MAJOR PROJECT ASSESSMENT:
Sapphire Wind Farm
Northern Tablelands, NSW
(09_0093)

Director-General's
Environmental Assessment Report
Section 75I of the
Environmental Planning and Assessment Act 1979

June 2013

ABBREVIATIONS

CIV	Capital Investment Value
Department	Department of Planning & Infrastructure
DGRs	Director-General's Requirements
Director-General	Director-General of the Department of Planning & Infrastructure
EA	Environmental Assessment
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
EPI	Environmental Planning Instrument
MD SEPP	State Environmental Planning Policy (Major Development) 2005
Minister	Minister for Planning and Infrastructure
Part 3A	Part 3A of the *Environmental Planning and Assessment Act 1979*
PEA	Preliminary Environmental Assessment
PPR	Preferred Project Report
Proponent	Sapphire Wind Farm Pty Ltd
RtS	Response to Submissions

Cover Photograph: A constructed wind farm (Wind Prospect, 2011)

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EXECUTIVE SUMMARY

Sapphire Wind Farm Pty Ltd proposes to construct and operate the Sapphire Wind Farm, consisting of up to 159 wind turbines, with a maximum installed capacity of 319MW. The site is located in the New England Tablelands, 18 kilometres west of Glen Innes, 28 km east of Inverell, within the Glen Innes Severn and Inverell Shire Council areas. The project is estimated to produce approximately 999,363 megawatt hours per annum (MWh), which would provide power for an estimated 136,899 homes in NSW. The project is expected to generate up to 100 construction jobs and up to eight ongoing operational and maintenance jobs and would involve a capital cost of $479 million.

The project is a transitional Part 3A project, and is classified as critical infrastructure under the *Environmental Planning and Assessment Act 1979.* The project is also a 'controlled action' under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and has been assessed under an accredited assessment process between NSW and the Commonwealth. However, the Commonwealth Minister for the Environment maintains a separate approval role for the project.

The project consists of the construction and operation of a wind farm with up to 159 turbines in three clusters, associated infrastructure, and subdivision. The project also includes transmission connection from the main substation to either the TransGrid 330 kilovolt double-circuit transmission line that runs through the Sapphire cluster, or through the TransGrid 132 kilovolt single-circuit overhead transmission line running adjacent to the Gwydir Highway to the south of the project area.

The Environmental Assessment for the project was placed on public exhibition from Wednesday 23 November 2011 until Thursday 1 March 2012 (100 days). The Department received 19 submissions during the exhibition of the EA, nine submissions from public authorities and 10 submissions from the general public and special interest groups. Of the 10 public submissions, five objected to the project, one supported the project and four did not object but raised concerns for consideration in the Department's assessment.

In addition, submissions were received from nine public authorities including: Glen Innes Severn Shire Council, Inverell Shire Council, Office of Environment and Heritage, Border Rivers-Gwydir Catchment Management Authority, Civil Aviation Safety Authority, NSW Health, NSW Trade & Investment, NSW Primary Industries, and NSW Office of Water. No objection to the project was raised subject to conditions and/or comments for the Department's consideration. The Department also consulted with the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) throughout the assessment process and is satisfied that the Commonwealth's issues have been addressed.

Key issues raised in submissions relate to flora and fauna, visual and landscape impacts, noise and vibration and health. A Submissions Report, prepared by the Proponent, addressing the issues raised in submissions, was submitted to the Department and included a Preferred Project Report which identified minor repositioning of access tracks and powerlines. In addition, the Proponent provided three addendums, one withdrawing the Gamesa G87 type turbine from consideration,

a second proposing subdivision of land containing wind farm infrastructure and a third providing an additional ecological assessment.

The Department through the assessment process has made recommendations to improve the project including the deletion of turbines (or acquisition of impacted residences), and implementation of environmental management plans (including an appropriate adaptive bird and bat management plan) to manage potential residual impacts.

The Department has undertaken a comprehensive assessment of the merits of the project, including a detailed review of the project against the Draft NSW Wind Farm Planning Guidelines. Overall, the Department considers that the project would provide a renewable energy source and help meet the energy requirements of the State as well as addressing local demand. The project would also have benefits for local industry and the community, as well as contributing to the challenges of climate change, reliance on fossil fuels and energy supply, and is therefore in the public interest. The Department also considers that all environmental issues have been adequately addressed and can be managed to acceptable levels, and that the project is broadly consistent with relevant provisions of the Draft NSW Wind Farm Planning Guidelines. The Department therefore recommends that the project be approved, subject to the Proponent's Statement of Commitments and the Department's recommended conditions.

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1. BACKGROUND

Sapphire Wind Farm Pty Ltd (the Proponent and a wholly owned subsidiary of Wind Prospect CWP Pty Ltd) proposes to construct and operate a wind farm and ancillary facilities 18km west of Glen Innes and 28 km east of Inverell in the north east of NSW in the Northern Tablelands. The project site covers 14,376 Ha within the Glen Innes Severn and Inverell Shire Council boundaries, and extends over 22 different properties, primarily used for agricultural purposes. The project location is shown below in Figure 1.

Figure 1: Project Location

(Source: Wind Prospect CWP Pty Ltd, 2012)

The project area is of moderate-to-high elevation, between 750m and 1100m above sea level. The turbines are to be located in three general clusters across the project site. The site is adjacent to the Waterloo Range to the east, 5km North West to Kings Plains National Park, 20km North West from Nullamanna National Park, and 30km

South West from Severn River Nature Reserve. Mount Topper State Forest is also located 30km from the site.

The site is located on land zoned 1(a) Rural, with land use in and around the site generally involving commercial agriculture (grazing). The land has predominantly been modified, cleared and grazed over many decades. The site overlaps 12 mineral exploration licences that are either currently valid, under application or are in the process of being renewed.

To the south east of the project site are the proposed Ben Lomond Wind Farm as well as the approved White Rock and Glen Innes Wind Farms.

The project application was made under Part 3A in May 2009. Since then it has been revised following additional modelling and consultation. The project currently comprises of two turbine layouts. Option 1 consists of 159 wind turbines, while Option 2 consists of 125 turbines. It is intended that one or a combination of these two layouts will be used for construction. Two transmission layouts have also been considered. All options have undergone environmental assessment.

2. PROPOSED PROJECT

2.1. Project Description

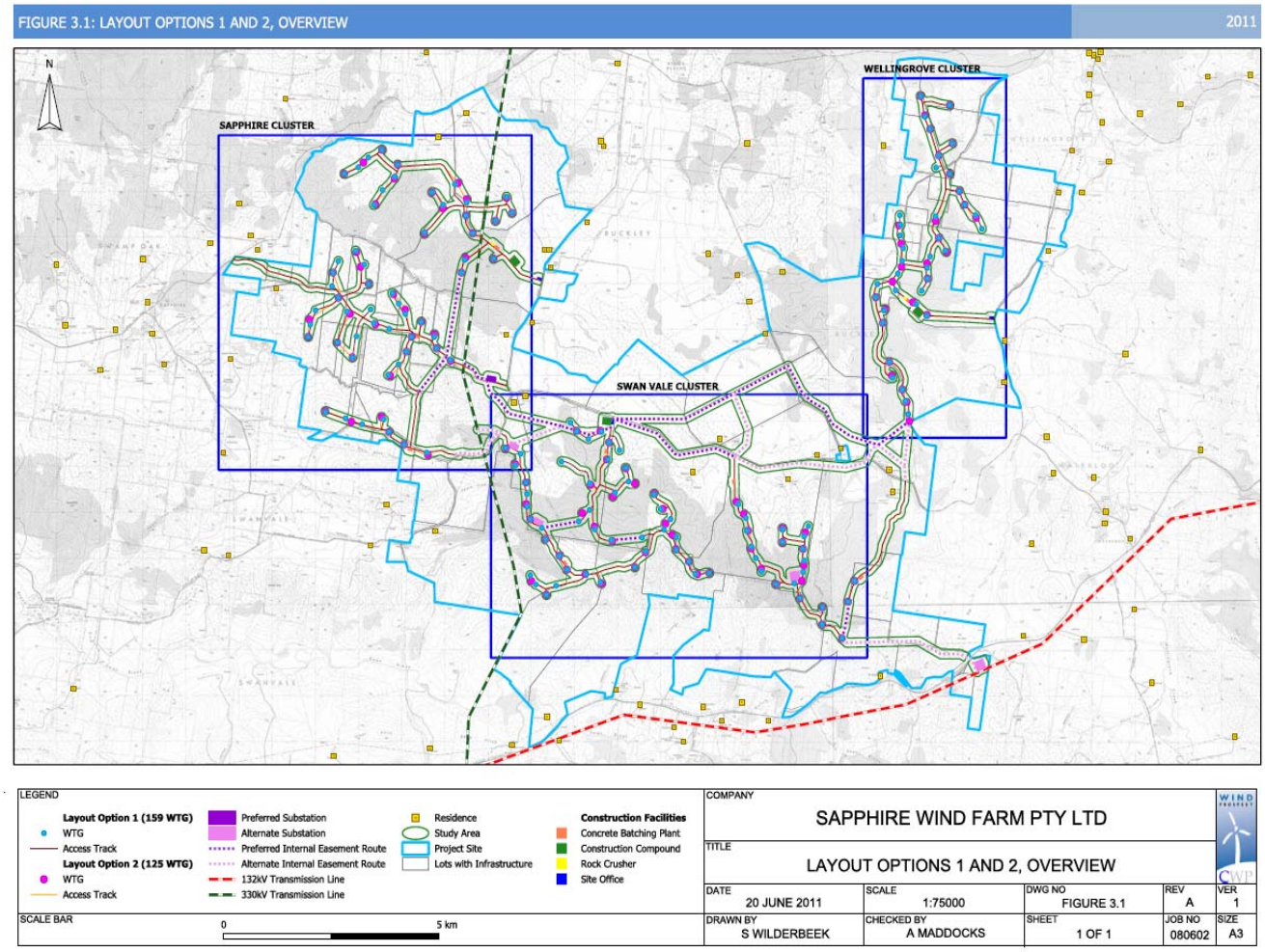
The project involves the construction, operation and maintenance of a wind farm with up to 159 turbines and associated infrastructure, with a total operational capacity of 319 megawatts. Total output is dependent on the final layout selected and the turbine model, which is to be determined through a tender process. The Proponent has sought approval for two different turbine layouts for flexibility during the tendering process, shown in Figure 2. Key components of the project are summarised in Table 1.

Transmission from the project to the grid for distribution will occur through 2 options, to be finalised by the Proponent:

1. Through the TransGrid 330 kilovolt double-circuit transmission line that runs through the Sapphire cluster, or

2. Through the TransGrid 132 kilovolt single-circuit overhead transmission line running adjacent to the Gwydir Highway to the south of the project area.

Figure 2:Project Layout



(Source: Wind Prospect CWP Pty Ltd, 2012)

Table 1: Key Project Components

Aspect	Description
Wind Turbines	The specific model of turbine for the project has not yet been determined. Turbines under consideration vary in generation capacity from 1.5 to 3.4 megawatts. Variation of turbine models across the three clusters may be considered to maximise the wind profile of the area. The potential turbines will be three bladed, semi-variable speed, pitch regulated with a rotor diameter between 80 and 126m. The turbines will have a blade tip height of up to 157m. Each turbine would be attached to a foundation of either a slab, slab and anchor, or mono-pile design depending on geotechnical conditions. A combination of foundation designs may be used. Allowance will also be given to 100m micro-siting.
Generator Transformer	Each turbine would be connected to a local transformer placed either within the nacelle of the turbine or at the base of the turbine. Oil filled transformers may be used, each containing 1000L of oil. Where oil filled transformers are used, appropriate measures will be taken to prevent any oil loss from reaching local water sources.
Main collector and switching substations	A collector and switching substation would be constructed (approximately 100x200m) to step up the voltage to either 132kv or 330kv. The substation will contain one or two 150 or 200 megavolt ampere (MVA) transformers to step up the voltage. Busbars, circuit breakers, isolators, voltage and current transformers and a static compensator-capacitor as agreed with TransGrid will also be installed. The substation would require its own power supply from the local 11kv or 22kv transmission network.
Cluster collector substations	Three 25x25m cluster substations will be placed near the overhead internal transmission lines. Each substation would consist of up to three medium voltage transformers, stepping up to 66kv to minimise onsite electrical reticulation losses.
Facilities building	A facilities building approximately 30m by 6m will be constructed near the substation. It will house instrumentation, electrical and communications equipment, maintenance stores and staff amenities.
Internal overhead and underground electrical reticulation	Above and underground cables would connect the wind farm clusters. Underground cable routes would generally be between turbines and follow the internal access roads. Control cables will join the generators and operational building consisting of optical fibre, twisted pair or multi-core-cable and may be above and underground. Earthing conductor electrodes would be installed in the vicinity of the cables, facilities building and the substation.
Site access and earthworks	Final road design for site access depends on the final turbine selection and the availability of suitable cranes.. Track-mounted cranes require 12m wide roads, whilst tyre-mounted cranes require 6m wide roads. The road would undergo rehabilitation after construction is complete. New access roads between turbines, hardstands and turning head areas will be constructed to allow on-site access. On-site roads will follow farm tracks and traverse ridgelines and plateaus where possible. Hardstands will be surfaced with local stone and vegetation clearance will be avoided where possible.
Concrete batching plant/s	Up to six temporary concrete batching plant locations are proposed to supply concrete and aggregate for the turbine foundations and access tracks during construction. It is unlikely that more than two will be operating at any one time. It would occupy an area of 50x100m, be powered by a diesel generator and produce approximately 40m^3 of concrete per hour.
Rock crushing facility	Up to three 60x50m rock crusher locations are proposed to supply aggregate to foundations and access roads.
Monitoring Masts	Up to six permanent meteorological monitoring masts up to 100m high are proposed to be installed on site to monitor wind conditions.

Aspect	Description
Other temporary project infrastructure	Earth works including construction handstands, site offices and construction compound consisting of storage for tools, materials, vehicles and components will be undertaken during the construction period. One compound will be retained as a permanent lay down area for the life of the project.
Utility services	The project will be connected to TransGrid's 132 or 330kv transmission network and will draw a minor amount of electricity when not generating.
Construction	The construction period is estimated to be between 18 and 24 months.
Subdivision	The development corridor where project infrastructure is to be constructed will be leased from 26 landholders. As the land is to be leased for a period greater than five years, it is deemed to be subdivision pursuant to section 4B(1)(b) of the *Environmental Planning and Assessment Act 1979,* and is therefore included as part of this application.
Capital Investment Value (CIV) and Jobs	The project has an estimated CIV of $479 million and will generate an estimated 100 construction jobs and eight operational jobs.

The turbines are to be located in three general clusters across the project area. The distribution of turbines between the two proposed layouts are summarised in Table 2 below.

Table 2: Turbine Cluster Distribution

Turbine Cluster	No. of turbines (Option 1)	No. of turbines (Option 2)
Sapphire	56	45
Swan Vale	66	51
Wellingrove	37	29
Total	**159**	**125**

2.2. Project Need and Justification

The demand for electricity in NSW has the potential to exceed the existing output unless new generation is brought online. The Australian Market Energy Operator (AMEO) publishes an annual report, the Electricity Statement of Opportunities (ESOO), which is based on forecast energy demand growth consistent with TransGrid's medium growth estimate, among other contributing sources. The forecast has changed slightly in the last few reports. In the 2 March 2012 update to the ESOO, the annual energy and forecast maximum demand have decreased since August 2011. The Department notes the latest 2012 ESOO analysis considers that NSW would not experience low reserve conditions (LRC) for the ten year period considered (prior to 2021-22). The LRC point is the time at which the network reliability standard may not be met, and at which point loadshedding may be required and brown-outs may occur in some areas. Therefore, the quality and reliability of supply will be affected (i.e. increases in brown-out events, severity and duration).

The Department notes that the timing of a generation capacity shortfall in New South Wales has shifted. The Department considers this in itself is sufficient to suggest that a level of caution should be applied to predictions made about events five to ten years into the future. Further, the changing regulatory, policy and market setting for electricity generation in New South Wales and more broadly across the National

Electricity Market is another factor that has the potential to affect future predictions. However, the Department considers it prudent to take a strategic approach to the issue of timing of additional generating capacity by accepting that such additional capacity *may be required* at any point in the period 2014-2022, and that additional generating capacity should be available for implementation within that period, *if required*, rather than conclusively determining a date for implementation at this time. To do otherwise is to fail to recognise that estimates such as the LRC point are not fixed and determinative, but rather reflect the uncertainties inherent in the assumptions around matters such as future market conditions, domestic and global economics, demand management and energy efficiency uptake.

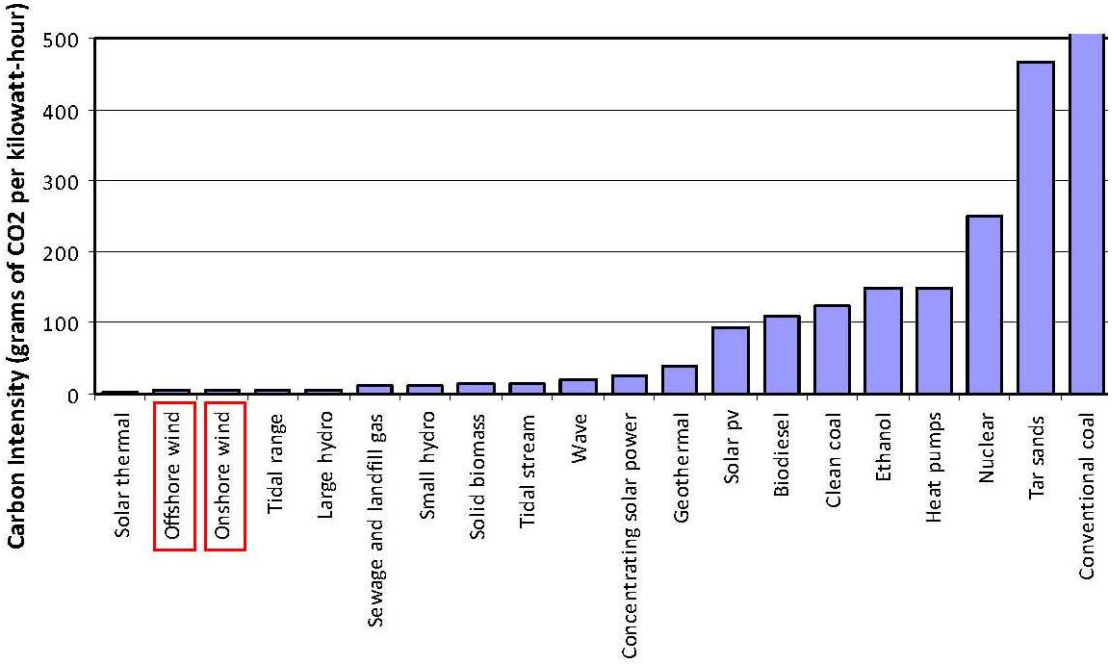
In addition to the identified need to invest in further electrical generation capacity, the State and Federal Governments both promote the generation of electricity from sustainable sources. The Australian Government's Mandatory Renewable Energy Target (MRET) scheme was established in 2001 to expand the renewable energy market and increase the amount being utilised in Australia's electricity supply. The Renewable Energy Target (RET) scheme is an expansion of the MRET and has been established to encourage additional generation of electricity from renewable energy sources to meet the Government's commitment to achieving a 20% share of renewables in Australia's electricity supply in 2020.

