ASSESSMENT REPORT
Glen Innes Wind Farm Modifications
Modification 2 (07_0036 MOD 2)
Modification 3 (07_0036 MOD 3)

1 BACKGROUND

1.1 Introduction

Glen Innes Windpower Pty Limited (GIWP), a fully owned subsidiary of OneWind, has approval to construct and operate the Glen Innes Wind Farm, located approximately 12 kilometres (km) west of Glen Innes in the Glen Innes Severn local government area (see Figure 1).

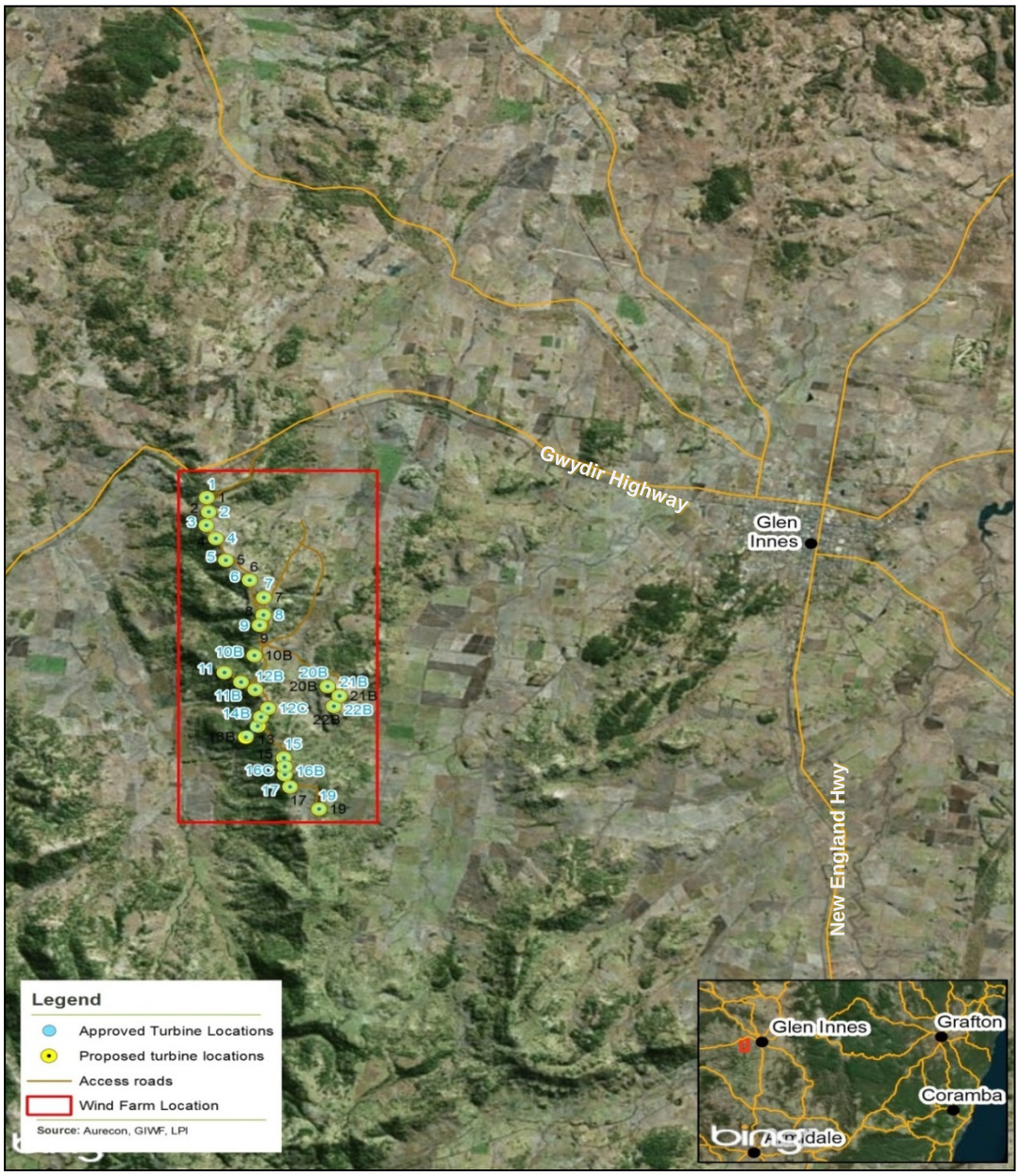


Figure 1: *Location of the Glen Innes Wind Farm*

On 2 October 2009, the then Minister for Planning granted approval for the Glen Innes Wind Farm (07_0036). The Minister's determination was later challenged in the NSW Land and Environment Court but approval was ultimately granted by the Court on 18 August 2010, subject to revised conditions including the removal of one turbine.

The project approval allows for:

- construction and operation of up to 25 wind turbines up to 130 metres (m) high;
- construction of a substation and associated facilities and services;
- installation of site access tracks;
- installation of electricity cabling; and
- other ancillary infrastructure and works including site office facilities and drainage works.

A brief chronology of key events relevant to the approval and modifications is presented in Table 1. Modifications 2 and 3 are the subject of this assessment report.

GIWP has yet to commence construction of the project.

Table 1: *Chronology of events*

Date	***Event***
14 March 2007	Glen Innes Wind Farm application lodged
5 November 2008 – 17 December 2008	Environmental Assessment (EA) exhibition
2 October 2009	Application determined
18 August 2010	NSW Land and Environment Court order with lapse date of 18 August 2013
26 July 2013	Modification 1 application lodged to extend lapse date to 18 August 2014
31 July 2013 – 14 August 2013	Modification 1 EA exhibition
16 August 2013	Modification 1 determined
12 March 2014	Modification 2 application lodged to increase turbine dimensions and micro-site two turbines
18 March 2014 – 2 April 2014	Modification 2 EA exhibition
23 May 2014	Modification 3 application lodged to extend lapse date to 18 August 2015
09 July 2014 – 23 July 2014	Modification 3 EA exhibition
21 August 2015	*Environmental Planning and Assessment Amendment (Transitional Part 3A Approvals) Regulation 2015* (EP&A Regulation amendment) made ensuring an approval will not lapse if an application to extend the lapse date has been lodged before the existing approvals lapse date.

1.2 Project Setting

The project site is located in the New England region on the Waterloo Range approximately 12 kilometres (km) west of Glen Innes. The north-south nature of the Waterloo Range provides the elevated land on which the turbine sites are located, approximately 120 m to 180 m above the level of the lowlands to the east and west of the site.

The wind farm site has been mostly cleared for grazing, however, areas of remnant woodland occur in close proximity to the wind farm, primarily on its western side where the land is steeper and less suitable for pastoral purposes.

The project site comprises 5 associated properties that will host the project infrastructure. All non-associated residences surrounding the project site are located greater than 1 km from the nearest wind turbine, with 8 non-associated residences located within 2 km and 42 non-associated residences located between 2 km and 5 km from the nearest wind turbine (see Figure 2).

The closest neighbouring non-associated residences are 'Mayvona' and 'Ilparran B', located approximately 1.05 km and 1.31 km respectively from the nearest turbines under the modified layout, but the residences are not occupied (and 'Ilparran B' is dilapidated). The closest occupied non-associated residence is 'Highfields', located approximately 1.42 km from the nearest turbine.

