitted in support of the proposal is profoundly defective…*
		Response: The issues raised in the documents attached to this submission are a matter for Departmental policy and not directly a matter associated with the Project.
Crawford	**13.3**	**Noise:** *the noise assessment fails to take account of factors that cause risk to the health of residents.*
		Response: There are nearly 250,000 wind turbines across sites all over the world – many of them close to people's houses. Reviews conducted by leading health and research organisations from all over the world, including Health Canada, the Australian Medical Association and Australia's National Health and Medical Research Council, have found no direct link between wind farms and health effects. Opponents of wind farms have claimed that

		'infrasound', or sound that is too low-frequency for humans to hear, can cause negative health effects. However, there have been multiple scientific, thorough, peer-reviewed studies on wind farm noise that have found that infrasound from wind farms is not a health concern.
Crawford	**13.4**	**Visual:** *(Visual Impact Assessment critique)*
		Response: The issues raised in the documents attached to this submission are a matter for Departmental policy and not directly a matter associated with the Project.
Crawford	**13.5**	**Noise:** *(Noise Impact Assessment critique)*
		Response: The issues raised in the documents attached to this submission are a matter for Departmental policy and not directly a matter associated with the Project.
Ennis	**14.1**	**Property Values:** *I think the extra visual pollution will have an effect on the value of our place and in future force us to leave our home.*
		Response: Please refer to Response 8.3.
Ennis	**14.2**	**Visual:** *If this new submission goes ahead, has the proposed landscaping for our home and cottage been updated due to the extra visual pollution.*
		Response: The Visual Impact Assessment prepared for the Modification Application concluded that the visual impact rating at the respondent's residence [R35] remained moderate. This assessment considered a range of factors in determining this rating, including the increase in wind turbine dimensions and the removal of four [4] wind turbines in close proximity to R35 (This resulted in an increase in the separation distance between the residence and the nearest wind turbine from 3.37 km to over 4 km). Unless any new Conditions of Approval deem otherwise, the Proponent will offer to undertake visual mitigation measures at the residence in accordance with Condition C23 of the current approval.
Ennis	**14.3**	**Health:** *We also note that there has recently been more funding allocated to the health side effects of wind turbines. This seems an ongoing unresolved issue.*
		Response: Funding allocations are a matter for politicians and policy makers to consider and not the domain of this Project. Also refer to response 13.3.
Ennis	**14.4**	**Justification:** *If the first submission was not viable with the smaller turbines why was it put forward. Upon approval [CWP Renewables] suddenly want to change the visual impact of the project.*
		Response: The development was initially conceived in 2008 and considered the use of wind turbine technology available in the market at that time. Those wind turbines and dimensions available flowed into the Environmental Assessment report in 2011 and eventual approval in 2013. Over that period there have been considerable advancements in wind turbine technology which allow for greater yields to be derived from a wind turbine installation. Therefore, the Modification Application seeks to reduce the overall footprint and impacts of the Project while maintaining the overall renewable energy yield from the wind farm.

Glen Innes Regional Airport	**15.0**	**Aviation: [***Request for additional work to be undertaken for the Aviation Impact Assessment Report to satisfy concerns.]*
		Response: Please refer to Appendix 2 - Supplementary Aviation Report.
Swan Vale Community Group	**16.1**	**Consultation:** *CWP Renewables have shown a lack of engagement with the Swan Vale community. There has been no community consultation but instead 1:1 meetings with some selected people along the highway. This has left some group members with a lack of trust and wondering who has been told what and/or offered what? We are requesting an open and transparent community meeting where everyone can be provided with the same information at the same time.*
		Response: Please refer to Response 9.1.
Swan Vale Community Group	**16.2**	**Consultation:** *Further to Point 1 there is a perceived lack of trust. It would be expected that a global company such as this would show more professionalism and consistency in engagement with a community so closely involved in the project.*
		Response: Please refer to Response 9.1.
Swan Vale Community Group	**16.3**	**Visual:** *This modification is seeking approval for the increase in height of the turbines from 157m to 200m and an increase in rotor diameter from 126m to 140m whilst reducing the total number of turbines from 159 to 109. In the absence of detailed maps showing the exact locations of the turbines it appears the number surrounding the Swan Vale cluster has not changed significantly. Therefore, this community stands to be further impacted by the increase in overall size and little reduction in total number of turbines.*
		Response: Detailed maps and coordinates of the proposed wind turbine locations were provided in the 2011 Environmental Assessment which was approved in 2013, and in the 2016 Modification Application. All impacts, including visual, have been assessed and detailed in the Modification Application for consideration. The reduction in wind turbines from 159 to 109 increases the distance between the Swan Vale community and the Project.
Swan Vale Community Group	**16.4**	**Visual and Noise:** *Also, the increased overall size would impact a greater number of neighbouring properties in terms of visual and noise impacts.*
		Response: A separate Visual and Noise Impact Assessment has been undertaken as part of the Modification Application for consideration.
Swan Vale Community Group	**16.5**	**Neighbour Agreements:** *There is emerging evidence of inequity in the matter of compensation. In some cases it is absentee landholders receiving compensation yet those families who reside in the area and who will experience the visual and noise impacts will receive little or no compensation.*
		Response: A consistent approach has been applied to the Proponent's discussions regarding voluntary Neighbour Agreements. The Department of Planning and Environment has been made aware of all correspondence in this regard. The Proponent cannot speak to the perceived inequity without

		further detail, however, is confident that a fair and balanced approach, and consideration of relative impacts has taken.
Swan Vale Community Group	**16.6**	**Neighbour Agreements:** *Some property owners have received neighbourhood agreements and some haven't.*
		Response: Please refer to Response 16.5.
Swan Vale Community Group	**16.7**	**Assessment Process:** *All properties in this area are operational farming enterprises. The criteria for compensation appear to be based on the location of the residence and not in any way related to the actual property boundaries. Farmers spend as much time in the paddocks as they do at the residence therefore boundaries should be considered.*
		Response: Planning assessment guidelines are a matter for the Department of Planning and Environment and policy makers to consider, and are not the domain of this Project.
Swan Vale Community Group	**16.8**	**Assessment Process:** *No map has been made available showing exact locations of these turbines. At this point of the planning process we would anticipate having GPS points at least so that the exact location is known.*
		Response: Project maps and GPS coordinates of proposed wind turbine locations are included in both the 2011 Environmental Assessment and the 2016 Modification Application.
Swan Vale Community Group	**16.9**	**Assessment Process:** *There are no conditions in the original departmental approval relating to community offsets or compensation. This amended application provides an opportunity to impose conditions that will offset the detrimental impact by way of benefit or compensation to neighbouring property owners.*
		Response: Please refer to Response 13.1.
Swan Vale Community Group	**16.10**	**Property Values:** *It is known from the experience of other wind farm developments and acknowledged by CWP Renewables that during the construction phase, property values will decrease and those within this Swan Vale cluster will be forced to sell at either a reduced value or hold out for many years for land values to return to existing value. There is a range of demographic of property owners in the area, some of whom were planning to sell in the next 2 – 5 years.*
		Response: Please refer to Response 8.3.
Swan Vale Community Group	**16.11**	**Property Values:** *Further to Point 9 above, reduced land rates should result in reduced council rates.*
		Response: Council rates are a matter for Council to consider, and are not the domain of this Project.
Swan Vale Community Group	**16.12**	**Property Values:** *Subsequent to the construction phase it is unknown whether the property values will return once development is completed. With both Transgrid and Wind Turbines, the panorama will become overly cluttered and reduce the long term appeal to potential property purchasers.*

		Response: Please refer to Response 8.3.
Swan Vale Community Group	**16.13**	**Communications:** *Very limited mobile phone service between Inverell and Glen Innes – how will this impact the construction workers and how has this not been addressed.*
		Response: A range of communication services will be established for use during construction, most notably UHF Radio.
Swan Vale Community Group	**16.14**	**Assessment Process:** *Open and transparent community meeting – everyone told all the facts at the same time to eliminate lack of trust and to ease the angst within the community. Matters addressed should include:* • *Equitable community offsets and/or compensation to community members* • *Provision of data and research regarding 'noise' impacts we are likely to experience* • *What are the safe exposure levels* • *How to address the clutter across our landscape – wind turbines and Transgrid towers and lines – offset by what?* • *Inclusion of conditions in the amended application to require community offsets and* • *Compensation to the satisfaction of the Swan Vale community*
		Response: Please refer to responses 16.1 through to 16.13. Many of these matters have been also been discussed at previous Community Consultative Committee meetings.
Swan Vale Community Group	**16.15**	**Assessment Process:** *The criteria for compensation to be based on proximity of boundaries not just the location of a residence.*
		Response: Please refer to Response 16.7.
Swan Vale Community Group	**16.16**	**Communications:** *Provision of a mobile phone tower to service the Swan Vale community through lobbying government and telecommunication providers.*
		Response: The Proponent would be amenable to supporting this idea and suggests that one forum to promote this concept could be through the Community Fund brought about by the Project.
Swan Vale Community Group	**16.17**	**Assessment Process:** *Reduced council rates due to significant reductions in land values by lobbying local councils.*
		Response: Please refer to Response 16.11.

Appendix 1 – Revised Noise Impact Assessment Report & Tabulate Criteria

Appendix 2 – Supplementary Aviation Report

Proposed Modification to Sapphire Wind Farm

Noise Impact Assessment

Report Number 640.11227R1

19 April 2016

Wind Prospect CWP Pty Ltd

45 Hunter Street

NEWCASTLE NSW 2300

Version: Revision 3

Proposed Modification to Sapphire Wind Farm

Noise Impact Assessment

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EXECUTIVE SUMMARY

This report details a revised noise impact assessment for a proposed modification to the approved Sapphire Wind Farm. The proposed modified project utilises a reduced number of wind turbine generators (WTGs), each of greater size and capacity to those in the approved project. The proposed modification to Sapphire Wind Farm incorporates a layout of up to 109 WTGs, with a maximum tip height of 200 m and 3 MW to 3.4 MW capacities, whereas the approved wind farm had two alternative layout options of 159 WTGs and 125 WTGs with a maximum tip height of 159 m and between 2MW and 3MW capacity respectively.

Background noise monitoring was undertaken in July 2009. Full details of the monitoring are provided in the original Sapphire Wind Farm Noise Assessment report (reference: report 40.1822 – R1R3 Section 6, dated August 2011).

The noise criteria adopted for both the original Sapphire Wind Farm Noise Assessment in 2011 and this updated assessment are based on the South Australia EPA *Noise Guidelines for Wind Farms*, 2003 (SA EPA Guidelines). Where noise levels at project-involved residences do not comply with the SA EPA Guidelines, the proponent intends to enter into agreements with the owners of those residences to achieve noise criteria in accordance with World Health Organisation (WHO) Guidelines.

Noise predictions of the proposed modification to the wind farm layout were made using the SoundPLAN software package, utilising ISO9613 algorithms and have assumed acoustically hard ground. Four alternative turbine models were considered, being:

- Vestas V126 Standard Blade
- Vestas V126 Serrated Blade Option - Mode 0
- GE 137 3.4 MW (which uses a serrated blade design)
- Senvion M122

The results for the Vestas V126 – Standard blade model, indicated that the wind farm may potentially exceed the relevant noise limits at up to 11 receptors.

The results for the Vestas V126 – serrated blade Option model, indicated that the wind farm may potentially marginally exceed the relevant noise limits at a single receptor.

A mitigation investigation was undertaken for the Vestas V126 serrated blade Option model utilising Sound Management Mode. Compliance at all receptors can be achieved using a mitigated layout where three WTGs are operated in Sound Management Mode 2. It should be noted that when WTGs are configured in Sound Management Mode they are always operating in the reduced noise mode, which is distinctly different from Sector Management.

The results for the Senvion M122 and GE 137 layouts, indicate that the wind farm may potentially marginally exceed the relevant noise limits at a single receptor. It is anticipated that a mitigation layout for these models will be possible through the implementation of a reduced output Sound Management Mode or the removal of a turbine from the current layout.

This noise impact assessment of the proposed modifications to Sapphire Wind Farm has shown that compliance with the noise limit requirements is attainable.

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1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR) have been engaged by Wind Prospect CWP Pty Ltd to complete a noise impact assessment for a proposed modification to the approved Sapphire Wind Farm, located approximately 28 km east of Inverell and approximately 18 km west of Glen Innes in NSW.

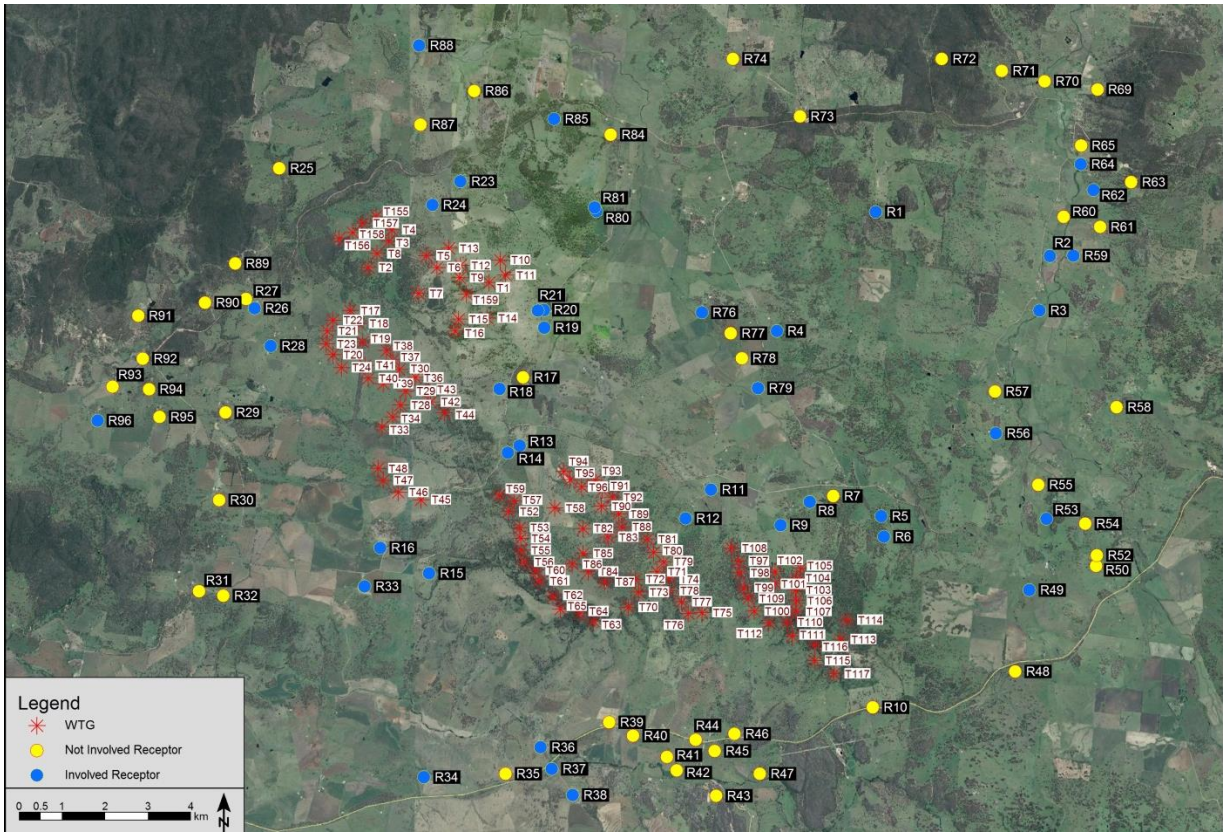
SLR (previously Heggies Pty Ltd) has been involved with the project since 2009 having previously completed the original noise impact assessments for Sapphire Wind Farm EIS. The original noise impact assessment report (reference: 40.1822 – R1R3, dated August 2011) is still relevant as it details the baseline noise monitoring undertaken for the project in 2009.

The modified project utilises a reduced number of wind turbine generators (WTGs), each with greater size and capacity. A layout of 109 WTGs is now being considered, whereas the approved wind farm had two alternative layout options of 159 WTGs and 125 WTGs. The maximum tip height will be increased to 200 m (previously 159 m) and WTGs of 3 MW to 3.4 MW size are being considered.

2 SITE LAYOUT

Figure 1 shows the locations of all receptor and the proposed WTG positions of the modified layout for Sapphire Wind Farm.

Figure 1 Site overview (image courtesy Google Earth)



A tabulated list of the receptors with details including their position, distance to closest WTGs from Sapphire Wind Farm and project involved host property status are included in **Table 1**.

A tabulated list of the proposed WTG positions for the modified layout for Sapphire Wind Farm is included in **Table 2**.

Table 1 Receptor locations (UTM, GDA 94)

ID	Property Name	X (m East)	Y (m North)	Closest WTG (km)	Project Involved?
R4	Bon Vista	353963	6715399	5.2	No
R5*	Evergreen	356394	6711085	2.2	Yes
R6*	Farley	356456	6710613	2.1	Yes
R7	Arranmore	355281	6711556	1.8	No
R8*	Woodburn	354732	6711418	1.6	Yes
R9	Tomali Park	354057	6710881	1.1	No
R10*	Osterley	356198	6706640	1.2	Yes
R11*	Yarrabin	352430	6711700	1.4	Yes

ID	Property Name	X (m East)	Y (m North)	Closest WTG (km)	Project Involved?
R12*	Mubbarra	351836	6711039	1.0	Yes
R13*	Narren Vale	347974	6712731	1.2	Yes
R14*	Kingshill	347698	6712560	1.0	Yes
R15*	Kia-Tami	345866	6709763	1.7	Yes
R16*	Woodstock	344726	6710350	1.4	Yes
R17	Strathdarr	348058	6714317	1.6	No
R18*	Yarrandoo	347511	6714046	1.4	Yes
R19*	Warrandah	348550	6715477	1.3	Yes
R20*	Lochlea	348541	6715879	1.2	Yes
R21*	311	348398	6715876	1.1	Yes
R23*	Carinya	346594	6718876	1.6	Yes
R24*	Derra Downs	345940	6718333	1.1	Yes
R25	Coleraine	342378	6719178	2.1	No
R26*	Spring Creek	341800	6715923	1.8	Yes
R27	Frasers Creek	341601	6716137	2.0	No
R28*	Tralee	342175	6715048	1.3	Yes
R29	Krystal Blue	341123	6713504	2.8	No
R30	Argyle	340979	6711465	3.8	No
R31	Glen Valley	340512	6709341	5.0	No
R32	Swan Peak	341074	6709238	4.6	No
R33*	Highlands	344366	6709456	2.3	Yes
R34*	Bellview	345747	6705021	5.0	Yes
R35	Golden Grove	347645	6705095	4.0	No
R36*	Yarrawa Park	348460	6705713	3.2	Yes
R37*	Coorimbla Park	348720	6705206	3.6	Yes
R38*	Inverness	349208	6704597	4.1	Yes
R39	Bon Vista	350062	6706296	2.4	No
R40	Hillview	350617	6705977	2.8	No
R41	Royal Oaks	351407	6705486	3.4	No
R42	Ashgrove	351629	6705174	3.7	No
R43	Warrawee	352554	6704583	3.9	No
R44	Mindora	352071	6705883	2.9	No
R45	Glen Idle	352517	6705629	3.1	No
R46	Alkoomie	352981	6706029	2.5	No
R47	Pieta	353569	6705096	2.9	No
R48	Adavale	359518	6707474	4.1	No
R49*	Evergreen	359844	6709367	4.3	Yes
R50	Waterloo	361396	6709936	5.9	No
R52	Waterloo Cottage	361416	6710180	6.0	No
R53*	Maids Valley	360243	6711025	5.2	Yes
R54	Fassifern	361144	6710913	6.0	No

ID	Property Name	X (m East)	Y (m North)	Closest WTG (km)	Project Involved?
R55	Tarana	360055	6711821	5.5	No
R56*	Fruin Glen	359066	6713012	5.5	Yes
R76*	Cubba	352218	6715832	4.6	Yes
R77	Meadow Vale	352892	6715346	4.7	No
R78	Pine Grove	353148	6714764	4.4	No
R79*	Woodburn	353527	6714064	3.8	Yes
R80*	Weean Cottage	349763	6718186	2.5	Yes
R81*	Weean	349717	6718265	2.5	Yes
R84	Glenidle	350098	6719960	3.9	No
R85*	Windemere	348773	6720327	3.5	Yes
R86	Millie	346918	6720977	3.7	No
R87	Croye	345670	6720193	2.4	No
R88*	Woodlands	345634	6722038	4.1	Yes
R89	Tomali Park	341348	6716963	2.5	No
R90	Wirra Willa	340648	6716052	2.9	No
R91	Roseana	339091	6715753	4.4	No
R92	Lambert	339201	6714752	4.3	No
R93	Swamp Oak	338494	6714102	5.1	No
R94	The Knoll	339343	6714044	4.3	No
R95	Rock Leigh	339587	6713397	4.2	No
R96	Unknown	338144	6713314	5.6	No

Table 2 Sapphire - proposed WTG locations (UTM, GDA 94)

Name	X	Y	Name	X	Y
1	347266	6716525	60	348340	6709831
2	344448	6716872	61	348429	6709584
3	344926	6717491	62	348750	6709223
4	344998	6717747	63	349698	6708647
5	345798	6717147	64	349373	6708822
6	346048	6716872	65	348923	6708922
7	345625	6716269	70	350498	6708972
8	344648	6717197	71	351173	6709797
9	346578	6716639	72	350664	6709622
10	347523	6717047	73	350748	6709322
11	347648	6716697	74	351458	6709627
12	346598	6716922	75	352223	6708847
13	346324	6717322	76	351898	6708822
14	347223	6715697	77	351748	6709097
15	346548	6715672	78	351455	6709353
16	346473	6715397	79	351323	6710022
17	344023	6715872	80	351097	6710241
18	344223	6715572	81	350946	6710557
19	344323	6715147	82	349451	6710805
20	343623	6714847	83	350035	6710600
21	343498	6715397	84	349573	6709797
22	343623	6715647	85	349448	6710222
23	343473	6715097	86	349198	6709972
24	343823	6714547	87	349954	6709563
28	345198	6713672	88	350351	6710840
29	345323	6713997	89	350285	6711138
30	345173	6714497	90	349873	6711322
33	344774	6713167	91	349898	6711697
34	345018	6713397	92	350142	6711527
36	345542	6714321	93	349726	6711927
37	345023	6714722	94	349003	6712128
38	344873	6714947	95	349149	6711937
39	344798	6714172	96	349420	6711771
40	344448	6714297	97	353073	6710047
41	344373	6714597	98	353098	6709772
42	345898	6713747	99	353198	6709422
43	345848	6713997	100	353433	6708881
44	346223	6713497	101	353923	6709522
45	345673	6711472	102	353923	6709797
46	345148	6711647	103	354398	6709372

Name	X	Y	Name	X	Y
47	344798	6711922	104	354423	6709647
48	344673	6712197	105	354523	6709872
155	344633	6718073	106	354423	6709122
156	343761	6717550	107	354398	6708872
157	344316	6717905	108	352898	6710349
158	344086	6717689	109	353300	6709174
159	346737	6716252	110	354198	6708622
52	347723	6711197	111	354323	6708297
53	347973	6710822	112	353774	6708606
54	347998	6710572	113	355441	6708221
55	347998	6710297	114	355598	6708672
56	348073	6710022	115	354843	6707728
57	347848	6711447	116	354848	6708097
58	348794	6711276	117	355298	6707422
59	347498	6711572			

3 LEGISLATION & GUIDELINES

The noise criteria adopted for both the original Sapphire Wind Farm Noise Assessment in 2011 and this updated assessment are based on the South Australia EPA *Noise Guidelines for Wind Farms*, 2003 (SA EPA Guidelines).

The SA EPA Guidelines are still the current assessment guideline adopted in NSW.

3.1 SA EPA Wind Farm Noise Guidelines

The SA EPA Guidelines recommend the following noise criteria for new wind farms,

> "*The predicted equivalent noise level ($L_{Aeq,\ 10min}$), adjusted for tonality in accordance with these guidelines, should not exceed:*
>
> - 35 dBA, or
> - the background noise level by more than 5 dBA,
>
> *whichever is the greater, at all relevant receivers for each integer wind speed from cut-in to rated power of the WTG.*"

The guidelines also provide information on measuring the background noise levels, locations and requirements on the number of valid data points to be obtained and the methodology for excluding invalid data points. It also outlines the process for determining lines of best fit for the background data, and determination of the noise limit.

The Guideline explicitly states that the "swish" or normal modulation noise from wind turbines is a fundamental characteristic of such turbines; however, it specifies that tonal or annoying characteristics of turbine noise should be penalised.

A 5 dBA penalty should be applied to the measured noise level if an "authorised" officer determines that tonality is an issue and that tonality should be assessed in a way acceptable to the EPA.

The Guideline does not provide an assessment for the potential of low frequency noise or infrasound, but it does state that recent turbine designs do not appear to generate significant levels of infrasound, as the earlier turbine models did.

The Guideline accepts that wind farm developers commonly enter into agreements with private landowners in which they are provided compensation. The guideline is intended to be applied to premises that do not have an agreement with the wind farm developer. This does not absolve the obligations of the wind farm developer entirely as appropriate action can be taken under the *Environmental Protection Act* if a development 'unreasonably interferes' with the amenity of an area. The guideline lists that there is unlikely to be unreasonable interference if:

- a formal agreement is documented between the parties
- the agreement clearly outlines to the landowner the expected impact of the noise from the wind farm and its effect on the landowner's amenity
- the likely impact of exposure will not result in adverse health impacts (e.g. the level does not result in sleep disturbance)

The proponent has discussed the possible noise implications of the proposed turbine layout with the involved residents whose property the turbines would be located on and will enter into agreements with these parties.

These agreements would specify that:

(a) The proponent would ensure that noise levels at the properties meet the World Health Organisation noise guidelines (see **Section 3.2**); and,

(b) The proponent would implement an adaptive management approach which could include the use of building treatments and turbine operation / management strategies if operational noise causes significant impact to the amenity of involved residents.

This noise agreement would only be required under those turbine configurations where the SA EPA Guidelines would be exceeded for that particular property.

3.2 World Health Organisation (WHO) Guidelines

Where noise levels at project-involved residences do not comply with the SA EPA Guidelines, the proponent intends to enter into agreements with the owners of those residences to achieve noise criteria in accordance with World Health Organisation (WHO) Guidelines. The proponent will apply those guidelines as necessary to ensure that the project does not result in an 'unreasonable interference' with the amenity or cause any adverse health effects at those residences. (See **Section 3.1**)

The WHO publication '*Guidelines for Community Noise'* identifies the main health risks associated with noise and derives acceptable environmental noise limits for various activities and environments.

The appropriate guideline limits are listed in **Table 3** below**.**

Table 3 WHO Guideline values for environmental noise in specific environments

Specific Environment	Critical Health Effect(s)	L_{eq} (dBA)	Time base (hours)	L_{Max} (dBA, Fast)
Outdoor living area	Serious Annoyance, daytime & evening	55	16	-
	Moderate annoyance, daytime & evening	50	16	-
Dwelling indoors	Speech Intelligibility & moderate annoyance, daytime & evening	35	16	
Inside bedrooms	Sleep disturbance, night-time	30	8	45
Outside bedrooms	Sleep disturbance – window open, night-time	45	8	60

For the assessment of project involved residences the adopted external criteria of 45 dBA or the level given by the SA EPA Guideline criteria, where higher, will be adopted. Effectively this becomes 45 dBA or background + 5 dBA, whichever is the higher.

4 BACKGROUND NOISE LEVELS

Background noise monitoring was undertaken in July 2009. The noise data was correlated to wind speed at a reference height of 100 m above ground level. Full details of the monitoring are provided in the original Sapphire Wind Farm Noise Assessment report (reference: report 40.1822 – R1R3 Section 6, dated August 2011).

Table 4 shows the background noise at each monitoring location, regressed to a third order polynomial function.

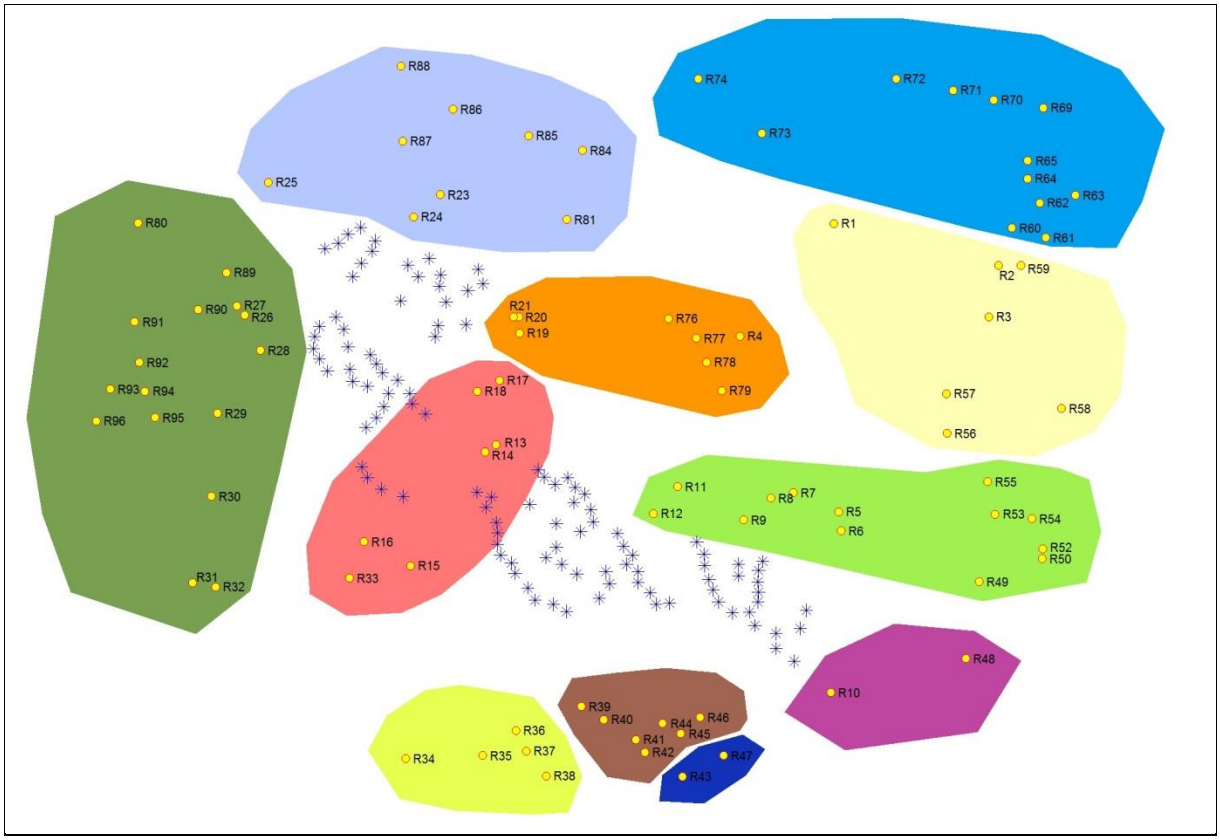
Table 4 Background noise regression equations

Location	Indicative of	
R3-Falkland *	R1*, R3*, R59*, R2*, R57 ,R56*, R58	$y = -0.0119x^3 + 0.2502x^2 - 1.1965x + 29.512$
R64-Springfield	R60 , R61 , R62* , R63 , R64* , R65 , R73 , R72 , R71 , R70 , R69 , R74	$y = 0.0016x^3 - 0.114x^2 + 1.8662x + 21.965$
R43- Ardleigh	R43, R47	$y=-0.0118X^3 + 0.4502x^2-3.071x + 33.042$
R5- Down Field *	R5*, R55, R49*, R53 , R54 , R6*, R52, R50 , R7 , R8* , R9* , R11* , R12*	$y = -0.0185x^3 + 0.4987x^2 - 3.4598x + 45.145$
R14-Kingshill *	R14*, R13*, R17, R18*, R15*, R16*, R33*	$y = 0.0079x^3 - 0.1564x^2 + 1.6257x + 33.331$
R23-Carinya *	R24*, R23*, R25, R87, R86, R80*, R81*, R84, R85* , R88*	$y = 0.0137x^3 - 0.2774x^2 + 2.6662x + 18.733$
R28-Tralee *	R28*, R26*, R27 , R29 , R90, R30, R94, R91, R93, R92, R31 , R32 ,, R89 , R95 , R96	$y = 0.0191x^3 - 0.4642x^2 + 4.0333x + 18.138$
R36 Yarrawah Park *	R36*, R37*, R35, R38*, R34*	$y = 0.0056x^3 - 0.0723x^2 + 0.5553x + 27.644$
R44-Mindora	R46, R45, R41, R42, R39 , R40, R44	$y = 0.0296x^3 - 0.6802x^2 + 5.6064x + 15.111$
R10-Mt Buckley	R10, R48	$y = -0.0168x^3 + 0.5433x^2 - 3.3808x + 32.251$
R19-Warrandah *	R20*, R21* , R19*, R76* , R77 , R4* , R78 , R79*	$y = -0.0301x^3 + 0.894x^2 - 6.3934x + 39.852$

Note: * denotes that property is project involved

Receptors were grouped into general regions where background noise monitoring locations were deemed indicative of the receptors of that region. The groupings are presented pictorially in **Figure 2**.

Figure 2 Receptor groupings for background noise



5 OPERATIONAL NOISE CRITERIA

As discussed in **Section 4** the noise criteria for the project are based on the monitoring and analysis completed for the original Noise Impact Assessment for Sapphire Wind Farm and are re-presented in **Table 5** as a function of hub height wind speed.

Table 5 Wind Farm Noise Criteria

Receiver Location / Group	Height z	Noise Limit, dBA @ Wind Speed Vz (m/s)									
	10m	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	100m	**4.3**	**5.7**	**7.2**	**8.6**	**10.0**	**11.5**	**12.9**	**14.3**	**15.8**	**17.2**
	139m	**4.5**	**6.0**	**7.5**	**9.0**	**10.5**	**12.0**	**13.5**	**15.0**	**16.5**	**18.0**
R3-Falkland *		35	35	35	35	36	36	35	35	35	35
R64-Springfield		35	35	35	36	36	36	35	35	35	35
43- Ardleigh *		35	35	35	37	41	44	48	52	55	58
R5- Down Field *		43	43	44	46	47	48	49	49	47	44
R14-Kingshill *		43	44	45	46	47	48	50	53	56	60
R23-Carinya *		35	35	35	35	36	39	41	45	51	57
R28-Tralee *		35	35	35	36	36	37	39	42	46	52
R36 Yarrawah Park *		35	35	35	36	37	38	40	42	45	49
R44-Mindora		35	35	36	37	38	40	43	48	56	66
R10-Mt Buckley		35	35	35	38	41	45	48	51	53	54
R19-Warrandah *		35	35	35	37	40	44	47	48	48	46

Note: * denotes that property is project involved

6 NOISE ASSESSMENT

6.1 Model Inputs

Noise emissions for the proposed WTG have been determined or estimated by the manufacturers from measurements conducted in accordance with International Standard IEC 61400-11. Copies of the certification test or manufacturers documentation that give the sound power level variation with wind speed, frequency spectra and tonality assessment have been provided to SLR by Wind Prospect CWP Pty Ltd and will be made available on request

Table 6 and **Table 7** summarise the relevant turbine input data used for noise level prediction.