The Proponent has identified that the project would help meet the RET targets for renewable energy as well as provide significant greenhouse gas benefits as Australia moves towards a more carbon constrained market. Similarly, the *NSW 2021: A Plan to Make NSW Number One* and the draft *Renewable Energy Action Plan* support the national RET of achieving a target of 20 per cent renewable energy by 2020.

The Department notes the project is estimated to produce approximately 999,363 megawatt hours per annum (MWh), which would provide power for an estimated 136,899 homes in NSW. This project would contribute to the 45,000 GWh national Renewable Energy Target, over the 20 year operational life of the project. The project would also contribute to the integrity of base load supply of electricity in NSW through diversification of power generation sources.

The Proponent has estimated (depending on final output/capacity) the proposal will displace up to an estimated 899,426 tonnes of carbon dioxide per annum while in operation (pursuant to the NSW wind farm greenhouse gas saving tool). The project is also estimated to displace 13,162,338 tonnes of carbon dioxide equivalents over the life of the project.

Figure 3: Typical industrial carbon footprints



(Source: Wind Prospect CWP Pty Ltd, 2012)

In addition to the environmental benefits, the Proponent has predicted the project will provide an economic injection of $477 million into the Australian economy with the potential for further economic benefits at a local level. Further social benefits are claimed by the Proponent through the establishment of a Community Fund (the details of which are yet to be decided by involved stakeholders), employment opportunities, and infrastructure upgrades.

The Department also considers that the proposed wind farm would make a contribution towards offsetting the emissions of CO_2, and other emissions that would otherwise be produced if the equivalent power supply was provided by fossil-fuel combustion. The project would also result in the avoidance of water consumption that would otherwise be used in fossil fuel fired power stations. Figure 3 shows the typical industrial carbon footprints for different types of power stations.

The Department supports the development of wind farms as a form of renewable energy, subject to the suitability of the location of these wind farms. This is consistent with Commonwealth and State policies promoting renewable energies as a means of addressing climate change. It is also consistent with State and Federal Government targets for reducing greenhouse gas emissions of at least 5 per cent below 2000 levels.

The Department considers that in conjunction with relevant demand management and efficiency measures, a diverse mix of generating solutions would provide the most risk-averse method of achieving a secure and reliable electricity supply base for the State, which is resilient to changing market factors including a more constrained carbon market and water restrictions associated with drought. Local embedded generation in regional areas would also result in greater transmission efficiencies (and associated greenhouse gas benefits from reduced transmission losses).

The Department also accepts that the subject proposal would involve a number of direct local benefits including employment generation and opportunities for local landowners to supplement rural income.

On the above basis, the Department considers the proposed Sapphire Wind Farm would have a role in helping to meet the energy requirements of the State as well as in addressing local demand. Further, the Department considers the project if approved would have benefits for local industry and the community, as well as contributing to the challenges of climate change, and reliance on fossil fuels.

3. STATUTORY CONTEXT

3.1. Major Project

The proposal is a major project under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) because it is development of a kind that is described in Schedule 1, Group 8, clause 24 of *State Environmental Planning Policy (Major Development) 2005* namely development for the purpose of a wind electricity generation facility that has a capital investment value of more than $30 million.

Part 3A of the EP&A Act, as in force immediately before its repeal on 1 October 2011 and pursuant to Schedule 6A to the EP&A Act as amended, continues to apply to *transitional Part 3A projects.* Clause 2 of Schedule 6A of the EP&A Act defines *transitional Part 3A projects* and includes projects for which environmental assessment requirements were issued within two years before the repeal of Part 3A, providing the EA is lodged by 30th November, 2012. Consequently, this report has been prepared in accordance with the requirements of Part 3A and associated regulations, and the Minister for Planning and Infrastructure (or his delegate) may approve or disapprove of the carrying out of the project under section 75J of the Act.

Delegations

On 27 February 2013, the Minister for Planning and Infrastructure delegated responsibility for the determination of project applications under Section 75J of the *Environmental Planning and Assessment Act 1979* to the Executive Director, Development Assessment Systems & Approvals where:

- a relevant local council has not made an objection; and
- a political donations disclosure statement has not been made; and
- there are less than 25 public submissions in the nature of objections.

The project has received less than 25 submissions in the nature of objections, the Proponent has not made a political donations disclosure statement and Glen Innes Severn and Inverell Shire Council have not objected to the project, therefore the Executive Director, Development Assessment Systems & Approvals, may determine the proposal under delegation.

3.2. Critical Infrastructure

The project is classified as critical infrastructure in accordance with section 75C of the *Environmental Planning and Assessment Act 1979* by virtue of the former

Minister's declaration of 11 November 2009 relating to renewable energy projects including the Sapphire Wind Farm (MP 09_0093).

3.3. Permissibility of the Project under relevant Environmental Planning Instruments

The site is zoned 1(a) Rural Agriculture pursuant to the Glen Innes Local Environmental Plan (LEP) 1991, and Severn LEP 2002. It was also zoned 1(a) under the Inverell LEP 1988, at the time the application was lodged. Generating works are permitted with development consent within the 1(a) zone. 'Generating Works' are defined as '*a building or place used for the purpose of making or generating gas, electricity or other forms of energy*' under the Environmental Planning and Assessment Model Provisions 1980. This definition encompasses a wind farm development. The Inverell LEP 2012 was gazetted in December, 2012. Under this LEP, the wind farm site is zoned RU 1 Primary Production. Electricity generating works are not permissible in this zone.

However, the *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP) also applies to the project. Division 4 of the Infrastructure SEPP relates to electricity generating works with Clause 34(1) stating that development for the purpose of electricity generating works may be carried out by any person with consent on land in a prescribed zone. Therefore, as the proposal is for the purpose of generating electricity in a prescribed zone (including the RU1 zone) it is permissible with consent.

3.4. Environmental Planning Instruments

There are no other environmental planning instruments that substantially govern the carrying out of the project.

3.5. Objects of the EP&A Act

Decisions made under the EP&A Act must have regard to the objects of the Act, as set out in Section 5 of the Act. The objects are:

(a) to encourage:
- *(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,*
- *(ii) the promotion and co-ordination of the orderly and economic use and development of land,*
- *(iii) the protection, provision and co-ordination of communication and utility services,*
- *(iv) the provision of land for public purposes,*
- *(v) the provision and co-ordination of community services and facilities, and*
- *(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and*
- *(vii) ecologically sustainable development, and*
- *(viii) the provision and maintenance of affordable housing, and*

(b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and

(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

The most relevant objects of Section 5 of the EP&A Act are those under 5(a) in particular those objects under 5(a) (i), (ii), (iii), (vi), (vii) as these objects form key areas of assessment within the environmental impact assessment and are of particular relevance to the eventual determination of the subject project application.

The Department is satisfied that the Proponent has considered the proper management of the environmental, social and economic impacts of the Project, and encourages the orderly and economic use of land and protection of utility services, as well as the consideration of the protection of the environment. These objects are key items for assessment with respect to the proposal and are addressed further in this Report.

With respect to ecologically sustainable development, the EP&A Act adopts the definition in the *Protection of the Environment Administration Act 1991*, including the precautionary principle which is discussed in Section 3.5.

In addition to the above, the agency and community consultation undertaken as part of the assessment process (see Section 4 of this report), address objects 5(b) and (c) of the Act.

Sections 5(a) (iv), (v) and (viii) are not relevant to this proposal as the proposal does not raise significant issues relating to land for public purposes, community services and facilities or affordable housing.

3.6. Ecologically Sustainable Development

The EP&A Act adopts the definition of Ecologically Sustainable Development (ESD) found in the *Protection of the Environment Administration Act 1991*. Section 6(2) of that Act states that ESD requires the effective integration of economic and environmental considerations in decision-making processes and that ESD can be achieved through the implementation of:

(a) the precautionary principle,
(b) inter-generational equity,
(c) conservation of biological diversity and ecological integrity,
(d) improved valuation, pricing and incentive mechanisms.

The Department's assessment of the ecological impacts of the project (section 5.1) is based on a conservative and rigorous assessment of the likely extent of ecological impacts and of likely offset requirements. This is to ensure that appropriate and adequate measures are put in place to prevent the threats of serious or irreversible environmental damage consistent with the precautionary principle and the principle of conservation of biological diversity and ecological integrity. The majority of potential impacts of the proposal are likely to be localised and would not diminish the options regarding land and resource uses and nature conservation available to future generations. The proposal would not require large scale earthworks and impacts to the site would be reversible. The development has significant social and environmental benefits on a local, state and federal level and can be argued to have global environmental benefits on the basis that the project would produce electricity without the production of greenhouse gases. With assessed benefits of the proposal, and the assessed impacts on the environment and their ability to be managed (section 5.1), it is considered that the development would be ecologically sustainable within the context of the above principles.

3.7. Statement of Compliance

In accordance with section 75I of the EP&A Act, the Department is satisfied that the Director-General's environmental assessment requirements have been complied with.

3.8. Environment Protection and Biodiversity Conservation Act

On 31 March 2011, the project was determined to be a 'controlled action' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), as it was considered likely that the project could have a significant impact on relelvent migratory and threatened species and ecological communities listed under sections 18, 18A, 20 and 20A of the EPBC Act (discussed in Section 5.1).

The project has been assessed by way of an accredited assessment process under the EPBC Act. The accredited assessment process provides that the assessment regimes under Part 3A of the EP&A Act are accredited under the EPBC Act. This means that separate assessment processes are not required under both the EPBC Act and the EP&A Act, and the NSW assessment process has been accredited by the Commonwealth. However, the Commonwealth Minister for the Environment maintains an independent approval role, and the Commonwealth provides input to certain stages of the assessment process.

The Department has consulted with the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) throughout the assessment process, and the Department's assessment of Commonwealth matters is detailed in Section 5 of this report.

4. CONSULTATION AND SUBMISSIONS

4.1. Exhibition

Under section 75H(3) of the EP&A Act, the Director-General is required to make the environmental assessment (EA) of an application publicly available for at least 30 days. After accepting the EA, the Department publicly exhibited it from Wednesday, 23 November 2011 until Thursday, 1 March 2012 (100 days) on the Department's website, and at:

- **Department of Planning & Infrastructure**, Information Centre, 23-33 Bridge Street, Sydney;
- **Inverell Shire Council, Administration Centre**, 144 Otho Street, Inverell;
- **Glen Innes Severn Shire Council**, 136 Church Street (Planning Office), Glen Innes;
- **Glen Innes Library,** 71 Grey Street, Glen Innes; and
- **NSW Nature Conservation Council,** Level 2/5 Wilson Street, Newtown.

The Department also advertised the public exhibition in the Sydney Morning Herald, Daily Telegraph, Glen Innes Examiner, Armidale Express and the Tamworth Northern Daily Leader on 23 November 2011, and notified relevant State and local government authorities in writing.

The Department received 19 submissions during the exhibition of the EA, nine submissions from public authorities and 10 submissions from the general public and special interest groups.

A summary of the issues raised in submissions is provided below.

4.2. Public Authority Submissions

Nine submissions were received from public authorities. These included:

- Glen Innes Severn Shire Council;
- Inverell Shire Council;
- Office of Environment and Heritage;
- Border Rivers-Gwydir Catchment Management Authority;
- Civil Aviation Safety Authority ;
- NSW Health;
- NSW Trade & Investment;
- NSW Primary Industries; and
- NSW Office of Water.

All nine public authorities provided comment and recommendations on the project in their respective submissions.

Glen Innes Severn Shire Council does not object to the project subject to compliance with the South Australian Environment Protection Authority's Wind Farms – Environmental Noise Guidelines. Council also requests that the provisions in the Wind Power Generation DCP 2008 and Glen Innes Severn Section 94A contributions plan are considered. In addition, Council requests that consideration is given to incorporating the principles set out in the "*Draft NSW Planning Guidelines Wind Farms"* in the assessment process.

Inverell Shire Council does not object to the project, However, it provided a number of comments including those detailed below.

- Council is satisfied that adequate measures are in place to ensure the integrity of Council's local infrastructure will be maintained during the construction phase of the project.

- Council welcomes the Proponent's voluntary Community Fund and would like the opportunity to meet with the Proponent and Glen Innes Council to discuss its implementation. In addition to the Community Fund Council requests the developer to make S94 contributions.

- Council is satisfied that the Department will include conditions requiring Construction and Operation Environmental Management Plans to be incorporated into any approval.

- Council request appropriate conditions be included requiring design plans, noise impacts and environmental management and mitigation measures be provided to and approved by the relevant consent authority for temporary facilities.

- Pursuant to Council's Development Control Plan –Wind Power Generation 2009 requests a re-design or removing turbines so that turbines do not encroach into the 2km setback from non involved households, or a staged construction so that the turbines within the 2km setback are built last so that more certainty is known about the impacts.

- Council has been contacted by 2 non involved residences known as "Krystal Blue" and "Spring Creek" and requests further justification on the impacts on these two properties prior to the Department making a decision. Council recommends further negotiations between the Proponent and the owners of the property "Spring Creek" and requests that turbines that breach the 2km boundary from non-involved households are justified on a case by case basis.

Office of Environment and Heritage does not object to the project and initially raised concern over the lack of detail to support the assessment of native fauna as well as the adequacy of mitigation measures regarding the risk of bird and bat strikes.

OEH provided the following recommendations:

- The Proponent should be required to ensure all avoidance measures implemented in finalising the location and design of the facility are provided, and justify the level of avoidance implemented.
- The EA should take into account site specific and landscape specific factors including (but not limited to) habitat, topographical features, movement corridors, and weather in assessing impacts on birds and bats, and include genuine consideration of cumulative impacts.
- OEH also commented that subject to successful negotiations with landholders, OEH would most likely be satisfied with the offset package.

Border Rivers-Gwydir Catchment Management Authority does not object to the project and recommend that any rehabilitation, replanting or landscaping use locally native species. In addition they also recommend that the Proponent obtain the more recent 2010 soil data from the Border Rivers Gwydir CMA, and that local representatives from either the Anawain or Glen Innes Local Aboriginal Land Councils are involved in future Aboriginal Cultural Heritage surveys.

The **Civil Aviation Safety Authority** does not object to the project and recommends that the Proponent contact and consult with Air Services Australia and the Aerial Agricultural Association of Australia. This is to assess any potential impacts of the project on aviation practices and assets.

The **Hunter New England Health District** does not object to the project and raised no issues with the project. They recommended that the photomontages of the project are listed on the Proponent's website and noted that they do not believe that there are any health issues associated with the project.

The **Department of Trade and Investment** raises no concern from the perspectives of agriculture, forests, fisheries or energy. However the Department of Trade and Investment is concerned about the impact on mineral exploration and potential future mining. It raised concern regarding Valob Mining Pty Ltd's ability to effectively explore its exploration licence area, and have concerns over potential sterilisation of

resources with regard to the proposed bio banking sites. It expects that prior to the final determination, the Proponent commits to ensuring to ensuring issues and impediments to future exploration or operational activities are avoided or minimised.

Primary Industries (within the wider portfolio of the Department of Trade and Investment) does not object to the project and raised no significant issues with the project. They stated that current concerns of Agriculture NSW will be addressed given that the proposed measures in the EA are adopted.

NSW Office of Water (in the Department of Primary Industries) does not object to the project and noted that the relevant permits must be obtained under the *Water Act 1912* and/or *Water Management Act 2000* prior to undertaking construction. NSW Office of Water requests that the Soil and Water Management Plan be provided to it for review prior to project commencement.

4.3. Public Submissions

Ten submissions were received from the public. This included submissions from the following special interest group, Church Communities Australia, as well as nine submissions from local residents.

Of the 10 public submissions, 5 (50%) objected to the project, 1 (10%) supported the project and 4 (40%) did not object but raised concerns. The key issues raised in public submissions are listed in Table 3.

Table 3: Summary of Issues Raised in Public Submissions

Issue	Proportion of submissions (%)
Biodiversity • Concerns regarding clearing of flora particularly of EEC and impacts on wildlife and fauna.	20
Visual • Impact on landscape character and values; • proximity of turbines from residences; • impact on rural setting; • impact on tourism; and • visual pollution.	50
Traffic and Infrastructure • Inadequate existing road infrastructure; • impact from increased traffic volume as a result of the wind farm; and • not enough detail regarding grid connection and if appropriate permission has been sought.	30
Health and Safety • Potential Impact on health of neighbouring properties; • health impacts on disabled resident (within 1.8km of the closest turbine); and • impact of fires and resultant bushfires.	20
Property Rights, Impacts and Devaluation • Concern over possible reduction in land values; • concern over potential inability to sell as a result of pending wind farm; • the uncertainty of the development restricts current development and sale potential in particular the prohibitive development time frame of 25 years provided by the Proponent; • concern over possible restrictions for future development on properties surrounding the wind farm; and • concern over potential uncertain impact on agriculture, and the ability to effectively farm the land.	20

Issue	Proportion of submissions (%)
Pending Inquiries • No wind farms should be approved until further research has been conducted into the impacts of wind farms as recommended by the Senate Inquiry; and • inquiries should be undertaken into costs to the taxpayer through government subsidies for wind farms.	20
Noise • Impacts of noise on the surrounding community; and • health impacts from noise.	20
Community Consultation and Impact • Lack of consultation with community and non-associated surrounding properties; and • concern over the development splitting the community.	30
Mining and Exploration • Concerned about the impact on mineral exploration and potential future mining.	10

The Department has considered the issues raised in submissions in its assessment of the project.

4.4. Proponent's Response to Submissions

The Proponent provided a response to the issues raised in submissions (see Appendix C). The response included a Preferred Project Report which resulted in minor repositioning of access tracks and powerlines. In addition, the Proponent provided three addendums, one withdrawing the Gamesa G87 turbine from consideration by the Proponent, a second proposing subdivision of land containing wind farm infrastructure and a third providing further ecological assessment.

