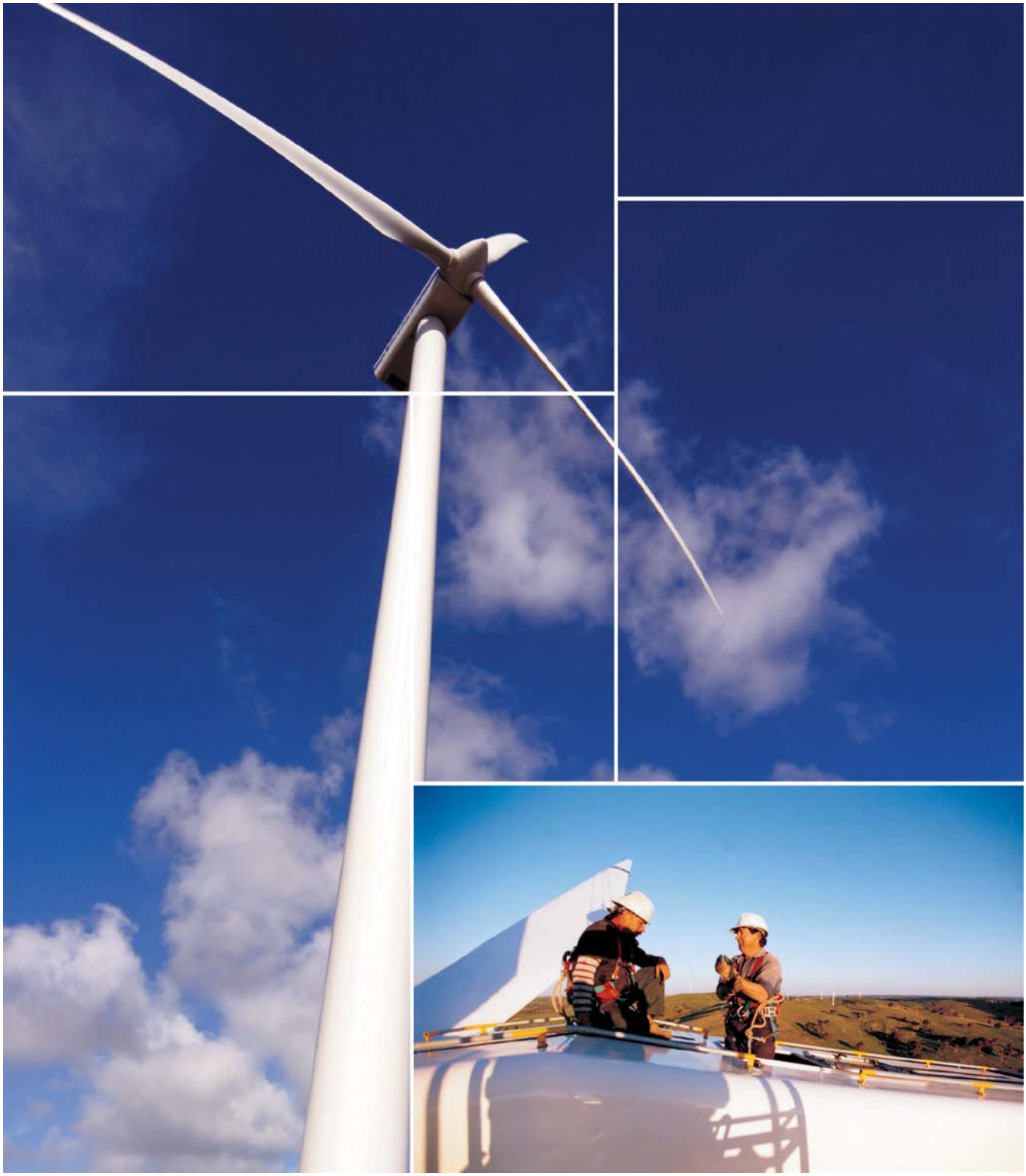

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Glen Innes Wind Farm DA Approval Modification

Aviation Risk Assessment

Reference: 236777

Prepared for: Glen Innes Wind Power

Revision: 3

2 July 2014

Document control record

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Document control						
Report title		Aviation Risk Assessment				
Document ID			**Project number**		236777	
File path		236777 – Glen Innes DA Application /3. Project Delivery / _Report – 2013 / Appendices				
Client		Glen Innes Wind Power	**Client contact**		Colin Paterson	
Rev	**Date**	**Revision details/status**	**Prepared by**	**Author**	**Verifier**	**Approver**
0	20 August 2013	Draft	AK	AK	MG	GM
1	22 October 2013	Final	AK	AK	MG	GM
2	29 November 2013	Final with DOPI comments included	HT	AK	MG	GM
3	2 July 2014	Final with additional airfield included	AK	AK	MG	GM
Current revision		**3**				

Approval			
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Contents

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Glossary of Terms

Term	Definition
AGL	Above Ground Level
ALGA	Australian Local Government Association
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulations
CFS	Country Fire Service
ERC	En route Chart
IFR	Instrument Flight Rules
LSALT	Lowest Safe Altitude
MW	Megawatts
NASAG	National Airports Safeguarding Advisory Group
nm	Nautical Mile
NOTAM	Notice to Airmen
NVFR	Night Visual Flight Rules
RPT	Regular Public Transport
VFR	Visual Flight Rules
WAC	World Aeronautical Chart
WTG	Wind Turbine Generator

1. Introduction

Glen Innes Wind Farm is located within the New England Region of New South Wales and on the Waterloo Range about 12 kilometres to the west of Glenn Innes. Spanning approximately 8.5 kilometres from north to south and about 3 kilometres from east to west, the 25 wind turbines locations are shown in Figure 1.

