5. ASSESSMENT OF ENVIRONMENTAL IMPACTS

Key issues raised in the submissions in response to the public exhibition of the project and/or identified during the Department's assessment included:

- impacts on visual amenity and landscape values;
- noise impacts;
- ecological impacts;
- aviation hazards;
- subdivision issues;
- impacts on land values; and
- community consultation and impacts.

All other issues are considered to be minor and have been addressed as part of the Proponent's Statement of Commitments.

5.1 Impacts on Visual Amenity and Landscape Values

Issues

The project will be visible in varying degrees from various viewpoints and areas surrounding the project site on the Gullen Range. A visual impact assessment was undertaken and presented in the Environmental Assessment to evaluate the level of visual impact on residents and users at these locations and the degree of change in the landscape as a consequence of the proposal. The visual assessment methodology included the following:

- description of the visual components of the wind farm;
- description of people's perception of wind farms in the landscape, based upon past research;
- definition of the viewshed of the wind farm based upon parameters of human vision;
- description of the planning policies that apply within the viewshed, particularly those such as "Significant Landscape Overlays" that recognise landscape values within the viewshed;
- description of the existing landscape characteristics and define the landscape units and their sensitivity;
- carrying out of a GIS-based "Zone of Visual Influence (ZVI)" or 'seen area' analyses that illustrates those areas from which wind turbines, in whole or part, are visible;
- utilisation of the ZVI analysis to locate indicative viewpoints within the public domain (i.e. from roadsides or from recognised lookout or other vantage points) from which turbines would be visible, as a means of explaining the visual impact of the proposal on publicly accessible locations;
- examination of the potential landscape mitigation measures that may apply to residences within the vicinity of the wind farm;
- analysis of the potential cumulative visual impact of this proposal; and
- description of the potential visual impact of night lighting.

Four landscape character types and 13 viewpoints within a 17 km radius of the site were used for the assessment. Photomontages were constructed for these 13 viewpoints to illustrate how the turbines would appear from these points. The assessment found that there were 128 non-participatory residences within three kilometres of the viewshed where the wind turbines would be highly visible and if closer than 1.5 kilometres, turbines would dominate the landscape. Most residences on the western side of the range were found to have some sort of shelter break/wind break screening present. However residences on the eastern side of the range (approximately 49) were less likely to be screened by topography and surrounding vegetation.

The visual assessment found that the area's landscape will be able to absorb the change in landscape character resulting from the introduction of the wind farm. It also considered that the wind farm will not represent a significant visual impact from most locations around the site. However, it did determine that a number of houses within three kilometres of the site would experience moderate to high visual impact.

Submissions

Many submissions identified visual impact of the project on the Gullen Range as a major concern. The submissions contended that the wind farm would destroy the physical characteristics of the area transforming it into an industrial landscape. Issues raised included:

- the project site is considered inappropriate, as the wind farm would have a negative visual impact on the surrounding area:
- concerns about the annoying visual effects of shadow flicker from wind turbines;
- there are a number of wind farms in the area and cumulative impacts need to be considered; and
- night lighting impacts will further impact visual amenity.

Consideration

Consideration of the visual impact of the project can be evaluated from two particular aspects:

1. broad visual impacts on the landscape of the area; and
2. specific visual impacts on surrounding properties.

Broad Landscape Impacts

The Gullen Range is one of the higher points on the Great Dividing Range (at 975 metres above sea level) with a considerable drop to the plains to the east of the range. The area was divided in the visual assessment into four different landscape categories, including: gently undulating farmland; hilly farmland; vegetated areas; and rural townships.

Various rural residential dwellings are located throughout the surrounding area of the project. In terms of overall landscape sensitivity, the visual assessment rated the surrounding areas of the project site as either low or moderate. That is, the area is fairly common and typical of the surrounding region. The Department concurs with the Environmental Assessment regarding suitability of the project in the context of Gullen's broad landscape value, rated as up to moderate significance. It acknowledges, however, that some members of the local community may not accept such a moderate ranking of the area's landscape values.

The Department recognises that public perception is an important component but only one element in the visual assessment methodology, as discussed further below. In terms of broad landscape consideration, the site provides a suitable setting for a wind farm development. There is already significant disturbance in the area which is a cleared agricultural landscape including existing built elements such as, industrial agriculture, aerodrome, telecommunication towers, and high voltage transmission lines.

In assessing any wind farm proposal, the Department deems it necessary that the landscape value be seen from a regional, if not State-wide perspective. For example, if a wind farm proposal such as this project is refused solely upon a local perspective of scenic quality, it would probably eliminate opportunities to construct wind farms possibly anywhere in the region, and possibly in the State. The Department's assessment is consistent with the general approach taken for previous wind farm proposals in that a wind farm would have to impact a landscape of regional, if not State or national importance, for it to be refused on the basis of scenic quality alone.

The Department recognises the strong and often highly emotive views of the potentially affected residents. It is understood that many within the local community (who have no financial benefit from the project) have strong negative feelings about the proposed wind farm. In some cases, this is regardless of the actual proximity to the turbines.

The Department considers that the current approach of assessing the impacts and issues associated with the project provides a reasonable and legitimate basis for decision making. The Department does not accept that there are critical and overwhelming matters of regional or State visual sensitivity that would provide grounds for rejecting the proposal outright. For this development, the broader and overall strategic benefits of the proposal are considered to provide a stronger weighting.

Specific Visual Impacts on Surrounding Properties

The second aspect of the visual impact relates to the impact on surrounding residences and viewpoints. Zone of visual influence modelling was completed to identify areas where the proposed wind farm could be viewed. The

Environmental Assessment considered the visual impact from 13 key viewpoints of surrounding residents, towns and roads within 17 km distance of the project site.

Visual sensitivity of users was determined to assess the visual impact of the wind farm from major viewpoints. The analysis took account of the visual catchment, duration and dominance of exposure and how the user values the landscape. The visual impact was determined when the visual sensitivity analysis was combined with the zoned distances of visual impact (Table 2). The location of 141 residences within three kilometres of the project site is shown in Figure 6. The Environmental Assessment describes the wind turbines to be highly visible and usually dominate the landscape for observes up to three kilometres from the wind turbines (Table 2). The Department considers that the most significant potential visual amenity impacts from the project would occur within this three-kilometre zone.

Table 2 - Visual Impact Relative to Separation Distance from Turbines

Distance between Observer and Nearest Turbine	Visual impact
>17 km	***Visually insignificant*** A very small element in the viewshed, which is difficult to discern and will be invisible in some lighting or weather circumstances.
8.5 km-17km	***Potentially noticeable, but will not dominate the landscape*** The degree of visual intrusion will depend on the landscape sensitivity and the sensitivity of the viewer; however the wind turbines do not dominate the landscape.
3.0km-8.5km	***Potentially noticeable and can dominate the landscape*** The degree of visual intrusion will depend on the landscape sensitivity of the viewer.
1.5km-3.0km	***Highly visible and will usually dominate the landscape*** The degree of visual intrusion will depend on the wind turbines placement within the landscape and factors such as foreground screening.
<1.5km	***Will be visually dominant in the landscape from most viewing locations.***

The Department recognises this impact and considers it necessary to require the Proponent to provide visual screening to residences who consider themselves to be affected by the proposal. As the viewing location is relatively fixed, planting may be designed to either screen the wind turbines from view, or significantly reduce the visual dominance of wind turbines through filtering. The conditions of approval recommended by the Department permit any residential receiver within three kilometres of the project to request and receive on-site landscape treatments from the Proponent.