4.5. Compliance with the Draft NSW Wind Farm Planning Guidelines

The Department has developed *Draft NSW Wind Farm Planning Guidelines* ('the Guidelines'), which were publicly exhibited from 23 December 2011 to 14 March 2012. The Guidelines provide a regulatory framework to guide investment in wind farms across NSW while minimising potential impacts on local communities, and it is intended that the Guidelines will be finalised shortly. The interim arrangements for transitional Part 3A wind farms such as Sapphire Wind Farm and the application of the draft guidelines vary depending on the stage of an application in the assessment process.

As the Sapphire Wind Farm has substantially progressed (the project had been placed on exhibition, but not determined) by the time the draft Guidelines were exhibited, the Proponent had not addressed (in the EA) all of the new requirements of the Guidelines. However, the Department has undertaken a detailed review of the project against the Guidelines and is satisfied that the Guidelines have been substantially addressed, and where gaps have been found, the Department has considered relevant provisions of the guidelines in developing conditions of approval. A detailed analysis of the proposal against the Guidelines is at Appendix E.

5. ASSESSMENT

The Department considers the key environmental issues for the project to be:

- Flora and Fauna (Section 5.1);
- Visual Amenity (Section 5.2);
- Noise and Vibration (Section 5.3); and
- Health Impacts (Section 5.4).

Other issues have been considered in section 5.5 of the report.

5.1. Flora and Fauna

An accredited assessment under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) has been undertaken by the Department to assess any potential matters. A flora and fauna assessment was undertaken by Eco Logical Australia Pty Ltd on behalf of the Proponent.

The assessment involved a literature and desktop review as well as a range of fieldwork surveys between October 2008 and January 2011. Methodologies included mapping of vegetation by type and condition. Targeted surveys were carried out for threatened flora and fauna considered likely to occur or with potential habitat. A variety of sampling techniques were used to specifically target a fauna species.

Biobanking surveys were adopted in February 2009 to allow for Biobanking as an offsetting option. Supplementary information was also provided by the Proponent at the RTS/PPR stage and in response to further questions by the Department throughout the assessment process. The Department is satisfied with the information provided and level of assessment undertaken by the Proponent.

EPBC Act

The Proponent conducted an EPBC Act Significance Assessment for those Matters of National Environmental Significance (NES) considered to have potential to occur within the study area, including those on an additional list within supplementary DGRs. The Proponent's assessment found a number of threatened migratory and threatened species and ecological communities listed under the EPBC Act would potentially be impacted by the proposal, which are discussed below, including those highlighted in the Department's supplementary DGRs. The Proponent's assessment found that a number of other species would not be impacted as they are unlikely to occur on site. The Proponent has justified its conclusion in additional information provided to the Department dated 7 December 2012. The reasoning for individual species considered unlikely to occur included the lack of suitable habitat on site, and the site location being outside the species known distribution.

The Department has consulted with the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) throughout the biodiversity assessment process and is satisfied that its concerns have been adequately addressed.

Flora Review

A total of 394 species of vascular plants were recorded within the study area with 278 native species and 116 exotic species. The Proponent's assessment identified that

there is potential for a number of threatened species to exist on site, however only the following 4 were recorded on site:

- *Bothriochloa biloba* (Lobed Bluegrass) (EPBC Act only);
- *Dichanthium setosum* (Bluegrass) (EPBC & TSC Act);
- *Eucalyptus mckieana* (McKie's Stringybark) (EPBC & TSC Act)*;* and,
- *Thesium australe* (Austral Toadflax) (EPBC & TSC Act).

However, the following threatened flora (EPBC & TSC Act) were not recorded on site, but potential habitat was observed:

- *Acacia pubifolia* (Velvet Wattle);
- *Astrotricha roddii* (Rod's Star Hair);
- *Digitaria porrecta* (Finger Panic Grass);
- *Diuris pedunculata* (Small Snake Orchid);
- *Eucalyptus nicholii* (Narrow-leaved Black Peppermint); and
- *Picris evae* (Hawkweed).

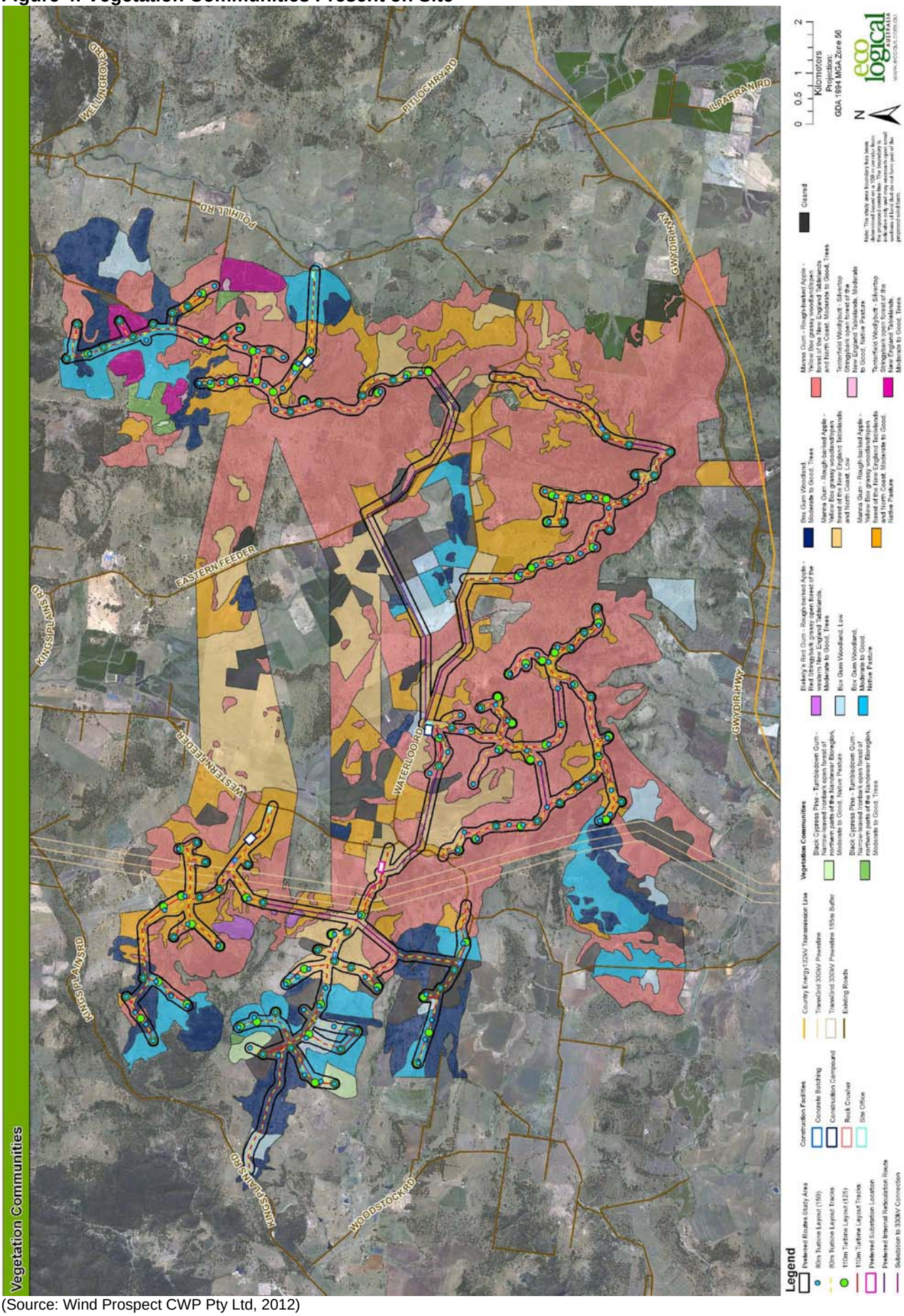
In addition, the Proponent identified only one Rare or Threatened Australian Plant (RoTAP) (*Bothriochloa biloba* (Lobed Bluegrass)), and identified no regionally significant species listed by either Glen Innes Severn or Inverell Shire Councils.

Four weed species listed as noxious weeds under the NSW Noxious Weeds Act 1993 and one Weed of National Significance were recorded within the study area.

Six vegetation communities were found on site (refer to Figure 4), three of which are classified as endangered ecological communities (TSC Act), which included:

- *Blakely's Red Gum – Yellow Box grassy open forest or woodland of the New England Tablelands (BRGYB);*
- *Manna Gum – Rough-barked Apple – Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (MGRBAYB); and*
- *White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (WB).*

Figure 4: Vegetation Communities Present on Site



(Source: Wind Prospect CWP Pty Ltd, 2012)

The vegetation to be cleared includes both BRGYB and WB which have characteristics of the *White Box Yellow Box Blakely's Red Gum Woodland* Endangered Ecological Community (EEC) under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland* and *Derived Native Grassland* Critically Endangered Ecological Community (CEEC) under the EPBC Act. These communities are both commonly known as Box Gum Woodland (BGW). Low quality BGW does not meet the criteria for CEEC however it does meet the criteria under the TSC Act.

The BGW EEC/CEEC is present primarily on the lower lying parts of the study area. The proposal would remove up to 41.37 ha of BGW which represents 11.32% of the BGW present within the study area and 2.17% of the BGW present within the project site[*].

The MGRBAYB community is included in the Ribbon Gum – Mountain Gum Grassy Forest/Woodland of the New England Tableland Bioregion EEC. The proposal involves the permanent removal of up to 243.11 ha of MGRAYB. The loss represents 16.31% of the study area, and 3.11% of the project site.

As part of the Preferred Project Report the Proponent made minor adjustments to the position of some access tracks and powerlines, which slightly changed the level of impact. The 'worst case layout' (159 turbine layout) would result in a total clearance of **288.77 ha** of vegetation, made up of **140.72 ha** of permanent vegetation removal and **148.05 ha** of temporary removal. This resulted in a increase of 2.25 ha of MGRBAYB clearance and a reduction of 4.14 ha of WB.

The Proponent acknowledges that the project involves the removal of vegetation across a large area, however, however most of the clearing is restricted to narrow, linear pathway clearance occurring in narrow bands throughout an open woodland and grassland landscape. The Proponent's assessment concluded that the project would not have a significant impact on EECs and threatened flora habitat. However, in order to offset the impacts on biodiversity arising from the clearing of native vegetation and endangered ecological communities, the Proponent has committed to implementing a biodiversity offset strategy.

Fauna Review

The EA states that the study area supports a diversity of fauna habitat types which include woodland, grassland, farm dams, ephemeral creeks, rocky outcrops and hollow-bearing trees. A total of 135 fauna species were recorded throughout the study area and during field surveys, 13 of which were introduced species.

The Proponent's EA categorised the fauna habitat into 3 broad habitat types, being open forest, woodland and grassland. These provide habitat for a variety of fauna species including:

- seven reptile species;
- four frog species;
- 83 bird species (two introduced);
- 19 mammals (non bat and 11 introduced); and

[*] Only 33.04ha of the BGW community to be removed is in suitable condition to meet the definition listed under the EPBC Act.

- 22 microbat species.

The open forest and woodland habitats provide habitat for a range of hollow-dependant species including threatened species. The EA states that the depending on grassland type and grazing intensity the grasslands can provide habitat for a number of ground dwelling fauna and granivorous bird species, while dams and creeks contain amphibians.

The EA states that there are 15,934 hollow bearing trees on site. These trees are indicated to be very mature and there is little evidence of recruitment (increase in natural population) in the landscape, however it is important to encourage recruitment to retain these faunal assemblages. The Proponent has indicated that the proposal has been designed to minimise where possible the removal of trees, however, the Proponent acknowledges a number of hollow-bearing trees will need to be removed during construction and at worst case this would be 1816 trees (11.4%), although the final number is predicted to be significantly less. All remaining turbines would be located at least 30m from hollow-bearing trees.

The Proponent has predicted that the proposed maximum clearance of 288.77 ha of vegetation and potential habitat for a number of species is not predicted to have a significant impact on fauna species, due to the linear design which would not isolate areas of potential habitat.

Birds
The EA has identified that the habitat within the study area supports potential for foraging, nesting and roosting habitat for a large variety of bird species. Birds of prey were also recorded on site, while habitat for wetland birds across the site is limited to farm dams and the ephemeral drainage lines across the study area.

Eighty-three bird species were recorded within the study area during the surveys, seven of which are threatened species (under TSC Act only). The seven threatened species are:

- *Climacteris picumnus victoriae (*Brown Treecreeper);
- *Stagonopleura guttata* (Diamond Firetail);
- *Melanodryas cucullata cucullata* (Hooded Robin);
- *Glossopsitta pusilla* (Little Lorikeet);
- *Petroica boodang* (Scarlet Robin);
- *Pyrrholaemus saggitatus* (Speckled Warbler); and
- *Neophema pulchella* (Turquoise Parrot).

In addition to the above species other threatened species which were not recorded on site but have potential to occur are:

- *Anthochaera phrygia* (Regent Honeyeater) (EPBC & TSC Act)*;*
- *Circus assimilis* (Spotted Harrier) (TSC Act);
- *Daphoenositta chrysoptera* (Varied Sittella) (TSC Act);
- *Hieraaetus morphnoides* (Little Eagle) (TSC Act);
- *Lophoictinia isura* (Square-tailed Kite) (TSC Act); and
- *Lathamus discolor* (Swift Parrot) (EPBC & TSC Act)*.*

Furthermore a total of 12 EPBC Act listed migratory birds were identified from the EPBC Act Protected Matters Search Tool. Potential habitat within the study area only exists for the following species, however, none of these species were recorded. These were:

- *Hirundapus caudacutus* (White-throated Needletail);
- *Merops ornatus* (Rainbow Bee-eater);
- *Anthochaera phrygia* (Regent Honeyeater);
- *Ardea alba* (Great Egret);
- *Ardea ibis* (Cattle Egret);
- *Apus pacificus* (Fork-tailed Swift); and
- *Lathamus discolor* (Swift Parrot).

The potential for the wind turbines to cause displacement of birds has been discussed by the Proponent, however, given the widely spread habitat across the site, the Proponent considers that any significant impact would be unlikely.

The most significant potential impact identified for birds is from bird strike with turbines. The EA suggests that based on a number of studies that the species most commonly impacted from turbine collision are wetland birds that fly in large flocks, birds of prey, and species that flock and fly above the canopy. The Proponent prepared a risk matrix for those species most commonly recorded within the study area, to determine the likely risk. The matrix factored in flight character, distribution across the site, and whether the species is migratory. The matrix found that no species was at a high risk of collision with turbines, however the following species were found to have a moderate risk:

- *Little Lorikeet (TSC Act);*
- *Crimson Rosella;*
- *Turquoise Parrot (TSC Act);*
- *Musk Lorikeet;*
- *Eastern Rosella;*
- *Nankeen Kestrel;*
- *Wedge-tailed Eagle;*
- *Black-shouldered Kite;*
- *Brown Goshawk; and*
- *Whistling Kite.*

The EA has established that migratory birds, and birds of prey would be most likely to be impacted by turbine strike, however passerine species may also be at risk of collision due to their fast flight patterns and occasional high flights.

A number of birds of prey were recorded within the study area, therefore, there is potential for turbine collision due to turbines being located on ridge tops. Also there is potential of collision by immature birds when dispersing from natal territories. The EA points out that a loss for these species has a greater impact on population numbers than most bird species, as they have large home ranges and low reproductive rates. Notwithstanding, the EA discusses that mortality rates for birds are approximately 1 or 2 birds per turbine per year. A report prepared by Biosis Research Pty Ltd for the Department of Environment and Heritage on the cumulative impact of 8 wind farms on the Tasmanian Wedge-Tailed Eagle only showed impacts from wind farms

contributing to a 0.001% increase in the mortality rate which, the Proponent argues is negligible.

The EA identifies that the study area may form part of the migratory route for the Regent Honeyeater. Potential exists for this species to migrate northwards through the site, however the study area is unlikely to be a key habitat for the species.

Although there are numerous hollow–bearing trees on site, the Tawny Frogmouth and White Throated Nightjar owls were the only nocturnal bird species recorded on site. Although, there is potential for turbine collision the Proponent argues that owl activity within the site appears to be low and therefore impact is predicted to be low.

Bats

The EA states that no threatened bat species were recorded within the locality prior to the study. The EPBC search tool found that the *Nyctophilus corbeni* (South-eastern Long-eared Bat) and *Chalinolobus dwyeri* (Large-eared Pied Bat) have the potential to occur in the locality. However, the Proponent notes that the habitat present in the study area is not generally suitable for the Large-eared Pied Bat.

The EA states that the limited historical records are likely due to the limited survey work previously conducted. Therefore, during the Proponent's survey, six threatened bat species listed below were recorded across the study site (TSC Act only):

- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle);
- *Miniopterus schreibersii* (Eastern Bentwing-bat);
- *Mormopterus norfolkensis* (Eastern Freetail-bat);
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat);
- *Scoteanax rueppellii* (Greater Broad-nosed Bat); and
- *Vespadelus troughtoni* (Eastern Cave Bat).

These species were identified through Anabat Detection and not confirmed. However, the Proponent has used a precautionary approach and listed them as potentially at risk. Although there were no bat caves within the area which the Eastern Bentwing-Bat or Eastern Cave Bat require for roosting, hollow-bearing trees provide potential roosting habitat for the remaining bats detected.

The Proponent as part of the assessment prepared a risk matrix to establish which bats would be present and impacted by the proposal, taking into account bat behaviour, habitat requirements and flight character. The Proponent used the following criteria to determine the potential for impact on bat species:

- **Low** – do not migrate, do not fly above canopy, do not roost in hollows, or roost in hollows but fly below canopy.
- **Moderate** – do not migrate, fly above canopy, roost in hollows.
- **High** – migrate or have large foraging range, fly above canopy, roost in hollows.

The EA discussed that studies have shown that 80% of bat fatalities currently recorded at wind energy developments in North America are from migratory species while only a small proportion are year-round residents. The Proponent's assessment concluded that 4 species would have high potential to be impacted by strike. These species either forage above the canopy, are migratory, or have large foraging areas

and may roost in the trees across the study area. The Yellow-bellied Sheathtail-bat, Southern Freetail Bat, the White Striped Freetail Bat (not listed under the EPBC or TSC Act) and the Eastern Bentwing-Bat were the species most likely to be impacted.