Table 6 WTG Manufacturers data

Make, model, power	Vestas V126 3.3 MW	GE 137 3.4 MW	Senvion M122 3.0 MW
Rotor diameter	126 m	137 m	122 m
Hub height	137 m	135 m	139 m
Cut-in wind speed	3 m/s	3 m/s	3 m/s
Rated wind speed	7.5 m/s		11 m/s
Rotor speed	5.3 -16.5 rpm		5.6 -11.3 rpm
'Standard Mode' Sound Power Level, $L_{WA,ref\ 8\ m/s}$	108.5 [1] dBA	106 dBA	103.9 dBA

Note: 1 Sound power level of standard blade option

Table 7 WTG Sound Power Level values (dBA)

Wind Turbine Model	**Wind speed Vs (m/s) ref: 10 m AGL**									
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Vestas V126 Standard Blade	95.2	98.3	103.1	107.8	108.5	108.5	108.5	108.5	108.5	108.5
Vestas V126 Serrated Blade - Mode 0	93.4	96.3	101.1	105.0	106.0	106.0	106.0	106.0	106.0	106.0
Vestas V126 Serrated Blade - Mode 2	93.4	96.3	100.6	102.6	103.1	104.2	104.5	104.5	104.5	104.5
GE 137 3.4 MW	93.5	98.5	103.3	106.0	106.0	106.0	106.0	106.0	106.0	106.0
Senvion M122		99.8	103.1	104.5	104.4	103.9	103.8	103.8		

6.2 Assessment of Tonality and Infrasound

A part of IEC 61400-11 noise testing is to conduct an assessment of the audibility of any tones present.

The tonal audibility is assessed using the methodology outlined in *Joint Nordic Method Version 2 – Objective Method for Assessing the Audibility of Tones in Noise* (JNM2). It should be noted that JNM2 imposes a sliding scale tonality penalty commencing when the tonal audibility $\Delta L_{A,k}$ >4 dB, and reaches the maximum allowable penalty of +6 dB when the tonal audibility $\Delta L_{A,k}$ >10 dB. The absence of any audible tones when tested in the near field as per IEC 61400-11 requirements, ensures that no audible tones will be experienced in the far field at receptors.

The tonal audibility data $\Delta L_{A,k}$ values have been supplied by the WTG manufacturers as follows:

Table 8 Audible tonality $\Delta L_{A,k}$ assessment to IEC 61400-11

Wind Turbine Model	Wind speed Vs (Hub Height) (m/s)									
	7	8	9	10	11	12	13	14	15	16
Vestas V126 3.3MW	-0.49	-2.47	-	-2.5	-0.34	-0.99	-1.71	-2.64	-	-
GE 137 3.4 3.4MW	≤4	≤4	≤4	≤4	≤4	≤4	≤4	≤4	≤4	≤4

The Senvion M122 has no statement with regard to tonality. Confirmation of the $\Delta L_{A,k}$ tests should be provided by the manufacturer prior to approval.

Infrasound is not tested as an obligatory part of IEC 61400-11. It is noted that, in general, modern WTG's do not exhibit significant levels of infrasound emissions.

6.3 Noise Model Predictions

The results of noise modelling are presented in **Table 9** for all assessed receptor locations for the three investigated WTG models for Sapphire Wind Farm at a reference wind speed of 8 m/s (10m AGL).

Table 9 Predicted Noise Levels – dBA Leq

Receiver	Vestas V126 Standard Blade	Vestas V126 serrated blade Option Mode 0	Senvion M122	GE 137	Receiver	Vestas V126 Standard Blade	Vestas V126 serrated blade Option Mode 0	Senvion M122	GE 137
R1	24.7	22.2	20.8	22.9	R46	38.9	36.4	34.6	36.8
R2	22.4	19.9	18.6	20.6	R47	36.2	33.7	31.9	34.2
R3	24.8	22.2	20.8	22.9	R48	30.6	28.0	26.4	28.6
R4	33.2	30.7	29.1	31.4	R49	30.6	28.1	26.5	28.7
R5	36.6	34.1	32.3	34.4	R50	24.4	21.9	20.4	22.6
R6	39.0	36.5	34.8	36.9	R52	24.3	21.8	20.4	22.5
R7	40.3	37.8	36.0	38.1	R53	26.1	23.6	22.0	24.2
R8	42.0	39.5	37.7	39.8	R54	24.7	22.2	20.7	22.9
R9	46.1	43.6	41.8	43.8	R55	27.9	25.4	23.8	26.0
R10	39.8	37.3	35.5	37.6	R56	26.5	24.0	22.4	24.6
R11	43.6	41.1	39.3	41.5	R57	25.9	23.4	21.9	24.1
R12	47.0	44.5	42.7	44.7	R58	22.5	20.0	18.6	20.7
R13	45.4	42.9	41.1	43.1	R59	21.8	19.2	17.9	19.9
R14	45.8	43.3	41.5	43.5	R60	21.8	19.2	18.0	19.9
R15	40.4	37.9	36.1	38.3	R61	22.3	19.7	18.4	20.4
R16	39.9	37.4	35.6	37.6	R62	21.5	18.9	17.7	19.6
R17	41.8	39.3	37.6	39.7	R63	21.4	18.8	17.6	19.5
R18	43.9	41.4	39.6	41.7	R64	20.7	18.2	16.9	18.8
R19	42.0	39.5	37.7	39.8	R65	20.4	17.8	16.6	18.5
R20	43.0	40.5	38.7	40.7	R69	19.2	16.7	15.5	17.3
R21	43.6	41.1	39.3	41.3	R70	19.3	16.8	15.6	17.5

Receiver	Vestas V126 Standard Blade	Vestas V126 serrated blade Option Mode 0	Senvion M122	GE 137	Receiver	Vestas V126 Standard Blade	Vestas V126 serrated blade Option Mode 0	Senvion M122	GE 137
R23	41.1	38.6	36.7	38.8	R71	20.0	17.5	16.3	18.2
R24	45.5	43.0	41.2	43.2	R72	20.6	18.1	16.8	18.7
R25	37.0	34.5	32.6	34.7	R73	25.1	22.6	21.2	23.3
R26	41.2	38.7	36.9	39.0	R74	27.3	24.8	23.3	25.4
R27	39.5	37.0	35.1	37.2	R76	34.1	31.6	29.9	32.2
R28	43.0	40.5	38.7	40.7	R77	33.2	30.7	29.0	31.2
R29	37.5	35.0	33.2	35.4	R78	35.9	33.4	31.7	34.0
R30	35.2	32.7	31.0	33.2	R79	36.6	34.1	32.4	34.6
R31	32.2	29.7	28.1	30.3	R80	32.6	30.1	28.4	30.6
R32	32.7	30.2	28.6	30.9	R81	32.6	30.1	28.4	30.6
R33	38.1	35.6	33.8	36.0	R84	31.0	28.5	26.8	29.1
R34	32.5	30.0	28.4	30.6	R85	32.4	29.9	28.2	30.4
R35	34.2	31.7	30.0	32.3	R86	32.7	30.2	28.4	30.6
R36	35.9	33.4	31.6	33.9	R87	35.6	33.1	31.3	33.4
R37	35.1	32.6	30.9	33.1	R88	28.5	26.0	24.4	26.6
R38	34.2	31.7	30.1	32.3	R89	36.4	33.9	32.1	34.3
R39	38.4	35.9	34.1	36.3	R90	36.2	33.7	31.9	34.1
R40	37.7	35.2	33.5	35.7	R91	33.3	30.8	29.1	31.4
R41	36.4	33.9	32.1	34.3	R92	30.0	27.5	25.8	28.1
R42	36.0	33.5	31.8	34.0	R93	31.5	29.0	27.4	29.7
R43	35.1	32.6	30.9	33.2	R94	33.7	31.2	29.5	31.8
R44	36.1	33.6	31.8	34.0	R95	34.0	31.5	29.8	32.1
R45	37.2	34.7	32.9	35.1	R96	31.4	28.9	31.4	31.4

The full assessment graphs are presented in;

- **Appendix A1** for the Vestas V126 Standard Blade layout
- **Appendix A2** for the Vestas V126 Serrated Blade Option (Mode 0) layout
- **Appendix A3** for the Senvion M122 layout
- **Appendix A4** for the GE 137 layout

Noise contour plots calculated at a reference wind speed of 8 m/s (10m AGL) are presented in;

- **Appendix B1** for the Vestas V126 Standard Blade layout
- **Appendix B2** for the Vestas V126 Serrated Blade Option (Mode 0) layout
- **Appendix B3** for the Senvion M122 layout
- **Appendix B4** for the GE 137 layout

The predicted exceedances for each turbine type are shown in **Table 10, Table 11, Table 12** and **Table 13**.

Table 10 Vestas V126 Standard Blade - Predicted Exceedances (dBA)

Location	Height z	Hub height wind speed, m/s										Max
	10m	3	4	5	6	7	8	9	10	11	12	
	100m	4.3	5.7	7.2	8.6	10.0	11.5	12.9	14.3	15.8	17.2	
	139m	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0	
R24* Derra Downs					0.5	0.5	0.5	0.5	0.1			0.5
R25 Coleraine					2.0	0.6						2.0
R87 Croye					0.6							0.6
R27 Frasers Creek				1.5	3.8	3.3	2.3	0.5				3.8
R29 Krystal Blue					1.8	1.3	0.3					1.8
R90 Wirra Willa					0.5							0.5
R89 Tomali Park					0.8	0.3						0.8
R46 Alkoomie					2.0	1.1						2.0
R45 Glen Idle					0.3							0.3
R39 Bon Vista					1.5	0.6						1.5
R40 Hillview					0.9							0.9
R10 Mt Buckley				2.1	2.1							2.1

Note: * denotes that property is project involved and predicted exceedance is from the WHO limit

The highest predicted exceedance for the Vestas V126 (Standard Blade) layout is at location R27 Frasers Creek with a level 3.8 dBA higher than the SA EPA limit.

Table 11 Vestas V126 Serrated Blade Option (Mode 0) - Predicted Exceedances (dBA)

Location	Height z	Hub height wind speed, m/s										Max
	10m	3	4	5	6	7	8	9	10	11	12	
	100m	4.3	5.7	7.2	8.6	10.0	11.5	12.9	14.3	15.8	17.2	
	139m	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0	
R27 Frasers Creek					0.3	0.8						0.8

The highest predicted exceedance for the Vestas V126 Serrated Blade Option layout is at location R27 Frasers Creek with a level 0.8 dBA higher than the SA EPA limit.

Table 12 GE137 - Predicted Exceedances (dBA)

Location	Height z	Hub height wind speed, m/s										Max
	10m	3	4	5	6	7	8	9	10	11	12	
	100m	4.3	5.7	7.2	8.6	10.0	11.5	12.9	14.3	15.8	17.2	
	139m	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0	
R27 Frasers Creek					1.6	1.1	0.1					1.6

The highest predicted exceedance for the GE 137 layout is at location R27 Frasers Creek with a level 1.6 dBA higher than the SA EPA limit.

Table 13 Senvion M122 - Predicted Exceedances (dBA)

Location	Height z	Hub height wind speed, m/s										Max
	10m	3	4	5	6	7	8	9	10	11	12	
	100m	4.3	5.7	7.2	8.6	10.0	11.5	12.9	14.3	15.8	17.2	
	139m	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0	
R27 Frasers Creek					0.1							0.1

The highest predicted exceedance for the Senvion M122 layout is at location R27 Frasers Creek with a level 0.1 dBA higher than the SA EPA limit.

6.4 Mitigation Layout

Information regarding Noise Management Mode for the GE137 WTG model was not available at the time of compiling this report as the turbine is relatively new. It is expected that subsequent testing will be undertaken to show the possibility of operating in Noise Management Mode.

A mitigated layout was developed using Mode 2 of the Vestas V126 WTG Serrated Blade Option. A total of 3 WTGs were placed into Mode 2 operation, which reduces the sound power output of those turbines compared to standard Mode 0 operation. **Table 14** shows a list of the WTGs placed in Mode 2 for the mitigated scenario.

Table 14 Mitigated Turbine Layout - Vestas V126 WTG Serrated Blade Option

Turbine Name	Type
T21	Mode 2
T22	Mode 2
T23	Mode 2

Full results at all wind speeds are shown in **Appendix A5.**

A noise contour plot is shown in **Appendix B5.**

The mitigated layout is shown to comply at all receptors at all wind speeds.

7 COMPARISON TO ORIGINAL LAYOUTS

The proposed modification to Sapphire Wind Farm incorporates a layout of up to 109 WTGs, with a maximum tip height of 200 m and 3 MW to 3.4 MW capacities, whereas the approved wind farm had two alternative layout options of 159 WTGs and 125 WTGs with a maximum tip height of 159 m and between 2 MW and 3 MW capacity respectively.

Making a precise comparison of the predicted noise levels between the approved layouts and the proposed modification is difficult given the potential number of combinations of layouts and turbine models involved. However, in general a comparative evaluation reveals that noise levels will be marginally higher at some receptors (where nearby turbines are common to both the approved and proposed modified layout, owing to the larger size and marginally higher sound power level of the latter) and lower at others (where clusters of turbines have been dropped from the approved layout). Furthermore, in regions where noise levels are expected to be higher compared to the approved layout, there are a high proportion of project involved receptors.

It should be noted that whilst the predicted noise level for the proposed modified layout may be marginally higher than approved layouts at some receptors, the noise level will be below the appropriate limit.

8 CONCLUSION

SLR has conducted a noise impact assessment of the proposed modification to Sapphire Wind Farm.

Computer noise modelling using the standard ISO9613 algorithm was completed for four alternative WTG models.

The results for the Vestas V126 – Standard blade model, indicated that the wind farm may potentially exceed the relevant noise limits at up to 11 receptors.

The results for the Vestas V126 – serrated blade Option model, indicated that the wind farm may potentially marginally exceed the relevant noise limits at a single receptor.

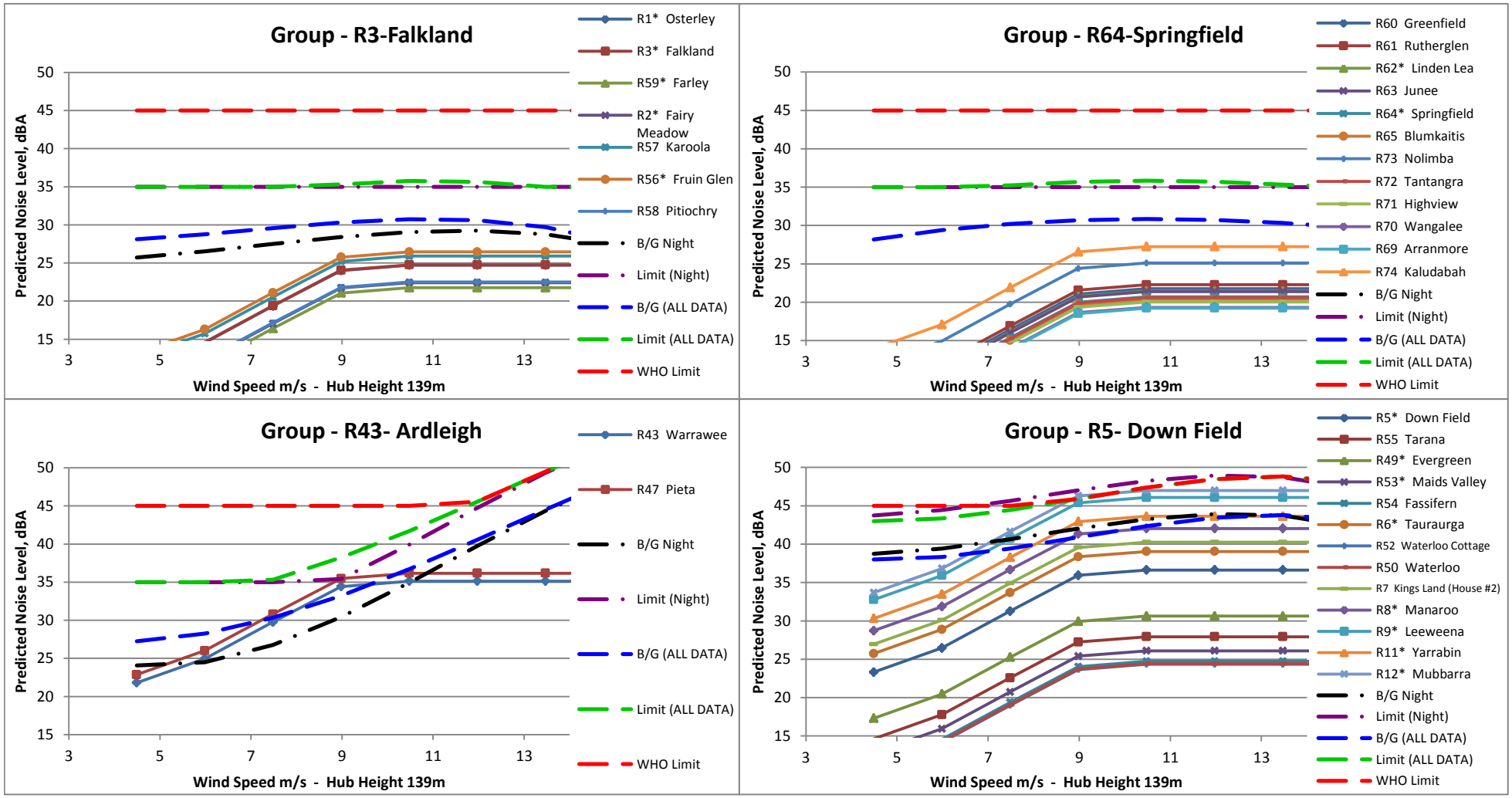
A mitigation investigation was undertaken for the Vestas V126 serrated blade Option model utilising Sound Management Mode. Compliance at all receptors can be achieved using a mitigated layout where three WTGs are operated in Sound Management Mode 2. It should be noted that when WTGs are configured in Sound Management Mode they are always operating in the reduced noise mode, which is distinctly different from Sector Management.

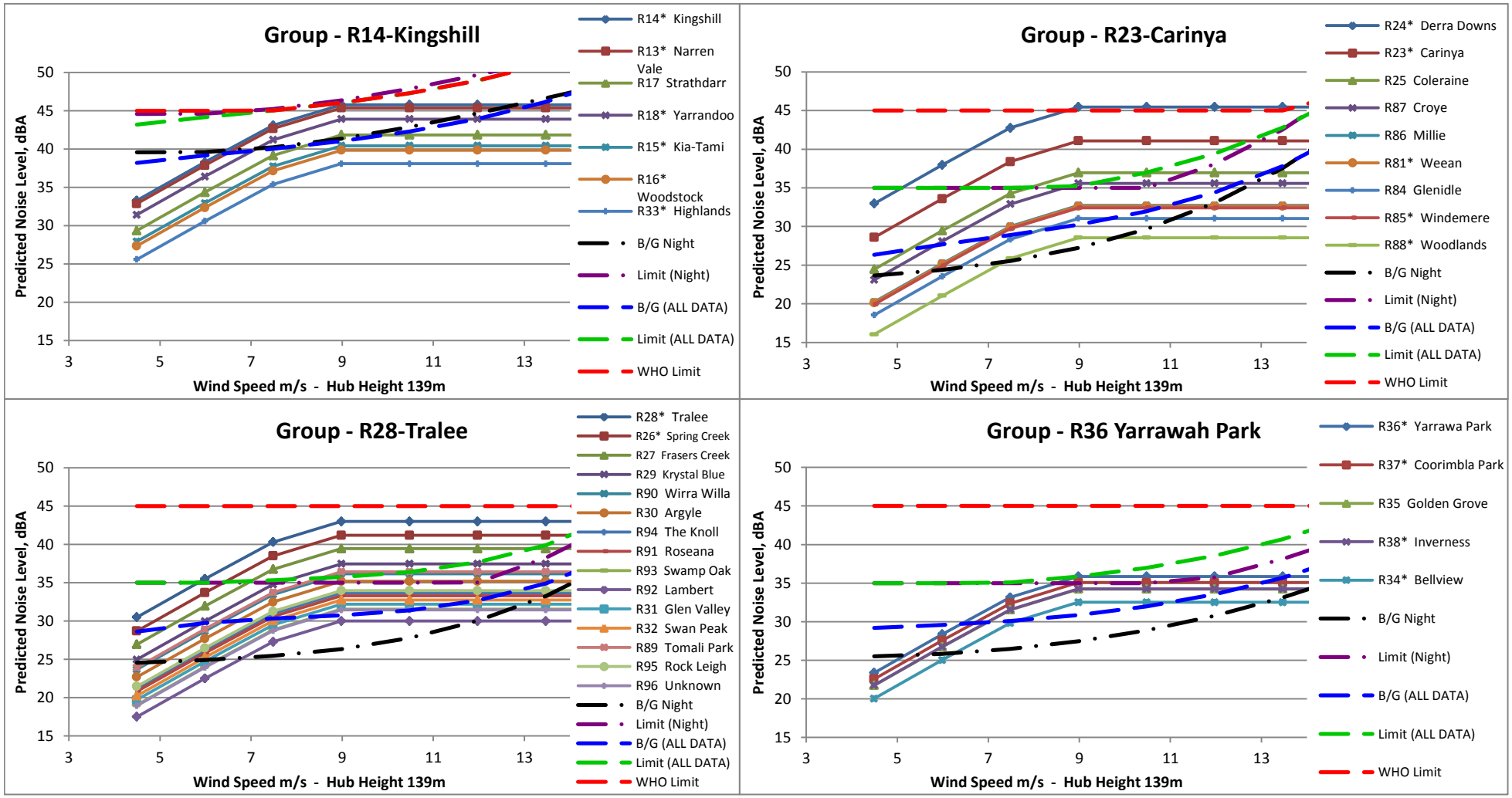
The results for the, indicated that the wind farm would comply with relevant noise limits at all receptors.

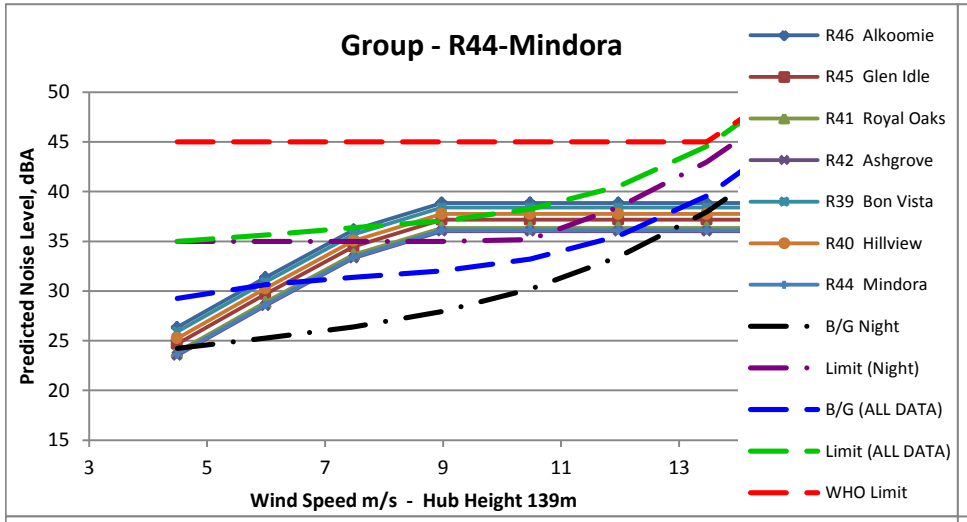
The results for the Senvion M122 and GE 137 layouts, indicate that the wind farm may potentially marginally exceed the relevant noise limits at a single receptor. It is anticipated that a mitigation layout for these models will be possible through the implementation of a reduced output Sound Management Mode or the removal of a turbine from the current layout.

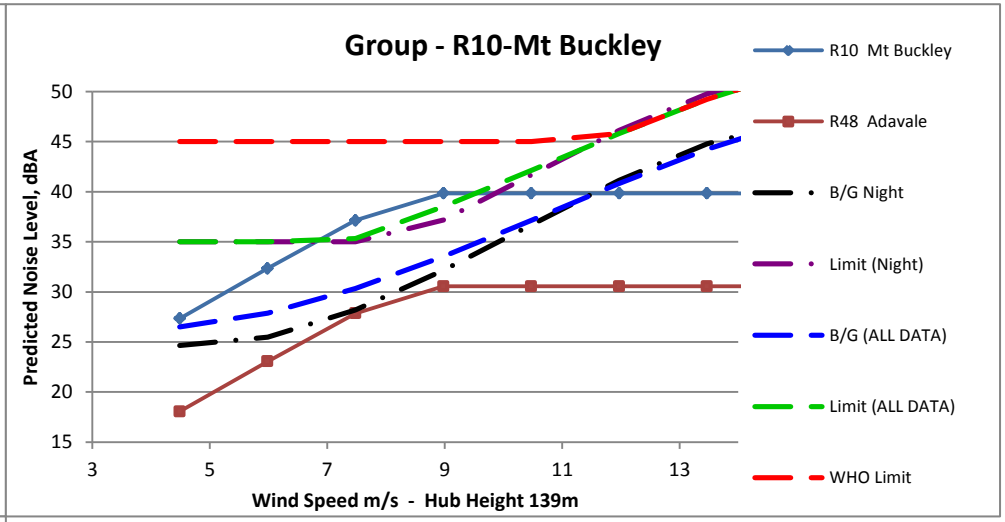
This noise impact assessment of the proposed modifications to Sapphire Wind Farm has shown that compliance with the noise limit requirements is attainable.

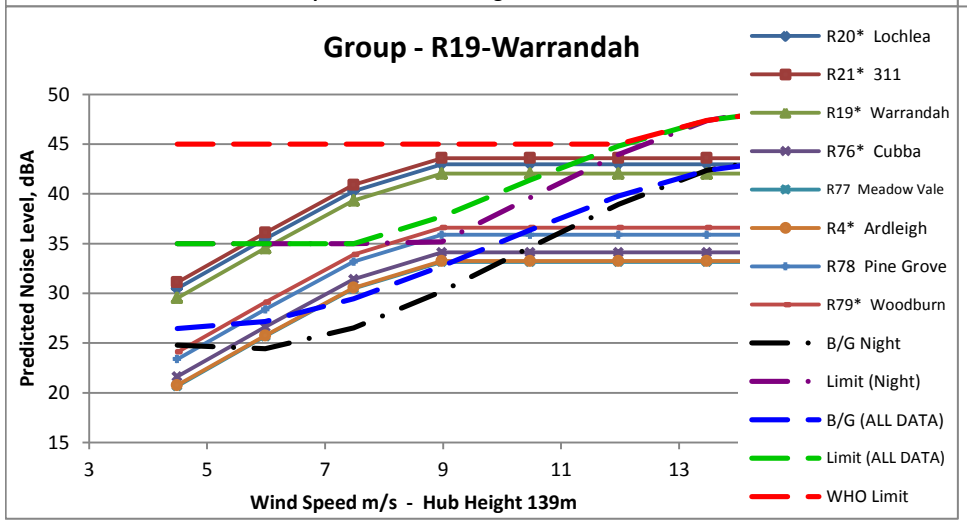
APPENDIX A NOISE ASSESSMENT GRAPHS

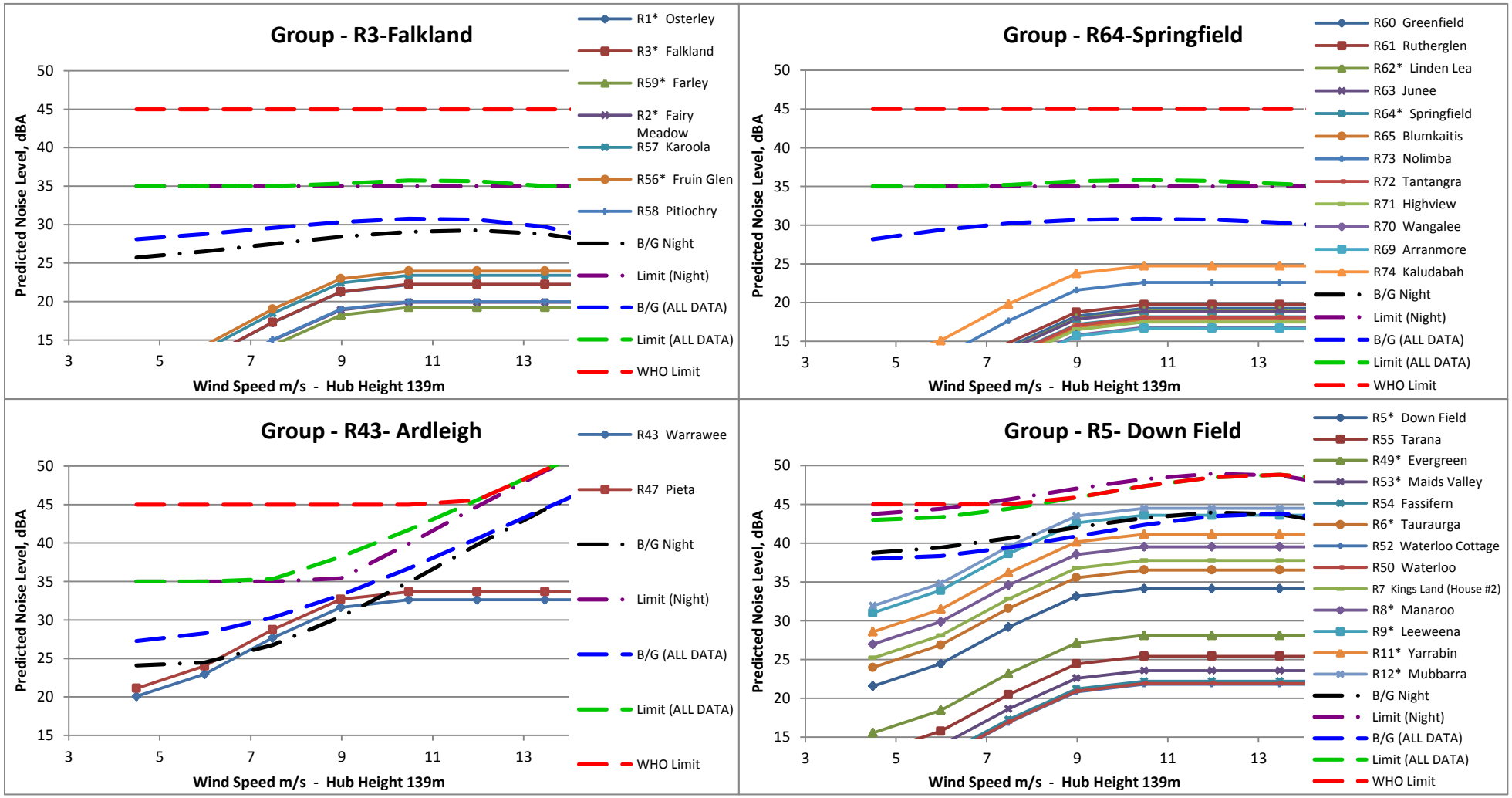

Group - R3-Falkland
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R1* Osterley
R3* Falkland
R59* Farley
R2* Fairy Meadow
R57 Karoola
R56* Fruin Glen
R58 Pitiochry
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R64-Springfield
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R60 Greenfield
R61 Rutherglen
R62* Linden Lea
R63 Junee
R64* Springfield
R65 Blumkaitis
R73 Nolimba
R72 Tantangra
R71 Highview
R70 Wangalee
R69 Arranmore
R74 Kaludabah
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R43- Ardleigh
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R43 Warrawee
R47 Pieta
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R5- Down Field
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R5* Down Field
R55 Tarana
R49* Evergreen
R53* Maids Valley
R54 Fassifern
R6* Tauraurga
R52 Waterloo Cottage
R50 Waterloo
R7 Kings Land (House #2)
R8* Manaroo
R9* Leeweena
R11* Yarrabin
R12* Mubbarra
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