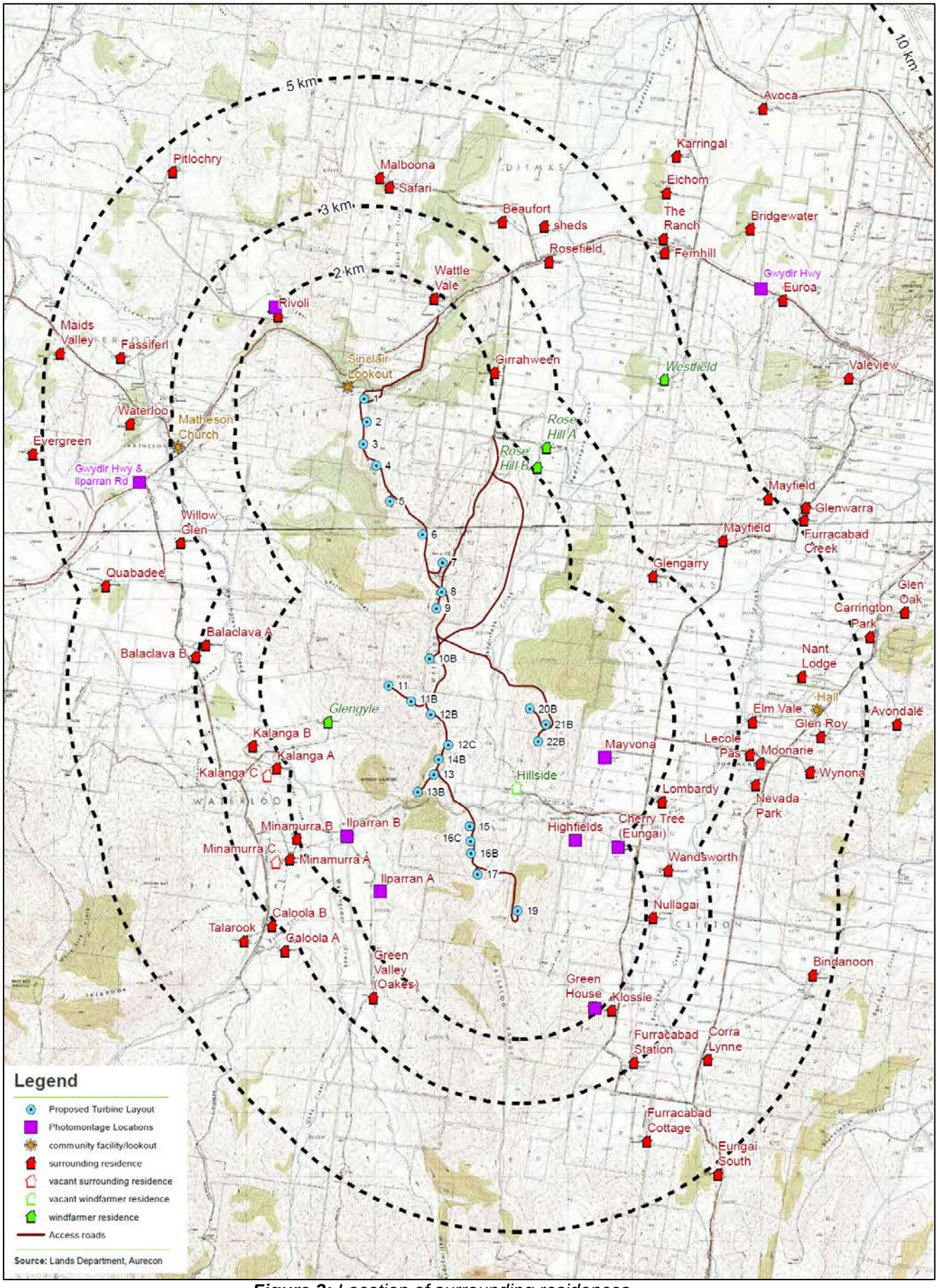


Figure 2: *Location of surrounding residences*

There are a number of other operating, approved or proposed wind farms in the New England region surrounding the project site, as shown in Figure 3.

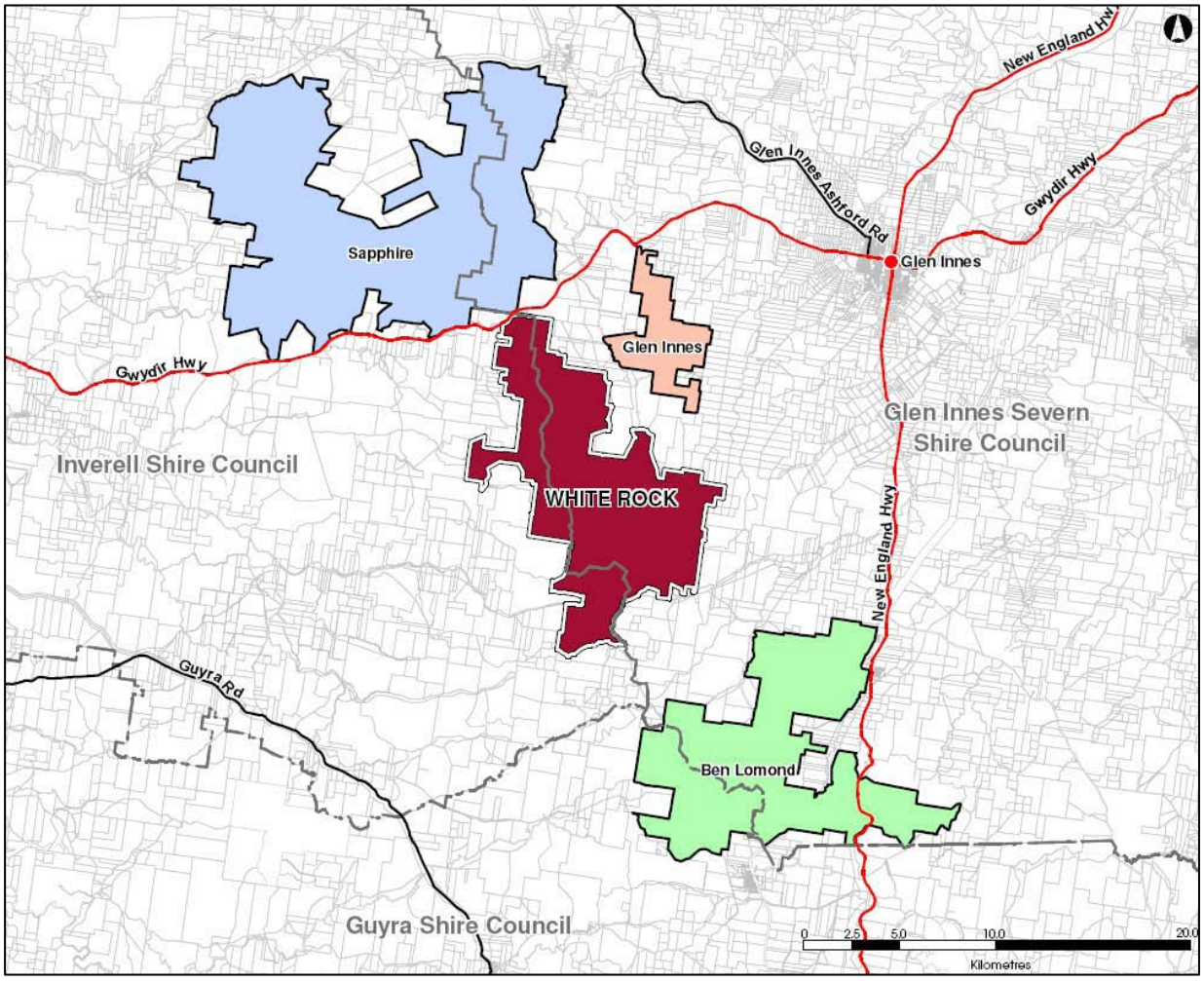


Figure 3: *Surrounding operating, approved or proposed wind farms*

2 PROPOSED MODIFICATIONS

GIWP has lodged two applications under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to further modify the project approval for the Glen Innes Wind Farm. The proposed modifications (ie. Modifications 2 and 3) are summarised below and described in full in the EAs which accompanied the applications (see Appendix A).

2.1 Modification 2

GIWP is seeking a modification to allow larger, more efficient turbines as well as micro-siting of two turbines within the approved layout to accommodate the larger turbines. Table 2 provides a comparison of the general specifications of the proposed higher efficiency turbine model with the approved turbine model. The key changes involve an increase in the maximum blade tip height of 20 m (from 130 m to 150 m) and an 11 m increase in the blade length (from 50 m to 61 m).

Table 2: *Wind turbine specifications*

Component	*Approved Turbines*	*Proposed Modification Turbines*	*Change*
Number of turbines	25	25	0%
Hub height	80 m	89 m	11%
Maximum blade tip height	130 m	150 m	15%
Minimum blade tip height	30 m	27.5 m	-8%
Rotor diameter	100 m	122 m	22%
Blade length	50 m	61 m	22%
Swept area per turbine	7,854 m^2	11,882 m^2	52%
Rated rotor speed	18 rpm	12.25 rpm	-32%
Max tip speed	94 m/s	78 m/s	-17%

Turbine No. 13 is proposed to be micro-sited 43 m in a north easterly direction and Turbine No. 13B is proposed to be micro-sited 44 m in a south westerly direction as shown on Figure 4.