The Eastern Bentwing-Bat was the only threatened bat that was frequently recorded across the study area (but not confirmed). This species is migratory and forages above the canopy and in open areas. Therefore, there is potential for this species to be struck while foraging across the woodland and between feeding areas. The White-Striped Freetail Bat and Yellow-bellied Sheathtail-bat were the only migratory, tree roosting species recorded within the study area. However, the EA suggests that given the open landscape where flight pathways are less influenced by canopy density and vegetation structure, the likelihood of bat strike is greatly reduced.

Barotrauma is when bats pass suddenly through an area of low air pressure surrounding the turbine blade tips, resulting in death through lung or tissue damage. The Proponent has discussed that current knowledge on the impact of Barotrauma is limited, and methods to mitigate or reduce the impact unknown. It is therefore conservatively assumed that bat species prone to strike would also be prone to Barotrauma.

The Proponent is proposing mitigation measures to prevent bat strike where possible, which include locating turbines a minimum of 30m from hollow-bearing trees and not installing aviation lighting (which attract insects and bats which feed on them) unless required by CASA. However, the Proponent acknowledges that some collisions will be unavoidable.

Other Fauna

Threatened mammals including the *Phascolarctos cinereus* (Koala), *Dasyurus maculates* (Spotted-tailed Quoll) and *Petaurus norfolcensis* (Squirrel Glider) were not recorded in surveys however due to habitat (such as Koala feed trees) supportive of these species being present on site, they are assumed to be present.

No threatened amphibians were recorded on site. Although the *Litoria booroolongensis* (Booroolong Frog) is listed to have potential to occur. This species however, has disappeared from the Northern Tablelands and is generally found along permanent streams with fringing vegetation, therefore, the EA has indicated it is unlikely to be present.

Three threatened reptiles were listed on the database searches as having potential to occur in the study area, however the EA indicates that potential habitat only exists for the *Underwoodisaurus sphyrurus* (Border Thick-tailed Gecko). The Proponent's assessment calculated that the majority of habitat would be marginal for this species as it would be primarily a grassy understorey with scattered wood debris (as opposed to granite or basalt, dense canopy, rocky outcrops and/or fallen timber) but has been mapped as potentially occurring due to historical recordings of the species in disturbed areas.

The Proponent has identified that other impacts such as the potential for the proposal to increase predation by feral animals are limited, due to the already open nature of the vegetation.

Cumulative Impacts

The Proponent assessed the cumulative impacts of other known proposed wind farms in the area, in particular Glen Innes Wind Farm (5 km to the south east of Sapphire Wind Farm), White Rock Wind Farm (5 km south east of Sapphire Wind Farm), and Ben Lomond Wind Farm (20 km south east of Sapphire Wind Farm), concluding that cumulative impacts are likely to be negligible.

The EA states that the majority of the area is used for agriculture, and therefore, the Proponent's offset package (which will protect and manage large parcels of land) would actually help protect areas of threatened species within the locality which may otherwise be impacted by agricultural practices. Furthermore, the vegetation clearing constitutes a very small proportion of existing vegetation and available woodland habitat in the region and there is no significant clearing of a particular type of vegetation.

The Proponent acknowledges that cumulative impacts as a result of the approved neighbouring White Rock Wind Farm are possible for birds and bats which forage widely. The Proponent, however, predicts impacts to be limited as the majority of species are unlikely to forage across wind farms due to their limited home ranges.

The Proponent claims that cumulative impacts from other wind farms in the region would be very unlikely as there are no adjacent or connected habitats and no known migratory bird pathways or wetlands where large numbers of birds are likely to congregate. Any impacts would be limited to highly mobile species which has been assessed as low to negligible by the Proponent.

OEH provided comment requiring cumulative impacts be considered for migratory honeyeaters and Eastern-Bentwing-Bat, which the Proponent addressed within the PPR. Honeyeaters fly at or near canopy height whilst foraging and move from ridge to ridge at a height of 5m to 50m and frequent the area in winter when eucalypts are flowering (principally White Box). Therefore there is a risk of turbine strike in areas where Manna Gum and White Box are flowering. The Proponent discusses that the cumulative impact is hard to determine but as White Rock Wind Farm did not identify White Box as a vegetation community, it reduces the likelihood of attracting migratory honeyeaters. Notwithstanding, Eucalyptus laevopinea and E.stellulata, both appear in the study area which could possibly attract honeyeaters.

The Proponent has determined that the cumulative impact on the Eastern Bentwing-Bat is hard to determine due to gaps in the understanding of these species, however the numbers around the site suggest that there is potential for a roosting site to be in the vicinity and therefore a risk of strike. What is known about the behaviour of this species is that they forage widely and can travel up to 65km in one night adding to the potential risk.

The Proponent has therefore committed to monitoring bird and bat strike across Sapphire Wind Farm, and to preparing a bird and bat monitoring program, in consultation with OEH. If unacceptable impacts are identified, then adaptive management approaches will be identified (in consultation with OEH) to allow a species specific approach to mitigation.

Avoidance, Mitigation and Offsets

The Proponent has described measures within the EA to avoid, minimise and/ or offset ecological impacts. This includes locating infrastructure where possible in cleared areas (avoiding vegetation clearance) and avoiding ecologically sensitive areas. Furthermore, in response to concerns raised by OEH, the Proponent has detailed several measures to avoid or reduce the impact of the wind farm within the PPR. This includes aligning roads along existing farm tracks where possible, and circumnavigating trees and vegetation communities. Micro-siting during construction would further avoid impacts to surrounding good quality vegetation or habitat.

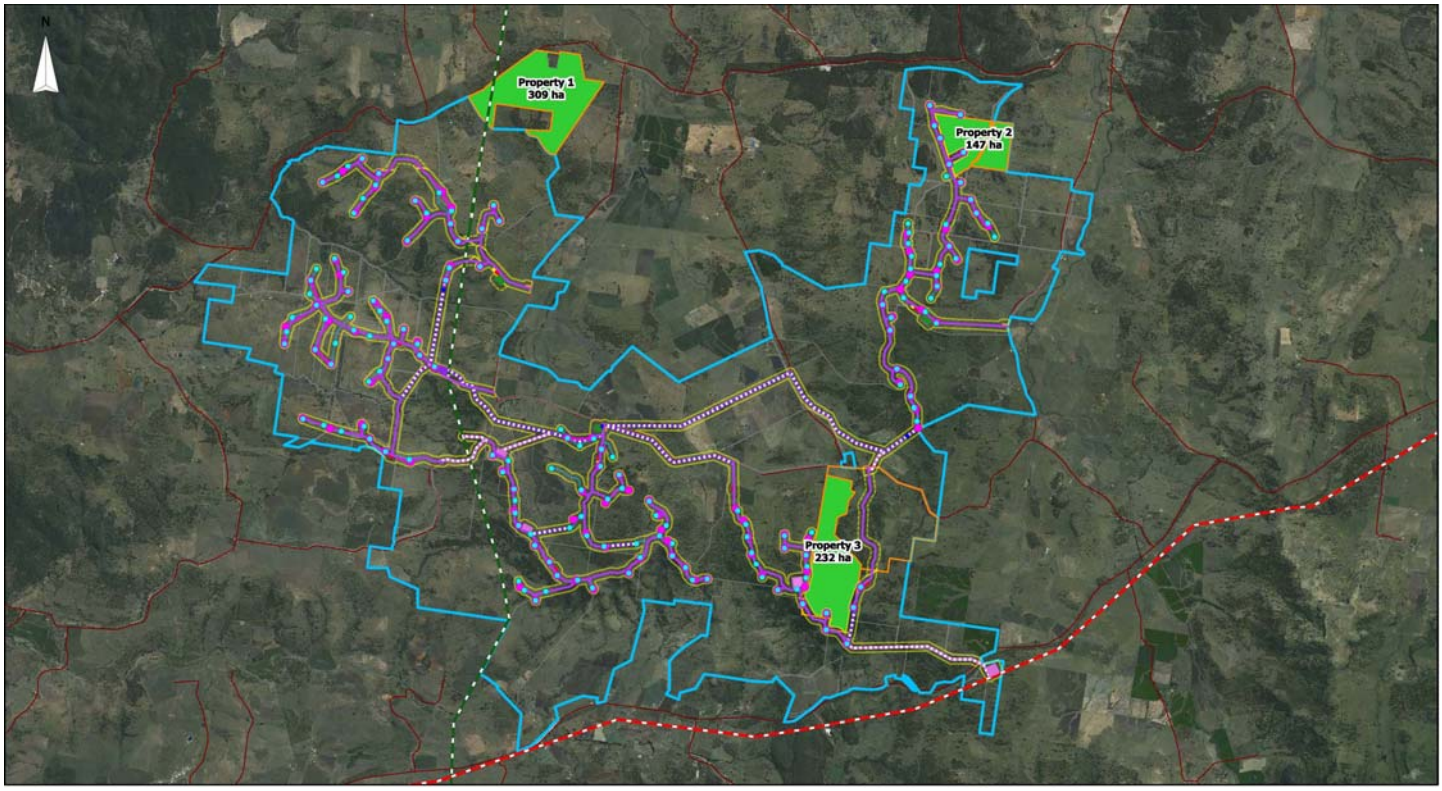
The Proponent has incorporated a number of mitigation and management measures into the Statement of Commitments. These include preparing and implementing Construction and Operational Environmental Plans, including but not limited to a post-construction bird and bat monitoring program (to confirm the impacts of the project on bird and bat populations, and include response mechanisms if unreasonable impacts are found), a conservation management plan and a threatened species management plan.

To offset the residual ecological impacts of the project, the Proponent has undertaken a Biobank Assessment to identify the "quantum" of the offset required in order to pursue the offset option of registering a Biobank site. Other offset options include securing and managing sites for conservation.

The Biobanking method required a targeted survey of six threatened flora and eight threatened fauna species. The Proponent identified during its ecological assessment that sufficient land is available providing "like for like" vegetation to meet the improve and maintain outcome consistent with the credit report from the Biobanking Assessment. Three properties on site have suitable vegetation types (see Figure 5), with the Proponent indicating that a combination of any 2 of the properties would provide a minimum offset ratio of 2:1.

In regards to habitat, the proposal has the potential to impact on 18.7 ha of Border Thick-tailed Gecko habitat which the Proponent states could be offset with approximately 184ha in property 3. Furthermore the Loss of 113.7 ha of potential foraging habitat for the Regent Honeyeater and Swift Parrot is proposed to be offset with between 350 and 427 ha of foraging habitat.

Figure 5: Propose Offset Sites



(Source: Wind Prospect CWP Pty Ltd, 2012)

Consideration

In assessing the acceptability of the biodiversity impacts, the Department has considered whether the Proponent has demonstrated that impacts on biodiversity wherever possible have been avoided, the magnitude of potential impacts have been reduced and potential to offset losses exist. The Department notes that given the extensive areas of EEC across the study area, and the requirement for turbines to be placed on ridge tops, 288.77ha vegetation will need to be cleared in a worst-case scenario.

The Department acknowledges that the project will result in relatively large amounts of native vegetation clearance in moderate to good condition. Notwithstanding, given the study area is mainly used for agricultural purposes much of the vegetation has been impacted by weed invasion, soil disturbance and high levels of grazing pressure.

The combined clearing of all EECs on site represents a loss of 27.63% of the study area and 5.28% of the project site. The Department considers that the clearing of the EECs on site is unlikely to result in an unacceptable impact on these endangered ecological communities in that the habitat to be impacted is not considered to be important for the long-term survival of the community in the locality, and much of the vegetation to be impacted is fragmented and degraded.

The Department is satisfied that the Proponent has minimised impacts through 'avoidance' including careful siting of turbines. The Proponent has minimised all unavoidable native vegetation clearance where possible, which included locating

turbines in cleared treeless areas, locating turbines in previously disturbed areas, locating associated infrastructure (construction compounds, substations etc) outside ecologically sensitive areas, avoiding hollow-bearing trees, where possible (and creating a 30m buffer around any such trees). In addition, reticulation has been placed underground and within the road footprint where possible and will pass overhead across gullies and waterways to reduce impact.

The Department accepts that some biodiversity impacts would be unavoidable as a result of the final development footprint of the project (including vegetation and habitat loss, potential direct injury to fauna during construction and reductions to local flora and fauna populations through the loss and disturbance of habitat including roosting, foraging and breeding resources). However, it is noted over 50% of the area to be cleared (148.05 ha) would not be needed for the wind farm in the long term and could be rehabilitated. Although it is acknowledged that it is unlikely that the Proponent will be able to revegetate and rehabilitate the impacted area to a condition prior to the removal, the Department is satisfied that over time the condition of vegetation could return to a similar type of community, and that the permanent impact could be reduced, and is therefore acceptable.

The Department has also considered issues raised by OEH in relation to avoidance measures, details to support the assessment of native fauna, and the adequacy of mitigation measures regarding the risk of bird and bat strikes. The Department is satisfied that the Proponent has conducted suitably robust survey work and satisfactorily addressed the issues raised by OEH in the PPR. OEH indicated that they would most likely be satisfied with the Proponent's offset package (subject to the securing the offset locations detailed within the PPR), and the Department is satisfied that the Proponent has demonstrated suitable offset arrangements exist on site.

The Department also considers that adequate management of construction activities would ensure the avoidance of significant ecological impacts. This includes ongoing ecological monitoring so as to ensure that potential impacts to habitats and threatened species adjacent to the project site are taken into account and avoided during construction. Therefore, although the Proponent has committed to developing construction management measures, this commitment should be reinforced through a condition of approval, to ensure the measures are developed in consultation with the appropriate public authorities and are approved by the Director-General.

Included in these measures is the requirement for the Proponent to develop, in consultation with the OEH, a Flora and Fauna Management Plan. This Plan is to outline measures to be implemented during construction, to ensure the protection and minimisation of native vegetation (and habitat) loss. The Plan is to be included within the Construction Environmental Management Plan, and would require the approval of the Director-General prior to the commencement of construction works. The Plan is required to include finalised plans that illustrate all terrestrial vegetation communities and those areas to be cleared for construction. Specific methods to manage the potential impacts on flora and fauna species and their habitat are also to be included in the Plan. Importantly, the Plan is to include a procedure for the review of management methods, in the event such methods are found to be ineffective.

The Department notes that the Proponent has identified a number of offset options, with the preference being to register Biobank sites as an offset. However, a number

of alternative options are available including conserving private land, or creating conservation reserves (subject to an agreement with OEH). The Department notes that the Proponent has highlighted sufficient areas within the site which contain similar or better quality vegetation to offset all losses (based on the Biobanking methodology) to a ratio of 2:1 for impacted vegetation communities. However, the exact ratio to offset would be determined through the recommended offset process, and the Department is satisfied that additional land is available on site if necessary. The Department is also satisfied that a number of offset options exist (including Biobanking or a conservation agreement with OEH), and that through careful management measures these proposed offsets will be achievable. The Department therefore recommends a condition requiring the Proponent to prepare and implement an appropriate biodiversity offset package. The package is to be developed in consultation with OEH. It is also required to be submitted to the Director-General for approval, prior to the commencement of any construction works.

Fauna

With regards to specific fauna impacts, the Department considers that construction is unlikely to cause unacceptable impacts. The project has a linear footprint, no large heavily vegetated areas are to be cleared, and it is unlikely to result in significant habitat fragmentation or loss of habitat corridors because the development will not isolate any substantial areas of native vegetation. Furthermore, it is not likely to impact on the movement of native fauna within the region due to existing habitat fragmentation and isolation within the region. However, as there is the potential for native fauna to occur within or close to the project site (due to the presence of native vegetation and habitat areas in and around the project site), the Department recommends that the Proponent consider, develop and include specific fauna management measures within the Flora and Fauna Management Plan.

The Department also recommends a condition that requires the Proponent to conduct pre clearing surveys by an experienced ecologist, prior to construction, during optimal times, to identify hollow bearing trees and threatened flora species. These surveys will enable the Proponent to mark hollow bearing trees to minimise removal through micrositing of turbines and assist in calculating suitable offsets. Any removal of hollow bearing trees (where avoidance was not possible) would be conducted with an ecologist present to minimise harm to fauna species. The Proponent is also required to ensure that construction personnel are made aware of the fauna species that have a potential of occurring within the project site and provide details of those specific measures that should be implemented to avoid significant ecological impacts.

The Department is satisfied that the Proponent has provided a suitably robust assessment of the potential risks of the project on bird and bat species from rotor interaction (including direct collision). Although it is acknowledged that there is some uncertainty regarding the impact of Barotrauma, the Department recognises that management techniques would help reduce any impact. The Department accepts that some level of mortality to individual bird and bats is likely to be unavoidable as a result of interaction with wind turbines, just as some level of faunal mortality is likely to occur in other activities, such as collision with vehicles on rural and regional roads. Notwithstanding, the Department considers that the project should be designed to avoid risks of collision wherever possible (including micrositing turbines away from

hollow bearing trees and implementing measures identified in the bird and bat adaptive management program).

The Department notes that detailed behaviour characteristics are not known for all species of birds and bats. Notwithstanding, the risk of bird and bat rotor interactions are generally known to be greater where wind farm development is located in proximity to wetlands (which are known congregation points for large flocks of birds), along known migratory paths, in proximity to forested areas and along forested ridgelines. Turbine lighting, as well as close turbine spacing and a linear pattern layout, is also generally correlated with higher rates of rotor interaction. In this regard, the Department notes turbine lighting is not proposed, and the site is not located near significant wetlands, and creek lines are ephemeral, although a number of small farm dams would provide habitat for a small number of water birds. The wind farm is not located in any known migratory paths and turbine sites are generally located away from the densest vegetation areas found on the steepest slopes in the project area. However it is noted that woodland species may be potentially impacted, however the Department is satisfied that any impact is likely to be low.

Raptors have potential to suffer from blade strike as they forage in open areas at high altitudes looking for prey. However, the Department accepts that stringent management and mitigation measures can reduce the impact. From examples of other wind farms with Wedge-tailed Eagle populations, notably Cullerin Wind Farm, bird strike was the result of unusual circumstances where poor weather conditions coincided with lambing, resulting in higher than normal levels of mortality. Therefore, mitigation measures such as prompt carcass removal will significantly reduce raptors striking the turbines by decreasing the attraction of the area to feeding birds.

The Department notes that the highest potential for bird or bat strike at wind farms is from high flying bird species such as raptors and bat species such as the Southern Freetail-Bat, White-striped Freetail Bat, Yellow-bellied Sheathtail-bat and the Eastern Bent-Wing Bat. The Department also notes that the Proponent's EA states that past studies have shown even with mitigation measures, some collisions will be unavoidable. However, the Department agrees with the Proponent's assessment and considers that the project would not pose an overall significant or unacceptable level of risk to bird and bat species from rotor interaction, due to the flight character and distribution of species across the site, coupled with appropriate mitigation measures to reduce the attraction of birds (e.g. carcass removal to reduce the risk of raptor strike while hunting for prey).

