RE Future

Mumblin Wind Farm

Application for Planning Permit

Appendix J – Aviation Impact and Lighting Risk Assessment Review

October 2025

July 2024

Severin Staalesen
Project Director
RE Future

By email: severin.staalesen@refuture.com.au

Our reference: 104401-02

Dear Severin

Re: Review and Update of Mumblin Wind Farm report

RE Future Pty Ltd is preparing a revised planning application for the Mumblin Wind Farm project located approximately 8 km west of Cobden township, in central southwest Victoria.

An aeronautical impact assessment was prepared by Landrum & Brown (L&B) dated 20 May 2021.

RE Future has requested Aviation Projects to review this report and provide a letter report detailing any changed impacts by updated layout and referring to aeronautical information since the report.

1. INTRODUCTION

The layout consists of 8 wind turbine generators (WTG) with a maximum height of 247 m above ground level (AGL).

The highest WTG has a maximum height of 383.73 m AHD / 1258.96 ft AMSL.

2. UPDATED ASSESSMENTS

The current editions of aeronautical information publications, effective 13 June 2024 have been reviewed to determine if any changes have been made since the original report in 2021.

2.1. Aerodromes in the Vicinity of the wind farm

No additional aerodromes have been discovered since the original report was compiled and no additional outcomes are evident. There are no aerodromes identified within 10 km of the Mumblin Wind Farm boundary.

The CAAP 92-1 referred to in section 4.7.1 of the 2021 report has been rescinded by CASA.

CASA have since published an Advisory Circular, AC91-10v1.1 *Operations in the Vicinity of Non-controlled Aerodromes* effective 2 December 2021 which provides guidance to pilots *on procedures that, when followed, will improve situational awareness and safety for all pilots when flying at, or in the vicinity of, non-controlled aerodromes. It is strongly recommended that pilots of radio-equipped aircraft use the "standard" traffic circuit…at all non-controlled aerodromes".*

The AC does not refer to any typical physical characteristics as shown in Figure 3 of the L&B report. It places emphasis on the pilot to ensure that the place that they intend to take-off from or land at is suitable for the operation of their aircraft.

2.2. Obstacle Limitation Surfaces (OLS)

OLS exist for aerodromes that are certified under Civil Aviation Safety Regulation (CASR) Part 139, *Aerodromes*.

The Mumblin Wind Farm is located outside of the OLS for all certified aerodromes.

The Mumblin Wind Farm does not infringe any OLS.

2.3. PANS-OPS Surfaces

PANS-OPS surfaces associated with a 25 nm Minimum Safe Altitude (MSA) include a 5 nm buffer and therefore exist out to a maximum of 55 km (30 nm) from an airport with instrument approach procedures.

The nearest airport, with instrument approach procedures, to the wind farm is Warrnambool Airport approximately 44.7 km west of the wind farm boundary.

Warrnambool Airport is provided with non-precision instrument approach procedures for runway 18 and runway 36. The PANS-OPS surfaces for the approach segments of the two approaches do not overlay the wind farm.

The proposed Mumblin Wind Farm is located laterally within the 25 nm MSA segment of the PANS-OPS area.

The 25 nm MSA published for Warrnambool Airport (effective 7 September 2023) above the wind farm is 3300 ft AMSL and has a PANS-OPS buffer of 1000 ft below that of 2300 ft AHD.

As the highest WTG will have an elevation of 383.73 m / 1258.96 ft AHD, it will not infringe the PANS-OPS surfaces. It will be more than 1000 ft / 300 m below the lowest altitude that an IFR aircraft can be when overhead the wind farm and using the 25 nm MSA.

The Mumblin Wind Farm will not have any impact upon any PANS-OPS area or surface. (See Figure 1.)

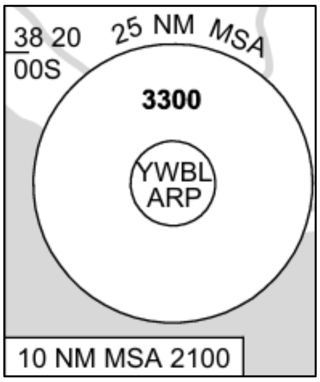

Figure 1 Warrnambool 25 MSA Diagram.

At a maximum height of 1258.96 ft AMSL, the Mumblin wind farm remains below the PANS-OPS surface for the relevant 25 nm MSA sector.

The updated Mumblin Wind Farm will not affect the PANS-OPS surfaces at Warrnambool Airport.

2.4. ATC Surveillance Radar Systems

There have been no new ATC surveillance radar systems installed in this area since the 2021 report.

The Mumblin Wind Farm would not impact upon ATC surveillance radar systems.

2.5. Aviation Navigation Aids

The navigation infrastructure remains the same.

The Mumblin Wind Farm is located outside of the protections surfaces for all aviation navigation systems.

2.6. IFR Air Routes and Grid Lowest Safe Altitudes (LSALT)

The LSALT associated with nearby air route W635 and the relevant Grid LSALT (effective 13 June 2024) remains unchanged at 2500 ft AMSL (1500 ft protection surface) and therefore the Mumblin Wind Farm does not infringe them.

2.7. Visual Flight Operations

The aviation activity in the area of the Mumblin Wind Farm is unlikely to have changed since the 2021 report.

2.8. Potential wake turbulence impacts from wind turbine generators (WTG)

The information contained in the L&B report is supplemented by the following commentary.

