



10th November 2014

Ms Anna Timbrell

Department of Planning & Environment
23-33 Bridge Street,
Sydney, NSW 2000

**Response to Submissions - Application MP 10_0135 Capital II Wind Farm -
Modification 2 (Blade Length)**

Dear Ms Timbrell,

The following report is prepared in response to submissions received regarding the Proponent's application (MP 10_0135) to modify the Capital II Wind Farm Project Approval to increase the wind turbine blade length by 6m.

Summary of Submissions

Thirty eight (38) public submissions and two government submissions were received during the exhibition period. Of the public submissions, one was received from a residence located 3.5km from the nearest wind turbine. A further submission was received by a residence 6.7km from the nearest wind turbine. Beyond that, the submissions received were from residences located 8-65km from the wind farm. The bulk of the submissions received were from residences in the vicinity of the proposed Jupiter Wind Farm, to which the Proponent has no relationship.

Response to Submissions

The below table (Table 1) provides an overview of the submissions received and the Proponents response, which should be read in conjunction with the additional information in Parts 1-5 and the following attachments:

Attachments

Attachment 1- Visual Impact Assessment - Moir Landscape

Attachment 2- Avifauna Impact Assessment – Dr Kevin Mills

Attachment 3- Noise Impact Assessment - Sonus

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Table 1 - Submissions received and individual responses

Submission	Issue	Response
A Gardner (Via Braidwood) Estimated 19 km distance from Capital II Wind Farm	Please refer to the original submission. The following is a summary of the issues raised: 1) <i>How did the proponent arrive at the subset of "potential impacts"?</i> Visual Amenity 2) <i>Who was the environmental consultant who reviewed the impacts on visual amenity?</i> 3) <i>Where is the supporting documentation from the chosen consultant regarding the findings on visual amenity?</i> Flora and Fauna 4) <i>What about the raptors?</i> 5) <i>Does the power increase have any effect?</i> 6) <i>Is there any change in bird activity depending on the water levels in Lake George?</i> 7) <i>Why did the department limit the study to avifauna? Bats?</i> 8) <i>Why is there "very little blade strike" on the Capital wind farm?</i> 9) <i>As the Capital 2 turbines on the shore of Lake George are at an elevation of 680 metres compared to the existing Capital 1 turbines on the ridges (up to 935 metres), surely it is an entirely different environment for "avifauna"</i> 10) <i>The Department requested that "A flora and fauna assessment should be undertaken..." Where is it?</i>	1) In consultation with the Department of Planning and Environment. Visual Amenity 2) Please refer to Additional Information - Part 1. 3) Please refer to Additional Information - Part 1. The submitter is concerned that the modification application relates to the diameter of the existing Capital Wind Farm wind turbines. This modification application only relates to the proposed Capital II Wind Farm. Flora And Fauna 4) Please refer to Additional Information - Part 2. 5) The Proponent is not seeking a power increase as part of this modification. 6) Please refer to Additional Information - Part 2. 7) Please refer to Additional Information - Part 2. 8) This is the predominant outcome for wind farms globally (with a very limited number of exceptions, none of which are located in Australia). Please refer to Additional Information - Part 2. 9) Please refer to the environmental assessment report for Capital II Wind Farm which includes a flora and fauna study. 10) Please refer to the environmental assessment report for Capital II Wind Farm which includes a

	Noise 11) Community Consultation Committee 12) Community Funding 13) Shadow Flicker 14)	flora and fauna study and Additional Information - Part 2. Prior to the commencement of construction of Capital II Wind Farm, the Proponent must prepare and submit for the approval of the Director General, a bird and bat adaptive management program. Noise 11) The Proponent is not seeking any modification to the approved noise conditions of consent. Please refer to Additional Information - Part 3. Community Consultation Committee The Capital Community Committee was established in 2013 (refer to http://www.infigenenergy.com/capital-precinct/community-committee.html). Its activities (including funding allocations) are reported on the Capital Community Consultation facebook page, Infigen's twitter account and local media (including the Bungendore Mirror). Membership consists of representatives from Palerang Council, the Bungendore Chamber of Commerce, Infigen Energy and local residents. Community Funding Contrary to the statements made by the submitter, Infigen Energy has invested considerable sums in the Bungendore community. This includes sealing Taylors Creek Road (in excess of \$2.65 million), acquisition of a new Cat 7 Fire Truck for the Taylors Creek RFS (\$185,000), and significant annual funding which is distributed based on the recommendations of the Capital Community Committee. Beneficiaries since December 2013 are:
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		Bungendore Spring Ball - \$5,000 CWA (Tarago) - \$4,800 Bungendore Tigers womens team - \$10,000 Bungendore Show 2014 - \$2,250 Bungednore Show 2015 - \$1,500 Bungendore High School Committee - \$500 Tarago RFS - \$1,500 Stewart Street Park - \$4,000 Tarago Progress Association (Anzac Day) \$1,010 Bungendore Pre School Christmas Raffle - \$500 Bungendore Christmas Festival - \$2,000 Boro / Mt Fairy Rural Fire Service - \$3,000 Run With The Wind fun run. In addition, Infigen Energy holds the annual 'Run With The Wind' fun run at Woodlawn Wind Farm. All profits from this event are distributed to local causes. By way of example, this year the funds were used to support the Tarago Landcare Groups project to maintain a historic tree lined drive in Tarago, and the provision of funds to the Boro / Mt Fairy RFS. Voluntary Planning Agreement. Finally, a Voluntary Planning Agreement has been executed with the Palerang Council which commits Infigen to provide \$20,000 (plus GST and CPI) per wind turbine installed at Capital II Wind Farm. The funds are to be allocated to the construction of new sports fields for Bungendore.
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		Shadow Flicker 12) Please refer to Additional Information - Part 4.
14 submissions: C Gabler (Mullon), Estimated 15 km distance from Capital II Wind Farm F Patterson (Tarago), Estimated 9 km distance from Capital II Wind Farm G Hajek (Mt Fairy), Estimated 14 km distance from Capital II Wind Farm L Katrivessis (Tarago), 17 km distance from Capital II Wind Farm Name Withheld 111249 (Tarago), Estimated 15 km distance from Capital II Wind Farm Name Withheld 111110 (Tarago), Estimated 15 km distance from Capital II Wind Farm Name Withheld 111122 (Mt Fairy), Estimated 11 km distance	I object to the proposed modification because the longer blades will lead to more noise affecting sleep and in other ways disturbing residents in the vicinity. In addition the increased size of the moving blades will make the turbines more visible and adversely affect visual amenity and property prices. And the increased rotor size will inevitably kill more birds and bats.	Noise The Proponent is not seeking any modification to the approved noise conditions of consent. Please refer to Additional Information - Part 3. Visual Amenity As described in the modification application, no increase to the approved tip height is being sought. As such, to the extent that longer blades are used, the tower height will accordingly be reduced. Please refer to Additional Information - Part 1. Property Prices Please refer to Additional Information - Part 5. Avifauna Please refer to Additional Information - Part 2.

from Capital II Wind Farm B Lowrey (Boro), Estimated 15 km distance from Capital II Wind Farm J Cole (Braidwood), Estimated 42 km distance from Capital II Wind Farm Name Withheld 111479 (Braidwood), Estimated 42 km distance from Capital II Wind Farm Name Withheld 111267 (Mt Fairy via Braidwood), Estimated 12 km distance from Capital II Wind Farm Name Withheld 111177 (Manar), Estimated 19 km distance from Capital II Wind Farm Name Withheld 111413 (Braidwood), Estimated 42 km distance from Capital II Wind Farm Name Withheld 111306 (Mt Fairy), Estimated 11 km distance from Capital II Wind Farm		
K Briggs (Tarago), 15 km distance from	I object to the proposed modification because the longer blades will lead to more noise affecting sleep and in other	Visual Amenity Roseview Road is located 14km to the <u>west</u> of the

Capital II Wind Farm	ways disturbing residents in the vicinity. We have our property on Roseview Road Mt Fairy. The whole of our Eastern view will be taken over by these Wind Turbines, In addition the increased size of the moving blades will make the turbines more visible, the over all noise will increase a lot more too. They are already effecting our property value and having them bigger will just make our property worth pebbles.	proposed Capital II Wind Farm. It is not possible to see any of the proposed wind farm from any residence on this road due to the presence of a very large mountain located immediately to the west of the submitters property. The mountain is approximately 120m higher than the submitters property and approximately 180m higher than the proposed wind farm. This submission appears to be directed at the proposed Jupiter Wind Farm, to which the Proponent has no relationship. Please refer to Additional Information - Parts 1, 3 and 5.
L Martin (Mt Fairy), Estimated 11 km distance from Capital II Wind Farm	I object to the proposed modification because the longer blades will lead to more noise affecting sleep and in other ways disturbing residents in the vicinity. In addition the increased size of the moving blades will make the turbines more visible and adversely affect visual amenity and property prices. And the increased rotor size will inevitably kill more birds and bats. I believe it also unfair to the current residents of this area who objected to the initial stages of Capital Wind Farm. In particular I recall a letter submitted to Department of Planning from a resident of Taylors Creek Road, and made public on such website stating words to the affect of; "I was told I would only see the tips of 2 turbine blades, I was told I wouldnt hear anything, I hear the turbines from all areas of my property and I see a number of towers'. I now feel to add further amenity issues, further noise issues further construction and increased vehicle to an area of residents that have already been subjected to these is unfair and proves a gross disregard to these rural residents and their concerns. The objections and concerns voiced by NSW rural residents faced with the construction of industrial turbines in their area is seen all over our newspapers, on our radios, on	Visual Amenity The submitter appears to reside at least 11km east of the proposed wind farm. The wind turbines will not be visible from this location due to a series of intervening hills and the fact that Capital II Wind Farm is located on low ground. Please refer to Additional Information - Part 1. Noise The Proponent is not seeking any modification to the approved noise conditions of consent. Please refer to Additional Information - Part 3. Avifauna Please refer to Additional Information - Part 2. Letter re Capital Wind Farm The Proponent conducted an extensive search of the Department website and could find no reference to the letter mentioned in this submission. In any event, the Proponent is seeking modification to the proposed Capital