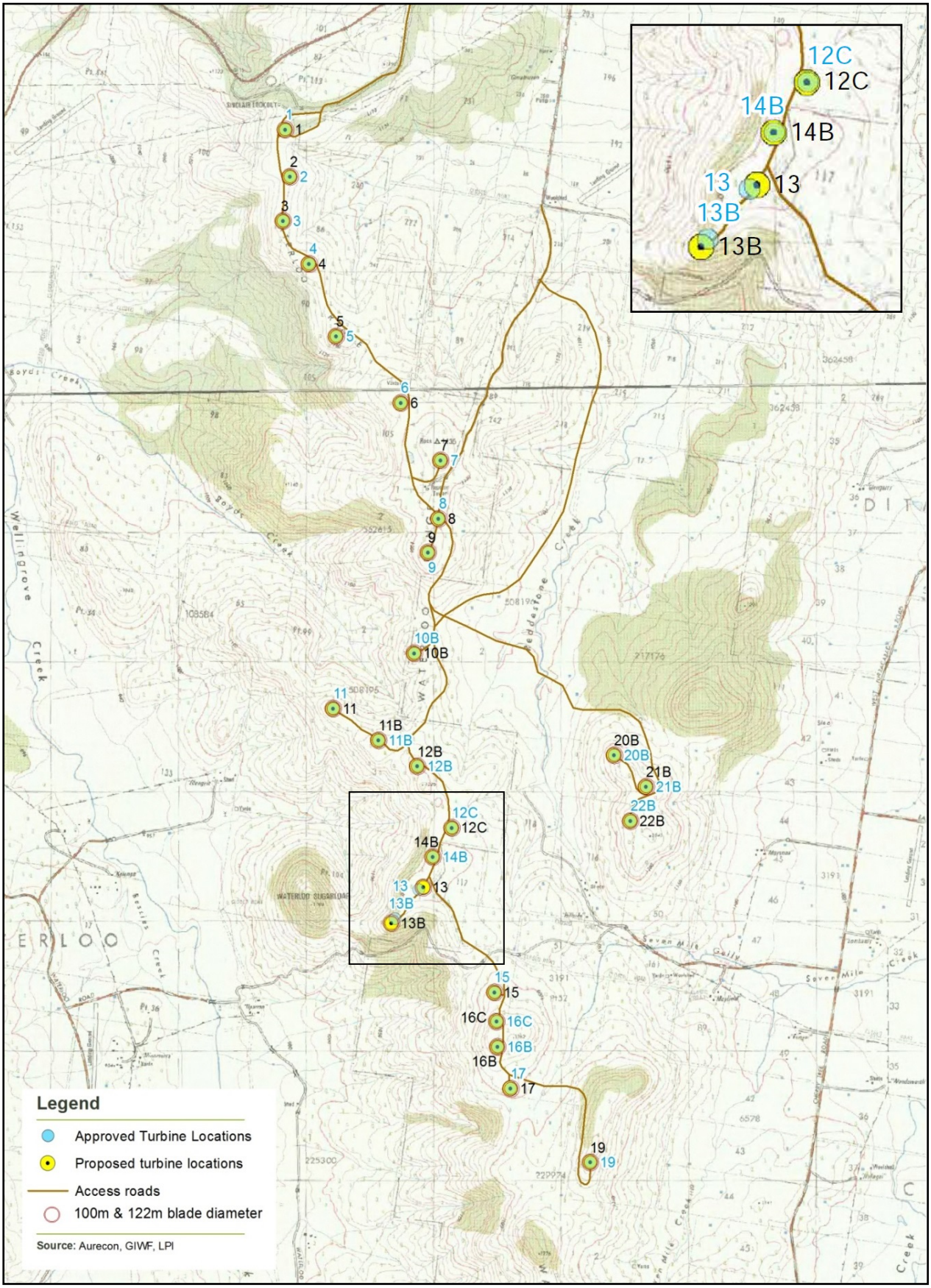


Figure 4: *Proposed turbine locations*

2.2 Modification 3

GIWP is unable to complete negotiations with manufacturers to supply the larger and more efficient turbines until Modification 2 is determined, due to uncertainty surrounding the approval. Consequently, GIWP is seeking to further extend the approval by an additional 12 months to enable it to complete detailed design and contractual negotiations.

As outlined in Table 1, the lapsing date in the project approval (ie. 18 August 2014) has passed since the application was lodged (ie. 23 May 2014). However, the project approval remains valid as a result of the amendment made to the EP&A Regulation in 2015 which provides that an approval does not lapse if an application to extend the lapse date is lodged before the lapsing date in the existing approval.

3 STATUTORY CONTEXT

3.1 Section 75W Modifications

Under Schedule 6A of the *Environmental Planning and Assessment Act 1979* (EP&A Act), the Glen Innes Wind Farm is classified as a 'transitional Part 3A project' and can be modified under the former Section 75W of the EP&A Act.

The Department is satisfied that the proposed modifications are within the scope of Section 75W as the proposals would:

- not significantly alter the approved layout of the project;
- not alter the ancillary infrastructure; and
- not significantly increase the environmental impacts of the project.

As outlined above, the lapse date in the existing project approval has now passed. However, the approval is taken to remain in force until Modification 3 is determined in accordance with clause 11A of Schedule 6A of the EP&A Act. Accordingly, the modifications may be determined.

3.2 Approval Authority

The Minister for Planning is the approval authority for the applications. However, under the Minister's delegation of 16 February 2015 the Executive Director, Resource Assessments and Business Systems, may determine the proposed modifications, as Glen Innes Severn Council has not made an objection, a political disclosure statement has not been made and there are less than 25 public submissions in the nature of objections.

4 CONSULTATION

4.1 Exhibition

The Department exhibited the modification applications and the accompanying EAs at the Department's Information Centre, Glen Innes Severn Council and the Nature Conservation Council on the dates as shown in Table 1.

The Department also made the relevant documents publicly available on its website and notified government agencies in writing.

4.2 Submissions

The Department received 19 submissions on Modification 2, including:

- 7 from public authorities;
- 8 from members of the general public; and
- 4 from public interest groups.

The Department received 15 submissions on Modification 3, including:

- 3 from public authorities;
- 11 from members of the general public; and
- 1 from a public interest group.

Copies of all submissions are included in Appendix B. A summary of the issues raised in submissions is provided below. GIWP has also provided a detailed response to these submissions (see Appendix C).

Agency Submissions

None of the submissions received from public authorities objected to the proposed modifications, but some raised concerns or made comments and/or recommendations in relation to managing potential environmental impacts.

Roads and Maritime Services (RMS) recommends the preparation of a Traffic Management Plan to address a range of matters including designation of haulage routes, road dilapidation, traffic control plans for pinch points and site access, and behavioural objectives including implementation of a code of conduct for drivers.

Department of Primary Industries (DPI) including Crown Lands, noted that the relocated Turbine No. 13B and 14B, combined with their proposed increased size, brings their reach within close proximity to, and potentially over, crown roads. The increase in blade diameter may also put blades over a section of crown road at the northern end of the project area. It advised the proposed changes would require clarification regarding interactions with these crown roads.

The **Environment Protection Authority** (EPA) did not raise any objections to the proposed modifications but identified the need for GIWP to demonstrate compliance with the noise criteria and identify and retain records of the conditions under which sector management would need to be applied.

The **Office of Environment and Heritage** (OEH) supports the proposal to extend the lapse date of the approval and raised no objections to the proposed modified turbines or turbine locations.

The **Department of Industry - Resources & Energy** (DRE) supports the use of more efficient turbines and the socio-economic benefits of the approved project.

NSW Rural Fire Service (RFS) did not raise any objections to the modifications, providing the existing conditions of approval related to bush fire management remain unchanged.

Community Submissions

The Department received a total of 12 public submissions to Modification 2, and 12 public submissions to Modification 3, including those from public interest groups and members of the general public.

All public submissions objected to, or raised concerns with, the proposed modifications.

Based on the information available in the submissions made from members of the general public, approximately 50% were received from residents within 5 km of the project. The remaining submissions did not provide an address, except for 1 from the Glen Innes township area and 2 from Queensland.