The L&B report incorrectly states that the rotor diameter of each WTG is 247 m. This is the maximum height of the turning rotor, or maximum tip height. The rotor diameter is likely to be in the order of 180 m in order to provide a ground clearance of at least 60 m for the rotor.

National Airports Safeguarding Framework (NASF) Guideline D – *Managing the Risk to Aviation Safety of Wind Turbine Installations (Wind Farms)/Wind Monitoring Towers* provides guidance to State/Territory and local government decision makers, airport operators and developers of wind farms to jointly address the risk to civil aviation arising from the development, presence and use of wind farms and WMTs.

NASF Guideline D provides guidance regarding WTG wake turbulence which states:

> *Wind farm operators should be aware that wind turbines may create turbulence which noticeable up to 16 rotor diameters from the turbine. In the case of one of the larger wind turbines with a diameter of 150 metres, turbulence may be present two kilometres downstream. At this time, the effect of this level of turbulence on aircraft in the vicinity is not known with certainty. However, wind farm operators should be conscious of their duty of care to communicate this risk to aviation operators in the vicinity of the wind farm…*

For the purpose of the wake turbulence analysis, a 180 m rotor diameter has been used. Based on this scenario, the effects of wake turbulence could be noticeable at 2880 m from the WTGs.

Aviation Projects, through desktop research of published scientific studies, has determined that any adverse turbulence would in most circumstances be confined to within 7 rotor diameters of a wind turbine generator (WTG), but considers that a conservative area of 10 rotor diameters is likely to be the maximum area where wake turbulence from WTGs would be felt by pilots of light aircraft operating downstream of a WTG. These studies also indicated that where any such turbulence is experienced, the pilot would be able to control the aircraft using normal control inputs.

Two of those studies are referred to below.

The *European Academy of Wind Energy* published an open access report titled "*Do wind turbines pose roll hazards to light aircraft?*" dated 2 November 2018. This study concluded:

> *In neutral conditions, the largest of these hazards are classified as medium hazards and exist 6.5 D downwind of the turbine in the bottom-left portion of the rotor disk. The highest hazards in the stable*

case also remained within the medium threshold and are located in two separate regions of the wake: approximately 4 D downwind in the bottom-right quadrant of the rotor and 6 D downwind in the top-left quadrant of the rotor.

The United Kingdom (UK) Civil Aviation Authority commissioned the University of Liverpool to conduct a *Wind Turbine Wake Encounter Study*, the results of which were published in March 2015.

> *At University of Liverpool, a full CFD method [4] was used with the HMB solver to study wind turbine wakes. The CFD results showed good agreement for the blade surface pressure distributions and flow field velocities with the wind tunnel measurements. The wake was then solved on a very fine mesh able to capture the wake vortices up to 8 radii downstream of the blades on the MEXICO wind turbine rotor.*
>
> *In general, the LIDAR measurements captured the regular wake mean velocity patterns. Statistic LIDAR data indicate that the effects of wind turbine rotor wake, in term of velocity deficit, are limited within a downwind distance of 5D. This is generally in agreement with the results of the full CFD method and the velocity deficit models.*
>
> *For a wind turbine with size similar to the WTN250, and using the Beddoes circulation formula, the off-line simulation results indicate that the wind turbine wake did not pose any hazards to the encountering aircraft 5 diameters further from the wind turbine. The dominant upset that the wake generated is a yawing moment on the aircraft. The wake generated crosswind, is smaller than the maximum crosswind of 17.75 ft/s for an airport (codes A-I or B-I) that is expected to accommodate single engine aircraft. These conclusions are in line with that found in the piloted flight simulation.*

These two studies are the only major studies of their kind.

Supporting the distances referred in the studies is the wind energy assessments carried out by wind turbine manufacturers and developers to ensure that all wind turbines operate in a free stream. Wind turbines are located at minimum distances from each other to prevent turbulence from one or more turbines affecting the operational efficiency of a downwind turbine or causing damage to the downwind turbine blades.

The turbulence from a wind turbine could be described as a shear type turbulence which is caused by the difference of the free flow wind speed at the edge of the turbine rotor being disrupted by the turbine blade being rotated by the wind and altering the wind speed within the rotor diameter moving downwind from the turbine. This shear type turbulence descends and weakens as it gets further away from the turbine. It is not a stream of turbulence being generated by the blades being turned by a mechanical force such as occurs with an aircraft propellor.

The WTG blades change pitch, dependent on the wind strength, to maintain a constant rotor speed. They interfere with the natural wind flow and cause some degree of turbulence downwind of the WTG. A consistent theme among the studies was that the higher turbulence exists very close to the WTG and rapidly dissipates due to the effect of the external environment, such as convection, turbulence from other sources such as trees and terrain undulations.

The studies indicate that turbulence is likely to dissipate below a level that could be felt by pilots within 7 rotor diameters (RD) from the WTG. Aviation Projects considers that a more conservative value of 10 RD is best used to assess areas where the likely turbulence created downwind of a WTG will not be felt by or impact pilots of light aircraft.

The studies referenced above also indicate that aircraft controllability is maintained when experiencing the likely turbulence when the aircraft is approximately 5 RD from a WTG.