The topography in the region decreases in height from the elevated Ben Lomond tableland (at about 1400 metres) about 10 kilometres to the south of the wind farm site to the Wellingrove Creek Valley (at a level of about 950 metres) several kilometres to the west of the site.

The selected sites along the Waterloo Range are located on ridges at elevations between 1160 and 1275 metres above sea level which are located between about 120 to 280 metres above the level of the lowlands to the east and west of the site respectively.

1.1 Background

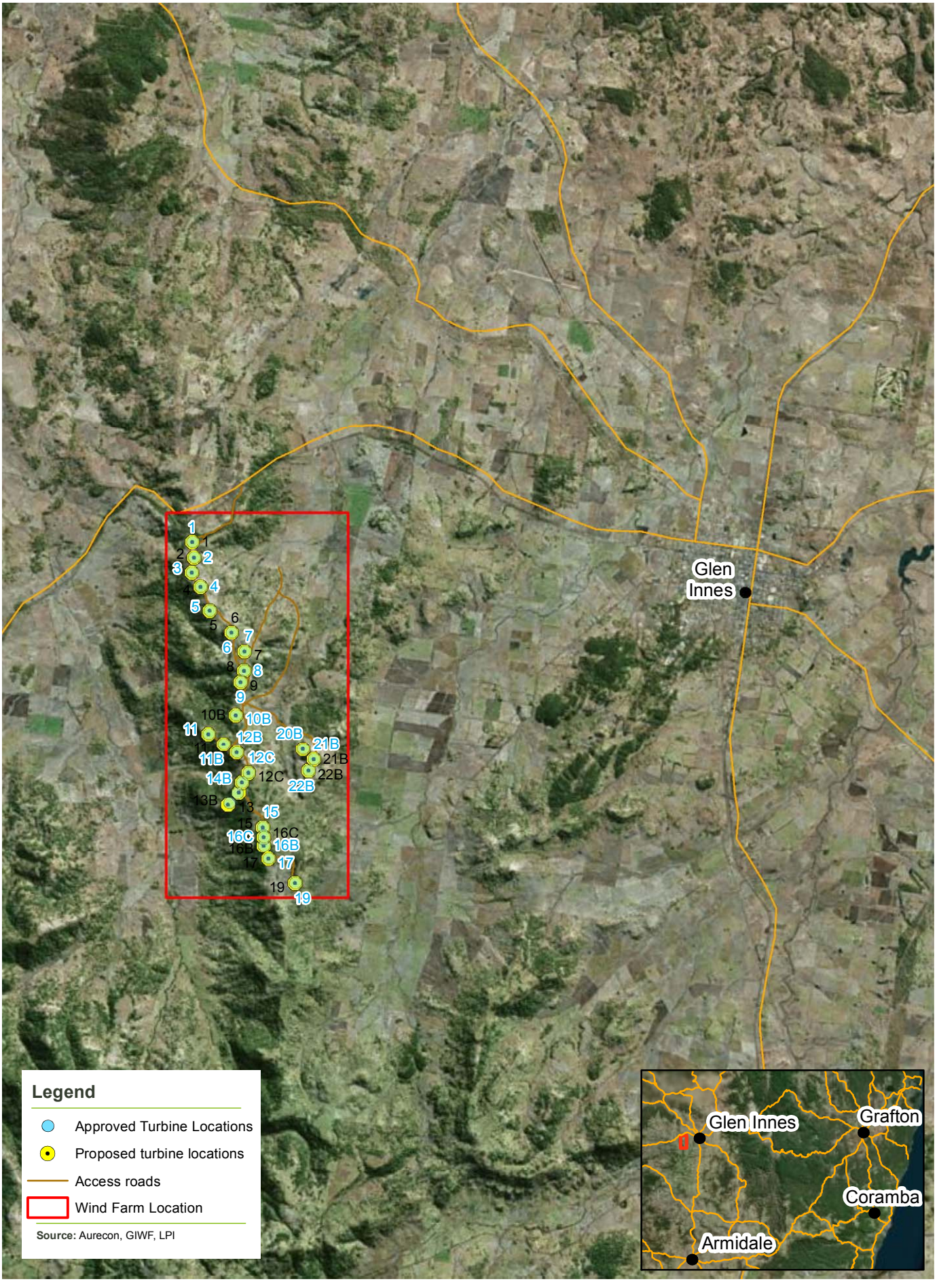
The Glen Innes Wind Farm development was approved by the Department of Planning under Part 3A of the EP&A Act on 2 October 2009. Following an appeal by the Glen Innes Landscape Guardians Inc, the Land and Environment Court upheld approval and modified conditions of consent were approved on 2 September 2010. The approval was for the construction of up to 25 wind turbine generators (WTGs) with a capacity of up to 75 MW. The Environmental Assessment which was originally submitted to the Department of Planning considered WTGs with a hub height of 80 m and a rotor diameter of 88-100 m (maximum blade tip height of 130 m).

Glen Innes Wind Farm Pty Ltd proposes to install 25 Alstom ECO122 wind turbine generators which have a hub height of 89 m and rotor diameter of 122 m (maximum blade tip height of 150 m). These larger turbine models will increase the efficiency of the wind farm.

