

**FINAL REPORT**

**RYE PARK WIND FARM**

**AERONAUTICAL IMPACT ASSESSMENT**

**AVIATION IMPACT STATEMENT**

**AND**

**QUALITATIVE RISK ASSESSMENT**

*J0403*

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**EPURON PTY LTD**

**EPURON**

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## EXECUTIVE SUMMARY

Ambidji has been commissioned by Epuron Pty Ltd to undertake an Aeronautical Impact Assessment (AIA), produce an Aviation Impact Statement (AIS) for Airservices Australia and conduct a Qualitative Risk Assessment (QRA) of the proposed Rye Park Wind Farm south of Rugby in New South Wales.

The wind farm comprises 126 turbines with a height of 157m. Epuron has advised the highest ground level is 770m Above Mean Sea Level (AMSL) thus giving a maximum tip elevation of 927m or 3042ft AMSL at turbines RYP\_139 and RYP\_50.

The AIA finds that there are:

- no registered or certified aerodromes within 56km (30nm) of the wind farm;
- no published Obstacle Limitation Surfaces (OLS) or Procedures for Air Navigation Services – Aircraft Operations (PANS – OPS) are penetrated;
- four Air Routes which will require increased Lowest Safe Altitudes (LSALT);
- two uncertified aerodromes within 30nm, Crookwell and Gundaroo, that will not be affected by the wind farm; and
- several Aircraft Landing Areas (ALA) within and close to the wind farm that may be impacted;

The AIS finds that:

- The radio navigation aids at Rugby and Yass will not be affected;
- There are two Airservices Australia (AsA) operated radar systems that may be affected: - Mt Majura and Mt Bobbara;
- The Monopulse Secondary Surveillance Radars (MSSR) at Mt Majura and Mt Bobbara will not be affected;
- The performance of the Primary Surveillance Radar (PSR) at Mt Majura could be impacted, although a simple assessment showed no significant adverse operational impacts on the serviceability of the radar, aircraft operations or to the air traffic service provider.

Airservices Australia has reviewed the Ambidji findings of the AIA and the AIS and confirms:

- the LSALT of the four identified air routes must be raised; and
- there will be no adverse impact on aviation Communications, Navigation and Surveillance (CNS) equipment from the Rye Park Wind Farm.

Airservices Australia requires two working days' notice prior to construction commencement in order to promulgate a NOTAM raising the LSALT for the four impacted air routes.

The QRA findings are summarised in the following table.

<b>Risk Element</b>	<b>Assessed Level of Risk</b>	<b>Comment</b>
Aerodrome Operations	LOW	
Aircraft Landing Area Operations	LOW	
Known Highly Trafficked Routes	LOW	
Published Air Routes	LOW	
Restricted Airspace	LOW	
Promulgated Flying Training Areas	LOW	
Night Flying	LOW	
Recreational/Sport/Commercial Flying	LOW	
GA Pilot Training	LOW	
Aerial Agricultural Operations	LOW	Risk within close proximity is MEDIUM
Air Ambulance Operations	LOW	Risk within close proximity is MEDIUM
Police Aviation Operations	LOW	Risk within close proximity is MEDIUM
Aerial Fire Fighting Operations	LOW	Risk within close proximity is MEDIUM
Weather and Topographical Issues	LOW	

## 1. INTRODUCTION

Ambidji has been commissioned by Epuron Pty Ltd to undertake an Aeronautical Impact Assessment, a Qualitative Risk Assessment, and produce an Aviation Impact Statement for the proposed Rye Park Wind Farm.

### 1.1 Rye Park Wind Farm

The wind farm layout proposes 126 wind turbines with a maximum height of 157m (515ft) above ground level (AGL). Epuron has advised that the highest ground elevation within the proposed site is 770m (2526ft) above mean sea level (AMSL). This gives a maximum turbine tip height of 927m (3042ft) AMSL at turbines RYP\_139 and RYP\_50.

The general location of the wind farm is shown at Figure 1.1 with the proposed turbine layout shown at Figure 1.2<sup>1</sup>.

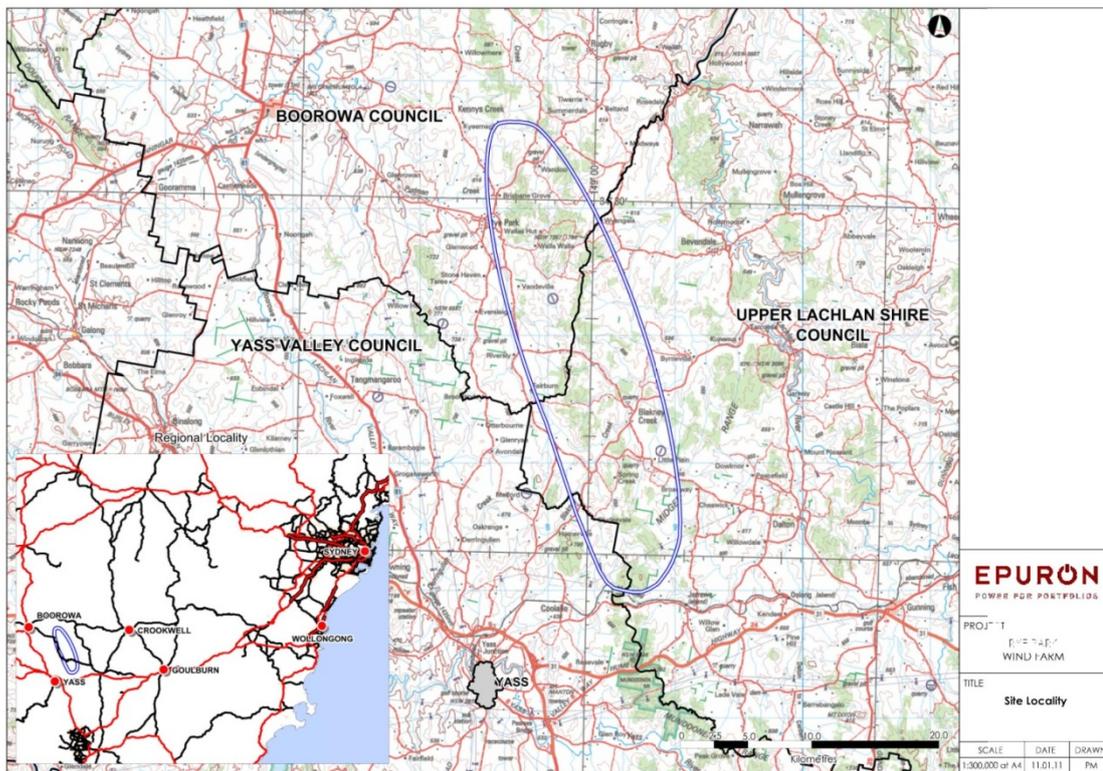


Figure 1.1 – Location of Rye Park Wind Farm

<sup>1</sup> Data supplied by Epuron

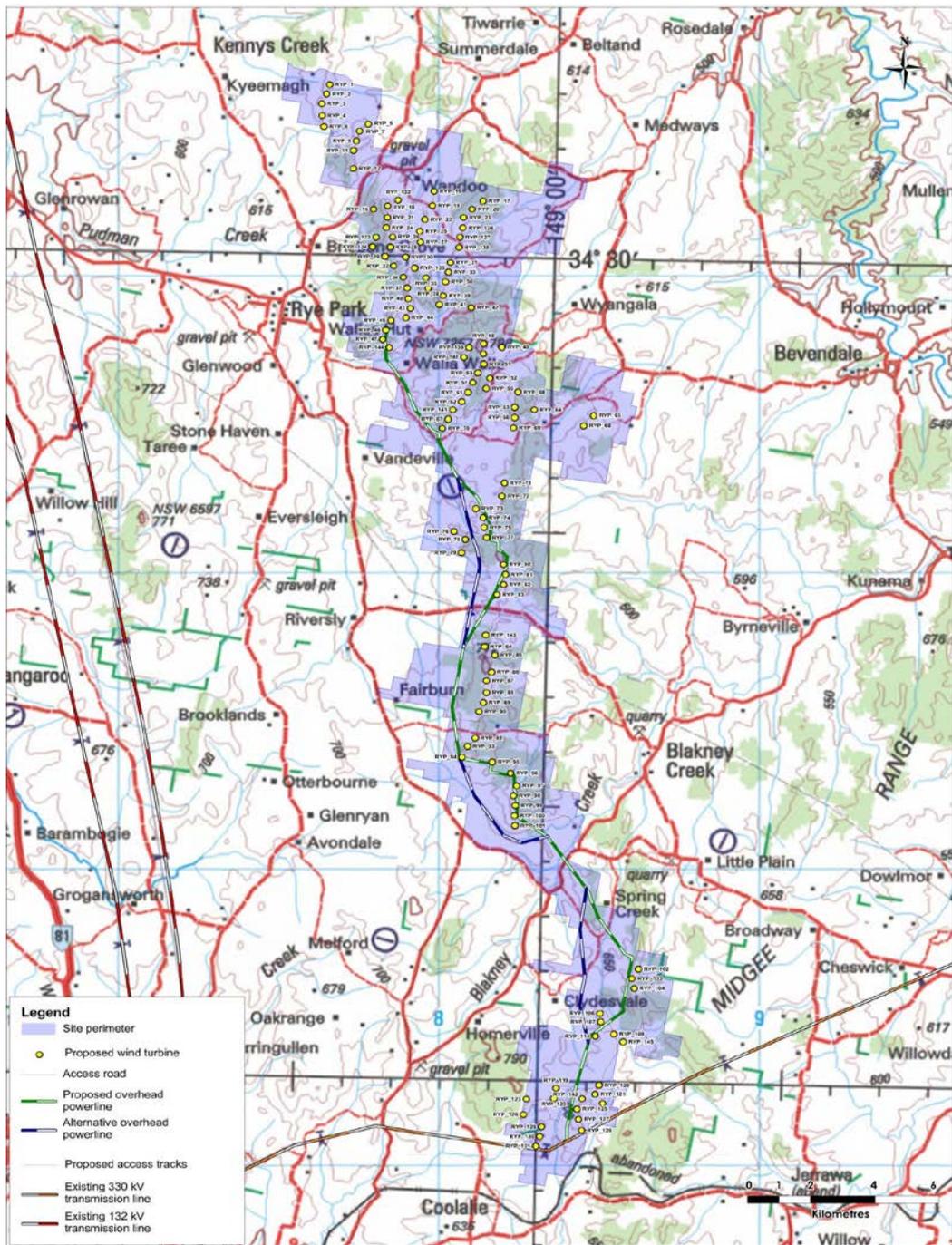


Figure 1.2 – Rye Park Wind Farm Turbine Layout

## 1.2 Epuron Environmental Assessment Sections 14.1 and 14.2

Epuron has conducted an Environmental Assessment for the Rye Park Wind Farm project which deals with Aviation at Section 14.1 and Communications Impacts at section 14.2<sup>2</sup>. Ambidji have been provided with a copy for reference.

As part of this Environmental Assessment Epuron has been in communication with the Department of Defence (DoD), the Civil Aviation Safety Authority (CASA) and Airservices Australia (AsA) regarding any likely impacts of the proposed Rye Park Wind Farm on military and civil:

- Flying operations;
- Communications, Navigation and Surveillance (CNS) facilities; as well as
- Aerodromes within the vicinity.

The results of these communications will be dealt with in the respective sections of this report.

## 1.3 Aeronautical Impact Assessment, Qualitative Risk Assessment and Aviation Impact Statement,

The Aeronautical Impact Assessment meets CASA requirements for assessment of the proposed Rye Park Wind Farm.

The Qualitative Risk Assessment meets the requirements of the National Airports Safeguarding Advisory Group (NASAG) guideline D<sup>3</sup> *Managing the Risk to Aviation Safety of Wind turbine Installations (Wind Farms)/Wind Monitoring Towers*.

The Aviation Impact Statement meets AsA<sup>4</sup> requirements for assessment of the proposed Rye Park Wind Farm.

## 2. SCOPE

To meet Epuron's requirements, the study required Ambidji to examine the proposed Rye Park Wind Farm development and undertake the following tasks:

- Review the findings reported in sections 14.1 Aviation and 14.2 Communications Impacts of the part of the Environmental Assessment provided by Epuron in relation to the requirements of the tasks to be undertaken by Ambidji.
- An Aeronautical Impact Assessment (AIA) particularly in respect to the Obstacle Limitation Surfaces (OLS) and Procedures for Air Navigation – Aircraft Operations (PANS-OPS) surfaces and published Lowest Safe Altitudes (LSALT) associated with Airways Routes within the vicinity of the proposed wind farm.

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<sup>2</sup> Epuron Environmental Assessment, section 14.1.3 page 219, date unknown. Information provided by Epuron.

<sup>3</sup> National Airports Safeguarding Framework, National Airports Safeguarding Advisory Group, May 2012

<sup>4</sup> Airservices Australia, Airservices Aviation Assessments for Wind Farm Developments, 5<sup>th</sup> March 2012

- An Aviation Impact Statement (AIS), in accordance with the requirements of Airservices Australia letter "Airservices Aviation Assessments for Wind Farm Development" dated 5<sup>th</sup> March 2012.
- A Qualitative Risk Assessment (QRA) in regard to the need for obstacle lighting which included:
  - The identification and assessment of potential aviation risk elements through:
    - Reference to CASA publications;
    - Reference to the Australian Aeronautical Information Publication (AIP);
    - Reference to the NASAG guidelines;
    - Consultations with key relevant stakeholders;
  - Assessment of the perceived impacts of the turbines on the operation of aerodromes and airstrips in the immediate vicinity of the wind farm;
  - Assessment of the perceived impacts of the turbines on aviation activity including:
    - General Aviation training;
    - Recreational/Commercial flying activity;
    - Air Ambulance Operations;
    - Police Aviation Operations;
    - Aerial Fire Fighting Operations;
    - Aerial Agricultural Operations;
    - Known highly trafficked VFR routes;
    - Night flying for light aircraft;
  - Assessment of any implications for the above from topographical, weather and visibility issues;
  - Assessment of other issues as identified through consultations and the assessment process;
  - Conclusions on the degree of aviation risk posed by the above described issues with commensurate recommendations on any mitigating actions.
- An assessment of the need, against the outcomes of the Qualitative Risk Assessment, for obstacle lighting of the wind farm.