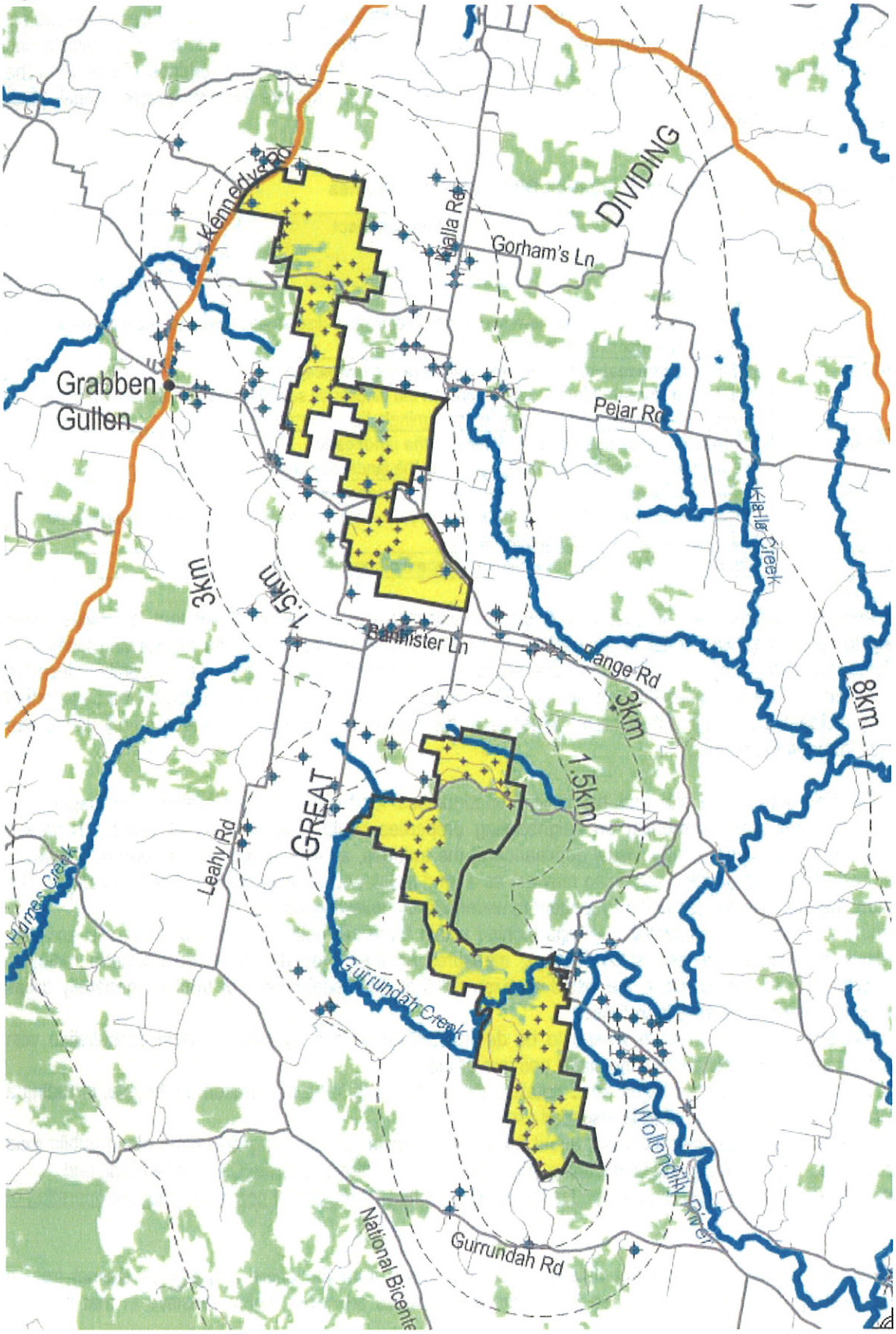
Due to the elevation of the site and the limited opportunities for turbine siting/relocation, the Department recognises that landscape screening on neighbouring properties could result in loss of views. However, screening may reduce the potential visual dominance of the turbines, as well as providing a form of offsets for impacted residences. In addition screening may act as a wind break and weather break in some instances. The Department therefore recommends the Proponent to undertake the following actions:

- notify all owners of residential dwellings located within three kilometres of the wind farm site and with views of turbine(s) to request landscaping measures on their property (the three kilometre radius is consistent with the advice in the visual assessment that the visual impact of turbines generally drops rapidly at approximately this distance);
- landscape mitigation measures need to be determined on a case by case basis in consultation with landholders using advice from the local Landcare group;
- a Landscape Plan should be provided detailing the landscaping to be undertaken on the site, including a program of maintenance of all landscaped areas;
- consult with Upper Lachlan Council about the need to provide landscaping measures along public road reserves. Implementation of landscaping measures will be as directed by the Director-General; and
- complete all landscaping required under the approval within 12 months of commencement of operation of the project.

In response to submissions about not having considered views from the entire property as distinct from a particular dwelling, the Proponent argued that views from houses are more highly sensitive in that it has a

stationary view of the surrounding landscape. Views to the turbines from other locations on the properties are considered of a less sensitive nature and are generally experienced while conducting other activities. The Department concurs with this view and considers that the visual impacts of turbines beyond the confines of the domestic curtilage do not hold the same weighting as for people's immediate living and entertaining areas.

Figure 6 – Location of Residences Relative to the Project



Visual Amenity Impacts on the Rural Zone

The issue of locating wind farms in rural areas thereby affecting visual amenity has been explored in many assessments undertaken both within NSW and elsewhere within Australia and overseas. It has been argued by proponents of wind farms that the issue of visual amenity from rural properties is largely immaterial where the wind farm is proposed to be located within a rural zone. This is because these zones, unlike rural residential or urban village zones, place a focus on providing land for the purposes of agriculture rather than protecting amenity, be it of a visual or acoustic nature. The same is true of the rural zone in which the project is located. Agricultural zoning objectives provide land for agricultural purposes and purposes incidental thereto. Agricultural pursuits (excepting feedlots, poultry farms and the like) are permissible without development consent. Rural and residential zones have different objectives and allow for different development types which translate to different amenity expectations. Whilst the Department recognises the genuine visual impact concerns of residents living in a rural zone, the Department considers that these concerns must be tempered with consideration of the objectives and permissibility of development in the rural zone.

Shadow Flicker

Other visual impacts of the wind farm of concern to the community include shadow flicker. Shadow flicker is the pulsating shadow created by the moving blades when the sun is low in the sky. There are no criteria in New South Wales for shadow flicker, however, many jurisdictions typically apply a standard of 30 hours per year at any dwelling. This standard is based on the impact of shadow flicker on amenity of residences rather than potential health impacts.

Intermittent changes in lighting can adversely impact human health. In photosensitive epileptics, these health effects can include triggering of seizures. In non-epileptics, these impacts can include headaches, nausea and dizziness. If flickering is between 8-30 Hz (flashes of light per second), it may trigger seizures (Epilepsy Association of Australia). Comparable turbines to that proposed for Gullen Range have been rated 1 Hz, well below critical health levels. Thus, the operation of the wind turbines is not expected to produce a flicker frequency that would adversely affect human health.

Shadow flicker analysis performed by the Proponent shows that of the seven non-involved and five involved residences potentially affected by shadow flicker, only one residence is predicted to be affected in excess of 30 hours per year. However, this residence is shown to have extensive vegetation on the western perimeter offering screening from the effects of shadow flicker. In addition, this residence is an involved landholder and thus is aware of the potential for impacts from the proposal (and would be subject to such commercial agreements as may be established between the landowner and the Proponent in this regard).