Air safety issues that were assessed in the 2008 Environmental Assessment include:

- Proximity of the proposed wind farm to landing fields
- Potential intrusion into air traffic zones and regulatory requirements
- Potential effects on activities such as aerial spraying of agricultural areas

A review of these issues with respect to the proposed modification is described in the sections below.



\\aurecon.info\Shares\AUSYD\Projects\GIS\Project-2\project\Glen-Innes\2013 Maps\EA\Figure 1.1 Locality Map.mxd\JOB No.\14-08-13\heather.tilley\Rev 0

1:120,000

0 2 4 km

Projection: GDA 1994 MGA Zone 56

Glen Innes Wind Farm **Environmental Assessment**

FIGURE 1: Locality Map

2. Methodology

The assessment seeks to ensure that the aviation related planning guidelines relevant to wind farms in NSW have been adhered to and that the operations of the identified aviation stakeholders will not be adversely impacted by the proposed modifications to Glenn Innes Wind Farm.

The following Aeronautical Charts and other documents have been reviewed:

- Glenn Innes Wind Farm Environmental Assessment 2008
- Section 75J Project Approval September 2010
- World Aeronautical Chart – Armidale (3357)
- Australia ERC Low – Sheets 3 and 4
- Australia ERC High – Sheets 3 and 4
- National Airfield Directory 2010/11
- Environment Protection and Heritage Council National Wind Farm Development Guidelines – Draft 2010

Table 1 below compares the approximate locations of the approved wind farm development with those which have been proposed as part of the development modification process.

Table 1 – Wind Turbine Layout Comparisons

Approved (August 2010)			Proposed			Difference	
Label	Eastings	Northings	Label	Eastings	Northings	metres	Bearing
1	364943	6710288	1	364943	6710288	0	
2	364981	6709924	2	364981	6709924	0	
3	364926	6709583	3	364926	6709583	0	
4	365131	6709251	4	365131	6709251	0	
5	365343	6708692	5	365343	6708692	0	
6	365850	6708179	6	365850	6708179	0	
7	366162	6707735	7	366162	6707735	0	
8	366146	6707285	8	366146	6707285	0	
9	366063	6707025	9	366063	6707025	0	
10B	365955	6706247	10B	365955	6706247	0	
11	365319	6705820	11	365319	6705820	0	
11B	365675	6705575	11B	365675	6705575	0	
12B	365980	6705375	12B	365980	6705375	0	
12C	366250	6704900	12C	366250	6704900	0	
13	365988	6704420	13	366026	6704440	43	NE
13B	365804	6704198	13B	365775	6704165	44	SW
14B	366100	6704675	14B	366100	6704675	0	
15	366585	6703630	15	366585	6703630	0	

Approved (August 2010)			Proposed			Difference	
Label	Eastings	Northings	Label	Eastings	Northings	metres	Bearing
16B	366608	6703210	16B	366608	6703210	0	
16C	366601	6703405	16C	366601	6703405	0	
17	366712	6702887	17	366712	6702887	0	
19	367335	6702318	19	367335	6702318	0	
20B	367524	6705460	20B	367524	6705460	0	
22B	367651	6704952	22B	367651	6704952	0	
21B	367774	6705217	21B	367774	6705217	0	

The proposed modification to Glen Innes Wind Farm retains the same turbine layout which was approved by the Department of Planning with the exception of Turbines 13 and 13B. These turbines have been micro-sited to the north east and south west of the approved turbine locations. This aviation assessment will therefore focus on the aviation risks associated with increasing the turbine size.

3. Aircraft safety requirements

Current guidelines and regulations applicable to aviation related impacts of wind farms in NSW include:

- Environment Protection and Heritage Council National Wind Farm Development Guidelines – Draft 2010;
- Guideline D: Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation – The National Airports Safeguarding Framework; and
- Draft NSW Planning Guidelines: Wind Farms – December 2011

3.1 Environment Protection and Heritage Council National Wind Farm Development Guidelines – Draft 2010

The draft Guidelines outline best practice for industry and planning authorities for assessing the impacts that are unique to wind farm developments and operations. Section 3.7 provides guidance to Aircraft Safety and states:

> *The physical intrusion of towers and blades into airspace used by aircraft is addressed by the Civil Aviation Safety Authority (CASA) guidelines, which are currently under review. The CASA guidelines, once finalised, may indicate that night lighting should be installed on some or all turbines within the wind farm. This, in turn, may pose a visual impact that will need to be considered in the landscape assessment and in the birds and bat assessment. The proponent should also ensure that key aviation bodies are consulted with during the planning and development of the project, particularly CASA, Air Services Australia and the Department of Defence.*
>
> *Aircraft safety related assessments are particularly important where major airports, aerodromes or landing strips are nearby, or if farmers in the area utilise aircraft for crop-dusting, mustering or other purposes. There is also a need to ensure that structures are reported so that they may be depicted*

on aeronautical charts. CASA Advisory Circular AC 138-09(0) – Reporting of Tall Structures provides details of when and how this is to be done.

It is noted that the abovementioned and other relevant stakeholders were consulted as part of the original 2008 Environmental Assessment and consultation undertaken as part of the project modification application is included in Appendix A.

CASA Advisory Circular AC 138-08(0) was withdrawn in September 2009 for internal review, with the outcome of the review withheld. It is noted that the night lighting of turbines is not proposed as part of the modification.