### **3. METHODOLOGY**

#### **3.1 Review of the Environmental Assessment Information Provided**

Epuron provided Ambidji with sections 14.1 Aviation and 14.2 Communications Impacts of their *Environmental Assessment* report. The information provided was assessed against the requirements of the DoD, CASA and AsA as listed in 1.2 above.

##### **3.1.1 National Airports Safeguarding Advisory Group (NASAG) Guideline D**

The National Airports Safeguarding Advisory Group (NASAG) released a series of guidelines as part of the National Airports Safeguarding Framework in May 2012. The relevant guideline is *Guideline D Managing the Risk to Aviation Safety of Wind turbine Installations (Wind Farms)/Wind Monitoring Towers*. At paragraph 26 the guideline says:

*“Following preliminary assessment by an aviation consultant of potential issues, proponents should expect to commission a formal assessment of any risks to aviation safety posed by the proposed development. This assessment should address any issues identified during stakeholder consultation.”*

At paragraph 27 the guideline says:

*The risk assessment should address the merits of installing obstacle marking or lighting. The risk assessment should determine whether or not a proposed structure will be a hazardous object. CASA may determine, and subsequently advise a proponent and relevant planning authorities that the structure(s) have been determined as:*

- (a) hazardous, but that the risks to aircraft safety would be reduced by the provision of approved lighting and/or marking; or*
- (b) hazardous and should not be built, either in the location and/or to the height proposed as an unacceptable risk to aircraft safety will be created; or*
- (c) not a hazard to aircraft safety.*

#### **3.2 Aeronautical Impact Assessment**

This assessment considers the existing facilities at CASA certified or registered aerodromes within 56km (30nm) of the boundary of the proposed wind farm.

This aeronautical study was undertaken as follows:

- Obstacle Limitation Surface infringements were accurately determined based on the siting information and airports layouts as detailed in the Australian AIP and publicly available Airport Master Plan documents;

- The relevant publicly available instrument approach and departure procedures and associated PANS-OPS surfaces were examined in detail to determine whether the development would impose any restriction on those procedures. Any restriction on the instrument procedures would have to be examined by Airservices Australia to assess the impact to these procedures and associated safety regulation standards;
- Existing flight paths along with likely future flight paths were examined in relation to the proposed development to determine if there would be any impact on future procedures;
- Flying training areas associated with civil and military flying training were assessed in relation to the location of the proposed development to determine if there would be any impact on those operations;
- A concise summary was made of the findings and any impediments to aviation operations.

### **3.3 Aviation Impact Statement**

The detailed aviation impact statement was carried out in accordance with Airservices Australia requirements to provide a report that reviews and assesses the items set out in the AIA above, as well as any likely impact on Communication, Navigation and Surveillance systems (CNS) used for the provision of Air Traffic Control.

#### **3.3.1 Communication and Navigation Systems**

The following items were reviewed and assessed:

- Published aeronautical information of the siting of radio communication facilities in the vicinity of the wind farm and its likely impact on the safety of aviation; and
- Published aeronautical information of the siting of radio navigation aids in the vicinity of the wind farm and its likely impact on the safety of aviation.

#### **3.3.2 Surveillance Systems**

The following items were reviewed and assessed:

- Information on the siting of aviation surveillance systems (radar) and the likely impact of the wind farm on the surveillance information available to Air Traffic Control systems;
- The probability of detection by the surveillance system; and
- Radar coverage implications.

Conduct an analysis of the impact of the wind farm on nearby surveillance systems in accordance with the EUROCONTROL *Guidelines on how to Assess*

*the Potential Impact of Wind Farms on Surveillance Sensors*<sup>5</sup>: This assessment involves an iterative five step process:

1. Initial Line of Sight Analysis (ILoS). Where the distance of the objects of interest are beyond the instrumented range of the radar no further analysis is undertaken;
2. Simple Line of Sight Analysis (SLoS). Where the distance of the objects of interest are within the instrumented range of the radar a computation is required to ascertain if the Line of Sight of the radar is infringed;
3. Complex Line of Sight Analysis (CLoS). If the Simple Line of Sight is infringed a more complex analysis is required whereby intervening terrain and objects are taken into account. If the objects still infringe the radar then a more complex analysis is required;
4. Radar Line of Sight (RLoS). This analysis is undertaken where the CLoS is within the instrumented range of the radar. For this analysis specific characteristics of the radar are taken into account to ascertain likely detection of the objects by the radar; and
5. Radar Clutter Detection Reduction Methods (RCDRM). If the RLoS determines a finite probability of detection then an assessment of the possible clutter produced by the objects of interest, if operationally significant, may be justified.

The results of this process are then used to determine if the proposed wind farm poses an acceptable or unacceptable risk to aviation safety through its impact on air traffic control surveillance systems.

### 3.4 Qualitative Risk Assessment

A Qualitative Risk Assessment is the analysis for risks, through facilitated interviews or meetings with stakeholders and outside experts, as to their probability of occurrence and impact expressed using non-numerical terminology; for example low, medium and high.

The methodology for the Qualitative Risk Assessment was as follows:

- The Australian AIP and CASA documents were reviewed to identify relevant physical and operational aviation issues that may impact on the requirement for lighting of the wind farm;
- Current topographical maps were studied to assess the local terrain and identify any local airstrips and any other relevant features;
- Key stakeholders, including local operators, recreational aviation groups and State Government Police Air Wing, Air Ambulance and Fire Services, were identified, contacted and surveyed to ascertain the extent of local aviation activity in the vicinity of the proposed wind farm. This included any informal low flying areas and highly trafficked unpublished air routes that may exist within the vicinity of the proposed wind farm;
- Based on the above, the nature of any impacts as a consequence of the operation of the wind farm was considered and discussed in regard to;

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<sup>5</sup> URL [http://www.eurocontrol.int/surveillance/public/standard\\_page/sur\\_WTTF.html](http://www.eurocontrol.int/surveillance/public/standard_page/sur_WTTF.html)

- General Aviation training;
  - Recreational and sport aviation activities;
  - Approved low flying activities (including aerial agricultural applications)
  - Any known highly trafficked VFR routes; and
  - Emergency Services (air ambulance, police and fire service);
- In addition, further consideration was given to the consequences (for the above elements) of the potential influence of topography and poor weather.

## 4. REVIEW OF THE ENVIRONMENTAL ASSESSMENT INFORMATION PROVIDED

### 4.1 Existing Environment

#### 4.1.1 Aerodromes

There are four registered or certified aerodromes with Instrument Approach and Landing Procedures (IAL) within 70km (38nm) of the proposed Rye Park Wind Farm:

- Canberra 62km (33nm) south-southeast;
- Goulburn 66km (35nm) east;
- Young 66km (35nm) northwest; and
- Cowra 70km (38nm) north.

Each of these aerodromes has an Obstacle Limitation Surface (OLS) and a Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS) prescribed airspace.

The proposed Rye Park Wind Farm, being greater than 56km (30nm) from these aerodromes, is considered sufficiently distant as to not impact on their operation. This concurs with the statement on page 219 of the Epuron Environmental Assessment.

#### Uncertified Aerodromes

Epuron has received a letter from the Office of the Director of Aviation Safety at CASA that, in part, advises "... ... the relevant aerodromes in the Crookwell and Yass area are not Certified or Registered, which limits CASA's ability to influence any regulatory outcomes".<sup>6</sup>

#### 4.1.2 Landing Strips

Epuron has identified eleven Aircraft Landing Areas (ALA's) located on private property within 5km of the project.

The suitability of an ALA for an intended aircraft operation is the responsibility of the pilot in command of the aircraft. In assessing the suitability of the ALA, the pilot must consider, among other things, the restriction and hazard that obstacles, including wind turbines, will have on the intended aircraft operation.

Epuron states:

*"The project does not encroach on any of the existing landing areas with the closest turbine being 570m from landing strip No. 9. Figure 14-4 demonstrates that the clearances are in excess of the CASA guidelines for landing strip No. 9.*

*As these private airstrips rely on visual rather than instrument*

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<sup>6</sup> Letter from the Office of the Director of Aviation Safety to NSW Department of Planning and Infrastructure; 18<sup>th</sup> September 2013. Copy supplied by Epuron. See Appendix E

*based landing techniques, and as the turbines are highly visible, it is unlikely that the proposed development would pose any additional hazard to users of these airstrips. It is expected that pilots will continue to use the local landing strips.”<sup>7</sup>*

As stated by Epuron above and accepting the responsibilities of the pilot in command of the aircraft, the proposed wind farm will pose minimal additional hazard to the use of the ALA’s in the area.

## **4.2 Consultation**

### **4.2.1 Department of Defence**

Epuron has been in communication with the Department of Defence (DoD) regarding the proposed wind farm;

*“On the 2<sup>nd</sup> November 2012 Epuron wrote to the Department of Defence in relation to the project. The Department of Defence is responsible for ensuring that new developments would not conflict with existing military aircraft operations, radio communications and the operation of navigational aids and radars. No concerns have thus far been raised by the Department of Defence in relation to the project.”<sup>8</sup>*

Epuron has received advice from the DoD that the Rye Park wind farm would not adversely affect military low flying operations or Defence communications or radar. (See 4.2.5 below)

### **4.2.2 Civil Aviation Safety Authority**

Epuron has also communicated with the Civil Aviation Safety Authority (CASA) regarding the height of the proposed structures and any requirement for the fitment of obstacle lighting.

CASA Civil Aviation Safety Regulation (CASR) 139.365 requires the notification to CASA of the intention to construct a building or structure which will be 110 metres or more above ground level<sup>9</sup>.

CASA has withdrawn the Advisory Circular AC 139-18(0) – Obstacle Marking and Lighting of Wind Farms and presently has no advice or regulation for lighting of obstacles beyond the environs of registered or certified aerodromes.

### **4.2.3 Airservices Australia**

Epuron communicated with Airservices Australia on 2<sup>nd</sup> November 2012. Airservices responded on 21<sup>st</sup> November 2012 advising they would be sending information and

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<sup>7</sup> Epuron Environmental Assessment, page 220.

<sup>8</sup> Environmental Assessment, Section 14.1.3 Consultation;

<sup>9</sup> Civil Aviation Safety Regulations 1998 Regulation 139.365

instructions for performing a detailed assessment. In a letter to wind farm developers on 5<sup>th</sup> March 2012 Airservices Australia detailed their requirements for the Assessment of Wind Farm Developments<sup>10</sup>.

Ambidji will prepare this Aviation Impact Statement (AIS) in accordance with the letter. (See section 6). The AIS will be a separate report for submission to AsA.

#### **4.2.4 Aerial Agricultural Applications**

Epuron acknowledges the formal policy position of the Aerial Agricultural Association of Australia (AAAA)<sup>11</sup>. Epuron accepts that the wind farm will likely impact aerial agricultural applications adjacent to turbine locations whilst noting that alternate spreading methods are available<sup>12</sup>.

#### **4.2.5 Communications Impacts**

Epuron has received advice from the DoD that:

*“Defence has assessed the proposal for any impacts to operations in the area. This includes low flying military aircraft, as well as affects to Defence communications and surveillance radars. Defence advises that the Rye Park wind farm would not adversely affect military aircraft operations or interfere with Defence communications and radar.”<sup>13</sup>*

It is noted that Epuron has not received such advice from Airservices Australia. The AIS prepared as part of this report will address the CNS aspect for civil aviation.

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<sup>10</sup> Airservices Australia, Airservices Aviation Assessments for Wind Farm Developments, 5<sup>th</sup> March 2012

<sup>11</sup> Aerial Agricultural Association of Australia;

<http://www.aerialag.com.au/Portals/0/Users/005/05/5/AAAA%20Windfarm%20Policy.pdf>, last viewed Oct 2013

<sup>12</sup> Epuron Environmental Assessment, page 222

<sup>13</sup> Epuron Environmental Assessment, page 229

## 5. AERONAUTICAL IMPACT ASSESSMENT

### 5.1 Obstacles

A list of the wind turbine locations and elevations AHD/AMSL is shown at Appendix B. The highest turbine tip (turbine RYP\_139) at 927m/ 3042ft is shown in yellow.

### 5.2 Aerodromes within 30 Nautical Miles – PANS-OPS and OLS Surfaces

There are no registered or certified aerodromes within 30 nm of the wind farm. The nearest aerodromes and distance from the nearest wind farm boundary are:

- Canberra (YSCB) 33.5nm
- Goulburn (YGLB) 35.4nm
- Young (YYNG) 35.5nm
- Cowra (YCWR) 38.4nm

There are nonregistered or uncertified aerodromes at Crookwell (YCRL), 21.7nm and Gundaroo (YGDO) 20.8nm from the nearest wind farm boundary. These aerodromes do not have published Instrument Approach and Landing Procedures and therefore do not have OLS or PANS-OPS prescribed airspace.

There are no infringements of OLS and PANS OPS surfaces.

Figure 5-1 shows the location of the above aerodromes in relation to the RYP WF.

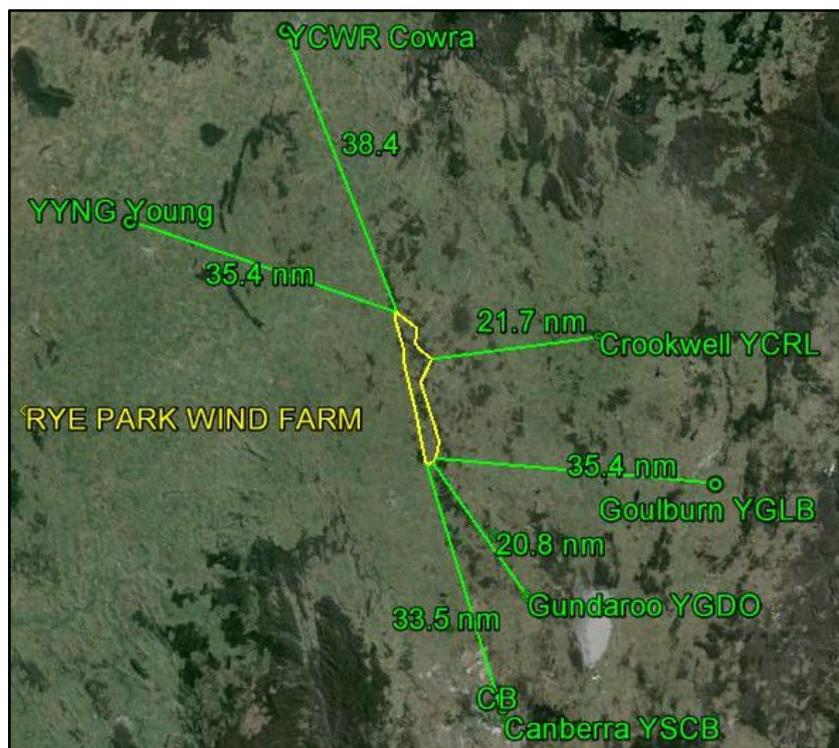


Figure 5.1 Aerodrome locations in relation to the RYP WF

### 5.3 Air Routes and Lowest Safe Altitudes (LSALTS)

A number of published air routes are in the vicinity and are shown in Figure 5.2 below.