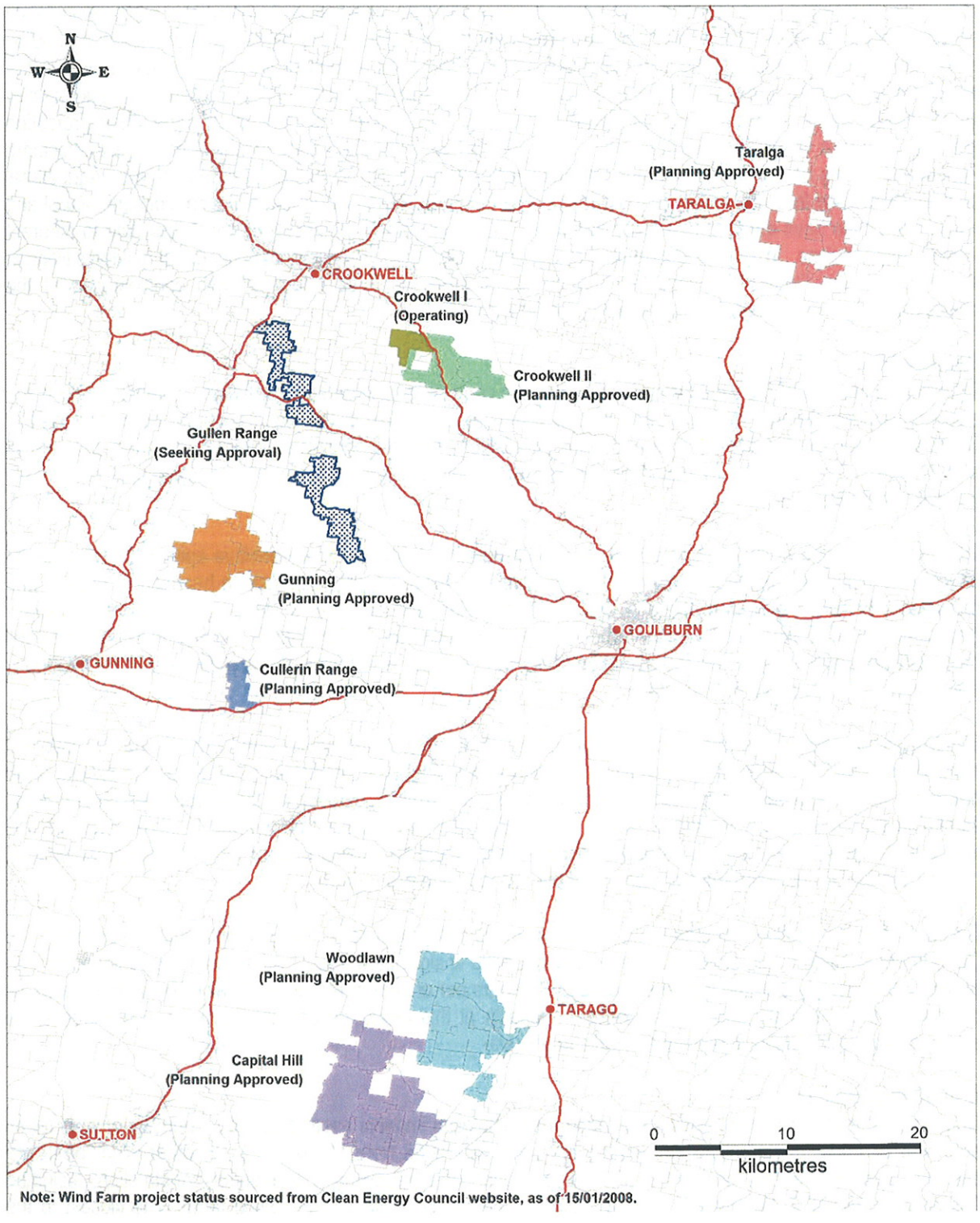
Based on the information presented and mitigation measures proposed in the Environmental Assessment, the Department considers that shadow flicker would not have a significant impact on surrounding residences. The project would comply with the typical standard of 30 hours per annum maximum shadow flicker at the site for all but one of the potentially affected residences. Impacts at this residence are not, however, considered to be significant giving the visual screening available on the site.

Cumulative Impacts

Concerns were raised in submissions regarding the cumulative impacts associated with a number of wind farms approved or under construction surrounding the proposal. Aside from Crookwell 1, no other wind farms are currently operating in the local area. A number have been approved or are under construction, including Gunning, Crookwell 2, Woodlawn, Taralga, Capital, Conroys Gap and Cullerin Wind farm. The closest to the project site is the Gunning Wind Farm, five kilometres to the south west.

Cumulative visual impacts from other wind farms in the area, described in Figure 7 are shown to be minimal in the proponent's visual assessment. Simultaneous views may only occur between the Gunning and Gullen Range wind farms since the distance separating these two wind farms is five kilometres. However due to the screening effect of undulating topography and the existing vegetation, it is unlikely that residences will have high impact simultaneous views of both wind farms. Site inspections the Department have confirmed the Proponent's claims and is in agreement that there will be no visual cumulative impacts as a result of this development proceeding.

Figure 7 – Approved Wind Farms in the Region



Visual Impacts at Night

Submissions also highlighted the potential impact from night lighting on nearby residences. Night lighting is used as hazard identification for aircraft. The Civil Aviation and Safety Authority (CASA) is currently revising its night-lighting advisory circular 139-18(0). The advisory detailed methods for the obstacle marking of wind turbines at night. The visual assessment discusses the impact of the proposal incorporating these guidelines and demonstrates that any night lighting required by the proponent would have minimal impact on surrounding residences due to existing light sources already found surrounding the site. This includes lights from passing

traffic, lighting from the surrounding townships and residences and existing telecommunication lighting. The Department is satisfied with the visual assessment on night lighting, however the extent of the night lighting and its placement should be decided by independent analysis as required in the conditions of approval.

Conclusions

The majority of the visual impact will occur during the operational phase of the wind farm. The Department accepts that the visual impacts of the proposed wind farm would alter the outlook and views of the site. The acceptability of changes to the visual outlook will always be a matter of conjecture because of the subjectivity of individual likes and dislikes. However, the Department believes vegetation screening will reduce impacts within reasonable bounds. Residences living within three kilometres of the site who believe themselves to be affected by the project would be provided with landscape screening should they request it. In addition the Proponent has committed to painting the wind turbines and blades with non-reflective off-white/light grey; as well as painting the substations and other on-site structures with grey to blend into the surrounding environment.

As part of its decision making, the Department must consider the severity of visual impact and how the impact could be managed within the context of the broader community and environmental benefits. Of particular consideration is the potential contribution of wind farms to the much broader national, and ultimately global, objective of greenhouse gas reduction. The development of wind farms would accord with the highest level of government and international policy.

5.2 Noise Impacts

Issues

The area surrounding Gullen Range is primarily used for agricultural (grazing) purposes. Residential dwellings surrounding the proposed wind farm have an ambient acoustic background dominated by natural sources which are largely wind influenced. Operational noise issues were addressed in the Environmental Assessment through a Noise Impact Assessment. The operational noise assessment was conducted in accordance with the South Australian Environmental Protection Authority's *Wind Farms: Environmental Guidelines* (SA Guidelines, 2003). The construction noise assessment was completed in accordance with the former *Environmental Noise Control Manual* as new guidelines are currently in the draft stage.

With respect to operational noise impacts, the SA Guideline (currently adopted and applied in NSW) specifies the following noise criteria for wind farms:

> *The predicted equivalent noise level (LAeq,10) adjusted for tonality in accordance with these guidelines should not exceed:*
> - *35dB(A); or*
> - *the background noise (LA90,10) by more than 5 dB(A).*
>
> *whichever is the greater, at all relevant receivers for each integer wind speed from the cut-in to rated power of the turbine.*

The Repower MM82 and MM92 turbines were utilised as the basis for the noise assessment undertaken by the Proponent. The Environmental Assessment described these turbines as being generally representative of the acoustic characteristic of the potential range of turbines under consideration by the Proponent. Sensitivity testing on larger turbines was performed by the Proponent, however results of this testing and 'acoustic extrapolation' were not described in the Environmental Assessment or the Submissions Report to a degree that would allow the veracity of the Proponent's claims to be tested. The Proponent has consistently argued that the MM92 2MW turbine would generate greater noise impacts than any potentially larger turbine that may be installed, and therefore is an appropriate basis for undertaking a worst-case noise impact assessment.

Approximately 250 residences are located within five kilometres of the proposed wind farm. Background noise monitoring was conducted at 17 locations (four of which were involved landowners) over approximately two weeks at each receiver between 12 July and 16 November 2007. These locations were identified in the Environmental Assessment as being the worst case representative of 72 residences expected to receive 32 dB(A) or more noise from the wind farm. The process for identifying relevant receivers satisfies the SA Guidelines and is therefore considered acceptable.

The noise impact assessment indicates that noise criteria can be achieved at all residential receiver clusters if MM82 turbines are installed, but that there may be exceedances of noise criteria at up to eight receiver clusters if the worst-case MM92 turbines are installed. These exeedances are expected to be less than 2 dB(A), with most occurring in the Bannister area (one Kialla cluster is affected). The Proponent argues that this outcome is acceptable and that 2 dB(A) exceedances can be mitigated through final detailed design of the project, turbine selection, operational management and performance verification prior to the commencement of operation.