3.2 Guideline D: Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation – The National Airports Safeguarding Framework

The Commonwealth Government's 2009 Aviation White Paper proposed the development of a national land use planning framework that would improve safety outcomes by ensuring aviation safety requirements are recognised in land use planning decisions through guidelines being adopted by jurisdictions on various safety-related issues.

The National Airports Safeguarding Advisory Group (NASAG), comprising of Commonwealth, State and Territory Government planning and transport officials, the Department of Defence, CASA, Airservices Australia and the Australian Local Government Association (ALGA) prepared a draft of the Framework in March 2012. Ministers agreed to the National Airports Safeguarding Framework in May 2012.

The Framework provides specific advice on measures to reduce hazards to aviation, how to implement them and how to identify any potential safety risks posed by wind turbine and wind monitoring.

3.3 Draft NSW Planning Guidelines: Wind Farms – December 2011

On December 2011, the NSW Department of Planning and Infrastructure prepared Draft Guidelines for consultation:

The potential for the proposed wind farm to impact on aviation safety should be assessed. This includes aviation safety issues associated with the wind turbines, transmission lines, nearby airports, defence facilities and private landing strips and activities such as aerial agriculture spraying/crop dusting.

Aerodromes or airfields within 30km of the proposed wind farm should be identified, e.g. using aerial photographs and through consultation and discussions with relevant councils, local communities and the Civil Aviation Safety Authority (CASA).

The proponent should consult with CASA and AirServices Australia where a wind farm is proposed within 30 kilometres of a declared aerodrome or airfield or the wind farm infringes the obstacle limitation surface around any declared aerodrome. CASA may require appropriate safeguards such as aviation safety hazard lighting or changes to turbine locations. The need for aviation hazard lighting should be considered taking into account any nearby aerodromes and aircraft landing areas, defined air traffic routes, aircraft operating heights, communication systems, and navigation aids.

Applicants should also consult with the Department of Defence if the wind farm is proposed in the vicinity of air force facilities.

Where the location of the turbines is likely to prevent or restrict aerial agricultural spraying, the impacts should be considered and an offset regime developed with the affected land owners taking into consideration any cost difference between the current aerial agricultural spraying and a reasonable alternative. This may include alternative application methods or continued aerial spraying but with additional costs associated with added flight times because of presence of the turbines.

3.4 Civil Aviation Safety Authority

Established in 1995 as an independent statutory authority, the Civil Aviation Safety Authority (CASA) has the primary responsibility for the maintenance, enhancement and promotion of the safety of civil aviation in Australia.

The Civil Aviation Regulations 1988 and the Civil Aviation Safety Regulations 1998, made under authority of the Civil Aviation Act, provide for general regulatory controls for the safety of air navigation. The Civil Aviation Act and CAR 1988 empower CASA to issue Civil Aviation Orders on detailed matters of regulation. The CASRs 1998 empower CASA to issue Manuals of Standards which support CASR by providing detailed technical material.

Civil Aviation Safety Regulations 1998 (CASR) Part 139, Subpart 139E Obstacle and Hazards stipulates that any person who proposes to construct a structure, the top of which will be greater than 110 metres above ground level, must inform CASA of that intention and the proposed height and location of the structure.

3.4.1 Navigable air space

Under *Civil Aviation Regulations 1998 – REG 157*, aircraft must not be flown at a height lower than 1,000 feet over any city, town or populous area, or any other area at a height lower than 500 feet unless:

- The aircraft is landing or taking off;
- The aircraft is engaged in private operations or aerial work operations, being operations that require low flying, and the owner or operator of the aircraft has received from CASA either a general permit for all flights or a specific permit for the particular flight to be made at a lower height while engaged in such operations;
- The pilot of the aircraft is engaged in a search, rescue, or dropping supplies in a search and rescue operation;
- The aircraft is a helicopter operated by, or for the purposes of, the Australian Federal Police or the police force of a State or Territory, and engaged in law enforcement operations.

The proposed modifications to Glenn Innes Wind Farm will result in turbines with a maximum blade tip height of 150 m (approximately 492.1 ft) which is below the 500 ft lower limit of navigable airspace in the locality.

3.4.2 CAAP 5.13-2(0) Night Visual Flight Rules

As a result of several NVFR related incidents occurring in Australia, CAAP 5.13-2(0) was circulated to highlight the hazards of night flying and to provide advice on how to fly safe NVFR operations.

Night Visual Flight Rules (NVFR) procedures depend on maintaining a safe height above terrain. *Civil Aviation Advisory Publication 5.13-2 (0) Night Visual Flight Rules Rating* provides the following recommendations:

- Maintain height above Lowest Safe Altitude (LSALT) or 1000 ft above the highest terrain within a 10 nm (18.5 km) radius;
- Don't go below LSALT on descent until positively established that high terrain/obstacles have been passed then establish the new LSALT for continuation of descent until in circuit area;
- If visual reference is lost then maintain above LSALT and declare an emergency if visual reference cannot be regained;
- HDG (Heading) – be aware of the direction you are flying in relation to terrain;
- Be aware of your LSALT for the route sector; and
- Be aware of the critical terrain and obstacles for your flight.