To ensure that potential risks are minimised as far as practicable, the Department has recommended conditions of approval reinforcing the Proponent's commitments, including siting turbines at least 30m from hollow bearing trees and ensuring that night lighting requirements for the project are minimised as far as possible, unless specifically required by the Civil Aviation Safety Authority for aviation hazard purposes.

To further ensure that impacts are kept to a minimum, the Department has recommended conditions of approval requiring the implementation of a bird and bat adaptive management program. The adaptive management program would be required to specifically identify pre-emptive and reactive measures for minimising impacts and would determine the incidence of mortality at different parts of the site

and at different seasons, and respond to identified issues. In addition, although the Proponent has committed to undertaking a post-construction bird and bat monitoring program for a period of up to five years from the date of initial operation, the Department recommends the monitoring program be in perpetuity, unless otherwise agreed to by the Director-General.

The Department is satisfied that with the implementation of the above measures, the bird and bat impacts of the project can be appropriately managed so as to not result in significant residual impacts. The Department is satisfied that the overhead transmission line component of the project would not pose a significant risk of collision or mortality to bird/ bat species beyond that posed by similar infrastructure already existing in the area (such as existing transmission lines) and that cumulative impacts would be negligible.

The Department is of the opinion that provided the recommended conditions are adopted, and that the Proponent implements the mitigation measures outlined in the EA and Submissions Report, as well as the actions described in the Proponent's Statement of Commitments, impacts on fauna and their habitat can be minimised, effectively managed and duly compensated through offsetting.

5.2. Visual Impact

A Landscape and Visual Impact Assessment (LVIA) was undertaken on behalf of the Proponent by Green Bean Design Pty Ltd (GBD). The assessment addressed two potential layouts of the project (159 or 125 wind turbines), with a maximum blade tip height of 156 metres (and an additional 157m blade tip height for the 125 wind turbine option), a 330kV or 132kV transmission line grid connection, substations, facilities buildings and a small car park.

The LVIA methodology incorporated:

- a desktop study;
- field inspections and photography;
- preparation of Zone of Visual Influence (ZVI) diagrams;
- assessment and determination of landscape sensitivity;
- assessment and determination of visual impact;
- preparation of photomontages; and
- preparation of shadow flicker assessment.

The LVIA is based off technical and design information provided to GBD by the Proponent. A series of panoramic photomontages were taken from visual receivers within a 10km viewshed of the project. The assessment also considered the impacts on motorists travelling on highways and local roads surrounding the project.

The Sapphire Wind Farm is located over 22 rural residential and farming properties. The viewshed of the project was defined as the area of land surrounding and beyond the project area which may be potentially affected by the project. Within this viewshed the following five Landscape Character Area (LCA's) have been identified:

- gently undulating to flat/cultivated/pastoral farmland and a few mining areas;
- steep sided valleys and hills;
- drainage lines;

- forested hills and ridgelines; and
- rural dwellings.

The EA established that the overall landscape sensitivity for each of the 5 LCA's had medium sensitivity to accommodate change as they represented landscapes that are reasonably typical of other landscape types found in the area, and the wider regional context of the New England Tablelands. The Proponent has stated that a medium sensitivity means that although some characteristics of the landscape are likely to be altered, the landscape is likely to have some capability to accommodate change. This is due to the large scale open landscape character, together with the relatively low density of settlement and potential receptors located within the immediate viewshed. In addition, the existing altered landscape contains built elements such as roads, agricultural industry, aircraft landing strips, communication towers, power lines and mining facilities.

Table 4 below indicates the predicted visibility of the turbines within the viewshed at varying distances. The table illustrates that the visual impact at receivers located over 10km from the project are likely to only have a low impact while receivers located within 1 to 3km of the project will have a moderate to high impact with potentially dominating views of the turbines.

Table 4: Viewshed Descriptors

Distance from turbine	Potential Viewshed Descriptors
>20 km	Wind turbines become indistinct with increasing distance. Rotor movement may be visible, but rotor structures are usually not discernable. Wind turbines may be potentially discernable but generally indistinct within the viewshed resulting in a Low level visibility and Nil level visibility where influenced or screened by surrounding topography and vegetation.
10 to 20 km	Wind turbines are noticeable but tending to become less distinct with increasing distance. Blade movement may be visible but becomes less discernable with increasing distance. Wind turbines are potentially discernable but generally indistinct within viewshed resulting in Low level visibility.
5 to 10 km	Wind turbines are visible but tending to become less distinct depending on the overall extent of view available from the potential receptor location. Movement of blades may be discernable where visible against the skyline. Wind turbines potentially noticeable resulting in Low to Moderate level visibility.
3 to 5 km	Wind turbines are clearly visible in the landscape but tending to become less dominant with increasing distance. Movement of blades discernable. Wind turbines are potentially noticeable but less dominant within the viewshed resulting in Moderate level visibility.
1 to 3 km	Wind turbines would generally dominate the landscape in which the wind turbine is situated. Potential for high visibility depending on the category of receptor, their location, sensitivity and subject to other visibility factors. Wind turbines are potentially dominant within the viewshed resulting in Moderate to High level visibility.
<1 km	Wind turbines would dominate the landscape in which they are situated due to large scale, movement and proximity. Wind turbines would be potentially dominant and significant within viewshed resulting in High level visibility.

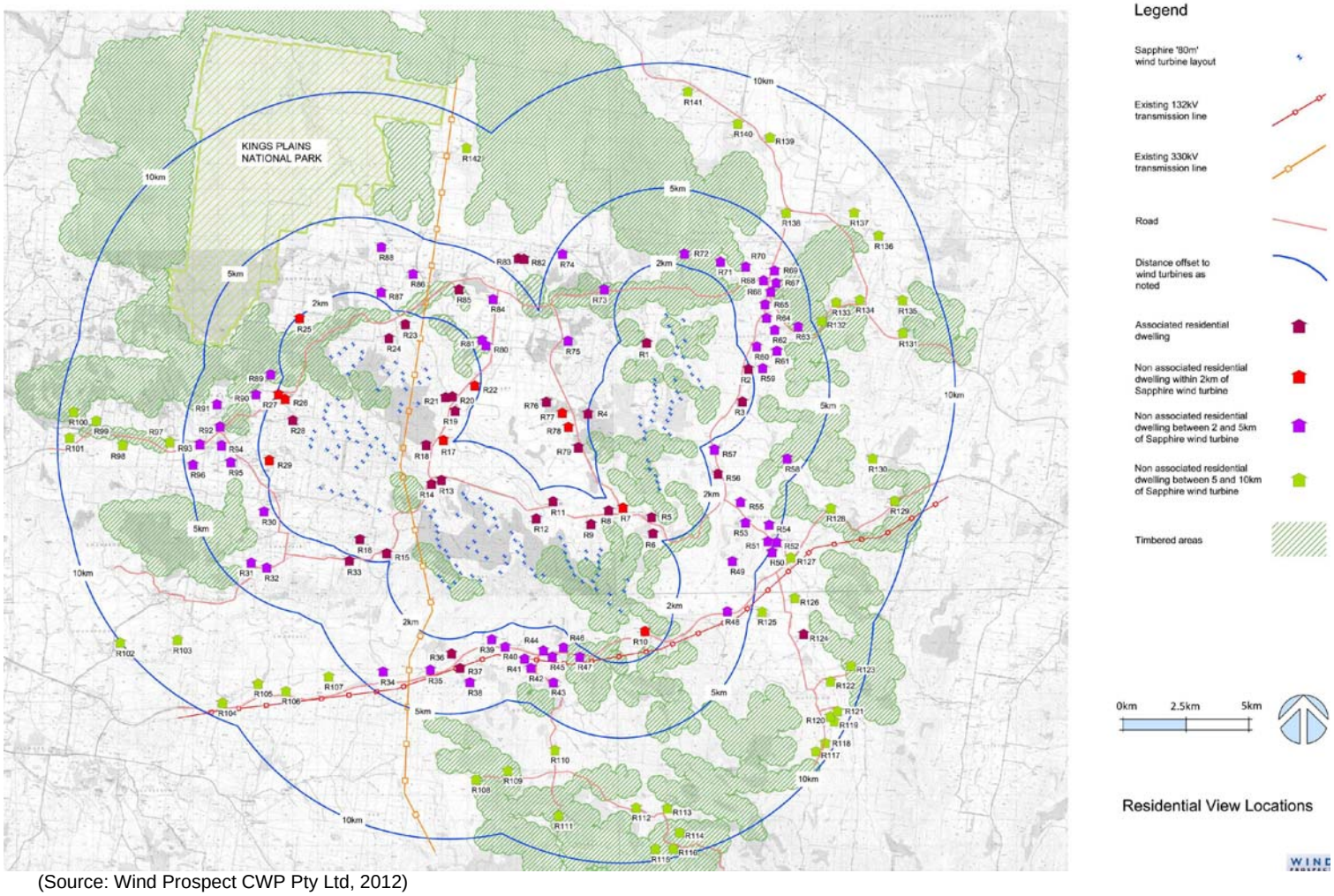
(Source: Wind Prospect CWP Pty Ltd, 2012)

The EA established that 139 receptors are located within 10km of the project (refer to Figure 6 for residential view locations). The Proponent's assessment established that for both layout options:

- 3 of the 139 residential receptor locations were determined to have a High visual impact;
- 34 of the 139 residential receptor locations were determined to have a Moderate visual impact (this includes 16 residences determined to have Low to Moderate visual impact);
- 81 of the 139 residential receptor locations were determined to have a Low visual impact; and
- 21 of the 139 residential receptor locations were determined to have a Nil visual impact.

Of the 3 properties with high impact one is an associated property. Properties R26 (Spring Creek) and R29 (Krystal Blue) are both located 1.7km away and are non associated.

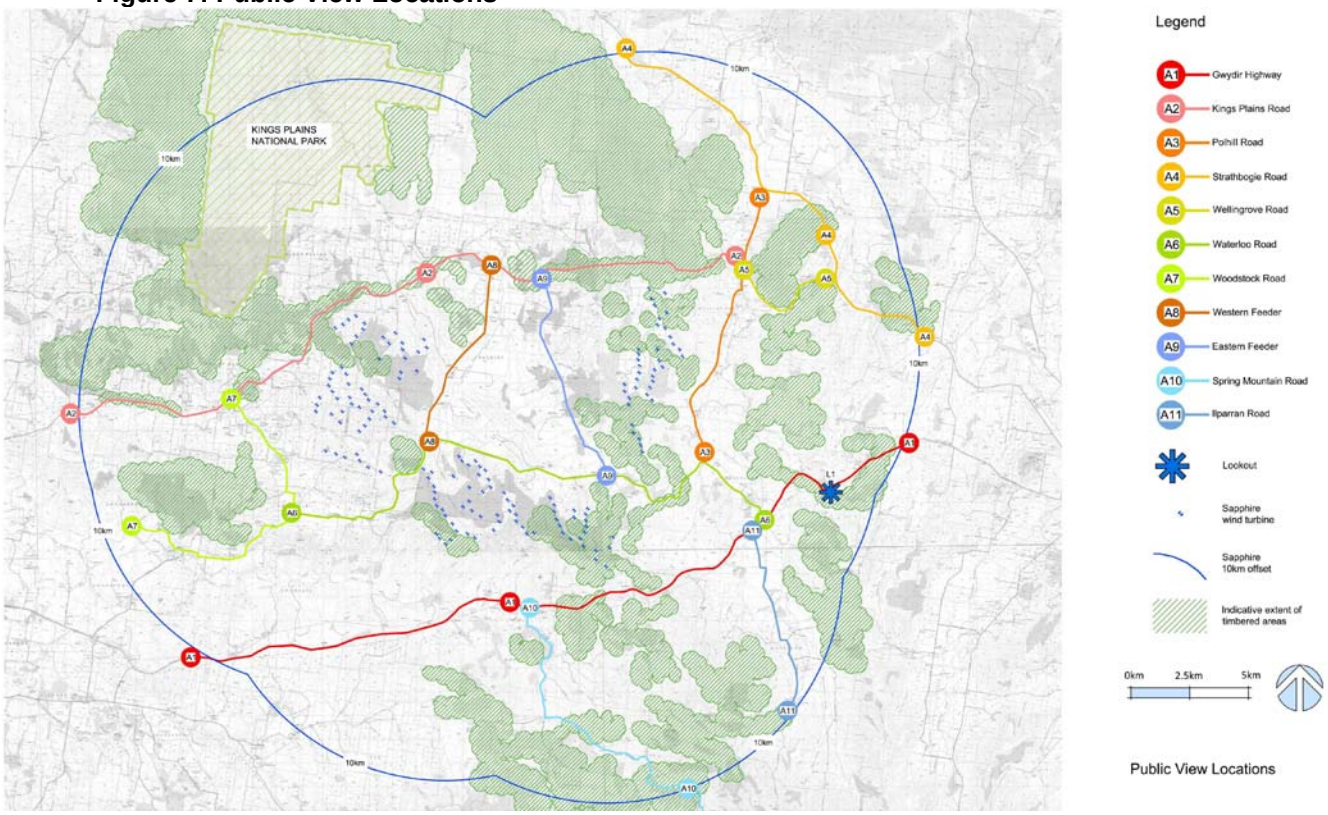
Figure 6: Residential View Locations



(Source: Wind Prospect CWP Pty Ltd, 2012)

The assessment also identified 13 public receptors along public roads within the project viewshed, including Sinclair lookout and Martins Lookout (Centennial Parklands in Glen Innes) (refer to Figure 7 for locations). 12 of the public receptors were found to have low impact while one was deemed to have no visual impact (Martins Lookout).

Figure 7: Public View Locations



(Source: Wind Prospect CWP Pty Ltd, 2012)

The EA has concluded that residential receptors over 10km are unlikely to experience any visual impact due to a combination of distance and screening from topography and vegetation. Impact from public view points is assessed to be low, while only 2 non associated dwellings will have a high impact. However, the EA acknowledges that further visual impact will be possible for people engaged in recreational and in particular farming activities on neighbouring private or public land. However, the visual assessment has determined that the visual impact to people engaging in work is less than for potential views from a dwelling. The Proponent also highlights that the term 'visual impact' does not necessarily entail a negative impact as this is subjective to the individual.

Wind Turbines – Blade Glint, Shadow Flicker and Night Lighting

At present there are no assessment guidelines governing shadow flicker in New South Wales. The Proponent conducted a shadow flicker assessment pursuant to the Victorian Planning Guidelines and the NSW draft Guidelines which limit the duration of shadow flicker to a maximum of 30 hours per year. The Proponent's assessment concluded that no associated or non associated residence would experience over 30 hours per year of shadow flicker. The EA also has assessed the health implications of shadow flicker from the risk of causing photosensitive epilepsy. The EA states that according to Epilepsy Action Australia flickers of flashing most likely to cause seizures occurs between 8 to 30Hz. As the flicker created from turbines is approximately 1Hz the EA concludes that it is unlikely to present a risk to people with photosensitive epilepsy. Similarly the EA has established that the potential impact of shadow flicker on motorists is unlikely, as the flicker effect will only be noticeable or cause annoyance between 2.5Hz and 15 Hz.

Blade Glint (reflection of sunlight off the turbine) is not expected to have a significant impact as the towers and blades are largely convex which tends to diverge light from the surfaces rather than converge light. In addition further mitigation is proposed through the use of matt coatings.

With respect to night lighting, the Proponent's Aeronautical Impact Assessment established that although there are no regulatory requirements for lighting, it may be required with respect to a duty of care. The Proponent is likely to only install night lighting if required to by the Civil Aviation Safety Authority (CASA) and the Commonwealth Department of Infrastructure and Transport (DIT). The results of the Aeronautical Impact Assessment will be submitted to CASA and DIT for their consideration. The EA concludes that if night lighting is required it would only be at times of reduced visibility. Furthermore, the potential impact is anticipated to be low and the intensity of night lighting would be no greater than other local sources of night lighting. Impact on motorists is perceived to be minimal as it would be for a short duration and shielded from undulating landforms. Similarly, the impact on residences is also expected to be reduced or lightly shielded by topography and vegetation.

Cumulative Impact

The EA illustrates that there are 3 proposed or approved wind farms within the same locality as the Sapphire Wind Farm, which include White Rock Wind Farm (approved with up to 199 turbines) Glen Innes Wind Farm (approved with up to 25 turbines) and Ben Lomond Wind Farm (proposed, up to 98 turbines).

The Ben Lomond Wind Farm was not included in the Proponent's assessment as there is no current indication that this project will proceed. However, the EA indicates that as the turbines are located over 25km away the likelihood of cumulative impact is low.

The Glen Innes Wind Farm and White Rock Wind Farm both have turbines located within the Sapphire 10km viewshed (6 turbines and 46 turbines respectively). Intervisibility would potentially occur from residential dwellings south east of the Sapphire wind farm, and west to north west of the Glen Innes wind farm. These views would generally be 'indirect'. Intervisibility between Sapphire and White Rock wind farms is generally low "Direct" and "Indirect" for residents within the 10km Sapphire viewshed. "Indirect" views are generally a result of undulating landforms, separation distance and vegetation. These are limited to areas east of Swan Vale, around the locality of Waterloo Road, Ilparren Road and Gwydir Highway junctions. "Sequential" views would occur for motorists travelling along the Gwydir Highway between the wind farms. These would be for short durations and influenced by the direction of travel and alignment of the wind turbines. The assessment determined that the cumulative impacts would not be significant and would be heavily influenced by distance, topography and vegetation.

Turbine modification for a 1m increase to tip of blade height

The EA included a supplementary assessment of the impacts of the 125 turbine layout with a turbine model which has a blade tip height of 157m (rather than 156m). Table 5 below details the parameters of the three options.

Table 5: Parameters of each turbine design layout

Element	159 Turbine Design Layout	125 Turbine Design Layout	157m tip of blade
Tower Height	100m	100m	94m
Rotor Diameter	92m	112m	126m
Overall height to tip of blade	146m	156m	157m
Total number of turbines	**159**	**125**	**125**

(Source: Wind Prospect CWP Pty Ltd, 2012)

The 157m blade tip option would be located in the same location as the other 125 turbine option. Although the blade tip height is 1m larger, the hub height would be 6m shorter.