Submissions

The submissions raised a number of general and specific issues in relation to potential noise impacts of the proposal. The key issues were:

- the worst case scenario noise impacts are not thoroughly accounted for in the Environmental Assessment;
- noise from turbines is constant and will disturb peace and quiet of the rural area;
- noise propagation during temperature inversions (a weather condition claimed to be a feature of the locality);
- health concerns;
- noise level and duration during the construction phase on site and on surrounding access roads; and
- need for on-going noise monitoring system at affected properties once the wind farm is operational.

Consideration

Operational Noise Impacts

The Department considers that the Proponent has undertaken an adequate level of noise impact assessment, and has demonstrated that the project could be designed and installed to achieve acceptable noise outcomes. The Department highlights, however, that this will be dependent on the Proponent's careful selection of wind turbines and detailed design of the project bearing in mind the outcomes of the noise assessment. The Department has recommended conditions of approval that require the Proponent to comply with the noise criteria specified in the SA Guidelines.

The Department accepts that there is a risk, albeit it minimal and limited in extent, that without careful design of the project and selection of appropriate wind turbines, the project will not comply with the noise criteria specified in the conditions of approval. This may be the case, for example, if wind turbines were selected without adequate regard to the outcomes of the noise assessment and cognisance of those scenarios and receiver clusters identified in the assessment as generating elevated noise impacts. This is a risk that the Proponent must bear and it has clearly and consistently stated that it is prepared to do so. Unlike other development types, the Department highlights that wind turbines generally have a much greater degree of operational flexibility to retrospectively deal with elevated noise levels (if they in fact occur in reality). Sector management is a common and appropriate means of dealing with such circumstances – turbine operation can be restricted with respect to wind speed or direction if noise monitoring detects actual or potential noise impacts above established noise criteria. In this context, the Department considers it appropriate to specify the noise criteria for the project, and to leave unfettered the Proponent's design flexibility in determining the engineering and operational solutions to achieve this outcome. Notwithstanding, the Department is satisfied that such engineering and operational solutions exist for the potential range of turbines that may be installed as part of the project.

The Proponent has committed to comply with the noise criteria set by the SA Guidelines once the final turbine model and layout has been decided. These guidelines will apply to all non-involved residences. As a safeguard to the community, the Proponent will be required to submit a revised Noise Assessment, and a Noise Compliance Assessment Plan. These must demonstrate how compliance with the noise criteria will be achieved. If the results show a lower level of noise emissions compared to the criteria then these new predictions will become the criteria.

In addition, the Proponent will be required to undertake monitoring to demonstrate compliance with the noise criteria on identified sensitive receivers. Should the noise criteria be exceeded, the Proponent will be required to investigate and take remedial measures to reduce noise. Once all reasonable and feasible measures are exhausted, remedial measures may include offering building acoustic treatments and/or noise screening to affected residents but only at the absolute discretion of the relevant landowner or resident.

The revised Noise Assessment and the Noise Compliance Assessment Plan must be submitted to the Department prior to the commissioning of the wind farm.

Rural Amenity

Rural zones have different objectives to residential zones and allow for different development types which translate to different amenity expectations. For example, rural activities may commence early in the morning and may utilise noisy machinery, thereby detracting from the amenity of the area. Wind Farms are permissible in a rural zone, however they are known to emit various levels of noise. Therefore wind farms are subject to strict noise guidelines that limit the impact on surrounding residents living within a rural zone

Conditions of Approval detail the specific manner in which the proponent should meet these noise limits. The Department recommends the Proponent be required to develop a Noise Management Plan, if the wind farm is approved. The plan should outline how the conditions of approval have been met. In this manner noise impacts to surrounding residences will be limited.

The Department also accepts any financial agreement undertaken between the Proponent and an associated landholder that will in part compensate for any loss of amenity due to noise. However, it is important that associated landholders be fully informed of noise impacts at their residences. Although noise levels at associated residences will not be required to meet the noise criteria specified, there will still be a need to comply with Guidelines for Community Noise (WHO, 1999) and Section 2.3 of Wind Farms: Environmental Noise *Guidelines* (SA EPA, 2003). In the event of any inconsistency between these guidelines, the lower noise limit will prevail.

Van Den Berg Effect and Temperature Inversions

The Van Den Berg effect is a phenomenon whereby high wind velocities can occur at turbine hub height without high wind velocities at ground levels, and as such, wind turbine noise at the receiver may not be masked by higher background noise. It is a scenario where the hub sits in the mixing layer where wind speeds are high enough for the turbine to operate at or close to maximum noise levels, whereas residences nearby are subjected to very low background noise levels, possibly much less than 30dB(A). The significant emergence of turbine noise above the background could potentially cause annoyance. This combination of location, topography and meteorological conditions is most common under temperature inversion conditions that occur most often during the more sensitive night time period. Fundamentally, it relates to the wind shear profile at the turbine site and how stable this wind shear remains at different times.

The Department understands an additional sensitivity analysis was performed by the Proponent to assess the effect of atmospheric stability, wind profile and the eponymous Van Den Berg effect. DECC considered this sensitivity analysis to be above and beyond the assessment requirements in the SA guidelines, however noting the analysis does not assess varying atmospheric stability or wind profiles.

For this proposal, the Department considers a flexible approach should be undertaken to deal with the Van Den Berg effect and other annoying characteristics of wind farms. The Department highlights this would be consistent with the SA Guidelines. This may mean switching off turbines under certain conditions or operating them in a low-noise mode, or alternatively, it may involve the Proponent undertaking facade treatment or the like on affected properties, should affected residents agree to such. Indeed, the Proponent has committed to implementing adaptive management measures such as switching turbines off under certain conditions if issues arising from atmospheric stability are found to be a problem.

The Department considers that its conditions requiring the Proponent to meet noise criteria described previously, including compliance monitoring would safeguard the community from any exceedances of the criteria. The conditions require corrective actions in response to community's complaints or if non-compliance is detected, through monitoring which the Proponent will be required to undertake.

Health Concerns

The Department received submissions from members of the public raising concern over the impact of infrasound (low-frequency noise generally less than 20 hertz) generated from wind turbines and that it can result in ill-health effects. A number of published studies have shown that there is no causal link between ill-health effects and infrasound emitted by wind turbines, but that it is rather one of potential annoyance. Furthermore, the level of low

frequency noise emitted by modern up-wind turbines is below the detectable threshold[2]. The Department is satisfied that the proposed wind farm would not result in ill-health effects from infrasound.

Construction Noise Issues

The construction impact assessment was completed using the known operational noise levels of a variety of heavy machinery and noise generating activities likely to be used during construction. The assessment shows that some associated landowners are anticipated to receive elevated construction noise levels when the turbine foundation civil works being undertaken are nearby. Noise levels are predicted to otherwise be well below the ambient background or close to it. The Proponent considers construction noise impacts to be acceptable in accordance with the EPA's Environmental Noise Control Manual (ENCM) given the duration of the works. A blasting assessment was not conducted by the proponent as the amount of blasting required is currently not known. However a blasting assessment should be conducted prior to commencement of works, which satisfies the ANZECC Technical basis for guidelines to minimise annoyance.

The Department believes mitigation measures suggested by the Proponent in the Environmental Assessment will minimise predicted construction noise impacts. A construction noise management plan is required to detail management measures on site and via access routes that will be adopted during the construction period.

The Department recommends that construction hours be limited to daytime hours and be assessed against a background plus 10dB(A). The Proponent's request for this limit to be extended to 20dB(A) on the basis that the wind farm has a large coverage area limiting the duration of intensive works is not warranted. Wind turbines are located in clusters around the site and therefore the Department believes noise impacts would be unacceptable. Subsequently the Proponent's request to extend Saturday working hours from 7am to 4pm based on a noise limit criteria of L_{90} + 20dB(A) is not supported by the Department.

Mitigation Measures and Monitoring System

In response to the concerns raised in the submissions, the Department's recommended conditions of approval will require the Proponent to conduct a revised noise assessment of the final turbine layout and type to be used. This will demonstrate compliance with the suggested noise criteria. The Proponent has committed to mitigating any predicted non-compliance through options of removal or relocation of turbines, adaptive management measures such as switching off offending turbines during conditions which cause noise criteria to be exceeded, or building treatments subject to the landowner's approval. A noise assessment compliance plan should be required of the proponent to describe in detail the commitments described above and the measures taken to implement them as well as discussing how the stipulated criteria are being met.