Figure 5.2 Air routes in the vicinity of the Rye Park Wind Farm (approximate boundaries)

The Grid LSALTs over the wind farm area are 4600ft to the west of 149°E and 5700ft to the east.

The highest wind turbine tips are RYP\_50 and RYP\_139 at 3042ft, which are located in the northern part of the WF. After applying the MOC of 1000ft, the result is 4042ft, rounded up to 4100 ft.

The nearby routes with LSALTs below 4100ft are:

Route	Section	LSALT
W762	RUG – NAR	3800ft
W478	RUG CTM	3900ft
W836	RUG GTH	3900ft
W827	RUG – YNG	3900ft

Table 5.1 - Nearby Air Routes with LSALT below 4100ft

These routes were examined to determine if the LSALT was impacted by the wind farm turbines.

The navigation tolerances and 5 nm buffers for all of the above routes are shown in Appendix C. A number of turbines are within the buffer areas, the highest of which is RYP\_11 at 2927ft. When the MOC of 1000ft is applied, the result is 3927ft, rounded up to 4000ft.

The LSALT of the above routes will have to be increased as follows:

Route	Section	Existing LSALT	Required LSALT
W762	RUG – NAR	3800ft	4000ft
W478	RUG _ CTM	3900ft	4000ft
W836	RUG _ GTH	3900ft	4000ft
W827	RUG – YNG	3900ft	4000ft

*Table 5.2 – Air Route segments requiring LSALT adjustment*

Whilst the increases in LSALTs are modest, and should not have a significant impact on aircraft operations and safety, the changes will have to be approved by CASA and implemented by publication of amended documents by AsA.

## 5.4 Airspace

The wind farm is situated in Class G airspace, beneath Class E airspace with a lower limit of 8500ft.

## 5.5 Airservices Australia Response

Airservices Australia has assessed the AIA and concurs with the findings of Ambidji as set out in this report. The full response is at Appendix F.

In relation to the AIA Airservices Australia concur that the Rye Park Wind Farm will:

- Not impact on any registered or certified aerodromes within 30nm; and
- Require the LSALT on air routes W762, W478, W836 and W827 to be raised to 4000ft

Epuron will need to provide Airservices Australia with at least two business days' notice prior to commencing construction of the wind farm to facilitate the issue of a NOTAM raising the LSALT of the affected air routes. This may be achieved by e-mailing the details to [NOF@airservicesaustralia.com](mailto:NOF@airservicesaustralia.com)

## **6. AVIATION IMPACT STATEMENT**

### **6.1 Navigation Aids**

CASR Part 139 Manual of Standards – Aerodromes, Chapter 11, sets out the general requirements for navigation aid sites and air traffic control (ATC) facilities, including the clearance planes for planned and existing facilities.

The Rugby and Yass Non Directional Beacons (NDB) are located 8250m and 7630m respectively from the nearest points of the wind farm. The restricted area applicable to an NDB is 150m (Part 139 MOS, paragraph 11.1.13.1 refers).

The wind farm will not impact on the performance of the Rugby and Yass NDBs.

### **6.2 Radar**

#### **6.2.1 Applicable Documents**

There are two documents, considered applicable, concerning the regulations and recommendations that apply to radar installations and the proposed Rye Park wind farm project. These are:

- Civil Aviation Safety Authority (CASA) Part 139 Manual of Standards (MOS) Aerodromes, and
- The Eurocontrol Document “Guidelines on How to Assess the Potential Impact of Wind Turbines on Surveillance Sensors”, Edition date: May 2010; Reference nr: EUROCONTROL-GUID-0130

The Eurocontrol document is referred to (by link) in the Airservices Australia letter dated 5th March 2012, which is shown in Appendix A.

#### **6.2.2 Airservices Australia Radar Installations**

There are two radar systems operated by Airservices Australia which were considered:

##### **Mt Majura (TAR)**

The TAR, comprising of a combined Primary Surveillance Radar (PSR) and Monopulse Secondary Surveillance Radar (MSSR) with Mode S is located at Mt Majura near Canberra airport. The main use of this system is surveillance of the Canberra Terminal Airspace. The MSSR component is also used for enroute surveillance.

The distance to the nearest point of the wind farm is 54.5km.

##### **Mt Bobbara (MSSR)**

An MSSR with Mode S for enroute surveillance radar is located on Mt Bobbara, 33.6km from the nearest point of the wind farm.

The locations of the radars in relation to the wind farm are shown in Figure 6.1.



Figure 6.1 Radar Locations and the Rye Park Wind Farm

### 6.2.3 CASA Part 139 Requirements

CASA Part 139 Manual of Standards (MOS) – Aerodromes stipulates the siting criteria to ensure unrestricted performance of navigation aids, radar sensors and other aviation facilities located on and in the vicinity of aerodromes.

Buildings, structures or terrain that is higher than the radar coverage, or radar clearance plane, can hide aircraft behind the particular object, effectively placing a radar shadow in a particular area thus reducing the ability of Air Traffic Control (ATC) to effectively control aircraft within the area of the shadow.

Para 11.1.14.4 (b) of the CASA MOS Part 139 is applicable to the Rye Park wind farm and the Airservices radars. This Para states:

*No metallic or other electrical reflective surfaces anywhere which subtend an angle of more than 0.5 degrees when viewed from the radar, e.g. fences, power lines, tanks as well as many buildings.*

The distances and the heights of the Rye Park Wind Farm turbines relative to the Mt Bobbara and Mt Majura radars ensures that the requirement of MOS Part 139 Para 11.1.14.4 (b) is met.

#### **6.2.4 Wind Turbines and Radars – Assessment using Eurocontrol Guidelines**

The following are extracts from the Eurocontrol Document “Guidelines on How to Assess the Potential Impact of Wind Turbines on Surveillance Sensors”

Edition date: May 2010

Reference nr: EUROCONTROL-GUID-0130

The requirements are applicable to current wind turbine design, e.g. 3-blades, 30-200m height, horizontal rotation axis.

The Eurocontrol document is referred to by Airservices in its letter dated 5th March 2012 (see Appendix A) for the assessment of the impact on Airservices Radars.

##### **Primary Surveillance Radar (PSR)**

ZONE 1: 0 - 500m

Requirement: Safeguarding (not permitted)

ZONE 2: 500m - 15km and in radar line of sight

Requirement: Detailed assessment

ZONE 3: Further than 15km but within maximum instrumented range and in radar line of sight

Requirement: Simple assessment

ZONE 4: Anywhere within maximum instrumented range but not in radar line of sight or outside the maximum instrumented range.

Requirement: No assessment

##### **Secondary Surveillance Radar (Classical, Monopulse and Mode S)**

ZONE 1: 0 - 500m

Requirement: Safeguarding (not permitted)

ZONE 2: 500m - 16km but within maximum instrumented range and in radar line of sight

Requirement: Detailed assessment

ZONE 4 Further than 16km or not in radar line of sight

Requirement: No assessment

It is to be noted that in the case of SSR there is no simple assessment zone 3.

When outside the radar line of sight of an SSR the impact of the wind turbine is considered to be tolerable.

When further than 16km from an SSR the impact of a wind turbine (3-blades, 30-200 m height, and horizontal rotation axis) is considered to be tolerable.

## 6.2.5 Assessment Requirements

### Mt Bobbara MSSR

In the case of the Mt Bobbara MSSR, this radar is located 33.6km from the nearest point of the wind farm, and the area is therefore beyond 16 km from the radar and is in Zone 4.

Therefore no further assessment of the Mt Bobbara MSSR is required.

### Mt Majura TAR

#### MSSR

In the case of the Mt Majura MSSR, this radar is located 54.5km from the nearest point of the wind farm, and the area is therefore beyond 16 km from the radar and is in Zone 4.

Therefore no further assessment of the Mt Majura MSSR is required.

#### PSR

The wind farm is located between 54.5 km (29.5 m) and 90km (49 nm) from the radar, and is therefore nominally within the instrumented range of the Mt Majura primary radar of 111.2km (60nm).

The radar antenna height is 917 m (3008 ft) AHD and there are areas of high terrain between the radar and the wind farm. Examination of the terrain profile between the Mt Majura radar site and the Rye Park Wind Farm area suggests a possible line of sight condition (Refer Figure 6.2).

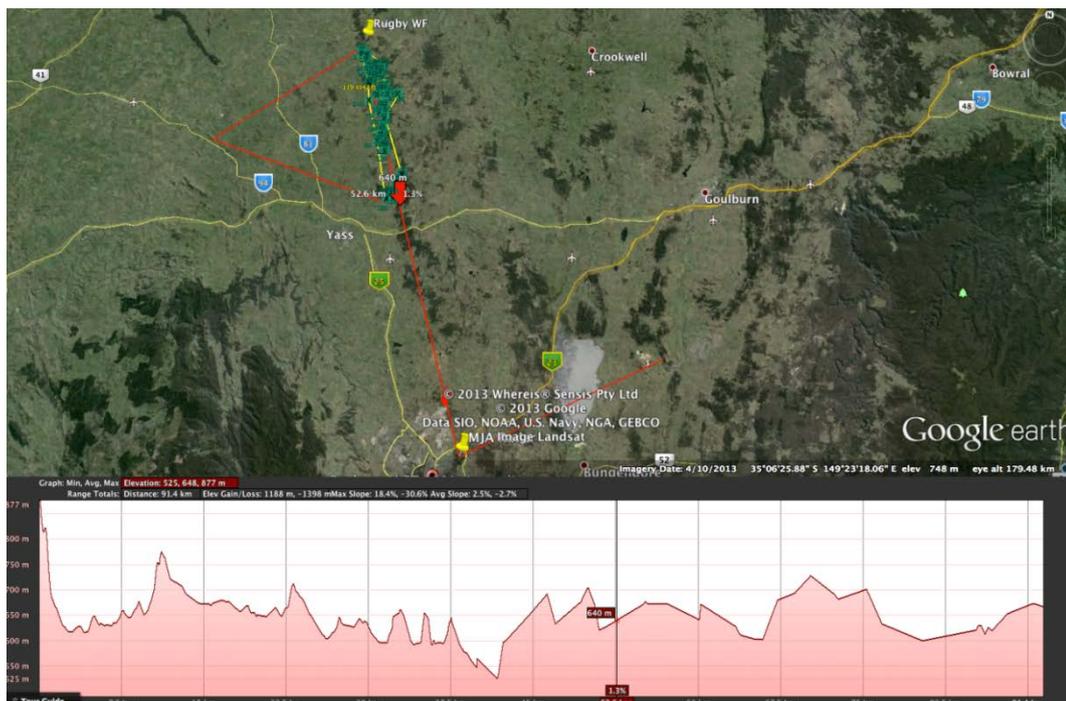


Figure 6.2 – Mt Majura to Rye Park Wind Farm – Terrain Profile

The terrain profile indicates that the Rye Park wind farm is located in Zone 3 for primary radars.

Therefore simple assessment of the impact by the wind farm on the Mt Majura PSR is proposed.

### **6.2.6 Assessment of the Wind Farm Effect on the Mt Majura PSR**

Due to the high elevation of the Mt Majura primary radar it has a slightly downward tilted antenna. The reason for this is to improve the aircraft coverage at low levels particularly for the Canberra Terminal Airspace. This downward tilt has the possibility of increasing the likelihood of coverage of objects, such as the wind turbines at the Rye Park wind farm.

Given the line of sight of the Mt Majura radar to the wind farm area, consideration of likely detection probability may be justified. Analysis of the primary radar without coverage limiting obstructions, in clear conditions, in the wind farm area suggests a finite possibility of detection of some of the wind farm turbines under some conditions.

Preliminary consideration of the Mt Majura radar configuration reveals that detection of the Rye Park wind farm is probable. Under optimal conditions this may generate radar plots. However, notwithstanding this normal operation of the radar performs filtering to restrict false plots from generating tracks that would appear on the radar controller's display. Generally strict criteria must be met to generate a track output to an air traffic controller. The probability of the radar 'seeing' some of the turbines and producing plots is medium. The likelihood of these plots generating a false track to the radar controller, through sophisticated filtering processes is reduced however finite.

### **6.2.7 Summary of Impacts on the PSR**

#### **Effects on the PSR**

The effects on the Mt Majura primary radar by some turbines of the Rye Park Wind farm cannot be declared as zero. However, the analysis suggests that the effects on the radar are localised to the area of the wind farm and are most likely intermittent. Any false target plots that may be generated by the wind farm are likely to be within the normal false plot processing capability of the radar. The false plot processing capability of the radar is designed to minimise the probability of false targets being presented to the air traffic controller for that sector to an acceptable level whilst maximising the probability of detection of a primary only aircraft within the same area.

**No significant adverse effect to the performance of the radar is anticipated.**

#### **Operational Impact**

The wind farm is located in Class G airspace below Class E airspace with a LL of 8500 ft. The nearest registered or certified aerodromes are beyond 30 nm from the wind farm boundary.

There are two non-registered, uncertified aerodromes at Crookwell, 21.7nm and Gundaroo (20.8nm) from the wind farm boundary.

The Rugby and Yass NDBs are located at least 7.6 km from the wind farm boundary, but there are no Instrument Flight Procedures published for these navigation aids. Their primary use is for track guidance.