3.4.3 Obstacle lighting and turbine marking

The installation of Obstacle Lighting at Glen Innes Wind Farm was not required as part of the section 75J Project Approvals issued by the NSW Minister for Planning in 2009. Whilst CASA has previously issued guidelines for the hazard lighting of wind turbines (*Advisory Circular AC139-18(0) Obstacle Marking and Lighting of Wind Farms, September 2004),* this Advisory Circular has since been withdrawn, pending review. CASA has advised in consultations for other wind farm projects that at present, it does not assess wind farm developments beyond the limits of an OLS area and cannot require that a wind farm implement hazard lighting outside of an OLS area.

However, CASA have advised in previous consultations that Proponents need to consider having a duty of care to aviation users in the area.

3.5 Airservices Australia

Airservices Australia is a government owned corporation providing traffic control management and related airside services to the aviation industry. Airservices Australia was established in 1995 at the same time as CASA. At this time Airservices Australia assumed responsibility for airspace management, aeronautical information, communications, radio navigation aids, airport rescue and fire fighting services and aviation search and rescue in Australia.

The World Aeronautical Chart (WAC) 3357 Armidale published by Airservices Australia is designed for pre-flight planning as well as pilotage. Airservices Australia will need to be notified prior to the commencement of construction activities so that this may be accurately reflected in the WAC.

Since WACs are reissued every 2-4 years, Airservices Australia firstly issues a Notice to Airmen (NOTAM) to advise pilots of any changes. The NOTAM is withdrawn once the details are included in the Aeronautical Information Publication (AIP) supplement which is available to all pilots.

AirServices Australia outlined a recently developed set of requirements for Aviation Impact Assessments for Wind Farms as part of its response to the consultations outlined.

These requirements state that the Aviation Impact Statement must cover as a minimum the following:

a) *Airspace Procedures:*

i) Obstacles

Co-ordinates in WGS 84 (to 0.1 second of arc or better)

Elevations AMSL (to 0.3 metres)

ii) Drawings

Overlayed on topographical base not less than 1:250,000. Details of datum and level of charting accuracy to be noted.

Electronic format compatible with Microstation version 8i.

iii) Aerodromes

Specify all registered/certified aerodromes that are located within 30 nm (55.56 km) from any obstacle referred to in (1.)

Nominate all instrument approach and landing procedures at these aerodromes.

Confirmation that the obstacles do not penetrate Annex 14 or OLS for any aerodrome. If an obstacle does penetrate, specify the extent.

iv) Air Routes

Nominate air routes published in ERC-L & ERC-H which are located near/over any obstacle referred to in (1.)

Specify two waypoint names located on the routes which are located before and after the obstacles.

v) Airspace

Airspace classification – A, B, C, D, E, G etc where the obstacles are located

b) Navigation/Radar:

i) Detected the presence of dead zones

ii) False target analysis

iii) Target positional accuracy

iv) Probability of detection

v) Radar coverage implications

vi) We would expect the analysis to follow the guidelines outlined in the EUROCONTROL Guidelines on How to Assess the Potential Impact of Wind Turbines on Surveillance Sensors.

3.6 Records of data relating to wind turbine structures

Section 2.39 of the Conditions of Approval state:

Prior to the commencement of construction and operation, the Proponent shall provide the following information to the Civil Aviation Authority, Royal Australian Air Force – Aeronautical Information Service and Airservices Australia as well as all known users of privately owned local airfields:

a) "as constructed" coordinates in latitude and longitude of each wind turbine generator;
b) Final height of each wind turbine generator in Australian Height Datum; and
c) Ground level at the base of each wind turbine generator in Australian Height Datam.

CASA, Airservices Australia and the Department of Defence all maintain databases and or maps of objects or structures that may be relevant to the safety of all flying operations.

Prior to the construction of the proposed wind farm, Glen Innes Wind Power will provide a plan of the final locations of the wind turbines and details of the height of each wind turbine to all stakeholders included in the above conditions of approval so that these organisations can record the details in their databases and on relevant maps.

4. Potential risks to aviation

4.1 Airfields in local area

The location of Glen Innes Wind Farm in relation to airfields in the local area is shown on World Aeronautical Chart 3357 Armidale (Figure 3).