	Department of Planning websites, letters to MPs, to subject residents around Capital Wind Farm to further construction, further heavy traffic, larger turbine blades and increased noise is a blatant disregard to our objections to these projects and associated problems.	II Wind Farm, not the existing Capital Wind Farm.
L DeGraaf (Muloon), Estimated 17 km distance from Capital II Wind Farm	I am objecting to the modification (in addition to the whole project) as it will have a direct impact on our life in a negative way. The increased size of the moving blades will make the turbines more visible and adversely affect visual amenity and dramatically reduce our property price. As it stands in the current proposal our quality of life will be negatively impacted, even more so with larger turbines.	Visual Amenity The submitter appears to reside approximately seventeen (17) kilometres from the nearest proposed wind turbine. It will not be possible to see any part of the wind farm from this location due to a series of large intervening hills. Please refer to Additional Information - Parts 1 and 5.
M Tomlinson (Tarago), Estimated 21 km distance from Capital II Wind Farm	I believe that the Capital Wind Farm II proposal is not appropriate or required for the following reasons: One of the key conclusions that has come out of the recent RET review is that electricity demand over the past few years has been declining and future electricity demand to 2020 can be easily met from current generating capacity. Currently Wind Farms are supplying a large surplus of electricity to the grid and therefore there is no justification for further generating capacity from new turbine construction. If the justification for Capital II Wind Farm is to supply the ACT with electricity then I suggest the ACT can be supplied from existing wind farms in South Australia rather than adding further surplus to the grid. The modification is proposing an increase in turbine size and blade lengths. I believe that this will seriously add to the destruction of visual amenity to the local residents around the wind farm, and will further contribute to the already existing noise, health and sleep deprivation problems that some of the locals are suffering.	Electricity Demand The submitter states Capital II Wind Farm should not be built as existing generation can meet demand. This statement ignores the fact that the National Electricity Market is operated on a competitive, rather than command and control, basis. Those generators that operate with the lowest short run marginal cost (SRMC) are dispatched into the market, at the expense of generators with higher short run marginal costs. Wind farms typically have a very low SRMC and are therefore dispatched ahead of more expensive forms of generation (gas and coal). It is a commercial decision for the less competitive generators to decide whether to stay in the market or retire their generating plant. Supplying surplus electricity to the grid Demand and supply is balanced on a five minute basis within the National Electricity Market. Surplus electricity is not sent into the grid as this would cause the electricity

		network to fail. Supply to ACT The ACT make their own decisions regarding electricity contracting. Visual Amenity Please refer to Additional Information - Part 1. Noise Please refer to Additional Information - Part 3.
M Crawford (Boro), Estimated 15 km distance from Capital II Wind Farm	Please refer to original submission. The grounds for objection are: a. Noise Impact. b. Visual impact. c. Vacuous advice about the impact on avifauna.	Noise Please refer to Additional Information - Part 3. Visual Amenity Please refer to Additional Information - Part 1. Avifauna Please refer to Additional Information - Part 2.
T Hambrook (Braidwood), Estimated 21 km distance from Capital II Wind Farm	We have two property's directly affected by Jupiter wind farm the first we knew of the wind towers was when our real-estate agent called to say the the buyers had pulled out of the sale of one property directly because of the wind farm and a flyer placed on their car, we knew NOTHING of the proposal and had ABSOLUTELY NO CONTACT even though we have lived her for 9 + yrs. Our property value has been cut in half and we now owe mortgages far greater then our as the real estates have called them "unsaleable" property's are worth even if we	Capital II Wind Farm is not associated with Jupiter Wind Farm. This submission takes issue with the proposed Jupiter Wind Farm.

	want to sell up at move which we very much do because of this wind farm and NO other reason we cant as we owe more then we can ever hope to sell our property for making it impossible to buy elsewhere Our two children we had hoped would have something to be proud of and or sell when we pass on to set them up in life we have worked extremely hard for this to happen and now they have nothing but a worthless place with a big mortgage This wind farm has been totally negligent in its absolute refusal to inform land owners of anything that is happening and in its massive efforts to hide everything from those directly affected losing hundreds of thousands of dollars in property value Please help people like us who have worked very hard for a long time to have a little peace of land with some value to pass onto our children we do not live 50 + kms out of town to live next to a construction zone for yrs to come we moved here to get away from the city and all it entails including CONSTRUCTION!!!"	
Name Withheld 111171 (Tarago), Estimated 15 km distance from Capital II Wind Farm	This is an absurd project due to the size of the turbine propellers, and the impact on the wild life and the environment and most of all the devaluation of properties that will not be hosting these monstrosities which is anywhere up to 50% - if these companies want to build these supposed eco friendly structures then the company should compensate the land owners in the vicinities of the turbines to the current market value of the properties.	Environmental Impact This has been dealt with extensively in the original project application and in the modification application. Property Values Please refer to the Additional Information - Part 5.
Name Withheld 111253 (Braidwood),	I object to the increased size of the turbine blades as the visual impact on the community that has to live near and	The submitter appears to reside approximately forty four (44) kilometers from the nearest proposed wind turbine.

Estimated 44 km distance from Capital II Wind Farm	under these industrial farms. The potential of birds and micro bat strike will increase and my neighbours de-valuing of their homes and properties has never been taken into account.	The Proponent does not accept that this submitter's neighbours will be impacted by the proposed modification. Please refer to the Additional Information - Part 5. Visual Impact Please refer to the Additional Information - Part 1. Avifauna Please refer to the Additional Information - Part 2.
Name Withheld 111079 (Boro), Estimated 15 km distance from Capital II Wind Farm	I object to the proposal for the wind turbines to increase in size in any way. The wind turbines built for Capital wind farm 1 are already imposing on local residents and this current proposal for Capital Wind Farm 2 are intending to build even bigger ones. How loud will the bigger turbines be? I believe if there is a real need to build these wind farms, consideration must be given to the residents who suffer their impact. Wind farms should be built where they WILL NOT impact residents in any way. No more approvals should be given for wind farms to develop or modify their applications until there are legislated guidelines in place at the very least. When wind farms can stand alone without needing coal fired power stations to generate base load power, then they may have a use, built in the right locations where they do not reduce property values, divide communities and impact on local residents. At the moment the appear to be a quick ineffective fix to make unaffected citizens feel good about doing something to reduce carbon emissions. Wind Farms are not effective and it would be better to spend the money on research and development of more effective power sources such as solar power.	Noise No change to the noise conditions of consent has been sought. Please refer to the Additional Information - Part 3. Property Values It appears this submitter lives approximately fifteen (15) kilometers from the nearest wind turbine. No evidence is provided regarding the purported impact on property values. Please refer to the Additional Information - Part 5. Stop Consideration of Wind Farm Proposals The submitter requests that all wind farm applications are frozen until legislation is in place to guide their assessment. This legislation already exists. This modification application will be considered in accordance with the NSW Environmental Planning and Assessment Act. Requirement for Base Load Generation Wind turbines do not rely upon coal fired generators to operate. Wind farms convert kinetic energy into electricity. This electricity is then dispatched into the network.

		Greenhouse Gas Emissions The submitter claims that wind farms are an ineffective method of reducing greenhouse gas emissions. South Australia now generates 31% of its electricity demand from wind farms (2014 SA electricity report: http://www.aemo.com.au/Electricity/Planning/South-Australian-Advisory-Functions/South-Australian-Electricity-Report page 21). Since wind farms started to be deployed in that state in large numbers (2006), the Australian Energy Market Operator has reported a 35% reduction in greenhouse gas emissions from electricity generation. South Australian greenhouse gas emissions from electricity generation fell by 7% in FY14 alone. Allocation of capital The submitter states that the Proponent would be better off allocating our capital towards research and development into solar and other forms of electricity generation. The Proponent's parent does indeed undertake this type of research and development. However, the Proponent is free to allocate its capital as it determines is appropriate from time to time.
Name Withheld 111118 (Mt Fairy), Estimated 11 km distance from Capital II Wind Farm	I object to the proposed modification because the longer blades will lead to more noise affecting sleep and in other ways disturbing residents in the vicinity. In addition the increased size of the moving blades will make the turbines more visible and adversely affect visual amenity and property prices. The increased rotor size will inevitably kill more birds and bats. One of the original criteria for the wind farm was to turn off the turbines when certain birds migrate through the farm. No audits are conducted to see if this occurs.	Noise Please refer to the Additional Information - Part 3. Visual Amenity It appears that the submitter resides approximately eleven (11) kilometres from the nearest wind turbine. The proposed wind turbines will not be visible from this location due to a series of intervening hills. Please refer to the Additional Information - in Part 1.

		Property Prices Please refer to the Additional Information - Part 5. Avifauna No requirement to turn off wind turbines was ever proposed for this wind farm, nor is any such provision justified. Post construction audits are a requirement and do form part of the existing conditions of consent. Prior to the commencement of construction of Capital II Wind Farm, the Proponent must prepare and submit for the approval of the Director General, a bird and bat adaptive management plan.
Name Withheld 111134 (Tarago), Estimated 15 km distance from Capital II Wind Farm	I object strongly to the proposed modification because the longer blades will lead to more noise affecting sleep and in other ways such as increase vibrations, disturbing residents in the vicinity. This is a rural area which is being increasingly industriclised with no regard for the locals or the environment. In addition to the noise and vibrational issues, the increased size of the moving blades will make the turbines more visible and adversely affect visual amenity and property prices. The increased rotor size will inevitably kill more birds and bats and noting that the area is known to provide habitat for threatened bird species such as the Glossy Black Cockatoo this is extremely distressing.	Noise No change to the noise conditions of consent has been sought. Please refer to the Additional Information - Part 3. Visual Amenity Please refer to the Additional Information - Part 1. Avifauna Please refer to the Additional Information - Part 2. The Glossy Black Cockatoo was not identified during the bird surveys for the Capital II Wind Farm environmental assessment. The assessment found that this species presence on site would be 'very unlikely' due to 'no habitat present' (the site is treeless). This appears to be a comment directed at the proposed Jupiter Wind Farm, to which the Proponent has no relationship.

A Griffin (Lake George), M Griffin (Lake George), Estimated 6.7 km distance from Capital II Wind Farm	I object to this application because: 1. As a resident who has been impacted by The Capital Wind Farm, I object to any wind farm being this close to residences. It is like living in an industrial area, not a natural environment at all. 2. Pre-construction we were told "we probably wouldn't hear any noise from the turbines" and, unfortunately post construction, we have found that we hear them most of the time and at a level above what is allowable. Mysteriously, any sound monitoring data "went missing". 3. I do not believe that increasing the blade length will not increase noise they produce which is potentially more irritating and stressful for residents. As this is increasing the area of the blades rotating through the air, (larger surface area). 4. This modification does not improve the visual amenity for residents even if the tower height is lower, but the diameter is larger - these things are massive. 5. Longer blades may have a larger flicker effect, which is a common impact at certain times of the year.	Proximity The submitters reside 6.7 kilometres from the nearest proposed wind turbine. Noise No change to the noise conditions of consent has been sought. The submitter claims that the existing Capital Wind Farm is not compliant with its noise conditions of consent. Repeated audits, including that conducted by the NSW Department of Planning, have shown the Capital Wind Farm to be compliant. Please refer to the Additional Information - Part 3. Visual Amenity Visual impact analysis demonstrates that the proposed wind turbines will not be visible from this residence, due to the intervening Hammonds Hill. Flicker Flicker is only possible where the wind turbines can be observed. The wind turbines are not visible from this residence. Further, flicker only occurs over significantly shorter distances, as described in detail in the original project application. Please refer to the Additional Information - Part 5.
C Johnston (Mt Fairy), Estimated 11 km distance from Capital II Wind Farm	I wish to object to the proposed modification as to the increase in Blade Length as this will adversely increase the noise of the turbines once in operation. This will affect residents in the vicinity by affecting sleep and many other health related issues associated with sleep deprivation. This modification will also affect the visual amenity on surrounding properties which in turn also impacts property	Noise No change to the noise conditions of consent has been sought. Please refer to the Additional Information - Part 3. Visual Amenity It appears that the submitter resides approximately eleven (11) kilometres from the nearest wind turbine. The