The primary use of the Mt Majura PSR is for approach control surveillance for Canberra Airport, which is located 32nm from the wind farm boundary, and is below the area of responsibility of Canberra Approach Control.

**Therefore no significant adverse operational impacts on the serviceability of the radar, aircraft operations and to the air traffic service provider are anticipated.**

### **6.2.8 Site Monitors**

As the Wind Farm is not located between the Mt Bobbara and Mt Majura radars and their site monitors, there will be no impact on the site monitor performance.

### **6.2.9 Summary and Conclusions**

The Aviation Impact Statement concluded that the Rye Park Wind Farm development will NOT impact upon the following:

- The OLS and PANS-OPS surfaces of any registered or certified aerodrome
- The performance of Navigation Aids
- The Mt Majura and the Mt Bobbara MSSR radars and their Site Monitors

However, the assessment concluded that:

- Whilst there is a remote possibility that the performance of the Mt Majura PSR could be impacted, a simple assessment of this impact showed that no significant adverse operational impacts on the serviceability of the radar, aircraft operations or to the air traffic service provider are anticipated.

### **6.2.10 Airservices Australia Response**

Airservices Australia has assessed the AIS and concurs with the findings of Ambidji as set out in this report. The full response is at Appendix F.

In relation to the AIS Airservices Australia concurs that the Rye Park Wind Farm will:

- Not impact on any registered or certified aerodromes within 30nm; and
- Not adversely impact on the performance of aviation Communications, Navigation and Surveillance (CNS) equipment within the vicinity.

## 7. QUALITATIVE RISK ASSESSMENT

### 7.1 Aerodromes and Aircraft Landing Areas in the Region

There are four registered or certified aerodromes with Instrument Approach and Landing Procedures (IAL) within 70km (38nm) of the proposed Rye Park Wind Farm.

Aerodrome	Distance from WF	Direction from WF
Canberra (certified)	33nm (62km)	South-southwest
Goulburn (registered)	35nm (66km)	East
Young (registered)	35nm (66km)	Northwest
Cowra (certified)	38nm (70km)	North

Table 7.1 Identified Aerodromes within the vicinity of Rye Park Wind Farm

Each of these aerodromes has prescribed airspace associated with the Obstacle Limitation Surface (OLS) and Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS) surfaces protecting the instrument approach paths.

The proposed Rye Park Wind Farm, being greater than 56km (30nm) from these aerodromes, is considered sufficiently distant as to not impact on their operation. This concurs with the statement on page 219 of the Epuron Environmental Assessment.

Epuron has identified eleven Aircraft Landing Areas (ALA's) located on private property within 5km of the project.

The suitability of an ALA for an intended aircraft operation is the responsibility of the pilot in command of the aircraft. In assessing the suitability of the ALA, the pilot must consider, among other things, the restriction and hazard that obstacles, including wind turbines, will have on the intended aircraft operation.

Epuron states:

*“The project does not encroach on any of the existing landing areas with the closest turbine being 570m from landing strip No. 9. Figure 14-4 demonstrates that the clearances are in excess of the CASA guidelines for landing strip No. 9.*

*As these private airstrips rely on visual rather than instrument based landing techniques, and as the turbines are highly visible, it is unlikely that the proposed development would pose any additional hazard to users of these airstrips. It is expected that pilots will continue to use the local landing strips.”<sup>14</sup>*

As stated by Epuron above and accepting the responsibilities of the pilot in command of the aircraft, the proposed wind farm will pose minimal additional hazard to the use of the ALA's in the area.

There are two significant uncertified aerodromes, Gundaroo 20.8nm and Crookwell 21.7nm, within 70km (38nm) of the Rye Park Wind Farm. The proposed Rye Park

<sup>14</sup> Epuron Environmental Assessment, page 220.

Wind Farm, being greater than 15km (8nm) from these aerodromes, is considered sufficiently distant as to not impact on their operation. As noted in section 4.1.1 above CASA has advised that their ability to influence regulatory change at or around uncertified aerodromes is limited.

## 7.2 Airspace

The Rye Park Wind Farm is located in class G airspace below class E with a lower limit of 8500ft and class C with a lower limit of 8500ft from 40nm Canberra.

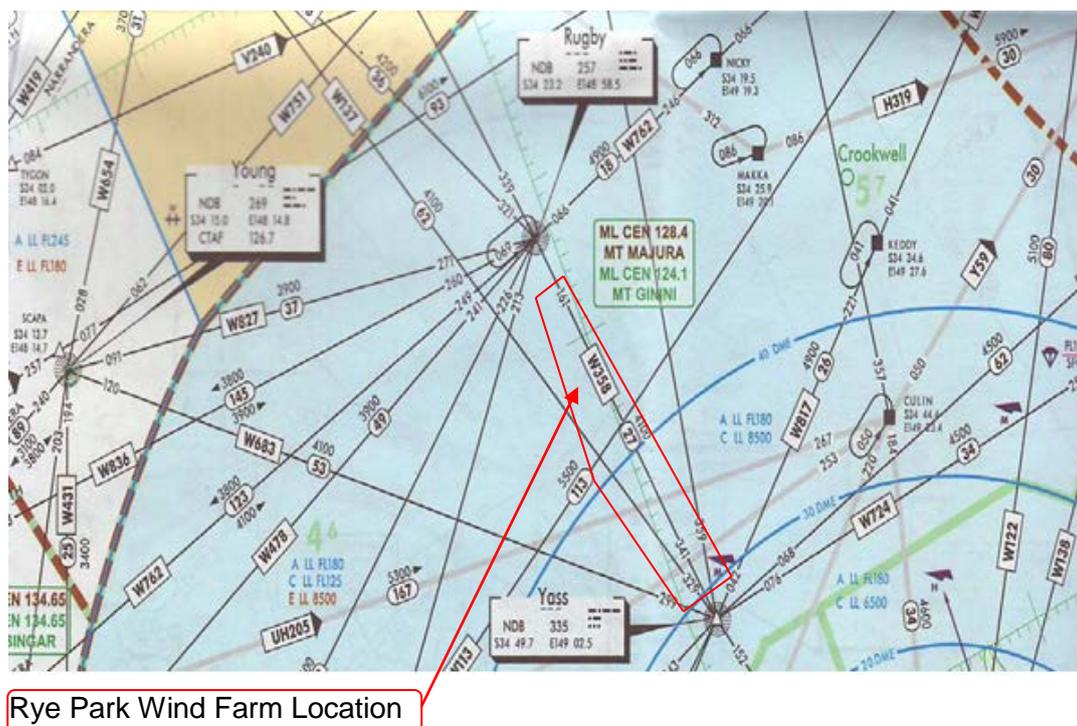


Figure 7.1 TAC-4 (Effective 30 May 2013) Canberra showing Rye Park Wind Farm Location

As shown in Figure 7.1 above, there are many airways routes passing overhead or in close proximity to the proposed Rye Park Wind Farm. Given the maximum advised tip height of 3042ft AMSL, applying a Minimum Obstacle Clearance (MOC) of 1000ft, gives a Lowest Safe Altitude (LSALT) of 4042ft which is rounded up to 4100ft. At this altitude the airways routes passing over the proposed wind farm area do not need adjusting. The airways routes passing over the YASS NDB are also 4100ft or above and do not need adjusting. The airways routes passing over the RUGBY NDB to the south-southwest through to the west (shown in Table 6.1) will require adjustment as shown in Table 5.2.

## 7.3 Impact on General Aviation Flying Training

The majority of General Aviation Flying Training is conducted in accordance with the Visual Flight Rules (VFR). VFR operations must be flown in accordance with Civil Aviation Regulation (CAR 1988) 157 which states in part; that an aircraft must not be

flown lower than 152m/500ft above the highest terrain or obstacle on or within a radius of 600m for fixed wing aircraft and 300m for helicopters. This requirement does not apply if the aircraft is engaged in approved low level flying activity.

For Instrument Flight Rules (IFR) training there are Non-Directional Beacons (NDB) at both Yass and Rugby. NDB's are infrequently used as part of IFR training because they are being phased out as a radio navigational aid. Any IFR training must take into consideration the LSALT applicable to the airways route and the Grid LSALT of the area in which training is conducted. For IFR training on radio navigation aids it is customary to have a safety pilot monitoring the aircraft position and altitude as well as monitoring other aviation traffic. It is considered that the Rye Park Wind Farm will have minimal impact on any IFR training conducted at these navigation aids.

There are no promulgated flying training areas in the vicinity of the Rye Park Wind Farm. Rye Park Wind Farm will have minimal impact on flying training.

#### **7.4 Impact on General, Recreational and Commercial Aircraft Activity**

Recreational general aviation is usually conducted in accordance with the Visual Flight Rules (VFR).

VFR operations must be flown not lower than 152m/500ft above the highest terrain or obstacle on or within a radius of 600m for fixed wing aircraft and 300m for helicopters and with a visibility not less than 5km when operating below 3000ft. This requirement does not apply if the aircraft is engaged in approved low level flying activity. Given that the wind farm will be appropriately marked on aeronautical charts and that it is highly visible it should have a minimal impact of VFR flight operations. Commercial General Aviation fixed wing flying is mostly charter operations conducted under Instrument Flight Rules (IFR) where lowest safe altitudes (LSALT) apply. The Grid LSALT for the area of the proposed wind farm is 4600ft to the west of 149° E and 5700ft to the east.

Given the proposed 927m (3042ft) tip altitude of highest wind turbines for the development, the Grid LSALT and the requirement for a pilot undertaking VFR flight to maintain prescribed minimum vertical and horizontal clearances of obstacles, there should be little impact on both VFR and IFR flight in the vicinity.

Stakeholders have advised that there is hang gliding and paragliding activity approximately 40km south east through to south west of the proposed wind farm on around 200 days per year. There is also a launch site approximately 20km to the east of the wind farm area, near Binalong, which is used on about 20 days per year. Cross country flights from this site would regularly traverse the wind farm area in the prevailing winds.

Hang glider and paraglider pilots operate by day only and are able to see and avoid wind farms. Pilots traversing the wind farm area would do so with significant height clearance. The ACT Hang Gliding and Paragliding Association have indicated that their members are familiar with flying near wind farms, such as the one to the east of Lake George. It is considered that the risk to hang glider and paraglider pilots is low.

## **7.5 Night Flying**

Aircraft flying at night under either VFR or IFR are protected by published or calculated LSALT and descent below them is restricted to within approximately 10km of the aerodrome environs. There is no published data for aerodromes within 15km of the proposed Rye Park Wind Farm. It is considered that any flight at night will be traversing the proposed wind farm area enroute to or from aerodromes more than 15km distant and as such will not be lower than the LSALT.

## **7.6 Any Known VFR Highly Trafficked Routes**

Feedback from stakeholders indicates that there are no highly trafficked VFR routes through the area.

## **7.7 Impact on New South Wales Emergency Services Aerial Operations**

### ***7.7.1 NSW Police Aviation Support Branch***

The Chief Pilot advises that all NSW Police Aviation Support Branch activities are subject to strict planning and risk assessment procedures. These procedures consider the nature and location of the operation and the likely impact of associated obstacles, terrain and weather. Wind farms are considered as large and visible obstacles. Night operation of the helicopter is generally in accordance with the Instrument Flight Rules (IFR). The Chief Pilot would like to see the location, extent and maximum height of all wind farms marked on aeronautical charts.

### ***7.7.2 NSW Helicopter Emergency Medical Services (HEMS)***

The Chief Pilot of CHC Helicopters who provide HEMS advises that all operations are subject to strict planning and risk assessment procedures. These procedures consider the nature and location of the operation and the likely impact of associated obstacles, terrain and weather. Wind farms are considered as large and visible obstacles. Night operation of the helicopter is generally in accordance with the Instrument Flight Rules (IFR). The Chief Pilot did advise that some operations, such as low level searches, may not be able to be conducted within a wind farm. Again, the Chief Pilot would like to see the location, extent and maximum height of all wind farms marked on aeronautical charts.

### ***7.7.3 NSW Air Ambulance***

The RFDS operates the fixed wing air ambulance service for NSW Ambulance Service. The Chief Pilot advises that all their operations are carried out in accordance with the IFR and as such the proposed wind farm would not impact on their operations. The aerodromes used by the RFDS aircraft in the wind farm vicinity are sufficiently distant to be unaffected by the turbines.

#### 7.7.4 NSW Rural Fire Service

The Manager, Aviation Unit, at RFS advises that all aerial fire fighting activity is strictly controlled and subject to on-going dynamic risk assessment. The contractors used by the RFS all utilise Standard Operating Procedures and the aircraft are flown by suitably trained and endorsed pilots. Aerial fire fighting aircraft are not deployed in or near wind farms when smoke, low visibility and turbulence make it dangerous to do so. Concern was also expressed that wind farms may restrict fixed wing aerial fire fighting aircraft from using some ALA's within the vicinity.

### 7.8 Agricultural Aviation Activities

The Aerial Agricultural Association of Australia (the peak body) automatically opposes wind farm developments unless the developer has (inter alia):

- Consulted in detail with local operators;
- Received independent expert advice on safety and economic impacts; and
- Considered the impacts on the aerial application industry.<sup>15</sup>

Pilots undertaking low level flying operations require appropriate licence endorsement and are required to fully familiarise themselves with all obstacles within the vicinity of their low level operations. Aerial Agriculture pilots are required to survey and plan each operation to take into account terrain and obstacles, including wind turbines.

Aerial Agricultural Operators accept that the decision to host wind turbines is the prerogative of the land holder, however they must accept that the presence of turbines on their property will impact on the ability to utilise aerial applications. Operators contacted in the area expressed concern that the presence of wind turbines would limit their ability to provide aerial application services on properties hosting turbines as well as properties adjacent to turbines. Indications are from this investigation, and supported by previous work done by Ambidji in the surrounding areas, that the use of aerial agricultural applications is an ad hoc rather than regular occurrence.