Key issues raised in the submissions from members of the general public included:

- *Buffer* – requesting all turbines be set back a minimum of 2 km from non-associated residences;
- *Visual* – including increased visual impacts of larger turbines, and increased shadow flicker;
- *Operational noise* – including increased noise impacts at two non-associated residences;
- *Biodiversity* – including impacts on birds and bats from the increased swept area of the larger turbines;
- *Community consultation* – including the duration of the exhibition period and insufficient community engagement by GIWP;
- *Property values* – including adverse impacts on property values as a result of the project and modifications;
- *Health* – including general concerns about the impacts of wind farms on human health;
- *Land use conflict* – including incompatibility with surrounding rural residential development; and
- *Aviation* – including impact on aviation for agricultural purposes.

5 ASSESSMENT

In its assessment of the merits of the modifications, the Department has considered:

- the modification applications;
- submissions on the proposed modifications and GIWP's response to submissions;
- the EA and conditions of approval for the original project;
- relevant environmental planning instruments, policies and guidelines; and
- the requirements of the EP&A Act.

The Department considers that the key issues for the modifications relate to noise, visual, and transport (see Sections 5.1, 5.2 and 5.3). Other issues relevant to the modifications are considered in Section 5.4.

5.1 Noise

A Noise Impact Assessment was undertaken by Aurecon Australia Pty Ltd in March 2014 to consider noise emissions associated with the proposed wind turbine modification and revised layout. Figure 5 shows the location of residences and background monitoring locations used in the assessment.

GIWP carried out two sets of noise predictions assessing the changes to the turbine layout and hub height. One set was carried out using the original ISO 9613 input conditions under the South Australian EPA's former *Wind Farm Environmental Noise Guidelines* (2003) consistent with the original noise assessment for the approved project. A second set was carried out using ISO 9613-2[1], which provides a more conservative set of modelling inputs in accordance with the South Australian EPA's current *Wind Farms Environmental Noise Guidelines* (2009) (the 2009 SA Guidelines).

Using the ISO 9613-2 model, the assessment indicates that the revised turbine design and layout would meet the applicable noise criteria at all non-associated residences with the exception of the 'Highfields' and 'Mayvona' residences during some wind speeds (ie. between 8 and 10 metres per second). Exceedances of between 1 and 3 decibels are predicted at these wind speeds (see Table 3).

These exceedances are similar to those predicted for the approved project, which predicted exceedances of up to 2 decibels when the wind strength is between 9 and 11 metres per second.

GIWP states that the predicted exceedances would only occur when the wind is blowing from the west, which occurs approximately 18% of the time.

Table 3: *Summary of predicted noise against noise criteria (exceedances in bold)*

Receiver	***Worst Case Noise Prediction (dBA $L_{Aeq(10\ Min)}$) with Reference to Hub Height Wind Speed (m/s)***										
	4	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Highfields											
Criteria	35	35	35	35	35	36	38	40	42	44	46
Modification*	23	25	29	32	35	**37**	37	37	37	37	37
Approval	17	23	29	32	35	**37**	**39**	39	40	-	-
Reduced operating mode	22	23	27	31	34	36	36	36	35	35	35
Mayvona											
Criteria	35	35	35	35	35	35	36	38	40	43	46
Modification*	24	25	29	33	**36**	**38**	**38**	38	37	37	37
Approval	17	23	28	32	35	**37**	**38**	**39**	39	-	-
Reduced operating mode	21	22	26	30	33	35	35	35	34	34	34

** Predictions using ISO 9613-2 model*

[1] International Organisation for Standardisation 1996, Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation, ISO 9613-2

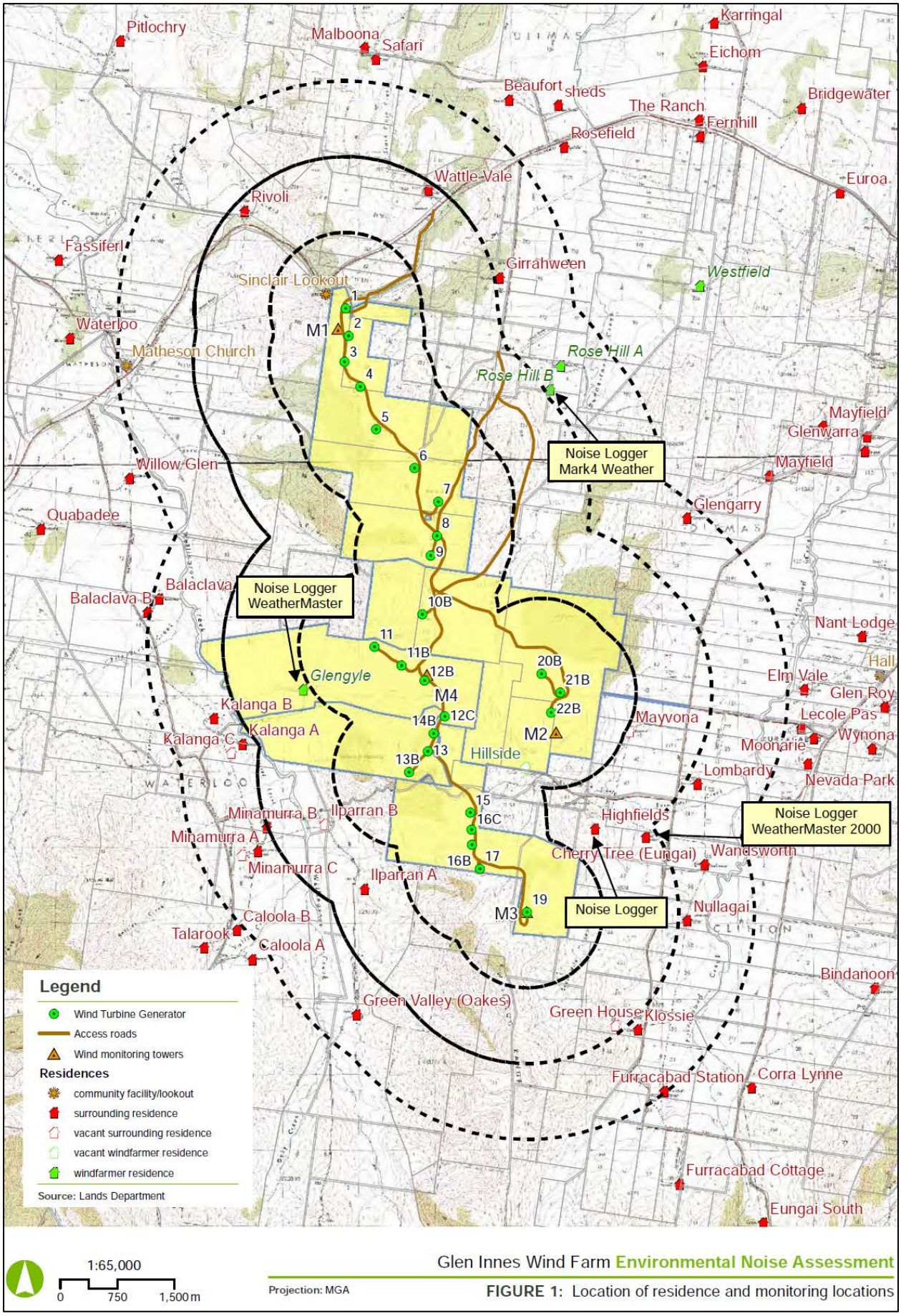


Figure 5: *Location of residence and monitoring locations*

To control noise emissions from the wind turbines and ensure compliance with the applicable noise criteria at all times, GIWP proposes to implement a sector management approach by changing the operating mode of selected turbines using the wind farm's SCADA control system. This system – based on real-time measurements of wind speed, direction and turbine operation – would involve operating the 7 applicable turbines (Turbine Nos. 15, 16B, 16C, 19, 20B, 21B, 22B) in reduced operating modes when the wind is blowing from the west at speeds when exceedances are likely to occur. The system was also proposed to be used to manage the predicted noise exceedances from the approved project.

The noise assessment indicates that the project would be able to comply with the applicable noise criteria at all wind speeds at all non-associated residences with effective sector management (see Table 3).

The NSW Land and Environment Court granted approval for the project on the basis that sector management would be used to achieve compliance with the applicable noise criteria.