Requirements for ongoing and long term compliance with the operational noise limits should be described in a Noise Management Plan as part of the Operational Environmental Management Plan. The Plan should provide procedural details for ensuring compliance and corrective actions in response to incidences of noise exceedances that may arise.

Conclusions

The Department notes that the Proponent has yet to determine the final turbine type and layout. As such, the Proponent should adhere to the stipulated noise criteria described in the Department's assessment of operational noise. Monitoring of noise and mitigation measures described in the revised noise assessment and Noise Compliance Assessment Plan will protect local rural residents from adverse noise and health impacts.

The Department considers that issues relating to noise modulation and temperature inversions have been adequately addressed in accordance with the Proponent's commitment to implementing adaptive management measures to mitigate noise impacts. These measures are considered site specific and are subject to agreement by the landowner.

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[2] See British Wind Energy Association (BWEA) *Low Frequency Noise and Wind Turbines Technical Annex*, February 2005 and references therein http://www.bwea.com/pdf/lfn-annex.pdf, accessed 2 February 2007.

In addition the construction noise impacts described are within the bounds considered acceptable by the Department. Extensions to the recommended noise limits and times by the Proponent are not recommended in order to further protect the local community from adverse noise impacts.

Subject to compliance with recommended conditions, the Department is satisfied that noise impacts would be acceptable.

5.3 Impacts on Ecology

Issues

The ecological impact assessment presented in the Environmental Assessment was based on field work conducted in March and April 2007. Follow-up surveys were conducted on the 1 and 2 November 2007. The assessment characterised the biodiversity attributes of the site and determined the likelihood and level of impact that may result during and after site development. The biodiversity assessment acknowledged that the survey work was deficient for some species, specifically spring flowering annuals, frogs and microchiropteran bats. As an alternative to additional survey effort, threatened species in these categories were evaluated for their potential to occur in the area. This is a precautionary approach to impact evaluation and the development of mitigation measures. Areas of potential habitat were identified as constraints to be avoided.

The site is predominantly disturbed by clearing, grazing, pasture improvement and weed invasion. However, areas exist that have been shown in the biodiversity assessment to be ecologically significant. The key identified construction impacts on flora and fauna are loss of habitat and habitat degradation from vegetation clearing/trampling and soil disturbance. Operational impacts are associated with the movement of the turbine blades, i.e. potential for bird and bat strikes. Assessment of operational impacts drew on past experiences at other sites and from what is known of the ecology of different species.

In general, the site is located across areas of pasture, woodland and forest. Ridgelines where the turbines are proposed carry remanent native vegetation and some grasslands as well as large exotic pastures and weeds. The surrounding slopes and gullies where wind farm infrastructure is located consist of substantially more native vegetation than the ridge tops. Pasture areas are predominantly dominated by exotic species however native species of grasslands found on the site include; wallaby grass, weeping grass, understory grasses such as *Joycea allida, Poa spp* as well as river tussock grass and kangaroo grass. Woodland species found on the site include; Scribbly gum, Broad-leaved Peppermint, Brittle gum, White box, Yellow box, Blakely's red gum, Apple box, Mountain gum, Snow gum, Ribbon gum and Narrow-leaf peppermint moist forest. The Yellow Box, Blakely's Red Gum, Snow Gum, Narrow-leaf Peppermint moist Forest and natural temperate grasslands were listed as Endangered Ecological Communities (EEC) under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Mammals, reptiles, birds and amphibians were targeted during site fauna surveys. Important habitat features identified on the site include hollow bearing trees, native grasslands, gully systems, woodland patches, wetlands (farm dams) and the connectivity between woodlands. Survey work occurred between 29 March and 5 April 2007 and 1 and 2 November 2007. Diverse assemblages of native fauna (species) were identified in the area, as summarised in Table 3. Five threatened fauna species were recorded during surveying including the Common Bent-wing Bat, Large-footed Myotis, Eastern False Pipistrelle, Squirrel Glider and the Powerful Owl. These species are considered vulnerable under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Table 3 - Species Found Across the Survey Area

Location	Amphibians	Avians	Mammals	Reptiles	Total
Kialla	0	31	7	8	47
Bannister	2	38	10	3	55
Pomeroy	5	53	17	6	83
Gurrundah	5	41	8	6	61

An evaluation of 46 threatened species with potential to occur onsite was undertaken in line with the EPBC 'Assessment of Significance' reporting tool. Of these 32 were found to have potential for moderate to high level of impact despite the use of effective mitigation strategies (species are presented in **Table 5**) . As a result constraint areas were mapped out around the site within the development envelope that excluded the placement of turbines within areas that the proponent felt these species could occur.

Table 4 – Potential Threatened Fauna at the Site

Class	Species
Avians	Glossy Black Cockatoo, Blue-billed Duck, Square-tailed Kite, Brown Treecreeper, Regent Honeyeater, Powerful Owl, Speckled Warbler, Swift Parrot, Fork-tailed Swift, White-throated Needletail, Rainbow Bee-eater, Satin Flycatcher, Rufous Fantial, Great Egret, Cattle Egret, Latham's Snipe, Gang-gang Cockatoo, Diamond Firetail and the Superb Parrot
Mammals	Eastern Pygmy Possum, Squirrel Glider, Eastern False Pipistrelle, Large-eared Pied Bat, Eastern Freetail Bat, Grey-headed Flying Fox and Common Bent-wing Bat
Reptiles	Grassland earless dragon

The proposal was not referred to the Commonwealth Department of Environment Water, Heritage and the Arts (DEWHA) even though there were several EPBC listed threatened fauna species and migratory birds that could potentially be impacted. Instead an assessment of significance was used to highlight the particular species that may occur, so that mitigation could be used to avoid impacts on these species.

Submissions

A number of submissions were received questioning the process and results of the Biodiversity Assessment. In summary, the issues and questions relate to:

- insufficient detail on final turbine placements and infrastructure to be constructed in relation to impact on flora and fauna especially local Earless Dragon and Powerful Owl populations; and
- concerns about bird and bat deaths from blade strikes.

Consideration

The biodiversity assessment has been based on a broad development footprint allowing room for the Proponent to finalise placement of turbines post-approval. It is the opinion of the Department that within this footprint the turbine placement and associated infrastructure impact on biodiversity was not conclusively quantified or illustrated in the Environmental Assessment. Subsequent information was provided in the Proponent's Submission report and additional surveying work was conducted by the Proponent. The Department is satisfied that this additional work is sufficient to demonstrate that the project will not have an adverse impact on ecology, with the exception of potential issues with the Powerful Owl and vegetation offsets. The Department recommends a precautionary approach be applied to deal with uncertainty in these areas, as outlined further below.

With respect to the Powerful Owl, the Environmental Assessment and associated survey effort have not provided sufficient information to conclusively demonstrate that the project will not impact on this species or local populations, particularly in the Pomeroy West section of the development. Population levels are not clearly identified, nor are habitat ranges, roosting, feeding and nesting sites. Mitigation measures proposed by the Proponent are not considered sufficient to entirely protect the species from impacts, instead they propose reactionary mitigation measures as impacts occur. Of key relevance is the fact that juvenile members of the species are known to disperse from their home range during certain times of the year. Therefore the Department recommends that a precautionary approach be applied by limiting the operation of turbines in these areas during these times in order to avoid adverse impacts. The Department recommends turbines of the entire Pomeroy section be switched off during time ranges of juvenile Powerful Owl dispersal unless an independent monitoring program can establish to the Director-General's satisfaction to demonstrate that no adverse impact will occur to the Powerful Owl population at West Pomeroy. In addition the Department requires the Proponent to pay a 'fine' for every Powerful Owl death that occurs due to the operation of the wind farm as a further deterrence to the Proponent. A similar 'fine' approach has previously been applied and supported by the Land and Environment Court.