Some concern was expressed about turbulence generated by wind turbines. One operator advised that he had had to abort application on a property approximately 9km downwind of a wind farm due to turbulence. The Australian Transport Safety Bureau advise:

*“... .. that we have no data in relation to wind farms. There was one occurrence earlier this year where an agricultural pilot reported experiencing turbulence that they thought came from a wind farm over 9km away. The ATSB did not investigate as there was no effective way of confirming that the wind farm had anything to do with the turbulence encountered by the pilot.”<sup>16</sup>*

<sup>15</sup> <http://www.aerialag.com.au/ResourceCenter/Policies.aspx>

<sup>16</sup> Personal email from ATSB dated 21 October 2013

## 7.9 Topographical and Weather Issues

Aircraft operating under Instrument Flight Rules (IFR) can operate in poor weather conditions and in cloud which precludes visual acquisition of obstacles and terrain. These operations are protected from obstacles and terrain by OLS and PANS OPS surfaces as well as LSALT's that are designed to keep the aircraft safely above obstacles and terrain.

Otherwise CAR 157 states (in part) that an aircraft operating under VFR must not fly lower than 152m/500ft over a non-populated area being terrain or obstacles on that terrain and within, for an aircraft other than a helicopter, 600m horizontally and, in the case of a helicopter, 300m horizontally to the same, unless:

- Due stress of weather or any other avoidable cause it is essential that a lower height be maintained; or
- It is engaged in approved low flying private or aerial work; or
- It is engaged in flying training and flies over part of a flying training area in respect of which low flying is authorised by CASA under sub regulation 141(1); or
- It is undertaking a baulked approach; or
- It is flying in the course of actually taking-off or landing at an aerodrome.

In this regard, the Aeronautical Information Publication (AIP) states that a pilot of a fixed wing aircraft operating under VFR (by day in Class G airspace<sup>17</sup>) must have 5 km forward visibility and remain clear of clouds and in sight of ground or water when operating below 3000ft AMSL. Helicopters are approved in the regulations to operate with 800m visibility if operating at a reduced speed.

In regard to the first bullet point above it is possible that due to lowering cloud base, and if through poor airmanship the aircraft had pressed on to the point that it was unable to execute a turn and fly away from the weather, an aircraft could find itself lower than 152m/500ft above the terrain or obstacles.

The Rye Park Wind Farm is proposed for an area of the Great Dividing Range north of Yass. This area is known for the onset of low cloud, reduced visibility, strong winds and turbulence associated with the mountains. VFR flight during the winter months usually stays west of the high country to avoid this known marginal or non VMC weather. IFR flight in light single or twin engine aircraft often divert to the west of Yass to remain below forecast low freezing levels but above the LSALT thus avoiding airframe ice build-up. It is considered that the proposed Rye Park Wind Farm will not affect VFR flight in marginal VMC conditions because during these conditions such flights generally remain clear of the mountainous area.

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<sup>17</sup> Class G: IFR and VFR flights are permitted and do not require an airways clearance. IFR flights must communicate with air traffic control and receive traffic information on other IFR flights and a flight information service. VFR flights receive a flight information service on request.

## 7.10 Qualitative Risk Assessment Summary

The assessed level of risk is summarised in Table 7.2 below

Risk Element	Assessed Level of Risk	Comment
Aerodrome Operations	LOW	
Aircraft Landing Area Operations	LOW	
Known Highly Trafficked Routes	LOW	
Published Air Routes	LOW	
Restricted Airspace	LOW	
Promulgated Flying Training Areas	LOW	
Night Flying	LOW	
Recreational/Sport/Commercial Flying	LOW	
GA Pilot Training	LOW	
Aerial Agricultural Operations	LOW	Risk within close proximity is MEDIUM
Air Ambulance Operations	LOW	Risk within close proximity is MEDIUM
Police Aviation Operations	LOW	Risk within close proximity is MEDIUM
Aerial Fire Fighting Operations	LOW	Risk within close proximity is MEDIUM
Weather and Topographical Issues	LOW	

*Table 7.2 Qualitative Risk Assessment Summary*

The risk assessment shows that the proposed wind farm will not be of operational significance nor be a hazard to aircraft safety.

## 8. REPORTING OF TALL STRUCTURES

CASA Advisory Circular AC 139-8(0) Reporting of Tall Structures<sup>18</sup> provides information on the requirements for and mechanisms of reporting tall structures to aviation organisations.

The RAAF Aeronautical Information Services (AIS) is responsible for maintaining the database of tall structures of any obstacle that is above 30m within 30km of a registered aerodrome, or above 45m everywhere else. This information is provided to a range of aviation organisations so that they can be identified on aeronautical charts

<sup>18</sup> AC 139-08(0): Reporting of Tall Structures, April 2005.

## **9. OBSTACLE LIGHTING REVIEW**

### **9.1 NASAG Guideline D *Managing Risk to Aviation Safety of Wind Turbine Installations (Wind Farms) and Wind Monitoring Towers***

The guidelines refer to large wind turbines being sufficiently conspicuous, by day, due to their shape and size provided the turbine is of a contrasting colour to the background.

*Rotor blades, nacelle and upper 2/3 of the supporting mast of wind turbines should be painted white, unless otherwise indicated by an aeronautical study. Other colours are acceptable, unless the colour of the turbine is likely to blend in with the background.*

Clauses of the guidelines relevant to this Obstacle Lighting Review indicate:

*Where a wind turbine 150m or taller in height is proposed away from aerodromes, the proponent should conduct an aeronautical risk assessment.*

*The risk assessment, to be conducted by a suitably qualified person(s), should examine the effect of the proposed wind turbines on the operation of aircraft. The study must be submitted to CASA to enable an assessment of any potential risk to aviation safety. CASA may determine that the proposal is:*

- hazardous, but that the risks to aircraft safety would be reduced by the provision of approved lighting and/or marking; or*
- not a hazard to aircraft safety.*

It is noted that the height used in Guideline D is increased to 150m or greater above ground level.

It is anticipated that the CASA regulations and documentation, which retains the 110m trigger height for the consideration of obstacle lighting, will take some time to be amended to incorporate the NASAG guidelines.

### **9.2 Requirement for Obstacle Lighting**

In line with the NASAG Guideline D and the findings of the QRA (See 7.10 above), obstacle lighting is not considered necessary as the assessed risk is LOW with no additional mitigation required.

### **9.3 Meteorological Monitoring Masts**

This guideline also refers to the marking and lighting of wind monitoring towers. The relevant points are summarised as:

*Wind monitoring towers are very difficult to see from the air due to their slender construction and guy wires. This is a particular problem for low flying aircraft, particularly aerial agricultural and emergency services operations.*

*Measures to be considered to improve visibility include:*

- *The top one third of wind monitoring towers be painted in alternating contrasting bands of colour. Examples can be found in the CASA MOS 139 sections 8 and 9;*
- *Marker balls, high visibility flags or high visibility sleeves placed on the outer guy wires;*
- *Ensuring the guy wire ground attachment points have contrasting colours to the surrounding ground and vegetation; or*
- *A flashing strobe light during daylight hours.*

## 10. SUMMARY OF FINDINGS

### 10.1 Review of Epuron Provided Environmental Assessment Information

The proposed Rye Park Wind Farm is greater than 56km (30nm) from the nearest registered or certified aerodromes with OLS and PANS-OPS prescribed airspace so will not have any impact on operations at these aerodromes. The safety of aircraft operations at ALA's are the responsibility of the pilot in command who is required to assess the suitability of the landing strip for the operation being undertaken.

Epuron has been in communication with the Department of Defence who have advised that the proposed Rye Park Wind Farm will have no impact on military flying operations in the area or upon communications, navigation and surveillance facilities.

### 10.2 Aeronautical Impact Assessment

#### 10.2.1 Aerodromes

There are no registered or certified aerodromes within 56km (30nm) of the wind farm. The aerodromes at Gundaroo and Crookwell are non-certified and do not have published OLS or PANS-OPS surfaces. The proposed wind farm will not impact on operations at these aerodromes.

#### 10.2.2 Air Routes and LSALTs

There are a number of published air routes over or near the wind farm. The highest turbine tip at RYP\_139 is 3042ft AMSL. Applying an MOC of 1000ft and rounding up gives a LSALT of 4100ft. The majority of routes have LSALT of 4100ft or greater. There are four routes tabulated below in Table 10.1 that will need to have their LSALT raised as shown to provide the required clearance from the turbines.

Route	Section	Existing LSALT	Required LSALT
W762	RUG – NAR	3800ft	4000ft
W478	RUG _ CTM	3900ft	4000ft
W836	RUG _ GTH	3900ft	4000ft
W827	RUG – YNG	3900ft	4000ft

Table 10.1 – Air Route segments requiring LSALT adjustment

#### 10.2.3 Airspace

The proposed wind farm is situated in Class G airspace below Class E airspace with a lower limit of 8500ft. The wind farm does not infringe controlled airspace. There are no promulgated Restricted or Danger Areas in the vicinity of the wind farm. There are no published Flying Training Areas in the vicinity of the wind farm.

### 10.3 Aviation Impact Statement

#### 10.3.1 Navigation Aids

The proposed wind farm will not impact on the performance of the Yass or Rugby NDB.

#### 10.3.2 Radar

There are two Airservices Australia radar installations considered in this assessment; Mt Majura at 54.5km and Mt Bobbara at 33.6km respectively from the Rye Park Wind Farm boundary.

It is considered that the wind farm will not impact on the MSSR installations at Mt Majura and Mt Bobbara however; there is a remote possibility that the Mt Majura PSR performance could be impacted. A simple assessment showed that no significant adverse operational impacts on the serviceability of the radar, aircraft operations or to the air traffic service provider are anticipated.

### 10.4 Airservices Australia Assessment

Airservices Australia has reviewed the Ambidji findings of the AIA and the AIS and confirms:

- The LSALTs for W762, W478, W836 and W872 will need to be raised to 4000ft;
- No registered or certified aerodromes will be impacted; and
- There will be no adverse impact to aviation Communications, Navigation and Surveillance [including radar] (CNS) facilities.

### 10.5 Qualitative Risk Assessment

A summary of the QRA is shown below in Table 10.2.

Risk Element	Assessed Level of Risk	Comment
Aerodrome Operations	LOW	
Aircraft Landing Area Operations	LOW	
Known Highly Trafficked Routes	LOW	
Published Air Routes	LOW	
Restricted Airspace	LOW	
Promulgated Flying Training Areas	LOW	
Night Flying	LOW	
Recreational/Sport/Commercial Flying	LOW	
GA Pilot Training	LOW	
Aerial Agricultural Operations	LOW	Risk within close proximity is MEDIUM
Air Ambulance Operations	LOW	Risk within close proximity is MEDIUM
Police Aviation Operations	LOW	Risk within close proximity is MEDIUM
Aerial Fire Fighting Operations	LOW	Risk within close proximity is MEDIUM
Weather and Topographical Issues	LOW	

*Table 10.2 Qualitative Risk Assessment Summary*

The risk assessment shows that the proposed wind farm will not be of operational significance nor be a hazard to aircraft safety.

## 10.6 Obstacle Lighting Review

Obstacle lighting is not considered necessary for the Rye Park Wind Farm.

Meteorological Monitoring Masts should be marked in accordance with NASAG Guideline D and their position notified to the RAAF, AsA and AAAA,

## 10.7 Duty of Care Disclaimer

As a part of corporate responsibility and duty of care, it is appropriate for the proponent to formally advise all relevant stakeholders of:

- the locations and heights of the turbines and meteorological masts and when they would be constructed or decommissioned; and
- the developer's intentions regarding marking and lighting of the wind farm turbines.

Epuron's attention is also drawn to the following determination of the New South Wales Court of Appeal, in the case of *Sheather vs Country Energy*, where, inter-alia, the court determined the following.<sup>19</sup>

*“Mr Sheather, the owner of the helicopter which crashed into a Country Energy owned spur line while flying well below the mandatory height regulations for aircraft, appealed an earlier decision on the grounds that Country Energy had failed to provide sufficient warning of the spur line. Despite Country Energy observing all legal compliance requirements, the NSW Court of Appeal held that Country Energy owed a duty of care to pilots and aircraft owners and had breached its duty of care.”*

Due cognisance of this decision should be taken by Epuron and its legal and insurance advisors in considering this report.

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<sup>19</sup> *Sheather v Country Energy* [2007] NSWCA 179



**APPENDIX A**

***Airservices Australia  
Aviation Assessments for Wind Farm Developments  
5th March 2012***

## APPENDIX A

***Airservices Australia  
Aviation Assessments for Wind Farm Developments  
5<sup>th</sup> March 2012***

*To Whom It May Concern*

### **Airservices Aviation Assessments for Wind Farm Developments**

Guidelines to manage the risk to aviation safety from wind turbine installations (Wind Farms/Wind Monitoring Towers) are under development by the National Airports Safeguarding Advisory Group (NASAG). NASAG is comprised of high-level Commonwealth, State and Territory transport and planning officials and has been formed to develop a national land use planning regime to apply near airports and under flight paths.

The wind farm guidelines will provide information to proponents and planning authorities to help identify any potential safety risks posed by wind turbine and wind monitoring installations from an aviation perspective.

Potential safety risks include (but are not limited to) impacts on flight procedures and aviation communications, navigation and surveillance (CNS) facilities which require assessment by Airservices.

To facilitate these assessments all wind farm proposals submitted to Airservices must include an Aviation Impact Statement (AIS) prepared by an aeronautical consultant in accordance with the AIS criteria set out below.

AIS must be undertaken by an aeronautical consultant with suitable knowledge and capabilities to provide a reliable and comprehensive report. All data is to be supplied in electronic form. If you are not familiar with any aeronautical consultants, you may wish to view the list on the Civil Aviation Safety Authority (CASA) website:

[http://www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC\\_90412](http://www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_90412)

## **AIS Criteria**

The AIS must provide a detailed analysis covering, as a minimum:

### Airspace Procedures:

1. Obstacles
  - Co-ordinates in WGS 84 (to 0.1 second of arc or better)
  - Elevations AMSL (to 0.3 metres)
2. Drawings
  - Overlaid 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.
3. Aerodromes
  - Specify all registered/certified aerodromes that are located within 30nm (55.56km) from any obstacle referred to in (1) above.
  - 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.
4. Air Routes
  - Nominate air routes published in ERC-L & ERC-H which are located near/over any obstacle referred to in (1) above.
  - Specify two waypoint names located on the routes which are located before and after the obstacles.
5. Airspace
  - Airspace classification – A, B, C, D, E, G etc where the obstacles are located.

### Navigation/Radar:

1. Detect the presence of dead zones
2. False target analysis
3. Target positional accuracy
4. Probability of detection
5. Radar coverage implications
6. 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.