	values. Another concern would be the impact on the local road system during transportation of these blades and erection equipment needed, as the length of the smaller blades at Capital I wind farm was disruptive and wearing on this narrow secondary road. Therefore to increase the size of the blades would have a detrimental effect on the surrounding residents in this area.	proposed wind turbines will not be visible from this location due to a series of intervening hills. Please refer to the Additional Information - Part 1. Transport Transport impacts were extensively assessed in the environmental assessment. Specific consideration to transportation of the longer blades was also considered in the modification application. A detailed transport management plan must be prepared in consultation with the primary industries division of TIRIS, the council and any other relevant road authority etc... for approval by the Department of Planning.
G Windberg (Roslyn), Estimated 65 km distance from Capital II Wind Farm	The application for approval to increase in blade size should not be approved. Blade materials are made from toxic substances which, when on fire and being dispersed by centrifugal force, require hazmat fire fighting procedures. An extra 12 m is an increase in the danger by 10% which is a significant increase.	The modification request was to increase the blade length by 6 metres, not 12 metres. The issue of fire has been addressed in the original project application. The submitter resides approximately sixty five (65) kilometers from the proposed wind farm.
JA Rovensky (Unknown), Unknown distance from Capital II Wind Farm	After reading an article in The Canberra Times dated 17 October 2014, by Emma Kelly titled 'Australia's biggest blades slated for proposed wind farm' It is clear the writer and the commentator from Clean Energy Council (CEC), an industry promotional body, needed to clarify statements made. They say the largest turbine blades in the UK and Denmark are 80 metres but do not say these are located off-shore, not on-shore and I believe Capital II Wind Farm is not off-shore. Nor do they inform the reader that these blades can travel at 80metres per second or 290km per hour. Surely concern about environmental damage caused by the	Wind Draft There are in excess of 200,000 wind turbines installed globally. The Proponent is unaware of any evidence to suggest 'wind draft' causes environmental damage. Wind Turbine Capacity The Proponent is not seeking a change to the approved capacity of up to 3.5 MW nor to the number of approved wind turbines (41). What is Infigen requesting? The Proponent seeks approval to increase the WTG blade diameter from 'up to 114 metres' to 'up to 126

	wind draft from these massive blades should be considered. Nor does the writer or the CEC adviser mention for an off-shore 3MW turbine in 2011 the foundations weighed in at around 800 tons, so it can be assumed a 6MW would require a larger foundation capacity. What impacts does 800 tons plus have on the environment? Further, off-shore turbines which support these large blades are 6MW not 3MW or 3.5MW. Will Infigen be asking for a change to the MW capacity of the turbines to ensure the larger blades will be able to operate without structural failure to the tower or nacelle? Will they reduce the number of turbines in accordance with an apparent greater capacity bigger blades and possibly greater MW's could possibly produce? If they do increase the MW capacity how heavy will the foundations need to be and what environmental effect will ensue? Why is Infigen requesting larger blades? Exactly what Infigen is requesting and why, needs to be addressed? This information also needs to be made available to the public for their comment. After all it will be the community who will be living with these turbines and unlike off-shore turbines people will be living and working in close proximity to these things. Perhaps, those who will be considering Infigen's request would do well to access and read widely from sources other than those provided by Infigen or the CEC, one of which should be: McMurtry, R.Y. & Krough, C. M. E. (2014). Diagnostic criteria for adverse health effects in the environs of wind turbines. Journal of the Royal Society of Medicine Open , 5(10), 1-5.	metres', whilst remaining within the approved maximum WTG tip height of 157 metres. This would result in each blade being up to 6 metres longer than currently approved, with the blade diameter increasing by up to 12 metres. Why is Infigen requesting larger blades? Significant improvements in WTG technology have occurred since the original Project Approval was received in 2011. WTG technology has evolved towards longer blade lengths to increase generation efficiency and therefore electricity production. The increase in electricity production results in a lower cost of energy and assists the NSW Government meet the objectives of the NSW Renewable Energy Action Plan, 2013 and the NSW 2021 plan of reaching a renewable energy target of 20% by 2020. Request for Public Exhibition This modification request was placed on public exhibition during the period from the 16th - 30th October 2014.
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R Gordon (Bungendore), Estimated 10 km distance from Capital II Wind Farm	This is a closely settled rural community with those living here having chosen to do so for the beautiful natural surroundings. It wasn't expected to be forced to live in a semi industrial zone with wind turbines dominating the landscape. With capital wind farms there is enough wind turbines for one district. Additional turbines will compound the environmental impact and further degrade the natural splendour of this district with corresponding impact on rural land values. Why should the residents be further imposed upon for political and corporate gain. You can bet that if these turbines were proposed for Sydney or Canberra there would be a massive outcry against the visual pollution. Surely common sense and fairness would say enough is enough for one district.	Visual Amenity The proposed wind farm is not visible from the submitter's residence. Please refer to the Additional Information - Part 1. Additional Turbines The submitter argues that additional wind turbines will have a negative impact on the environment and property values. The Proponent is not seeking consent for any additional wind turbines. Please refer to the Additional Information - Part 5.
R Corrigan (Tarago), 3.5 km distance from Capital II Wind Farm	I am opposing the application to increase the blade length of the Capital 2 windfarm on 3 grounds. 1. The greater blade length will increase the noise emanating from the turbines when operating. I live between Capital 1 and Woodlawn windfarms and am frequently woken at night by excessive noise from each of these operations. During the day depending on the wind direction noise is also clearly audible. Increasing the length of the blades must increase the noise levels. Modelling carried out by the proponent does not take into account the particular cumulative effect of the turbines or the particular conditions at each house. 2. The spurious claim that increased blade length will not lead to visual impact cannot be supported. The existing turbines dominate the whole skyline, if thicker towers and longer blades are allowed there can be no doubt that they will be more visible. At least one property close to the present windfarm has been valued at a greatly decreased rate by local estate agents.	Noise No change to the noise conditions of consent has been sought. The operational noise of the existing Capital and Woodlawn Wind Farms has been audited by the NSW Government and found to be compliant. The submitter states that the use of longer blades 'must' increase noise levels. This is incorrect. Each wind turbine model generates differing levels of noise due to varying characteristics found throughout each wind turbine model. These unique characteristics are taken into account when designing the wind farm. The Proponent undertook to comply with the noise conditions of consent in the original application and remains committed to complying with those noise conditions. The noise conditions of consent were determined having regard to the cumulative effects of the proposed and

	3. Effects on avifauna will be considerable, especially as the rotor blades are so much longer and the turbines are to be located closer to the lake shoreline. Bird counts which I have participated in over the last 3 years have shown increasing numbers and diversity of water birds using Lake George which is a refuge for these birds when inland waters are dryer. Over the last two years large numbers of freckled ducks have been observed on the lake over many months, at times numbering over 500 birds. As well pink eared ducks (up to 1000) and wading birds such as red necked avocets (over 1000) have been present for lengthy times. These and other water bird species fly between Lake George and Lake Bathurst in the east, putting them at increased risk of blade strike, when they need to negotiate differing blade sizes. Little eagles are seen in the vicinity of the eastern side of Lake George and their range would not be limited to the area away from the turbines. Since capital 1 has been operating there has been to my knowledge no public information regarding bird or other fauna surveys undertaken by the proponent which means it is impossible for the local community to gauge the effects of the installation on wildlife.	existing wind turbines. Please refer to the Additional Information - Part 3. Visual Amenities The submitter is concerned by the prospect of the use of thicker towers <u>and</u> longer blades. This is a misunderstanding of the proposed modification. In order to facilitate the longer blades within the fixed maximum tip height of 157m, the tower height will necessarily need to be reduced. Within a fixed height, as the blades get longer, the tower must get shorter and the nacelle lower. The tower and nacelle is materially more visually identifiable than the blades. Please refer to the Additional Information - Part 1. Property Values The submitter claims that a property near an existing wind farm has been valued at 'a greatly decreased rate by real estate agents'. No explanation is given as to who the real estate agent is, the address of the property, its relative position to the proposed wind farm, the purpose for which the agent was valuing the property, the robustness of the valuation, the baseline of the valuation and factors affecting the valuation. It is therefore not possible to comment on this property. However, it is noted that the submitter has misunderstood the visual impact (the submitter assumes towers were to be increased in size). Please refer to the Additional Information - Part 5. Avifauna The submitter is under the impression that the proposed wind turbine locations are being moved closer to Lake George. This is incorrect. The modification application
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		relates only to the proposed extension of the wind turbine blades by 6 metres. It is pleasing to hear that bird populations are increasing in the area since the 90 wind turbines of Capital Wind Farm and Woodlawn Wind Farm commenced operation. The issue of birds travelling between Lake George and Lake Bathurst has been examined as part of the Capital II Wind Farm environmental assessment, as well as the EA for Capital Wind Farm and Woodlawn Wind Farm. Whilst we do not rely on anecdotal reports to assess the health of local bird populations, it is encouraging to hear that the populations of various water bird species appear to be increasing. This correlates well with the various assessments undertaken into this issue. Bird studies have commenced on site. The results of these studies will be incorporated into the bird and bat adaptive management program which will be submitted for the approval of the Director General prior to construction. Please refer to the Additional Information - Part 2.
Name Withheld 111469 (Tarago), Estimated 8 km distance from Capital II Wind Farm	We are very worried that the increase in blade length will mean an increase in noise! I read with interest that there is no guarantee that the increased length will not mean additional noise - in some cases it may, in others it may not! I also note that the report relating to noise was based on turbines other than those manufactured and used at Capital Windfarm - is that because they are known for being inferior and possibly noisier (including the cooling fans!) when compared to those the report was based on?	Noise No change to the noise conditions of consent has been sought. The Proponent stands by the undertaking made in the original application and statement of commitments. Please refer to the Additional Information - Part 3. Wind Turbine Selection The wind turbines at Capital Wind Farm are suited to a Class II wind regime. The wind regime at Capital II Wind Farm is a Class III site (i.e. lower wind). Therefore, the most appropriate wind turbine for the site is likely to be