Table 1 Wake Turbulence Distances

1 RD (m)	*16 RD (m)*	*10 RD (m)*	*7 RD (m)*
180	2880	1800	1260

In conditions of high wind speed the WTGs are ‘parked’ with the blades in a ‘feathered’ condition to reduce the wind impact upon them. Turbulence from the feathered blades still exists but would be significantly less than when the turbine is rotating. Other mechanical turbulence generated by trees, hills and other objects during high winds would significantly exceed and break up any minor turbulence from a stationary WTG.

Aircraft are designed to withstand significant turbulence according to aviation meteorological standards that are recognised worldwide. Even in recent circumstances with an airliner in severe turbulence which injured passengers, the aircraft was controllable (except for the first part of the event where it descended rapidly) and has not suffered any damage (although it will undergo a major inspection). It was an encounter with severe turbulence far greater than normally experienced and is avoided wherever possible.

The downwind turbulence from WTGs beyond 7RD or even 10RD may be felt by the pilot of a light aircraft but the pilot will still be able to make minor control adjustments to maintain control of the aircraft’s attitude, altitude and heading.

Such turbulence is likely to be classified as Light on an intensity scale published by the Australian Bureau of Meteorology shown in Figure 2.

Intensity	Airspeed Fluctuat-ions (kt/s)	Vertical Gust (ft/s)	G Load	Aircraft Reaction	Reaction Inside Aircraft
Light	5 – 14	5 - 19	0.15 – 0.49	Momentary slight and erratic changes in attitude and/or altitude. Rhythmic bumpiness.	Little effect on loose objects.
Moderate	15 – 24	20 - 35	0.50 – 0.99	Appreciable changes in attitude and/or altitude. Pilot remains in control at all times. Rapid bumps or jolts.	Unsecured objects move. Appreciable strain on seatbelts.
Severe	≥ 25	36 -49	1.0 – 1.99	Large abrupt changes in attitude and/or altitude. Momentary loss of control.	Unsecured objects are tossed about. Occupants violently forced against seatbelts.
Extreme	≥ 25	≥ 50	> 2.0	Very difficult to control aircraft. May cause structural damage.	

Figure 2 Turbulence intensities[1]

Light and moderate turbulence can be generated by lines of trees near runways.

[1] Bureau of Meteorology – Hazardous Weather Phenomena – Turbulence

> *Turbulence may disturb an aircraft's attitude about its major axis, and cause rapid bumps or jolts to be experienced, but in most cases it does not significantly alter the aircraft's flight path.*

Adverse turbulence from any source is most critical during initial climb after take-off until the aircraft is established in a climb and at the appropriate speed, and during final approach where the aircraft is configured for landing and operating at a slow speed prior to landing.

2.9. Marking and Lighting of WTGs

CASR Part 139 Manual of Standards provides details for the marking and lighting of obstacles at and within the vicinity of a certified aerodrome.

The National Airports Safeguarding Framework (NASF), Guideline D, *Managing the Risk to aviation safety of wind turbine installations (wind farms)/Wind Monitoring Towers* suggests consideration of the following measures specific to the marking and lighting of WMTs:

- *the top 1/3 of wind monitoring towers to be painted in alternating contrasting bands of colour. Examples of effective measures can be found in the Manual of Standards for Part 139 of the Civil Aviation Safety Regulations 1998. In areas where aerial agriculture operations take place, marker balls or high visibility flags can be used to increase the visibility of the towers;*
- *marker balls or high visibility flags or high visibility sleeves placed on the outside guy wires;*
- *ensuring the guy wire ground attachment points have contrasting colours to the surrounding ground/vegetation; or*
- *a flashing strobe light during daylight hours.*

It is Aviation Projects assessment that there would only be a limited number of low-level flight operations in this area and therefore is an acceptable level of aviation safety risk associated with the potential for an aircraft collision with WTG and WMTs that are not provided with obstacle lighting.

This section establishes the external context to ensure that stakeholders and their objectives are considered when developing risk management criteria, and that externally generated threats and opportunities are properly taken into account.

General aviation operations

The general aviation (GA) activity group is considered by the Australian Transport Safety Bureau (ATSB) to be all flying activities that do not involve commercial air transport (activity group), which includes scheduled (RPT) and non-scheduled (charter) passenger and freight type. It may involve Australian civil (VH–) registered aircraft, or aircraft registered outside of Australia.

General aviation/recreational encompasses:

- Aerial work (activity type). Includes activity subtypes: agricultural mustering, agricultural spreading/spraying, other agricultural flying, photography, policing, firefighting, construction – sling loads, other construction, search and rescue, observation and patrol, power/pipeline surveying, other surveying, advertising, and other aerial work
- Own business travel (activity type)
- Instructional flying (activity type). Includes activity subtypes: solo and dual flying training, and other instructional flying

- Sport and pleasure flying (activity type). Includes activity subtypes: pleasure and personal transport, glider towing, aerobatics, community service flights, parachute dropping, and other sport and pleasure flying
- Other general aviation flying (activity type). Includes activity subtypes: test flights, ferry flights and other flying.