With respect to off-sets for vegetation clearing, the Proponent has indicated at worst, approximately 58 hectares of native vegetation clearing will result from the construction of the wind farm. As a compensatory measure the Proponent has committed to offset a worst case scenario of native vegetation loss that may occur should the project be approved. The Proponent has suggested an off-set site that contains similar native vegetation to that being cleared. The offset site is located in the Pomeroy West area. The Proponent has indicated it will offset at a ratio of 2:1 the area of cleared native vegetation. The Department agrees with the Proponent's proposed offset measure as long as it is managed in perpetuity and is consistent with the DECC's Biodiversity Offset Principles. These principles outline management measures that when implemented ensure an effective counterbalance to biodiversity impacts resulting from the project. The offset plan will be completed prior to the commencement of construction with input from the DECC. Notwithstanding this offset plan, the Proponent should continue to strictly adhere to its commitments during construction in order to uphold the guiding principle of "improve or maintain environmental outcomes". The Department recommends the condition, which requires the Proponent, before commencement of construction, to establish clearly defined work areas (including access tracks) using fencing, signage, markers and maps. All on-site construction movements are to be restricted to these areas, to prevent uncontrolled or inadvertent access by vehicles or construction personnel to areas being protected.

A constraint area of native temperate grassland was identified in the Environmental Assessment, located in the Gurrundah portion of the proposed development that potentially contained the Grassland Earless Dragon. An inconsistency between the Proponent's statement of commitment No.14 that states "turbines and infrastructure will avoid constraint areas of vegetation and potential habitat for threatened species" and the proposed location of turbines at the site occurred. The Proponent undertook further detailed surveying in February 2008 to establish whether the Grassland Earless Dragon was present in the area where turbine GUR_08 and associated infrastructure would be located. Results of the surveying showed the species was not present in the area or the immediate vicinity. Therefore the Department believes turbine GUR_08 will not impact on the threatened species and is therefore permitted.

Bird and bat strikes are major concerns when considering the faunal impacts of wind farms. Specific issues raised in the submissions concerned the extent of the bird and bat population, expected impacts from blade strikes, and how deaths from collisions would be monitored. A detailed consideration of the wind farm impacts on birds and bats was provided in the Environmental Assessment. An assessment of significance was undertaken to determine whether impacts may occur to potentially threatened species. The assessment found, based on evidence from existing wind farms and species ecology, that the proposal was unlikely to create a population level impact. However, it acknowledges a level of uncertainty. The Proponent proposes to deal with the uncertainty through rigorous and properly timed monitoring of collision impacts. It commits to a bird and bat monitoring program following commissioning of the wind farm and using adaptive management such that should mortalities exceed a pre-determined threshold, additional measures would be considered including diversion structures, turning off blades at critical times, and enhancement of off-site habitats.

The Wedge-tailed Eagle is also a high order predator and occurs at low density in the landscape. The assessment concluded that for raptors, the risk was related primarily to foraging activity and thus, the risk could be reduced by managing the availability of prey on the site. To reduce the attractiveness of the ridge to foraging raptors, the Proponent's Statement of Commitments (SoC) include control or removal of rabbits, carrions and young lambs on the turbine ridges. The SoC also commits to the filling of dams/wet depressions on project involved properties and construction of alternative water points subject to the agreement of these landowners. As a further safeguard the Department is requiring the Proponent to pay a fine of $1500.00 to NSW Wildlife Information and Rescue Service every time a Wedge-tailed Eagle is killed by a turbine.

Overall, the Department considers that potential risk of bird and bat deaths from the operation of the wind farm would be low and that impacts can be adequately managed. To ensure the implementation of a Bird and Bat Adaptive Management Program, the Department recommends a program which incorporates monitoring and a decision matrix. This will clearly set out how the Proponent responds to the outcomes of monitoring. The Proponent is required to implement reasonable and feasible mitigation measures where the need for further action is identified through the Program. In addition, consistent with the recent Land and Environment Court decision on the Taralga Wind Farm, the Department recommends a penalty of $1500.00 on the Proponent for each Wedge-tailed Eagle kill that has reasonably been attributed to the project. This condition should be

extended to include the Powerful Owl in order to impose a duty of care on the Proponent. The penalty would be in the form of a financial contribution to the NSW Wildlife Information and Rescue Service (WIRES). This is considered an appropriate compensatory payment and consistent with the polluter pays principle.

The Department is satisfied that the proposed wind farm would not have a significant impact on flora and fauna provided the Proponent implements the measures it has committed to undertake and subject to the recommended removal of turbines. These measures are generally reflected in the recommended conditions of approval and/or Proponent's SoC, and includes:

- during times of juvenile Powerful Owl dispersion the Pomeroy section of the wind farm will be switched off
- offset an appropriate area based on a worst case scenario impact by the proponent, whilst improving or maintaining environmental outcomes on site.
- careful siting of the infrastructure and access tracks to avoid removal of trees and destruction of rocky outcrops;
- implementation of a Bird and Bat Adaptive Management Program which must incorporate monitoring and response mechanisms.
- preparation and implementation of a Construction Environmental Management Plan and a Traffic Management Plan to manage construction works and minimise impacts;
- Amendments and further monitoring to proposed turbine layout to avoid constraint areas where threatened species occur or potentially occur.

5.4 Aviation Hazards and Crookwell Airstrip

Issues

The aviation assessment provided in the Environmental Assessment identifies the Crookwell aerodrome and Ashwell airstrip as being in the vicinity of the proposal. The Crookwell aerodrome is located approximately four kilometres south of Crookwell, it is utilised by emergency services to fight bushfires and provide training, as well as an emergency medical evacuation site. Although its use by these services is infrequent, it is considered by the NSW Rural Fire Service (RFS) to be a strategic location that supports emergency operations over a large portion of the Southern Tablelands Zone. In addition the aerodrome has been shown to be a valuable site for training pilots in higher elevation and country environments, as well as being a known safe haven if adverse weather conditions arise over the Great Dividing Range, it is also used by Aerial Agricultural, Government and private charter aircraft.

The Environmental Assessment discusses reasons why the installation of wind turbines will not prevent diligent and competent aircraft operators from utilising the Crookwell aerodrome. A generic circuit flight path was developed in the aviation assessment to demonstrate how a representative limited performance aircraft could technically take off and land in favourable weather conditions without being impacted by turbines.

The Ashwell airstrip is utilised by one individual relatively infrequently as a private airstrip as discussed in the aviation assessment. The individual mentioned that the wind farm may impinge on the future implementation of instrument approach procedures.

Submissions

A number of submissions were received questioning the possible aviation hazards arising from the project, however these were all to do with the Crookwell aerodrome. In summary, the issues and questions relate to:

- the safety and operational impact to the Crookwell airstrip; and
- future use of the Ashwell airstrip.

Consideration

Regulation 92 of the Civil Aviation Regulations (CAR 1988) regulates the use of aerodromes. The Crookwell Aerodrome is not a registered aerodrome as it is considered an Aeroplane Landing Area and therefore not regulated by CASA. Subsequently *Civil Aviation Regulations 1998 (CASR) Part 139, Subpart 139E Obstacles and Hazards* for aerodrome runway classifications and Obstacle Limitation Surfaces do not apply to Crookwell aerodrome. It is on this basis that CASA has declined to provide formal written advice to the Department on aviation hazards, despite several requests from the Department to provide technical guidance. Notwithstanding,

the Department has had the benefit of informal technical conversations with staff from CASA and RFS, as well as local aviators, and has based its precautionary approach to the management of aviation hazards associated with the project on that informal technical advice.

Due to its varying uses, particularly its use by emergency services, the Department believes the Crookwell Aerodrome should not be assessed solely on the basis that it is an Aeroplane Landing Area. Wind turbines placed on the Gullen Range surrounding the Crookwell Aerodrome would be in excess of 150 metres above the ground level of the aerodrome. The turbines would therefore be classified as obstacles under CASR Part 139 regardless of the location or surrounding airspace usage.

During bushfires the RFS has conducted multi aircraft fire bombing operations from Crookwell aerodrome in periods of low visibility and smoke. A generic flight circuit as illustrated in the Environmental Assessment cannot be applied to such situations due to the number and type of aircraft flying in various meteorological conditions. The RFS has indicated the proposal would severely inhibit any such firebombing operations and its ability to provide a rapid and effective response to bush fires in the area[3]. Fire fighting and flight training pilots have expressed concerns that erection of turbines on terrain west of the aerodrome is unacceptable from a safety aspect. The RFS has stated the airstrip now plays an integral part in the state wide training of ground and air crews for both initial training and re accreditation.