	We were guaranteed to never hear the turbines in the first place - as told personally by David Griffin originally in the initial planning stage - to hear them as regularly as we do is very upsetting! The idea of hearing them even more is even more unsettling!	different to that used at Capital Wind Farm.
Name Withheld 111270 (Mt Fairy), 10.7 km distance from Capital II Wind Farm	This submission is on behalf of myself and my wife, Marie Alaimo. We object to the proposed modification. We already experience noise from the current turbines which are 3km to our west. Our concern is the longer blades will lead to more noise. In addition the increased size of the moving blades will make the turbines more visible and adversely affect visual amenity and may effect property prices.	This residence is over ten (10) kilometres from the nearest proposed wind turbine. Noise No change to the noise conditions of consent has been sought. Please refer to the Additional Information - Part 3. Visual Amenity As described in the modification application, no increase to the approved tip height is being sought. As such, to the extent that longer blades are used, the tower height will necessarily be reduced. Please refer to the Additional Information - Part 1. A visual impact analysis demonstrates that the proposed wind turbines are not visible from this residence (747 m ASL) due to an intervening hill 2,800 m to the west (813 m ASL) and the fact that the wind turbines are generally at about 690 m ASL (>10km west).
Name Withheld 111265 (Tarago), Estimated 15 km distance from Capital II Wind Farm	I wish to lodge my strong objection to this proposal. The larger turbine blades proposed will have an extremely negative impact on the residents of the local area. These impacts include greater noise from each individual turbine leading to greater impacts on nearby residences who are forced to hear this 24 hours a day, 7 days a week. Aside from the underlying health issues the turbines cause, just the	Noise No change to the noise conditions of consent has been sought. Please refer to the Additional Information - Part 3. Visual Amenity As described in the modification application, no increase

	stress and sleeplessness this noise will cause local residents is unacceptable. Another major impact is the negative visual affect the larger blades will have. The turbines will stand out even more as a blight on the beautiful landscape and send local property prices even further down than they already are.	to the approved tip height is being sought. As such, to the extent that longer blades are used, the tower height will necessarily be reduced. Please refer to the Additional Information - Part 1.
Name Withheld 111263 (via Braidwood), Estimated 42 km distance from Capital II Wind Farm	I oppose the Capital II Wind Farm modification on the basis of inadequate decommissioning plans. As was common some years ago, decommissioning plans were given scant attention. This is particularly true in this case. In the approval (Instrument), the Department naively believes that, decades down the line, the then owner of the wind farm will decommission the wind farm. Where addressed, developers rely heavily on the scrap value of the towers (whatever that may be in 25 years) to pay for the decommissioning. Smaller towers, as proposed here, would indicate that the decommissioning and rehabilitation plans should be addressed in detail. The original approval (01/11/11) was made under the then rules and guidelines. However, the Planning Assessment Commission in rejecting the Gullen Range modification said on October 2, 2014: “Although this is a modification application to an already approved wind farm, the Commission considers it should have regard to the intent and spirit of the draft guidelines in determining this application.” The NSW Wind Farm Guidelines have a clear and extensive section on decommissioning and rehabilitation (D&R). The developer is required to include a D&R Plan which includes amongst other items, the estimated cost of dismantling and the proposed funding arrangements for that cost to be met. As this cost will amount to many millions of	Decommissioning The Proponent is not seeking to amend the decommissioning requirements. The increased blade length will have negligible effect on decommissioning procedure and decommissioning costs. The Proponent is required to comply with the decommissioning requirements contained in Part G of the conditions of consent.

	dollars (\$103 mill - \$115 mill for Liverpool Range), it is important that the taxpayer is not left to fund it. The Guidelines do allow for the Department to impose the requirement for a bond for an inadequate D&R plan. By definition, anything based on forecasts 25 years into the future will be inadequate. Given: - Infigen's stated desire to sell the Capital Wind Farm complex. - Infigen's ongoing losses - The market's assessment of their performance, a bond is unsuitable and should be replaced with a bank guarantee. In summary: - The application should be rejected until a detailed D&R plan in accordance with the Guidelines is submitted. - A D&R bank guarantee be insisted upon as a condition of approval - This plan and any others additions required by the Department should be available for comment for 14 days - As this modification, others already approved, and I note, a new one on Transmission Line relocation, make the current overall proposal nothing like the original approved Capital 2 wind farm, this modification must be approved by the PAC.	
Australian Industrial Wind Turbine Awareness Network	Noise- Low Frequency Noise	Noise Please refer to the Additional Information - Part 3.

Submission	Issue	Response
Transport Roads &	A traffic management plan (TMP) must be developed in	As part of the CEMP required under condition C13,

Maritime Services	consultation with RMS Southern Traffic Operations Unit and Wollongong City, Wollondilly Shire, Wingecarribee Shire, Goulburn Mulwaree and Palerang Local Council Traffic Committees. The TMP (and associated traffic control plans) shall be submitted to all relevant Local Council Traffic Committees for final acceptance. A copy of the accepted TMP shall be forwarded to RMS prior to any transportation occurring or works commencing on the site for this development.	the Proponent shall prepare and implement a Traffic Management Protocol (condition C14) to outline management of traffic conflicts that may be generated during construction and operation of the project. The plan shall address the requirements of the RMS, the primary industries division of TIRIS, the council and any other relevant road authority.
Office of Environment and Heritage	Impacts on avifauna Impacts on bats List of at risk species	Avifauna Please refer to the Additional Information - Part 2.

Additional Information

Part 1 – Visual

There are 29 properties located within a 5km radius of Capital II Wind Farm, 16 of those properties are owned by wind farmers. The remaining 13 properties not owned by wind farmers range in distance from 2.55km to 4.56km to the nearest WTG location.

A majority of submissions raised concerns about the visual impact of the proposed modification. It is worth noting that of these submissions, only one lives within a 5km radius of Capital II Wind Farm (at 3.5km). It appears that none of the other submitters can see the wind farm at all.

A visual impact assessment was completed as part of the Environmental Assessment for Capital II Wind Farm. As part of this assessment three viewpoints from a total of eighteen were considered to have a moderate visual impact, while the remaining viewpoints were considered to have a low visual impact.

Moir Landscape has provided a visual impact assessment for the proposed modification which is included at Attachment 1.

To review the likely impact on residences within a 5km radius of Capital II Wind Farm a viewpoint (WF03) was assessed for visual impact. WF03 is located at a distance of 1.6km to the nearest WTG location and is included for reference in the Moir assessment. It can be concluded from this viewpoint, a 6m blade increase at this distance (1.6km) is unlikely to have any perceivable impact on views at non-associated receptors.

At a distance of 2.55 km (the closest non-associated receptor) the additional 6m would not be perceivable relative to the approved blade length and therefore have no impact on views at non-associated receptors.

Part 2 - Avifauna

Birds

Dr Kevin Mills has provided further analysis including the 3% of bird observations above 20m and this has been included as Attachment 2.

Dr Mills has provided data that determines 2% of observations were recorded at heights between 20-50m and that 1% of observations were recorded at heights above 50m. At heights of 31m and 43m above the ground (the difference in blade base height between the approved and proposed modification) there is no difference in the range of birds that fly between both of these zones. Between 20m-31m and 20m-43m, 2% of observations took place, so regardless of the modification in blade length there is the same potential impact on bird strike.

Bats

As part of the Environmental Assessment for Capital II Wind Farm an assessment of bat fauna concluded that bat activity is low in the project area. From the ten species that were recorded around the operational wind farm, none were considered in any threat category, with the exception of the Eastern Bentwing Bat that contributed to 0.4% of the activity. The turbine areas at the Capital II Wind Farm are in open

pasture, so it can be expected that there would not be a high level of bat activity throughout the year in this area. The bat assessment found that “Capital Wind Farm II will be constructed in habitat (tree-less open pasture) that is renowned as being very poor for bat foraging and provides no roost sites for tree dwelling or cave roosting bats”. A 7-part test of significance of potential impacts of the proposal revealed that no local population of the threatened species recorded in the project area would be impacted by the proposal.

Prior to the commencement of construction of Capital II Wind Farm, the Proponent must prepare and submit for the approval of the Director General, a bird and bat adaptive management program.

Part 3- Noise

A majority of submissions raised concerns about the potential noise impact of the proposed modification. It is worth noting that out of these submissions only one is located within a 5km radius of Capital II Wind Farm (at 3.5km).

Sonus has provided further information and analysis for the potential noise impacts for the proposed modification, which can be found as Attachment 3.

Part 4-Shadow Flicker

As part of the Environmental Assessment for Capital II Wind Farm a shadow flicker assessment was undertaken using both the existing Capital I and proposed Capital II Wind Farm wind turbines to illustrate the cumulative impacts. The analysis was based on a high impact scenario of 55 wind turbines at a height of 157 metres.

That assessment found that seven homesteads are likely to be affected by shadow flicker as shown in Table 2. Of these seven homesteads, five are located within the shadow flicker zone currently established by Capital I. Two new properties will be affected by the extent of shadow flicker associated with Capital II Wind Farm. These two properties likely to be affected by the shadow flicker are both wind farmers and are therefore classified as non-relevant receivers.

Table 2 - Effects of shadow flicker on nearby residences

Residence	Hours per year affected	Wind Farm	Wind Farmer
E02	>31	Capital I	Yes
E03	>31	Capital I	Yes
E04	11-13	Capital I	Yes
E05	1-3	Capital I	Yes
G01	>31	Capital II Wind Farm	Yes
G04	20-30	Capital II Wind Farm	Yes
G07	24-25	Capital I	Yes

Source- Environmental Assessment Capital II Wind Farm

It is also worth noting that as part of the conditions for consent (B7) shadow flicker must not exceed 30 hours/annum at any residences not associated with the project.

Verification of the ability to achieve this shall be provided to the Director-General as detailed under condition C 14k.

Part 5- Property Prices

A large number of statistically relevant studies have been conducted on the topic of wind farms and property prices. This issue has been addressed in the original project application. The Proponent also provides the following additional information.

As the Clean Energy Council reports, "The most comprehensive study so far conducted on this issue was a decade-long project by the Lawrence Berkeley National Research Laboratory in 2009 in the United States. Researchers collected data on almost 7500 sales of single-family homes situated within 10 miles of a wind facility across nine different US states, and found no negative relationship between wind turbines and property values. The study found *"neither the view of the wind facilities nor the distance of the home to those facilities is found to have any consistent, measurable, and statistically significant effect on home sales prices"*."

Meta-analysis conducted by the Energy and Policy Institute in the US produced the following summary of known property value studies:

Year	Organization	Geography	Transactions	Findings	Method	Reliability
2014	Cebr and RenewableUK	UK	1,043,000	No impact	regression analysis	High
2014	UGuelph	Ontario, Canada	7,004	No impact	hedonic analysis	High
2014	Uconnecticut, LBNL	Massachusetts, USA	122,000	No impact	hedonic analysis	High
2013	LBNL	USA	50,000	No impact	hedonic analysis	High
2013	URhode Island	Rhode Island, USA	48,554	No impact	hedonic analysis	High
2012	UNew Hampshire	New Hampshire, USA	4,600	No impact	hedonic analysis	High
2010	Uillinois	Illinois, USA	3,851	No long-term impact	hedonic analysis	High
2009	LBNL	USA	7,500	No impact	hedonic analysis	High
2009	NSW Valuer General	Australia	45	No impact	case study	Low
2007	RICS	UK	919	No impact	hedonic analysis	Moderate
2003	REPP	USA	25,000	No impact	regression analysis	High
Total			1,312,473			

Year	Organization	Geography	Transactions	Findings	Method	Reliability
2013	Reardon Appraisal	New South Wales, Aus	15	Negative impact	Paired sales analysis	Low
2013	Lansink Appraisals	Ontario, Canada	12	Negative impact	Paired sales analysis	Low
2013	E.ON Energy Research Center	Germany	1,405	Negative impact	hedonic analysis	moderate
2012	McCann Appraisals	Indiana, USA	13	Negative impact	paired sales analysis	Low
2012	UWisconsin	New York State, USA	11,331	Negative impact	hedonic analysis	moderate
2009	Gardner Appraisals	Texas, USA	7	Negative impact	paired sales analysis	Low
2009	McCann Appraisals	Indiana, USA	68	Negative impact	invalid statistical method	Low
Total			12,851			

The full report is available at:
http://www.energyandpolicy.org/property_values_not_hurt_by_wind_energy



David Griffin
 GM Development

Attachment 1- Visual Impact Assessment: Moir Landscape

Attachment 2- Avifauna Impact Assessment: Kevin Mills

Attachment 3- Noise Impact Assessment Sonus



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10th November 2014

Rachel Drury
Development Manager
Infigen Energy
Level 22, 56 Pitt Street
Sydney NSW 2000

Re: Application MP 10_0135 Capital II Wind Farm - Modification 2 (Blade Length)

Dear Rachel,

The following provides an assessment of the potential visual impact resulting from Application MP 10_0135 Capital II Wind Farm - Modification 2 (Blade Length).