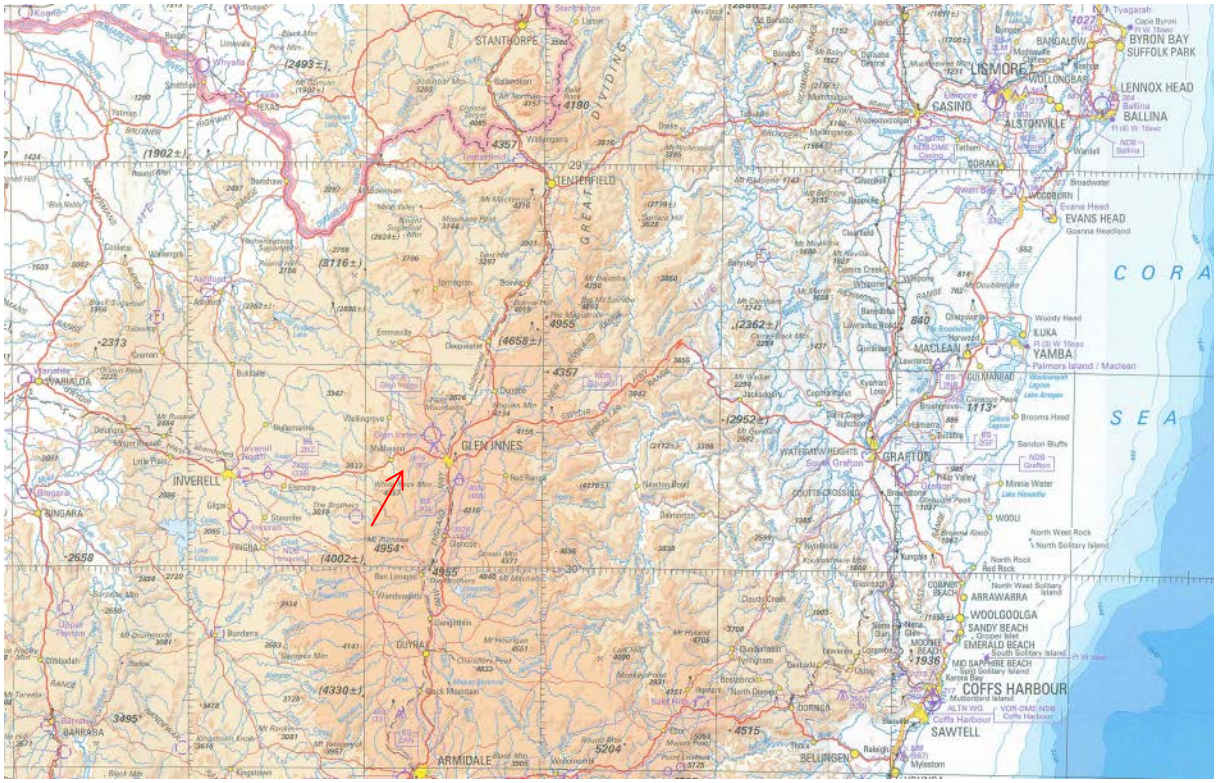


Figure 2 – WAC 3357 (Armidale) Close up of Glen Innes and surrounding area

The 2008 Environmental Assessment identified the following airfields within the local surrounding area of the wind farm:

- Glen Innes aerodrome about 10 kilometres to the north east of the wind farm site;
- Six privately operated airfields located on properties surrounding the wind farm site;
- Inverell airfield about 50 kilometres to the west of the wind farm site. Its operations will not be affected by the development and it is not discussed further.

4.1.1 Glen Innes Airport

Glen Innes Airport is an unlicensed aerodrome operated by Glen Innes Severn Council which consists of two runways 14/32 1498 metres with north south orientation and 10/28 1676 metres with an east west orientation. A media release by the Minister for Trade and Investment; Regional Infrastructure and Services announced funding of up to $1.6 million for Glen Innes Severn to support infrastructure upgrades at this aerodrome. These upgrades are intended to add strength to plans for an aviation training college at the site.

The Obstacle Limitation Surface (OLS) for Glen Innes Airport identifies the lower limits of the aerodrome airspace above which objects are regarded as potential obstacles to aircraft operations

and must be reported to CASA. Since the wind turbine layout in the proposed modification remains unchanged, the wind farm is clear of the obstacle restriction area and the proposed structures will not infringe on the Glenn Innes OLS.

4.1.2 Privately operated airfields

The approximate locations of the six privately operated airfields are listed in the table below. One additional airfield, located approximately 2.9 kilometres south east of the wind farm was identified from aerial imagery of the study area and is also included in the table below. It is considered unlikely, but possible that other uncertified/unregistered airfields that were not identified in this assessment may exist in the vicinity of Glen Innes Wind Farm.

Table 2 – Location of privately operated airfields in the vicinity of Glen Innes Wind Farm

Ref No.	Approximate Location		Height (m AHD)	Distance from approved turbines (km)	Air Strip Orientation
	Easting	Northing			
1	363,350	6,703,000	980	2.5 west	North-south
2	363,000	6,710,100	975	1.5 west	SW-NE
3	365,800	6,714,900	1045	4.4 north	SW-NE
4	367,300	6,709,700	1055	2.5 east	SW-NE
5	371,200	6,705,500	1070	3.0 east	East-west
6	369,750	6,704,350	1075	2.0 east	North-south
7	369,770	6,700,710	1090	2.9 south east	East-west

An assessment of these unsealed grass landing strips suggest the smaller aircraft that will use these areas would operate under Visual Flight Rules rather than Instrument based landings. The location of the turbines in the proposed modification are identical to the approved layout and the minor increase in the maximum blade tip height of 20 metres is unlikely to significantly increase the air safety risk for operators of these airfields.

4.2 Recreational users of airspace

Recreational use of air space can involve hot air balloons, micro-light and ultralight aircraft, gliders and parachuting. Examination of the Australian ERC L3 (May 2013) shows no regular Recreational or Sport aviation activity within the immediate vicinity of Glen Innes Wind Farm. Regular ultralight aircraft activity is indicated as being present approximately 30 nautical miles west of Glen Innes and 20 nautical miles north of Inverell.