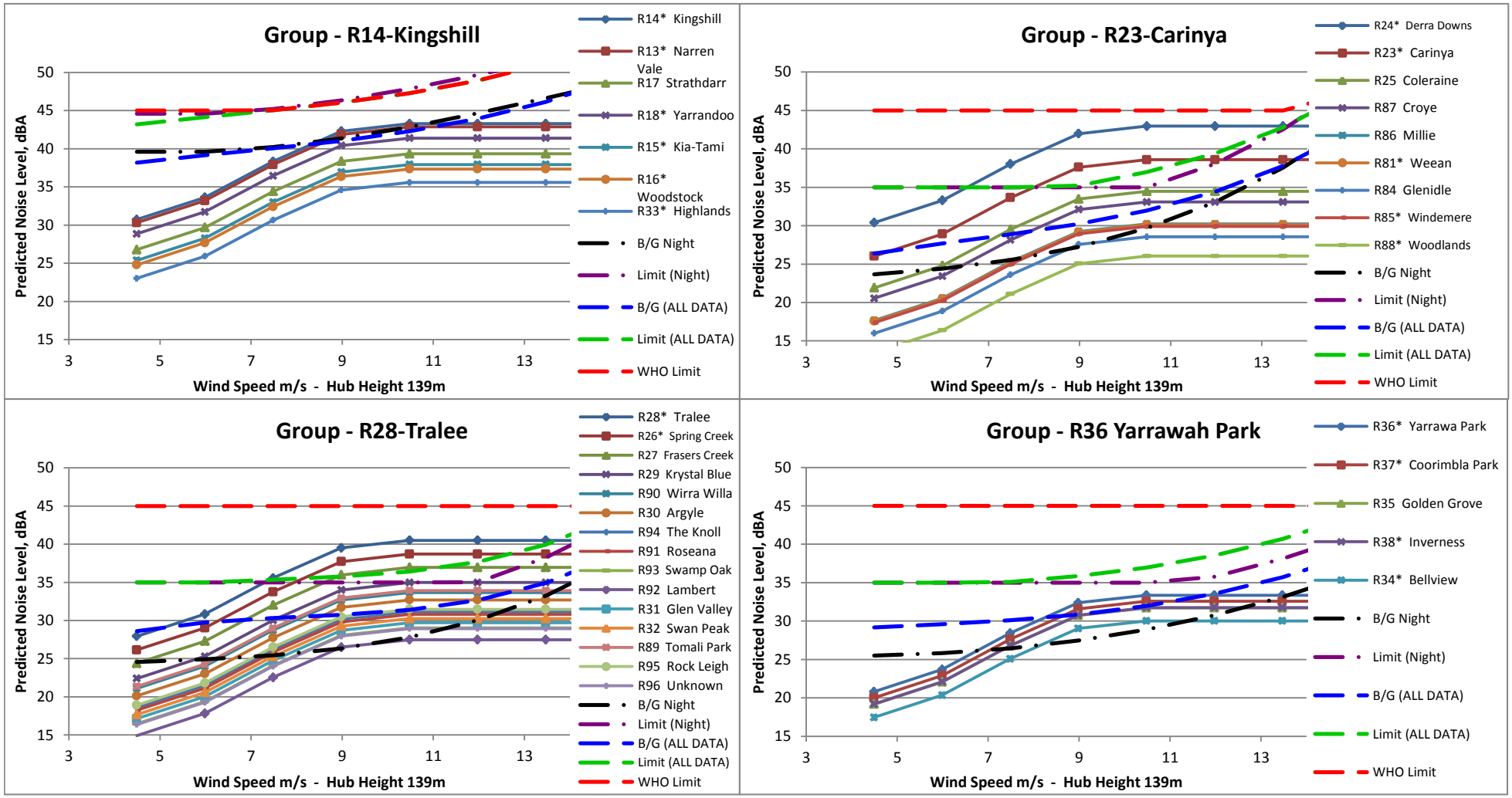

Group - R14-Kingshill
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R14* Kingshill
R13* Narren Vale
R17 Strathdarr
R18* Yarrandoo
R15* Kia-Tami
R16* Woodstock
R33* Highlands
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R23-Carinya
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R24* Derra Downs
R23* Carinya
R25 Coleraine
R87 Croye
R86 Millie
R81* Weean
R84 Glenidle
R85* Windemere
R88* Woodlands
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R28-Tralee
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R28* Tralee
R26* Spring Creek
R27 Frasers Creek
R29 Krystal Blue
R90 Wirra Willa
R30 Argyle
R94 The Knoll
R91 Roseana
R93 Swamp Oak
R92 Lambert
R31 Glen Valley
R32 Swan Peak
R89 Tomali Park
R95 Rock Leigh
R96 Unknown
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R36 Yarrawah Park
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R36* Yarrawa Park
R37* Coorimbla Park
R35 Golden Grove
R38* Inverness
R34* Bellview
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

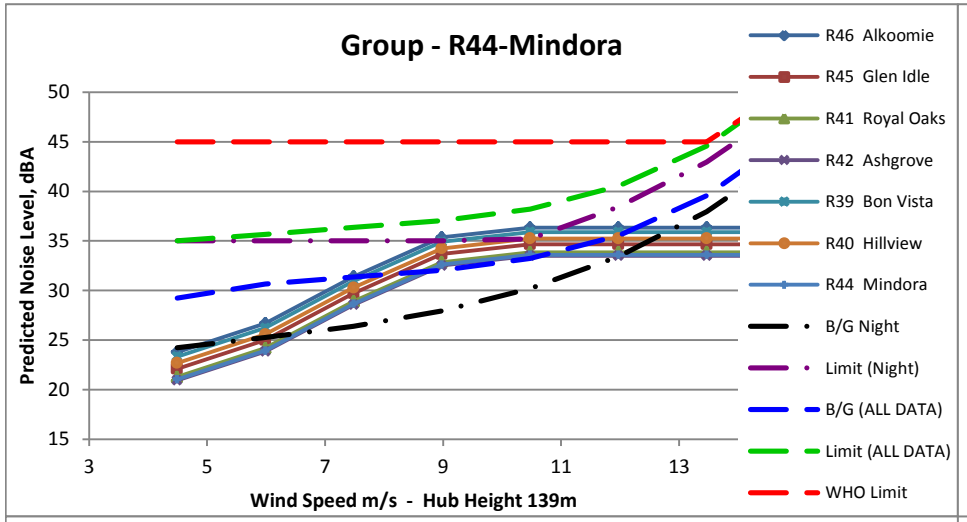

Group - R44-Mindora
Predicted Noise Level, dBA
50
45
40
35
30
25
20
15
3
5
7
9
11
13
Wind Speed m/s - Hub Height 139m
R46 Alkoomie
R45 Glen Idle
R41 Royal Oaks
R42 Ashgrove
R39 Bon Vista
R40 Hillview
R44 Mindora
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

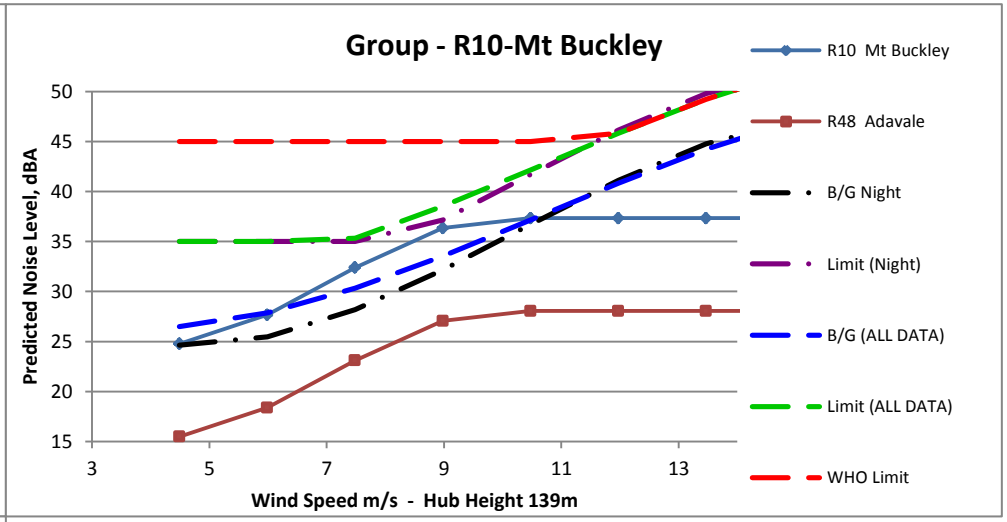

Group - R10-Mt Buckley
Predicted Noise Level, dBA
50
45
40
35
30
25
20
15
3
5
7
9
11
13
Wind Speed m/s - Hub Height 139m
R10 Mt Buckley
R48 Adavale
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

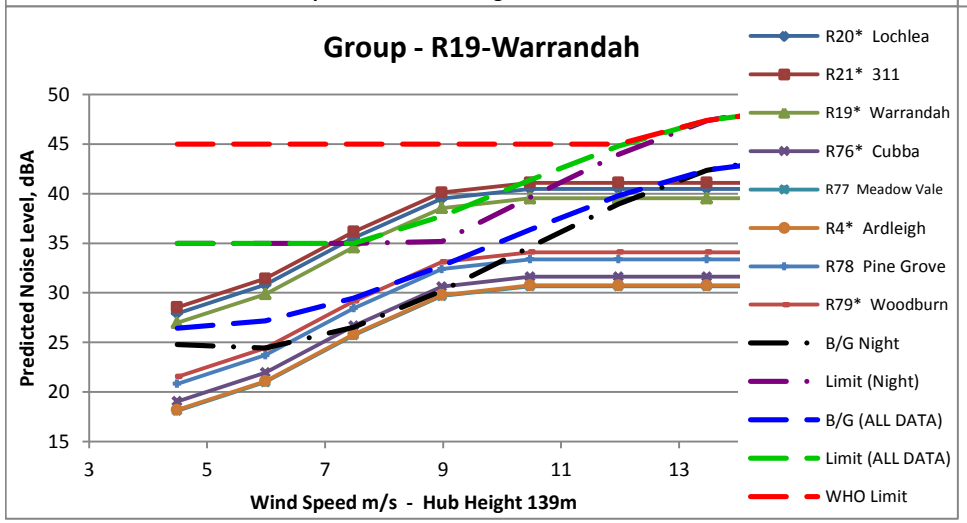

Group - R19-Warrandah
Predicted Noise Level, dBA
50
45
40
35
30
25
20
15
3
5
7
9
11
13
Wind Speed m/s - Hub Height 139m
R20* Lochlea
R21* 311
R19* Warrandah
R76* Cubba
R77 Meadow Vale
R4* Ardleigh
R78 Pine Grove
R79* Woodburn
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

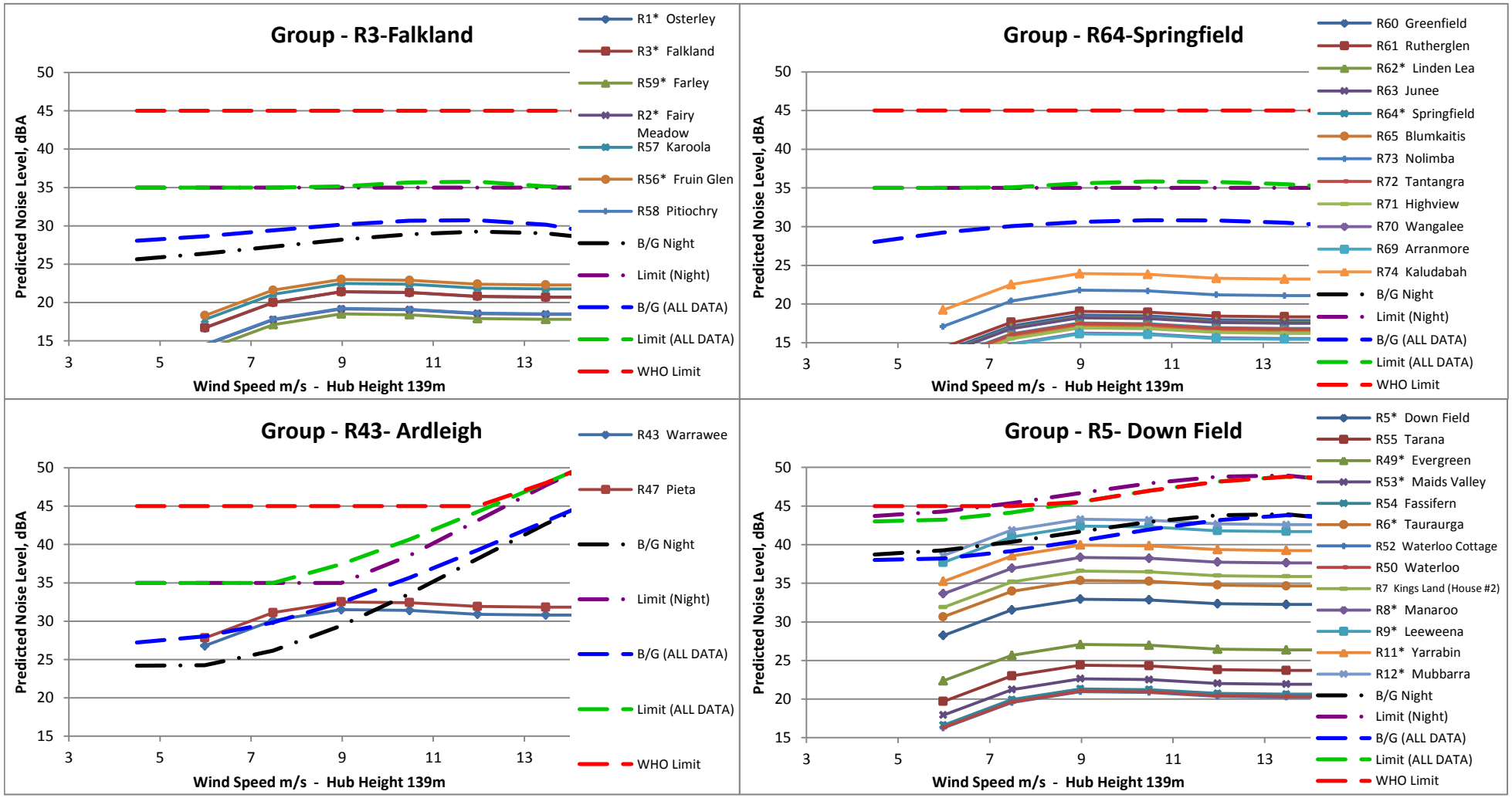

Group - R3-Falkland
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R1* Osterley
R3* Falkland
R59* Farley
R2* Fairy Meadow
R57 Karoola
R56* Fruin Glen
R58 Pitiochry
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R64-Springfield
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R60 Greenfield
R61 Rutherglen
R62* Linden Lea
R63 Junee
R64* Springfield
R65 Blumkaitis
R73 Nolimba
R72 Tantangra
R71 Highview
R70 Wangalee
R69 Arranmore
R74 Kaludabah
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R43- Ardleigh
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R43 Warrawee
R47 Pieta
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R5- Down Field
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R5* Down Field
R55 Tarana
R49* Evergreen
R53* Maids Valley
R54 Fassifern
R6* Taurarga
R52 Waterloo Cottage
R50 Waterloo
R7 Kings Land (House #2)
R8* Manaroo
R9* Leeweena
R11* Yarrabin
R12* Mubbarra
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

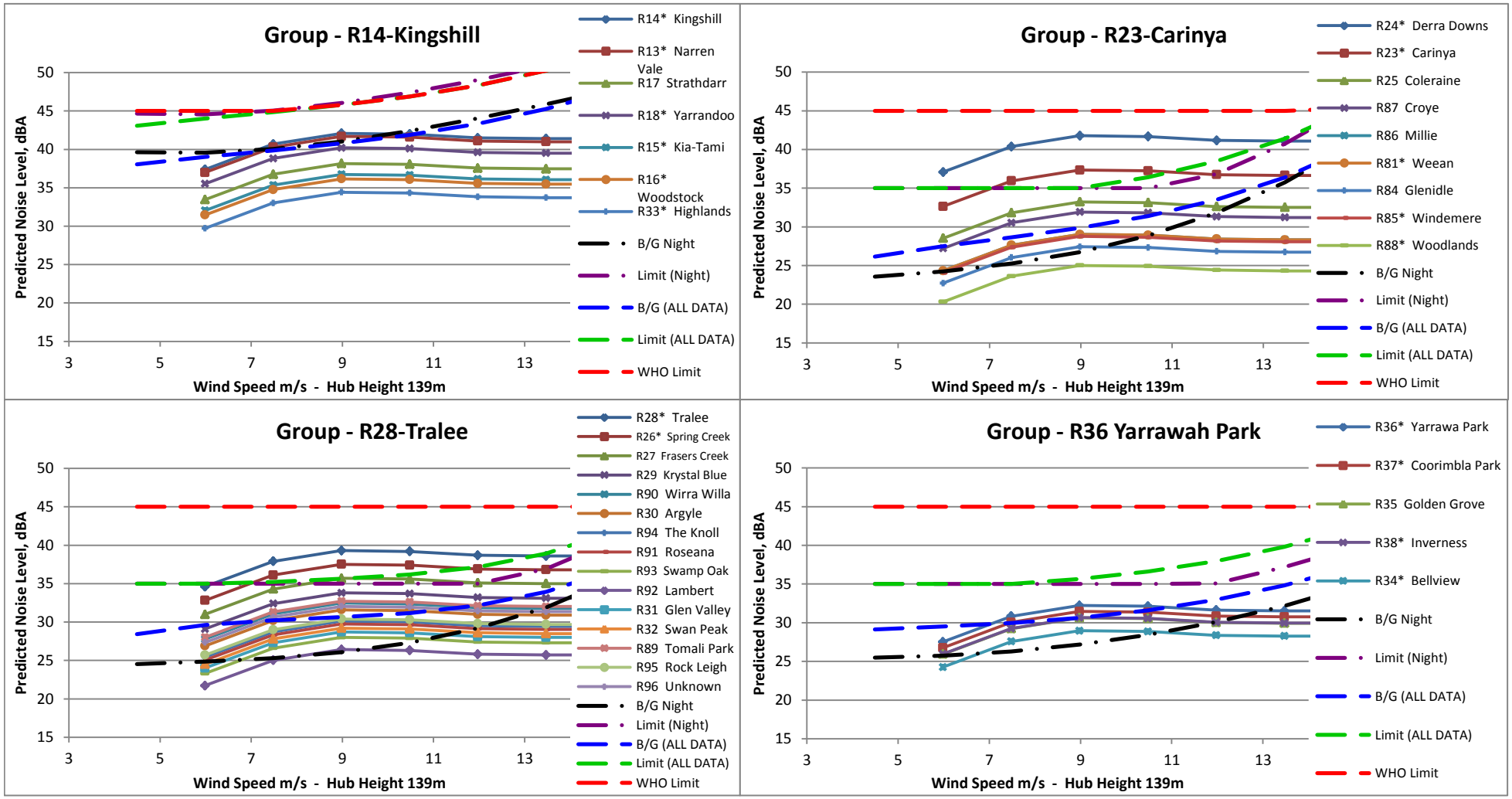

Group - R14-Kingshill
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R14* Kingshill
R13* Narren Vale
R17 Strathdarr
R18* Yarrandoo
R15* Kia-Tami
R16* Woodstock
R33* Highlands
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R23-Carinya
R24* Derra Downs
R23* Carinya
R25 Coleraine
R87 Croye
R86 Millie
R81* Weean
R84 Glenidle
R85* Windemere
R88* Woodlands
Group - R28-Tralee
R28* Tralee
R26* Spring Creek
R27 Frasers Creek
R29 Krystal Blue
R90 Wirra Willa
R30 Argyle
R94 The Knoll
R91 Roseana
R93 Swamp Oak
R92 Lambert
R31 Glen Valley
R32 Swan Peak
R89 Tomali Park
R95 Rock Leigh
R96 Unknown
Group - R36 Yarrawah Park
R36* Yarrawa Park
R37* Coorimbla Park
R35 Golden Grove
R38* Inverness
R34* Bellview

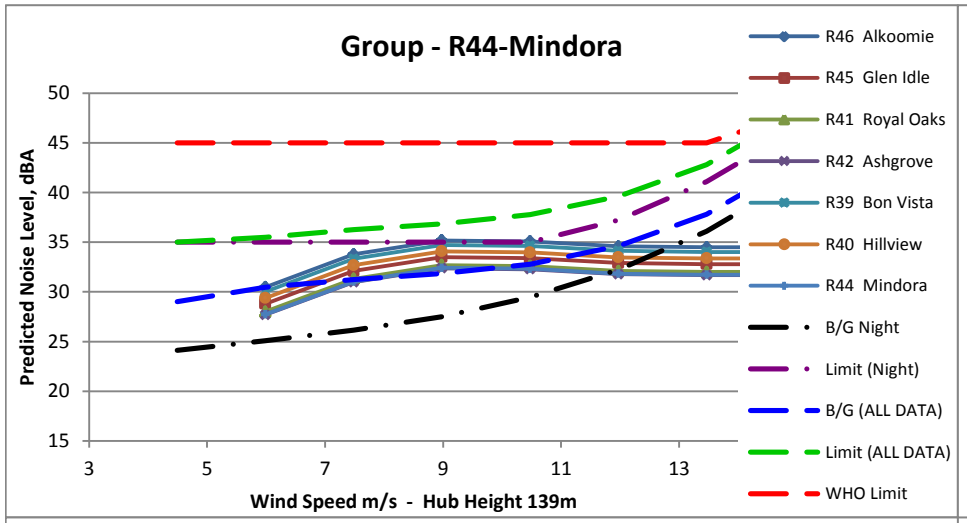

Group - R44-Mindora
Predicted Noise Level, dBA
50
45
40
35
30
25
20
15
3
5
7
9
11
13
Wind Speed m/s - Hub Height 139m
R46 Alkoomie
R45 Glen Idle
R41 Royal Oaks
R42 Ashgrove
R39 Bon Vista
R40 Hillview
R44 Mindora
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

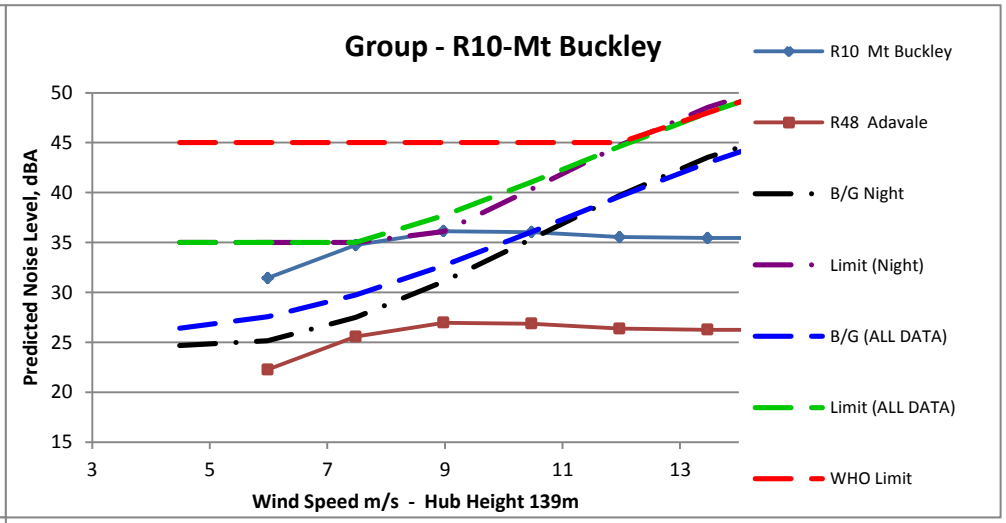

Group - R10-Mt Buckley
Predicted Noise Level, dBA
50
45
40
35
30
25
20
15
3
5
7
9
11
13
Wind Speed m/s - Hub Height 139m
R10 Mt Buckley
R48 Adavale
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

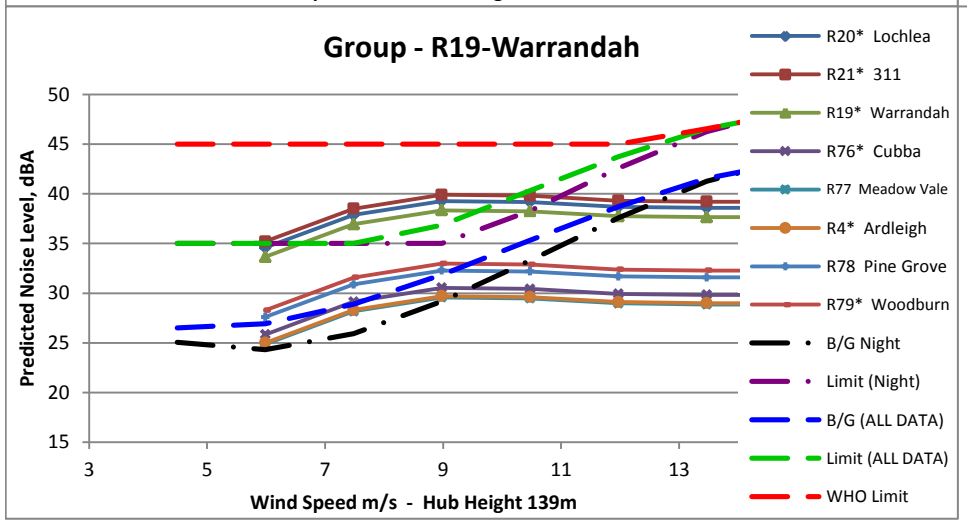

Group - R19-Warrandah
Predicted Noise Level, dBA
50
45
40
35
30
25
20
15
3
5
7
9
11
13
Wind Speed m/s - Hub Height 139m
R20* Lochlea
R21* 311
R19* Warrandah
R76* Cubba
R77 Meadow Vale
R4* Ardleigh
R78 Pine Grove
R79* Woodburn
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

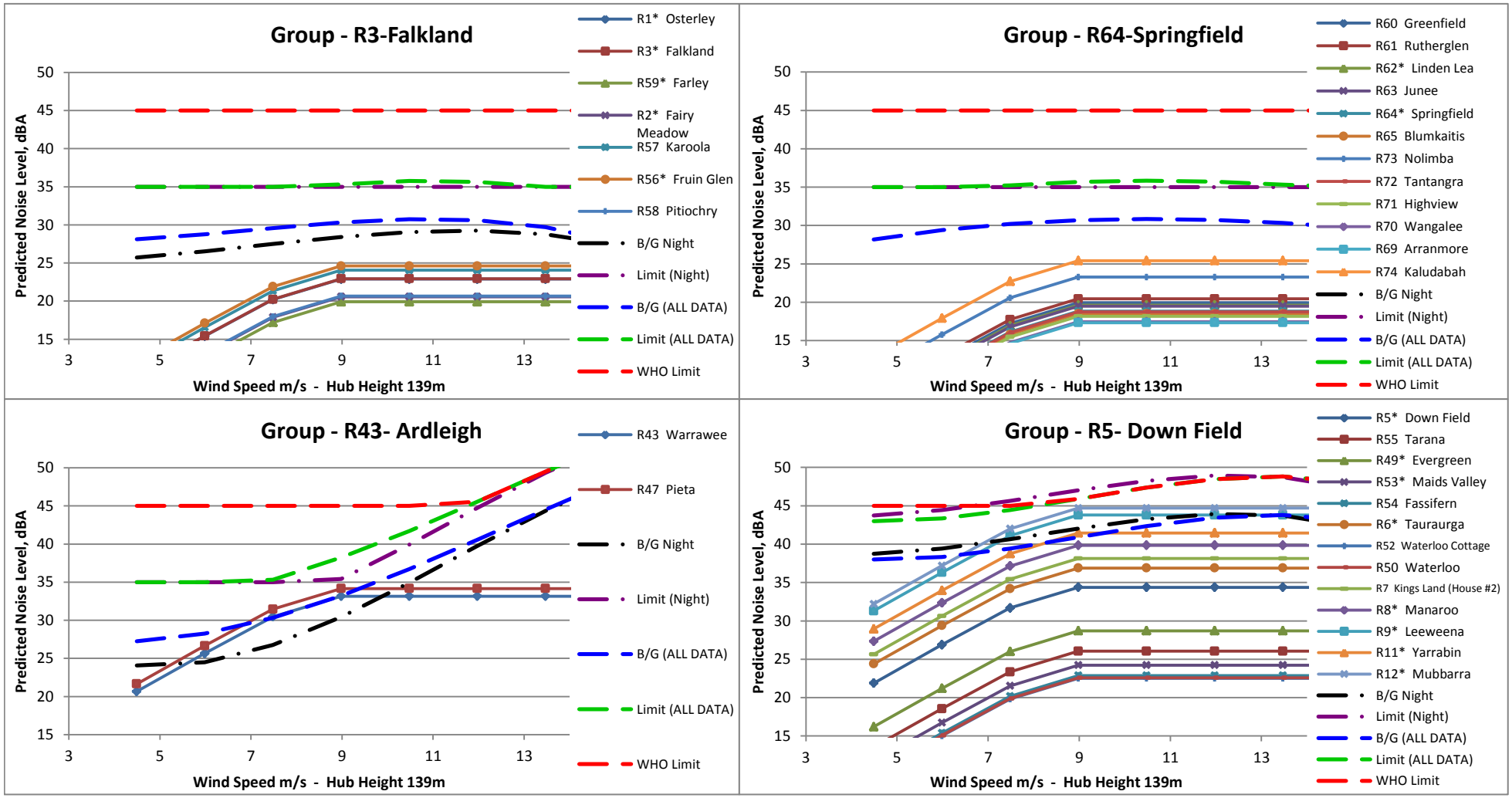

Group - R3-Falkland
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R1* Osterley
R3* Falkland
R59* Farley
R2* Fairy Meadow
R57 Karoola
R56* Fruin Glen
R58 Pitiochry
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R64-Springfield
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R60 Greenfield
R61 Rutherglen
R62* Linden Lea
R63 Junee
R64* Springfield
R65 Blumkaitis
R73 Nolimba
R72 Tantangra
R71 Highview
R70 Wangalee
R69 Arranmore
R74 Kaludabah
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R43- Ardleigh
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R43 Warrawee
R47 Pieta
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R5- Down Field
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R5* Down Field
R55 Tarana
R49* Evergreen
R53* Maids Valley
R54 Fassifern
R6* Tauraurga
R52 Waterloo Cottage
R50 Waterloo
R7 Kings Land (House #2)
R8* Manaroo
R9* Leeweena
R11* Yarrabin
R12* Mubbarra
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

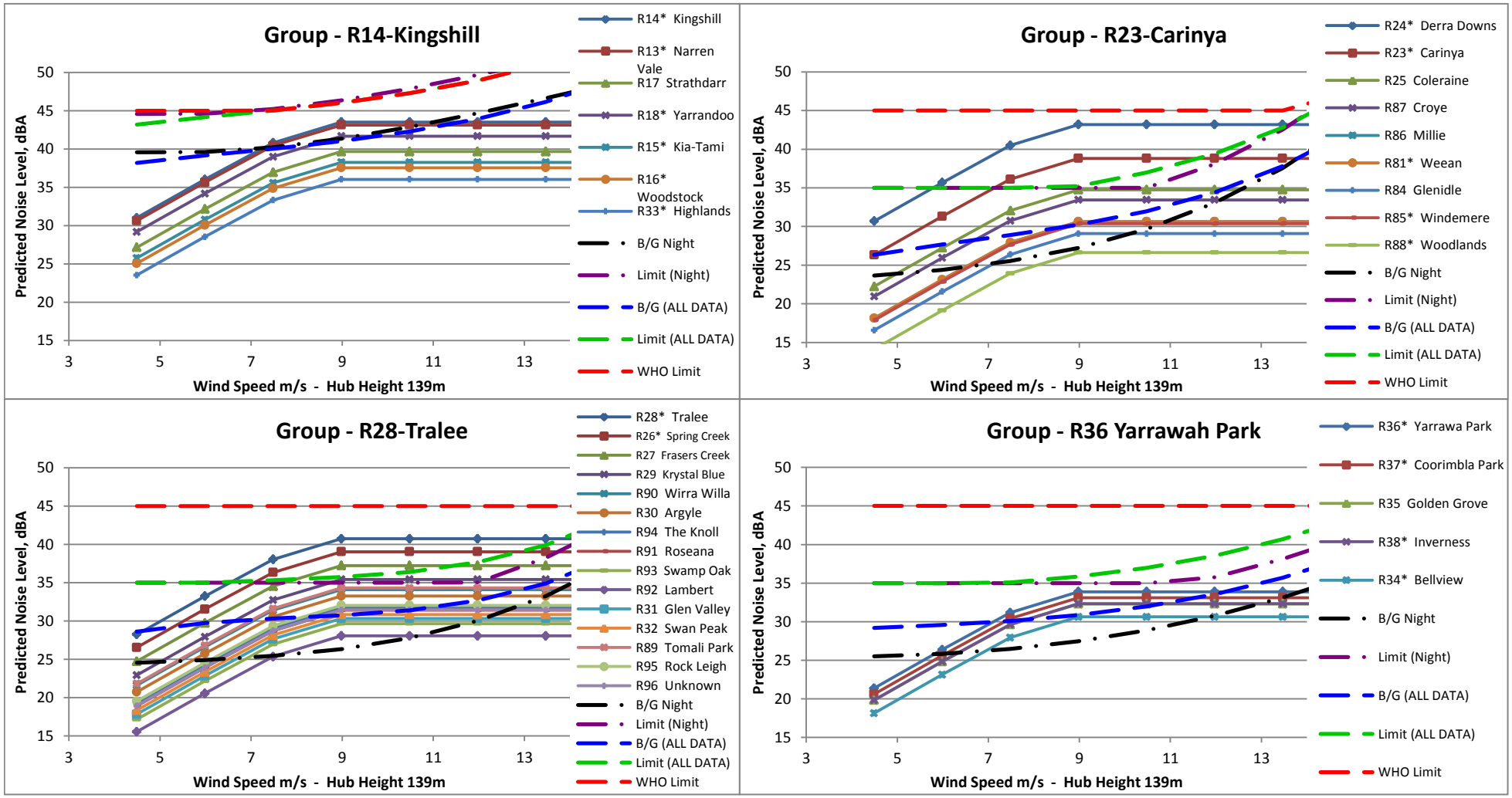

Group - R14-Kingshill
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R14* Kingshill
R13* Narren Vale
R17 Strathdarr
R18* Yarrandoo
R15* Kia-Tami
R16* Woodstock
R33* Highlands
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R23-Carinya
R24* Derra Downs
R23* Carinya
R25 Coleraine
R87 Croye
R86 Millie
R81* Weean
R84 Glenidle
R85* Windemere
R88* Woodlands
Group - R28-Tralee
R28* Tralee
R26* Spring Creek
R27 Frasers Creek
R29 Krystal Blue
R90 Wirra Willa
R30 Argyle
R94 The Knoll
R91 Roseana
R93 Swamp Oak
R92 Lambert
R31 Glen Valley
R32 Swan Peak
R89 Tomali Park
R95 Rock Leigh
R96 Unknown
Group - R36 Yarrawah Park
R36* Yarrawa Park
R37* Coorimbla Park
R35 Golden Grove
R38* Inverness
R34* Bellview

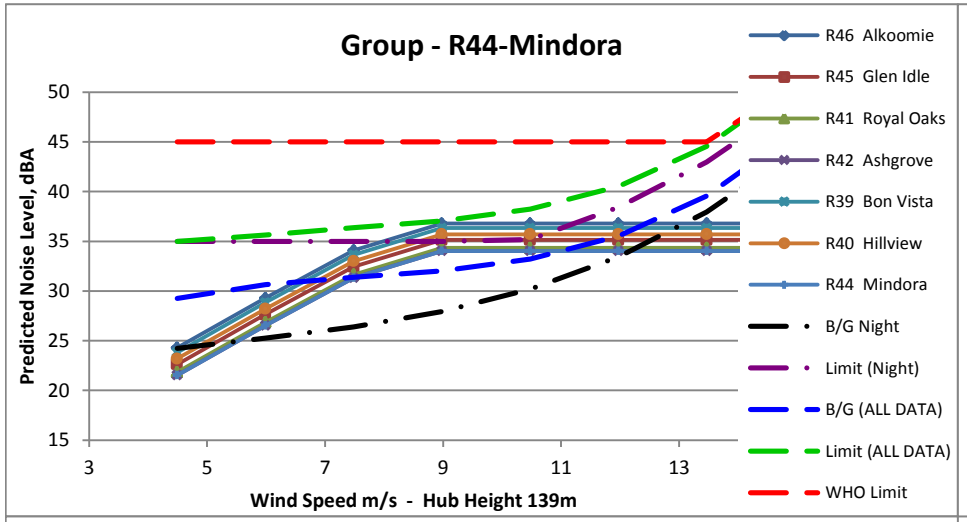

Group - R44-Mindora
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R46 Alkoomie
R45 Glen Idle
R41 Royal Oaks
R42 Ashgrove
R39 Bon Vista
R40 Hillview
R44 Mindora
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