The RFS has indicated to the Department that it would be prudent that the same restrictions as determined by CASA, are applied to the Crookwell aerodrome as to those of a designated aerodrome in order to ensure the safety of all aircraft, including those undertaking fire fighting operations, are maintained within the approach, takeoff and circuit zones of the airstrip.

Regardless of particular aerodrome classification, wind turbines in the proximity would cause significant restrictions to be placed on the current emergency and operational use of the aerodrome. In order to maintain the aerodromes current use and safety level as well as not impact the emergency service operations, the Department deems it necessary to condition the approval by limiting the location of wind turbines to outside a 3600 metre area initially suggested by RFS as well as various flight school operators who utilise the airstrip. This is consistent with the requirements for a Code 2, Non-Instrument runway under *Manual of Standards Part 139 – Aerodromes* (Version 1.4) (Civil Aviation Safety Authority, April 2008). By taking this approach the Department considers current emergency service operations and the safety levels at the aerodrome will be maintained.

In order to preserve the current integrity of the Crookwell aerodrome the Department considers that no turbine should be located inside a 3600m circular area surrounding the aerodrome. Therefore 11 turbines would need to be deleted from the proposal including KIA_03, KIA_04, KIA_05, KIA_06, KIA_07, KIA_08, KIA_09, KIA_10, KIA_11, KIA_12, and KIA_14.

The aviation assessment stated that the individual aerodrome user at Ashwell considered the wind farm would not impact on the current use of the airstrip. At the moment no instrument procedures have been developed for the airstrip, therefore the Department does not consider the wind farm will impact on the current use of the airstrip. If future instrument procedures were implemented at the airstrip then these would have to take into account the existence of the wind turbines when developing these procedures.

5.5 Subdivision Issues

Issues

The Department has assessed the impact the wind farm would have on approved subdivisions occurring around the site. The Upper Lachlan Shire Council provided two properties in the vicinity that have received subdivision approval.

[3] This includes operations in the west of Lake Burragorang, south of Katoomba and north of Goulburn as well as within Upper Lachlan Shire local government area.

Submissions

A submission by the owners of a property adjacent to the Pomeroy section believe their approved subdivision would be affected by the proposal.

Consideration

On 24 July 2008, Upper Lachlan Shire Council issued development consent for a 20 lot subdivision with site-specific dwelling entitlement for land adjacent to the Pomeroy West portion of the project. Five Lots[4] have dwelling sites within 250- 800 metres of planned turbines POM_20, POM_19, POM_16, POM_15, POM_14, POM_13 AND POM_12. Potential environmental impacts to the approved subdivision including noise and visual impacts have not been addressed by the Proponent.

The Department considers that the proximity of turbines to the approved subdivision lots will severely affect the identified and approved dwelling sites, resulting in significant amenity impacts. Mitigation as suggested in the Proponent's Statement of Commitments (being "reasonable and feasible noise mitigation measures to achieve a noise criterion (LA_{eq10}) of 30 dB(A) inside bedrooms for no more than one dwelling on each parcel of land) are not considered by the Department to be sufficient to adequately address these amenity impacts. Therefore the turbines should either be deleted from the proposal or the Proponent should be required to acquire eight affected lots at the owner's request. The Department proposes that the Proponent be required to acquire the affected lots if requested by the owner, and recommends imposition of conditions of approval accordingly. The acquisition conditions would only take effect if the Proponent proceeds with the turbines in question, thereby allowing the Proponent to effectively delete these turbines (ie choose not to proceed) as an alternative to acquisition.

5.6 Impacts on Land Values

Issues

Given the variability and subjectiveness of the public perception of wind farms, a perceived reduction in a particular amenity such as landscape quality or rural tranquillity could negatively affect a section of the property market. This is usually translated to lower saleability and market value of property.

As part of the Environmental Assessment, Henderson and Horning Property Consultants conducted an assessment of the likely impact of the project on local land values by examining overseas wind farms and using the Crookwell Wind Farm developed in 1998 as a case study. The latter wind farm is the nearest existing wind farm to the Gullen Range site (approximately 10 kilometres), has similar land uses (agricultural and rural residential), and several sales have taken place since the wind farm was built. The Crookwell case study examined the sale transactions in the Crookwell area over a 15 year period (1990 to 2006).

Submissions

The submissions raised a number of issues regarding the process and results of the land value impact assessment. The usefulness of the land value assessment was questioned on the basis that:

- the example used (Crookwell Wind Farm) to demonstrate the effects of the wind farm on land values is inappropriate for comparison because it is of a different size and scale;
- the area surrounding Gullen Range is no longer a farming community; it includes a substantial "lifestyle factor" which should have a higher value than agricultural areas;
- failure to incorporate surrounding approved subdivisions; and
- evidence from other wind farm sites in Australia and overseas showing an impact on property values.

Consideration

The review of market sales in the Crookwell case study found no market evidence that having a view of the wind turbines had an effect on reducing land values. The Department also agrees that the Crookwell case has close similarities with the proposed Gullen Range Wind Farm, particularly as the assessment included sales transactions following the approval of the Crookwell 2 wind farm (which will have between 46 and 50 turbines), and its experience is therefore useful for drawing insights or for verification purposes.

[4] Lots, 6, 7, 8, 9, and 10.

The most extensive survey to examine the effect of wind farms on property values was undertaken in the United States and presented an Analytical Report by the Renewable Energy Policy Project[5]. The study did not model the changes in property values, rather it was an empirical review where data from ten wind farm sites was collected and subjected to a statistical regression analysis to determine price changes in three ways:

- How property values (prices) changed over the entire period of the study for the view shed and comparable region;
- How prices changed in the view shed before and after the projects came on-line; and
- How property values changed for both the view shed and comparable community but only for the period after the project came on-line.

The results identified that in 30 separate analyses (i.e. ten wind farm sites subjected to three assessments, 26 property values in the affected view shed performed better than the comparable properties. The study conclusion that "there is no support for the claim that wind development will harm property values" was qualified with a statement that more data will need to be analysed as it becomes available. This suggests that the conclusions drawn from the analysis are indicative and preliminary and should be used cautiously when translating to other sites that were not investigated.

The Bald Hills Wind Farm Panel Inquiry in Victoria examined the issues of property devaluation for neighbouring properties in a more qualitative manner[6]. A number of property valuers and real estate agents provided submissions and appeared before the Panel Inquiry as expert witnesses. From a review of this evidence the Panel Inquiry report concluded that:

> *All that appears to emerge from the range of submissions and evidence on valuation issues is the view that the effect of wind energy facilities on surrounding property values is inconclusive, beyond the position that the agricultural land component of value would remain unchanged. On this there appeared to be general agreement.*

The Department notes the concerns expressed in the submissions regarding the project's potential to adversely affect property values. It is arguable as to whether the wind farm may have a dampening effect on a sensitive section of the property buying market. In light of the current global economic down turn and its affect on property markets, the Department considers an accurate assessment of general declining property values due to surrounding wind farms is difficult to ascertain.

The Department therefore refers to survey data taken by the Proponent and the Upper Lachlan Shire Council referendum on wind farms in order to determine the local and regional view of wind farms. The Department believes people's views of the wind farms in their local areas would have a significant effect on surrounding property prices. Results of the Upper Lachlan Shire Council referendum asking residents if they support wind farms in the local government area showed 70.09% of residents were in favour of wind farms in the area. Areas surrounding the site including Crookwell and Grabben Gullen also showed a significant majority of support for wind farms. These results are supported by results contained in the Environmental Assessment where some 89% of 300 residents surveyed in the Goulburn-Crookwell-Yass were in favour of wind farm projects being developed in the Southern Tablelands. Considering the level of support shown in these surveys, it can be inferred that property values would not be significantly impacted at the site.

After considering the results of the Crookwell Wind farm case study on property values, the stated US survey, the Bald Hills Wind Farm Panel Inquiry and the results of referendums and surveys on the popularity of wind farms in the Upper Lachlan Shire, no conclusive evidence of significant value changes, transfers or inequities can be identified to property values in the vicinity of the proposal. The Department therefore considers property values will not be adversely affected by the proposal especially in light of the general property market downturn.

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[5] Sterzinger, G *et. al The Effect of Wind Development on Local Property Values*, May 2003.

[6] *Bald Hills Wind Farm Project: EES, EES Supplement and Called-in Permits* Panel Report, Victorian State Government, 24 June 2004.