[http://www.eurocontrol.int/surveillance/public/standard\\_page/sur\\_WTTF.html](http://www.eurocontrol.int/surveillance/public/standard_page/sur_WTTF.html)

### **Airservices Review of AIS**

Airservices will review the quality and completeness of an AIS and will undertake limited modelling and analysis to confirm the findings and recommendations of the report.

Provided the AIS is of sound quality and is complete in accordance with the above criteria, there will be no charge for the review or limited modelling and analysis.

If the AIS is not of sound quality or is not complete in accordance with the above criteria, no modelling or analysis will be undertaken. Airservices will advise the proponent that the AIS does not meet the requirements and that the proposal cannot be assessed by Airservices.

If Airservices review of an AIS confirms impacts identified in the report (or identifies additional impacts), Airservices will advise the proponent of the impacts and the required mitigating actions (where mitigation is feasible). The proponent will also be advised that there will be charges for any mitigation actions to be undertaken by Airservices.

These charges may be advised at the time but it is likely that a detailed quote will be needed and this will only be provided on request from the proponent.

Please contact Joe Doherty, Airport Development Manager (02) 62685101 or alternatively [joseph.doherty@airservicesaustralia.com](mailto:joseph.doherty@airservicesaustralia.com) if you have any questions.

Current as at 5 March 2012<sup>20</sup>

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<sup>20</sup> Recent e-mail communication from Airservices Australia confirms this letter is current.

**APPENDIX B**

***Rye Park Wind Farm  
Site Identification, Elevations, Distances from Mt Majura Primary Surveillance Radar  
and Coordinates***

**APPENDIX B**

***Rye Park Wind Farm  
 Site Identification, Elevations, Distances from Mt Majura Primary Surveillance Radar  
 and Coordinates***

<b>Turbine ID</b>	<b>Site Elev ASL m</b>	<b>Turbine Tip ASL m</b>	<b>Max Tip Elev ASL ft</b>	<b>Radar to Site nm</b>	<b>Latitude</b>	<b>Longitude</b>
RYP_1	711	868	2848	49.1	-34.4475	148.9220
RYP_2	707	864	2835	49.0	-34.4505	148.9210
RYP_3	700	857	2812	48.8	-34.4534	148.9190
RYP_4	680	837	2747	48.6	-34.4571	148.9200
RYP_5	715	872	2861	48.3	-34.4594	148.9350
RYP_6	660	817	2681	48.4	-34.4603	148.9200
RYP_7	725	882	2894	48.2	-34.4616	148.9320
RYP_9	712	869	2852	48.0	-34.4645	148.9310
RYP_11	735	892	2927	47.9	-34.4675	148.9310
RYP_12	722	879	2884	47.5	-34.4730	148.9310
RYP_15	680	837	2747	46.8	-34.4795	148.9580
RYP_16	713	870	2855	46.7	-34.4852	148.9380
RYP_17	725	882	2894	46.5	-34.4816	148.9750
RYP_18	705	862	2829	46.8	-34.4841	148.9420
RYP_19	675	832	2730	46.6	-34.4838	148.9580
RYP_20	749	906	2973	46.4	-34.4849	148.9720
RYP_21	695	852	2796	46.5	-34.4877	148.9430
RYP_22	690	847	2779	46.4	-34.4881	148.9550
RYP_23	730	887	2911	46.3	-34.4873	148.9690
RYP_24	702	859	2819	46.4	-34.4907	148.9420
RYP_25	705	862	2829	46.2	-34.4917	148.9540
RYP_26	707	864	2835	46.2	-34.4936	148.9440
RYP_27	710	867	2845	46.0	-34.4950	148.9540
RYP_28	738	895	2937	46.0	-34.4966	148.9440
RYP_29	742	899	2950	45.9	-34.4995	148.9420
RYP_30	740	897	2943	45.8	-34.4996	148.9490
RYP_31	750	907	2976	45.5	-34.5010	148.9640
RYP_32	740	897	2943	45.7	-34.5024	148.9450
RYP_33	745	902	2960	45.3	-34.5040	148.9640
RYP_34	725	882	2894	45.4	-34.5057	148.9490
RYP_35	739	896	2940	45.3	-34.5059	148.9560
RYP_36	732	889	2917	45.2	-34.5069	148.9630

RYP_37	710	867	2845	45.2	-34.5090	148.9500
RYP_38	740	897	2943	45.1	-34.5089	148.9570
RYP_39	713	870	2855	44.9	-34.5111	148.9620
RYP_40	710	867	2845	45.0	-34.5123	148.9500
RYP_41	707	864	2835	44.8	-34.5139	148.9610
RYP_42	700	857	2812	44.6	-34.5146	148.9720
RYP_43	695	852	2796	44.8	-34.5152	148.9510
RYP_44	685	842	2763	44.7	-34.5181	148.9500
RYP_45	668	825	2707	44.7	-34.5190	148.9440
RYP_46	672	829	2720	44.6	-34.5218	148.9420
RYP_47	690	847	2779	44.4	-34.5247	148.9420
RYP_48	759	916	3006	43.9	-34.5254	148.9780
RYP_49	720	877	2878	43.8	-34.5265	148.9820
RYP_50	770	927	3042	43.8	-34.5286	148.9760
RYP_51	740	897	2943	43.6	-34.5317	148.9760
RYP_52	725	882	2894	43.3	-34.5360	148.9790
RYP_53	740	897	2943	43.4	-34.5345	148.9740
RYP_56	717	874	2868	43.1	-34.5392	148.9770
RYP_57	720	877	2878	43.3	-34.5375	148.9720
RYP_58	720	877	2878	43.0	-34.5401	148.9880
RYP_61	745	902	2960	43.1	-34.5404	148.9710
RYP_62	745	902	2960	43.0	-34.5433	148.9690
RYP_63	715	872	2861	42.7	-34.5447	148.9870
RYP_64	725	882	2894	42.6	-34.5454	148.9940
RYP_65	660	817	2681	42.3	-34.5468	149.0140
RYP_66	705	862	2829	42.5	-34.5477	148.9870
RYP_67	695	852	2796	42.7	-34.5488	148.9650
RYP_68	668	825	2707	42.1	-34.5498	149.0110
RYP_69	716	873	2865	42.3	-34.5508	148.9870
RYP_70	662	819	2687	42.6	-34.5514	148.9630
RYP_71	712	869	2852	41.4	-34.5677	148.9840
RYP_72	706	863	2832	41.2	-34.5717	148.9840
RYP_73	710	867	2845	41.0	-34.5756	148.9750
RYP_74	720	877	2878	40.9	-34.5783	148.9770
RYP_75	730	887	2911	40.7	-34.5813	148.9780
RYP_76	713	870	2855	40.7	-34.5827	148.9680
RYP_77	735	892	2927	40.5	-34.5843	148.9790
RYP_78	705	862	2829	40.5	-34.5850	148.9710
RYP_79	700	857	2812	40.3	-34.5891	148.9700
RYP_80	756	913	2996	39.9	-34.5927	148.9850

RYP_81	740	897	2943	39.7	-34.5956	148.9850
RYP_82	744	901	2957	39.6	-34.5985	148.9850
RYP_83	730	887	2911	39.4	-34.6017	148.9830
RYP_84	760	917	3009	38.5	-34.6175	148.9790
RYP_85	745	902	2960	38.4	-34.6200	148.9820
RYP_86	760	917	3009	38.1	-34.6246	148.9820
RYP_87	732	889	2917	37.9	-34.6282	148.9800
RYP_88	731	888	2914	37.7	-34.6317	148.9800
RYP_89	745	902	2960	37.6	-34.6345	148.9790
RYP_90	735	892	2927	37.4	-34.6373	148.9770
RYP_92	730	887	2911	37.0	-34.6454	148.9760
RYP_93	735	892	2927	36.8	-34.6480	148.9740
RYP_94	693	850	2789	36.7	-34.6508	148.9710
RYP_95	720	877	2878	36.3	-34.6564	148.9820
RYP_96	740	897	2943	36.2	-34.6559	148.9890
RYP_97	710	867	2845	35.9	-34.6597	148.9910
RYP_98	725	882	2894	35.8	-34.6627	148.9900
RYP_99	715	872	2861	35.6	-34.6657	148.9900
RYP_100	705	862	2829	35.4	-34.6688	148.9900
RYP_101	695	852	2796	35.3	-34.6718	148.9900
RYP_102	739	896	2940	32.2	-34.7148	149.0330
RYP_103	745	902	2960	32.1	-34.7179	149.0310
RYP_104	740	897	2943	31.9	-34.7206	149.0320
RYP_106	722	879	2884	31.6	-34.7285	149.0210
RYP_107	730	887	2911	31.4	-34.7310	149.0210
RYP_109	730	887	2911	31.2	-34.7347	149.0260
RYP_110	719	876	2874	31.2	-34.7355	149.0190
RYP_119	745	902	2960	30.4	-34.7515	149.0060
RYP_120	745	902	2960	30.3	-34.7503	149.0210
RYP_121	740	897	2943	30.2	-34.7530	149.0200
RYP_122	730	887	2911	30.3	-34.7546	149.0060
RYP_123	750	907	2976	30.4	-34.7549	148.9960
RYP_124	725	882	2894	30.0	-34.7559	149.0220
RYP_125	730	887	2911	30.0	-34.7577	149.0140
RYP_126	750	907	2976	30.1	-34.7596	148.9960
RYP_127	720	877	2878	29.8	-34.7608	149.0140
RYP_128	701	858	2815	29.8	-34.7632	149.0010
RYP_129	723	880	2888	29.6	-34.7642	149.0150
RYP_130	695	852	2796	29.7	-34.7662	149.0010
RYP_131	707	864	2835	29.5	-34.7692	149.0000

RYP_132	690	847	2779	46.8	-34.4823	148.9460
RYP_133	700	857	2812	46.2	-34.4937	148.9390
RYP_134	710	867	2845	46.1	-34.4967	148.9380
RYP_135	740	897	2943	45.5	-34.5029	148.9520
RYP_136	730	887	2911	46.1	-34.4904	148.9680
RYP_137	725	882	2894	45.9	-34.4933	148.9670
RYP_138	730	887	2911	45.7	-34.4964	148.9670
RYP_139	770	927	3042	43.9	-34.5268	148.9710
RYP_140	723	880	2888	43.8	-34.5298	148.9700
RYP_141	710	867	2845	42.9	-34.5458	148.9660
RYP_142	730	887	2911	30.1	-34.7545	149.0150
RYP_143	755	912	2993	38.8	-34.6140	148.9790
RYP_144	670	827	2714	44.2	-34.5268	148.9450
RYP_145	715	872	2861	31.0	-34.7367	149.0290