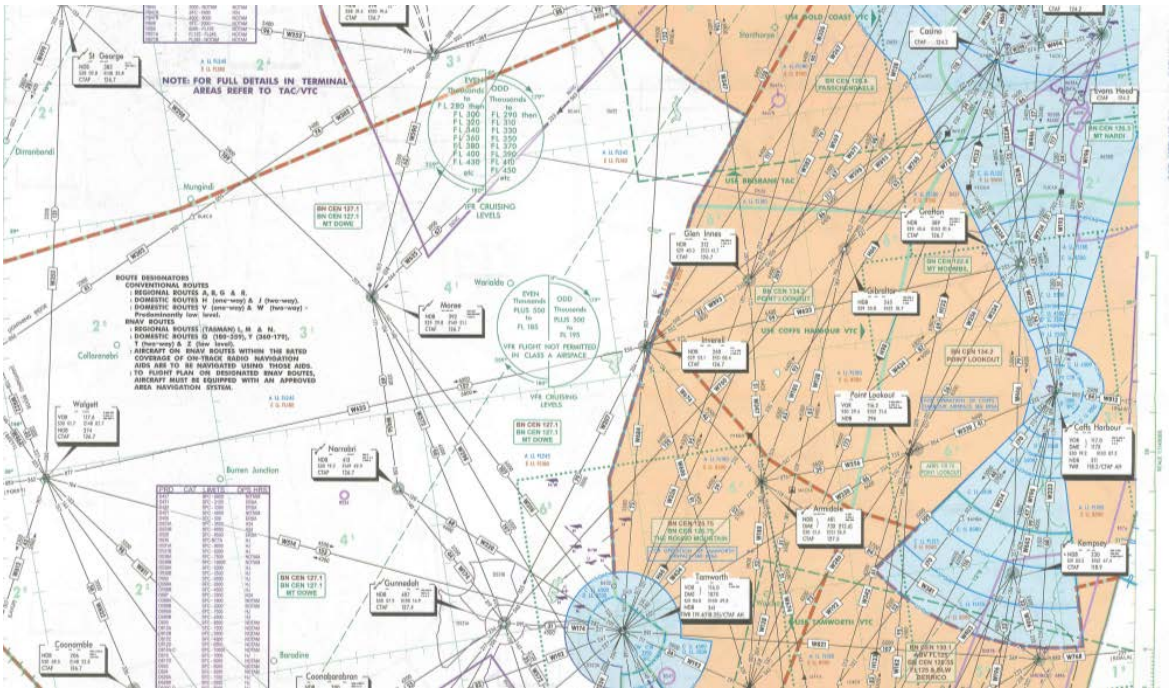


Figure 3 – Australia ERC Low 3 Chart – Sydney to Brisbane

The wind farm will be readily apparent to participants in such activities who will be able to avoid the turbines. The increase in turbine dimensions with a maximum blade tip height of 20 m would not significantly increase the aviation risk to recreational users in the locality.

4.3 Published air routes in local area

The airspace in the area surrounding Glen Innes Wind Farm is classified as Class A, E and G airspace as shown in Figure 3. In Australia, Class A is high-level en route airspace with a Lower Limit of FL245 (~24,500 ft). All national and international Regular Public Transport (RPT) jet flights into or between major Australian cities would operate only in controlled airspace (Class A while en route). Class E is mid-level en route airspace with a Lower Limit of FL180 (~18,000 ft).

Glen Innes Wind Farm is located in the vicinity of three designated flight routes as displayed on the Australia Low En Route Chart (Figure 3) and one designated flight route as displayed on the Australian High En Route Chart (Figure 4). These routes are:

- Route W893 from Inverell to Glen Innes with a lowest safe altitude of 5800 ft.
- Route W326 with a lowest safe altitude of 6400 ft going in the direction from Tamworth to Glen Innes and 6300 ft in the opposite direction.
- Route W347 from Armidale to Glen Innes with a lowest safe altitude of 6400 ft.
- Route Q94 passes north-west of Glen Innes Wind Farm, travelling between Laravale (LAV) and Parkes (PKS)

Given the vertical separation distances between Glen Innes Wind Farm and these air routes, it is not anticipated that any safety impacts will occur as a result of the proposed modifications to turbine size.