Whilst both the Department and the EPA would prefer projects to comply with noise criteria without relying upon sector management, leaving the use of sector management as a contingency measure if any non-compliance is detected post-commissioning, it is accepted that given the NSW Land and Environment Court approval it would be unreasonable to require this in this instance.

The EPA recommended that GIWP be required to:

- comply with the applicable noise criteria;
- identify and retain records of the wind speed and direction conditions under which sector management is required; and
- retain records demonstrating that sector management has been implemented when necessary to comply with the noise criteria.

The Department accepts that the proposed modifications would not significantly change the noise impacts of the approved project (Nb. Noise level changes of between 1 and 2 decibels are generally not perceptible by the human ear), and that sector management could be used to avoid any noise exceedances at the 'Highfields' and 'Mayvona' residences.

The existing conditions of approval require GIWP to comply with applicable noise limits and to implement measures (such as sector management) to ensure that noise levels comply with these criteria.

However, the conditions do not reflect contemporary wind farm noise regulation (eg. the conditions refer to the former 2003 SA Guidelines rather than the current 2009 SA Guidelines) and the Department has recommended a number of changes to contemporise and strengthen the noise regulation of the wind farm, including in relation to sector management. These changes include requiring GIWP to:

- comply with the applicable noise criteria for wind turbine noise at all times (with reference to the specific noise criteria at each wind integer speed);
- measure wind turbine noise in accordance with the 2009 SA Guidelines (or any subsequent NSW government policy), as modified to apply penalties for the presence of any identified tonality or low frequency noise, in accordance with the draft *NSW Planning Guidelines: Wind Farms* (2011);
- undertake noise monitoring following the commencement of operations to verify that the wind farm is complying with the applicable noise criteria, including during times when sector management is being employed; and
- detail how sector management would be used and monitored, as part of the Operational Environmental Management Plan for the project.

The Department has also recommended minor changes to the conditions regarding construction noise, construction blasting and vibration, and ancillary infrastructure noise criteria to simplify and rationalise the conditions.

The Department has also recommended rationalising the conditions relating to verification of the operational noise performance of the wind farm. In this regard, conditions 2.22 to 2.26 of the existing approval require GIWP to undertake verification monitoring of the wind turbines within 6 months of commissioning and provide for mitigation of any identified exceedances, including mitigation at affected receiver locations (eg. through installation of insulation).

The Department notes that the noise modelling undertaken for the project indicates that the wind farm is able to meet the applicable noise criteria at all times at all non-associated residential receiver locations, subject to the implementation of sector management for a small number of turbines during infrequent

adverse winds at two residences. As outlined above, the Department has recommended conditions requiring GIWP to comply with these criteria.

The Department has retained the verification requirements in the project approval, given that actual monitoring of the working wind farm turbines would be important for establishing noise levels and verifying the modelling results.

However, the Department has removed the conditions relating to at-receiver mitigation, as GIWP's noise assessment indicates that the project would comply with the applicable criteria (subject to sector management) and the recommended conditions require GIWP to comply with these criteria at all times.

As currently worded, the conditions contemplate the potential for exceedances of the criteria. This is not the case, and if GIWP is found to exceed the applicable criteria then it would be in breach of its consent, and therefore subject to potential compliance action under the EP&A Act and/or its Environment Protection Licence (EPL).

Consequently, the Department has recommended that the conditions contemplating non-compliance, and provisions relating to at-receiver mitigation, be deleted. As outlined above, this would not absolve GIWP from its responsibilities under the project approval to comply with the applicable noise criteria at all times, or to comply with conditions in relation to community consultation, complaints management, compliance monitoring, incident reporting, independent auditing and environmental management.

5.2 Visual

The general location and extent of the wind farm and the associated landscape features remain unchanged with the proposed modifications. However, as discussed in Section 1, Turbine No. 13 is proposed to be micro-sited 43 m in a north easterly direction and Turbine No. 13B is proposed to be micro-sited 44 m in a south westerly direction. The turbines would also have different dimensions, including approximately 20 m (15%) higher at the blade tip and 9 m (11%) higher at the hub than those approved, resulting in a maximum height of approximately 150 m. This includes an increase in blade length of 11 m (22%).

GIWP prepared a visual assessment to assess the visual impact of the modification, including an assessment of shadow flicker, blade glint and revised photomontages. Figure 2 shows the locations of the revised photomontages.

Wind Turbines

The assessment compared the visibility and scale of the approved and proposed wind turbines in relation to the 23 non-associated residences located within 3 km of the nearest turbine. Table 4 provides a summary of this comparison.

Table 4: *Visibility and scale of proposed turbines at non-associated residences (changes shown in bold and difference shown in brackets)*

Non-associated Residence	Tips visible	Hubs visible	Distance to nearest turbine (m)	Vertical subtended angle (°)	Horizontal subtended angle (°)	Visibility rating
Furracabad Station	**12 (+3)**	**6 (+1)**	2,981	**4.49 (+0.38)**	25	M
Klossie	**10 (+2)**	4	2,135	**6.21 (+0.53)**	32	M
Green House	**8 (+1)**	**5 (+1)**	1,899	**6.77 (+0.60)**	32	M
Green Valley (Oakes)	**18 (+1)**	**16 (+2)**	2,514	**6.67 (+0.43)**	56	M
Nullagai	**3 (+2)**	1	2,115	**2.93 (+0.94)**	**20 (+17)**	M
Ilparran A	**14 (+2)**	11	1,536	**10.28 (+0.70)**	96	H
Wandsworth	16	13	2,428	**5.87 (+0.46)**	69	M
Minamurra C	**25 (+2)**	22	**2,457 (-40)**	**6.50 (+0.48)**	91	H
Minamurra A	23	**21 (+1)**	**2,247 (-41)**	**7.18 (+0.53)**	94	H
Cherry Tree (Eungai)	15	**13 (+1)**	1,852	**7.44 (+0.60)**	92	H
Highfields	17	**15 (+1)**	1,419	**9.64 (+0.78)**	127	H
Minamurra B	21	**20 (+2)**	**2,013 (-39)**	**8.09 (+0.61)**	99	H
Ilparran B	10	8	**1,308 (-42)**	**9.58 (+1.09)**	98	H
Lombardy	15	**12 (+1)**	2,157	**5.50 (+0.53)**	84	H
Kalanga C	25	**21 (+2)**	2,349	**6.65 (+0.46)**	104	H
Kalanga A	**25 (+1)**	19	2,161	**7.19 (+0.49)**	107	H
Mayvona	8	8	1,051	**12.32 (+1.01)**	93	H
Kalanga B	25	**21 (+1)**	2,311	**6.53 (+0.48)**	104	H

Non-associated Residence	*Tips visible*	*Hubs visible*	*Distance to nearest turbine (m)*	*Vertical subtended angle (°)*	*Horizontal subtended angle (°)*	*Visibility rating*
Balaclava A	**25 (+1)**	22	2,905	**4.24 (+0.38)**	98	M
Glengarry	4	2	2,817	**3.9 (+0.40)**	21	M
Girrahween	**15 (+2)**	**12 (+1)**	2,073	**5.54 (+0.55)**	87	H
Rivoli	2	3	1,850	**4.40 (+0.67)**	**15 (+2)**	M
Wattle Vale	22	**16 (+2)**	1,902	**4.86 (+0.60)**	49	H
Average (change)	15.6 (+1.1)	12.7 (+0.7)	2,108 (-7)	6.64 (+0.60)	73.61 (+0.83)	-

As the proposed modified turbine layout is almost identical to that approved, the horizontal subtended view angle only increases at two non-associated residences. However, the number of turbine blade tips, turbine hubs and the vertical field of view has increased at a number of non-associated residences as a result of the proposed larger turbines. Figure 6 and Figure 7 show the locations that would experience increased views of the turbines.

The largest increase in the number of turbine tips visible for a non-associated residence would occur at Furracabad Station, located 2.98 km south east of Turbine No. 19, where three additional blade tips and one turbine hub would be visible. However, due to the separation distance between the residence and the additional visible turbines, the change in visual impact is not considered sufficiently perceptible to result in a significant impact.

The largest increases in vertical subtended view angle for non-associated residences would occur at 'Ilparran B' and 'Mayvona'. Figures 8 to 11 provide photomontages from these residences comparing the proposed larger turbines with those approved.