5.7 Community Consultation and Impacts

Issues

Issues raised by the community have been cited within the body of this assessment. These include visual and noise impacts. It is understood that this proposal has generated a degree of concern within the surrounding community. The Proponent cites the results of the Upper Lachlan Shire Council poll on wind farms and its own survey work as indicative of the general community views on wind farms. . However the following community issues were raised primarily from immediate non-involved landholders.

Submissions

Issues raised in submissions include:

- cumulative impacts of surrounding wind farms;
- inadequacy of the Community Enhancement Program; and
- inadequate community consultation regarding immediate non-involved landholders

Consideration

Cumulative Impacts

Aside from Crookwell 1, no other wind farms are currently constructed in the local area. A number have been approved or are under construction (Gunning, Crookwell 2, Woodlawn, Taralga, Capital, Conroys Gap, Cullerin). The closest wind farm to the project site is Gunning Wind Farm, 5 km to the south west. The cumulative impact of the proposal in terms of visual amenity, biodiversity, noise, traffic, telecommunications, air, water quality, air hazard and economic impacts were considered in the EA. The following conclusions were made:

- *visual* – Aside from the Gunning Wind Farm, the potential for cumulative visual impact is considered relatively minor for simultaneous and sequential views from wind farms surrounding the Gullen Range proposal. Potential for impact on residences located between Gullen Range and Gunning Wind Farms was determined to be low due to the undulating nature of the landscape and blocking vegetation.
- *biodiversity* – no negative cumulative impact is expected from the development of the Gullen Range site as fauna corridors are found to exist solely within development sites and are not interconnecting. Resident species populations may be affected by collisions across all wind farm sites. However monitoring programs will be used to calculate these impacts and trigger adaptive management scenarios. Limited clearing of vegetation is a stated commitment of the Proponent. Any clearing that does occur will be offset.
- *noise* – at distances greater than 2 km, the wind farm noise attenuates to reach background levels, and no cumulative impact would result from the operation of the proposed wind farm. Construction noise impacts could potentially have a cumulative impact. However no other large scale developments are planned to occur simultaneously.
- *telecommunications* – the Proponent has committed to boosting transmission if current levels of reception are diminished as a consequence of the wind farm operation. As the impact can be addressed on a case by case basis, the proposal is not expected to have a cumulative impact.
- *traffic and transport* – localised increases in traffic movements would occur during construction. The Proponent has committed to mitigating safety risks and upgrading roads during the construction period, in consultation with the RTA and Upper Lachlan Council.
- *physical impacts* – air, soil and water impacts during the construction phase would have very localised impacts. The Proponent has committed to mitigating the physical impacts of the project.
- *economic impacts* – a positive cumulative impact in terms of economic benefits to the local community would be provided by the project. The benefits include lease payments to involved landowners, employment for local contractors during the construction and decommissioning phases, and increased demand for services during these periods.

The above conclusions are considered to be a fair assessment of the expected cumulative impacts. Overall, the Department considers that the proposal would not create a negative cumulative impact to communities surrounding the proposal.

Adequacy of Community Enhancement Program

The Proponent has offered an annual allocation of $75 000 per annum indexed to CPI for the life of the project. Submissions have questioned this amount as being insufficient considering the capital size of the project. The Upper Lachlan Shire Council also disagrees with the amount claiming a higher figure is required under its Development Control Plan. The Department concurs with Council in this circumstance, and considers that contributions should be levied consistent with the Development Control Plan (ie $850 per megawatt of installed capacity per annum). The recommended conditions of approval reflect this approach.

Community Consultation

Various concerns were raised by submissions which claimed there had been an ineffective level of community consultation with immediate non-involved landholders surrounding the proposed development. The proponent engaged the community through a series of measures, including an open house session, newsletters and face to face meetings with involved landowners.

The Environmental Assessment itself states that the majority of consultation focussed on informing the community. This method of consultation is directive based and does not foster constructive dialogue between stakeholders. Conflicts often arise when a Proponent is seen to be imposing their project plans upon the community. This is represented by the significant number of submissions citing a lack of community consultation.

By placing greater emphasis on "community consultation", i.e. listening, better community understanding of the project can occur. This will subsequently lead to an improved outcome between Proponents and community, thus generating broader acceptance of such projects with non-involved surrounding landholders.

Overall, the Department considers that community consultation with immediate non-involved landholders was shown to be lacking for this project. This has resulted in a certain level of conflict between the immediate community and the Proponent. The Proponent should review and improve their community consultation plan in order to mitigate against such outcomes during latter stages of this project.

6. CONCLUSIONS AND RECOMMENDATIONS

The Gullen Range Wind Farm Project presents an opportunity to harness a commercial wind resource. The project would produce renewable electricity in line with the Renewable Energy Target obligations proposed by the Federal Government in 2009. As stated in the Environmental Assessment, this would equate to greenhouse gas reduction and substantial savings in water consumption and pollution that would otherwise result from burning energy generating fossil fuels. The Project thus represents a good example of a renewable energy initiative with certain greenhouse gas saving benefits.

The Department recommends removal of 11 wind turbines proposed by the Proponent as it perceives these turbines will have an unacceptable impact on Aviation. The Department also recommends the entire Pomeroy section of the proposal be switched off during times of juvenile Powerful Owl dispersion subject to an independent study showing to the Director-General's satisfaction that the Powerful Owl population in West Pomeroy will not be adversely impacted by the proposal. In addition an offset plan is recommended to offset any loss of native vegetation that may occur during the construction so as to protect the biodiversity of the area. Further the Department considers an approved subdivision with approved site dwelling locations adjacent to 7 turbines in the Pomeroy portion of the proposal would inflict severe amenity impacts to site dwellings and subsequently recommends the Proponent acquire the affected lots at the owner's request. Section 5 of this report discusses reasons for these recommendations. By addressing these issues the Department believes the concerns of the local community can be balanced with the overall strategic benefits of the wind farm to the greater community. The remaining turbines are considered to be acceptable, providing the recommended conditions are applied. The key remaining issues (after the exclusion of said turbines) are visual and operational noise impacts.

The visual assessment considered the visual impact of the project from two particular aspects – acceptability of the proposed wind farm at the broad landscape level; and specific impacts on surrounding properties. The visual assessment also determined that residences within 3 kilometres of the proposal would have moderate to high visibility of the wind farm. The Proponent should be required to negotiate individual landscaping treatments for these residences upon request, using a suitably qualified landscape consultant. The acceptability of changes to the visual outlook will always be a matter of conjecture because of the subjectivity of individual likes and dislikes. The Department recognises the concerns of some potentially affected residents and sections of the community who have a special attachment to the Gullen Range landscape. As part of the framework for broader decision making, the Department must consider the severity and ability to manage the visual impacts of the project within the context of the broader community and environmental benefits, and in particular, the potential contribution of wind farms to the much broader national, and ultimately global, objective of greenhouse gas reduction. For this project, the overall strategic benefits of the proposal are considered to provide a stronger weighting than visual amenity concerns.

Operational noise is subject to the noise limits set in the South Australian Guidelines. These noise limits are reflected in the recommended conditions of approval with additional requirements regarding a revised noise assessment following selection of the final turbine model and turbine layout, and operational noise monitoring. The Department therefore recommends the Proponent not exceed the South Australian Guidleines once it has made its final turbine model and layout decision. In this way the Department believes the local community can be safeguarded against any noise exceedences from larger turbines.

The Department's recommendations provide a rigorous and strict framework for the management, monitoring and reporting on the construction and operation of the Project covering: noise; visual amenity; flora and fauna; traffic and transport; telecommunications interference; hazards and risks; water quality/soil erosion; and decommissioning.

The Project will provide a range of benefits while the potential impacts are considered to be manageable and is therefore in the public interest. The Department is satisfied that the identified adverse impacts can be mitigated to acceptable levels with the mitigation measures proposed and implementation of the Conditions of Approval.

Consequently, the Department recommends that the proposal be approved subject to the recommended Conditions in Appendix A.

APPENDIX A – RECOMMENDED CONDITIONS OF APPROVAL

APPENDIX B – SUBMISSIONS REPORT

APPENDIX C – STATEMENT OF COMMITMENTS

APPENDIX D – ENVIRONMENTAL ASSESSMENT