1 Introduction

1.1 Qualifications and Experience

I hold a degree of Bachelor Of Landscape Architecture and I am a Registered Landscape Architect (No.1103) with the Australian Institute of Landscape Architects (AILA).

For the past 17 Years I have practiced as a Landscape Architect in the fields of Landscape Design, Urban Design, Landscape Planning and Landscape & Visual Impact Assessment. For the past 14 years I have been the Director of Moir Landscape Architecture, a Newcastle, NSW based Landscape Architecture and Urban Design practice.

To date I have undertaken the Landscape and Visual Assessment of five wind farms as well as numerous large scale energy, infrastructure and development projects. Moir Landscape Architecture prepared the Landscape and Visual Impact Assessment for Capital II Wind Farm which formed part of the approved submission.

In 2013 I was appointed as an Expert Witness to VCAT regarding the Cherry Tree Wind Farm. In 2012 I participated as a member of a four person working party assisting the NSW Department of Planning and Infrastructure in reviewing and redrafting the NSW Wind Farm Guidelines, specifically in the area of Landscape and Visual Assessment.

1.2 Background

It is understood Infigen Energy received approval from the NSW Planning and Assessment Commission for the construction and operation of Capital II Wind Farm on the 1st of November 2011. Approval was granted for 41 wind turbine generators (WTGs) with a maximum blade tip of 157 metres. This includes a blade diameter of up to 114 metres and a tower height of up to

100m. The proponent seeks approval to increase the WTG blade diameter from 'up to 114 metres to 'up to 126 metres'. To the extent a longer blade diameter is used, the tower height will be reduced to ensure the tip height remains within the approved 157m.

1.3 Persons assisting with this work

I have been assisted throughout all facets of the preparation of this advice by Ashley Rathgen B.L.Arch RLA (Senior Landscape Architect with 5 years experience in Landscape and Visual impact Assessment).

2 Assessment

2.1 Methodology

To assess the variation in the appearance of the wind turbines, two photomontage comparisons have been prepared. Photomontage 01 illustrates the northern group of WTGs from Western Leg Road (off Taylors Creek Road), a publicly accessible minor road within 2km of the proposed northern group of the Capital II Wind Farm. Photomontage 2 illustrates the southern most group of WTGs from Currandooley Road to (off Tarago Road).

Due to the limited time frame photomontages have been prepared using terrain modelling in Google Earth. Studies undertaken into the accuracy of Google Earth data have indicated that it is generally accurate within 2 metres on both the vertical and horizontal planes. Although not sufficient accuracy for detailed design the accuracy is more than adequate for this type of assessment. Considering the distance of views and scale of the subject, variations of this extent would be very difficult to discern without survey equipment.

2.2 Findings

- Photomontage 01A (refer to Sheet 1) provides an indicative photomontage illustrating the proposed northern group of WTGs with the approved 57 metre blade length (114 metre diameter) and a 100 metre tower (overall blade tip height of 157 metres).
- Photomontage 01B (refer to Sheet 1) provides an indicative photomontage illustrating the proposed northern group WTGs with the modified 63 metre blade length (126 metre diameter) and a 94 metre tower (overall blade tip height 157 metres).
- Photomontage 02A (refer to Sheet 3) provides an indicative photomontage illustrating the proposed southern group of WTGs with the approved 57 metre blade length (114 metre diameter) and a 100 metre tower (overall blade tip height of 157 metres).
- Photomontage 02B (refer to Sheet 3) provides an indicative photomontage illustrating the proposed southern group of WTGs with the modified 63 metre blade length (126 metre diameter) and a 94 metre tower (overall blade tip height 157 metres).
- Due to the viewing distance Sheet 2 and Sheet 4 provide zoomed and cropped images of photomontages 01 and 02.

Regardless of the variation in the blade length, with a blade tip height of 157 metres, the proposed wind turbines will be a prominent element in the landscape character. The assessment has been undertaken in this context and seeks only to determine the extent of variance in visual impact as a result of the alteration of the blade and tower length.

It is evident from the photomontages that the landscape character of the viewpoint does not vary between the approved and modified sizes. Any variation in height is difficult to discern, particularly in the context of the broader view as depicted in Photomontages 01A, 01B, 02A and 02B.

3 Conclusion

In the context of the determination that the visual impact associated with the approved sized WTGs was acceptable it is in my opinion that the variation in impact with the modified WTGs is negligible and should be considered acceptable.



Kind regards,

David Moir B.L.Arch RLA

Director

Moir Landscape Architecture

Attachments:

Sheet 1: Photomontages 01A and 01B

Sheet 2: Photomontages 01C and 01D

Sheet 3: Photomontages 02A and 02B

Sheet 4: Photomontages 02C and 02D



PHOTOMONTAGE 1A PROPOSED 57m BLADE & 100m TOWER OVERALL HEIGHT OF 157m (BASED ON APPROVED WTG)



PHOTOMONTAGE 1B PROPOSED 63m BLADE & 94m TOWER - OVERALL HEIGHT OF 157m (BASED ON MODIFICATION)

PHOTOMONTAGE 01: WESTERN LEG ROAD

LOCATION	Western Leg Road	View from Western Leg Road (off Taylors Creek Road) looking in a generally west direction towards the proposed northern group of WTGs associated with Capital II Wind Farm.
COORDINATES	35° 5.333'S 149° 29.854'E	
ELEVATION	707m	Photomontage 01A illustrates the proposed WTGs with a blade length of 57m and a tower height of 100m (overall WTG height of 157m).
VIEWING DIRECTION	Generally West	
DISTANCE TO NEAREST TURBINE	Approx. 1,678m	Photomontage 01B illustrates the proposed WTGs with a blade length of 63m and a tower height of 94m (overall WTG height of 157m).

LEGEND

Proposed Wind Turbines

Existing Wind Turbines

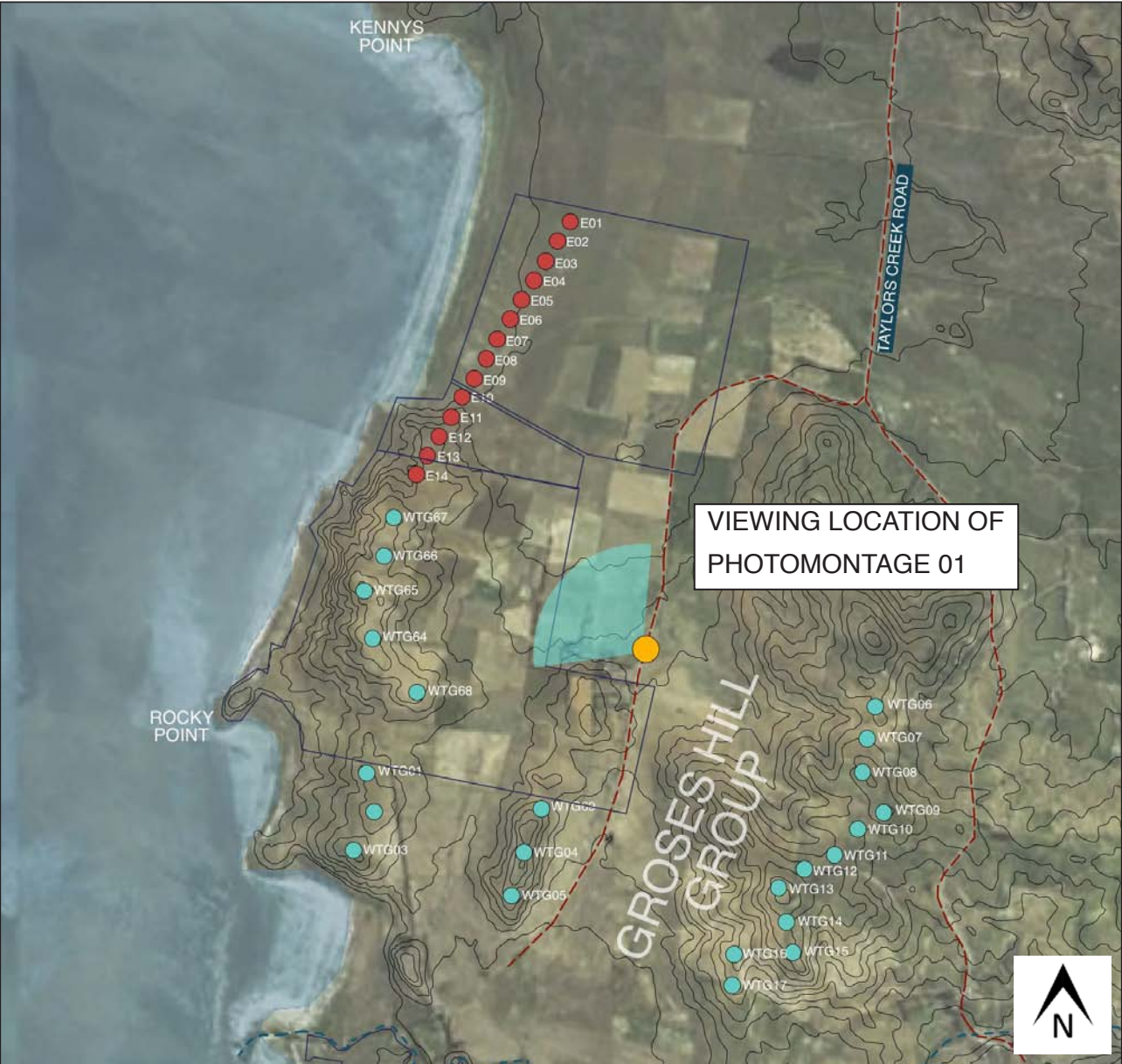
Minor/Access Road

Existing Contours

Residence

Property boundary

Viewpoint Location



PHOTOMONTAGE 01 LOCATION

EXISTING WTG67 ASSOCIATED WITH CAPITAL I WIND
FARM - GROSES HILL GROUP

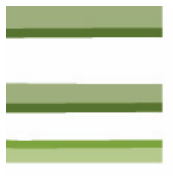


PHOTOMONTAGE 1C (ZOOMED AND CROPPED FROM PHOTOMONTAGE 01A) PROPOSED 57m BLADE & 100m TOWER OVERALL HEIGHT OF 157m (BASED ON APPROVED WTG)

EXISTING WTG67 ASSOCIATED WITH CAPITAL I WIND
FARM - GROSES HILL GROUP



PHOTOMONTAGE 1D (ZOOMED AND CROPPED FROM PHOTOMONTAGE 01B) PROPOSED 63m BLADE & 94m TOWER - OVERALL HEIGHT OF 157m (BASED ON MODIFICATION)