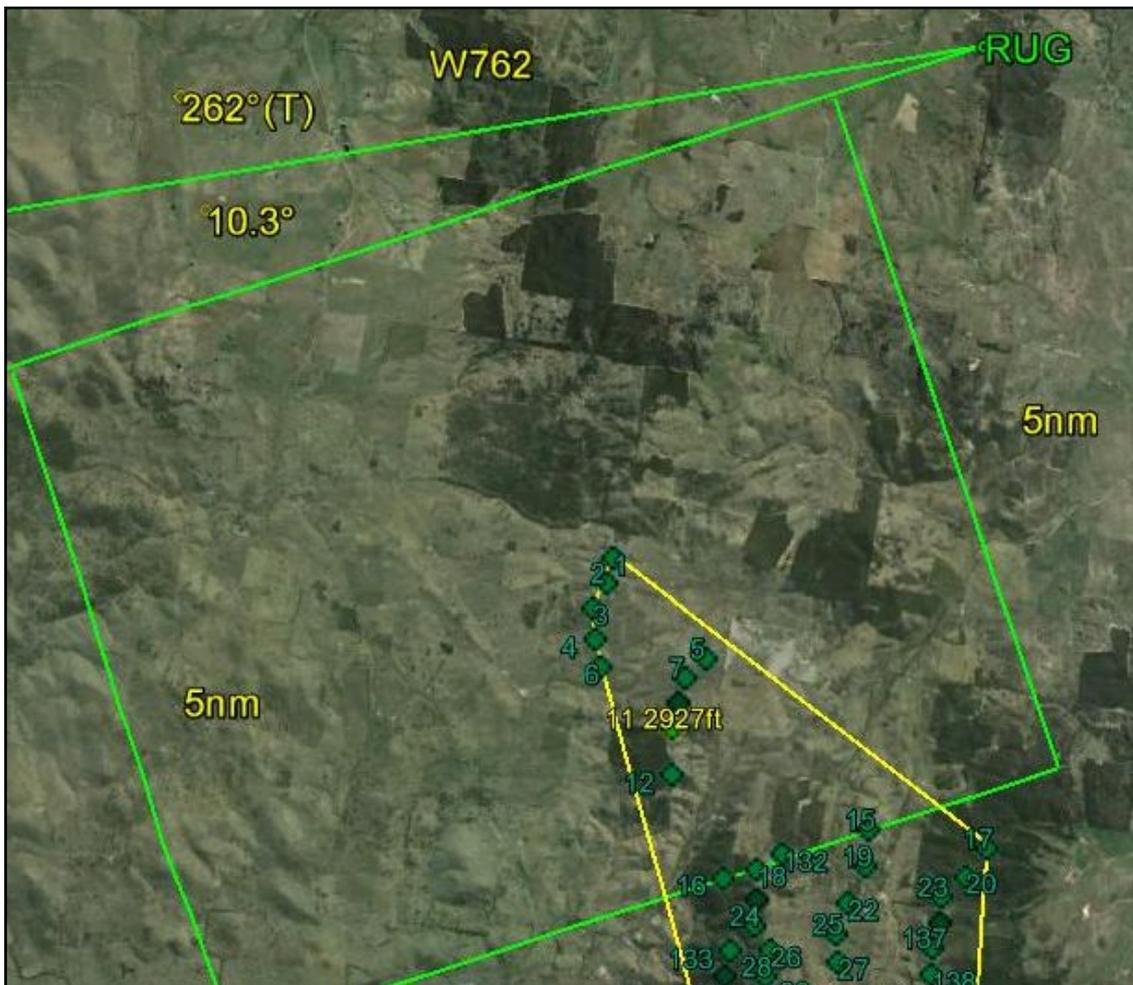
**APPENDIX C**

***Navigation Aid Tolerances and Buffer Areas for LSALT Calculations  
Rye Park Wind Farm***

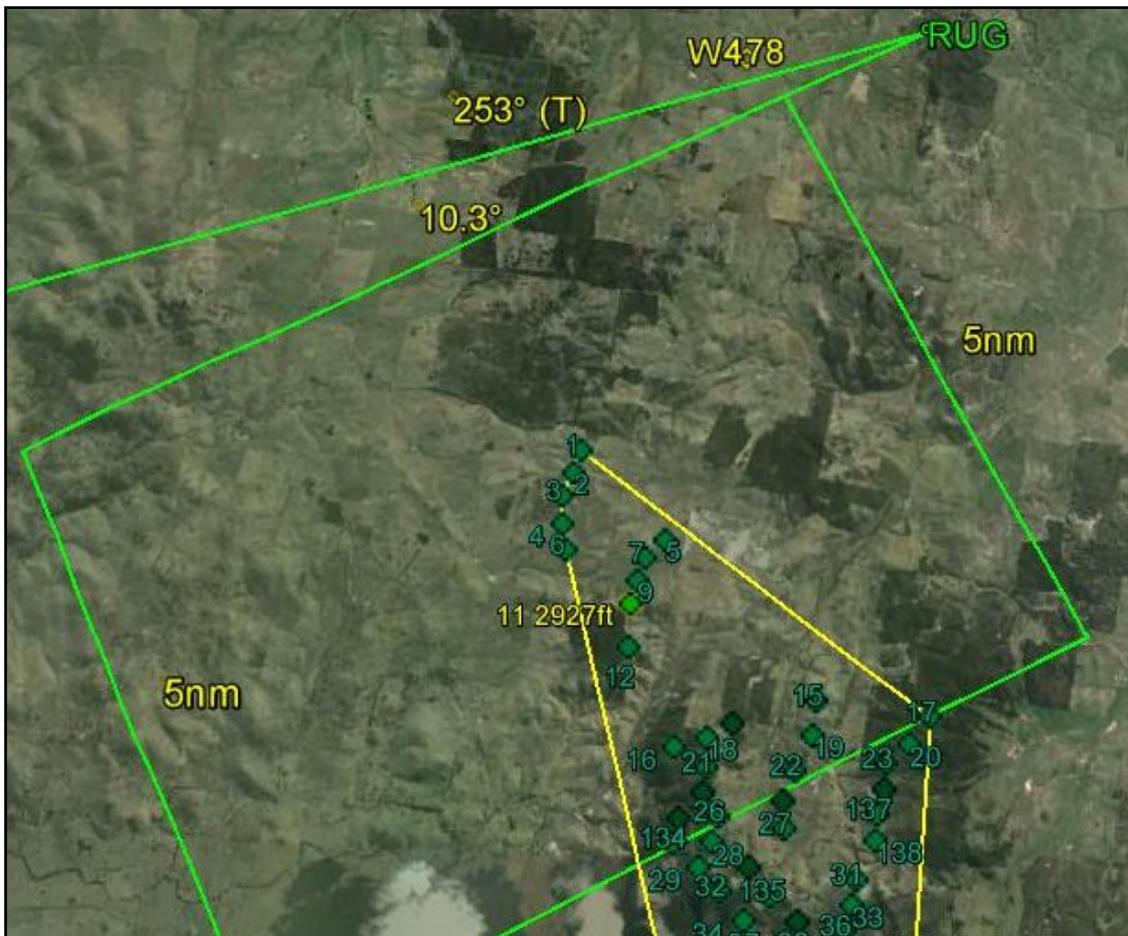
## APPENDIX C

### Navigation Aid Tolerances and Buffer Areas for LSALT Calculations Rye Park Wind Farm

#### W762 RUG – NAR Navigation Aid tolerances and buffer areas



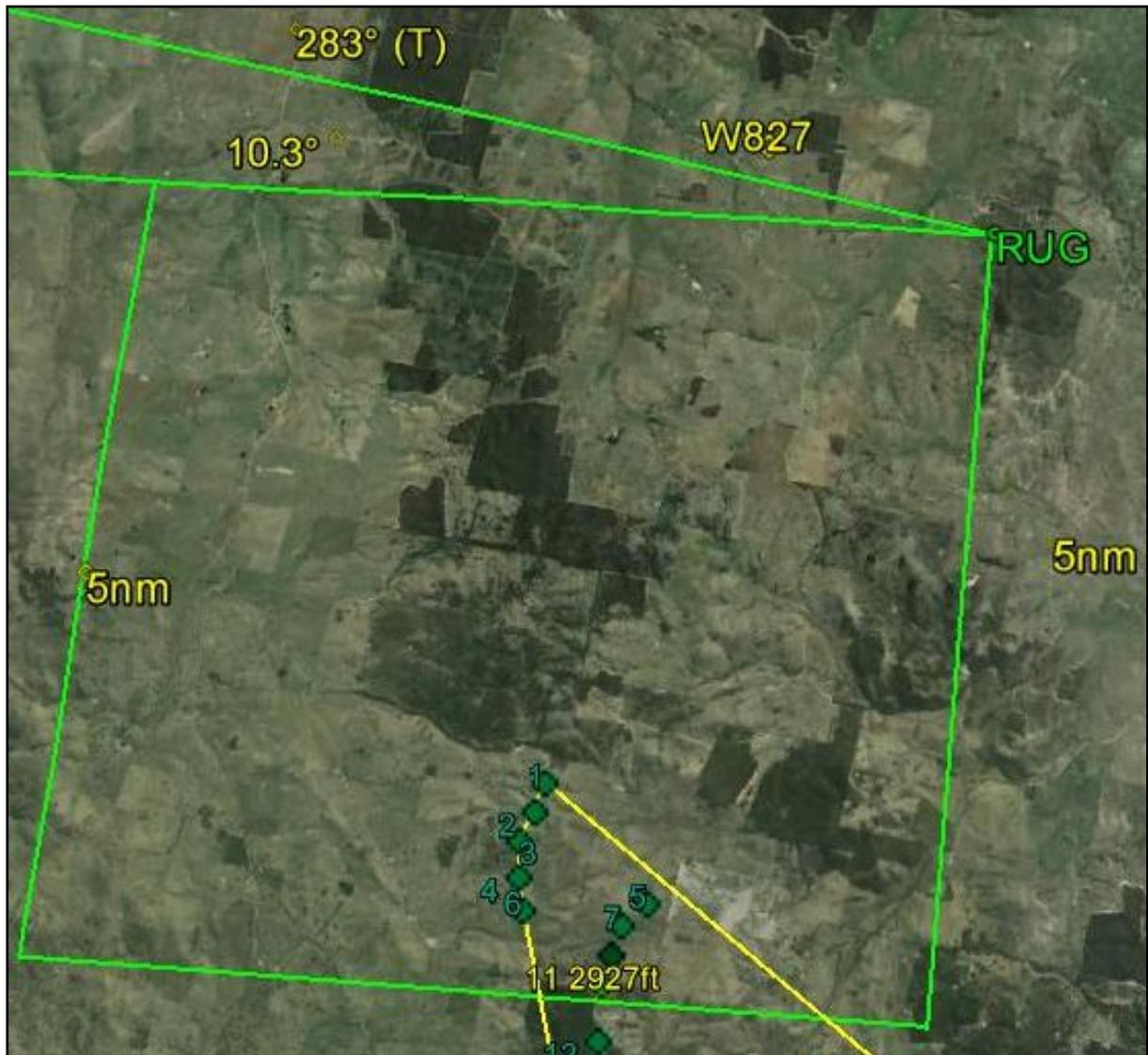
**W478 RUG – CTM Navigation Aid tolerances and buffer areas**



**W836 RUG – GTH Navigation Aid tolerances and buffer areas**



**W827 RUG – YNG Navigation Aid tolerances and buffer areas**





**APPENDIX D**

***Stakeholder Consultations Rye Park Wind Farm***

## APPENDIX D

### Stakeholder Consultations Rye Park Wind Farm

<p><i>Aerial Agricultural Association of Australia</i></p>	<p>AAAA has produced a Wind farm policy which is available on the AAAA website. AAAA opposes <b>all</b> wind farm developments unless the developer has (inter alia):</p> <ol style="list-style-type: none"> <li>a. consulted in detail with local operators;</li> <li>b. received independent expert advice on safety and economic impacts; and</li> <li>c. considered the impacts on the aerial application industry.</li> </ol> <p>AAAA recommends wind farm developers be made aware of “duty of care” responsibilities established under <i>Sheather v Country Energy</i> (NSW Court of Appeals).</p> <p>AAAA recommends that all wind monitoring towers including guy wires should be clearly marked and that wind farm locations and tall structures should be included on aeronautical charts.</p>
<p><i>Yassair</i></p>	<p>The Chief Pilot considers the proposed wind farm will have a fair impact on business as there are a number of customers in that area. Most of the work is aerial spreading of fertilizer where ground access is difficult. Mentioned that downwind turbulence is an issue and cited an article regarding turbulence up to 15km downwind of a Danish offshore wind farm. Also advised that he had to abort an operation due to turbulence 9km downwind of the Gunning Wind Farm due to turbulence. This incident was reported to the ATSB</p>
<p><i>Col Adams Aerial Services</i></p>	<p>“We don’t operate in that area; ergo that wind farm will not be an issue for us.” In general we don’t like wind farms because they interfere with aerial agricultural operations and they are a problem for aerial fire fighting.</p>
<p><i>NSW RFS</i></p>	<p>The Manager, RFS Aviation Section advises that the RFS consider wind farms/turbines to be another obstacle to be considered and avoided. All operations use Standard Operating Procedures and Dynamic Risk Assessments whenever operations are near wind farms. RFS will not deploy aerial assets into areas of smoke/low visibility where there are known obstacles. Generally do not deploy aerial assets into wind farm areas. Road access provided for wind farm maintenance provides better access but needs to be used with caution, particularly in fast moving grass fire situations. Noted that Met Monitoring Towers were a major issue because they “spring up” and were difficult to see. Also expressed concern about impact of wind farms on ALA usage.</p>
<p><i>RFDS Fixed Wing Air Ambulance</i></p>	<p>Very little impact. All RFDS operations are IFR in fixed wing aircraft. Our operating procedures preclude descent below LSALT until within 15km of aerodrome.</p>
<p><i>NSW Police Aviation Support Branch</i></p>	<p>Chief Pilot considers them to be another obstacle to be avoided. They become an issue for night/low visibility operations. Aviation Support Branch use Standard Operating procedures and Dynamic Risk Assessment whenever operations are near obstacles including wind farms. Where possible we avoid them. Met Monitoring towers are a major issue because they are near impossible to see; they are erected</p>

	quickly and usually are not notified to anyone.
<i>CHC Helicopters NSW HEMS</i>	Wind farms are large obstacles and will impact on our operations if we have to work in or near them. Again they use Standard Operating Procedures and Dynamic Risk Assessments near obstacles. As far as land search operations are concerned we will not enter the wind farm area in marginal VMC conditions. "If it's not safe – we won't do it!"
<i>Wagga Air Centre Flying Training</i>	Will have very little impact on our operations as we do not venture that far. It may have minimal impact on VFR operations from Wagga to Canberra in marginal weather as the preferred route is to Yass and then down the valley to Canberra. Tracking that way avoids going over the hills on the direct track
<i>Air Escape Canberra/Tumut</i>	"The rules say we have to be above the highest obstacle!" We do not fly much in that area, but if we do we like to be well above the highest obstacle.
<i>Canberra Aeroclub</i>	Not really an issue, we don't do much in that area.
<i>ACT Hang Gliding</i>	"When conducting cross country flights Hang glider and Paraglider pilots are able to see and avoid wind farms. Pilots traversing the area would not consider landing in the area and would only traverse the wind farm with significant height clearance. ACTHPA pilots are familiar with flying in the general vicinity of wind farms, such as the one to the East of Lake George. A risk of accident may arise because of more limited landing areas as a consequence of wind farm development, although I assess that this risk is Low."



***APPENDIX E***

***CASA Letter to NSW Department of Planning and Infrastructure***

## APPENDIX E

### **CASA Letter to NSW Department of Planning and Infrastructure**



**Australian Government**  
**Civil Aviation Safety Authority**

OFFICE OF THE DIRECTOR OF AVIATION SAFETY

Trim Ref: G113/1042

18 September 2013

Ms Karen Jones  
Avg Director  
Infrastructure Projects  
Department of Planning and Infrastructure  
GPO Box 39  
SYDNEY NSW 2001

Dear Ms Jones

I refer to your letter of 12 August 2013 to Mr Malcolm McGregor at the Civil Aviation Safety Authority (CASA) regarding representations that your Department has received in respect of wind farms and their possible effect on aerodromes in the Yass and Crookwell areas.

I am advised that CASA has previously given advice to the NSW Department of Planning and Infrastructure on these wind farms, most recently in a letter to Mr Neville Osborne dated 30 January 2013 in respect of the Yass Valley wind farm. CASA advice mentioned that none of the relevant aerodromes in the Crookwell and Yass areas are Certified or Registered, which limits CASA's ability to influence any regulatory outcomes.

In relation to the comment about CASA possibly imposing aviation buffer zones, this is not an action that CASA would generally take, based upon previous analysis of suitable mitigators.

Notwithstanding these comments, accurate information will help pilots to assess any safety risk arising from the presence of wind turbines in these areas. Accordingly, CASA suggests that it may be appropriate for the areas to be marked on appropriate charts to provide advice to pilots of the presence of any obstacle. This has been done previously for other wind farms.

I trust this information is of assistance.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Carolyn Hutton'.

Carolyn Hutton  
Manager  
Corporate Relations Branch

GPO Box 2005 Canberra ACT 2601 Telephone: (02) 6217 1390 Facsimile: (02) 6217 1209

***APPENDIX F***

***Airservices Australia Assessment e-mail Response***

## APPENDIX F

### *Airservices Australia Assessment e-mail Response*

**Ian Jennings**

**From:** Neidert, Jessica <Jessica.Neidert@AirservicesAustralia.com>  
**Sent:** Wednesday, 15 January 2014 9:24 AM  
**To:** Ian Jennings  
**Cc:** Sloan, Mitchell  
**Subject:** Airservices response: Rye Park Wind Farm (NSW-WF-038)

Hi Ian

I refer to your request for the assessment of Rye Park Wind Farm, NSW.