The assessment of the impacts of the 3rd option concluded that there would be no discernable difference between the ZVI diagrams prepared for the 110m design layout. Furthermore, the reduced height of the nacelle may in fact remove the view of the nacelle at some viewpoints.

Also, the 1m change would not change the visual impact on any of the 139 residential dwellings or public view points, or further impact shadow flicker or cumulative impact.

Ancillary Infrastructure

The EA discussed the potential visual impact from ancillary infrastructure. The most likely impact would be from the substation and transmission lines. The EA proposes a number of substation options, which depend on the final option of electricity connection to either the 132kv transmission line or 330kv transmission line (which both pass throughout the project site). The EA has established that views of each of the substation locations would be minimal due to surrounding tree cover and topography. The EA indicates that the majority of electrical connections between the wind turbines and on site substation would be via underground cabling, including areas along prominent ridgelines within the project boundary. Overhead electrical lines would be required to connect the clusters to the substation. This would involve single tapered concrete poles between 26m and 40m high for the 132kV option, or a concrete 'H' frame twin pole or steel lattice support structure between 28m and 50m high for the 330kV option. Overall the EA determined that the electrical infrastructure would be unlikely to have a significant impact on the majority of surrounding view locations for either option (although it is noted that the 132kV option would have a lower impact due to smaller transmission line towers). All non associated residential receivers have been assessed to have no or low visual impact, while all the residential receivers with medium to high visual impact are associated with the project, and therefore it can be assumed are accepting of the impacts.

Consideration

The Department is satisfied that the visual impacts of the ancillary infrastructure associated with the project (substation, internal overhead transmission line etc) are unlikely to be significant for the reasons outlined in the Proponent's assessment (as

identified in the preceding section) and can be managed through the implementation of appropriate landscaping design and rehabilitation measures. The Department has recommended conditions of approval requiring appropriate visual treatment of ancillary infrastructure (including landscaping) and for the rehabilitation of disturbed areas as far as practicable to minimise, and mitigate visual impacts from the disturbance footprint of the project.

In relation to the overhead transmission line connection to the grid, although the final alignment option would be subject to detailed engineering design, the two proposed options are unlikely to constitute a dominant visual element within the landscape. Connections between turbines and upon ridgelines are generally underground, and the dense vegetation and topography screens the transmission lines from non associated sensitive receivers. In consideration of the above, the Department has focused its assessment on the potential visual impacts of the wind turbines.

The Department notes that only two "non-associated" receptors identified in the Proponent's assessment are likely to experience high visual impact from the project. The remaining are "associated" receptors, who have reached a commercial agreement with the Proponent. Consequently, the Department's consideration has focused on non-associated receptors. The predicted high visual impact on the two non associated receptors "Spring Creek" and "Krystal Blue" can be seen below in Figures 8 and 9. "Spring Creek" will have up to 60 visible turbines from the dwelling while "Krystal Blue" will have up to 44 visible turbines from the dwelling.

Figure 8: Spring Creek Photomontage

(Source: Wind Prospect CWP Pty Ltd, 2012)

Figure 9: Krystal Blue Photomontage

(Source: Wind Prospect CWP Pty Ltd, 2012)

The Department conducted a site visit in October 2012, which included a visit to the two properties. The Department subsequently concluded that both properties had an unacceptable visual impact. Due to differences in circumstances at these properties, the Department recommends 2 different approaches to resolve and reduce the visual

impact. The same approach additionally addresses the noise impacts at both properties discussed in Section 5.3.

In regards to "Spring Creek", it is clear within the landowner's submission and through conversations between the Department and the landholder that the preferred option would be for the Proponent to acquire the property. The submission and discussions with the Proponent and land holder indicate that previous attempts for the two parties to reach an agreement were partially successful, however disagreement in relation to the timing of the acquisition caused negotiations to fail. The Proponent offered to acquire the property prior to construction of the Sapphire cluster. The Department agrees with the landholder that this time frame creates too much uncertainty because other clusters could commence earlier, thereby possibly delaying acquisition for many years. It therefore recommends that the Proponent acquire the property prior to any construction of the project.

In regards to "Krystal Blue", due to personal circumstances the landholder does not wish to have the property acquired. The Department therefore recommends taking a precautionary approach and recommends removing the three closest turbines from the scope of the project. Although a significant number of turbines would still be visible from the dwelling, the closest turbines would be located a further half a kilometre away (over 2km from the dwelling). The Department is satisfied that the removal of the most dominate turbines would result in a reduced and acceptable impact. In addition the Department recommends that the Proponent provide additional mitigation measures, which may include landscaping treatments to visually screen the dwelling. The Department also considers it appropriate to give the landholder the opportunity to be acquired if their circumstances should change. Therefore, the Department recommends a condition to enable the landholder to request the Proponent to acquire the property within 5 years of operation commencing. If the Proponent does acquire the property then the three turbines recommended for removal could be reinstated into the approval and constructed.

The Department also notes that the vast majority of non-associated dwellings surrounding the project site would be located over 2km from the project. Eight non associated dwellings, are located under 2km from the closest turbines, which have all been determined by the Proponent to have low to moderate visual impact (with the exception of 2 dwellings mentioned above). The Department acknowledges the subjective nature of the visual impact of wind turbines. This means that it is possible that a dwelling with a high visibility of turbines may be interpreted by some residents as a positive impact or at least not concerned, and the small number of community objections can be construed to mean that there is low community objection to the proposal. Notwithstanding, the Department recommends conditions requiring the Proponent to contact all neighbouring residents or businesses identified in the EA as having high to moderate impact regarding mitigation measures to inform the Design and Landscape Plan, and if requested by any dwelling or business within 5km, provide and bear full cost of landscaping treatments (e.g. vegetation screening).

Blade Glint, Shadow Flicker and Night Lighting

With respect to potential blade glint impacts, the Department agrees with the Proponent that this can be effectively managed through appropriate turbine treatments (such as the use of low sheen and matt finishes) to ensure negligible impacts and has recommended conditions of approval in this regard.

The Department accepts the findings of the Proponent's assessment, which predicts that shadow flicker at any residence would not exceed 30 hours per year and that the flicker rate (1Hz) is not enough to cause health impacts such as photosensitive epilepsy. To ensure the amenity of surrounding residents is preserved, the Department recommends a condition to ensure that shadow flicker arising from the operation of the project shall not exceed 30 hours/annum at any non-associated receptor.

With respect to night lighting, the Department notes a final determination cannot be made on this until CASA have been consulted on the conclusions of the aviation hazard assessment. The Department agrees that if obstacle lighting is required, night lighting would be most visible to motorists travelling along local roads. However, impacts would be short and partially screened by vegetation and undulating landforms. Although night lighting would be visible at a number of residential view locations, views from dwellings would be limited and vegetation and landforms would help screen the majority of turbines. Should aviation hazard lighting be required for the project, the Department considers that all reasonable efforts should be made to ensure that lighting requirements are designed to be as minimally intrusive as possible (in consultation with CASA), and has recommended conditions in this regard. The Department has also recommended conditions of approval requiring consideration of potential intrusive effects from night lighting (if required) in implementing screen planting at neighbouring receptors.

Impacts to Landscape and Public Views

The Proponent's Environmental Assessment considered that the project would result in a medium impact to landscape characteristic elements in the area and low impact to representative public viewpoints.

The Department notes that the Proponent's assessment has indicated that the view shed of the project would be limited to only a relatively small part of the region. The Department therefore considers that the project would have only a limited influence on broader landscape views and values.

With respect to public view points, the Department considers that given the limited locations and large distance of the project area from the majority of public view locations, any views of this region would be limited to distant views. The Proponent's assessment has identified that the presence of intervening landforms and vegetation would significantly screen views of the project.

With respect to views from surrounding roads, the Department is satisfied that given the largely transient nature of views from moving vehicles, that road side views are unlikely to be significantly affected by the project and may in fact provide a point of interest to visitors to the area. The Department also notes that the Gwydir Highway is the only road with high volumes of traffic, and although at various sections a large number of turbines may be visible, the views would be distant.

In consideration of the above factors, the Department considers that the project's impacts on landscape values as a whole would be acceptable. Whilst accepting that some residual impacts to landscape amenity may remain (particularly at a local

level), the Department does not consider that these residual impacts would outweigh the project's broader public interest with respect to renewable energy generation.

5.3. Noise

A Noise Impact Assessment was conducted by SLR Consulting Australia Pty Ltd on behalf of the Proponent. The methodology employed is supported by the South Australian Environment Protection Authority (SA EPA) *Environmental Guidelines for Wind Farms (February 2003)*, World Health Organisation Limits, and relevant industrial noise, construction noise, traffic and vibration guidelines.

Noise monitoring was undertaken in the period from 7 July 2009 to 23 July 2009 at 11 locations to determine baseline noise levels of the area. Noise and vibration impacts from wind farm operations, construction and traffic generation were also assessed.

Operational Noise

The assessment was carried out for the two alternate wind farm layouts. The 159 WTG layout which was assessed using either Vestas V90 or Gamesa G87 turbines, or the 125 WTG layout which was assessed using either Siemens SWT 2.3-101 or Vesta V112 turbines. Due to an error identified by the Department, the Gamesa G87 turbine was withdrawn from consideration by the Proponent. The Proponent states that the Vestas V90 and Siemans SWT 101 turbines represent the worst case noise impact for each of the two planning layouts, based on turbines currently available to the market. The Vesta V112 represents the quietest wind turbines on the market.

Noise generated by wind turbines increases as wind speeds increase. However, as background noise levels are also affected by increased wind speed, the noise generated by wind turbines at a higher speed may be fully or partially masked by a corresponding increase to background noise levels at the receiver from windy conditions. In recognition of this relationship between wind speed and background noise, the SA Guidelines specify operational noise limits with consideration to applicable background noise levels at receptors.

The SA Guidelines require that the noise generated by the operation of wind turbines do not exceed a noise level of 35 dB(A) L_{Aeq} or the background noise level by more than 5 dB(A) (whichever is greater) at surrounding "non-associated" landowners. The SA Guidelines do not identify specific noise limits for "associated" landowners noting that this is subject to agreement between parties as part of commercial negotiations. Despite this, in order to protect the amenity of residents in Commercial Agreements, the Proponent has committed to ensuring that sound levels will comply with the World Health Organisation (WHO) guidelines for sleep disturbance. The WHO Guidelines recommend an indoor level of 30dB(A) which equates to an outdoor noise level of 45dB(A) with windows open, or 52dB(A) with windows closed.

The SA Guidelines require the predicted noise levels from the wind farm to be compared against the measured background noise levels in the area, with sufficient data considered to be approximately 2000 data points. Monitoring was commenced at 13 locations, however a number of locations did not receive sufficient data due to equipment failure. Where this occurred the nearest monitoring location was selected as being representative. The EA therefore presented 11 locations for background

monitoring. Although 3 of 11 the monitoring locations fell short of the required 2000 intervals, because of battery failure, as between 53% and 66% of the data had been collected and the correlation coefficient was relatively good (between 0.3 to 0.47) the Department accepts the result as satisfactory.

Noise predictions were made for all receptors within 6km of a proposed turbine. The assessment predicted noise levels at all relevant receivers for the wind speed range from cut-in to approximately 10 m/s (as the published manufacturers sound power level has only been published up to 10 m/s). The EA justifies this range as the audibility of the wind turbine noise begins to 'plateau off' at higher wind speeds because of higher masking background noise. The assessed range is reported to cover the most critical noise operational conditions.

The noise assessment determined that the 159 turbine layout (option 1), was predicted to comply with all relevant noise criteria (SA EPA Guidelines and WHO Guidelines) at all neighbouring dwellings accept for a single marginal exceedance of 0.2dBA at Spring Creek (at a wind speed of 8.6m/s) equipped with the Vestas V90 turbine.

The second 125 turbine option was predicted to comply with all relevant noise criteria except for Spring Creek equipped with the quieter Vestas 112 turbine with a single marginal exceedance of 0.2dBA (at a wind speed of 8.6m/s). However, the 'worst case' Siemens SWT 101 turbine was predicted to have a marginal exceedance (0.8 dBA at 10m/s) at Krystal Blue and a medium exceedance at Spring Creek (2.5 dBA at 10m/s).

The Proponent states that once the final turbine model has been selected and the final noise modelling determined, that any exceedances will be resolved through landowner agreements, reducing turbine operational noise (which may include operating in 'noise optimised mode', turning off turbines at specific wind speeds or acoustic upgrades at receivers), micrositing turbine positions or by the removal of turbines.

In addition to the noise generated from the wind turbines, a combined collector and switching station is required at the connection point to the TransGrid transmission infrastructure. The EA has discussed two possible points of connection, either to a 330kV transmission line through the western section of the site or to a 132kV transmission line which runs to the south of the site. Tables 6 and 7 below show the substation site options and nearest receptors and predicted "worst case" noise impacts.

Table 6: Substation Site Options

Substation Option	Substation Type	East (m)	North (m)	Nearest receptor (proximity)
A	330 kV	347164	6713081	11 Kingshill (630m), 16 Narren Vale (775m), 38 Yarrandoo (950m)
B	330 kV	347683	6711612	11 Kingshill (900m), 38 Yarrandoo (2440m), 16 Narren Vale (2630m)
C	330 kV	348253	6709952	111 Kia-Tami (2320m), 11 Kingshill (2630m),16 Narren Vale (2750m),
D	330 kV	347083	6712964	11 Kingshill (700m), 16 Narren Vale (875m), 38 Yarrandoo (1160m),
E	132 kV	354213	6708773	28 Leeweena (2120m), 97 Manaroo (2695m), 170 Tauraurga (2920m),
F	132 kV	358507	6706840	208 Adavale (1187m), 153 Mt Buckley (2326m), 220 Quabadee (2475m)

(Source: Wind Prospect CWP Pty Ltd, 2012)

Table 7: Substation noise levels at receivers.

Substation Option			
A	37 dBA @ 11 Kingshill	36 dBA @ 16 Narren Vale	36 dBA @ 38 Yarrandoo
B	37 dBA @ 11 Kingshill	34 dBA @ 16 Narren Vale	26 dBA@ 38 Yarrandoo
C	20 dBA @ 111 Kia-Tami	28 dBA @ 11 Kingshill	27 dBA @ 16 Narren Vale
D	39 dBA @ 11 Kingshill	35 dBA @ 16 Narren Vale	35 dBA @ 38 Yarrandoo
E	21 dBA @ 28 Leeweena	10 dBA @ 97 Manaroo	23 dBA @ 170 Tauraurga
F	24 dBA @ 208 Adavale	16 dBA @ 153 Mt Buckley	13 dBA @ 220 Quabadee

(Source: Wind Prospect CWP Pty Ltd, 2012)

Noise generated by the operation of stationary facilities is required in New South Wales to comply with the *NSW Industrial Noise Policy* (EPA, 2000) (INP). Under the INP the most stringent project specific noise limit that can apply to a sensitive receiver is 35 dB(A) for $L_{Aeq(15\ minute)}$ noise and 45 dB(A) for peak noise events ($L_{A1\ (1\ minute)}$) in the night time period. The noise limits under the INP apply to all receivers (associated and non-associated).

The Proponent has adopted the 'worst case' 35dBA to provide the most conservative assessment. The above tables illustrate that all but 1 substation option (option C) will exceed the 35dBA noise limit within the INP for the 330kV substation option. Both options will comply with the INP criteria for the 132kV option. The Proponent considers that although there are exceedances of the INP criteria, the locations are still viable through post approval mitigation measures. This could include utilising a transformer with lower sound power levels, or mitigation measures to be incorporated into the design of the substation, which would depend on the type of transformer used. Furthermore, acoustic upgrades to affected dwellings may further reduce the impact. Also, the conservative assessment did not take onto account the potential for background noise, which therefore could result in a 'criteria' greater than 35dBA. As the assessment is 'worst case' the final substation selection could possibly result in a lower sound level than that which was assumed, which could correspondingly result in compliance with the criteria.

In addition to the above, the EA and PPR state that discussions between the Proponent and TransGrid (after the completion of the Noise Assessment) have led to another preferred option for a 330Kv substation. Although this option was not considered in the noise assessment, the location is a significant distance from the nearest residence (1.91km from "non-associated" and 1.26km from "associated") and, therefore it is predicted to comply with all relevant criteria.

In addition to the collector and switching substation, the project is proposing 2 smaller (25m x 25m) cluster substations, which would each consist of up to 3 medium voltage transformers stepping up the voltage to 66 kV to minimise reticulation losses. Although no sound output at the source was provided, the Proponent has assessed that as these substations are smaller, and located a reasonable distance from any receptor (1.8km for the Sapphire Cluster substation and 1.1km to the Wellingrove cluster substation), that noise will comply with the relevant criteria.

Construction Noise

Noise will be generated from construction activities including construction of access roads, establishment of turbine tower foundations and electrical substations, digging of trenches and erection of turbine towers.

The Proponent conducted a noise assessment based on the *Interim Construction Noise Guideline* (DECCW, 2009) (ICNG). The area surrounding the proposed wind farm is primarily used for agricultural purposes with an ambient noise background dominated by natural sources which is reflected in the low Rating Background Level dB(A).

The anticipated construction period is approximately 18 to 24 months, with civil works expected to span approximately 12 to 15 months. As it is anticipated that the majority of construction would be during standard construction hours the EA considers it appropriate that construction noise levels up to 10 dBA above the RBLs would be acceptable. Construction noise levels exceeding 10 dBA above the RBL would be considered 'noise affected' and levels greater than 75dBA 'highly noise affected'. The Proponent carried out worst case construction noise modelling at all nearby receivers. 29 receivers were found to be noise affected, 12 of which were non-associated dwellings. Foundation establishment (in particular rock breaking), was the only activity predicted to impact over the 10 dBA limit at non-associated receivers. The EA states that the operation of the rock breaker is dependant on geotechnical conditions of the foundation site and would be operated intermittently at most. The EA also states that consideration of mitigation measures such as shrouding may be required when operating the rock breaker at the most exposed locations. The EA considers that due to the anticipated short period of localised works, impacts on all receivers would be acceptable and that no receivers would be highly noise affected.

The concrete batching plant is predicted to be below the ambient background noise at all non associated dwellings, however 3 associated dwellings will be "noise affected' (above 10 dBA).

Blasting and Vibration

Blasting may occur to clear large rock outcrops to prepare turbine foundations. The closest residence would be 1000m away and therefore the assessment concluded that blasting is likely to meet all human comfort limits and building assessment criteria would be easily met.

The highest levels of ground vibration would occur from activities such as the operation of the vibratory roller (during construction of roads), and the operation of the rock breaker. However, due to the separation distances from residences, the building and human comfort vibration criteria would easily be met.