'Ilparran B' is a vacant, dilapidated non-associated residence located 1.31 km from the nearest turbine (ie. Turbine No. 13B), with direct views of up to 10 turbines. Under the proposed Modification 2, Turbine No. 13B would be located 42 m closer to the dwelling. As a result, 'Ilparran B' would experience an increase in vertical subtended view angle of 1.09°. Existing vegetation would provide partial screening of a number of turbines, with only Turbine No. 13B being completely visible from the residence.

'Mayvona' is a vacant non-associated residence located 1.05 km from the nearest turbine (ie. Turbine No. 22B). Under the modification, it would experience an increase in vertical subtended view angle of 1.01°. Existing vegetation would provide significant screening for a number of turbines, with no turbines completely visible from the residence.

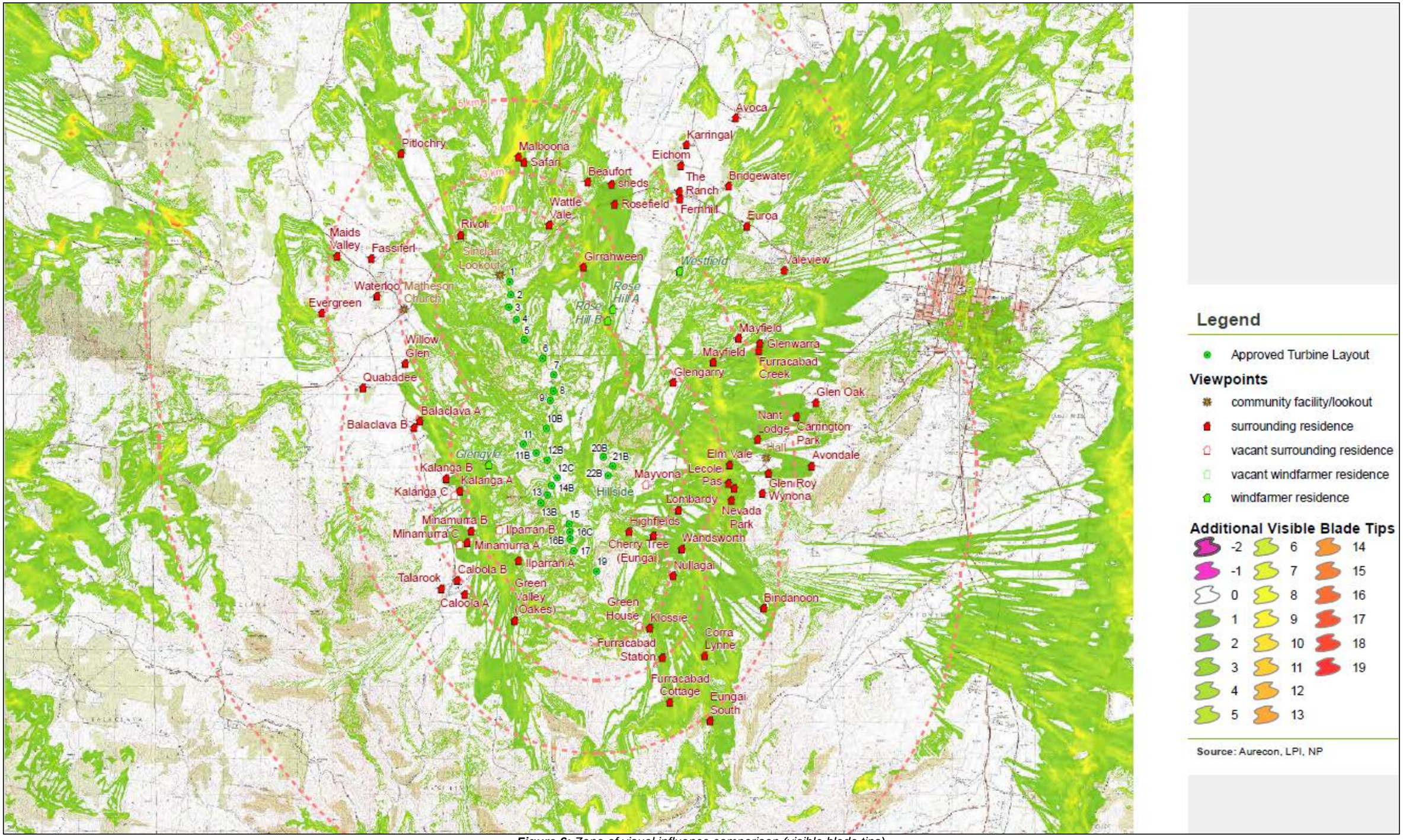
The assessment indicates that the increases in impacts at 'Ilparran B' and 'Mayvona', as well as all other non-associated residences, would only be marginal and that the change in visual impact would not be sufficiently perceptible to result in a significant additional impact to any non-associated residences.

The Department accepts the conclusions of the assessment that the increase in turbine dimensions would have minor additional impacts on non-associated residences and public viewpoints. These impacts would be mitigated with vegetative screening and landscape treatments near the viewing locations as required under the existing conditions of approval.

In this regard, condition 2.1 of the existing project approval requires GIWP to implement vegetative screening and landscaping treatments at non-associated residences within 3 km of visible wind turbines, at the request of the landowner.

The increase in turbine tip height would increase the number of turbine blade tips, turbine hubs and the vertical field of view at a number of non-associated residences within 3 – 4 km of the nearest turbine.

As such, the Department has recommended that the distance for vegetative screening and landscaping treatments be extended to non-associated residences within 4 kilometres of visible turbines. This is generally consistent with contemporary wind farm approvals with turbines of similar tip height. The Department has also strengthened the drafting of the relevant landscaping condition to reflect current drafting of similar obligations, and to extend the Secretary's dispute resolution role to cover the implementation of any landscaping measures rather than just the scope of these landscaping treatments.



Legend

- Approved Turbine Layout

Viewpoints

- community facility/lookout
- surrounding residence
- vacant surrounding residence
- vacant windfarmer residence
- windfarmer residence

Additional Visible Blade Tips

-2	6	14
-1	7	15
0	8	16
1	9	17
2	10	18
3	11	19
4	12	
5	13	

Source: Aurecon, LPI, NP

Figure 6: *Zone of visual influence comparison (visible blade tips)*

Figure 7: *Zone of visual influence comparison (visible hubs)*

Figure 8: *Photomontage comparing the approved turbines (top) with the proposed larger turbines (bottom) from 'Ilparran B' (view to the east of residence)*

Figure 9: *Photomontage comparing the approved turbines (top) with the proposed larger turbines (bottom) from 'Ilparran B' (view from south east corner of residence)*

Figure 10: *Photomontage comparing the approved turbines (top) with the proposed larger turbines (bottom) from 'Mayvona' (view from southern side of residence)*

Figure 11: *Photomontage comparing the approved turbines (top) with the proposed larger turbines (bottom) from 'Mayvona' (view from western side of residence)*

Shadow Flicker

With regard to shadow flicker, the assessment indicates that the theoretical shadow flicker would increase at four non-associated residences, with exceedances predicted beyond the 30 hours per annum criteria specified in the *Draft NSW Planning Guidelines: Wind Farms* (2011) at 'Ilparran B' and 'Mayvona' as shown in . Maximum theoretical shadow flicker duration was also predicted to exceed 30 hours per annum at 'Mayvona' for the approved project (by 2 hours per annum).

Table 5: *Theoretical shadow flicker duration (exceedances shown in bold)*

Non-associated Residence	***Shadow Flicker Hours per Annum***			
	Approved	***Proposed Modification***	***Difference***	***With Cloud Cover***
Mayvona	**32**	**42**	+10	27.0
Ilparran A	19	29	+10	18.7
Ilparran B	24	**37**	+13	23.8
Highfields	13	20	+7	12.9
Rivoli	0	0	0	0
Wattle Vale	0	0	0	0
Green House	0	0	0	0
Cherry Tree	0	0	0	0

While the maximum theoretical shadow flicker duration is predicted to exceed 30 hours per annum at these two non-associated residences for the proposed modification, GIWP anticipates that actual shadow flicker is unlikely to exceed 30 hours per annum at any non-associated residences due to mitigating environmental factors such as cloud cover and existing vegetative screening. In order to more accurately represent shadow flicker, the mean number of cloudy days can be taken into consideration[2]. The monthly cloud cover readings taken by the Australian Bureau of Meteorology from 1962 to 2010 at the weather station located at Glen Innes Post Office 29.74°S 151.74°E (Site No. 056011) is shown in Table 6.