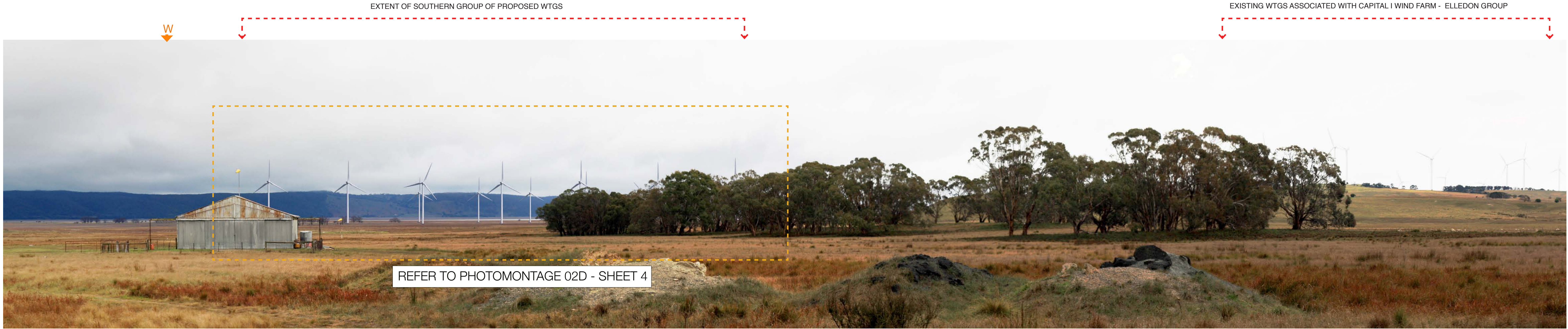
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PHOTOMONTAGE 01

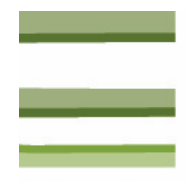
PHOTOMONTAGE 01: WESTERN LEG ROAD		
LOCATION	Western Leg Road	Photomontage 01C and 01D have been zoomed and cropped from Photomontages 01A and 01B.
COORDINATES	35° 5.333'S 149° 29.854'E	
ELEVATION	707m	Photomontage 01C illustrates the proposed WTGs with a blade length of 57m and a tower height of 100m (overall WTG height of 157m).
VIEWING DIRECTION	Generally West	
DISTANCE TO NEAREST TURBINE	Approx. 1,678m	Photomontage 01C illustrates the proposed WTGs with a blade length of 63m and a tower height of 94m (overall WTG height of 157m).



PHOTOMONTAGE 2A PROPOSED 57m BLADE & 100m TOWER OVERALL HEIGHT OF 157m (BASED ON APPROVED WTG)



PHOTOMONTAGE 2B PROPOSED 63m BLADE & 94m TOWER - OVERALL HEIGHT OF 157m (BASED ON MODIFICATION)



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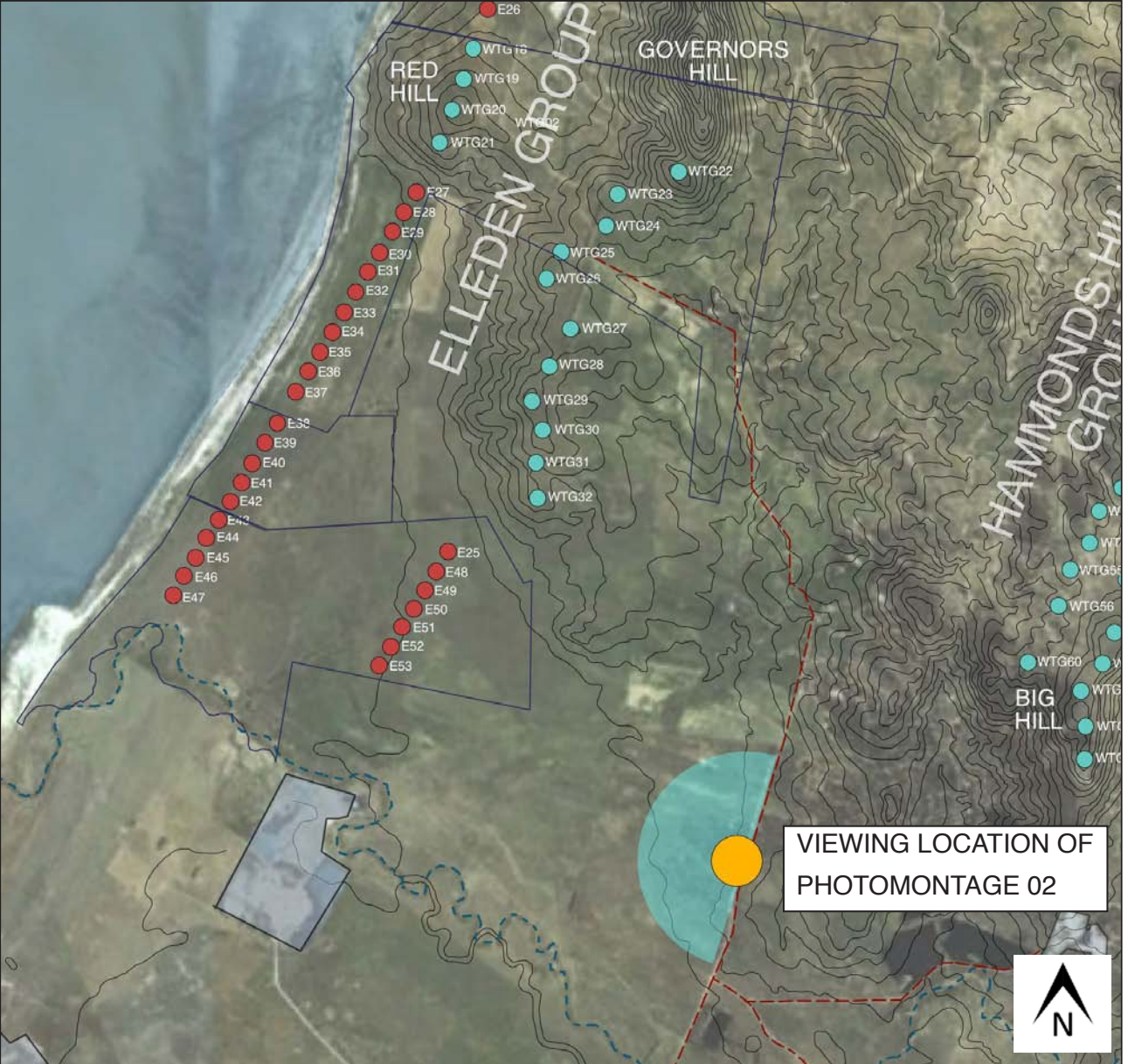
PHOTOMONTAGE 02

PHOTOMONTAGE 01: CURRANDOOLEY ROAD

LOCATION	Currandooley Road	View from Currandooley Road (off Tarago Road) looking in a generally west direction towards the proposed southern group of WTGs associated with Capital II Wind Farm.
COORDINATES	35° 11.138'S 149° 29.515'E	
ELEVATION	699m	Photomontage 02A illustrates the proposed WTGs with a blade length of 57m and a tower height of 100m (overall WTG height of 157m).
VIEWING DIRECTION	Generally West	
DISTANCE TO NEAREST TURBINE	Approx. 2,675m	Photomontage 02B illustrates the proposed WTGs with a blade length of 63m and a tower height of 94m (overall WTG height of 157m).

LEGEND

- Proposed Wind Turbines
- Existing Wind Turbines
- Minor/Access Road
- Existing Contours
- Residence
- Property boundary
- Viewpoint Location



PHOTOMONTAGE 02 LOCATION



PHOTOMONTAGE 2C (ZOOMED AND CROPPED FROM PHOTOMONTAGE 02A) PROPOSED 57m BLADE & 100m TOWER OVERALL HEIGHT OF 157m (BASED ON APPROVED WTG)



PHOTOMONTAGE 2D (ZOOMED AND CROPPED FROM PHOTOMONTAGE 02B) PROPOSED 63m BLADE & 94m TOWER - OVERALL HEIGHT OF 157m (BASED ON MODIFICATION)



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SHEET 4 ISSUE A 06.11.14

PHOTOMONTAGE 02

PHOTOMONTAGE 02: CURRANDOOLEY ROAD		
LOCATION	Western Leg Road	Photomontage 02C and 02B have been zoomed and cropped from Photomontages 02A and 02B.
COORDINATES	35° 11.138'S 149° 29.515'E	
ELEVATION	699m	Photomontage 02C illustrates the proposed WTGs with a blade length of 57m and a tower height of 100m (overall WTG height of 157m).
VIEWING DIRECTION	Generally West	Photomontage 02C illustrates the proposed WTGs with a blade length of 63m and a tower height of 94m (overall WTG height of 157m).
DISTANCE TO NEAREST TURBINE	Approx. 2,675m	

RESPONSE TO LETTER FROM DEPARTMENT OF ENVIRONMENT AND PLANNING REGARDING INFORMATION OF BIRDS AT CAPITAL WIND FARM

Kevin Mills & Associates

November 2014

Following the application by Infigen Energy to modify the approved wind turbines on the Capital II wind farm, the Department of Environment and Planning sought further information; the following is an extract from their letter.

“Whilst attachment 2 (ecological assessment) states that “[t]he surveys on Capital found that 97% of all bird observations were below 20 metres”, the remaining 3% should be addressed in the ecological assessment, including the species likely to be above the 20 metres. Also, information to address potential impacts on bats must be included.”

Several submissions have also been received by the Department expressing concern about the impact of blade strike on birds.

The Attachment 2 referred to above is our letter of June 2014, which summarised our bird survey results on the Capital Wind Farm in 2004 and 2010. The relevant extract from the 2010 report is provided here at Appendix 1.

The few birds that fly above 20 metres can be divided into those that fly individually and those that flock. The former includes the Wedge-tailed Eagle and Australian Raven, while the latter includes the Sulphur-crested Cockatoo. While many birds will fly above 20 to 30 metres on occasions, their primary level of activity is below 20 metres.

The OE&H submission provided a list of birds that they say fly at rotor height. We note that these are all very common rural birds and none are threatened. The Department also listed nine species of diurnal birds of prey, only one of which, the Little Eagle, is listed as threatened. The 12 waterbirds listed are common and widespread and not threatened, although two species recorded on Lake George are noted.

Although detailed data on blade strike is not extensive in Australia, it seems to be the case that the issue in this country is generally not significant. There are obviously certain locations where wind turbines should not be constructed, such as at mountain passes where bird movements are high and on wetlands that support large numbers of water birds. Such locations overseas have provided a very negative picture of the potential for impact on birds, which has been transferred to Australia without proper local assessments.

The following conclusions are made in relation to the above matters.

- The few bird species that were recorded flying above 20 metres are common and widespread species.

- At 31 and 43 metres above the ground (the difference in blade tip height) there is no difference in the range of birds that fly between both of these zones. Between 20m-31m and 20m-43m, 2% of observations took place, so regardless of the modification in blade length there is likely to be the same risk of bird strike.
- Birds of prey are often mentioned as being susceptible to blade-strike. This appears to be based largely on overseas experience of poorly placed wind turbine arrays. Observations locally suggest that birds of prey readily avoid the rotating blades. For example, it is not unusual to see Wedge-tailed Eagles flying amongst rotating turbines.
- It is accepted that many birds may fly at rotor height on occasion. Our view is that risk to threatened or other important species is a matter of probability. The evidence to date seems to be that blade strike is not a significant issue for such species.
- The following condition of consent applies to Capital II: “prior to the commencement of construction the proponent must prepare and submit for the approval of the director general a bird and bat adaptive management program which takes account of bird/bat monitoring methods identified in the current editions of AusWEA best practice guidelines” It is understood that the first bird surveys have taken place from 13th October 2014.
- The data that a monitoring program will provide will be useful in formulating future strategies for the placement of wind turbines in the landscape.