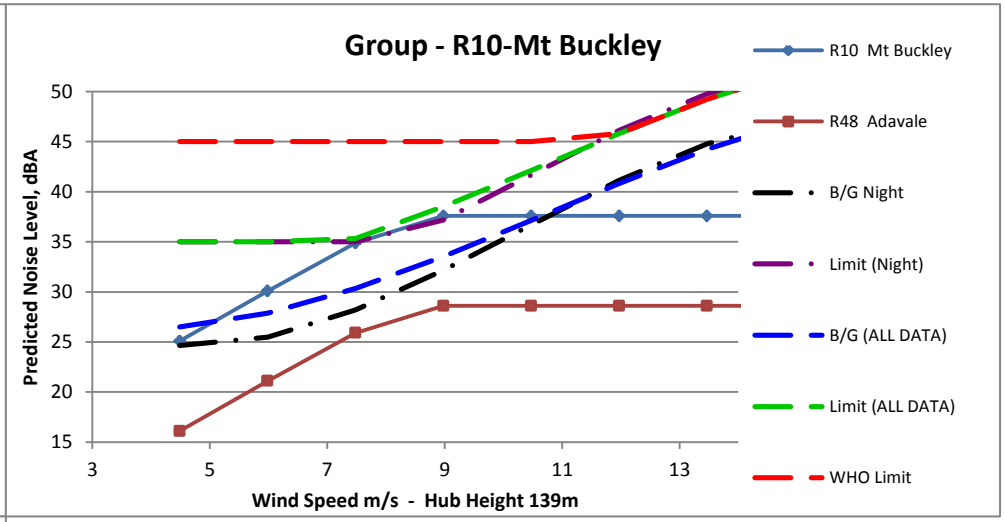

Group - R10-Mt Buckley
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R10 Mt Buckley
R48 Adavale
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

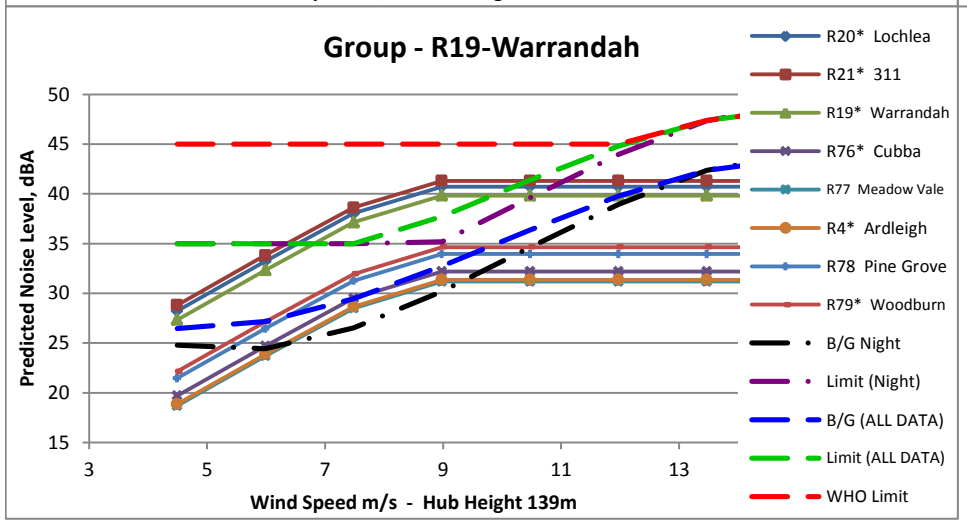

Group - R19-Warrandah
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R20* Lochlea
R21* 311
R19* Warrandah
R76* Cubba
R77 Meadow Vale
R4* Ardleigh
R78 Pine Grove
R79* Woodburn
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

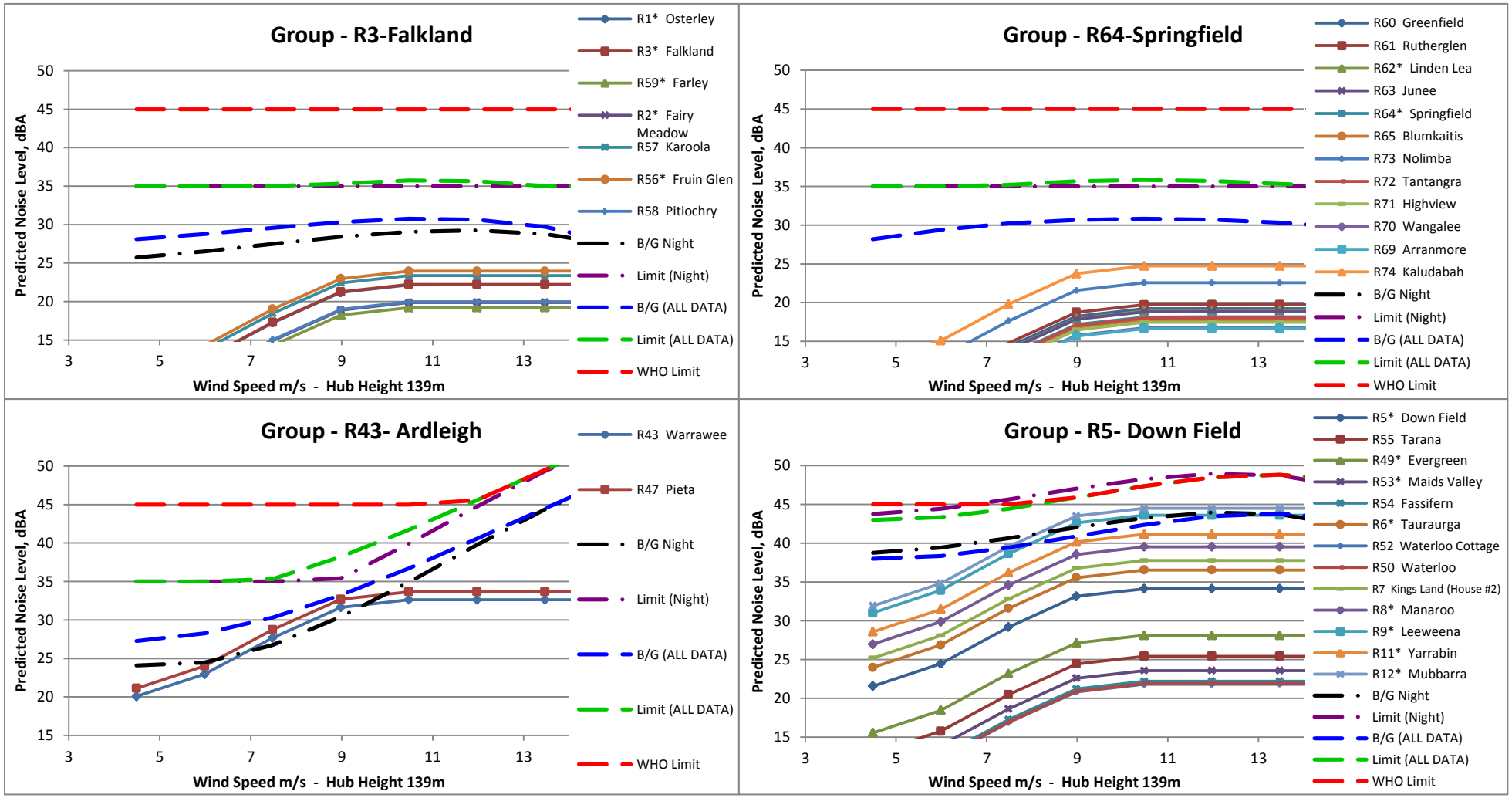

Group - R3-Falkland
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R1* Osterley
R3* Falkland
R59* Farley
R2* Fairy Meadow
R57 Karoola
R56* Fruin Glen
R58 Pitiochry
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R64-Springfield
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R60 Greenfield
R61 Rutherglen
R62* Linden Lea
R63 Junee
R64* Springfield
R65 Blumkaitis
R73 Nolimba
R72 Tantangra
R71 Highview
R70 Wangalee
R69 Arranmore
R74 Kaludabah
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R43- Ardleigh
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R43 Warrawee
R47 Pieta
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R5- Down Field
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R5* Down Field
R55 Tarana
R49* Evergreen
R53* Maids Valley
R54 Fassifern
R6* Tauraurga
R52 Waterloo Cottage
R50 Waterloo
R7 Kings Land (House #2)
R8* Manaroo
R9* Leeweena
R11* Yarrabin
R12* Mubbarra
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

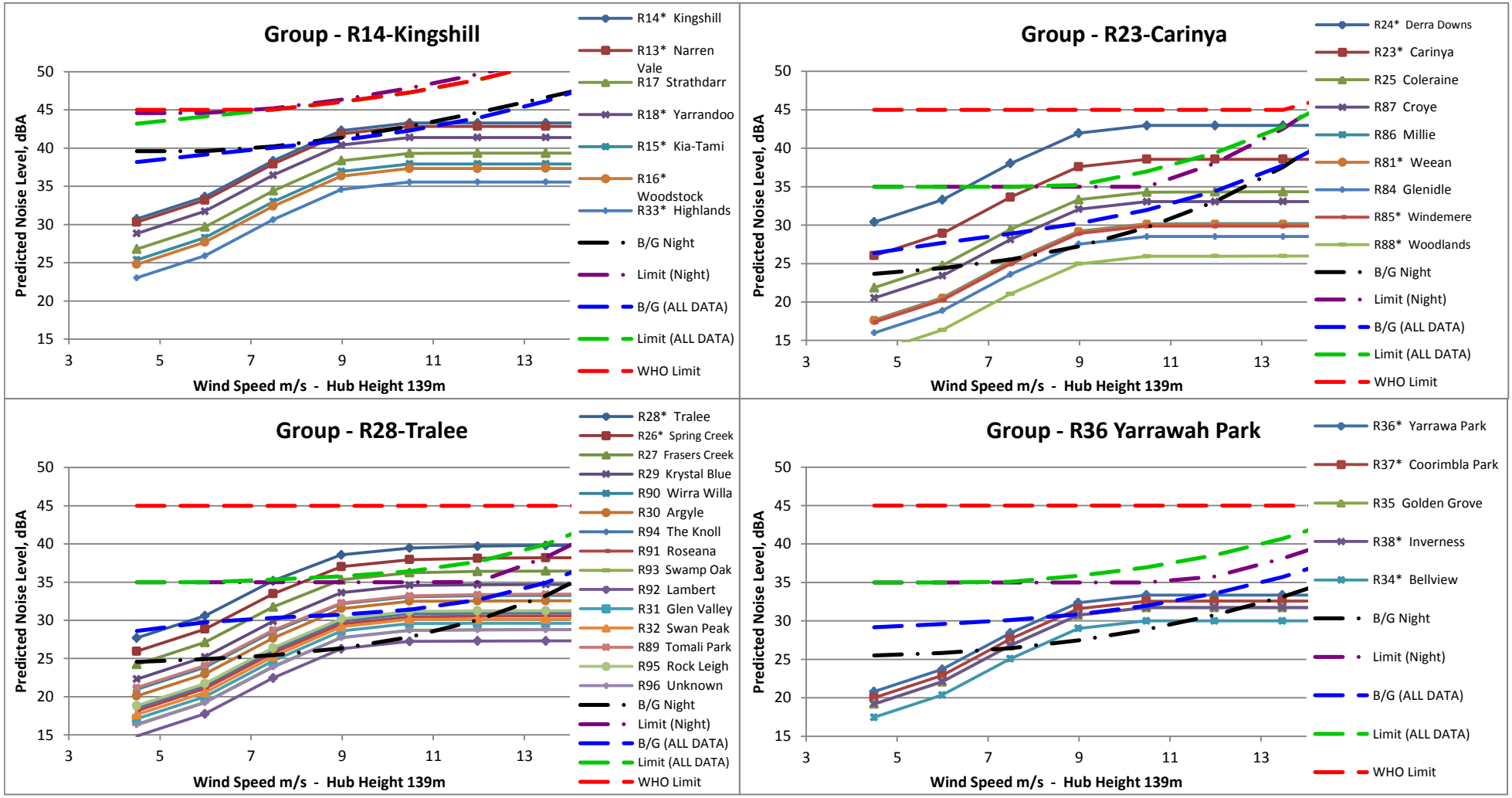

Group - R14-Kingshill
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R14* Kingshill
R13* Narren Vale
R17 Strathdarr
R18* Yarrandoo
R15* Kia-Tami
R16* Woodstock
R33* Highlands
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R23-Carinya
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R24* Derra Downs
R23* Carinya
R25 Coleraine
R87 Croye
R86 Millie
R81* Weean
R84 Glenidle
R85* Windemere
R88* Woodlands
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R28-Tralee
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R28* Tralee
R26* Spring Creek
R27 Frasers Creek
R29 Krystal Blue
R90 Wirra Willa
R30 Argyle
R94 The Knoll
R91 Roseana
R93 Swamp Oak
R92 Lambert
R31 Glen Valley
R32 Swan Peak
R89 Tomali Park
R95 Rock Leigh
R96 Unknown
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R36 Yarrawah Park
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R36* Yarrawa Park
R37* Coorimbla Park
R35 Golden Grove
R38* Inverness
R34* Bellview
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

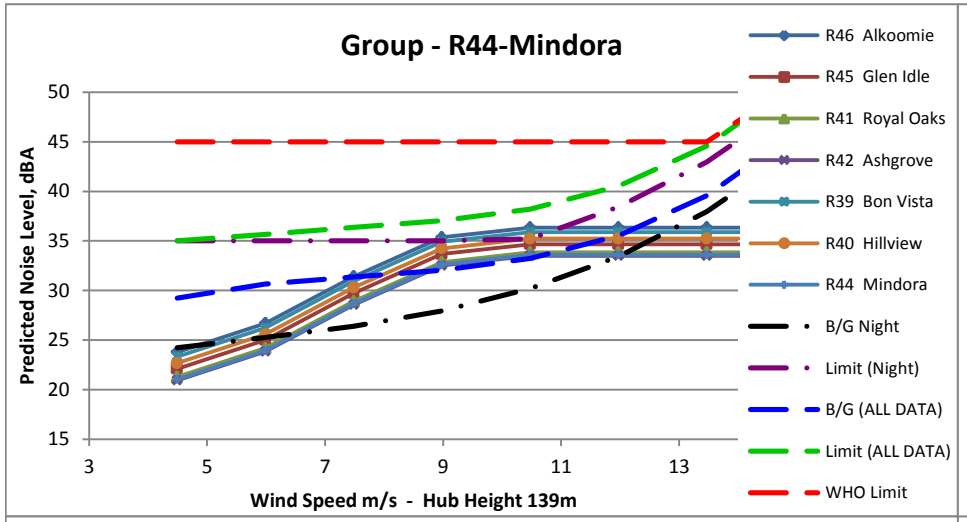

Group - R44-Mindora
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R46 Alkoomie
R45 Glen Idle
R41 Royal Oaks
R42 Ashgrove
R39 Bon Vista
R40 Hillview
R44 Mindora
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

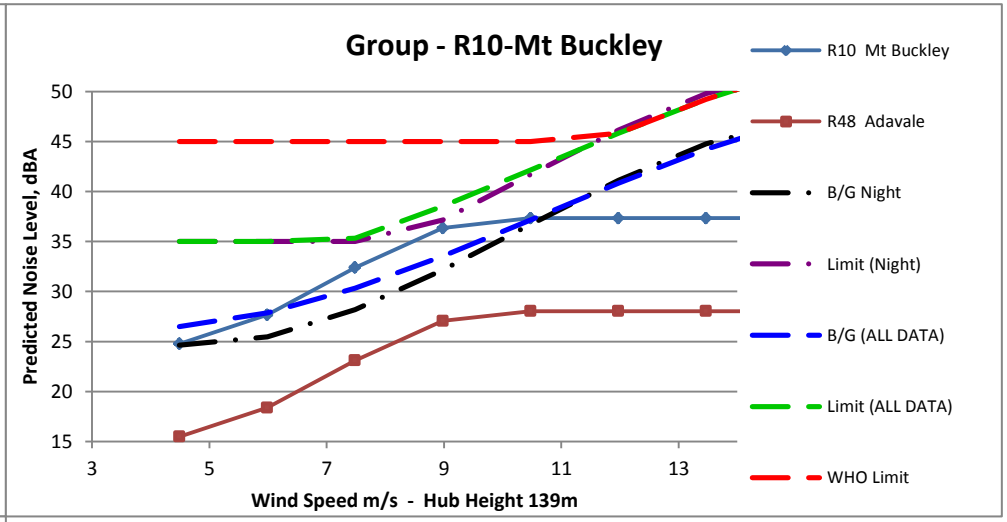

Group - R10-Mt Buckley
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R10 Mt Buckley
R48 Adavale
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

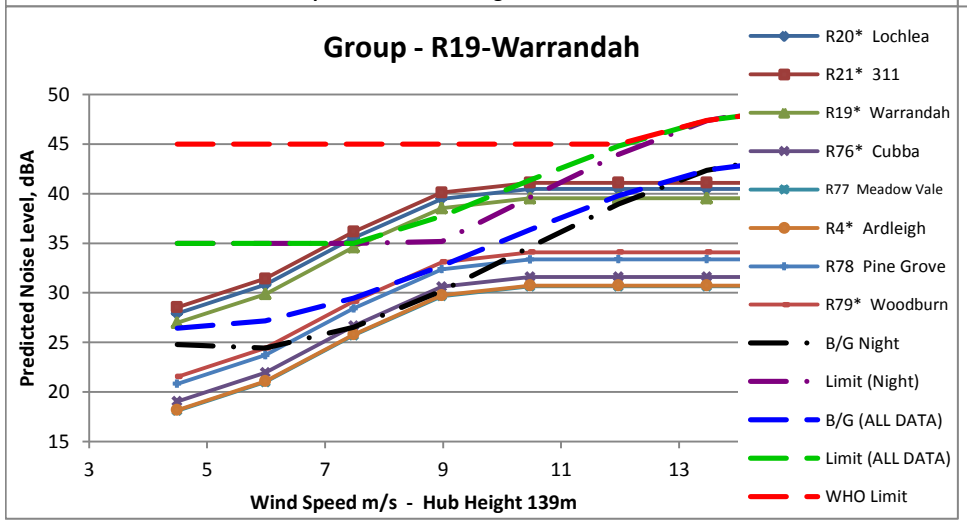

Group - R19-Warrandah
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R20* Lochlea
R21* 311
R19* Warrandah
R76* Cubba
R77 Meadow Vale
R4* Ardleigh
R78 Pine Grove
R79* Woodburn
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit


Group - R3-Falkland
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R1* Osterley
R3* Falkland
R59* Farley
R2* Fairy Meadow
R57 Karoola
R56* Fruin Glen
R58 Pitiochry
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R64-Springfield
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R60 Greenfield
R61 Rutherglen
R62* Linden Lea
R63 Junee
R64* Springfield
R65 Blumkaitis
R73 Nolimba
R72 Tantangra
R71 Highview
R70 Wangalee
R69 Arranmore
R74 Kaludabah
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R43- Ardleigh
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R43 Warrawee
R47 Pieta
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R5- Down Field
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R5* Down Field
R55 Tarana
R49* Evergreen
R53* Maids Valley
R54 Fassifern
R6* Taurarga
R52 Waterloo Cottage
R50 Waterloo
R7 Kings Land (House #2)
R8* Manaroo
R9* Leeweena
R11* Yarrabin
R12* Mubbarra
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

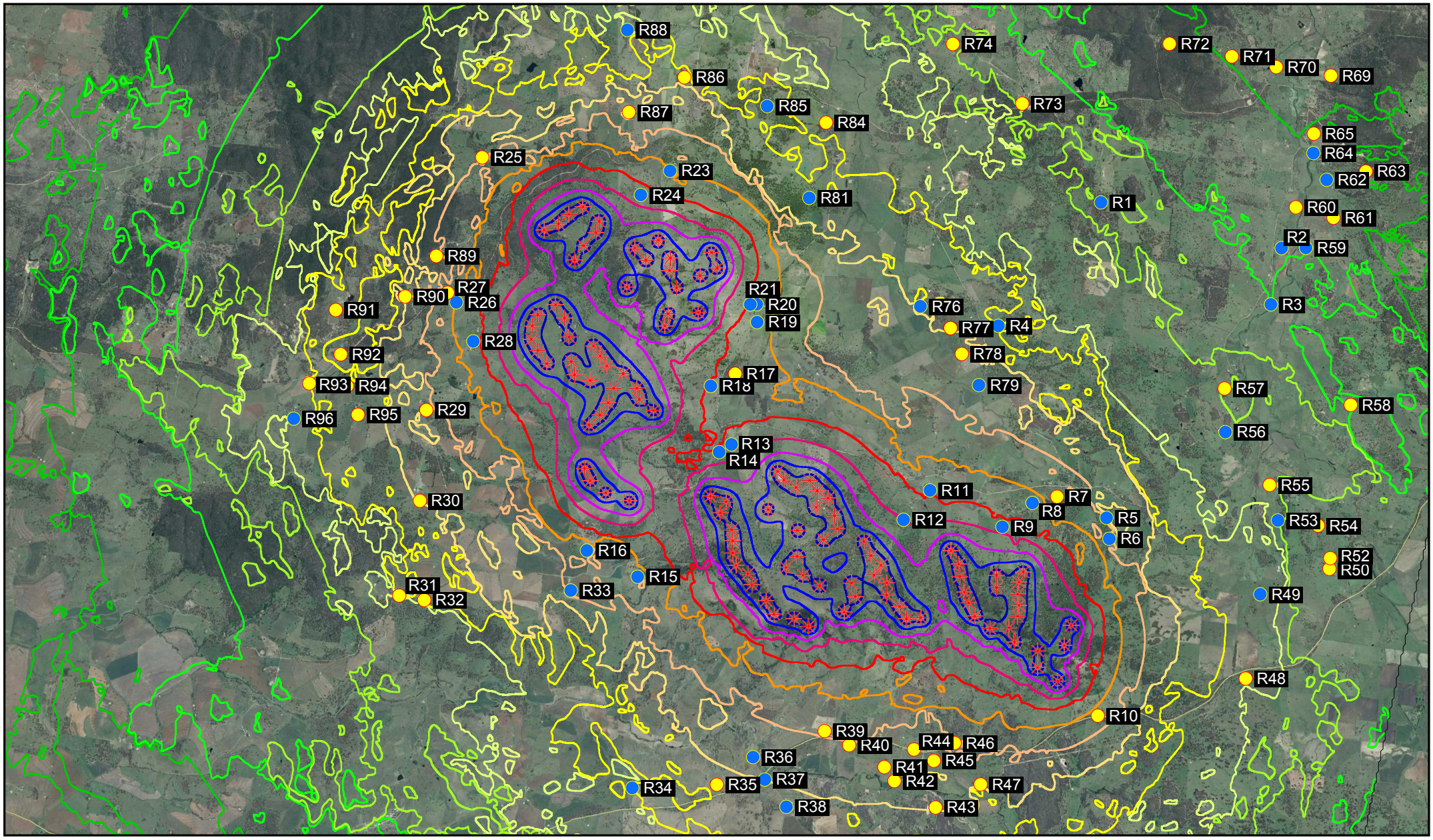

Group - R14-Kingshill
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R14* Kingshill
R13* Narren Vale
R17 Strathdarr
R18* Yarrandoo
R15* Kia-Tami
R16* Woodstock
R33* Highlands
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R23-Carinya
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R24* Derra Downs
R23* Carinya
R25 Coleraine
R87 Croye
R86 Millie
R81* Weean
R84 Glenidle
R85* Windemere
R88* Woodlands
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R28-Tralee
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R28* Tralee
R26* Spring Creek
R27 Frasers Creek
R29 Krystal Blue
R90 Wirra Willa
R30 Argyle
R94 The Knoll
R91 Roseana
R93 Swamp Oak
R92 Lambert
R31 Glen Valley
R32 Swan Peak
R89 Tomali Park
R95 Rock Leigh
R96 Unknown
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit
Group - R36 Yarrawah Park
Predicted Noise Level, dBA
Wind Speed m/s - Hub Height 139m
R36* Yarrawa Park
R37* Coorimbla Park
R35 Golden Grove
R38* Inverness
R34* Bellview
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit


Group - R44-Mindora
Predicted Noise Level, dBA
50
45
40
35
30
25
20
15
3
5
7
9
11
13
Wind Speed m/s - Hub Height 139m
R46 Alkoomie
R45 Glen Idle
R41 Royal Oaks
R42 Ashgrove
R39 Bon Vista
R40 Hillview
R44 Mindora
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit


Group - R10-Mt Buckley
Predicted Noise Level, dBA
50
45
40
35
30
25
20
15
3
5
7
9
11
13
Wind Speed m/s - Hub Height 139m
R10 Mt Buckley
R48 Adavale
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit


Group - R19-Warrandah
Predicted Noise Level, dBA
50
45
40
35
30
25
20
15
3
5
7
9
11
13
Wind Speed m/s - Hub Height 139m
R20* Lochlea
R21* 311
R19* Warrandah
R76* Cubba
R77 Meadow Vale
R4* Ardleigh
R78 Pine Grove
R79* Woodburn
B/G Night
Limit (Night)
B/G (ALL DATA)
Limit (ALL DATA)
WHO Limit

APPENDIX B NOISE CONTOUR MAPS



SLR Consulting Australia

Suite 6, 131 Bulleen Road
Balwyn North
VIC 3104
Australia

SCALE:

Scale 1:80000

0 0.5 1 2 3 km

ORIENTATION:

N

PROJECT NO.	640.11227	
REPORT NO.	640.11227-R1	**PREDICTION ALGORITHM:**
APPENDIX:	B1	ISO 9613-2 1996
PREPARED:	DWW	
DATE	10/02/2016	

CLIENT: **Wind Prospect CWP Pty Ltd**

PROJECT: **Sapphire Wind Farm Revised NIA**

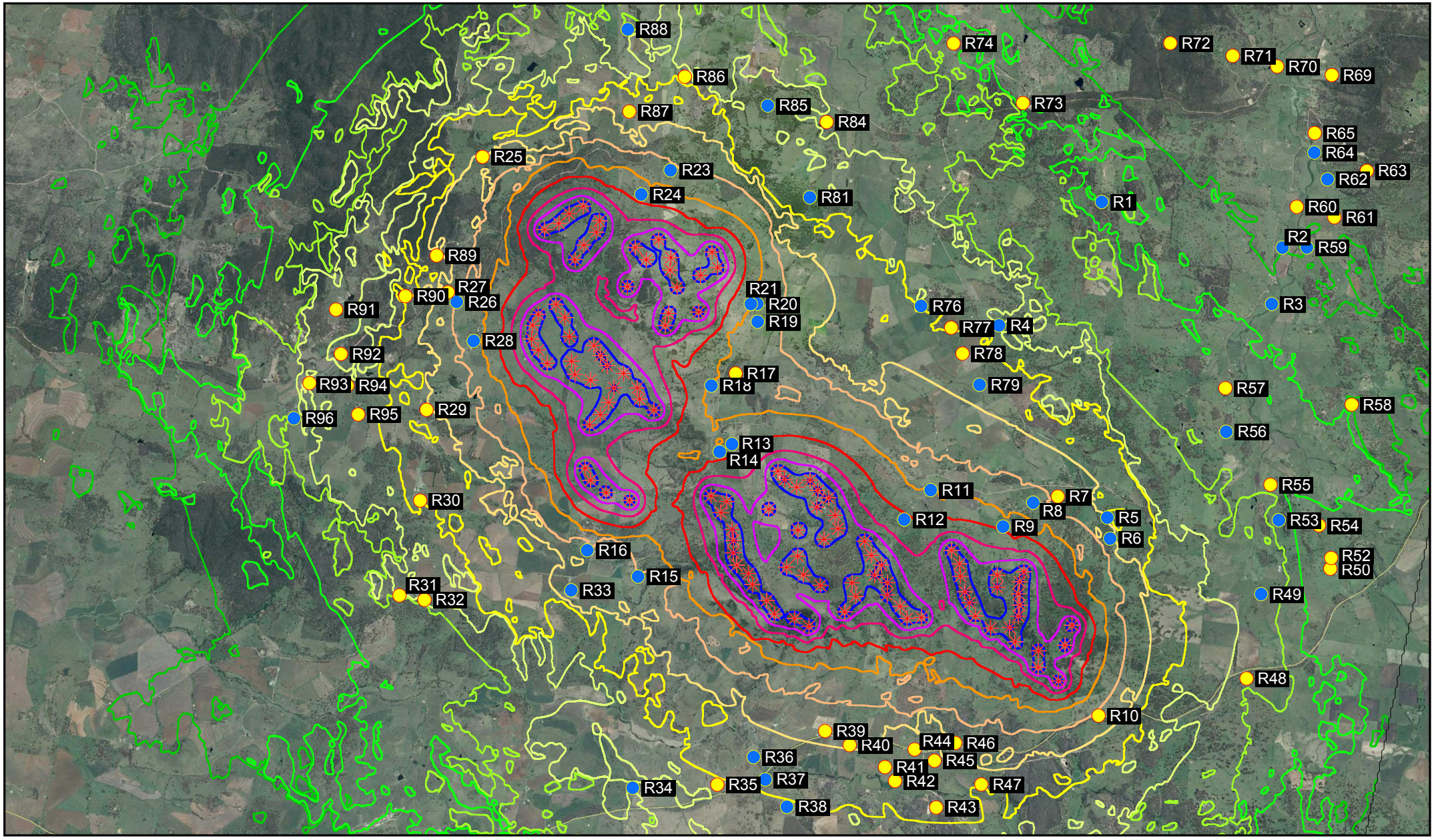
DESCRIPTION: **109 x Vestas V126 Standard 3.3MW Hub Height 139m**

Level: dBA

	<=	20
20 <	<=	23
23 <	<=	26
26 <	<=	29
29 <	<=	32
32 <	<=	35
35 <	<=	38
38 <	<=	41
41 <	<=	44
44 <	<=	47
47 <	<=	50
50 <	<=	53
53 <	<=	56
56 <		

REV NO. : 001

MAP NO. : 001



SLR

SLR Consulting Australia

Suite 6, 131 Bulleen Road
Balwyn North
VIC 3104
Australia

SCALE:

Scale 1:80000

0 0.5 1 2 3 km

ORIENTATION:

N

PROJECT NO.	640.11227	
REPORT NO.	640.11227-R1	**PREDICTION ALGORITHM:**
APPENDIX:	B2	ISO 9613-2 1996
PREPARED:	DWW	
DATE	10/02/2016	

CLIENT:
Wind Prospect CWP Pty Ltd

PROJECT:
Sapphire Wind Farm Revised NIA

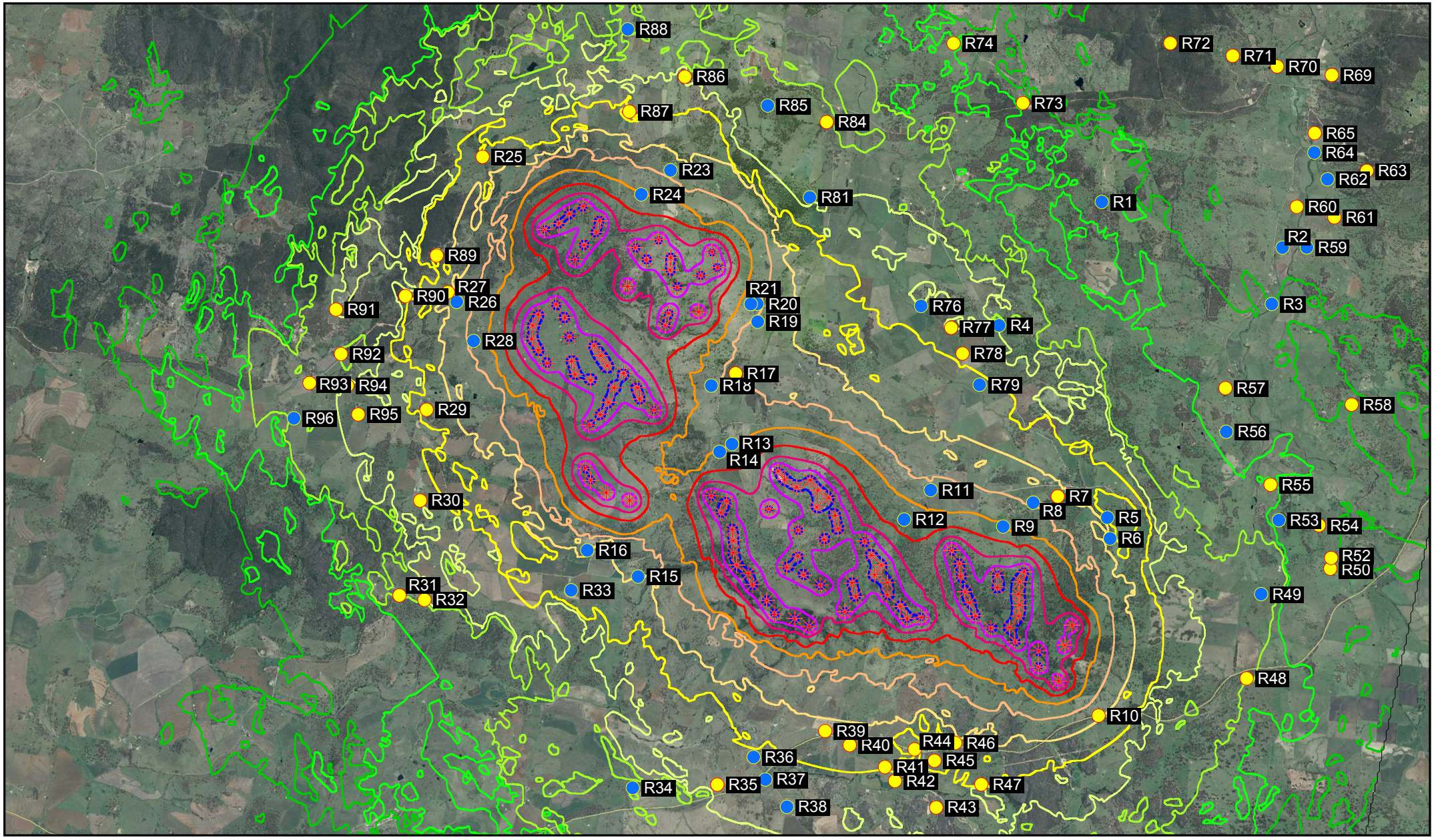
DESCRIPTION:
109 x Vestas V126 Serrated 3.3MW
Hub Height 139m