Table 6: *Cloud cover at Glen Innes*

Statistics	***Jan***	***Feb***	***Mar***	***Apr***	***May***	***Jun***	***Jul***	***Aug***	***Sep***	***Oct***	***Nov***	***Dec***	***Annual***
Clear Days	6.1	4.3	6.8	9.3	9.4	10.1	12.6	12.9	11.7	8.9	6.9	6.3	105.3
Cloudy Days	13.2	12.2	11.5	9.4	11.0	10.9	9.5	9.2	8.3	10.5	11.8	12.6	130.1

Based on the cloud cover readings, there are on average 130.1 days of cloud cover per year in the project area. This is approximately one third of the year. If this is applied to the theoretical predicted shadow flicker duration, the actual predicted shadow flicker would be below 30 hours per annum at all non-associated residences, as shown in .

The Department acknowledges that there are a number of assumptions in calculating the theoretical maximum shadow flicker and the maximum theoretical levels predicted are probably unlikely to occur.

The Department also notes that 'Ilparran B' and 'Mayvona' are both vacant residences.

Condition 2.6 of the project approval requires GIWP to ensure that any non-associated residence does not experience shadow flicker for more than 30 hours per annum, and to undertake a shadow flicker verification report following commissioning. If shadow flicker was found to be an issue, it could be mitigated through a number of methods, including:

- screening of the view to the wind turbine that is causing the flicker, through additional landscaping devices such as vegetative planting;
- curtains and other window screening devices can be used during the short periods of shadow flicker to prevent shadow flicker from entering a residence; and
- implementing a turbine shut-down protocol, using automated flicker timers, where any turbines are switched off that are causing the shadow flicker.

GIWP has committed to monitoring wind speed and direction during hours of flicker risk, and shutting down relevant turbines if and when required.

[2] Shadow flicker would only occur when there is sufficient intensity in sunlight to cast a shadow from a turbine to nearby receptors. Under cloudy conditions, a shadow would not be cast

With this measure the Department is satisfied the impact of shadow flicker from the modifications can be adequately managed such that no significant impacts would occur. Notwithstanding, in addition to the existing conditions of approval regarding shadow flicker compliance and verification, the Department has recommended that the verification assessment include all potentially affected residences (including 'Ilparran B' and 'Mayvona'), that the Operational Environmental Management Plan be required to include measures to mitigate any shadow flicker impacts.

Blade Glint

The Department is satisfied the existing conditions of approval for the design of the turbines, that require the turbines to be painted matt-off-white/grey and finished with a surface treatment that minimises any potential for glare or reflection, would minimise any potential for blade glint.

5.3 Transport

The assessment of the traffic and transport impacts of the approved project was based on the construction of 26 turbines with a hub height of 80 m and rotor diameter of 88-100 m. The proposed modifications seek to construct up to 25 turbines (as approved by the Court), however with an increased hub height of 89 m, rotor diameter of 122 m and blade length of 61 m.

As Modification 2 seeks to use larger wind turbine components, increased turning restrictions are anticipated with an overhang expected for the transportation of the blade.

A traffic assessment, inclusive of swept path assessments (in both the EA and Response to Submissions for Modification 2) of the largest vehicles was undertaken to determine the feasibility and accessibility of the vehicles along the transport route along the Gwydir Highway and New England Highway, in accordance with the existing conditions of approval. This transport route is shown on Figure 12 and Figure 13.

Figure 12: *Transport route options through Glen Innes township*

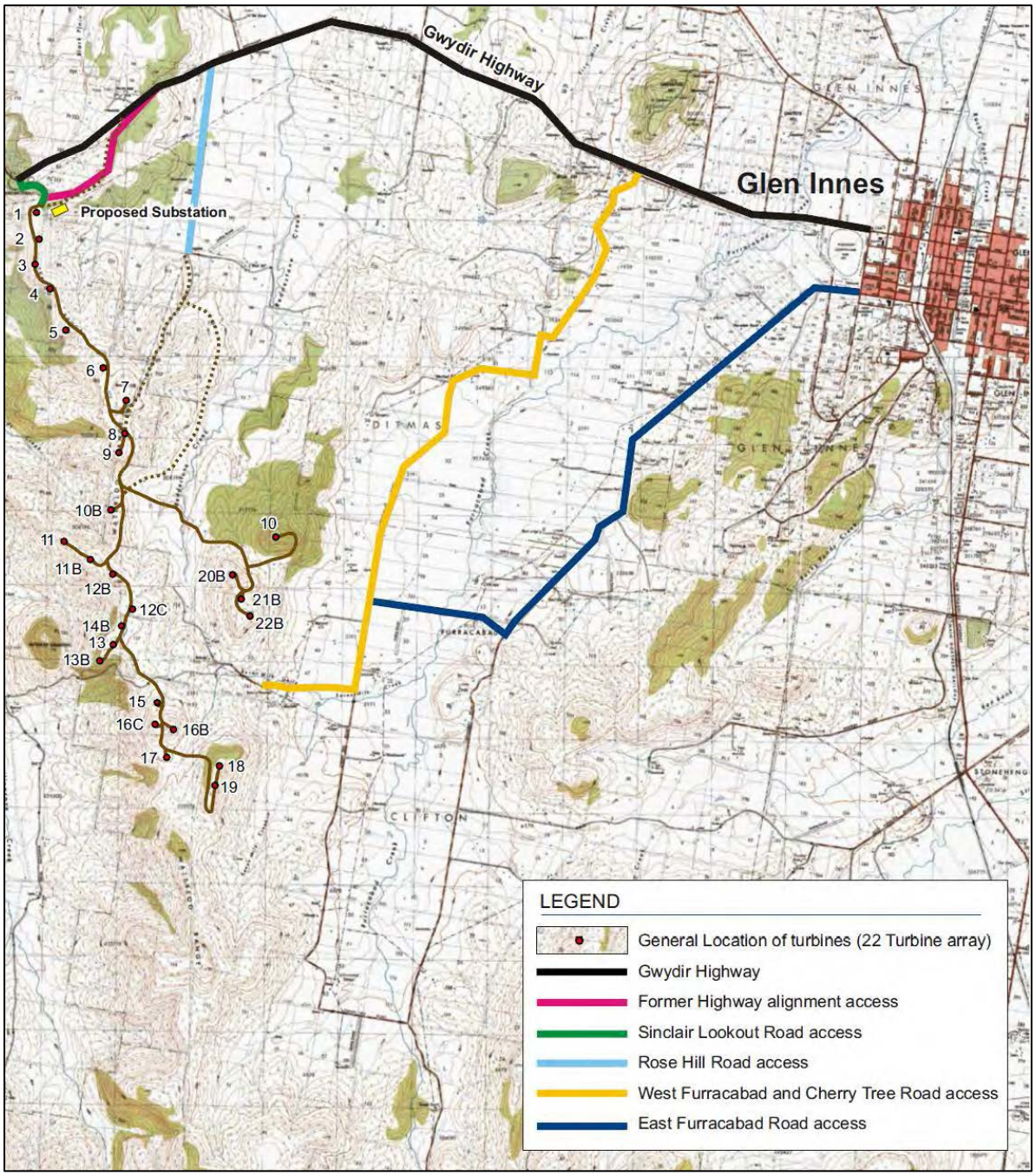


Figure 13: *Transport route options*

The assessment concluded that there would be key locations where manoeuvring constraints for the transportation of the wind farm components would be experienced, however these could be mitigated with the implementation of appropriate traffic management measures for the use of oversize/overmass vehicles. These include appropriate markings and signs for special purpose vehicles, the use of pilot and escort vehicles and the use of warning lights and signs.

Other measures that may be required include restriction of on-street parking and avoidance or temporary removal of roadside infrastructure (such as signs, light poles, overhead wiring etc.).

The Department is satisfied that the traffic and transport impacts of the modified project have been satisfactorily addressed by GIWP, and considers that the modified project would not result in any significant additional impacts. The impacts would be adequately managed through the existing conditions of approval which include restrictions regarding access to the project site, require approval from the relevant roads authority for the use of oversize/overmass vehicles, require all the relevant roads approvals to be obtained prior to commencing work and require a Road Dilapidation Report and detailed Construction Traffic Management Plan.