Traffic Noise

The Proponent has assessed traffic noise against the *Environmental Criteria for Road Traffic Noise* (EPA) (ECRTN). The Proponent established the criterion of equivalent (LAeq, 1 hour) noise levels of no greater than 55dB(A) during daytime (7am to 10pm).

As shown in Table 8, the required setback to meet the ECRTN criteria would be between 40 and 60m depending on location. The assessment states that as the location is a rural farming community most receptors are setback significantly over the required setback distance and therefore easily meet the ECRTN criteria.

Table 8: ECRTN Setback Criteria

Proposed Access Road	VPD Current	VPD Projected Maximum Construction Traffic *	Projected increase in existing road traffic noise level	ECRTN classification	ECRTN requirement	Approximate distance at which ECRTN requirement is achieved
Gwydir Highway	1360	Up to 250	0.7 dBA	Freeway / Arterial	$L_{eq(15hr)}$ 60 dBA	60 m
Waterloo Road	60	Up to 250	7 dBA	Local	$L_{eq(1hr)}$ 55 dBA	40 m
Pollhil Road	< 50	Up to 250	7 dBA	Local	$L_{eq(1hr)}$ 55 dBA	<40 m
Western Feeder Road	< 50	Up to 250	7 dBA	Local	$L_{eq(1hr)}$ 55 dBA	<40 m
Kings Plain Road	< 200	Up to 250	4 dBA	Local	$L_{eq(1hr)}$ 55 dBA	60 m

Note * assumes that concrete is delivered from Glenn Innes or Inverell and is not produced by local batching plant.
(Source: Wind Prospect CWP Pty Ltd, 2012)

The EA acknowledges that there could potentially be a need for out-of-hours deliveries during construction, which has potential to cause sleep disturbance to residential receivers along the route. The Proponent's preliminary calculations indicate the maximum noise levels at a distance of 10m from the road would be 45-80dBA as a result of heavy vehicles. As the background noise levels would be low (approximately 30dBA) the predicted maximum noise levels would potentially cause sleep disturbance.

The Proponent, however, argues that this is not a significant issue as construction traffic will primarily utilise the Gwydir Highway. As this route has approximately 1400 vehicles per day, including significant heavy vehicles, the projected night time traffic impact would not be anticipated to be significantly greater than what currently exists. Despite this, the Proponent proposes to mitigate any impacts including notifying the affected public and restricting engine braking in built up areas.

Mitigation

The Proponent has committed to monitoring noise levels during operation and implementing an approach of adaptive management where noise impacts are identified. The adaptive management approach proposed includes documenting noise complaints through a complaints line or other means, investigating the nature of the complaint, including conditions when noise impact occurs, and implementing measures to minimise the impact including sector management (i.e. slowing down or shutting down of specific turbines during periods of likely worst impact, such as specific weather conditions), or providing acoustic attenuation at the receiver.

The Proponent's EA proposes a number of mitigation measures during construction to minimise noise at affected properties in accordance with the ICNG which could involve maintenance of vehicles, landscaping (including raised embankments and vegetation), and providing acoustic upgrades (glazing, façade, masking noise etc) to affected dwellings.

The Proponent also plans to use administrative measures such as inspections and scheduling. Construction hours including heavy vehicle movement are proposed to be restricted to 7am and 6pm, Monday to Friday and between 8am and 1pm on Saturdays. Night time deliveries would involve prior notification to the impacted public and restricted use of exhaust/engine brakes in built up areas.

Consideration

Operational Noise – Wind Turbines

The Department is satisfied that the Proponent has undertaken a robust and representative assessment of the operational noise impacts of the project's wind turbine generators. Based on this assessment, the Department is satisfied that the project, subject to the recommended conditions, can be designed and operated to achieve acceptable operational noise outcomes at nearby receptors, both associated and non-associated.

The Department notes that the Spring Creek and Krystal Blue properties could be potentially noise affected, but this is only likely if the worst case turbine is selected by the Proponent. Spring Creek could have a minor or moderate exceedance under all 3 of the turbines assessed. Krystal Blue would have minor exceedances if the 'worst case' Siemens SWT 101 (125 turbine layout) turbine was selected. The Proponent has committed to ensuring that the chosen turbine meets the noise requirements at all residences and will re-analyse the noise modelling and modify the project as necessary to comply, which may include micro-siting, running in low-noise mode or removal of turbines. In addition land owner agreements may be reached.

As discussed in Section 5.2 of this report, due to high visual impacts and potential noise exceedances at both Krystal Blue and Spring Creek, the Department recommends more specific action to be taken than that proposed by the Proponent. In regards to Spring Creek, the Department recommends that the Proponent acquire the property prior to any construction of the project if requested by the landholder. In regards to Krystal Blue, as the landholder does not currently wish to be acquired, the Department recommends taking a precautionary approach and recommends removing the three closest turbines from the scope of the project. The removal of the most dominant turbines would therefore reduce visual impact, and as the closest turbines would now be over 2km from the dwelling, would result in compliance with the appropriate noise guidelines under all turbine options, even without further mitigation. Furthermore, as previously discussed, the Department considers it necessary to give the landholder the opportunity to be acquired if the landowners circumstances change, and recommends a condition to enable the landholder to request the Proponent to acquire the property within 5 years of the commencement of operation.

To protect the amenity of these properties, a condition of approval is recommended ensuring that if agreements are unsuccessful, that applicable noise levels are met.

This would involve the Proponent mitigating the noise impacts by operating turbines in low noise mode, or turning turbines off in certain weather conditions.

To ensure that the final project design (including likely micro-siting refinements and turbine selection) does not result in noise levels any greater than those predicted by the Proponent's assessment, the Department has recommended conditions of approval requiring the Proponent to prepare a detailed design noise report consistent with the requirements of the SA Guidelines prior to the commissioning of the wind turbines, to confirm the noise impacts of the final turbine layout and design. The report must demonstrate noise levels are no greater than the criteria within the SA Guidelines.

Furthermore, the Department has recommended stringent compliance monitoring requirements following the commencement of operation of the project to confirm the performance of the project, including requirements to investigate and take appropriate remedial action where a non-compliance is identified. Appropriate remedial action would take the form of source measures (i.e. design changes or sector management) or receiver measures, but only if agreed to by the receiver (i.e. acoustic shielding or similar in the case that all reasonable and feasible at source measures have been exhausted).

No exceedance of adopted WHO criteria is predicted at associated receptors. Notwithstanding, the Proponent's assessment identified that there may be specific conditions when receptors may experience reduced noise amenity such as annoyance impacts from modulation effects (i.e. the "whooshing" sound caused by different wind speeds or wind gradients forming between the top and bottom of the rotor blades during stable atmospheric conditions - also known as "Van Den Berg effects"). The Proponent predicts that the likelihood of such impacts occurring is very low. If the conditions did prevail which would trigger modulation, the impact could reduce amenity although still meeting the criteria within the SA Guidelines (e.g. the noise is at an acceptable level but fluctuating could cause irritation). However, if atmospheric conditions did reduce the amenity at dwellings it would be variable and intermittent and for a short period of time.

In regards to temperature inversions (the atmospheric condition in which temperature increases with height) the Department agrees with the Proponent's assessment that conditions for temperature inversions are unlikely. Furthermore, the conditions required to create temperature inversions generally require little or no wind, which would probably result in the wind turbines not operating as they require a minimum wind speed of 3m/s.

Potential impacts from low frequency noise has generated significant concern amongst members of the public in relation to recent wind farm proposals. Similarly, infrasound, which is noise occurring at frequencies below 20Hz (which is below human detection) and is often mistakenly used to describe low frequency noise has been raised as a concern. The Department is satisfied, based on the consensus of research both in Australia (i.e. literature reviews undertaken in the development of the SA Guidelines) and overseas technical reports (as reviewed by the Proponent), low frequency and infrasound noise emissions would be significantly below the recognised threshold of perception for acoustic energy within this range.

Analysis of wind turbine spectrum shows that low frequency noise is typically not a significant feature of modern wind turbine noise. On this basis, the Department is satisfied that subject to modern design standards, the wind turbines associated with the Sapphire Wind Farm project are unlikely to pose a significant risk of low frequency noise and infrasound impacts to surrounding receptors. Notwithstanding, the Department has recommended a condition of approval for the Noise Compliance Plan to report against the SA Guidelines.

With respect to noise impacts to neighbouring (non-associated) properties, the Department notes that the Proponent's assessment has demonstrated that the project can be designed to achieve compliance with applicable noise amenity criteria at all but 2 neighbouring non-associated dwellings (discussed previously). As indicated above there will be a requirement for monitoring and rectification of any exceedances. On this basis, the Department is satisfied that the project would not significantly impact on the noise amenity of surrounding dwellings subject to the recommendations previously discussed for the 2 impacted properties.

Operational Noise – Ancillary Infrastructure

The Department is satisfied based on the Proponent's assessment that although some of the assessed substation locations will exceed noise criteria, options and mitigation measures do exist to ensure the substation would not pose an operational noise risk to surrounding receptors by itself or cumulatively with associated wind turbines. The Department accepts that the noise predictions are 'worst case', and that mitigation measures through substation design (including using a transformer with a lower sound power level to reduce predicted noise levels) could achieve acceptable outcomes. Notwithstanding, the Department has recommended stringent operational noise verification requirements as part of its conditions of approval to ensure that the substation is designed incorporating all reasonable and feasible mitigation measures to achieve applicable noise criteria at the nearest receivers. To further protect the amenity of sensitive receivers the Department recommends a condition requiring the Proponent to comply with the most stringent noise limit of 35 dB(A) for $L_{Aeq(15\ minute)}$ noise and 45 dB(A) for peak noise events ($L_{A1\ (1\ minute)}$) in the night time period pursuant to the *NSW Industrial Noise Policy* (EPA, 2000) (INP).

The Department notes that the corona and aeolian noise typically generated by overhead transmission lines is generally intermittent and in most cases not high enough to be audible above background noise. The proposed overhead transmission lines are to be constructed only within the project site and therefore no impacts are expected on non associated properties. Notwithstanding, the Department has recommended conditions of approval requiring the lines to be designed and installed with consideration to the protection of the noise amenity of surrounding dwellings.

Construction Noise and Vibration Impacts

In accordance with the Director-General's requirements, the Proponent has assessed construction noise impacts associated with the project consistent with the *Interim Construction Noise Guidelines* (DECC, 2009) (ICNG) which requires the derivation of construction noise goals based on existing background noise levels. In the case of low existing background noise levels (such as the project site), the ICNG requires that construction noise goals be set at background + 10 dB(A). The Proponent has determined that there would be aspects of construction which exceed the targets of

35 dB(A) for $L_{Aeq(15\ minute)}$ noise and 45 dB(A) for peak noise events ($L_{A1\ (1\ minute)}$) in the night time period (although most work is proposed during regular construction hours).

Although the Department acknowledges potential impacts are transient, mitigation methods to reduce any impact should be deployed. To ensure that all reasonable and feasible noise mitigation measures are implemented during construction, the Department has recommended conditions of approval requiring the Proponent to develop comprehensive noise management measures as part of a construction environmental management plan, including measures for community notification, noise monitoring and complaints management.

With respect to traffic noise, the Department concurs with the Proponent's assessment that any road traffic noise impacts are most likely to be a result of construction related traffic rather than operational traffic, which would be limited to operational personnel and intermittent maintenance activities. Based on the Proponent's assessment, the Department is satisfied that the construction traffic noise impacts associated with the project are acceptable.

With respect to vibration impacts, the Department is satisfied that the assessment has demonstrated that ground borne and blasting vibration generated during the construction of the project can be managed to achieve relevant human comfort and building damage criteria. Furthermore, the project would not pose a perceptible source of vibration impacts during operation. Notwithstanding, the Department has recommended best practice vibration and blasting limits be incorporated into the conditions of approval to provide performance standards that must be achieved during the construction and operation of the project.

5.4. Health Impacts

A number of concerns regarding health impacts of wind turbines were raised in submissions and by the broader community. These concerns were predominantly aimed at the potential for "Wind Turbine Syndrome" (the claim that exposure to wind turbines causes adverse health impacts) and the effects of low frequency noise on vestibular organs – balance, motion and position. In addition, further concern was raised regarding the lack of Australian research into the health effects of turbines on people, as raised in the Federal Senate Inquiry into the social and economic impact of rural wind farms.

The Proponent has established that the main health concerns raised by the public predominantly relate to low frequency noise and infrasound impacts, atmospheric stability and amplitude modulation noise (discussed in Section 5.3), shadow flicker (Section 5.2), and the impact of magnetic fields.

The EA indicates that Electric and Magnetic Fields (EMFs) can be caused naturally (lightning or the Earth's magnetic field) or as a result of human activity, from electricity. EMFs occur wherever electricity is present, so therefore in the case of wind farms this is found in electrical equipment such as transmission lines, substations and electrical components within the turbines. The EA states that this equipment will produce Extremely Low Frequency (ELF) EMFs which means the current alternates direction between 30 and 300 times per second or at 30 to 300 Hertz.

The Proponent states that there are no Australian standards regulating exposure to ELF EMFs, however the National Health and Medical Research Council (NHMRC) issued interim guidelines (which have since been rescinded) limiting exposure to 50/60 Hz of electric and magnetic field. Furthermore the NHMRC recommended exposure limit (24 hour exposure) is 1000 milligaus (mG) for magnetic fields and 5 kilovolts per metre (kV/m) for electric fields. If exposure is for a few hours a day the limit is increased to 10,000 mG for magnetic fields and 10 kV/m for electric fields.

The EA states that electric fields are close to zero for most equipment/appliances due to the shielding provided by the equipment itself. To the extent there is a potential health concern, the focus is now on magnetic fields (MFs), rather than electric fields. MFs are found in house hold appliances with equipment (such as a hair dryer) typically producing magnetic field strengths of up to 25 mG. The Proponent's assessment states that the typical magnetic field strength around the home is in the range of 0.1 to 2.5 mG and for homes near power lines, this could increase to 10 mG.

The project is proposing internal under and above ground electric cabling up to 132kV, and either 132 or 330 kV overhead electrical cabling between the switching station and connection point with the transmission network. The assessment has concluded that measurements have found that a maximum level of 78 mG is found underneath a 220 kV line while magnetic fields under a 330kV high voltage transmission line ranges from 5 to 50 mG. Variations are a result of loadings on transmission lines, with the maximum levels predicted to be short term. The assessment also concludes that the magnetic fields from the 66kv powerline or 33 kV cabling is expected to be weaker and effects considered negligible, particularly as the nearest receptor to the 66kV powerline is over 240m away (as MFs fall quite rapidly with distance). The EA concludes that the levels are substantially under the recommended NHMRC levels.

In regards to the substation, the predicted magnetic field levels are between 1 mG to 66 mG recorded at the security fence around the substation. As the nearest receptor to any substation option (including cluster substations) is 630m away (associated dwelling to substation option A), levels of magnetic fields are expected to be extremely low.

The strength of magnetic fields from the wind turbines is anticipated to be negligible at any receptors and significantly under the 1000 mG guideline. The EA states that test results from a 1.65MW turbine in Canada show a measured magnetic field in the front door of the wind turbine to be 0.4mg. At a distance of 3m values were recorded to be as low as 0.04mG, and at 7.5m no measurable magnetic field was detected. Therefore, even with a higher megawatt turbine, given the large setback from any receptors (935m from the closest dwelling), magnetic fields are not predicted to be an issue.

The Proponent has concluded that the negligible levels of magnetic fields produced by the generation of electricity through turbines would not pose a threat to human health.

Consideration

The issue of EMFs and health effects has been extensively reviewed over the past 30 years both in Australia and internationally, however adverse health effects due to EMFs have not been proven. Notwithstanding, the Department has taken a conservative approach and does not rule them out. However, due to the distance between infrastructure and receivers the Department considers it is unlikely to be an issue. As there is currently no Australian Standard for electric or magnetic field exposure limits, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) has released fact sheets based on the International Commission on Non-Ionizing Radiation Protection (ICNIRP) standards which are generally used and accepted. The Department is satisfied that as the levels of EMFs are significantly under the ICNIRP levels (1000 mG for public exposure and 5000 mG for occupational exposure), impact on human health would not occur. In addition, the Department is satisfied that commitments from the Proponent demonstrate application of the principles of prudent avoidance by locating transmission and power lines as far as practical from residences and in accordance with the minimum distances set in Essential Energy's Procedural Guideline – Easement Requirements.

The Department has considered the impacts of low frequency noise and wind turbine syndrome. In this regard, the Department notes the National Health and Medical Research Council (NHMRC) conducted a review of the evidence relating to the adverse health impacts caused by the wind turbines and concluded that "*There are no direct pathological effects from wind farms and that any potential impact on humans can be minimised by following existing planning guidelines".* The NHMRC are currently conducting a systematic review of the potential health impacts of wind farms and update of the Public Statement: Wind Farms and Health, which is anticipated to be completed mid 2013.

The Department has consulted with NSW Health regarding potential health impacts resulting from wind farms. NSW Health advised it supports the National Health and Medical Research Council position. The Department notes that impacts such as shadow flicker are not predicted at any dwellings (over the maximum of 30 hours per year), that the proposal is consistent with the South Australian 'Environmental Noise Guidelines: Wind Farms' (February 2003), and with the planning requirements identified in the Director-General's Requirements for the proposal. Accordingly, it is considered that the proposed wind farm would not give rise to any adverse human health impacts.

5.5. Other Issues

The Department's consideration of other issues identified in the assessment is presented in Table 9.