Level: dBA

	<=	20
20 <	<=	23
23 <	<=	26
26 <	<=	29
29 <	<=	32
32 <	<=	35
35 <	<=	38
38 <	<=	41
41 <	<=	44
44 <	<=	47
47 <	<=	50
50 <	<=	53
53 <	<=	56
56 <		

REV NO. :
001

MAP NO. :
002



SLR

SLR Consulting Australia

Suite 6, 131 Bulleen Road
Balwyn North
VIC 3104
Australia

SCALE:

Scale 1:80000

0 0.5 1 2 3 km

ORIENTATION:

N

PROJECT NO.	640.11227	
REPORT NO.	640.11227-R1	**PREDICTION ALGORITHM:**
APPENDIX:	B3	ISO 9613-2 1996
PREPARED:	DWW	
DATE	10/02/2016	

CLIENT:
Wind Prospect CWP Pty Ltd

PROJECT:
Sapphire Wind Farm Revised NIA

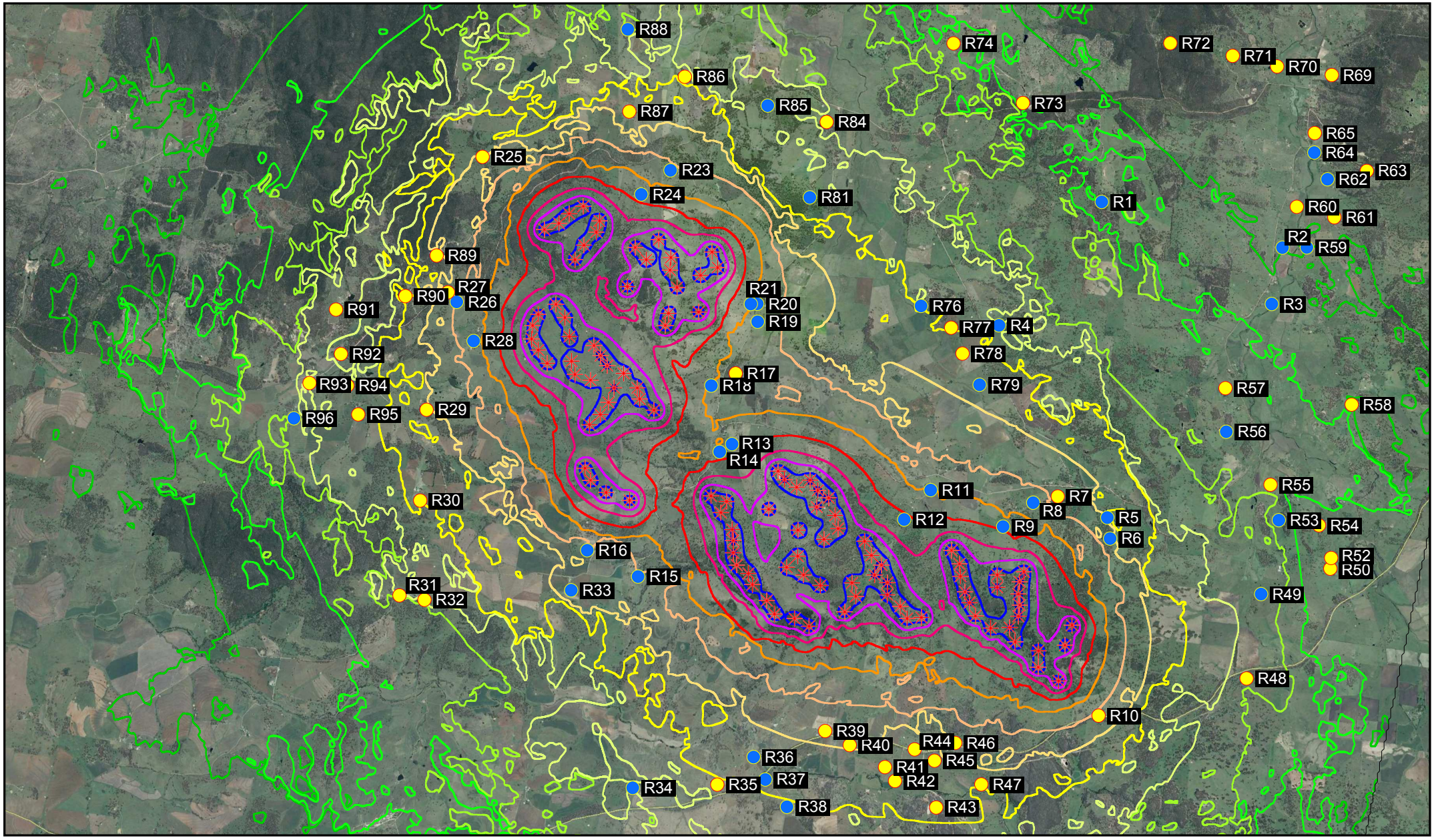
DESCRIPTION:
109 x Senvion M122 3.0MW
Hub Height 139m

Level: dBA

	<=	20
20 <	<=	23
23 <	<=	26
26 <	<=	29
29 <	<=	32
32 <	<=	35
35 <	<=	38
38 <	<=	41
41 <	<=	44
44 <	<=	47
47 <	<=	50
50 <	<=	53
53 <	<=	56
56 <		

REV NO. :
001

MAP NO. :
003



SLR

SLR Consulting Australia

Suite 6, 131 Bulleen Road
Balwyn North
VIC 3104
Australia

SCALE:

Scale 1:80000

0 0.5 1 2 3 km

ORIENTATION:

N

PROJECT NO.	640.11227	
REPORT NO.	640.11227-R1	**PREDICTION ALGORITHM:**
APPENDIX:	B4	ISO 9613-2 1996
PREPARED:	DWW	
DATE	10/02/2016	

CLIENT:

Wind Prospect CWP Pty Ltd

PROJECT:

Sapphire Wind Farm Revised NIA

DESCRIPTION:

109 x GE 137 3.4MW
Hub Height 139m

Level: dBA

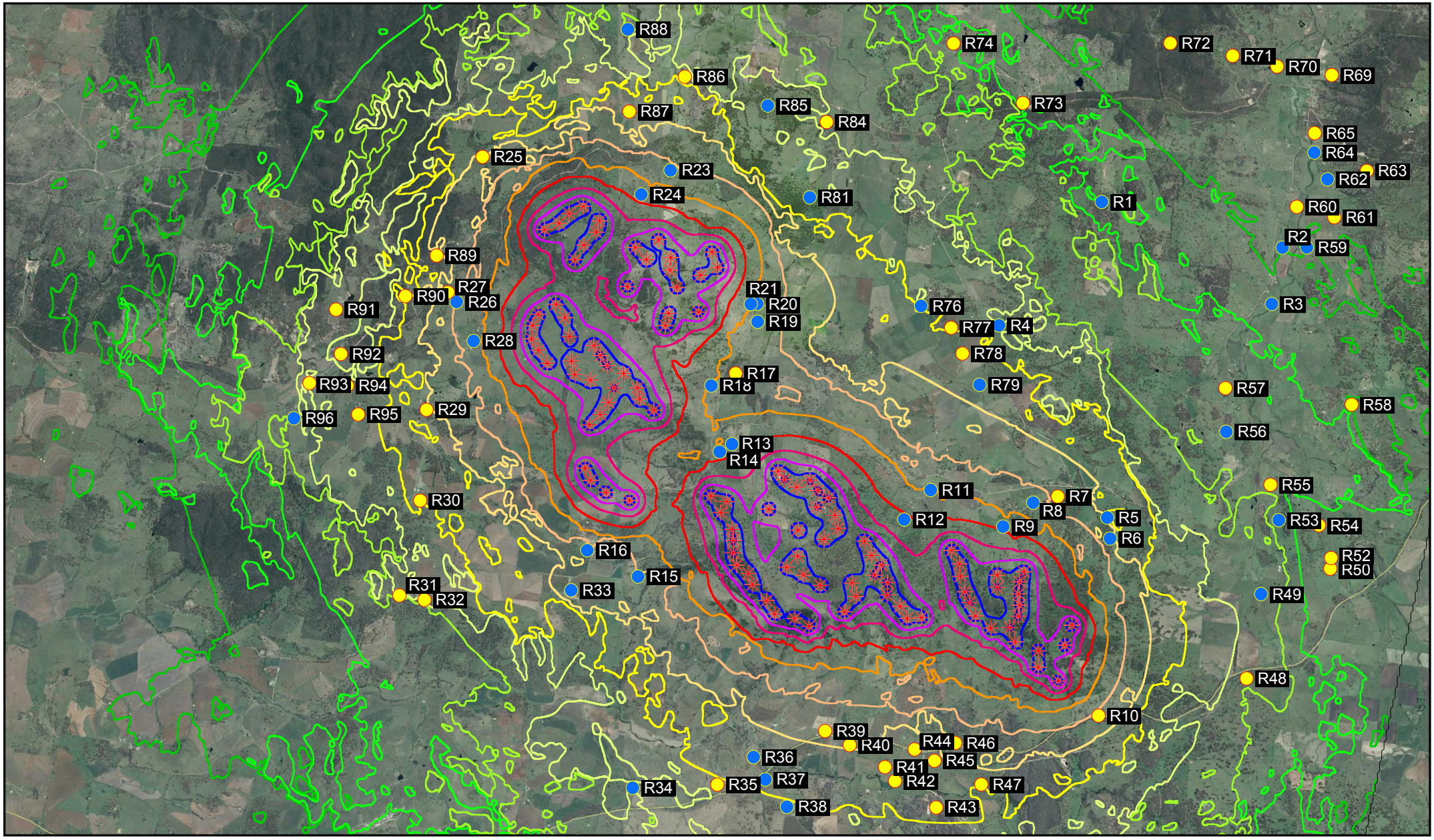
	<=	20
20 <	<=	23
23 <	<=	26
26 <	<=	29
29 <	<=	32
32 <	<=	35
35 <	<=	38
38 <	<=	41
41 <	<=	44
44 <	<=	47
47 <	<=	50
50 <	<=	53
53 <	<=	56
56 <		

REV NO. :

001

MAP NO. :

004



SLR Consulting Australia

Suite 6, 131 Bulleen Road
Balwyn North
VIC 3104
Australia

SCALE:

Scale 1:80000

0 0.5 1 2 3 km

ORIENTATION:

N

PROJECT NO.	640.11227	
REPORT NO.	640.11227-R1	**PREDICTION ALGORITHM:**
APPENDIX:	B5	ISO 9613-2 1996
PREPARED:	DWW	
DATE	10/02/2016	

CLIENT:

Wind Prospect CWP Pty Ltd

PROJECT:

Sapphire Wind Farm Revised NIA

DESCRIPTION:

106 x Vestas V126 Serrated Mode 0 3.3MW
3 x Vestas V126 Serrated Mode 2 3.3MW
Hub Height 139m

Level: dBA

	<=	20
20 <	<=	23
23 <	<=	26
26 <	<=	29
29 <	<=	32
32 <	<=	35
35 <	<=	38
38 <	<=	41
41 <	<=	44
44 <	<=	47
47 <	<=	50
50 <	<=	53
53 <	<=	56
56 <		

REV NO. :

001

MAP NO. :

005

Vestas V126 non-serrated

Wind Speed (m/s) @ 10m AGL	3	4	5	6	7	8	9	10	11	12
Hub Height	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0
SA EPA Criteria										
R3-Falkland Group	35.0	35.0	35.0	35.2	35.7	35.7	35.2	35.0	35.0	35.0
R1* Osterley	11.4	14.5	19.4	24.0	24.7	24.7	24.7	24.7	24.7	24.7
R3* Falkland	11.4	14.6	19.4	24.1	24.8	24.8	24.8	24.8	24.8	24.8
R59* Farley	8.4	11.6	16.4	21.1	21.8	21.8	21.8	21.8	21.8	21.8
R2* Fairy Meadow	9.1	12.2	17.1	21.7	22.4	22.4	22.4	22.4	22.4	22.4
R57 Karoola	12.6	15.7	20.5	25.2	25.9	25.9	25.9	25.9	25.9	25.9
R56* Fruin Glen	13.1	16.3	21.1	25.8	26.5	26.5	26.5	26.5	26.5	26.5
R58 Pitiochry	9.2	12.3	17.1	21.8	22.5	22.5	22.5	22.5	22.5	22.5
SA EPA Criteria										
R64-Springfield Group	35.0	35.0	35.1	35.6	35.8	35.8	35.5	35.0	35.0	35.0
R60 Greenfield	8.5	11.6	16.4	21.1	21.8	21.8	21.8	21.8	21.8	21.8
R61 Rutherglen	9.0	12.1	16.9	21.6	22.3	22.3	22.3	22.3	22.3	22.3
R62* Linden Lea	8.1	11.3	16.1	20.8	21.5	21.5	21.5	21.5	21.5	21.5
R63 Junee	8.1	11.2	16.0	20.7	21.4	21.4	21.4	21.4	21.4	21.4
R64* Springfield	7.4	10.5	15.3	20.0	20.7	20.7	20.7	20.7	20.7	20.7
R65 Blumkaitis	7.1	10.2	15.0	19.7	20.4	20.4	20.4	20.4	20.4	20.4
R73 Nolimba	11.8	14.9	19.7	24.4	25.1	25.1	25.1	25.1	25.1	25.1
R72 Tantangra	7.3	10.4	15.2	19.9	20.6	20.6	20.6	20.6	20.6	20.6
R71 Highview	6.7	9.9	14.7	19.3	20.0	20.0	20.0	20.0	20.0	20.0
R70 Wangalee	6.0	9.2	14.0	18.6	19.3	19.3	19.3	19.3	19.3	19.3
R69 Arranmore	5.9	9.1	13.9	18.5	19.2	19.2	19.2	19.2	19.2	19.2
R74 Kaludabah	13.9	17.1	21.9	26.6	27.3	27.3	27.3	27.3	27.3	27.3
SA EPA Criteria										
R43- Ardleigh Group	35.0	35.0	35.0	37.4	40.7	44.3	48.0	51.8	55.3	58.4
R43 Warrawee	21.8	25.0	29.8	34.4	35.1	35.1	35.1	35.1	35.1	35.1
R47 Pieta	22.9	26.0	30.8	35.5	36.2	36.2	36.2	36.2	36.2	36.2
SA EPA Criteria										
R5- Down Field Group	43.0	43.2	44.2	45.5	47.0	48.2	48.8	48.5	47.0	44.0
R5* Down Field	23.3	26.5	31.3	35.9	36.6	36.6	36.6	36.6	36.6	36.6
R55 Tarana	14.6	17.8	22.6	27.2	27.9	27.9	27.9	27.9	27.9	27.9
R49* Evergreen	17.3	20.5	25.3	29.9	30.6	30.6	30.6	30.6	30.6	30.6
R53* Maids Valley	12.8	15.9	20.7	25.4	26.1	26.1	26.1	26.1	26.1	26.1
R54 Fassifern	11.4	14.6	19.4	24.0	24.7	24.7	24.7	24.7	24.7	24.7
R6* Tauraurga	25.7	28.9	33.7	38.3	39.0	39.0	39.0	39.0	39.0	39.0
R52 Waterloo Cottage	11.0	14.2	19.0	23.6	24.3	24.3	24.3	24.3	24.3	24.3
R50 Waterloo	11.1	14.3	19.1	23.7	24.4	24.4	24.4	24.4	24.4	24.4
R7 Kings Land (House #2)	26.9	30.1	34.9	39.6	40.3	40.3	40.3	40.3	40.3	40.3
R8* Manaroo	28.7	31.9	36.7	41.3	42.0	42.0	42.0	42.0	42.0	42.0
R9* Leeweena	32.8	35.9	40.7	45.4	46.1	46.1	46.1	46.1	46.1	46.1
R11* Yarrabin	30.3	33.5	38.3	42.9	43.6	43.6	43.6	43.6	43.6	43.6
R12* Mubbarra	33.7	36.8	41.6	46.3	47.0	47.0	47.0	47.0	47.0	47.0
SA EPA Criteria										
R14-Kingshill Group	43.1	44.0	44.9	45.8	46.9	48.3	50.3	52.8	56.1	60.3
R14* Kingshill	33.3	38.3	43.1	45.8	45.8	45.8	45.8	45.8	45.8	45.8
R13* Narren Vale	32.9	37.9	42.7	45.4	45.4	45.4	45.4	45.4	45.4	45.4
R17 Strathdarr	29.3	34.3	39.1	41.8	41.8	41.8	41.8	41.8	41.8	41.8
R18* Yarrandoo	31.4	36.4	41.2	43.9	43.9	43.9	43.9	43.9	43.9	43.9
R15* Kia-Tami	27.9	32.9	37.7	40.4	40.4	40.4	40.4	40.4	40.4	40.4
R16* Woodstock	27.4	32.4	37.2	39.9	39.9	39.9	39.9	39.9	39.9	39.9
R33* Highlands	25.6	30.6	35.4	38.1	38.1	38.1	38.1	38.1	38.1	38.1
SA EPA Criteria										
R23-Carinya Group	35.0	35.0	35.0	35.0	36.4	38.5	41.4	45.3	50.6	57.3

R24* Derra Downs	33.0	38.0	42.8	45.5	45.5	45.5	45.5	45.5	45.5	45.5
R23* Carinya	28.6	33.6	38.4	41.1	41.1	41.1	41.1	41.1	41.1	41.1
R25 Coleraine	24.5	29.5	34.3	37.0	37.0	37.0	37.0	37.0	37.0	37.0
R87 Croye	23.1	28.1	32.9	35.6	35.6	35.6	35.6	35.6	35.6	35.6
R86 Millie	20.2	25.2	30.0	32.7	32.7	32.7	32.7	32.7	32.7	32.7
R81* Weean	20.1	25.1	29.9	32.6	32.6	32.6	32.6	32.6	32.6	32.6
R84 Glenidle	18.5	23.5	28.3	31.0	31.0	31.0	31.0	31.0	31.0	31.0
R85* Windemere	19.9	24.9	29.7	32.4	32.4	32.4	32.4	32.4	32.4	32.4
R88* Woodlands	16.0	21.0	25.8	28.5	28.5	28.5	28.5	28.5	28.5	28.5
SA EPA Criteria R28-Tralee Group	35.0	35.0	35.2	35.6	36.2	37.2	38.9	41.9	46.2	52.4
R28* Tralee	30.5	35.5	40.3	43.0	43.0	43.0	43.0	43.0	43.0	43.0
R26* Spring Creek	28.7	33.7	38.5	41.2	41.2	41.2	41.2	41.2	41.2	41.2
R27 Frasers Creek	27.0	32.0	36.8	39.5	39.5	39.5	39.5	39.5	39.5	39.5
R29 Krystal Blue	25.0	30.0	34.8	37.5	37.5	37.5	37.5	37.5	37.5	37.5
R90 Wirra Willa	23.7	28.7	33.5	36.2	36.2	36.2	36.2	36.2	36.2	36.2
R30 Argyle	22.7	27.7	32.5	35.2	35.2	35.2	35.2	35.2	35.2	35.2
R94 The Knoll	21.2	26.2	31.0	33.7	33.7	33.7	33.7	33.7	33.7	33.7
R91 Roseana	20.8	25.8	30.6	33.3	33.3	33.3	33.3	33.3	33.3	33.3
R93 Swamp Oak	19.0	24.0	28.8	31.5	31.5	31.5	31.5	31.5	31.5	31.5
R92 Lambert	17.5	22.5	27.3	30.0	30.0	30.0	30.0	30.0	30.0	30.0
R31 Glen Valley	19.7	24.7	29.5	32.2	32.2	32.2	32.2	32.2	32.2	32.2
R32 Swan Peak	20.2	25.2	30.0	32.7	32.7	32.7	32.7	32.7	32.7	32.7
R80* Weean Cottage	19.1	24.1	28.9	31.6	31.6	31.6	31.6	31.6	31.6	31.6
R89 Tomali Park	23.9	28.9	33.7	36.4	36.4	36.4	36.4	36.4	36.4	36.4
R95 Rock Leigh	21.5	26.5	31.3	34.0	34.0	34.0	34.0	34.0	34.0	34.0
R96 Unknown	18.9	23.9	28.7	31.4	31.4	31.4	31.4	31.4	31.4	31.4
SA EPA Criteria R36 Yarrawah Park Group	35.0	35.0	35.0	35.6	36.6	38.0	39.8	42.3	45.4	49.3
R36* Yarrawa Park	23.4	28.4	33.2	35.9	35.9	35.9	35.9	35.9	35.9	35.9
R37* Coorimbla Park	22.6	27.6	32.4	35.1	35.1	35.1	35.1	35.1	35.1	35.1
R35 Golden Grove	21.7	26.7	31.5	34.2	34.2	34.2	34.2	34.2	34.2	34.2
R38* Inverness	21.7	26.7	31.5	34.2	34.2	34.2	34.2	34.2	34.2	34.2
R34* Bellview	20.0	25.0	29.8	32.5	32.5	32.5	32.5	32.5	32.5	32.5
SA EPA Criteria R44-Mindora Group	35.0	35.5	36.3	36.8	37.8	39.6	42.8	47.9	55.5	66.1
R46 Alkoomie	26.4	31.4	36.2	38.9	38.9	38.9	38.9	38.9	38.9	38.9
R45 Glen Idle	24.7	29.7	34.5	37.2	37.2	37.2	37.2	37.2	37.2	37.2
R41 Royal Oaks	23.9	28.9	33.7	36.4	36.4	36.4	36.4	36.4	36.4	36.4
R42 Ashgrove	23.5	28.5	33.3	36.0	36.0	36.0	36.0	36.0	36.0	36.0
R39 Bon Vista	25.9	30.9	35.7	38.4	38.4	38.4	38.4	38.4	38.4	38.4
R40 Hillview	25.2	30.2	35.0	37.7	37.7	37.7	37.7	37.7	37.7	37.7
R44 Mindora	23.6	28.6	33.4	36.1	36.1	36.1	36.1	36.1	36.1	36.1
SA EPA Criteria R10-Mt Buckley Group	35.0	35.0	35.0	37.7	41.1	44.6	48.0	51.0	53.2	54.4
R10 Mt Buckley	27.3	32.3	37.1	39.8	39.8	39.8	39.8	39.8	39.8	39.8
R48 Adavale	18.1	23.1	27.9	30.6	30.6	30.6	30.6	30.6	30.6	30.6
SA EPA Criteria R19-Warrandah Group	35.0	35.0	35.0	36.9	40.3	43.7	46.6	48.3	48.3	46.2
R20* Lochlea	30.5	35.5	40.3	43.0	43.0	43.0	43.0	43.0	43.0	43.0
R21* 311	31.1	36.1	40.9	43.6	43.6	43.6	43.6	43.6	43.6	43.6
R19* Warrandah	29.5	34.5	39.3	42.0	42.0	42.0	42.0	42.0	42.0	42.0
R76* Cubba	21.6	26.6	31.4	34.1	34.1	34.1	34.1	34.1	34.1	34.1
R77 Meadow Vale	20.7	25.7	30.5	33.2	33.2	33.2	33.2	33.2	33.2	33.2
R4* Ardleigh	20.7	25.7	30.5	33.2	33.2	33.2	33.2	33.2	33.2	33.2
R78 Pine Grove	23.4	28.4	33.2	35.9	35.9	35.9	35.9	35.9	35.9	35.9
R79* Woodburn	24.1	29.1	33.9	36.6	36.6	36.6	36.6	36.6	36.6	36.6

Vestas V126 serrated - Mode 0

Wind Speed (m/s) @ 10m AGL	3	4	5	6	7	8	9	10	11	12
Hub Height	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0
SA EPA Criteria										
R3-Falkland Group	35.0	35.0	35.0	35.2	35.7	35.7	35.2	35.0	35.0	35.0
R1* Osterley	9.6	12.5	17.3	21.2	22.2	22.2	22.2	22.2	22.2	22.2
R3* Falkland	9.7	12.6	17.3	21.3	22.2	22.2	22.2	22.2	22.2	22.2
R59* Farley	6.7	9.6	14.3	18.2	19.2	19.2	19.2	19.2	19.2	19.2
R2* Fairy Meadow	7.3	10.2	14.9	18.9	19.9	19.9	19.9	19.9	19.9	19.9
R57 Karoola	10.8	13.7	18.4	22.4	23.4	23.4	23.4	23.4	23.4	23.4
R56* Fruin Glen	11.4	14.3	19.0	23.0	24.0	24.0	24.0	24.0	24.0	24.0
R58 Pitiochry	7.4	10.3	15.0	19.0	20.0	20.0	20.0	20.0	20.0	20.0
SA EPA Criteria										
R64-Springfield Group	35.0	35.0	35.1	35.6	35.8	35.8	35.5	35.0	35.0	35.0
R60 Greenfield	6.7	9.6	14.3	18.3	19.2	19.2	19.2	19.2	19.2	19.2
R61 Rutherglen	7.2	10.1	14.8	18.8	19.7	19.7	19.7	19.7	19.7	19.7
R62* Linden Lea	6.4	9.3	14.0	17.9	18.9	18.9	18.9	18.9	18.9	18.9
R63 Junee	6.3	9.2	13.9	17.8	18.8	18.8	18.8	18.8	18.8	18.8
R64* Springfield	5.6	8.5	13.2	17.2	18.2	18.2	18.2	18.2	18.2	18.2
R65 Blumkaitis	5.3	8.2	12.9	16.8	17.8	17.8	17.8	17.8	17.8	17.8
R73 Nolimba	10.0	12.9	17.6	21.6	22.6	22.6	22.6	22.6	22.6	22.6
R72 Tantangra	5.5	8.4	13.1	17.1	18.1	18.1	18.1	18.1	18.1	18.1
R71 Highview	4.9	7.8	12.6	16.5	17.5	17.5	17.5	17.5	17.5	17.5
R70 Wangalee	4.2	7.1	11.8	15.8	16.8	16.8	16.8	16.8	16.8	16.8
R69 Arranmore	4.1	7.0	11.7	15.7	16.7	16.7	16.7	16.7	16.7	16.7
R74 Kaludabah	12.2	15.1	19.8	23.8	24.8	24.8	24.8	24.8	24.8	24.8
SA EPA Criteria										
R43- Ardleigh Group	35.0	35.0	35.0	37.4	40.7	44.3	48.0	51.8	55.3	58.4
R43 Warrawee	20.1	23.0	27.7	31.6	32.6	32.6	32.6	32.6	32.6	32.6
R47 Pieta	21.1	24.0	28.7	32.7	33.7	33.7	33.7	33.7	33.7	33.7
SA EPA Criteria										
R5- Down Field Group	43.0	43.2	44.2	45.5	47.0	48.2	48.8	48.5	47.0	44.0
R5* Down Field	21.6	24.5	29.2	33.1	34.1	34.1	34.1	34.1	34.1	34.1
R55 Tarana	12.9	15.8	20.5	24.4	25.4	25.4	25.4	25.4	25.4	25.4
R49* Evergreen	15.6	18.5	23.2	27.1	28.1	28.1	28.1	28.1	28.1	28.1
R53* Maids Valley	11.0	13.9	18.6	22.6	23.6	23.6	23.6	23.6	23.6	23.6
R54 Fassifern	9.7	12.5	17.3	21.2	22.2	22.2	22.2	22.2	22.2	22.2
R6* Tauraurga	24.0	26.9	31.6	35.6	36.5	36.5	36.5	36.5	36.5	36.5
R52 Waterloo Cottage	9.3	12.2	16.9	20.8	21.8	21.8	21.8	21.8	21.8	21.8
R50 Waterloo	9.4	12.2	17.0	20.9	21.9	21.9	21.9	21.9	21.9	21.9
R7 Kings Land (House #2)	25.2	28.1	32.8	36.8	37.8	37.8	37.8	37.8	37.8	37.8
R8* Manaroo	27.0	29.9	34.6	38.5	39.5	39.5	39.5	39.5	39.5	39.5
R9* Leeweena	31.0	33.9	38.6	42.6	43.6	43.6	43.6	43.6	43.6	43.6
R11* Yarrabin	28.6	31.5	36.2	40.1	41.1	41.1	41.1	41.1	41.1	41.1
R12* Mubbarra	31.9	34.8	39.5	43.5	44.5	44.5	44.5	44.5	44.5	44.5
SA EPA Criteria										
R14-Kingshill Group	43.1	44.0	44.9	45.8	46.9	48.3	50.3	52.8	56.1	60.3
R14* Kingshill	30.7	33.6	38.3	42.3	43.3	43.3	43.3	43.3	43.3	43.3
R13* Narren Vale	30.3	33.2	37.9	41.9	42.9	42.9	42.9	42.9	42.9	42.9
R17 Strathdarr	26.8	29.7	34.4	38.4	39.3	39.3	39.3	39.3	39.3	39.3
R18* Yarrandoo	28.8	31.7	36.5	40.4	41.4	41.4	41.4	41.4	41.4	41.4
R15* Kia-Tami	25.4	28.3	33.0	36.9	37.9	37.9	37.9	37.9	37.9	37.9
R16* Woodstock	24.8	27.7	32.4	36.4	37.4	37.4	37.4	37.4	37.4	37.4
R33* Highlands	23.0	25.9	30.6	34.6	35.6	35.6	35.6	35.6	35.6	35.6
SA EPA Criteria										
R23-Carinya Group	35.0	35.0	35.0	35.0	36.4	38.5	41.4	45.3	50.6	57.3

R24* Derra Downs	30.4	33.3	38.0	42.0	43.0	43.0	43.0	43.0	43.0	43.0
R23* Carinya	26.0	28.9	33.6	37.6	38.6	38.6	38.6	38.6	38.6	38.6
R25 Coleraine	21.9	24.8	29.5	33.5	34.5	34.5	34.5	34.5	34.5	34.5
R87 Croye	20.5	23.4	28.1	32.1	33.1	33.1	33.1	33.1	33.1	33.1
R86 Millie	17.7	20.6	25.3	29.2	30.2	30.2	30.2	30.2	30.2	30.2
R81* Weean	17.6	20.5	25.2	29.1	30.1	30.1	30.1	30.1	30.1	30.1
R84 Glenidle	16.0	18.9	23.6	27.6	28.5	28.5	28.5	28.5	28.5	28.5
R85* Windemere	17.4	20.3	25.0	28.9	29.9	29.9	29.9	29.9	29.9	29.9
R88* Woodlands	13.5	16.4	21.1	25.1	26.0	26.0	26.0	26.0	26.0	26.0
SA EPA Criteria										
R28-Tralee Group	35.0	35.0	35.2	35.6	36.2	37.2	38.9	41.9	46.2	52.4
R28* Tralee	27.9	30.8	35.6	39.5	40.5	40.5	40.5	40.5	40.5	40.5
R26* Spring Creek	26.1	29.0	33.7	37.7	38.7	38.7	38.7	38.7	38.7	38.7
R27 Frasers Creek	24.4	27.3	32.0	36.0	37.0	37.0	37.0	37.0	37.0	37.0
R29 Krystal Blue	22.4	25.3	30.0	34.0	35.0	35.0	35.0	35.0	35.0	35.0
R90 Wirra Willa	21.1	24.0	28.7	32.7	33.7	33.7	33.7	33.7	33.7	33.7
R30 Argyle	20.1	23.0	27.7	31.7	32.7	32.7	32.7	32.7	32.7	32.7
R94 The Knoll	18.6	21.5	26.2	30.2	31.2	31.2	31.2	31.2	31.2	31.2
R91 Roseana	18.2	21.1	25.9	29.8	30.8	30.8	30.8	30.8	30.8	30.8
R93 Swamp Oak	16.5	19.4	24.1	28.1	29.0	29.0	29.0	29.0	29.0	29.0
R92 Lambert	14.9	17.8	22.5	26.5	27.5	27.5	27.5	27.5	27.5	27.5
R31 Glen Valley	17.1	20.0	24.8	28.7	29.7	29.7	29.7	29.7	29.7	29.7
R32 Swan Peak	17.7	20.6	25.3	29.3	30.2	30.2	30.2	30.2	30.2	30.2
R80* Weean Cottage	17.6	20.5	25.2	29.1	30.1	30.1	30.1	30.1	30.1	30.1
R89 Tomali Park	21.4	24.3	29.0	32.9	33.9	33.9	33.9	33.9	33.9	33.9
R95 Rock Leigh	18.9	21.8	26.5	30.5	31.5	31.5	31.5	31.5	31.5	31.5
R96 Unknown	16.4	19.3	24.0	28.0	28.9	28.9	28.9	28.9	28.9	28.9
SA EPA Criteria										
R36 Yarrawah Park Group	35.0	35.0	35.0	35.6	36.6	38.0	39.8	42.3	45.4	49.3
R36* Yarrawa Park	20.8	23.7	28.4	32.4	33.4	33.4	33.4	33.4	33.4	33.4
R37* Coorimbla Park	20.0	22.9	27.6	31.6	32.6	32.6	32.6	32.6	32.6	32.6
R35 Golden Grove	19.2	22.1	26.8	30.7	31.7	31.7	31.7	31.7	31.7	31.7
R38* Inverness	19.2	22.1	26.8	30.8	31.7	31.7	31.7	31.7	31.7	31.7
R34* Bellview	17.5	20.4	25.1	29.0	30.0	30.0	30.0	30.0	30.0	30.0
SA EPA Criteria										
R44-Mindora Group	35.0	35.5	36.3	36.8	37.8	39.6	42.8	47.9	55.5	66.1
R46 Alkoomie	23.8	26.7	31.4	35.4	36.4	36.4	36.4	36.4	36.4	36.4
R45 Glen Idle	22.1	25.0	29.7	33.7	34.7	34.7	34.7	34.7	34.7	34.7
R41 Royal Oaks	21.3	24.2	28.9	32.9	33.9	33.9	33.9	33.9	33.9	33.9
R42 Ashgrove	21.0	23.8	28.6	32.5	33.5	33.5	33.5	33.5	33.5	33.5
R39 Bon Vista	23.3	26.2	31.0	34.9	35.9	35.9	35.9	35.9	35.9	35.9
R40 Hillview	22.7	25.6	30.3	34.3	35.2	35.2	35.2	35.2	35.2	35.2
R44 Mindora	21.0	23.9	28.7	32.6	33.6	33.6	33.6	33.6	33.6	33.6
SA EPA Criteria										
R10-Mt Buckley Group	35.0	35.0	35.0	37.7	41.1	44.6	48.0	51.0	53.2	54.4
R10 Mt Buckley	24.8	27.7	32.4	36.4	37.3	37.3	37.3	37.3	37.3	37.3
R48 Adavale	15.5	18.4	23.1	27.1	28.0	28.0	28.0	28.0	28.0	28.0
SA EPA Criteria										
R19-Warrandah Group	35.0	35.0	35.0	36.9	40.3	43.7	46.6	48.3	48.3	46.2
R20* Lochlea	27.9	30.8	35.5	39.5	40.5	40.5	40.5	40.5	40.5	40.5
R21* 311	28.5	31.4	36.2	40.1	41.1	41.1	41.1	41.1	41.1	41.1
R19* Warrandah	27.0	29.9	34.6	38.5	39.5	39.5	39.5	39.5	39.5	39.5
R76* Cubba	19.1	21.9	26.7	30.6	31.6	31.6	31.6	31.6	31.6	31.6
R77 Meadow Vale	18.1	21.0	25.7	29.7	30.7	30.7	30.7	30.7	30.7	30.7
R4* Ardleigh	18.2	21.1	25.8	29.8	30.7	30.7	30.7	30.7	30.7	30.7
R78 Pine Grove	20.8	23.7	28.4	32.4	33.4	33.4	33.4	33.4	33.4	33.4
R79* Woodburn	21.5	24.4	29.1	33.1	34.1	34.1	34.1	34.1	34.1	34.1