The Department notes that the modified turbine locations combined with the increased blade diameter could result in a number of turbines potentially impacting segments of unformed Crown road reserves, as raised in the submission from DPI. In particular, the blade diameters of Turbine Nos. 1, 13 and 14B would potentially extend over segments of unformed Crown road reserves in their vicinity. The unformed Crown road reserves would be able to be avoided through micro-siting during the detailed design stage of the project. The Department has recommended a condition requiring GIWP to ensure the future use of any unformed Crown road reserve is not compromised by the project.

5.4 Other Issues

The Department's consideration of other issues associated with the proposed modifications is provided in Table 7 below. The Department is satisfied that all other issues associated with the proposed modification are minor and/or would be adequately managed through the existing conditions of approval.

Table 7: *Summary of other impacts*

Issue	***Impact and Consideration***	***Recommendation***
Aviation	GIWP has undertaken an assessment of the impacts of the modified and relocated turbines on civil aviation, the Glen Innes Aerodrome, aerial agricultural operations, recreational activities and the Department of Defence. The Glen Innes Aerodrome, owned and operated by Glen Innes Severn Council, is located 10km north of the wind farm. The assessment concluded that the modified wind turbines would not penetrate any Obstacle Limitation Surface (OLS) or Procedures for Air Navigation Services – Aircraft Operations Surfaces (PANS-OPS), including that of the Glen Innes Aerodrome. The blade tip height would remain below navigable airspace levels (500 ft), and therefore obstruction lighting is not required to be installed. The project approval contains conditions for managing aviation-related issues, including requirements on GIWP to: • provide the final design details of the wind turbines to the Civil Aviation Safety Authority, Royal Australian Air Force Aeronautical Information Service and Airservices Australia; and • if any aerial agricultural activity is demonstrated to be disrupted on any property surrounding the site (being any non-associated property having a boundary located within 2.5km of a turbine), fully fund the cost difference between the current aerial agricultural activities and a reasonable alternative application or continuing aerial agricultural activities. The Department considers the existing conditions remain appropriate for the proposed modifications.	No additional conditions required.
Flora and Fauna	GIWP undertook an assessment of the impacts of the modified turbines on flora and fauna, with reference to the original assessment in the EA. Two endangered ecological communities (EECs) occur in the vicinity of the project, including: • Ribbon Gum - Mountain Gum - Snow Gum Grassy Forest / Woodland; and • White Box – Yellow Box – Blakely's Red Gum Woodland. No threatened fauna species were recorded in the project area during the surveys undertaken, however the assessment concluded that some could potentially occur, including the Eastern Falsistrelle, Eastern Bentwing-bat, Large-eared Pied Bat, Yellow-bellied Sheathtail Bat, Diamond Firetail and Speckled Warbler. The project would involve clearing some areas of native vegetation and fauna habitat, however no large scale clearing would be undertaken. The majority of the native vegetation to be cleared is grassland, comprising a mixture of native grassland, native pasture and exotic grassland. The EECs and fauna habitat	No additional conditions required.

Issue	*Impact and Consideration*	*Recommendation*
	would be avoided. The original assessment concluded the impact on flora and fauna from clearing would be negligible. As the modified turbines would be micro-sited within locations previously assessed in the original EA, the Department considers that the impact from vegetation clearing on the EECs and those threatened fauna species that may occur in the area would remain negligible. The modified wind turbines have a 52% larger swept path area and a 32% lower rotation speed. The assessment concluded that the additional impact of blade-strike on birds and bats would be negligible due to the physical characteristics of the project site and low likelihood of at risk species known to occur in the area. As such, whilst the increase in swept path area of the turbines and decrease in speed of rotation could result in some increased avifauna mortalities, the Department accepts that the impact of blade-strike would be negligible. The existing project approval contains a number of conditions to manage the impact of vegetation clearing, including requirements for: • an offset package to compensate for any loss in habitat; • a Flora and Fauna Management Plan; and • a Bird and Bat Adaptive Management Program. The Department is satisfied that the existing conditions remain appropriate for the proposed modifications.	
Aboriginal Heritage	A desktop assessment of the impacts of the relocated turbines on Aboriginal cultural heritage was undertaken by GIWP. This assessment indicated that no Aboriginal sites have been recorded within the revised turbine layout, that the recorded Aboriginal site in the vicinity of the project site can be avoided and that it is unlikely that unidentified Aboriginal artefacts would be impacted by the revised turbine locations. The project approval contains conditions to mitigate any impacts on Aboriginal heritage, including: • if works are required in the vicinity of the previously identified heritage item, a management and mitigation strategy will be developed in consultation with the Office of Environment and Heritage (OEH) and the Glen Innes Aboriginal Land Council; and • if GIWP becomes aware of any previously unidentified Aboriginal heritage item, all work likely to affect the item must stop immediately and OEH must be notified. The Department is satisfied that the existing conditions remain appropriate for the proposed modifications.	No additional conditions required.
Non-Indigenous Heritage	A desktop assessment of the impacts of the relocated turbines on non-indigenous heritage was undertaken by GIWP. The assessment concluded that the proposed modification is unlikely to have adverse impacts on any heritage items as the proposed turbines would be micro-sited within approved locations previously assessed in the original EA. The project approval contains a condition that if GIWP becomes aware of any previously unidentified historical relic, all work likely to affect the relic must stop immediately and the Heritage Office must be notified. The Department is satisfied that the existing conditions remain appropriate for the proposed modifications.	No additional conditions required.

Issue	Impact and Consideration	Recommendation
Lapsing of consent	The Department accepts that a one year extension to the lapsing date (from the date of approval of the modifications) is reasonable given the uncertainty surrounding renewable energy targets in recent years, the time necessary to design and plan the wind farm development, and the unchanged nature of land use surrounding the site since the original project approval.	Extension to the lapsing date in the project approval (ie. to 31 January 2017).

6 RECOMMENDED CONDITIONS

The Department has drafted a recommended Notice of Modification (see Appendix D) for the proposed modifications, as well as a consolidated version of the project approval conditions as modified (Appendix E). The recommended modifications to the conditions include:

- extending the project approval lapsing date (to 31 January 2017);
- updated operational noise management conditions;
- updated construction noise and vibration conditions;
- updated visual impact mitigation conditions;
- updated traffic and transport conditions;
- minor changes to ensure the impacts of decommissioning the project are appropriately incorporated in the project approval; and
- administrative changes to update definitions and to reflect contemporary best practice for wind farm projects.

GIWP has reviewed and does not object to the recommended conditions.

7 CONCLUSION

The Department has assessed the modification applications in accordance with the relevant statutory requirements, having regard to the EA, submissions, as well as documentation relating to the original project.

Based on this assessment, the Department is satisfied that the proposed modification is reasonable and would not result in any significant change in environmental impacts beyond those associated with the original project. The proposed changes to the operational noise conditions would ensure that noise is managed in accordance with contemporary best practice standards for wind farms in NSW.

Consequently, the Department is satisfied that the proposed modifications are in the public interest and should be approved, subject to conditions.

8 RECOMMENDATION

It is recommended that the Executive Director, Resource Assessments and Business Systems, as delegate of the Minister for Planning:

- considers the findings and recommendations of this report;
- determines that the proposed modifications fall within the scope of Section 75W of the EP&A Act;
- approves the modification applications, subject to conditions; and
- signs the attached Notice of Modification (see Appendix D).

12/01/16

Diana Charteris
Senior Planning Officer
Resource Assessments

12.01.16.

Mike Young
Director
Resource Assessments

APPENDIX A: ENVIRONMENTAL ASSESSMENT

See the Department's website at:

Modification 2 - http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6238

Modification 3 - http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6521

APPENDIX B: SUBMISSIONS

See the Department's website at:

Modification 2 - http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6238

Modification 3 - http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6521

APPENDIX C: RESPONSE TO SUBMISSIONS

See the Department's website at:

Modification 2 - http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6238

Modification 3 - http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6521

APPENDIX D: NOTICE OF MODIFICATION

See the Department's website at:

Modification 2 - http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6238

Modification 3 - http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6521

APPENDIX E: CONSOLIDATED APPROVAL CONDITIONS

See the Department's website at:

Modification 2 - http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6238

Modification 3 - http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6521