Appendix 1

Extracts from report by KMA (2010)

Targeted bird counts at 12 counts spread throughout the Capital Wind Farm site undertaken in 2004 and 2010 recorded 893 observations of 49 species over a total observation time of 20.8 hours. The results of these surveys are provided in **Table 3**.

Table 3
Summary of bird survey data

Count No.	Time (mins)	No. species	Height Class (No. of birds)				
			Ground	<10m	10-20m	20-50m	>50m
2004							
1	60	12	4	13	5	1	3
2	60	9	9	9	2	2	-
3	50	9	5	10	4	2	-
4	40	8	18	6	-	-	-
5	30	8	12	2	2	-	3
6	60	11	14	4	2	2	-
7	45	12	6	7	3	1	-
8	30	12	11	5	2	1	-
9	60	18	1	19	3	1	-
2010							
1	360	21	na	184	7	6	-
2	300	22	na	176	40	2	2
3	150	16	na	250	18	4	-
All Sites	1245 mins 20.8 hrs	49 -	90 (87%)	685 (10%)	88 (2%)	22 (1%)	8 (1%)

The results of the bird surveys indicate that of the 893 individual bird observations, 87% were observed below 10 metres in height. Few birds fly higher than 50 metres from the ground, representing less than one percent of observations (8 birds out of 893 observations). Larger birds of prey are the main birds seen at higher levels. The only species observed flying above 50 metres in the current study was the Wedge-tailed Eagle. Those species previously observed flying above 50 metres were the Wedge-tailed Eagle and Australian Raven (KMA 2005).

Bird Survey Results**Location: Whole of area associated with Capital Wind Farm Stage 2.****Date: 28.04.10****Time: 09.30 to 15.30 (6 hours)**

Species	0-10 m	10-20 m	20-50 m	>50 m
Australasian Grebe	2 (dams)			
Australasian Pipit	20			
Australian Kestrel		1		
Australian Magpie	15	2		
Australian Raven	13	2	1	
Australian Shelduck	2 (dams)			
Australian Wood Duck	64 (dams)			
Brown Falcon	2			
Common Starling*	183			
Crested Pigeon	11			
European Goldfinch*	1			
Flame Robin	Pair			
House Sparrow*	1			
Magpie-lark	2			
Pacific Black Duck	40 (dams)			
Sulphur-crested Cockatoo			5	
Superb Fairy-wren	3			
Welcome Swallow		2		
White-faced Heron	1			
Willie Wagtail	2			
Yellow-rumped Thornbill	5			

Location: Whole of area associated with Capital Wind Farm Stage 2.**Date: 29.04.10****Time: 10.30 to 15.30 (5 hours)**

Species	0-10 m	10-20 m	20-50 m	>50 m
Australasian Grebe	6 (dams)			
Australasian Pipit	17			
Australian Magpie	44			
Australian Raven	12			
Australian Wood Duck	67 (dams)			
Chestnut Teal	2 (dam)			
Common Starling*		160		
Crested Pigeon	1			
Diamond Firetail	5			
European Goldfinch*	5			
Flame Robin	4			
Galah	18			
Grey Fantail	1			
Grey Teal	2 (dam)			
Little Raven	50	40	2	
Magpie-lark	4			
Pacific Black Duck	6 (dams)			

Silvereye	20	
Superb Fairy-wren	4	
Wedge-tailed Eagle		2
Willie Wagtail	9	
Yellow-rumped Thornbill	4	

Location: Whole of area associated with Capital Wind Farm Stage 2.

Date: 14.05.10

Time: 10.00 to 12.30 (2.5 hours)

Species	0-10 m	10-20 m	20-50 m	>50 m
Australasian Pipit	25	4	2	
Australian Kestrel		1		
Australian Magpie	96		2	
Australian Raven	6			
Australian Wood Duck	32 (dam)			
Black-fronted Dotterel	1 (dam)			
Brown Falcon	1			
Common Starling*	164	30		
Galah	65			
House Sparrow*	1			
Little Raven	6			
Magpie-lark	5			
Pacific Black Duck	2 (dam)			
Welcome Swallow	7	12		
Willie Wagtail	2			
Yellow-rumped Thornbill	2	1		

Infigen Energy
Level 22, 56 Pitt Street
SYDNEY NSW 2000

S4400C5

Attention: Rachel Drury

7 November 2014

Dear Rachel,

**CAPITAL WIND FARM 2
MODIFICATION 2**

Modification 2 seeks to increase the approved wind turbine generator (WTG) rotor diameter for the Capital 2 Wind Farm from “up to 114m” to “up to 126m”.

As part of the modification application process, Sonus was engaged by Infigen to conduct noise modelling on representative WTGs with blade lengths of up to 126m to ensure that the Operational Noise Criteria of the Capital 2 Wind Farm Approval could be achieved.

Sonus correspondence S4400C4 dated 13 August 2014 included the following:

As discussed, an increase in blade length does not necessarily translate into an increase in the noise levels from a WTG. For example, the Senvion 3.4M104 WTG with a rotor diameter of 104m has a documented sound power level of 105.6 dB(A) at its rated power wind speed; whereas the Senvion 3.2M114 WTG with a larger rotor diameter of 114m has a lower documented sound power level of 104.2 dB(A) at its rated power wind speed. There are many other examples where a WTG with a larger blade length has a lower sound power level than the Senvion 3.4M104 WTG such as the Vestas V110, V117 and V126 with rotor diameters of 110m, 117m and 126m respectively and the Siemens SWT3.2 with a rotor diameter of 113m¹, and conversely, there will be examples where the opposite is true. This is because the sound power level of a turbine is the result of many variables, of which blade length is but one.

Therefore, a proposal to increase blade length does not prejudice the ability of a wind farm to secure compliance with its operational noise criteria (as contained in Part E of the Project Approval 10/09150 dated 1 November 2011) subject to a detailed noise assessment based on a representative WTG with an increased blade length, or a revised noise assessment for a final WTG model and layout as required under Condition E3 of the Project Approval.

¹ When removing a 2 dB(A) margin of uncertainty to enable a direct comparison with the Senvion sound power level data.



Submissions have been received on the application for Modification 2 and include the following concerns:

- The correlation between noise and blade length;
- The correlation between noise and rated power;
- The potential to increase vibrations and affect sleep.

Environmental Noise

Condition E1 of the Approval provides the following noise level requirements at nominated non-associated receivers:

Operational Noise Criteria at Non-Associated Receivers (dB(A))

Receiver	Noise Level Criteria (dB(A)) for Integer Wind Speeds at 10m Above Ground						
	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s
G05	35	35	35	36	37	38	40
G06	35	35	35	36	37	38	40
G10	35	35	35	36	37	39	40
G11	35	35	35	36	37	39	40
G12	35	35	35	36	37	39	40
G13	35	35	35	36	37	39	40
G14	35	35	35	36	37	39	40
G15	35	35	35	36	37	39	40
G16	35	35	35	36	37	39	40
G17	35	35	35	36	37	39	40
G18	35	35	35	36	37	39	40
Gundry	35	36	38	39	41	42	43
Roth	35	36	38	39	41	42	43



Noise modelling has been conducted for two representative WTGs incorporating a rotor diameter which is greater than 114m and up to 126m and two representative WTGs with a rotor diameter which is up to 114m. The WTG co-ordinates are provided in Appendix A. The representative WTGs are tabulated below:

Representative WTG	Rotor Diameter (m)
Alstom ECO122, 2.7 MW	122
Senvion 3.0M122	122
Senvion 3.2M114	114
Vestas V110-2.0MW	110

The sound power levels for the WTGs are provided in Appendix B.

Predicted Noise Levels

Noise predictions were conducted using the CONCAWE² noise propagation model which takes into account the influence of distance, topography, absorption and weather conditions. The predictions have been based on the following input conditions which result in the highest noise levels from the wind farm to the non-associated receivers:

- weather category 6 (night with no clouds);
- atmospheric conditions at 10°C and 80% relative humidity;
- wind direction from all WTGs to the particular residence under consideration, even in circumstances where WTGs are located in different directions from the residence; and,
- maximum barrier attenuation of 2 dB.

The predictions were conducted for each integer wind speed ranging from the approximate cut-in wind speed to the approximate rated power wind speed.

² CONCAWE - The oil companies' international study group for conservation of clean air and water – Europe, 'The propagation of noise from petrochemical complexes to neighbouring communities', May 1981.



ECO 122, 2.7M Alstom Wind Turbine

Residence ID	Predicted Noise Level versus Approval (dB(A)) at Integer Wind Speeds													
	4 m/s		5 m/s		6 m/s		7 m/s		8 m/s		9 m/s		10 m/s	
	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion
Non-Associated Receivers														
G05	24	35	30	35	33	35	33	36	33	37	33	38	32	40
G06	21	35	27	35	30	35	30	36	30	37	30	38	30	40
G10	20	35	26	35	29	35	29	36	28	37	29	39	28	40
G11	18	35	24	35	27	35	27	36	27	37	27	39	26	40
G12	19	35	25	35	28	35	28	36	28	37	28	39	27	40
G13	16	35	22	35	25	35	25	36	25	37	25	39	25	40
G14	17	35	23	35	26	35	26	36	26	37	26	39	25	40
G15	17	35	23	35	26	35	26	36	26	37	26	39	25	40
G16	15	35	21	35	24	35	25	36	24	37	24	39	24	40
G17	16	35	22	35	25	35	25	36	25	37	25	39	25	40
G18	14	35	20	35	23	35	23	36	23	37	23	39	22	40
Gundry	10	35	16	36	20	38	20	39	19	41	19	42	19	43
Roth	19	35	25	36	28	38	28	39	27	41	28	42	27	43



Senvion 3 MW Wind Turbine

Residence ID	Predicted Noise Level versus Approval (dB(A)) at Integer Wind Speeds													
	4 m/s		5 m/s		6 m/s		7 m/s		8 m/s		9 m/s		10 m/s	
	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion
Non-Associated Receivers														
G05	29	35	32	35	34	35	34	36	33	37	33	38	33	40
G06	26	35	29	35	31	35	31	36	30	37	30	38	30	40
G10	24	35	28	35	30	35	30	36	29	37	29	39	29	40
G11	23	35	26	35	28	35	28	36	27	37	27	39	27	40
G12	24	35	27	35	29	35	29	36	28	37	28	39	28	40
G13	21	35	24	35	26	35	26	36	25	37	25	39	25	40
G14	22	35	25	35	27	35	27	36	26	37	26	39	26	40
G15	22	35	25	35	27	35	27	36	26	37	26	39	26	40
G16	20	35	23	35	26	35	25	36	25	37	25	39	25	40
G17	21	35	24	35	27	35	26	36	26	37	26	39	26	40
G18	19	35	22	35	24	35	24	36	23	37	23	39	23	40
Gundry	15	35	19	36	21	38	21	39	20	41	20	42	20	43
Roth	23	35	27	36	29	38	29	39	28	41	28	42	28	43