Senvion M122

Wind Speed (m/s) @ 10m AGL Hub Height	3 4.5	4 6.0	5 7.5	6 9.0	7 10.5	8 12.0	9 13.5	10 15.0	11 16.5	12 18.0
SA EPA Criteria R3-Falkland Group	35.0	35.0	35.0	35.2	35.7	35.7	35.2	35.0	35.0	35.0
R1* Osterley		16.7	20.0	21.4	21.3	20.8	20.7	20.7		
R3* Falkland		16.7	20.0	21.4	21.3	20.8	20.7	20.7		
R59* Farley		13.8	17.1	18.5	18.4	17.9	17.8	17.8		
R2* Fairy Meadow		14.5	17.8	19.2	19.1	18.6	18.5	18.5		
R57 Karoola		17.8	21.1	22.5	22.4	21.9	21.8	21.8		
R56* Fruin Glen		18.3	21.6	23.0	22.9	22.4	22.3	22.3		
R58 Pitiochry		14.5	17.8	19.2	19.1	18.6	18.5	18.5		
SA EPA Criteria R64-Springfield Group	35.0	35.0	35.1	35.6	35.8	35.8	35.5	35.0	35.0	35.0
R60 Greenfield		13.9	17.2	18.6	18.5	18.0	17.9	17.9		
R61 Rutherglen		14.3	17.6	19.0	18.9	18.4	18.3	18.3		
R62* Linden Lea		13.6	16.9	18.3	18.2	17.7	17.6	17.6		
R63 Junee		13.5	16.8	18.2	18.1	17.6	17.5	17.5		
R64* Springfield		12.8	16.1	17.5	17.4	16.9	16.8	16.8		
R65 Blumkaitis		12.5	15.8	17.2	17.1	16.6	16.5	16.5		
R73 Nolimba		17.1	20.4	21.8	21.7	21.2	21.1	21.1		
R72 Tantangra		12.7	16.0	17.4	17.3	16.8	16.7	16.7		
R71 Highview		12.2	15.5	16.9	16.8	16.3	16.2	16.2		
R70 Wangalee		11.5	14.8	16.2	16.1	15.6	15.5	15.5		
R69 Arranmore		11.4	14.7	16.1	16.0	15.5	15.4	15.4		
R74 Kaludabah		19.2	22.5	23.9	23.8	23.3	23.2	23.2		
SA EPA Criteria R43- Ardleigh Group	35.0	35.0	35.0	37.4	40.7	44.3	48.0	51.8	55.3	58.4
R43 Warrawee		26.8	30.1	31.5	31.4	30.9	30.8	30.8		
R47 Pieta		27.8	31.1	32.5	32.4	31.9	31.8	31.8		
SA EPA Criteria R5- Down Field Group	43.0	43.2	44.2	45.5	47.0	48.2	48.8	48.5	47.0	44.0
R5* Down Field		28.2	31.5	32.9	32.8	32.3	32.2	32.2		
R55 Tarana		19.7	23.0	24.4	24.3	23.8	23.7	23.7		
R49* Evergreen		22.4	25.7	27.1	27.0	26.5	26.4	26.4		
R53* Maids Valley		17.9	21.2	22.6	22.5	22.0	21.9	21.9		
R54 Fassifern		16.6	19.9	21.3	21.2	20.7	20.6	20.6		
R6* Tauraurga		30.7	34.0	35.4	35.3	34.8	34.7	34.7		
R52 Waterloo Cottage		16.3	19.6	21.0	20.9	20.4	20.3	20.3		
R50 Waterloo		16.3	19.6	21.0	20.9	20.4	20.3	20.3		
R7 Kings Land (House #2)		31.9	35.2	36.6	36.5	36.0	35.9	35.9		
R8* Manaroo		33.6	36.9	38.3	38.2	37.7	37.6	37.6		
R9* Leeweena		37.7	41.0	42.4	42.3	41.8	41.7	41.7		
R11* Yarrabin		35.2	38.5	39.9	39.8	39.3	39.2	39.2		
R12* Mubbarra		38.6	41.9	43.3	43.2	42.7	42.6	42.6		
SA EPA Criteria R14-Kingshill Group	43.1	44.0	44.9	45.8	46.9	48.3	50.3	52.8	56.1	60.3
R14* Kingshill		37.4	40.7	42.1	42.0	41.5	41.4	41.4		
R13* Narren Vale		37.0	40.3	41.7	41.6	41.1	41.0	41.0		
R17 Strathdarr		33.5	36.8	38.2	38.1	37.6	37.5	37.5		
R18* Yarrandoo		35.5	38.8	40.2	40.1	39.6	39.5	39.5		
R15* Kia-Tami		32.0	35.3	36.7	36.6	36.1	36.0	36.0		
R16* Woodstock		31.5	34.8	36.2	36.1	35.6	35.5	35.5		
R33* Highlands		29.7	33.0	34.4	34.3	33.8	33.7	33.7		
SA EPA Criteria R23-Carinya Group	35.0	35.0	35.0	35.0	36.4	38.5	41.4	45.3	50.6	57.3

R24* Derra Downs		37.1	40.4	41.8	41.7	41.2	41.1	41.1		
R23* Carinya		32.6	35.9	37.3	37.2	36.7	36.6	36.6		
R25 Coleraine		28.5	31.8	33.2	33.1	32.6	32.5	32.5		
R87 Croye		27.2	30.5	31.9	31.8	31.3	31.2	31.2		
R86 Millie		24.3	27.6	29.0	28.9	28.4	28.3	28.3		
R81* Weean		24.3	27.6	29.0	28.9	28.4	28.3	28.3		
R84 Glenidle		22.7	26.0	27.4	27.3	26.8	26.7	26.7		
R85* Windemere		24.1	27.4	28.8	28.7	28.2	28.1	28.1		
R88* Woodlands		20.3	23.6	25.0	24.9	24.4	24.3	24.3		
SA EPA Criteria										
R28-Tralee Group	35.0	35.0	35.2	35.6	36.2	37.2	38.9	41.9	46.2	52.4
R28* Tralee		34.6	37.9	39.3	39.2	38.7	38.6	38.6		
R26* Spring Creek		32.8	36.1	37.5	37.4	36.9	36.8	36.8		
R27 Frasers Creek		31.0	34.3	35.7	35.6	35.1	35.0	35.0		
R29 Krystal Blue		29.1	32.4	33.8	33.7	33.2	33.1	33.1		
R90 Wirra Willa		27.8	31.1	32.5	32.4	31.9	31.8	31.8		
R30 Argyle		26.9	30.2	31.6	31.5	31.0	30.9	30.9		
R94 The Knoll		25.4	28.7	30.1	30.0	29.5	29.4	29.4		
R91 Roseana		25.0	28.3	29.7	29.6	29.1	29.0	29.0		
R93 Swamp Oak		23.3	26.6	28.0	27.9	27.4	27.3	27.3		
R92 Lambert		21.7	25.0	26.4	26.3	25.8	25.7	25.7		
R31 Glen Valley		24.0	27.3	28.7	28.6	28.1	28.0	28.0		
R32 Swan Peak		24.5	27.8	29.2	29.1	28.6	28.5	28.5		
R80* Weean Cottage		23.4	26.7	28.1	28.0	27.5	27.4	27.4		
R89 Tomali Park		28.0	31.3	32.7	32.6	32.1	32.0	32.0		
R95 Rock Leigh		25.7	29.0	30.4	30.3	29.8	29.7	29.7		
R96 Unknown		27.3	30.6	32.0	31.9	31.4	31.3	31.3		
SA EPA Criteria										
R36 Yarrawah Park Group	35.0	35.0	35.0	35.6	36.6	38.0	39.8	42.3	45.4	49.3
R36* Yarrawa Park		27.5	30.8	32.2	32.1	31.6	31.5	31.5		
R37* Coorimbla Park		26.8	30.1	31.5	31.4	30.9	30.8	30.8		
R35 Golden Grove		25.9	29.2	30.6	30.5	30.0	29.9	29.9		
R38* Inverness		26.0	29.3	30.7	30.6	30.1	30.0	30.0		
R34* Bellview		24.3	27.6	29.0	28.9	28.4	28.3	28.3		
SA EPA Criteria										
R44-Mindora Group	35.0	35.5	36.3	36.8	37.8	39.6	42.8	47.9	55.5	66.1
R46 Alkoomie		30.5	33.8	35.2	35.1	34.6	34.5	34.5		
R45 Glen Idle		28.8	32.1	33.5	33.4	32.9	32.8	32.8		
R41 Royal Oaks		28.0	31.3	32.7	32.6	32.1	32.0	32.0		
R42 Ashgrove		27.7	31.0	32.4	32.3	31.8	31.7	31.7		
R39 Bon Vista		30.0	33.3	34.7	34.6	34.1	34.0	34.0		
R40 Hillview		29.4	32.7	34.1	34.0	33.5	33.4	33.4		
R44 Mindora		27.7	31.0	32.4	32.3	31.8	31.7	31.7		
SA EPA Criteria										
R10-Mt Buckley Group	35.0	35.0	35.0	37.7	41.1	44.6	48.0	51.0	53.2	54.4
R10 Mt Buckley		31.4	34.7	36.1	36.0	35.5	35.4	35.4		
R48 Adavale		22.3	25.6	27.0	26.9	26.4	26.3	26.3		
SA EPA Criteria										
R19-Warrandah Group	35.0	35.0	35.0	36.9	40.3	43.7	46.6	48.3	48.3	46.2
R20* Lochlea		34.6	37.9	39.3	39.2	38.7	38.6	38.6		
R21* 311		35.2	38.5	39.9	39.8	39.3	39.2	39.2		
R19* Warrandah		33.6	36.9	38.3	38.2	37.7	37.6	37.6		
R76* Cubba		25.8	29.1	30.5	30.4	29.9	29.8	29.8		
R77 Meadow Vale		24.9	28.2	29.6	29.5	29.0	28.9	28.9		
R4* Ardleigh		25.0	28.3	29.7	29.6	29.1	29.0	29.0		
R78 Pine Grove		27.6	30.9	32.3	32.2	31.7	31.6	31.6		
R79* Woodburn		28.3	31.6	33.0	32.9	32.4	32.3	32.3		

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Wind Speed (m/s) @ 10m AGL	3	4	5	6	7	8	9	10	11	12
Hub Height	**4.5**	**6.0**	**7.5**	**9.0**	**10.5**	**12.0**	**13.5**	**15.0**	**16.5**	**18.0**
SA EPA Criteria										
R3-Falkland Group	35.0	35.0	35.0	35.2	35.7	35.7	35.2	35.0	35.0	35.0
R1* Osterley	10.4	15.4	20.2	22.9	22.9	22.9	22.9	22.9	22.9	22.9
R3* Falkland	10.4	15.4	20.2	22.9	22.9	22.9	22.9	22.9	22.9	22.9
R59* Farley	7.4	12.4	17.2	19.9	19.9	19.9	19.9	19.9	19.9	19.9
R2* Fairy Meadow	8.1	13.1	17.9	20.6	20.6	20.6	20.6	20.6	20.6	20.6
R57 Karoola	11.6	16.6	21.4	24.1	24.1	24.1	24.1	24.1	24.1	24.1
R56* Fruin Glen	12.1	17.1	21.9	24.6	24.6	24.6	24.6	24.6	24.6	24.6
R58 Pitiochry	8.2	13.2	18.0	20.7	20.7	20.7	20.7	20.7	20.7	20.7
SA EPA Criteria										
R64-Springfield Group	35.0	35.0	35.1	35.6	35.8	35.8	35.5	35.0	35.0	35.0
R60 Greenfield	7.4	12.4	17.2	19.9	19.9	19.9	19.9	19.9	19.9	19.9
R61 Rutherglen	7.9	12.9	17.7	20.4	20.4	20.4	20.4	20.4	20.4	20.4
R62* Linden Lea	7.1	12.1	16.9	19.6	19.6	19.6	19.6	19.6	19.6	19.6
R63 Junee	7.0	12.0	16.8	19.5	19.5	19.5	19.5	19.5	19.5	19.5
R64* Springfield	6.3	11.3	16.1	18.8	18.8	18.8	18.8	18.8	18.8	18.8
R65 Blumkaitis	6.0	11.0	15.8	18.5	18.5	18.5	18.5	18.5	18.5	18.5
R73 Nolimba	10.8	15.8	20.6	23.3	23.3	23.3	23.3	23.3	23.3	23.3
R72 Tantangra	6.2	11.2	16.0	18.7	18.7	18.7	18.7	18.7	18.7	18.7
R71 Highview	5.7	10.7	15.5	18.2	18.2	18.2	18.2	18.2	18.2	18.2
R70 Wangalee	5.0	10.0	14.8	17.5	17.5	17.5	17.5	17.5	17.5	17.5
R69 Arranmore	4.8	9.8	14.6	17.3	17.3	17.3	17.3	17.3	17.3	17.3
R74 Kaludabah	12.9	17.9	22.7	25.4	25.4	25.4	25.4	25.4	25.4	25.4
SA EPA Criteria										
R43- Ardleigh Group	35.0	35.0	35.0	37.4	40.7	44.3	48.0	51.8	55.3	58.4
R43 Warrawee	20.7	25.7	30.5	33.2	33.2	33.2	33.2	33.2	33.2	33.2
R47 Pieta	21.7	26.7	31.5	34.2	34.2	34.2	34.2	34.2	34.2	34.2
SA EPA Criteria										
R5- Down Field Group	43.0	43.2	44.2	45.5	47.0	48.2	48.8	48.5	47.0	44.0
R5* Down Field	21.9	26.9	31.7	34.4	34.4	34.4	34.4	34.4	34.4	34.4
R55 Tarana	13.5	18.5	23.3	26.0	26.0	26.0	26.0	26.0	26.0	26.0
R49* Evergreen	16.2	21.2	26.0	28.7	28.7	28.7	28.7	28.7	28.7	28.7
R53* Maids Valley	11.7	16.7	21.5	24.2	24.2	24.2	24.2	24.2	24.2	24.2
R54 Fassifern	10.4	15.4	20.2	22.9	22.9	22.9	22.9	22.9	22.9	22.9
R6* Tauraurga	24.4	29.4	34.2	36.9	36.9	36.9	36.9	36.9	36.9	36.9
R52 Waterloo Cottage	10.0	15.0	19.8	22.5	22.5	22.5	22.5	22.5	22.5	22.5
R50 Waterloo	10.1	15.1	19.9	22.6	22.6	22.6	22.6	22.6	22.6	22.6
R7 Kings Land (House #2)	25.6	30.6	35.4	38.1	38.1	38.1	38.1	38.1	38.1	38.1
R8* Manaroo	27.3	32.3	37.1	39.8	39.8	39.8	39.8	39.8	39.8	39.8
R9* Leeweena	31.3	36.3	41.1	43.8	43.8	43.8	43.8	43.8	43.8	43.8
R11* Yarrabin	29.0	34.0	38.8	41.5	41.5	41.5	41.5	41.5	41.5	41.5
R12* Mubbarra	32.2	37.2	42.0	44.7	44.7	44.7	44.7	44.7	44.7	44.7
SA EPA Criteria										
R14-Kingshill Group	43.1	44.0	44.9	45.8	46.9	48.3	50.3	52.8	56.1	60.3
R14* Kingshill	31.0	36.0	40.8	43.5	43.5	43.5	43.5	43.5	43.5	43.5
R13* Narren Vale	30.6	35.6	40.4	43.1	43.1	43.1	43.1	43.1	43.1	43.1
R17 Strathdarr	27.2	32.2	37.0	39.7	39.7	39.7	39.7	39.7	39.7	39.7
R18* Yarrandoo	29.2	34.2	39.0	41.7	41.7	41.7	41.7	41.7	41.7	41.7
R15* Kia-Tami	25.8	30.8	35.6	38.3	38.3	38.3	38.3	38.3	38.3	38.3
R16* Woodstock	25.1	30.1	34.9	37.6	37.6	37.6	37.6	37.6	37.6	37.6
R33* Highlands	23.5	28.5	33.3	36.0	36.0	36.0	36.0	36.0	36.0	36.0
SA EPA Criteria										
R23-Carinya Group	35.0	35.0	35.0	35.0	36.4	38.5	41.4	45.3	50.6	57.3

R24* Derra Downs	30.7	35.7	40.5	43.2	43.2	43.2	43.2	43.2	43.2	43.2
R23* Carinya	26.3	31.3	36.1	38.8	38.8	38.8	38.8	38.8	38.8	38.8
R25 Coleraine	22.2	27.2	32.0	34.7	34.7	34.7	34.7	34.7	34.7	34.7
R87 Croye	20.9	25.9	30.7	33.4	33.4	33.4	33.4	33.4	33.4	33.4
R86 Millie	18.1	23.1	27.9	30.6	30.6	30.6	30.6	30.6	30.6	30.6
R81* Weean	18.1	23.1	27.9	30.6	30.6	30.6	30.6	30.6	30.6	30.6
R84 Glenidle	16.6	21.6	26.4	29.1	29.1	29.1	29.1	29.1	29.1	29.1
R85* Windemere	17.9	22.9	27.7	30.4	30.4	30.4	30.4	30.4	30.4	30.4
R88* Woodlands	14.1	19.1	23.9	26.6	26.6	26.6	26.6	26.6	26.6	26.6
SA EPA Criteria										
R28-Tralee Group	35.0	35.0	35.2	35.6	36.2	37.2	38.9	41.9	46.2	52.4
R28* Tralee	28.2	33.2	38.0	40.7	40.7	40.7	40.7	40.7	40.7	40.7
R26* Spring Creek	26.5	31.5	36.3	39.0	39.0	39.0	39.0	39.0	39.0	39.0
R27 Frasers Creek	24.7	29.7	34.5	37.2	37.2	37.2	37.2	37.2	37.2	37.2
R29 Krystal Blue	22.9	27.9	32.7	35.4	35.4	35.4	35.4	35.4	35.4	35.4
R90 Wirra Willa	21.6	26.6	31.4	34.1	34.1	34.1	34.1	34.1	34.1	34.1
R30 Argyle	20.7	25.7	30.5	33.2	33.2	33.2	33.2	33.2	33.2	33.2
R94 The Knoll	19.3	24.3	29.1	31.8	31.8	31.8	31.8	31.8	31.8	31.8
R91 Roseana	18.9	23.9	28.7	31.4	31.4	31.4	31.4	31.4	31.4	31.4
R93 Swamp Oak	17.2	22.2	27.0	29.7	29.7	29.7	29.7	29.7	29.7	29.7
R92 Lambert	15.6	20.6	25.4	28.1	28.1	28.1	28.1	28.1	28.1	28.1
R31 Glen Valley	17.8	22.8	27.6	30.3	30.3	30.3	30.3	30.3	30.3	30.3
R32 Swan Peak	18.4	23.4	28.2	30.9	30.9	30.9	30.9	30.9	30.9	30.9
R80* Weean Cottage	17.2	22.2	27.0	29.7	29.7	29.7	29.7	29.7	29.7	29.7
R89 Tomali Park	21.8	26.8	31.6	34.3	34.3	34.3	34.3	34.3	34.3	34.3
R95 Rock Leigh	19.6	24.6	29.4	32.1	32.1	32.1	32.1	32.1	32.1	32.1
R96 Unknown	18.9	23.9	28.7	31.4	31.4	31.4	31.4	31.4	31.4	31.4
SA EPA Criteria										
R36 Yarrawah Park Group	35.0	35.0	35.0	35.6	36.6	38.0	39.8	42.3	45.4	49.3
R36* Yarrawa Park	21.4	26.4	31.2	33.9	33.9	33.9	33.9	33.9	33.9	33.9
R37* Coorimbla Park	20.6	25.6	30.4	33.1	33.1	33.1	33.1	33.1	33.1	33.1
R35 Golden Grove	19.8	24.8	29.6	32.3	32.3	32.3	32.3	32.3	32.3	32.3
R38* Inverness	19.8	24.8	29.6	32.3	32.3	32.3	32.3	32.3	32.3	32.3
R34* Bellview	18.1	23.1	27.9	30.6	30.6	30.6	30.6	30.6	30.6	30.6
SA EPA Criteria										
R44-Mindora Group	35.0	35.5	36.3	36.8	37.8	39.6	42.8	47.9	55.5	66.1
R46 Alkoomie	24.3	29.3	34.1	36.8	36.8	36.8	36.8	36.8	36.8	36.8
R45 Glen Idle	22.6	27.6	32.4	35.1	35.1	35.1	35.1	35.1	35.1	35.1
R41 Royal Oaks	21.8	26.8	31.6	34.3	34.3	34.3	34.3	34.3	34.3	34.3
R42 Ashgrove	21.5	26.5	31.3	34.0	34.0	34.0	34.0	34.0	34.0	34.0
R39 Bon Vista	23.8	28.8	33.6	36.3	36.3	36.3	36.3	36.3	36.3	36.3
R40 Hillview	23.2	28.2	33.0	35.7	35.7	35.7	35.7	35.7	35.7	35.7
R44 Mindora	21.5	26.5	31.3	34.0	34.0	34.0	34.0	34.0	34.0	34.0
SA EPA Criteria										
R10-Mt Buckley Group	35.0	35.0	35.0	37.7	41.1	44.6	48.0	51.0	53.2	54.4
R10 Mt Buckley	25.1	30.1	34.9	37.6	37.6	37.6	37.6	37.6	37.6	37.6
R48 Adavale	16.1	21.1	25.9	28.6	28.6	28.6	28.6	28.6	28.6	28.6
SA EPA Criteria										
R19-Warrandah Group	35.0	35.0	35.0	36.9	40.3	43.7	46.6	48.3	48.3	46.2
R20* Lochlea	28.2	33.2	38.0	40.7	40.7	40.7	40.7	40.7	40.7	40.7
R21* 311	28.8	33.8	38.6	41.3	41.3	41.3	41.3	41.3	41.3	41.3
R19* Warrandah	27.3	32.3	37.1	39.8	39.8	39.8	39.8	39.8	39.8	39.8
R76* Cubba	19.7	24.7	29.5	32.2	32.2	32.2	32.2	32.2	32.2	32.2
R77 Meadow Vale	18.7	23.7	28.5	31.2	31.2	31.2	31.2	31.2	31.2	31.2
R4* Ardleigh	18.9	23.9	28.7	31.4	31.4	31.4	31.4	31.4	31.4	31.4
R78 Pine Grove	21.5	26.5	31.3	34.0	34.0	34.0	34.0	34.0	34.0	34.0
R79* Woodburn	22.1	27.1	31.9	34.6	34.6	34.6	34.6	34.6	34.6	34.6

Vestas V126 serrated -Mitigated

Wind Speed (m/s) @ 10m AGL / Hub Height	3 4.5	4 6.0	5 7.5	6 9.0	7 10.5	8 12.0	9 13.5	10 15.0	11 16.5	12 18.0
SA EPA Criteria R3-Falkland Group	35.0	35.0	35.0	35.2	35.7	35.7	35.2	35.0	35.0	35.0
R1* Osterley	9.6	12.5	17.2	21.2	22.2	22.2	22.2	22.2	22.2	22.2
R3* Falkland	9.7	12.6	17.3	21.2	22.2	22.2	22.2	22.2	22.2	22.2
R59* Farley	6.7	9.6	14.3	18.2	19.2	19.2	19.2	19.2	19.2	19.2
R2* Fairy Meadow	7.3	10.2	14.9	18.9	19.9	19.9	19.9	19.9	19.9	19.9
R57 Karoola	10.8	13.7	18.4	22.4	23.4	23.4	23.4	23.4	23.4	23.4
R56* Fruin Glen	11.4	14.3	19.0	23.0	23.9	23.9	23.9	23.9	23.9	23.9
R58 Pitiochry	7.4	10.3	15.0	19.0	20.0	20.0	20.0	20.0	20.0	20.0
SA EPA Criteria R64-Springfield Group	35.0	35.0	35.1	35.6	35.8	35.8	35.5	35.0	35.0	35.0
R60 Greenfield	6.7	9.6	14.3	18.2	19.2	19.2	19.2	19.2	19.2	19.2
R61 Rutherglen	7.2	10.1	14.8	18.7	19.7	19.7	19.7	19.7	19.7	19.7
R62* Linden Lea	6.4	9.3	14.0	17.9	18.9	18.9	18.9	18.9	18.9	18.9
R63 Junee	6.3	9.2	13.9	17.8	18.8	18.8	18.8	18.8	18.8	18.8
R64* Springfield	5.6	8.5	13.2	17.2	18.1	18.1	18.2	18.2	18.2	18.2
R65 Blumkaitis	5.3	8.2	12.9	16.8	17.8	17.8	17.8	17.8	17.8	17.8
R73 Nolimba	10.0	12.9	17.6	21.6	22.6	22.6	22.6	22.6	22.6	22.6
R72 Tantangra	5.5	8.4	13.1	17.0	18.0	18.0	18.0	18.0	18.0	18.0
R71 Highview	4.9	7.8	12.5	16.5	17.5	17.5	17.5	17.5	17.5	17.5
R70 Wangalee	4.2	7.1	11.8	15.8	16.7	16.7	16.8	16.8	16.8	16.8
R69 Arranmore	4.1	7.0	11.7	15.7	16.6	16.6	16.7	16.7	16.7	16.7
R74 Kaludabah	12.2	15.1	19.8	23.7	24.7	24.7	24.7	24.7	24.7	24.7
SA EPA Criteria R43- Ardleigh Group	35.0	35.0	35.0	37.4	40.7	44.3	48.0	51.8	55.3	58.4
R43 Warrawee	20.1	23.0	27.7	31.6	32.6	32.6	32.6	32.6	32.6	32.6
R47 Pieta	21.1	24.0	28.7	32.7	33.7	33.7	33.7	33.7	33.7	33.7
SA EPA Criteria R5- Down Field Group	43.0	43.2	44.2	45.5	47.0	48.2	48.8	48.5	47.0	44.0
R5* Down Field	21.6	24.5	29.2	33.1	34.1	34.1	34.1	34.1	34.1	34.1
R55 Tarana	12.9	15.8	20.5	24.4	25.4	25.4	25.4	25.4	25.4	25.4
R49* Evergreen	15.6	18.5	23.2	27.1	28.1	28.1	28.1	28.1	28.1	28.1
R53* Maids Valley	11.0	13.9	18.6	22.6	23.6	23.6	23.6	23.6	23.6	23.6
R54 Fassifern	9.7	12.5	17.3	21.2	22.2	22.2	22.2	22.2	22.2	22.2
R6* Tauraurga	24.0	26.9	31.6	35.6	36.5	36.5	36.5	36.5	36.5	36.5
R52 Waterloo Cottage	9.3	12.2	16.9	20.8	21.8	21.8	21.8	21.8	21.8	21.8
R50 Waterloo	9.4	12.2	17.0	20.9	21.9	21.9	21.9	21.9	21.9	21.9
R7 Kings Land (House #2)	25.2	28.1	32.8	36.8	37.8	37.8	37.8	37.8	37.8	37.8
R8* Manaroo	27.0	29.9	34.6	38.5	39.5	39.5	39.5	39.5	39.5	39.5
R9* Leeweena	31.0	33.9	38.6	42.6	43.6	43.6	43.6	43.6	43.6	43.6
R11* Yarrabin	28.6	31.5	36.2	40.1	41.1	41.1	41.1	41.1	41.1	41.1
R12* Mubbarra	31.9	34.8	39.5	43.5	44.5	44.5	44.5	44.5	44.5	44.5
SA EPA Criteria R14-Kingshill Group	43.1	44.0	44.9	45.8	46.9	48.3	50.3	52.8	56.1	60.3
R14* Kingshill	30.7	33.6	38.3	42.3	43.3	43.3	43.3	43.3	43.3	43.3
R13* Narren Vale	30.3	33.2	37.9	41.9	42.9	42.9	42.9	42.9	42.9	42.9
R17 Strathdarr	26.8	29.7	34.4	38.3	39.3	39.3	39.3	39.3	39.3	39.3
R18* Yarrandoo	28.8	31.7	36.5	40.4	41.4	41.4	41.4	41.4	41.4	41.4
R15* Kia-Tami	25.4	28.3	33.0	36.9	37.9	37.9	37.9	37.9	37.9	37.9
R16* Woodstock	24.8	27.7	32.4	36.4	37.3	37.3	37.3	37.3	37.3	37.3
R33* Highlands	23.0	25.9	30.6	34.6	35.6	35.6	35.6	35.6	35.6	35.6
SA EPA Criteria R23-Carinya Group	35.0	35.0	35.0	35.0	36.4	38.5	41.4	45.3	50.6	57.3

R24* Derra Downs	30.4	33.3	38.0	42.0	43.0	43.0	43.0	43.0	43.0	43.0
R23* Carinya	26.0	28.9	33.6	37.6	38.6	38.6	38.6	38.6	38.6	38.6
R25 Coleraine	21.9	24.8	29.4	33.3	34.3	34.3	34.3	34.3	34.3	34.3
R87 Croye	20.5	23.4	28.1	32.1	33.0	33.1	33.1	33.1	33.1	33.1
R86 Millie	17.6	20.5	25.3	29.2	30.2	30.2	30.2	30.2	30.2	30.2
R81* Weean	17.6	20.5	25.2	29.1	30.1	30.1	30.1	30.1	30.1	30.1
R84 Glenidle	16.0	18.9	23.6	27.5	28.5	28.5	28.5	28.5	28.5	28.5
R85* Windemere	17.3	20.2	25.0	28.9	29.9	29.9	29.9	29.9	29.9	29.9
R88* Woodlands	13.5	16.3	21.1	25.0	25.9	26.0	26.0	26.0	26.0	26.0
SA EPA Criteria R28-Tralee Group	35.0	35.0	35.2	35.6	36.2	37.2	38.9	41.9	46.2	52.4
R28* Tralee	27.7	30.6	35.2	38.6	39.5	39.7	39.8	39.8	39.8	39.8
R26* Spring Creek	26.0	28.8	33.5	37.0	37.9	38.1	38.2	38.2	38.2	38.2
R27 Frasers Creek	24.2	27.1	31.7	35.3	36.2	36.4	36.5	36.5	36.5	36.5
R29 Krystal Blue	22.3	25.2	29.9	33.6	34.6	34.7	34.7	34.7	34.7	34.7
R90 Wirra Willa	21.0	23.9	28.5	32.2	33.1	33.2	33.3	33.3	33.3	33.3
R30 Argyle	20.1	23.0	27.7	31.5	32.5	32.5	32.6	32.6	32.6	32.6
R94 The Knoll	18.5	21.4	26.1	29.9	30.9	30.9	31.0	31.0	31.0	31.0
R91 Roseana	18.2	21.1	25.7	29.5	30.5	30.5	30.6	30.6	30.6	30.6
R93 Swamp Oak	16.4	19.3	24.0	27.7	28.7	28.8	28.8	28.8	28.8	28.8
R92 Lambert	14.9	17.8	22.4	26.3	27.2	27.3	27.3	27.3	27.3	27.3
R31 Glen Valley	17.1	20.0	24.7	28.6	29.6	29.6	29.6	29.6	29.6	29.6
R32 Swan Peak	17.7	20.5	25.3	29.1	30.1	30.1	30.2	30.2	30.2	30.2
R80* Weean Cottage	16.5	19.4	24.0	27.8	28.8	28.9	28.9	28.9	28.9	28.9
R89 Tomali Park	21.2	24.1	28.7	32.3	33.2	33.4	33.4	33.4	33.4	33.4
R95 Rock Leigh	18.8	21.7	26.4	30.2	31.2	31.2	31.3	31.3	31.3	31.3
R96 Unknown	16.3	19.2	23.9	27.7	28.7	28.7	28.8	28.8	28.8	28.8
SA EPA Criteria R36 Yarrawah Park Group	35.0	35.0	35.0	35.6	36.6	38.0	39.8	42.3	45.4	49.3
R36* Yarrawa Park	20.8	23.7	28.4	32.4	33.4	33.4	33.4	33.4	33.4	33.4
R37* Coorimbla Park	20.0	22.9	27.6	31.6	32.6	32.6	32.6	32.6	32.6	32.6
R35 Golden Grove	19.2	22.1	26.8	30.7	31.7	31.7	31.7	31.7	31.7	31.7
R38* Inverness	19.2	22.1	26.8	30.8	31.7	31.7	31.7	31.7	31.7	31.7
R34* Bellview	17.5	20.3	25.1	29.0	30.0	30.0	30.0	30.0	30.0	30.0
SA EPA Criteria R44-Mindora Group	35.0	35.5	36.3	36.8	37.8	39.6	42.8	47.9	55.5	66.1
R46 Alkoomie	23.8	26.7	31.4	35.4	36.4	36.4	36.4	36.4	36.4	36.4
R45 Glen Idle	22.1	25.0	29.7	33.7	34.7	34.7	34.7	34.7	34.7	34.7
R41 Royal Oaks	21.3	24.2	28.9	32.9	33.9	33.9	33.9	33.9	33.9	33.9
R42 Ashgrove	21.0	23.8	28.6	32.5	33.5	33.5	33.5	33.5	33.5	33.5
R39 Bon Vista	23.3	26.2	31.0	34.9	35.9	35.9	35.9	35.9	35.9	35.9
R40 Hillview	22.7	25.6	30.3	34.3	35.2	35.2	35.2	35.2	35.2	35.2
R44 Mindora	21.0	23.9	28.7	32.6	33.6	33.6	33.6	33.6	33.6	33.6
SA EPA Criteria R10-Mt Buckley Group	35.0	35.0	35.0	37.7	41.1	44.6	48.0	51.0	53.2	54.4
R10 Mt Buckley	24.8	27.7	32.4	36.4	37.3	37.3	37.3	37.3	37.3	37.3
R48 Adavale	15.5	18.4	23.1	27.1	28.0	28.0	28.0	28.0	28.0	28.0
SA EPA Criteria R19-Warrandah Group	35.0	35.0	35.0	36.9	40.3	43.7	46.6	48.3	48.3	46.2
R20* Lochlea	27.9	30.8	35.5	39.5	40.5	40.5	40.5	40.5	40.5	40.5
R21* 311	28.5	31.4	36.2	40.1	41.1	41.1	41.1	41.1	41.1	41.1
R19* Warrandah	27.0	29.9	34.6	38.5	39.5	39.5	39.5	39.5	39.5	39.5
R76* Cubba	19.1	21.9	26.7	30.6	31.6	31.6	31.6	31.6	31.6	31.6
R77 Meadow Vale	18.1	21.0	25.7	29.7	30.7	30.7	30.7	30.7	30.7	30.7
R4* Ardleigh	18.2	21.1	25.8	29.8	30.7	30.7	30.7	30.7	30.7	30.7
R78 Pine Grove	20.8	23.7	28.4	32.4	33.4	33.4	33.4	33.4	33.4	33.4
R79* Woodburn	21.5	24.4	29.1	33.1	34.1	34.1	34.1	34.1	34.1	34.1

SUPPLEMENTARY REPORT

AERONAUTICAL IMPACT ASSESSMENT

AVIATION IMPACT STATEMENT

QUALITATIVE RISK ASSESSMENT

AND

OBSTACLE LIGHTING REVIEW

SAPPHIRE WIND FARM

J0466

Copy No.: 1.1

To be read in conjunction with the Final Report

Report to:

CWP Renewables Pty Ltd

6 April 2016

AMBIDJI
AIR TRANSPORT INNOVATION

Melbourne, Australia

DOCUMENT RELEASE APPROVAL

Approved for Final Release:

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Appendix A: Glen Innes Aerodrome Circuit Area Diagrams
Appendix B: Visual Flight Rules
Appendix C: Glossary of Terms and Abbreviations

EXECUTIVE SUMMARY

Supplementary to the original report CWP Energy has requested that Ambidji give further consideration to the proposed flying training school at Glen Innes aerodrome.