ATSB occurrence taxonomy

The ATSB uses a taxonomy of occurrence sub-type. Of specific relevance to the subject assessment are terms associated with terrain collision. Definitions sourced from the ATSB website are provided below:

- Collision with terrain: Occurrences involving a collision between an airborne aircraft and the ground or water, where the flight crew were aware of the terrain prior to the collision.
- Controlled flight into terrain (CFIT): Occurrences where a serviceable aircraft, under flight crew control, is inadvertently flown into terrain, obstacles, or water without either sufficient or timely awareness by the flight crew to prevent the event.
- Ground strike: Occurrences where a part of the aircraft drags on, or strikes, the ground or water while the aircraft is in flight, or during take-off or landing.
- Wirestrike: Occurrences where an aircraft strikes a wire, such as a powerline, telephone wire, or guy wire, during normal operations.

National aviation occurrence statistics 2010-2019

The Australian Transport Safety Bureau (ATSB) recently published a summary of aviation occurrence statistics for the period 2010-2019 (AR-2020-014, Final - 29 April 2020).

According to the report, there were no fatalities in high or low capacity RPT operations during the period 2010-2019. In 2019, 220 aircraft were involved in accidents in Australia, and a further 154 aircraft involved in serious incidents (an incident with a high probability of becoming an accident). In 2019 there were 35 fatalities from 22 fatal accidents. There have been no fatalities in scheduled commercial air transport in Australia since 2005.

Of the 326 fatalities recorded in the 10-year period, almost two thirds (175 or 53.68%) occurred in the general aviation segment. On average, there were 1.51 fatalities per aircraft associated with a fatality in this segment. The fatalities to aircraft ratio ranges from 1.09 to 177:1. Whilst it can be inferred from the data that the majority of fatal accidents are single person fatalities, it is reasonable to assert that the worst credible effect of an aircraft accident in the general aviation category will be multiple fatalities.

A breakdown of aircraft and fatalities by general aviation sub-categories is provided in Table 2 (source: ATSB).

Table 2 Number of fatalities by General Aviation sub-category - 2010 to 2019

Sub-category	*Aircraft assoc. with fatality*	*Fatalities*	*Fatalities to aircraft ratio*
Aerial work	37	44	1.18:1
Instructional flying	11	19	1.72:1
Own business travel	3	5	1.6:1
Sport and pleasure flying	53	94	1.77:1
Other general aviation flying	11	12	1.09:1
Totals	115	174	1.51:1

Figure 3 refers to Fatal Accident Rate by operation type per million departures over the 6-year period (source: ATSB). Note the rates presented are not the full year range of the study (2010–2019). This was due to the availability of exposure data (departures and hours flown) which was only available between these years. According to the ATSB report, the number of fatal accidents per million departures for GA aircraft over the 6-year reporting period ranged between 6.6 in 2014 and 4.9 in 2019.

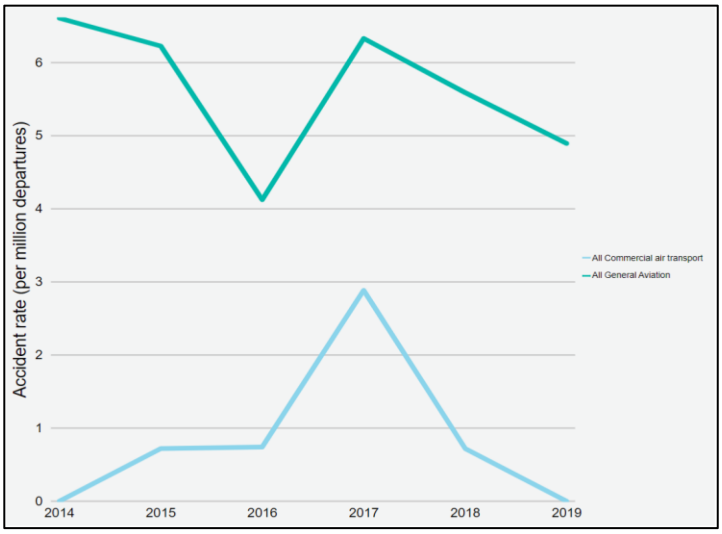

Figure 3 Fatal Accident rate (per million departures by operation type

In 2018, there were 9 fatal accidents and 9 fatalities involving GA aircraft, resulting in a rate of 5.6 fatal accidents per million departures and 7.7 fatal accidents per million hours flown.

In 2019, there were 1,760,000 landings, and 1,320,000 hours flown by VH-registered general aviation aircraft in Australia, with 8 fatal accidents and 17 fatalities. Based on these results, in 2019 there were 4.9 fatal accidents per million departures and 6.4 fatal accidents per million hours flown. A summary of fatal accidents from 2010-2019 by GA sub-category is provided in Table 3 (source: ATSB).

Table 3 Fatal accidents by GA sub-category – 2010 -2019

Sub-category	*Fatal accidents*	*Fatalities*
Agricultural spreading/spraying	13	13
Agricultural mustering	11	12
Other agricultural	1	1
Survey and photographic	5	10
Search and rescue	2	2
Firefighting	2	2
Other aerial work	3	4
Instructional flying	11	19
Own business travel	3	5
Sport and pleasure flying	53	94
Other general aviation flying	11	12
Total	**115**	**174**

Over the 10-year period and subsequently, no aircraft has collided with a WTG or a WMT in Australia.

Of the 20,529 incidents, serious incidents and accidents in GA operations in the 10-year period, 1,404 (6.83%) were terrain collisions.

The underlying fatality rate for GA operations discussed above is considered tolerable within Australia's regulatory and social context.