3.2 MW Senvion Wind Turbine

Residence ID	Predicted Noise Level versus Approval (dB(A)) at Integer Wind Speeds													
	4 m/s		5 m/s		6 m/s		7 m/s		8 m/s		9 m/s		10 m/s	
	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion
Non-Associated Receivers														
G05	25	35	29	35	32	35	32	36	32	37	31	38	31	40
G06	22	35	26	35	29	35	29	36	29	37	29	38	29	40
G10	21	35	24	35	28	35	28	36	27	37	27	39	27	40
G11	19	35	23	35	26	35	26	36	26	37	25	39	25	40
G12	20	35	24	35	27	35	27	36	27	37	26	39	26	40
G13	17	35	21	35	24	35	24	36	24	37	24	39	24	40
G14	18	35	22	35	25	35	25	36	25	37	24	39	24	40
G15	18	35	22	35	25	35	25	36	25	37	24	39	24	40
G16	17	35	20	35	23	35	24	36	23	37	23	39	23	40
G17	18	35	21	35	24	35	25	36	24	37	24	39	24	40
G18	15	35	19	35	22	35	22	36	22	37	21	39	21	40
Gundry	12	35	15	36	19	38	19	39	18	41	18	42	18	43
Roth	20	35	24	36	27	38	27	39	26	41	26	42	26	43



Vestas V110-2.0MW Wind Turbine

Residence ID	Predicted Noise Level versus Approval (dB(A)) at Integer Wind Speeds													
	4 m/s		5 m/s		6 m/s		7 m/s		8 m/s		9 m/s		10 m/s	
	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion
Non-Associated Receivers														
G05	25	35	28	35	30	35	30	36	31	37	31	38	31	40
G06	22	35	25	35	28	35	28	36	28	37	28	38	29	40
G10	20	35	24	35	26	35	26	36	27	37	27	39	27	40
G11	19	35	22	35	24	35	24	36	25	37	25	39	25	40
G12	20	35	23	35	25	35	26	36	26	37	26	39	26	40
G13	17	35	20	35	22	35	23	36	23	37	23	39	23	40
G14	18	35	21	35	23	35	23	36	24	37	24	39	24	40
G15	18	35	21	35	23	35	23	36	24	37	24	39	24	40
G16	16	35	19	35	22	35	22	36	22	37	23	39	23	40
G17	17	35	20	35	23	35	23	36	23	37	24	39	24	40
G18	15	35	18	35	20	35	20	36	21	37	21	39	21	40
Gundry	11	35	15	36	17	38	17	39	17	41	18	42	18	43
Roth	19	35	23	36	25	38	25	39	26	41	26	42	26	43

Based on the above, Modification 2 does not prejudice the ability of the Capital 2 Wind Farm to secure compliance with Condition E1 of the Project Approval 10/09150 dated 1 November 2011.

A detailed noise assessment for a final WTG model and layout is required under Condition E3 of the Project Approval as the final pre-construction confirmation of compliance.

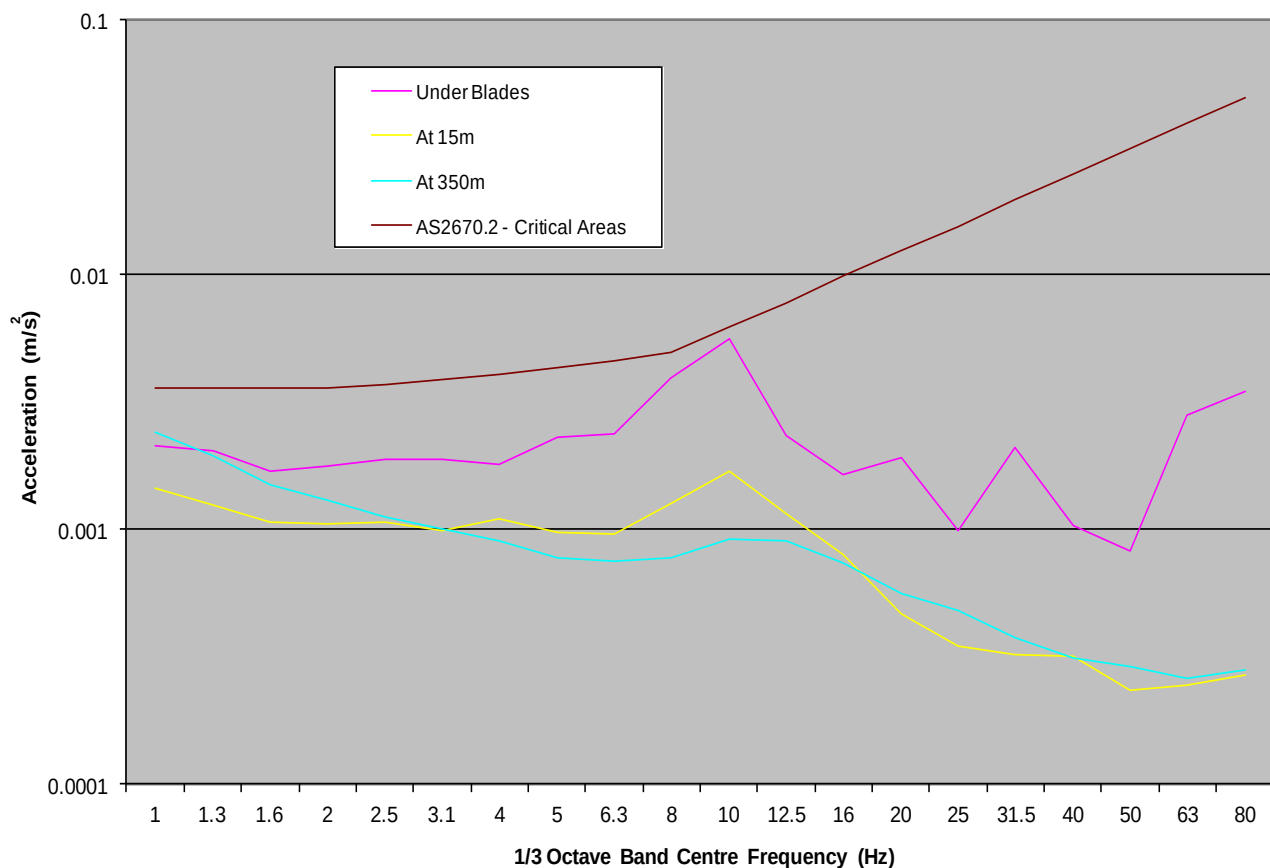


Vibration

Modern wind farms produce very low levels of ground vibration and as such is not the subject of specific assessments required by the authorities.

The ground vibration at the base of a WTG within the Chalicum Hills Wind Farm has been measured at various distances. The graph below compares the measured level of vibration against the recommendation of Australian Standard AS2670.2 for “critical areas” such as operating theatres. The graph indicates that the level of vibration directly below the turbine, at 15m and at 350m was below the recommendation for “critical areas”. At residential distances, the ground vibration from wind turbines would be undetectable.

Comparison of Measured Vibration with AS2670.2





Please call me if you have any questions or require any further information.

Yours faithfully
Sonus Pty Ltd

A handwritten signature in dark ink, appearing to read "Jason Turner", is written over a series of horizontal lines.

Jason Turner
Associate

Encl: Appendix A Page 10
Appendix B Page 11 - 12



APPENDIX A

Wind Turbine Coordinates

WTG ID	Coordinates	
	Easting (m)	Northing (m)
E1	727064	6117207
E2	727014	6116976
E3	726969	6116718
E4	726923	6116495
E5	726811	6116279
E6	726751	6116055
E7	726494	6115961
E8	726255	6115795
E9	726038	6115638
E10	726015	6115342
E11	727100	6112030
E12	727122	6111694
E13	727086	6111436
E14	726004	6111141
E15	725894	6110958
E16	725750	6110719
E17	725606	6110479
E18	725462	6110240
E19	725319	6110001
E20	725175	6109761
E21	725189	6109523
E22	725286	6109247
E23	725224	6108992
E24	724747	6107881
E25	724690	6107661
E26	724506	6107481
E27	724422	6107265
E28	724330	6107056
E29	724272	6106832
E30	724157	6106629
E31	724097	6106405



APPENDIX B

Alstom ECO122, 2.7 MW Wind Turbine Sound Power Levels

Wind Speed 10m above ground (m/s)	SWL (dB(A)) for each Octave Band Centre Frequency								Total SWL (dB(A))
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
4	79.3	86.4	92.0	93.7	92.8	88.0	79.3	65.2	98.5
5	85.3	92.4	98.0	99.7	98.8	94.0	85.3	71.2	104.5
6	88.4	95.5	101.1	102.8	101.9	97.1	88.4	74.3	107.6
7	78.4	95.6	101.2	102.9	102.0	97.2	88.5	74.4	107.7
8	88.2	95.3	100.9	102.6	101.7	96.9	88.2	74.1	107.4
9	88.3	95.4	101.0	102.7	101.8	97.0	88.3	74.2	107.5
10	87.9	95.0	100.6	102.3	101.4	96.6	87.9	73.8	107.1

Senvion 3.0M122 Wind Turbine Sound Power Levels

Wind Speed 10m above ground (m/s)	SWL (dB(A)) for each Octave Band Centre Frequency								Total SWL (dB(A))
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
4	83.5	88.9	95.6	96.5	96.2	91.4	86.9	79.4	101.8
5	86.8	92.2	98.9	99.8	99.5	94.7	90.2	82.7	105.1
6	89.3	94.6	101.2	101.0	99.9	96.4	90.5	78.8	106.5
7	80.7	94.4	101.1	101.3	99.1	96.1	91.2	84.1	106.3
8	86.5	94.2	100.3	100.6	98.6	96.0	92.9	87.2	105.9
9	86.4	94.1	100.2	100.5	98.5	95.9	92.8	87.1	105.8
10	86.4	94.1	100.2	100.5	98.5	95.9	92.8	87.1	105.8



Senvion 3.2M114 Wind Turbine Sound Power Levels

Wind Speed 10m above ground (m/s)	SWL (dB(A)) for each Octave Band Centre Frequency								Total SWL (dB(A))
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
4	81.5	86.9	93.6	94.5	94.2	89.4	84.9	77.4	99.8
5	85.2	90.6	97.3	98.2	97.9	93.1	88.6	81.1	103.5
6	88.9	94.2	100.8	100.6	99.5	96.0	90.1	78.4	106.1
7	88.1	94.2	100.9	101.1	98.9	95.9	91.0	83.9	106.1
8	86.7	94.4	100.5	100.8	98.8	96.2	93.1	87.4	106.1
9	86.4	94.1	100.2	100.5	98.5	95.9	92.8	87.1	105.8
10	86.4	94.1	100.2	100.5	98.5	95.9	92.8	87.1	105.8

Vestas V110-2.0MW Wind Turbine Sound Power Levels

Wind Speed 10m above ground (m/s)	SWL (dB(A)) for each Octave Band Centre Frequency								Total SWL (dB(A))
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
4	81.5	88.2	92.1	93.8	94.2	93.6	89.5	78.7	100.3
5	83.7	91.0	94.9	97.6	98.7	98.3	94.3	83.9	104.4
6	86.2	93.2	97.2	99.9	101.7	101.2	97.3	86.8	107.1
7	87.0	93.4	97.5	100.0	101.9	101.4	97.5	86.7	107.3
8	88.0	93.7	97.9	100.3	102.1	101.6	97.3	86.3	107.5
9	88.5	93.8	98.1	100.6	101.9	101.6	96.8	85.8	107.5
10	88.5	94.0	98.1	100.9	101.7	101.6	96.7	85.6	107.5