This report is supplementary to, and must be read in conjunction with, Ambidjiôs *Final Report - Aeronautical Impact Assessment, Aviation Impact Statement, Qualitative Risk Assessment and Obstacle Lighting Review - Sapphire Wind Farm dated 23 February 2016* (The original report).

A desktop analysis of the available information was conducted to further the Qualitative Risk Assessment conducted in the original report.

A Development Application, number DA 09/12-13, submitted by Australia Asia Flight Training Pty Ltd for the development of an ñeducational establishmentò comprising aviation training college, incorporating accommodation, teaching facilities, dining and recreational facilities in association with Glen Innes Aerodrome facility, and 3 lot subdivision was approved on 12 December 2012.

From information gathered, this college will eventually cater for 600 students seeking airline entry standard flying training. Such training will commence with ab-initio trainees learning to fly and finish with pilots holding CASA approved airline standard licences. It is envisaged that up to 40 aircraft will be required to service this training load. Additional aerodrome works, such as sealing runway 10/28, the addition of parallel taxiways, hard stand and hangar facilities have been proposed. The Director of Glen Innes Regional Airport is anticipating aircraft movements of 100,000 per annum at full operation of the flying school.

The Sapphire Wind Farm is sufficiently distant from the Glen Innes aerodrome to not affect the safe operation of aircraft at, into or out of its existing runways. The location and height of the wind turbines will be marked on the aeronautical charts used by pilots for planning flight purposes, so they can plan to fly on tracks and at heights that avoid the obstacles. Once the 25nm Minimum Safe Altitude is raised from 5,300ft to 5,500ft none of the prescribed airspace associated with the 4 published Instrument Departure and Approach Procedures will be impacted. Aircraft operating to the Visual Flight Rules will be able to see the turbines and fly accordingly. Aircraft operating to the Instrument Flight Rules will be above the Lowest Safe Altitude or Minimum Safe Altitude and within the prescribed airspace associated with the published instrument approaches. There are existing unlit obstacles, of significant height approximately 10nm to the south of the aerodrome. These range up to 5106ft AHD. There are terrain spot heights up to 4554ft in the same area.

The Glen Innes circuit area, even at 5nm radius for high performance jet aircraft is sufficiently distant from the Sapphire Wind Farm to ensure safe aircraft operations.

Given that the Sapphire Wind Farm is beyond the vicinity of the Glen Innes aerodrome the CASA regulations of Part 139 ï Aerodromes are not applicable. As was the case in 2009 when CASA withdrew Advisory Circular 139-18(0) ï Obstacle Marking of Wind Farms there is a question as to the legality of CASA mandating aviation obstacle lighting on tall structures

beyond the Obstacle Limitation Surface of a registered or certified aerodrome. The National Airports Safeguarding Framework (NASF), which is again focused on airports, requires a risk assessment to be undertaken to ascertain the hazard to aircraft safety posed by a wind farm. If the assessed risk is HIGH the wind farm should not be built, MEDIUM risk can be mitigated by marking and/or lighting, whilst a LOW risk indicates that no mitigation is required as it is not a hazard to aircraft safety.

CASA, if consulted by the Planning Authority, may recommend the installation of obstacle lighting; however to do so they would need to provide evidence from a risk assessment to demonstrate the need.

It is often stated that aircraft flown in accordance with the VFR can legally fly at 500 feet above the ground. This ñfactòis from Regulation 157 ï Low Flying of the Civil Aviation Regulations 1988 (CAR) Part 11, Division 2 Flight Rules. This regulation is often selectively quoted to indicate that an aircraft can fly at 500ft above the ground, when in fact the requirement is 500ft above the highest point of the ground **and any object on it**.

As far as the flying training at Glen Innes is concerned the Sapphire Wind Farm is sufficiently distant from the aerodrome to not be a hazard to aircraft safety, does not require aviation obstacle lighting and will just be another obstacle, along with hills, powerlines and communications towers, for the trainee pilots to consider. There are a number of highways and major roads in the area that provide good visual reference to guide VFR pilots to Glen Innes.

1. INTRODUCTION

Supplementary to the original report CWP Energy has requested that further consideration be given to the proposed flying training school at Glen Innes aerodrome.

> *"The college will include serviced accommodation, active and quiet leisure, classrooms, operations facilities and simulation bays. The second runway will be sealed to 1,200m and parallel sealed taxiways will be constructed in addition to new hardstands for up to 40 aircraft and hangars and refuelling facilities for JET A1 and Avgas."*[1]

2. SCOPE

To access the available information about the proposed Glen Innes flying training school and assess any impact the Sapphire Wind Farm may have on its operation.

3. METHOD

Conduct a desktop analysis of the information available about the proposed flying training school at Glen Innes airport in relation to any impact the Sapphire Wind Farm may have on its operation.

4. ANALYSIS

4.1 Available Information

Glen Innes Severn Council, as part of the Joint Regional Planning Panel (JRPP), approved Development Application number 9/12-13 by Australia Asia Flight Training Pty Ltd for the development of an ñeducational establishmentò comprising aviation training college, incorporating accommodation, teaching facilities, dining and recreational facilities in association with Glen Innes Aerodrome facility, and 3 lot subdivision[2]. This application was approved on 12 December 20112. The development is to be constructed in four stages; stage 1 - 30 accommodation units and all other infrastructure, stage 2 ï 18 accommodation units and the demolition of the caretakerôs residence and workshop/storage shed, stage 3 ï 18 accommodation units, and stage 4 ï 37 accommodation units.

[1] Wikipedia, Glen Innes Airport, page last modified 21 June 2015; https://en.wikipedia.org/wiki/Glen_Innes_Airport Accessed 31 March 2016

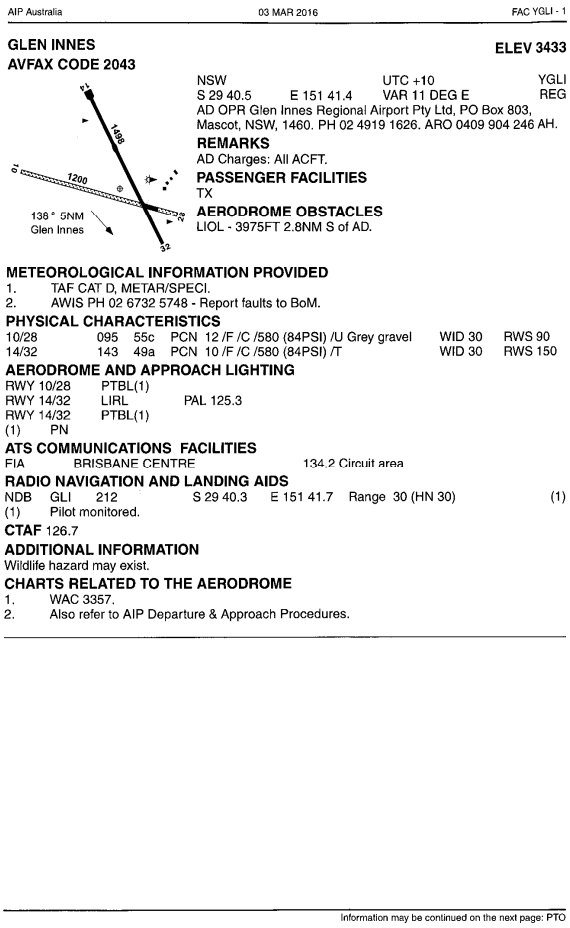
[2] Notice of Determination of a Development Application DA 09/12-13, Glen Innes Severn Council, 12 December 2012

A supplementary report to the JRPP for DA 9/12-13, dated 20 November 2012 has some additional information regarding facilities that are not evident in the determination report. These include the commencement with 100 students and developing over a five year period; a control tower, hangar and hardstand area for aircraft parking, as well as above ground aviation fuel storage units.

The Wikipedia entry cited above indicates that the existing gravel runway, RWY 10/28, will be sealed for a length of 1200m as well as the construction of sealed parallel taxiways and hardstands for up to 40 aircraft.

4.2 Glen Innes Aerodrome

The Australian Aeronautical Information Publication En-Route Supplement Australia (ERSA) publishes the information regarding Glen Innes aerodrome as shown in figure 4.2.1 below.



AIP Australia 03 MAR 2016 FAC YGLI - 1

GLEN INNES **ELEV 3433**
AVFAX CODE 2043

NSW UTC +10 YGLI
S 29 40.5 E 151 41.4 VAR 11 DEG E REG
AD OPR Glen Innes Regional Airport Pty Ltd, PO Box 803, Mascot, NSW, 1460. PH 02 4919 1626. ARO 0409 904 246 AH.

REMARKS
AD Charges: All ACFT.

PASSENGER FACILITIES
TX

AERODROME OBSTACLES
LIOL - 3975FT 2.8NM S of AD.

METEOROLOGICAL INFORMATION PROVIDED
1. TAF CAT D, METAR/SPECI.
2. AWIS PH 02 6732 5748 - Report faults to BoM.

PHYSICAL CHARACTERISTICS

10/28	095	55c	PCN 12 /F /C /580 (84PSI) /U Grey gravel	WID 30	RWS 90
14/32	143	49a	PCN 10 /F /C /580 (84PSI) /T	WID 30	RWS 150

AERODROME AND APPROACH LIGHTING
RWY 10/28 PTBL(1)
RWY 14/32 LIRL PAL 125.3
RWY 14/32 PTBL(1)
(1) PN

ATS COMMUNICATIONS FACILITIES
FIA BRISBANE CENTRE 134.2 Circuit area

RADIO NAVIGATION AND LANDING AIDS
NDB GLI 212 S 29 40.3 E 151 41.7 Range 30 (HN 30) (1)
(1) Pilot monitored.

CTAF 126.7

ADDITIONAL INFORMATION
Wildlife hazard may exist.

CHARTS RELATED TO THE AERODROME
1. WAC 3357.
2. Also refer to AIP Departure & Approach Procedures.

Information may be continued on the next page: PTO

Figure 4.2.1 – Glen Innes ERSA Entry

The aerodrome elevation is 3433ft above the Australian Height Datum (AHD).

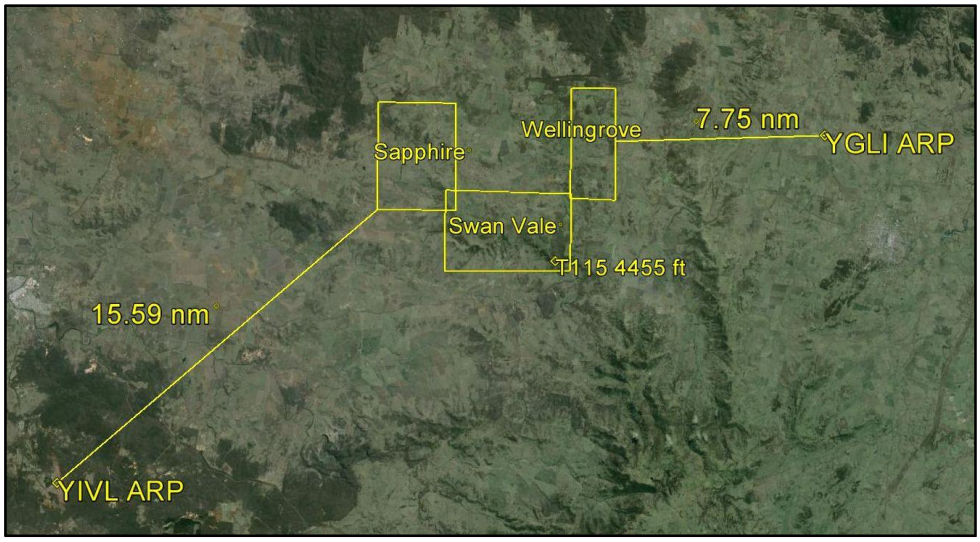


Figure 4.2.2 – Sapphire Wind Farm relative to YGLI and YIVL

The Sapphire Wind Farm is 14.35km (7.75nm) from the Glen Innes aerodrome reference point. This puts the wind farm beyond the Obstacle Limitation Surface (OLS) for the aerodrome.

The closest wind farm boundary is 1.1km (0.6nm) south west of the extended RWY28 centreline at 13.85km (7.5nm) from the runway threshold. The extended centrelines for the other runways track away from the Sapphire Wind Farm. The wind farm is well beyond the standard circuit areas for both runways.

Glen Innes has four Instrument Approach Procedures, all associated with runway 14/32 which is the only runway currently sealed and equipped with lights. They are:

- GNSS ARRIVAL
- RNAV (GNSS) RWY 14
- RNAV (GNSS) RWY 32
- NDB RWY 14

Refer to Section 4.6.2 of the *Final Report - Aeronautical Impact Assessment, Aviation Impact Statement, Qualitative Risk Assessment and Obstacle Lighting Review - Sapphire Wind Farm dated 23 February 2016* (original report) for the detailed analysis of the impact of the Sapphire Wind Farm on these instrument approaches.

There is a published Minimum Safe Altitude (MSA) for these instrument procedures.

The MSA in the Sector over the Sapphire Wind Farm is 5300ft within 25nm of the GLI

NDB and is 6100ft within 10nm. The Sapphire Wind Farm is impacted by the 25nm and 10nm MSA.

When the Minimum Obstacle Clearance of 1000ft is applied to the highest tip AHD of 4455ft, the result is 5455ft. This height will penetrate the 25nm MSA by 155ft.

As the 10nm MSA is 6100ft, and the altitude at the IF for the RWY 14 NDB approach is 6100ft, aircraft would be required to be no lower than 6100ft within 10nm. It is considered that the increase in the 25nm MSA to 5500ft will have minimal impact on flight operations.

Airservices Australia advise that to accommodate a maximum tip height of 1357.8m (4455ft) AHD in the *Swan Vale cluster* the Glen Innes aerodrome 25nm MSA in the NW sector will need to be raised from 5300ft to 5500ft. A permanent NOTAM would be required to implement this increase[3].

A request has been made to the operator of Glen Innes aerodrome seeking agreement to raise the MSA in the NW sector from 5300ft to 5500ft.

The Sapphire Wind Farm does not impact on any of the published Departure and Approach Procedures at Glen Innes aerodrome.

Night Visual Flight Rules operations are also governed by published LSALT. Descent into an aerodrome for VFR at night operations does not normally proceed below the LSALT/MSA until the aircraft is within 3nm from the aerodrome and in VMC. Assuming the 25nm MSA for YGLI is raised to 5500ft above the wind farm, night VFR operations will not be impacted.

The Sapphire Wind Farm is sufficiently distant from Glen Innes aerodrome to not be of operational significance and is not considered to be a hazard to aircraft safety. Since the assessed risk to aircraft safety is LOW there is no mitigation required, therefore the Sapphire Wind Farm does not require aviation obstacle lighting.

The Instrument Approach Procedure for Glen Innes Runway 14 NDB Approach (figure 4.2.3 below) depicts existing significant unlit obstacles up to 5106ft AHD approximately 10nm south of the aerodrome as well as terrain spot heights of 4554ft in the same area.

[3] Sapphire Wind Farm AIS, AIA, QRA and OLR, Ambidji Report 23 February 2016

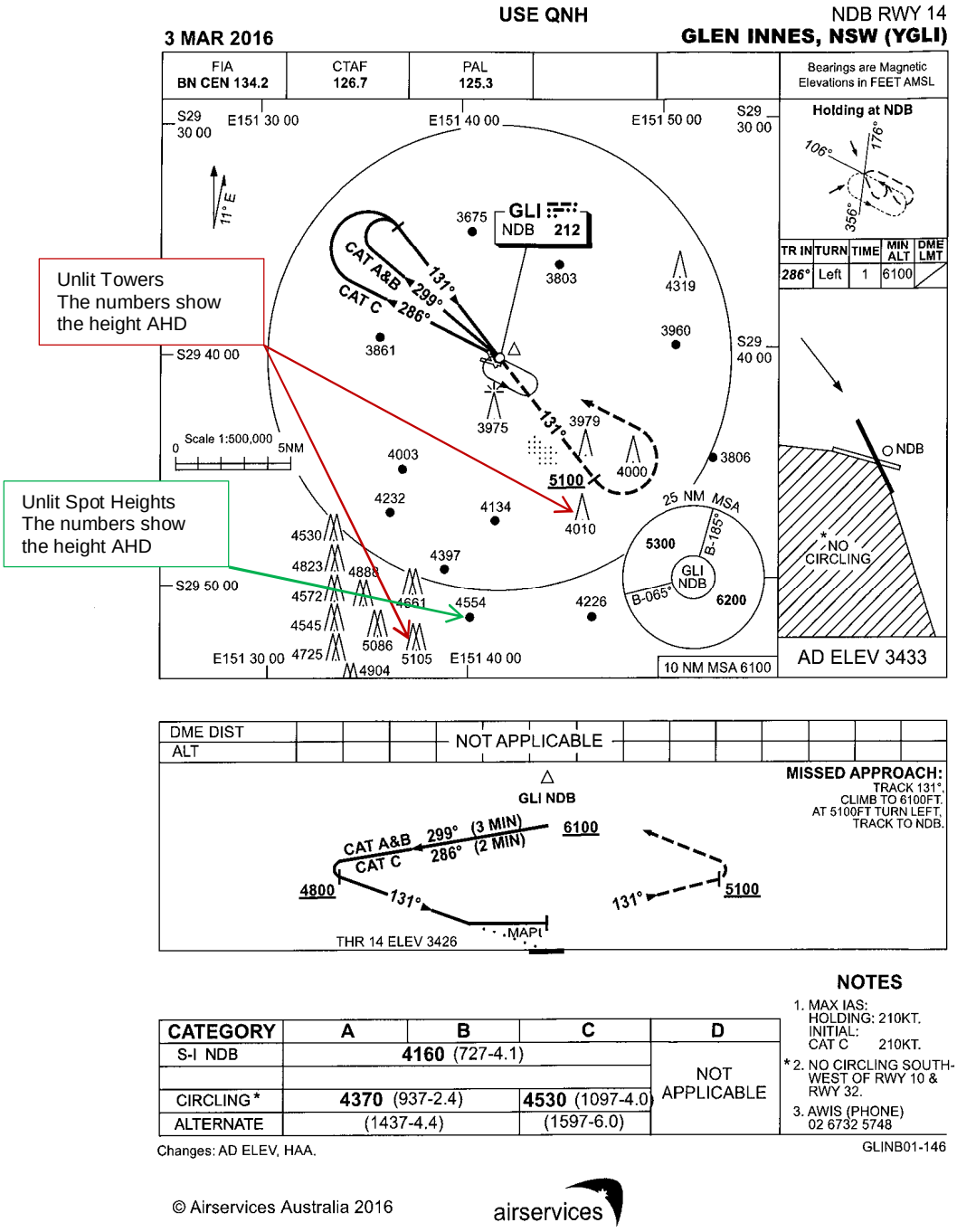


Figure 4.2.3 – YGLI NDB RWY14

4.3 Visual Flight Rules

The following information regarding Visual Flight Rules is provided to inform the readers of this report who may not be trained pilots. The Visual Flight Rules Regulations are shown at Appendix B.

It is often stated that aircraft flown in accordance with the VFR can legally fly at 500 feet above the ground. This ñfactòis taken from Civil Aviation Regulations 1988 (CAR) Part 11, Division 2 Flight Rules, Regulation 157 ï Low Flying.

This regulation is often selectively quoted to indicate that an aircraft can fly at 500ft above the ground, when in fact it is 500ft above the highest point of the ground **and any object on it**. If the wind turbine tip is 625ft above the ground an aircraft must be 500ft above the tip, which is 625 + 500 = 1125ft above the ground. The highest turbine tip in the Sapphire wind farm is 4455ft above the Australian Height Datum (AHD). For a VFR aircraft to comply with CAR 157 it would need to be at a height of 4455 + 500 = 4955ft AHD. For aviation purposes height above AHD is known as altitude. Consequently a VFR aircraft would need to be flying at an altitude of 5000ft over the wind turbines to comply with this regulation.

The primary regulation for Visual Flight Rules is CAR 171 ï VFR Flight, which at subregulation 2) states ñWhere an aircraft cannot be flown in accordance with the Visual Flight Rules, the pilot in command shall comply with the Instrument Flight Rules contained in Division 4 of this Part, or land at the nearest suitable aerodrome.ò

4.4 Flying Training

Ab-initio flying training is conducted in accordance with the Visual Flight Rules (VFR) and in Visual Meteorological Conditions (VMC). As the name implies such flying is conducted by visual reference to the ground or water, at a prescribed distance clear of cloud, with a specified visibility range and a minimum height above the terrain or highest obstacle thereon.

Advanced flying training introduces instrument flying which is conducted in accordance with the Instrument Flight Rules (IFR) allowing flight at night and in cloud. IFR flight is protected by Lowest Safe Altitudes (LSALT) and prescribed airspace associated with published Departure and Approach Procedures (DAP). IFR flight utilises terrestrial radio navigation aids (Navaids) and Global Navigation Satellite System (GNSS) equipment to guide the aircraft at suitably equipped aerodromes. Where there are no published DAP at an aerodrome IFR flight must revert to VFR flight and be able to see the aerodrome prior to descending below the prescribed airspace. VFR at Night is also governed by LSALT and visual reference to the aerodrome for approach and landing.

Activity generated by the Glen Innes flying school will be initially circuit area training where the students learn and practice the techniques of aircraft ground handling, take-off and landing within sight of the aerodrome. Progressively students practice emergency procedures such as engine failure, forced landing, dealing with aerodynamic

stall and abnormal aircraft attitude recovery. These activities are conducted in specific airspace near the aerodrome, but clear of the circuit area over suitable terrain that is open, flat and clear of obstacles such as trees, powerlines and buildings. Once students have mastered the control of the aircraft they learn to plan and navigate aircraft flights on progressively more complex tasks to achieve the competency required for the granting of a private pilotôs licence. All of this training is conducted as VFR flight.

The Glen Innes flying school will cater for advanced flying training into multi-engine aircraft and Instrument Flying in accordance with the Instrument Flight Rules. IFR training is conducted in suitably equipped aircraft and utilises the published instrument departure and approach procedures for the aerodrome. Consequently these aircraft will operate above the LSALT and MSA associated with the relevant approach procedure.

4.5 Circuit Area Operations

The Glen Innes aerodrome is at an elevation of 3433ft AHD. Aerodrome Traffic Circuit heights are measured above the aerodrome elevation. The circuit direction at Glen Innes is a standard left hand pattern[4]. Standard traffic circuit pattern dimensions are dependent on aircraft approach category. High performance aircraft, large turbo-prop or medium jet passenger aircraft operate at a circuit speed over 150 knots and use a larger circuit pattern which is generally no more than 5nm radius at a height of 1500ft above the aerodrome elevation. Most general aviation aircraft use a circuit speed between 55 and 150kts, a circuit radius of no more than 3nm at a height of 1000ft above the aerodrome elevation. Low performance aircraft such as ultralights, trikes, powered parachutes and small fixed wing aircraft operate at a circuit speed below 55kts at a height of 500ft above the aerodrome elevation. From diagrams associated with noise abatement requirements, the depicted circuit patterns for training at Glen Innes will not extend beyond 1.7nm (3km) from the aerodrome. See appendix A.

The circuit patterns at Glen Innes aerodrome, even for high performance aircraft using a 5nm radius, are clear of the Sapphire Wind Farm.

For VFR aircraft departing the Glen Innes circuit the wind turbines will be highly visible due to their contrasting colour and size. For aircraft departing IFR or VFR at night the flight rules applicable ensure the aircraft climbs and tracks to remain clear of obstacles, including terrain and turbines.

4.6 Future Airport Development

Future development of the aerodrome must consider existing obstacles as part of the design process. Any future instrument approach and departure procedures such as an Instrument Landing System (ILS) or Required Navigation Performance (RNP) approaches for new or extended runways must be designed to ensure obstacle clearance is maintained in accordance with ICAO Annexe 14 PANS-OPS criteria.

[4] CAAP 166 ï 1(3) Operations on the Vicinity of non-controlled aerodromes, August 2014, Figure 3.

Ambidji notes that the áapproved development plansô JRPP DA09/12-13 refer to the construction of buildings and carparks and a section governing noise abatement and permitted hours of operation. There is no reference to aerodrome manoeuvring area (runways, taxiways, and hardstands) modification or construction other than at condition 44[5]

> ñAll facilities and works at Glen Innes Aerodrome are to comply with the Manual of Standards Part 139 Ï Aerodromes, made under Part 139 of the Civil Aviation Safety Regulations 1998.
>
> Note: It is a requirement under this manual to prepare and communicate a Method of Working Plan (MWOP) prior to the commencement of any works.
>
> *Reason: To ensure that all facilities meet accepted safety standards, and that works are performed in a safe manner and communicated to pilots and other interested parties."*

Aerodrome capacity, the number of aircraft able to land and take-off in a given time, is determined primarily by the facilities available on the ground, particularly the ability for aircraft to enter and leave the active runway quickly via appropriately located taxiways. Noise abatement procedures also have an impact on aerodrome capacity.

4.7 Obstacle Lighting

The hazard to aircraft safety assessed in the Qualitative Risk Assessment (refer section 5 of the original report) does not change with the inclusion of a flying training facility at Glen Innes. Whilst there may be an increase in aircraft movements, the regulations governing flying, including pilot training, provide the necessary mitigation by ensuring aircraft remain clear of the turbines. Aviation Obstacle Lighting is not required. Refer to Section 6.3 of the original report.

4.8 CASA Consultation

The National Airports Safeguarding Framework - Guideline D recommends that turbines over 150m AGL built within 30km (16.2nm) of a certified or registered aerodrome be notified to CASA. The Sapphire Wind Farm is within 30km of the registered Glen Innes aerodrome.

CASA issued Advisory Circular AC139-18(0) *Obstacle Marking of Wind Farms* in July 2007. CASA withdrew this AC in October 2008 after consideration of its legality and complaints to CASAôs Industry Complaints Commissioner.

[5] Notice of Determination of a Development Application DA 09/12-13, Glen Innes Severn Council, 12 December 2012