Worldwide accidents involving wind farms

Worldwide since aviation accident statistics have been recorded, there have been a total of 5 aviation accidents involving a wind farm (i.e. where WTGs were erected). To provide some perspective on the likelihood of a VFR aircraft colliding with a WTG, a summary of the 4 accidents and the relevant factors applicable to this assessment is incorporated in this section.

Based on the statistics set out in the Global Wind Energy Council (GWEC) report 2016, there were 341,320 WTGs operating around the world at the end of 2016.

Based on the Australia's Clean Energy Council statistics there were 102 wind farms in Australia at the end of 2019. Aviation Projects has researched public sources of information, regarding aviation safety occurrences associated with wind farms. Occurrence information published by Australia, Canada, Europe (Belgium, Denmark, France, Germany, Norway, Sweden and The Netherlands), New Zealand, the United Kingdom and the United States of America was reviewed.

The 5 recorded aviation accidents involving a wind farm are summarised as follows:

- One accident occurred in Texas, United States in October 2019 resulting in minor aircraft damage but no injury to the pilot and significant injury to a person on the ground. The aircraft, an Air Tractor AT502, was returning from a local aerial application flight and was flown deliberately at low-level in close vicinity to a wind turbine generator (WTG) because the pilot believed his friend was working on the turbine. The aircraft collided with a tagline rope that was attached to a blade of the WTG and which was being held by a person working on the ground. The worker was thrown about 20 ft in the air and experienced significant non-life-threatening injuries. The aircraft sustained minor damage however the pilot landed the aircraft without further incident.

- One accident, which resulted in 2 fatalities, occurred in Palm Springs in 2001. This accident involved a wind farm but was not caused by the wind farm. The cause of the accident was the inflight separation of the majority of the right canard and all of the right elevator resulting from a failure of the builder to balance the elevators per the kit manufacturer's instructions. The accident occurred above a wind farm, and the aircraft struck a WTG on its descent and therefore the cause of the accident was not attributable to the wind farm and not applicable to this AIA.
- Two accidents involving collision with a WTG were during the day, as follows:
- One accident occurred in Melle, Germany in 2017 as the result of a collision with a WTG mounted on a steel lattice tower at a very low altitude during the day with good visibility and no cloud. The accident resulted in one fatality. If the tower was solid and painted white, as is standard on contemporary wind farms, then it more than likely would have been more visible than if it were to be equipped with an obstacle light which in all likelihood would not have been operating during daylight with good visibility conditions.
- One accident occurred in Plouguin, France in 2008 when the pilot decided to descend below cloud in an attempt to find the destination aerodrome. The aircraft was flying in conditions of significantly reduced horizontal visibility in fog where the top of the WTGs were obscured by cloud. The WTGs became visible too late for avoidance manoeuvring and the aircraft made contact with two WTGs. The aircraft was damaged but landed safely. No fatalities were recorded.

In both cases, it is difficult to conclude that obstacle lighting would have prevented the accidents.

- One fatal accident, near Highmore, South Dakota in 2014 occurred at night in Instrument Meteorological Conditions (IMC).

There is one other accident mentioned in a database compiled by an anti-wind farm lobby group (wind-watch.org), which suggests a Cessna 182 collided with a WTG near Baraboo, Wisconsin, on 29 July 2000. The NTSB database records details of an accident involving a Cessna 182 that occurred on 28 July 2000 in the same area. For this particular accident, NTSB found that the probable cause of the accident was VFR flight into IMC encountered by the pilot and exceeding the design limits of the aircraft. A factor was flight to a destination alternate not performed by the pilot. No mention in the NTSB database is made of WTGs or a wind farm.

2.10. Risk Assessment

A risk management framework is comprised of likelihood and consequence descriptors, a matrix used to derive a level of risk, and actions required of management according to the level of risk.

The risk assessment framework used by Aviation Projects and risk event description is provided in Annexure 3.

Risk Identification

The primary risk being assessed is that of aviation safety associated with the height and location of WTGs and WMTs proposed by the Project.

Based on an extensive review of accident statistics data (see summary above) and stakeholders who were consulted during the preparation of this AIA, 4 identified risk events associated with WTGs relate to aviation safety or potential visual impact, and are listed as follows:

1. Potential for an aircraft to collide with a WTG, controlled flight into terrain (CFIT) (related to aviation safety).
2. Potential for a pilot to initiate manoeuvring in order to avoid colliding with a WTG resulting in collision with terrain (related to aviation safety).
3. Potential for the hazards associated with the Project to invoke operational limitations or procedures on operating crew (related to aviation safety).
4. Potential effect of obstacle lighting on neighbours (related to potential visual impact).

It should be noted that according to guidance provided by the Commonwealth Department of Infrastructure, Transport, Regional Development and Communications, and in line with generally accepted practice, the risk to be assessed should primarily be associated with passenger transport services. Therefore, the risk being assessed herein is primarily associated with smaller aircraft likely to be flying under the VFR, and so the maximum number of passengers exposed to the nominated consequences is likely to be limited.

The four risk events identified here are assessed in detail in the following section.

Risk Analysis, Evaluation and Treatment

For the purpose of considering applicable consequences, the concept of worst credible effect has been used.

Untreated risk is first evaluated, then, if the resulting level of risk is unacceptable, further treatments are identified to reduce the residual level of risk to an acceptable level.