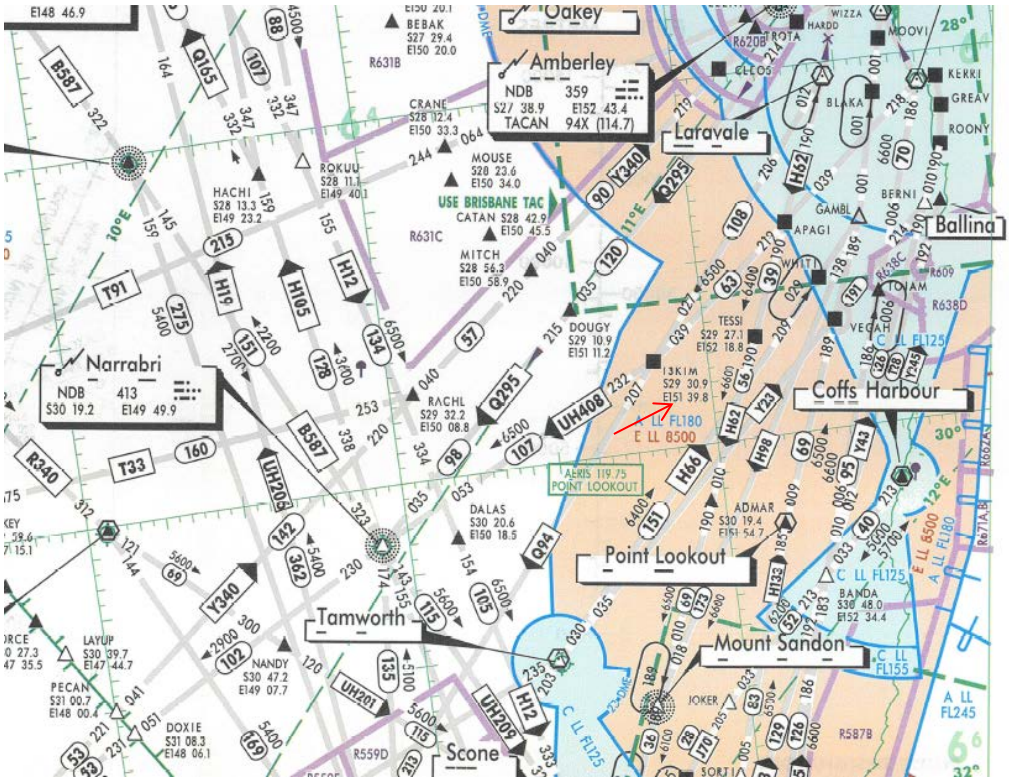


Figure 4 – Australia ERC High Chart

4.4 Defence use of airspace

The Department of Defence previously assessed the wind farm development proposal and advised that the proposed development is outside any areas affected by the Defence (Areas Control) Regulations (DACR) and that the proposal will not affect existing Defence communications. The Department also requested that the colour used for the wind turbines ensures that they are conspicuous and does not allow the turbines to blend into the ground.

4.5 Aerial agricultural operations

Section 2.53 of the existing Conditions of Approval addresses the concerns of local aerial agriculture operations:

> *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 2.5 kilometres of a turbine constructed in accordance with this Project, due to the operation of the turbines, the Proponent shall fully fund to the affected landowner, the cost difference between the current aerial agricultural activities;*
>
> *a) And a reasonable alternative application method in the affected area; or*
> *b) And continuing aerial agricultural activities should additional expenses occur due to the extra flight time and trips required because of the presence of wind turbines.*
>
> *If the Proponent and affected landowner cannot agree on the amount of compensation payable under this condition, either party may refer the matter to the Director General for resolution at any time. The Director-General's determination of the matter will be final and binding to both parties.*

Currently, the landowners who form part of the windfarm have agreed that aviation spraying can continue and in agreement with the pilots, new routes and heights may need to be utilised for the aerial spraying, and if there is any extra costs involved, the wind farm will compensate the landowners. It is anticipated this would not affect neighbouring properties.

5. Mitigation measures

5.1 Aeronautical Navigation Aids

The World Aeronautical Chart (WAC) 3357 Armidale published by Airservices Australia is designed for pre-flight planning as well as pilotage. Glen Innes Wind Farm will need to inform Airservices Australia once construction of the wind farm commences so that a Notice to Airmen (NOTAM) can be issued until this change is accurately reflected in the WAC.

5.2 Air Traffic Services

Prior to the commencement of construction and operation of the wind farm, Glen Innes Power Pty Ltd will provide the following information to CASA, Royal Australian Air-Force-Aeronautical Information Service, Airservices Australia and known users of privately owned local airfields:

- As constructed coordinates in latitude and longitude of each wind turbine;
- Final height of each wind turbine in AHD; and
- Ground level at the base of each wind turbine in AHD.

This would be no different from what was approved in August 2010.

5.3 Aerial Agricultural Operators

Currently, the landowners who form part of the windfarm have agreed that aviation spraying can continue and in agreement with the pilots, new routes and heights may need to be utilised for the aerial spraying, and if there is any extra costs involved, the wind farm will compensate the landowners. It is anticipated this would not affect neighbouring properties.

6. Conclusions

This Aviation Impact Assessment has examined the potential aviation related impacts associated with the increase in turbine dimensions for the Glen Innes Wind Farm located on the Waterloo Range in NSW.

Whilst the wind turbine model selected for the proposed modification of Glen Innes Wind Farm is larger than what was previously approved for the project, the wind turbines selected would not penetrate any OLS or PANS-OPS surfaces. As blade tip heights remain below navigable airspace levels (500 ft), there is currently no legal requirement for the installation of obstruction lighting at Glen Innes Wind Farm.

Furthermore, the Civil Aviation Regulations require that, unless it is necessary for take-off and landing, or special circumstances, an IFR or Night VFR aircraft must not be flown at a height of less than 1,000 ft above the highest obstacle within 10 nm (18.5 km) radius of the aircraft in flight. Other than the two turbines which have been micro-sited, the locations of all other individual turbines are identical to what was approved in August 2010.

Given the findings mentioned above, there is limited air safety risk due to the proposed increase in turbine size. No significant impact was identified in the original assessment and no additional impact is expected as a result of the proposed modification.

7. References

Aircraft Owners and Pilots Association of Australia, 2010/11, *National Airfield Directory,* Aircraft Owners and Pilots Association of Australia

Airservices Australia, 2010. *World Aeronautical Chart 1:1,000,000 – Armidale (3357)*

Airservices Australia 2013. *Australia ERC Low 3 Sydney – Brisbane*

Airservices Australia 2011. *Australia ERC High 3*

CASA, 2005, Advisory Circular AC 139-0(0) *Reporting of Tall Structures*

Department of Infrastructure and Transport, 2012, *The National Airports Safeguarding Framework – Guideline D: Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation,* Commonwealth of Australia

Environment Protection and Heritage Council, 2010, *National Wind Farm Development Guidelines – Draft,* Commonwealth of Australia

NSW Department of Planning & Infrastructure, 2011, *NSW Planning Guidelines Wind Farms – Draft for Consultation December 2011*

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