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APPENDIX A

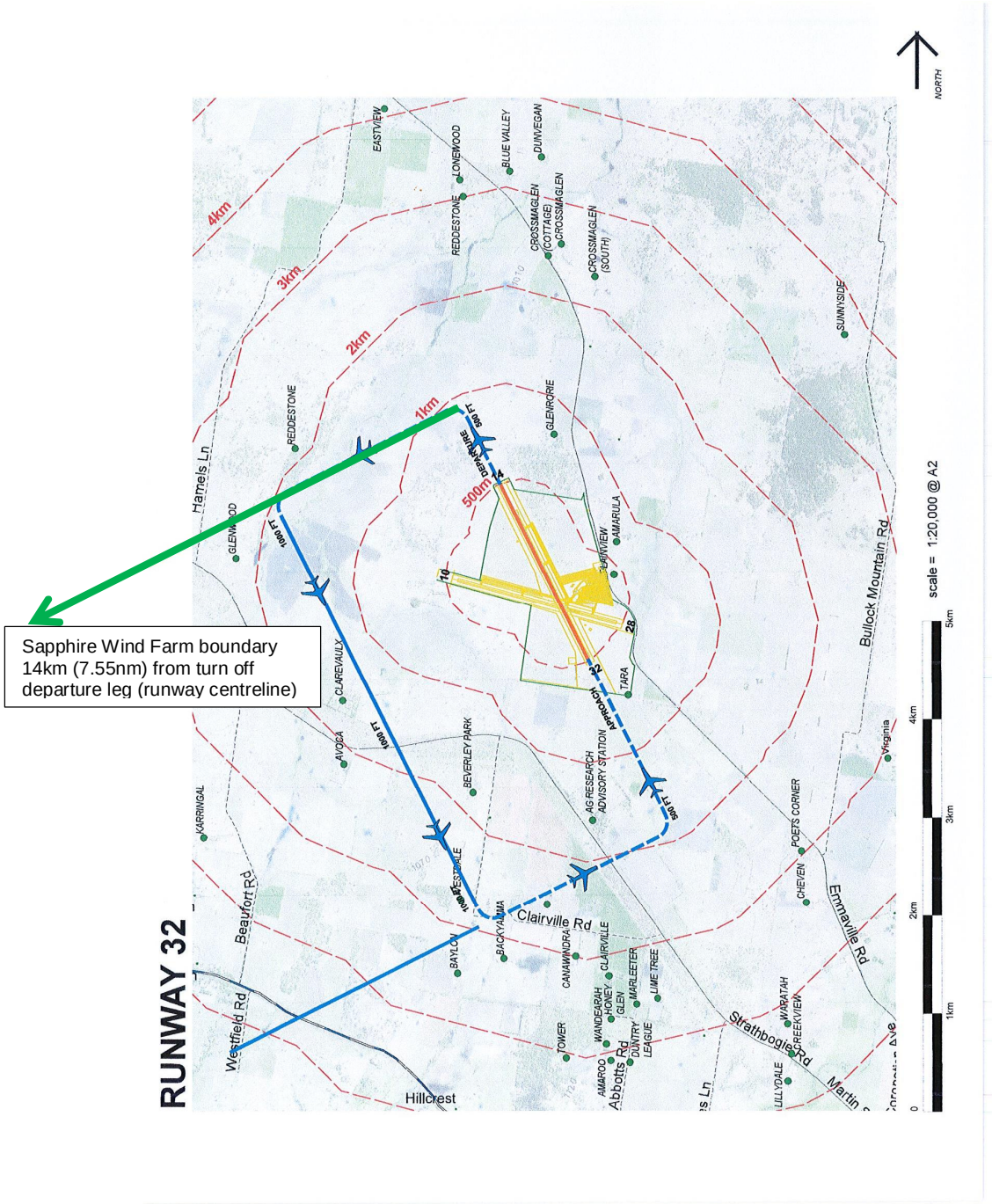
Glen Innes Regional Airport

Circuit Area Diagrams

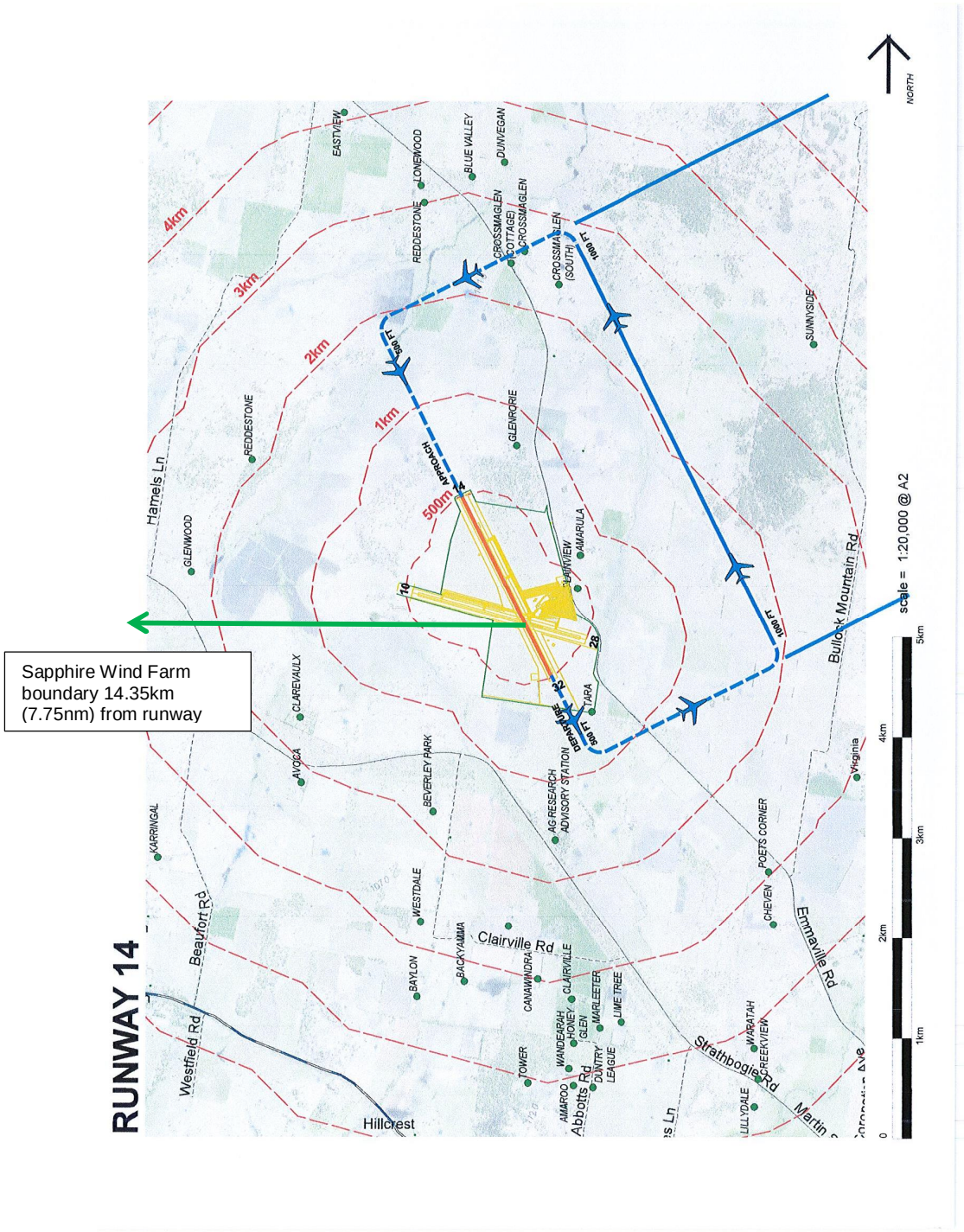
And

Noise Monitor Receptor Locations

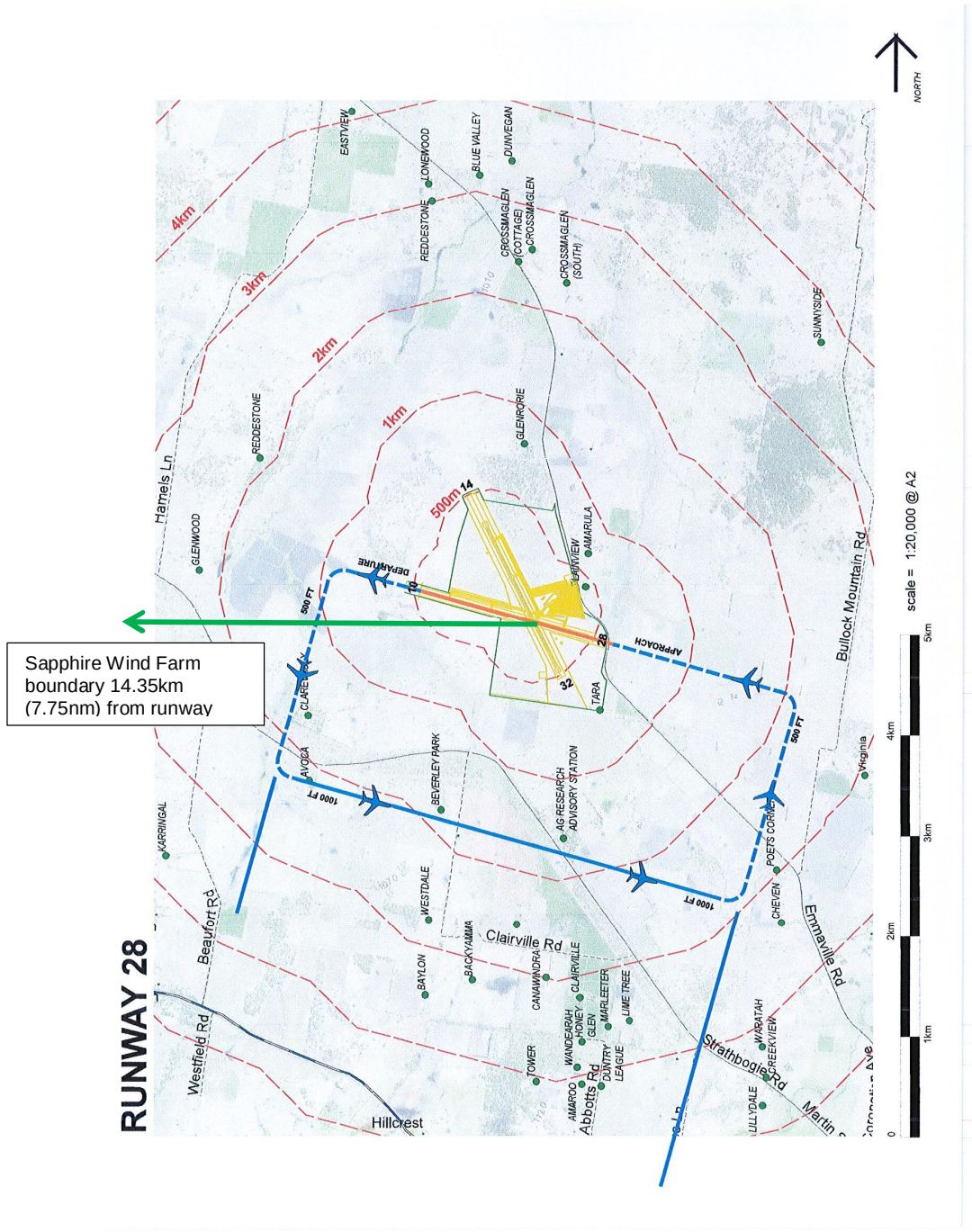
Runway 32


Sapphire Wind Farm boundary
14km (7.55nm) from turn off
departure leg (runway centreline)
RUNWAY 32
NORTH
scale = 1:20,000 @ A2
4km
3km
2km
1km
500m
1000 FT
500 FT
Departure
Approach
Clairville Rd
Bullock Mountain Rd
Emmaville Rd
Strathbogie Rd
Beaufort Rd
Westfield Rd
Abbotts Rd
Hillcrest
Hamels Ln
EASTVIEW
LONEWOOD
BLUE VALLEY
DUNVEGAN
REDDESTONE
CROSSMAGLEN (COTTAGE)
CROSSMAGLEN
CROSSMAGLEN (SOUTH)
SUNNYSIDE
GLENRORIE
AMARULA
TARA
CLAREVAULX
AVOCA
BEVERLEY PARK
AG RESEARCH ADVISORY STATION
KARRINGAL
BAYLON
BACKYAMMA
CANAWINDRA
CLAIRVILLE
MARLEETER
LIME TREE
WANDERAH
HONEY GLEN
TOWER
DUNTRY LEAGUE
AMAROO
POETS CORNER
CHEVEN
WARATAH
CREEKVIEW
LILLYDALE
Virginia

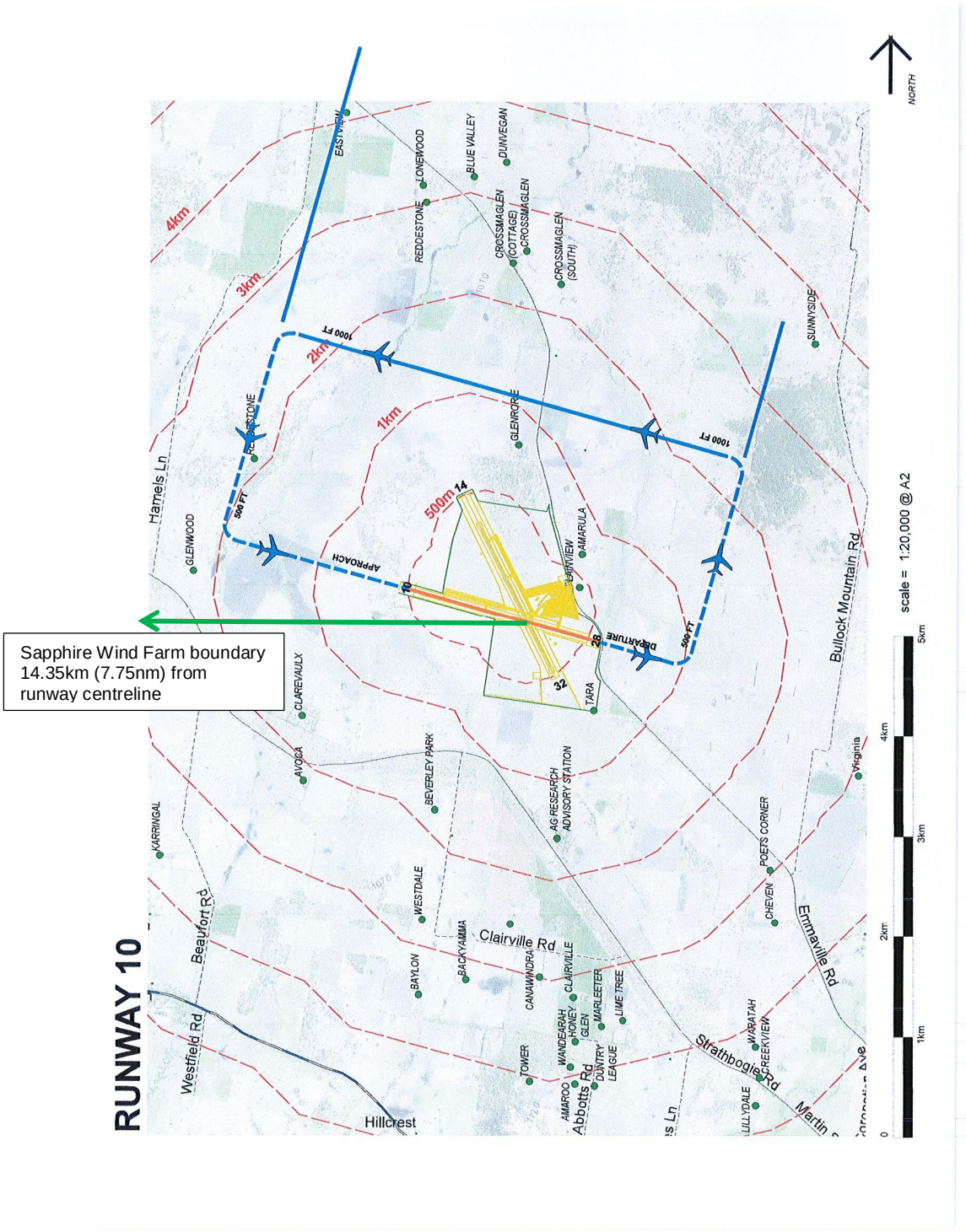
Runway 14


RUNWAY 14
Sapphire Wind Farm boundary 14.35km (7.75nm) from runway
4km
3km
2km
1km
500m
1000 FT
500 FT
APPROACH
DEPARTURE
10
28
NORTH
scale = 1:20,000 @ A2
Hamels Ln
Beaufort Rd
Westfield Rd
Clairville Rd
Abbotts Rd
Strathbogie Rd
Emmaville Rd
Bullock Mountain Rd
Martin
Hillcrest
EASTVIEW
LONEWOOD
BLUE VALLEY
DUNVEGAN
REDDESTONE
CROSSMAGLEN COTTAGE
CROSSMAGLEN
CROSSMAGLEN (SOUTH)
SUNNYSIDE
GLENROBIE
GLENWOOD
AMARULA
FAIRVIEW
TARA
CLAREVAULX
AVOCA
BEVERLEY PARK
AG RESEARCH ADVISORY STATION
KARRINGAL
WESTDALE
BAYLON
BACKYAMMA
CANAWINDRA
CLAIRVILLE
MARLEEFER
LIME TREE
WANDERAH
GLEN
DUNTRY LEAGUE
TOWER
AMAROO
POETS CORNER
CHEVEN
WARATAH
GREENVIEW
LILLYDALE
Virginia

Runway 28


Sapphire Wind Farm boundary 14.35km (7.75nm) from runway
RUNWAY 28
NORTH
scale = 1:20,000 @ A2
4km
3km
2km
1km
500m
500 FT
1000 FT
APPROACH
DEPARTURE
Hamels Ln
Bullock Mountain Rd
Beaufort Rd
Westfield Rd
Clairville Rd
Emmaville Rd
Strathbogie Rd
Abbotts Rd
Martin
Hillcrest
EASTVIEW
LONEWOOD
BLUE VALLEY
DUNVEGAN
REDDESTONE
CROSSMAGLEN (COTTAGE)
CROSSMAGLEN
CROSSMAGLEN (SOUTH)
SUNNYSIDE
GLENROHE
GLENWOOD
CLAREVIEW
AMARULA
TARA
AVOCA
BEVERLEY PARK
AG RESEARCH ADVISORY STATION
KARRINGAL
WESTDALE
BAYLON
BACKYAMMA
CANAWINDRA
CLAIRVILLE
MARLEETER
LIME TREE
WANDERAH
HONEY GLEN
TOWER
AMAROO
DUNTRY LEAGUE
POETS CORNER
CHEVEN
WARATAH
CREEKVIEW
LILLYDALE
Virginia

Runway 10


Sapphire Wind Farm boundary
14.35km (7.75nm) from
runway centreline
RUNWAY 10
NORTH
scale = 1:20,000 @ A2
4km
3km
2km
1km
500m
1000 FT
500 FT
APPROACH
DEPARTURE
14
32
Hamels Ln
Bullock Mountain Rd
Beaufort Rd
Westfield Rd
Clairville Rd
Ermaville Rd
Strathbogie Rd
Abbotts Rd
Hillcrest
EASTVIEW
LONEWOOD
BLUE VALLEY
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CROSSMAGLEN (COTTAGE)
CROSSMAGLEN
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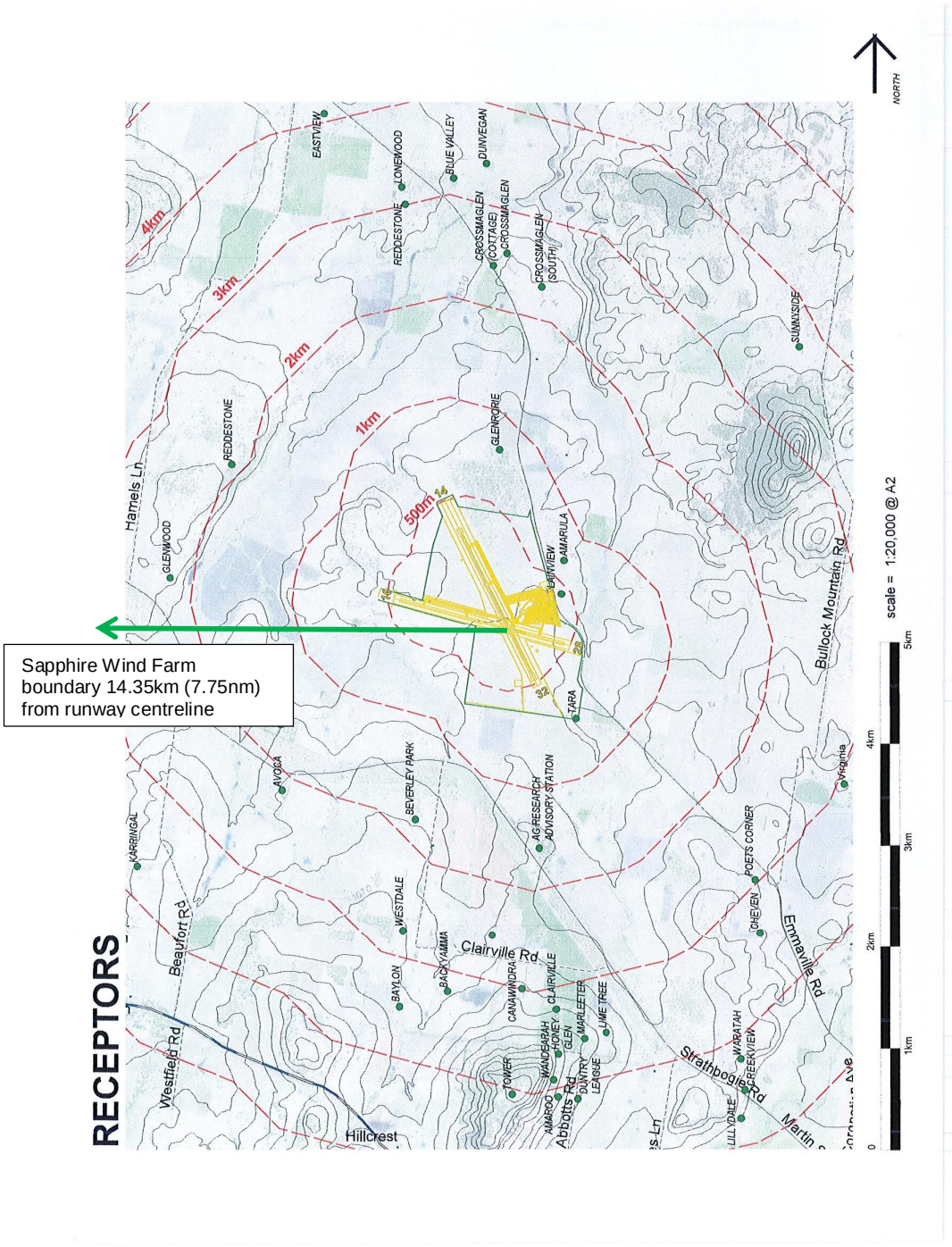
GLENROSE
AMARULA
TARA
GLENWOOD
CLAREVAULX
AVOCA
BEVERLEY PARK
AG RESEARCH ADVISORY STATION
KARRINGAL
WESTDALE
BAYLON
BACKYAMMA
CANAWINDRA
CLAIRVILLE
MARLEETER
LIME TREE
WANDEARAH
HONEY GLEN
DUNTRY LEAGUE
TOWER
AMAROO
POETS CORNER
CHEVIEN
WARATAH
CREEKVIEW
LILLYDALE
Virginia

Noise Receptors



APPENDIX B

Civil Aviation Regulations (1988)

Part 12 Division 3

Visual Flight Rules

Appendix B

Visual Flight Rules

CAR 157 Low Flying[6]

1) The pilot in command of an aircraft must not fly the aircraft over:

   a. Any city, town or populous area at a height lower than 1000ft; or

   b. Any other area at a height lower than 500ft.

   Penalty 50 penalty units

2) An offence against subregulation 1) is an offence of strict liability

3) A height specified in subregulation 1) is the height above the highest point of the terrain and any object on it, within a radius of:

   a. In the case of an aircraft other than a helicopter ï 600 metres; or

   b. In the case of a helicopter ï 300 metres;

   from a point on the terrain vertically below the aircraft.

   3A) Paragraph 1) a) does not apply in respect of a helicopter flying at a designated altitude with an access lane details of which have been published in the AIP or NOTAMs for use by helicopters arriving or departing from a specified place.

4) Subregulation 1) does not apply if:

   a. Through the stress of weather or any other unavoidable cause it is essential that a lower height be maintained; or

   b. The aircraft is engaged in private operations or aerial work operations, being operations that require low flying, and the owner or operator of the aircraft has received from CASA either a general permit for all flights or a specific permit for the particular flight to be made at a lower height while engaged in such operations; or

   c. The pilot of the aircraft is receiving flight training in low-level operations or aerial applications operations within the meaning of Part 61 of CASR; or

   d. The pilot of the aircraft is engaged in a baulked approach procedure, or the practice of such procedure under the supervision of a flight instructor or a check pilot; or

[6] https://www.legislation.gov.au/Details/F2015C00993/Html/Volume_3#_Toc438213033 last accessed 1 April 2016.

e. The aircraft is flying in the course of actually taking off or landing at an aerodrome; or

f. The pilot of the aircraft is engaged in:

   i. A search; or

   ii. A rescue; or

   iii. Dropping supplies;

   In a search and rescue operation; or

g. The aircraft is a helicopter:

   i. Operated by, of for the purposes of the Australian Federal Police or the police force of a State or Territory; and

   ii. Engaged in law enforcement operations; or

h. The pilot of the aircraft is engaged in an operation which requires the dropping of packages or other articles or substances in accordance with directions issued by CASA.

Subregulation 4) a) provides for the pilot, who through poor airmanship has ópressed onô into marginal VMC, to extricate themselves from an unsafe situation. Refer to CAR 171 subregulation 2) below for what a pilot is required to do if they cannot proceed in accordance with the VFR.

The Visual Flight Rules are shown in Civil Aviation Regulations 1988 (CAR) Part 12 Division 3[7].

CAR 171 VFR flight

1) A flight conducted in accordance with the provisions of this Division is classed as a flight under the Visual Flight Rules.

2) Where an aircraft cannot be flown in accordance with the Visual Flight Rules, the pilot in command shall comply with the Instrument Flight Rules contained in Division 4 of this Part, or land at the nearest suitable aerodrome.

   Penalty 25 penalty points

3) An offence against sub regulation 2) is an offence of strict liability.

CAR 172 Flight Visibility and Distance from Cloud

1) The pilot in command of an aircraft must not conduct a VFR flight at a height of,

[7] https://www.legislation.gov.au/Details/F2015C00993/Html/Volume_3#_Toc438213061 last accessed 1 April 2016.

or less than 2000ft above ground or water if:

a. The pilot is not able to navigate by reference to the ground or water; and

b. CASA has not directed that the flight may be conducted at a height of 2000ft or less.

Penalty 50 penalty points.

2) Subject to subregulation 4), the pilot in command must not conduct a VFR flight if:

a. The flight visibility during that flight is not equal to or greater than the applicable distance determined by CASA; and

b. The vertical and horizontal distances from cloud are not equal to or greater than the applicable distances determined by CASA

Penalty 50 penalty points.

2AA) An offence against subregulation 1) or 2) is an offence of strict liability.

2A) CASA may determine applicable distances for the purpose of subregulation 2)

2B) CASA must notify the distances determined under subregulation 2A) in AIP or NOTAMS

3) When determining applicable distances, CASA may do so by reference to class of airspace

4) In spite of subregulation 2) the pilot in command of an aircraft may conduct a special VFR flight if:

a. Air traffic control gives permission for the flight; and

b. The flight is conducted in accordance with any special conditions to which the permission is subject,

5) In this regulation: *special VFR flight* means a VFR flight:

a. Conducted in a control zone; or

b. Conducted in a control area next to a control zone for the purpose of entering or leaving the zone;

When the flight visibility or distances from cloud are less that the applicable distances determined under subregulation 2).

174B VFR flights at night

2) The pilot in command of an aircraft must not fly the aircraft at night under the VFR at a height of less than 1000ft above the highest obstacle located within 10nm of the aircraft in flight if it is not necessary for take-off or landing.

Penalty 25 penalty points

3) The pilot in command of a single engine aircraft must not fly the aircraft at night under the VFR if the flight is not one of the following operations:

a. Private operations;

b. Aerial work operations;

c. Charter operations that do not involve the carrying of passengers for hire or reward;

d. Charter operations that involve the carrying of passengers fro hireor reward if:

i. The operator is approved in writing by CASA to conduct he operations; and

ii. The operations are conducted in a turbine powered aeroplane approved in writing by CASA for the operations.

Penalty 25 penalty points

4) An offence against subregulation 1) or 2) is an offence of strict liability

5) It is a defence to a prosecution under subregulation 1) if CASA gave permission for the flight.

APPENDIX C

Glossary of Terms and Abbreviations

APPENDIX G

AERONAUTICAL STUDY GLOSSARY

To facilitate the understanding of aviation terminology used in this report, the following is a glossary of terms and acronyms that are commonly used in aeronautical impact assessments and similar aeronautical studies. A full list of terms and abbreviations used in this report is included in this Appendix. It should be noted that, within aviation, the International standard unit for altitude is feet (ft.) and distance is nautical mile (nm).

AC (Advisory Circulars) are issued by CASA and are intended to provide recommendations and guidance to illustrate a means, but not necessarily the only means, of complying with the *Regulations*.

Aeronautical study is a tool used to review aerodrome and airspace processes and procedures to ensure that safety criteria are appropriate.

AHD (Australian Height Datum) is the datum to which all vertical control for mapping is to be referred. The datum surface is that which passes through mean sea level at the 30 tide gauges and through points at zero AHD height vertically below the other basic junction points.

AIP (Aeronautical Information Publication) is a publication promulgated to provide operators with aeronautical information of a lasting character essential to air navigation. It contains details of regulations, procedures and other information pertinent to flying and operation of aircraft. In Australia, the AIP may be issued by CASA or Airservices Australia.

Air routes exist between navigation aid equipped aerodromes or waypoints to facilitate the regular and safe flow of aircraft operating under Instrument Flight Rules (IFR).

Airservices Australia is the Australian government-owned corporation providing safe and environmentally sound air traffic management and related airside services to the aviation industry.

Altitude is the vertical distance of a level, a point or an object, considered as a point, measured from mean sea level.

AMSL (Above Mean Sea Level) is the elevation (on the ground) or altitude (in the air) of any object, relative to the average sea level datum. In aviation, the ellipsoid known as World Geodetic System 84 (WGS 84) is the datum used to define mean sea level.

ATC (Air Traffic Control) service is a service provided for the purpose of:

a. preventing collisions:

   1. between aircraft; and

   2. on the manoeuvring area between aircraft, vehicles and obstructions; and

b. expediting and maintaining an orderly flow of air traffic.

CASA (Civil Aviation Safety Authority) is the Australian government authority responsible under the *Civil Aviation Act 1988* for developing and promulgating appropriate, clear and concise aviation safety standards. As Australia is a signatory to the ICAO *Chicago*

Convention, CASA adopts the standards and recommended practices established by ICAO, except where a difference has been notified.

CASR (Civil Aviation Safety Regulations) are promulgated by CASA and establish the regulatory framework *(Regulations)* within which all service providers must operate.

Civil Aviation Act 1988 (the Act) establishes the CASA with functions relating to civil aviation, in particular the safety of civil aviation and for related purposes.

ICAO (International Civil Aviation Organization) is an agency of the United Nations which codifies the principles and techniques of international air navigation and fosters the planning and development of international air transport to ensure safe and orderly growth. The ICAO Council adopts standards and recommended practices concerning air navigation, its infrastructure, flight inspection, prevention of unlawful interference, and facilitation of border-crossing procedures for international civil aviation. In addition, the ICAO defines the protocols for air accident investigation followed by transport safety authorities in countries signatory to the Convention on International Civil Aviation, commonly known as the *Chicago Convention*. Australia is a signatory to the *Chicago Convention.*

IFR (Instrument Flight Rules) are rules applicable to the conduct of flight under IMC. IFR is established to govern flight under conditions in which flight by outside visual reference is not safe. IFR flight depends upon flying by reference to instruments in the flight deck, and navigation is accomplished by reference to electronic signals. It is also referred to as, ña term used by pilots and controllers to indicate the type of flight plan an aircraft is flying,òsuch as an IFR or VFR flight plan.

IMC (Instrument Meteorological Conditions) are meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, less than the minimum specified for visual meteorological conditions.

LSALT (Lowest Safe Altitudes) are published for each low level air route segment. Their purpose is to allow pilots of aircraft that suffer a system failure to descend to the LSALT to ensure terrain or obstacle clearance in IMC where the pilot cannot see the terrain or obstacles due to cloud or poor visibility conditions. It is an altitude that is at least 1,000 feet above any obstacle or terrain within a defined safety buffer region around a particular route that a pilot might fly.

MOS (Manual of Standards) comprises specifications *(Standards)* prescribed by CASA, of uniform application, determined to be necessary for the safety of air navigation.

NASAG (National Airports Safeguarding Advisory Group) set up in May 2010 to implement the Australian Governmentôs National Aviation Policy White Paper, *Flight Path to the Future* initiatives relating to safeguarding airports and surrounding communities from inappropriate development. NASAG comprises representatives from state and territory planning and transport departments, the Civil Aviation Safety Authority (CASA), Airservices Australia, the Department of Defence and the Australian Local Government Association (ALGA) and is chaired by the Department of Infrastructure and Regional Development (DIRD).

NASF (National Airports Safeguarding Framework) is the set of guidelines, adopted in July 2012, developed by NASAG to safeguard airports and surrounding communities.

NOTAMs (Notices to Airmen) are notices issued by the NOTAM office containing information or instruction concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to persons concerned with flight operations.

Obstacles - All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

OLS (Obstacle Limitation Surfaces) are a series of planes associated with each runway at an aerodrome that defines the desirable limits to which objects may project into the airspace around the aerodrome so that aircraft operations may be conducted safely.

PANS-OPS (Procedures for Air Navigation Services - Aircraft Operations) is an Air Traffic Control term denominating rules for designing instrument approach and departure procedures. Such procedures are used to allow aircraft to land and take off under Instrument Meteorological Conditions (IMC) or Instrument Flight Rules (IFR). ICAO document 8168-OPS/611 (volumes 1 and 2) outlines the principles for airspace protection and procedure design which all ICAO signatory states must adhere to. The regulatory material surrounding PANS-OPS may vary from country to country.

PANS-OPS Surfaces - Similar to an Obstacle Limitation Surface, the PANS-OPS protection surfaces are imaginary surfaces in space which guarantee the aircraft a certain minimum obstacle clearance. These surfaces may be used as a tool for local governments in assessing building development. Where buildings may (under certain circumstances) be permitted to penetrate the OLS, they cannot be permitted to penetrate any PANS-OPS surface, because the purpose of these surfaces is to guarantee pilots operating under IMC an obstacle free descent path for a given approach.

Prescribed airspace is an airspace specified in, or ascertained in accordance with, the Regulations, where it is in the interests of the safety, efficiency or regularity of existing or future air transport operations into or out of an airport for the airspace to be protected. The prescribed airspace for an airport is the airspace above any part of either an OLS or a PANS OPS surface for the airport and airspace declared in a declaration relating to the airport.

Regulations (Civil Aviation Safety Regulations)

VFR (Visual Flight Rules) are rules applicable to the conduct of flight under VMC. VFR allow a pilot to operate an aircraft in weather conditions generally clear enough to allow the pilot to maintain visual contact with the terrain and to see where the aircraft is going. Specifically, the weather must be better than basic VFR weather minima. If the weather is worse than VFR minima, pilots are required to use instrument flight rules.

VMC (Visual Meteorological Conditions) are meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, equal or better than specified minima

ABBREVIATIONS

Abbreviations used in this report, and the meanings assigned to them for the purposes of this report are detailed in the following table:

Abbreviation	Meaning
AC	Advisory Circular (document support CASR 1998)
ACFT	Aircraft
AD	Aerodrome
AHD	Australian Height Datum
AHT	Aircraft height
AIP	Aeronautical Information Publication
Airports Act	Airports Act 1996, as amended
AIS	Aeronautical Information Service
ALA	Aircraft Landing Area
Alt	Altitude
AMSL	Above Minimum Sea Level
A(PofA)R	Airports (Protection of Airspace) Regulations, 1996 as amended
APARs	Airports (Protection of Airspace) Regulations, 1996 as amended
ARP	Aerodrome Reference Point
AsA	Airservices Australia
ATC	Air Traffic Control(ler)
ATM	Air Traffic Management
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation
Cat	Category
DAP	Departure and Approach Procedures (charts published by AsA)
DER	Departure End of (the) Runway
DEVELMT	Development
DME	Distance Measuring Equipment
Doc nn	ICAO Document Number nn
DIRD	Department of Infrastructure and Regional Development. (Formerly Department of Infrastructure and Transport)
DoIT	Department of Infrastructure and Transport. Also called ñInfrastructureò (Formerly Department of Infrastructure, Transport, Regional Development and Local Government (DITRDLG) and previously the Department of Transport and Regional Services (DoTARS))
DITRDLG	See DoIT above
DOTARS	See DITRDLG above
ELEV	Elevation (above mean sea level)
ENE	East North East
ERSA	Enroute Supplement Australia
FAF	Final Approach Fix

Abbreviation	Meaning
FAP	Final Approach Point
ft	feet
GA	General Aviation
GNSS	Global Navigation Satellite System
GP	Glide Path
IAS	Indicated Airspeed
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IHS	Inner Horizontal Surface, an Obstacle Limitation Surface
ILS	Instrument Landing System
ISA	International Standard Atmosphere
km	kilometres
kt	Knot (one nautical mile per hour)
LAT	Latitude
LLZ	Localizer
LONG	Longitude
LSALT	Lowest Safe Altitude
m	metres
MAPt	Missed Approach Point
MDA	Minimum Descent Altitude
MGA94	Map Grid Australia 1994
MOC	Minimum Obstacle Clearance
MOS	Manual of Standards, published by CASA
MSA	Minimum Sector Altitude
SSR	Monopulse Secondary Surveillance Radar
MVA	Minimum Vector Altitude
NASAG	National Airports Safeguarding Advisory Group
NASF	National Airports Safeguarding Framework
NDB	Non Directional Beacon
NE	North East
NM or nm	Nautical Mile (= 1.852 km)
nnDME	Distance from the DME (in nautical miles)
NNE	North North East
NOTAM	NOtice To AirMen
OAS	Obstacle Assessment Surface
OCA	Obstacle Clearance Altitude
OCH	Obstacle Clearance Height
OHS	Outer Horizontal Surface
OIS	Obstacle Identification Surface
OLS	Obstacle Limitation Surface
PANS-OPS	Procedures for Air Navigation Services ï Aircraft Operations, ICAO Doc 8168
PRM	Precision Runway Monitor

Abbreviation	Meaning
PROC	Procedure
PSR	Primary Surveillance Radar
QNH	An altimeter setting relative to height above mean sea level
Rnnn	Restricted Airspace ï promulgated in AIP as R with 3 numbers
REF	Reference
RL	Relative Level
RNAV	aRea NAVigation
RNP	Required Navigation Performance
RPA	Rules and Practices for Aerodromes ð replaced by the MOS Part 139 ð Aerodromes
RPT	Regular Public Transport
RWY	Runway
SFC	Surface
SID	Standard Instrument Departure
SOC	Start Of Climb
SSR	Secondary Surveillance Radar
STAR	Standard ARrival
TAR	Terminal Area Radar
TAS	True Air Speed
THR	Threshold (Runway)
TNA	Turn Altitude
TODA	Take-Off Distance Available
VFR	Visual Flight Rules
V_n	aircraft critical Velocity reference
VOR	Very high frequency Omni directional Range