A summary of the level of risk associated with the Project, under the proposed treatment regime, with specific consideration of the effect of obstacle lighting, is provided in Table 4 through to Table 7.

Table 4 Aircraft collision with wind turbine generator (WTG)

Risk ID:	1. Aircraft collision with wind turbine generator (WTG) (CFIT)

Discussion

An aircraft collision with a WTG would result in harm to people and damage to property. Property could include the aircraft itself, as well as the WTG.

There have been 5 reported occurrences worldwide of aircraft collisions with a component of a WTG structure since the year 2000 as discussed in above. These reports show a range of situations where pilots were conducting various flying operations at low level and in the vicinity of wind farms in both IMC and VMC. No reports of aircraft collisions with wind farms in Australia have been found.

In consideration of the circumstances that would lead to a collision with a WTG:

- GA VFR aircraft operators generally don't individually fly a significant number of hours in total, let alone in the area in question
- There is a very small chance that a pilot, suffering the stress of weather, will continue into poor weather conditions (contrary to the rules of flight) rather than divert away from it, is not aware of the wind farm, will not consider it or will not be able to accurately navigate around it.
- If the aircraft was flown through the wind farm, there is still a very small chance that it would hit a WTG.

Refer to the discussion of worldwide accidents in above.

There are no known aerial application operations conducted at night in the vicinity of the Project site.

If a proposed object or structure is identified as likely to be an obstacle, details of the relevant proposal must be referred to CASA for CASA to determine, in writing:

(a) whether the object or structure will be a hazard to aircraft operations

(b) whether it requires an obstacle light that is essential for the safety of aircraft operations

The Project site is clear of the obstacle limitation surfaces (OLS) of any aerodrome.

Consequence

If an aircraft collided with a WTG, the worst credible effect would be multiple fatalities and damage beyond repair. This would be a Catastrophic consequence.

Consequence	Catastrophic

Untreated Likelihood

There have been 5 reports of aircraft collisions with WTGs worldwide, which have resulted in a range of consequences, where aircraft occupants sustained minor injury in some cases and fatal injuries in others. Similarly, aircraft damage sustained ranged from minor to catastrophic. One of these accidents resulted from structural failure of the aircraft before the collision with the WTG. Only two relevant accidents occurred during the day, and only one resulted in a single fatality. It is assessed that collision with a WTG resulting in multiple fatalities and damage beyond repair is unlikely to occur, but possible (has occurred rarely), which is classified as Possible.

Untreated Likelihood	Possible

Current Treatments (without lighting)

- The Project site is clear of the obstacle limitation surfaces (OLS) of any aerodrome.
- Aircraft are restricted to a minimum height of 500 ft (152.4 m) AGL above the highest point of the terrain and any object on it within a radius of 300 m in visual flight during the day when not in the vicinity of built-up areas. WTGs will be a maximum of 247 m (810.4 ft) at the top of the blade tip. The rotor blade at its maximum height will be approximately 94.6 m (310.4 ft) above aircraft flying at the minimum altitude of 152.4 m AGL (500 ft).
- In the event that descending cloud forces an aircraft lower than 500 ft (152.4 m) AGL, the minimum visibility of 5,000 m required for visual flight during the day should provide adequate time for pilots to observe and manoeuvre their aircraft clear of WTGs.
- If cloud descends below the WTG hub (assumed to be approximately 200 m AGL), obstacle lighting would be obscured and therefore ineffective.
- At night, during visual flight, aircraft are restricted to a minimum height of 304.8 m (1,000 ft) above obstacles (including terrain) which are within 10 nm of the aircraft and potentially even higher during instrument flight (day or night).
- Aircraft authorised to intentionally fly below 152.4 m (500 ft) AGL (day) or below safety height (night) are operated in accordance with procedures developed as an outcome of thorough risk management activities undertaken specifically for and prior to undertaking such authorised flights. Any obstacle including WTGs in the path of the authorised flight would be specifically risk assessed during that process.
- The WTGs are typically coloured white so they should be visible to pilots during the day.
- The 'as constructed' details of WTGs are required to be notified to Airservices Australia so that the location and height of all WTGs can be noted on aeronautical maps and charts.
- Because the Project WTGs are proposed to be above 100 m AGL, there is a statutory requirement to report the WTGs to CASA and notified to Airservices Australia prior to construction.

Level of Risk

The level of risk associated with a Possible likelihood of a Catastrophic consequence is 8 (Unacceptable).

Current Level of Risk	8 - Unacceptable

Risk Decision

A risk level of 8 is classified as Unacceptable: Immediate action required by either treating or avoiding risk. Refer to executive management.

Risk Decision	Unacceptable

Recommended Treatments

The following treatments which can be implemented at little cost will provide an acceptable level of safety:

- Details of the Project should be communicated to local and regional aircraft operators prior to construction to heighten their awareness of its location and so that they can plan their operations accordingly. Specifically:

○ Engage with local aerial agricultural and aerial firefighting operators to develop procedures, which may include, for example, stopping the rotation of the WTG blades prior to the commencement of the subject aircraft operations within the Project site. ○ Arrangements should be made to publish details of the Project in ERSA for surrounding aerodromes, which would involve notification to Airservices Australia. ○ Landholders with wind farm components located on their landholding are obliged to inform the pilots or operating companies invited to conduct aerial applications of the obstacle environment prior to such operations commencing.	
Residual Risk With the implementation of the Recommended Treatments listed above, the likelihood of an aircraft collision with a WTG resulting in multiple fatalities and damage beyond repair will be **Unlikely**, and the consequence remains **Catastrophic**, resulting in an overall risk level of **7 - Tolerable**. It is considered that the significant cost of obstacle lighting (which is not a preventative control), may only slightly reduce the likelihood of a collision given that the pilot is already in a highly undesirable situation (and not in all situations – such as where the obstacle light may be obscured by cloud) and hence is not justified. The level of risk with the implementation of the Recommended Treatments is considered **As Low As Reasonably Practicable (ALARP).** **It is our assessment that there will be an acceptable level of aviation safety risk associated with the potential for an aircraft collision with a Project WTG without obstacle lighting on the WTGs.**	
Residual Risk	7 - Tolerable

Table 5 Harsh manoeuvring leading to controlled flight into terrain

Risk ID:	2. Harsh manoeuvring leads to controlled flight into terrain (CFIT)

Discussion

An aircraft colliding with terrain as a result of manoeuvring to avoid colliding with a WTG would result in harm to people and damage to property.

There are a few ground collision accidents resulting from manoeuvring to avoid wind farms, but none in Australia, and all were during the day.

The Project is clear of the OLS of all aerodromes.

Aircraft are restricted to a minimum height of 500 ft (152.4 m) AGL above the highest point of the terrain and any object on it within a radius of 300 m in visual flight during the day when not in the vicinity of built-up areas. WTGs will be a maximum of 247 m (810.4 ft) at the top of the blade tip. The rotor blade at its maximum height will be approximately 94.6 m (310.4 ft) above aircraft flying at the minimum altitude of 152.4 m AGL (500 ft).

Nevertheless, the minimum visibility of 5000 m required for visual flight during the day should provide adequate time for pilots to observe and manoeuvre their aircraft clear of WTGs.

If cloud descends below the WTG hub, obstacle lighting would be obscured and therefore ineffective.

Aircraft are restricted to a minimum height of 304.8 m (1000 ft) above obstacles within 10 nm of the aircraft in visual flight at night and potentially even higher during instrument flight (day or night).

Aircraft authorised to intentionally fly below 152.4 m (500 ft) AGL (day) or below safety height (night) are operated in accordance with procedures developed as an outcome of thorough risk management activities.

Assumed risk treatments

- The WTGs are typically coloured white so they should be visible during the day.
- The WMTs are marked in accordance with NASF Guidelines so they should be visible during the day.
- The 'as constructed' details of WTGs and WMTs are required to be notified to Airservices Australia so that the location and height of WTGs can be noted on aeronautical maps and charts.
- Since the WTGs and WMTs will be higher than 100 m AGL, there is a statutory requirement to report the WTG to CASA.
- Landholders with wind farm components located on their landholding are obliged to inform the pilots or operating companies invited to conduct aerial applications of the obstacle environment prior to such operations commencing.

Consequence

If an aircraft collided with terrain, the worst credible effect would be multiple fatalities and damage beyond repair. This would be a Catastrophic consequence.

Consequence	Catastrophic

Untreated Likelihood

There are a few ground collision accidents resulting from manoeuvring to avoid WTGs, but none in Australia, and all were during the day. It is assessed that a ground collision accident following manoeuvring to avoid a WTG is unlikely to occur, but possible (has occurred rarely), which is classified as Possible.

Untreated Likelihood	Possible

- Current Treatments (without lighting)
- The Project is clear of the OLS of any aerodrome
- Aircraft are restricted to a minimum height of 500 ft (152.4 m) AGL above the highest point of the terrain and any object on it within a radius of 300 m in visual flight during the day when not in the vicinity of built-up areas. WTGs will be a maximum of 247 m (810.4 ft) at the top of the blade tip. The rotor blade at its maximum height will be approximately 94.6 m (310.4 ft) above aircraft flying at the minimum altitude of 152.4 m AGL (500 ft).
- The WMTs, at a maximum height of 130 m AGL are marked in accordance with NASF Guidelines so they should be visible during the day
- Nevertheless, the minimum visibility of 5000 m required for visual flight during the day should provide adequate time for pilots to observe and manoeuvre their aircraft clear of WTGs and WMTs.
- If cloud descends below the WTG hub, obstacle lighting would be obscured and therefore ineffective.
- Aircraft are restricted to a minimum height of 304.8 m (1000 ft) above obstacles within 10 nm of the aircraft in visual flight at night and potentially even higher during instrument flight (day or night).
- Aircraft authorised to intentionally fly below 152.4 m AGL (500 ft) (day) or below safety height (night) are operated in accordance with procedures developed as an outcome of thorough risk management activities.
- The WTGs are typically coloured white, typical of most WTGs operational in Australia, so they should be visible during the day.
- The WMTs will be marked in accordance with NASF guidelines so they should be visible during the day.
- The 'as constructed' details of WTGs and WMTs are required to be notified to Airservices Australia so that the location and height of wind farms can be noted on aeronautical maps and charts.
- Since the WTGs and WMTs will be higher than 100 m AGL, there is a statutory requirement to report the WTGs to CASA.

Level of Risk

The level of risk associated with a Possible likelihood of a Catastrophic consequence is 8.

Current Level of Risk	8 – Unacceptable

Risk Decision

A risk level of 8 is classified as Unacceptable: Immediate action required by either treating or avoiding risk. Refer to executive management.