Airspace Procedures

With respect to procedures promulgated by Airservices in accordance with ICAO PANS-OPS and Document 9905, at a maximum height of 927m (3042ft), this wind farm will affect air routes Lower Safe Altitude (LSALT).

1. W478 (RUG-CTM and CTM-RUG): Turbine RYP\_11 (2927ft) penetrates protection surface by 27ft.
2. W762 (RUG-NAR): Turbine RYP\_11 (2927ft) penetrates protection surface by 127ft.
3. W827 (YNG-RUG and RUG-YNG): Turbine RYP\_11 (2927ft) penetrates protection surface by 27ft.
4. W836 (GTH-RUG): Turbine RYP\_11 (2927ft) penetrates protection surface by 27ft.
5. W836 (RUG-GTH):
  - o Turbines RYP\_1 (2848ft) penetrates protection surface by 48ft.
  - o Turbines RYP\_2 (2835ft) penetrates protection surface by 35ft.
  - o Turbines RYP\_3 (2812ft) penetrates protection surface by 12ft.
  - o Turbines RYP\_5 (2861ft) penetrates protection surface by 61ft.
  - o Turbines RYP\_7 (2894ft) penetrates protection surface by 94ft.
  - o Turbines RYP\_9 (2852ft) penetrates protection surface by 52ft.
  - o Turbines RYP\_11 (2927ft) penetrates protection surface by 127ft.
  - o Turbines RYP\_12 (2884ft) penetrates protection surface by 84ft.

If the proponent wishes to proceed with the wind farm to a height of 927m (3042ft) AHD, a NOTAM will be required from Airservices to permanently raise all of the above affected air routes LSALT to 4000ft.

Please provide us with at least 2 business days to issue the relevant Airservices NOTAM prior to construction commencing by emailing [NOF@airservicesaustralia.com](mailto:NOF@airservicesaustralia.com).

This wind farm will not affect Canberra RTCC and does not fall within 30nm of any aerodrome that has existing instrument procedures.

Communications, Navigation and Surveillance

This wind farm to a maximum height of 927m (3042ft) AHD will not adversely impact the performance of Precision/Non-Precision Nav Aids, HF/VHF Comms, A-SMGCS, Radar, PRM, ADS-B, WAM or Satellite/Links.

Kind Regards

**Jessica Neidert**  
Airport Development Assistant | C&IA Group

Our Values: Excellence, Inclusion, Cohesion, Initiative

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## ***APPENDIX G***

### ***Glossary of Terms and Abbreviations***

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### *Glossary of Terms and Abbreviations*

#### **Aeronautical Study Glossary**

This is a glossary of terms and acronyms commonly used in aeronautical studies.

**AC** (Advisory Circulars) are issued by CASA and are intended to provide recommendations and guidance to illustrate a means, but not necessarily the only means, of complying with the *Regulations*.

**Aeronautical study** is a tool used to review aerodrome and airspace processes and procedures to ensure that safety criteria are appropriate.

**AHD** (Australian Height Datum) is the datum to which all vertical control for mapping is to be referred. The datum surface is that which passes through mean sea level at the 30 tide gauges and through points at zero AHD height vertically below other basic junction points.

**AIP** (Aeronautical Information Publication) is a publication promulgated to provide operators with [aeronautical](#) information of a lasting character essential to [air navigation](#). It contains details of regulations, procedures and other information pertinent to flying and operation of aircraft. In Australia, the AIP is published by Airservices Australia.

**Air routes** exist between navigation aid equipped aerodromes or waypoints to facilitate the regular and safe flow of aircraft operating under Instrument Flight Rules (IFR).

**Airservices Australia** is the Australian government-owned corporation providing safe and environmentally sound [air traffic management](#) and related airside services to the aviation industry.

**Altitude** is the vertical distance of a level, a point or an object, considered as a point, measured from mean sea level.

**AMSL** (Above Mean Sea Level) is the elevation (on the ground) or altitude (in the air) of any object, relative to the average sea level datum. In aviation, the ellipsoid known as World Geodetic System 84 (WGS 84) is the datum used to define mean sea level.

**ARP** (Aerodrome Reference Point) is the designated geographical location of an aerodrome.

**ATC** (Air Traffic Control) service is a service provided for the purpose of:

- a. preventing collisions:
  1. between aircraft; and
  2. on the manoeuvring area between aircraft, vehicles and obstructions; and
- b. expediting and maintaining an orderly flow of air traffic.

**CASA** (Civil Aviation Safety Authority) is the Australian Government authority responsible under the *Civil Aviation Act 1988* for developing and promulgating appropriate, clear and concise aviation safety standards. As Australia is a signatory to the ICAO *Chicago Convention*, CASA adopts the standards and recommended practices established by ICAO, except where a difference has been notified.

**CASR** (Civil Aviation Safety Regulations) are promulgated by CASA and establish the regulatory framework (*Regulations*) within which all service providers must operate.

**Civil Aviation Act 1988** (the Act) establishes the CASA with functions relating to civil aviation, in particular the safety of civil aviation and for related purposes.

**ICAO** (International Civil Aviation Organization) is an [agency](#) of the [United Nations](#) which codifies the principles and techniques of international air navigation and fosters the planning and development of international [air transport](#) to ensure safe and orderly growth. The ICAO Council adopts standards and recommended practices concerning air navigation, its infrastructure, [flight inspection](#), prevention of unlawful interference, and facilitation of border-crossing procedures for international [civil aviation](#). In addition, the ICAO defines the protocols for [air accident](#) investigation followed by [transport safety authorities](#) in countries signatory to the [Convention on International Civil Aviation](#), commonly known as the *Chicago Convention*. Australia is a signatory to the *Chicago Convention*.

**IFR** (Instrument Flight Rules) are rules applicable to the conduct of flight under IMC. IFR are established to govern flight under conditions in which flight by outside visual reference is not safe. IFR flight depends upon flying by reference to instruments in the [flight deck](#), and navigation is accomplished by reference to electronic signals. It is also referred to as, “a term used by pilots and controllers to indicate the type of flight plan an aircraft is flying,” such as an IFR or VFR flight plan.

**IMC** (Instrument Meteorological Conditions) are meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, less than the minimum specified for visual meteorological conditions.

**LSALT** (Lowest Safe Altitudes) are published for each low level air route segment. Their purpose is to allow pilots of aircraft that suffer a system failure to descend to the LSALT to ensure terrain or obstacle clearance in IMC where the pilot cannot see the terrain or obstacles due to cloud or poor visibility conditions. It is an altitude that is at least 1,000 feet above any obstacle or terrain within a defined safety buffer region around a particular route that a pilot might fly.

**MOS** (Manual of Standards) comprises specifications (*Standards*) prescribed by CASA, of uniform application, determined to be necessary for the safety of air navigation.

**MSA** (Minimum Sector Altitude) is published for each aerodrome with an instrument approach procedure. The MSA is the lowest altitude which may be used which will provide a minimum clearance of 1000ft above all objects located in an area contained within a sector of a circle of 25nm or 10nm radius centred on a radio aid to navigation or, where there is no radio navigation aid, the Aerodrome Reference Point.

**NASAG** (National Airports Safeguarding Advisory Group) set up in May 2010 to implement the Australian Government's National Aviation Policy White Paper, *Flight Path to the Future* initiatives relating to safeguarding airports and surrounding communities from inappropriate development. NASAG comprises high-level Commonwealth, State and Territory planning and transport officials and is chaired by the Department of Infrastructure and Transport (DoIT). NASAG has been formed to develop a national land use planning regime to apply near airports and under flight paths.

**NOTAMs** (Notices to Airmen) are notices issued by the NOTAM office containing information or instruction concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to persons concerned with flight operations.

**Obstacles** All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

**OLS** (Obstacle Limitation Surfaces) are a series of planes associated with each runway at an aerodrome that defines the desirable limits to which objects may project into the airspace around the aerodrome so that aircraft operations may be conducted safely.

**PANS-OPS** (Procedures for [Air Navigation](#) Services - Aircraft Operations) is an [Air Traffic Control](#) term denominating rules for designing [instrument approach](#) and departure [procedures](#). Such procedures are used to allow aircraft to land and take off under [Instrument Meteorological Conditions](#) (IMC) or Instrument Flight Rules ([IFR](#)). [ICAO document 8168-OPS/611 \(volumes 1 and 2\)](#) outlines the principles for airspace protection and procedure design which all ICAO signatory states must adhere to. The regulatory material surrounding PANS-OPS may vary from country to country.

**PANS OPS Surfaces** Similar to an Obstacle Limitation Surface, the PANS-OPS protection surfaces are imaginary surfaces in space which guarantee the aircraft a certain minimum obstacle clearance. These surfaces may be used as a tool for local governments in assessing building development. Where buildings may (under certain circumstances) be permitted to penetrate the OLS, they cannot be permitted to penetrate any PANS-OPS surface, because the purpose of these surfaces is to guarantee pilots operating under IMC an obstacle free descent path for a given approach.

**Prescribed Airspace** is an airspace specified in, or ascertained in accordance with, the Regulations, where it is in the interests of the safety, efficiency or regularity of existing or future air transport operations into or out of an airport for the airspace to be protected. The prescribed airspace for an airport is the airspace above any part of either an OLS or a PANS OPS surface for the airport and airspace declared in a declaration relating to the airport.

**Regulations** (Civil Aviation Safety Regulations)

**Restricted Airspace** is airspace of defined dimensions above the land or territorial waters of a State, within which the flight of aircraft is restricted in accordance with certain specified conditions. *Note:*

*This designation is used when necessary in the interests of public safety or the protection of the environment.* For example airspace is often restricted for such activities as Military Flying Training or surrounding hazardous locations such as live artillery firing ranges or aerial fire fighting at large wild fires.

**VFR** (Visual Flight Rules) are rules applicable to the conduct of flight under VMC. VFR allow a [pilot](#) to operate an [aircraft](#) in weather conditions generally clear enough to allow the pilot to maintain visual contact with the terrain and to see where the aircraft is going. Specifically, the weather must be better than basic VFR weather minima. If the weather is worse than VFR minima, pilots are required to use [instrument flight rules](#).

**VMC** (Visual Meteorological Conditions) are meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, equal to or better than specified minima.

### Abbreviations

Abbreviations used in this report, and the meanings assigned to them for the purposes of this report are detailed in the following table:

Abbreviation	Meaning
AC	Advisory Circular (document support CASR 1998)
ACFT	Aircraft
AD	Aerodrome
AHD	Australian Height Datum
AHT	Aircraft height
AIP	Aeronautical Information Publication
AIRPORTS ACT	Airports Act 1996, as amended
AIS	Aeronautical Information Service
ALA	Aircraft Landing Area
ALT	Altitude
AMSL	Above Minimum Sea Level
A(POFA)R	Airports (Protection of Airspace) Regulations, 1996 as amended
APARs	Airports (Protection of Airspace) Regulations, 1996 as amended
ARP	Aerodrome Reference Point
AsA	Airservices Australia
ATC	Air Traffic Control(ler)
ATM	Air Traffic Management
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation
Cat	Category
DAP	Departure and Approach Procedures (charts published by AsA)
DER	Departure End of (the) Runway

Abbreviation	Meaning
DEVELMT	Development
DME	Distance Measuring Equipment
Doc nn	ICAO Document Number nn
DoIT	Department of Infrastructure and Transport. Also called "Infrastructure". (Formerly Department of Infrastructure, Transport, Regional Development and Local Government (DITRDLG) and previously the Department of Transport and Regional Services (DoTARS))
DITRDLG	See DoIT above
DOTARS	See DITRDLG above
ELEV	Elevation (above mean sea level)
ENE	East North East
ERSA	Enroute Supplement Australia
FAF	Final Approach Fix
FAP	Final Approach Point
ft	feet
GA	General Aviation
GNSS	Global Navigation Satellite System
GP	Glide Path
IAS	Indicated Airspeed
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IHS	Inner Horizontal Surface, an Obstacle Limitation Surface
ILS	Instrument Landing System
ISA	International Standard Atmosphere
km	kilometres
kt	Knot (one nautical mile per hour)
LAT	Latitude
LLZ	Localizer
LONG	Longitude
LSALT	Lowest Safe Altitude
m	metres
MAPt	Missed Approach Point
MDA	Minimum Descent Altitude
MGA94	Map Grid Australia 1994
MOC	Minimum Obstacle Clearance
MOS	Manual of Standards, published by CASA
MSA	Minimum Sector Altitude
MVA	Minimum Vector Altitude
NASAG	National Airports Safeguarding Advisory Group
NDB	Non Directional Beacon
NE	North East
NM	Nautical Mile (= 1.852 km)
nnDME	Distance from the DME (in nautical miles)

Abbreviation	Meaning
NNE	North North East
NOTAM	NOtice To AirMen
OAS	Obstacle Assessment Surface
OCA	Obstacle Clearance Altitude
OCH	Obstacle Clearance Height
OHS	Outer Horizontal Surface
OIS	Obstacle Identification Surface
OLS	Obstacle Limitation Surface
PANS-OPS	Procedures for Air Navigation Services – Aircraft Operations, ICAO Doc 8168
PRM	Precision Runway Monitor
PROC	Procedure
QNH	An altimeter setting relative to height above mean sea level
Rnnn	Restricted Airspace – promulgated in AIP as R with 3 numbers
REF	Reference
RL	Relative Level
RNAV	aRea NAVigation
RNP	Required Navigation Performance
RPA	Rules and Practices for Aerodromes — replaced by the MOS Part 139 — Aerodromes
RPT	Regular Public Transport
RWY	Runway
SFC	Surface
SID	Standard Instrument Departure
SOC	Start Of Climb
STAR	Standard ARrival
TAR	Terminal Approach Radar
TAS	True Air Speed
THR	Threshold (Runway)
TNA	Turn Altitude
TODA	Take-Off Distance Available
VFR	Visual Flight Rules
V <sub>n</sub>	aircraft critical Velocity reference
VOR	Very high frequency Omni directional Range