Table 9: Department's Consideration of Issues raised in Public and Agency Submissions

Issue	Department's Consideration
Property Impacts and Land Use	In regard to potential property devaluation the Proponent addressed this issue in the EA and PPR and indicated that studies have shown in Australia and overseas that wind farms generally do not have a negative impact on the value of surrounding land. The Department acknowledges that, in relation to impacts on land values, the NSW Valuer-General commissioned a report on the impacts of wind farms on land values in Australia. The

	report states as its principal finding that there are no obvious discernible impacts on land values from wind farms in the large majority of cases. The Department notes that Council controls could possibly limit certain types of development within proximity of wind turbines, however, the Department does not consider that the construction of a wind farm should restrict future developments on properties, providing they are well sited. In consideration of the above the Department does not consider there to be grounds for the recommendation of financial compensation to any individual receptor on the basis of reduced property value or reduced development potential. The Department notes that this does not preclude any landowner from reaching an independent agreement with the Proponent at any time. The proposed development is also not expected to have a significant impact on agriculture or land use. The wind turbines are located on private involved properties, which are currently used for grazing cattle and sheep. The infrastructure would occupy a relatively small amount of land of the involved properties land, so therefore the impact would be minimal.
Consultation Process	The Department is satisfied that these matters have been adequately addressed in the Proponent's Submissions Report and / or Statement of Commitments.
Bush Fire Risk and Safety	The Department is satisfied that these matters have been adequately addressed in the Proponent's EA and Statement of Commitments. The Proponent has provided a number of mitigation measures which include adhering to all regulations under the NSW *Rural Fires Act 1997* and the Northern Tablelands Draft Bushfire Management Plans. In addition a condition of approval has been recommended requiring the Proponent to provide for asset protection consistent with relevant RFS guidelines and provide for necessary emergency management. A further condition has been recommended requiring all licences, permits and approvals to be obtained and maintained including compliance with the Building Code of Australia. The Department has also recommended a condition requiring the Proponent to prepare a report outlining a comprehensive Safety Management System, covering all on-site systems relevant to ensuring safe operation of the project.
Pending Inquiries	Submissions were received requesting that no wind farms be approved until further research has been conducted into the impacts of wind farms as recommended by the Senate Inquiry into the social and economic effects of rural wind farms. However under the Environmental Planning and Assessment Act 1979, the Department of Planning and Infrastructure is required to accept applications for, and undertake the assessment of, State significant wind farm projects. Provided acceptable environmental outcomes are achieved through the assessment process, wind farms can provide regional development and sustainability benefits for the State. Concern was also raised regarding the cost to the taxpayer though government subsidies for wind farms. The Department is not aware of any direct Commonwealth or NSW subsidy for the construction or operation of wind farms. Most wind farms apply for eligibility to create Large Scale Generation Certificates (LGCs), formerly Renewable Energy Certificates, under the Commonwealth's Renewable Energy Target (RET) scheme. Eligible renewable energy generators are able to create 1 LGC for every megawatt hour (MWh) of eligible electricity generated. Other parties, predominantly electricity retailers, are required to surrender LGCs equivalent to a proportion of their total electricity sales (ramping up to 20% by 2020). Wind farms are able to sell the certificates they create to liable parties, thereby gaining additional revenue to help offset the higher costs of wind energy generation compared to other generation, such as coal or gas. It should be noted that the above scheme is a Commonwealth requirement.
Traffic and Transport	Public submissions have raised concern related to traffic impacts, while

Impacts	Inverell Shire Council has raised concern regarding possible damage to Council assets. The Department agrees that the Proponent should be required to investigate the existing condition of all public roads proposed to be used for construction, and upgrade these to a standard considered necessary to accommodate the traffic volumes associated with the project as well as over-mass or over-dimensional traffic that would be required for turbine transport. The Department has recommended conditions requiring an independent expert to determine whether the proposed route allows for safe access of construction and operational vehicles (including over-size vehicles) and, where necessary upgrades are required. These are to be carried out in consultation with the relevant road authority at the full expense of the Proponent. In regards to road dilapidation, the Department has recommended conditions of approval requiring the Proponent to commission an independent expert to undertake pre-construction road dilapidation surveys in consultation with Councils and the RMS to assess the current condition of the road(s) and describe mechanisms to restore any damage that may result due to traffic and transport related to the construction of the project. The Report shall be submitted to the relevant road authority for review prior to the commencement of haulage. Following completion of construction, a subsequent report shall be prepared to assess any damage that may have resulted from the construction of the project and restore the relevant roads to their original condition, at full cost to the Proponent. Similarly, the Department has recommended a Decommissioning Road Dilapidation process to ensure appropriate mechanisms are implemented to restore any damage to roads during decommissioning of the project. The Department considers that this process would provide a robust basis for determining the need for and extent of upgrade works required. The consultation requirements with the RMS and Councils will also ensure that relevant design standards of these road authorities are taken into account in this assessment. The Department has further recommended conditions of approval requiring all the upgrade works identified by the assessment be implemented in a timely manner, in accordance with the reasonable requirements of the relevant road authority, and at the full expense of the Proponent. To ensure appropriate traffic management during the construction and decommissioning periods, without undue disruption to the local road network, the Department has also recommended that the Proponent be required to prepare a Traffic Management Plan in consultation with road authorities prior to the commencement of construction and decommissioning.
Mining and Exploration	Concern has been raised about the impact on mineral exploration and potential future mining including a submission from the Department of Trade and Investment. There are 8 companies which hold mineral titles across the site, however there are no mineral drill holes or metallic mineral deposits recorded on site, and no metallic mineral sites currently being mined within the project site. There is potential for some impact to the exploration of the area for mineral resource during construction and operation. However, the proposal will not result in the sterilisation of the entire wind farm site for mineral exploration. As stated by the Proponent, exploration activities would still be possible across a majority of the wind farm site. The only limitation to invasive exploration methods will be in close proximity to the placement of infrastructure, i.e. turbines and powerlines, as a result of operational, engineering and safety considerations, and areas set aside for offsets. To minimise areas subject to exploration restrictions in the vicinity of wind farm infrastructure and to minimise conflicts, the Proponent has committed to liaise with current mineral lease holders and provide updates of any modifications to the project. To ensure the project incurs minimal impact to the potential for exploration of mineral resources, allowing the co-existence of the project and mineral

	exploration to be achieved, the Department has recommended a number of conditions. The Department recommends that prior to construction, the Proponent must liaise with the Department of Trade and Investment - Minerals Resources to assist in obtaining information of all current exploration licence holders, including applications lodged for new and renewal of expired exploration licences and potential mining leases. This recommendation ensures that the Proponent would be aware of, and be able to consider, all those parties that may potentially be affected by the location of the wind farm site and transmission line corridors. Secondly, prior to construction, the Proponent must ensure an effective consultation process with relevant titleholders and companies with exploration and mining licences to negotiate measures to be applied during construction and operation of the project. This should determine buffer distances of the project components, so as to minimise the potential for any sterilisation of resources on the tenements and future resource exploration and extraction activities. In order to ensure this consultation process is carried out in a timely and sequential manner, the Department also recommends that the Proponent must, within six months of the Minister's project approval, update the Department of Trade and Investment - Minerals Resources of the progress of the consultation process identified above, and provide subsequent updates at a maximum of six months from the date of providing the initial update. The Department's recommendations discussed above would ensure the project incurs minimal impact on the potential for exploration of mineral resources, allowing the co-existence of the project and mineral exploration to be achieved. It would also ensure those affected from the placement of project components would have adequate opportunity to liaise with the Proponent to negotiate the implementation of measures that will maximise mineral exploration potential and minimise sterilisation and access constraints. It should also be noted that there is no clear grounds to unreasonably restrict the development, given there is no specific mining proposals within the project area. Furthermore, the proposed wind farm is unlikely to sterilise access to resources in the long term, given options to decommission it.
Contributions	Both Glen Innes Severn Council and Inverell Shire Council requested the developer pay Section 94 Contributions. Glen Innes Severn Council requests that in line with the Glen Innes Severn Section 94A Development Contribution Plan, a contribution of 1% of the cost of the development be paid to Council. The Department notes that based on a capital investment value of $479 million, this would equate to a payment of up to $4.79 million to Glen Innes Severn Council (depending on the percentage of infrastructure located within the LGA after micrositing and layout selection). Inverell Shire Council, also requested payment of Section 94 contributions. The necessary infrastructure support for the construction of this project, such as road upgrades, will be provided by the Proponent. In addition it is noted that the isolated location poses no significant amenity impacts to the community, while infrastructure development of this type is unlikely to place any significant demands on Council services particularly with a maximum workforce of only 8 people employed during operation. The Proponent has voluntarily committed to providing a Community Fund annually, contributing up to $397,500 per year ($2500 per wind turbine). The fund would be established in close cooperation with the Councils to provide funding for local community interest groups and activities. In light of the development providing key infrastructure to the state and helping to meet the energy requirements of the State as well as addressing local demand, the Department does not consider that a s94A levy is warranted in this instance. Similarly, contributions under Section 94 are not

	required under the Inverell Shire Council S94 Plan as there is no reasonable nexus to require contributions in accordance with the plan. This approach is consistent with recent wind farm approvals such as White Rock Wind Farm.

6. CONCLUSION

The Department considers that the Sapphire Wind Farm would result in benefits to the wider community by helping to meet the energy requirements of the State as well as addressing any future electricity demand shortfall without the production of additional greenhouse gases. In addition, the project would provide economic investment and benefits to the local community and a greater level of both local and broader community access to renewable energy, as well as contributing to the challenges of climate change, reliance on fossil fuels and energy supply.

The key environmental impacts associated with the proposal relate to flora and fauna, visual, noise and health impacts. Other concerns included property and devaluation impacts, land use impacts (including mineral exploration), the consultation process, health and safety, community benefits and contributions, traffic and transport impacts.

The Department has assessed the Proponent's Environmental Assessment, Preferred Project and Response to Submissions Report, addendums, and Statement of Commitments and submissions received on the project. Based on its assessment, the Department is satisfied that the Proponent has undertaken an appropriate level of assessment. The Department is satisfied that the Proponent has proposed adequate construction and operational environmental management measures.

The Department's assessment indicates that the project would result in some unavoidable biodiversity impacts to threatened species habitat and to the *Ribbon Gum – Mountain Gum Grassy Forest/Woodland of the New England Tableland Bioregion* EEC*, White Box Yellow Box Blakely's Red Gum Woodland* EEC and *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland* and *Derived Native Grassland* CEEC. However, the impacts can be suitably offset in perpetuity consistent with "maintain or improve" principles. The Department is also satisfied that potential risks in relation to rotor collisions can be effectively managed through the implementation of an appropriate adaptive bird and bat management plan.

The Department's assessment on visual impacts raised concern regarding the visual dominance of turbines on two non-involved residences, Spring Creek and Krystal Blue. This has led the Department to recommend that the Proponent acquire the property Spring Creek prior to any construction of the project and remove the three closest turbines to Krystal Blue from the scope of the project and offer acquisition. However, subject to the above, the Department has concluded that significant impacts are unlikely and considers that the project's impacts on landscape values as a whole would be acceptable, and does not consider that any residual impacts would outweigh the project's broader public interest with respect to renewable energy generation.

The Department's assessment of noise has considered potential impacts and has concluded that significant impacts are unlikely. In particular, the assessment indicates that relevant operational criteria could be achieved at sensitive receptors surrounding the site. The Department's assessment of health impacts considered that the proposed wind farm would not give rise to any adverse human health impacts.

The Department's assessment has also addressed a range of other relevant matters. The Department considers that none of these matters raise any significant issues, and is satisfied that any residual impacts can be effectively managed. Consideration has been given to the Draft NSW Wind Farm Planning Guidelines, and the Department is satisfied that the project is broadly consistent with relevant provisions of these guidelines.

The Department has formulated stringent recommended conditions of approval in relation to flora and fauna, visual and landscape, noise, decommissioning, and traffic and transport, amongst others, to ensure that the project achieves acceptable environmental standards, protects public amenity and offsets residual impacts.

The Department considers that subject to the Proponent's nominated environmental commitments, its recommended impact avoidance and management measures contained in the EA and the Department's recommended conditions, the impacts associated with the construction and operation of the project can be minimised and managed to acceptable levels.

On balance, the Department considers the project to be justified and in the public interest and should be approved subject to the Department's recommended conditions of approval and the Proponent's Statement of Commitments.

7. RECOMMENDATION

It is RECOMMENDED that the Executive Director, as delegate of the Minister for Planning and infrastructure:

- note the information provided in this report;
- approve the Major Project Application, subject to conditions; and
- sign the attached instrument.

Prepared by
James Archdale

Neville Crane 14/6/13

Manager- Energy
Infrastructure Projects

Executive Director
Development Assessment Systems and Approvals

APPENDIX A ENVIRONMENTAL ASSESSMENT

See the Department's website at:
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=3245

APPENDIX B SUBMISSIONS

See the Department's website at:
http://majorprojects.planning.nsw.gov.au/index.pl?action=list_submissions&job_id=3245

APPENDIX C PROPONENT'S RESPONSE TO SUBMISSIONS

See the Department's website at:
http://majorprojects.planning.nsw.gov.au/index.pl?action=list_submissions&job_id=3245

APPENDIX D RECOMMENDED CONDITIONS OF APPROVAL

APPENDIX E NSW PLANNING GUIDELINES WIND FARM CHECKLIST

Issue	NSW Planning Guidelines Checklist	Response
Consultation	• Form a Community Consultative Committee (CCC). • Document the consultation process undertaken, including stakeholders consulted. Identify and tabulate issues raised by stakeholders during consultation. Describe how issues raised have been addressed. • Consult with all neighbours with dwellings within 2km of a proposed wind turbine. Identify the neighbours' issues and potential approaches to mitigate any adverse impacts. • Consider seeking agreement with neighbours with dwellings within 2km of a proposed wind turbine.	• Section 6 of the EA documents the consultation process. • Wind Prospect has conducted extensive consultation in the form of letters of notification, face-to-face notification of neighbouring properties within a 5km radius (or letter drop when necessary), newsletters, public opinion surveys, project website, media releases and radio interviews. • The Proponent has not reached agreements with all properties within 2km. • The Department has recommended a condition requiring the Proponent establish a CCC for the life of the project. • The Proponent has initiated the process to form the CCC.
Landscape and visual amenity	• Provide photomontages from all non-host dwellings within 2km of a proposed wind turbine. • Identify the zone of visual influence of the wind farm (no less than 10km) and likely impacts on community and stakeholder values. Consider cumulative impacts on landscape and views. • Outline mitigation measures to avoid or manage impacts.	• Section 8 and Appendix 7 of the EA. • Photomontage locations were selected to represent a range of distances between the view point and the turbine (1.4km to 8.3km). Although not all the non host dwellings within 2km had photomontages, 8 of the 12 locations were non associated dwellings. • The zone of visual influence and mitigation measures to avoid or manage impacts were addressed within section 8 of the EA.
Noise	• Undertake assessment based on separate daytime (7am to 10pm) and night-time periods (10pm to 7am). • Predict noise levels at all dwellings within 2km of a proposed turbine. • Consider special audible characteristics, including tonality, amplitude modulation, and low frequency noise (apply penalties where relevant). • Outline measures to avoid, minimise, manage and monitor impacts.	• The noise assessment in Section 9 of the EA was produced giving consideration to the South Australian Guidelines, which was required by the DGRs. The NSW Guidelines follow closely but improve on the methodologies and practices of the SA Guidelines. The NSW Guidelines give greater consideration to low-frequency noise, tonality, excessive amplitude modulation and auditing and compliance issues. The Proponent's EA addresses these issues, however, not in the detail required by the Guidelines, in particular regarding low-frequency noise. The Department accepts the Proponent has assessed the impacts under the SA Guidelines, however, the Department has considered the NSW Guidelines in formulating

		conditions to ensure acceptable night/day performance.
Health	• Consider and document health issues, focusing on neighbours with dwellings within 2km of proposed wind turbines.	• The main health concern identified by the Proponent was the impact of magnetic fields which was addressed in section 15 of the EA. All other health concerns identified in submissions were adequately addressed within the PPR.
Ecological issues	• Consider potential impacts on birds and bats, particularly migratory species and outline the proposed monitoring and mitigation strategy	• Section 10 and Appendix 11 of the EA and section 4 of the PPR.
Aviation safety	• Outline current agricultural aerial uses on neighbouring properties. • Consider the potential for the proposed wind farm to impact on aviation safety associated with agricultural aerial uses consistent with the draft guidelines.	• Section 13 of the EA section 3 of the PPR.
Bushfire hazard	• Consider bush fire issues consistent with the draft guidelines, including the risks that a wind farm will cause bush fire and any potential impacts on the aerial fighting of bush fires.	• Section 16 of the EA
Blade throw	• Assess blade throw risks consistent with the draft guidelines. • Outline measures to avoid, minimise, manage and monitor impacts.	• The Proponent assessed the likelihood of blade throw within the assessment for its proposed Crudine Ridge Wind Farm. Wind turbines are designed to meet international engineering and manufacturing safety standard in particular the International Electrotechnical Commission (IEC) standard IEC 61400-1: 'Wind Turbine Generator Systems – Part 1: Safety Requirements'. • The assessment concluded that if blade throw did occur, in the worst case scenario the estimated distance of blade throw would be one turbine tip-height. Blade fragment throw (from a damaged blade) can result in fragments travelling much greater distances. The assessment concluded that most research has established that worst case fragment throws would be up to 500m, however one study found a wost case scenario, with a 1 in 50 year wind speed, that there was a 1% chance of throw distances of 1462m for very small fragments (10% blade fragments). The Proponent concluded that pursuant to the assessment of the

		Kittitas Valley Wind Power project (USA) on the probability of blade throw, the likelihood of a blade or other object being thrown was found to be less than one in one billion. • In regards to ice throw, research shows that the hazard area extends 100m downwind and that there is virtually no ice throw hazard 25m upwind. • Due to a combination of distance of receptors form turbines, IEC manufacturing standards and operation management techniques (e.g. monitoring icy weather conditions to apply mitigation measures to prevent ice throw), the Department is satisfied that the probability of blade throw and associated impacts to be minimal.
Economic issues	• Consider whether the wind farm use is consistent with relevant local or regional land use planning strategies. • Consider potential to impact upon mining/petroleum leases and exploration licences. • Consider any potential impacts upon property values consistent with the draft guidelines, including properties within 2km.	• Section 5 of the EA addresses relevant local or regional land use planning strategies. • Section 19.2 of the EA and section 3 of the PPR addresses mineral exploration. • Socio-economic issues (including land value) are addressed in section 19 of the EA and section 3 of the PPR.
Decommissioning	• Include a Decommissioning and Rehabilitation Plan in the EA, including proposed funding arrangements. • Confirm that the Proponent not the landowner is responsible for decommissioning.	• Decommissioning is addressed in section 3.9.10 of the EA, however, no decommissioning plan has been provided at this stage. The Department has recommended a condition of approval requiring the submission of a Decommissioning and Rehabilitation Plan prior to the commencement of construction, as well as requiring the lease to ensure that the Proponent is responsible for decommissioning.
Monitoring and compliance program	• Outline program to monitor environmental performance to ensure compliance including mechanisms for reporting outcomes and procedures to rectifying non-compliance – including any provisions for independent reviews.	• Monitoring and compliance programs have been discussed throughout the EA, however the Department has recommended specific conditions ensuring suitable monitoring and compliance programs are in place.
Council planning controls	• Outline whether the proposal is consistent with any relevant provisions of the relevant council's Development Control Plan and list any variations.	• Section 5 of the EA.