Risk Decision	Unacceptable

Recommended Treatments The following treatments which can be implemented at little cost will provide an acceptable level of safety: • Ensure details of the Project WTGs have been communicated to Airservices Australia, and local and regional aerodrome and aircraft operators prior to construction. • Although there is no requirement to do so, the Proponent may consider engaging with local aerial agricultural and aerial firefighting operators to develop procedures for their safe operation within the Project site. • Landholders with wind farm components located on their landholding are obliged to inform the pilots or operating companies invited to conduct aerial applications of the obstacle environment prior to such operations commencing.
Residual Risk With the additional Recommended Treatments listed above, the likelihood of ground collision resulting from manoeuvring to avoid a WTG resulting in multiple fatalities and damage beyond repair will be **Unlikely**, and the consequence remains **Catastrophic**, resulting in an overall risk level of **7 – Tolerable.** It is considered that the significant cost of obstacle lighting (which is not a preventative control), may only slightly reduce the likelihood of a collision given that the pilot is already in a highly undesirable situation (and not in all situations – such as where the obstacle light may be obscured by cloud) and hence is not justified. In the circumstances, the level of risk under the proposed treatment plan is considered **ALARP.** **It is assessed that there is an acceptable level of aviation safety risk associated with the potential for ground collision resulting from manoeuvring to avoid a Project WTG without obstacle lighting on the WTGs.**

Residual Risk	7 - Tolerable

Table 6 Effect of the Project on operating crew

Risk ID:	3. Effect of the Project on operating crew

Discussion

Introduction or imposition of additional operating procedures or limitations can affect an aircraft's operating crew.

There are no known aerial application operations conducted at night in the vicinity of the Project site.

Consequence

The worst credible effect a wind farm could have on flight crew would be the imposition of operational limitations, and in some cases, the potential for use of emergency procedures. This would be a Minor consequence.

Consequence	Minor

Untreated Likelihood

The imposition of operational limitations is unlikely to occur, but possible (has occurred rarely), which is classified as Possible.

Untreated Likelihood	Possible

Current Treatments

- The Project is clear of the OLS of all aerodromes.
- Aircraft are restricted to a minimum height of 500 ft (152.4 m) AGL above the highest point of the terrain and any object on it within a radius of 300 m in visual flight during the day when not in the vicinity of built-up areas.
- WTGs will be a maximum of 247 m (810.4 ft) at the top of the blade tip. The rotor blade at its maximum height will be approximately 94.6 m (310.4 ft) above aircraft flying at the minimum altitude of 152.4 m AGL (500 ft).
- In the event that descending cloud forces an aircraft lower than 500 ft (152.4 m) AGL, the minimum visibility of 5000 m required for visual flight during the day should provide adequate time for pilots to observe and manoeuvre their aircraft clear of WTGs.
- Nevertheless, the minimum visibility of 5000 m required for visual flight during the day should provide adequate time for pilots to observe and manoeuvre their aircraft clear of WTGs.
- If cloud descends below the WTG hub, obstacle lighting would be obscured and therefore ineffective.
- Aircraft are restricted to a minimum height of 304.8 m (1000 ft) above obstacles within 10 nm of the aircraft in visual flight at night and potentially even higher during instrument flight (day or night).
- Aircraft authorised to intentionally fly below 152.4 m AGL (500 ft) (day) or below safety height (night) are operated in accordance with procedures developed as an outcome of thorough risk management activities.
- The WTGs are typically coloured white so they should be visible during the day.

- The 'as constructed' details of WTGs are required to be notified to Airservices Australia so that the location and height of wind farms can be noted on aeronautical maps and charts.
- Since the WTGs will be higher than 100 m AGL, there is a statutory requirement to report the WTGs to CASA.

Level of Risk

The level of risk associated with a Possible likelihood of a Minor consequence is 5.

Current Level of Risk	5 - Tolerable

Risk Decision

A risk level of 5 is classified as Tolerable: Treatment action possibly required to achieve ALARP - conduct cost/benefit analysis. Relevant manager to consider for appropriate action.

Risk Decision	Accept, conduct cost benefit analysis

Recommended Treatments

Given the current treatments and the limited scale and scope of flying operations conducted within the vicinity of the Project site, there is likely to be little additional safety benefits to be gained by installing obstacle lighting for WTGs and Permanent WMTs which are in close proximity to WTGs.

CASA - Reference: Assessment: 11120038 Register No: 10.2022.292.1

> *CASA is not recommending red obstacle lighting for night visibility. And there is no regulatory requirement for obstacle lighting. It is recommended that Goldwind evaluates potential hazards to low flying aircraft using any unregulated aerodromes in the vicinity. If there is going to be night flying in the area for some reason (eg. mine surveys, emergency services, fire control, land management etc) consideration could be given to lighting the masts with red obstacle lights (minimum intensity 200 candela) at night and during periods of poor visibility at the top of the structure. The following additional treatments will provide an additional margin of safety:*

- Ensure details of the Project WTGs and WMTs have been communicated to Airservices Australia, and local and regional aerodrome and aircraft operators prior to construction.
- Although there is no requirement to do so, the Proponent may consider engaging with local aerial agricultural and aerial firefighting operators to develop procedures for such aircraft operations in the vicinity of the Project site.
- Landholders with wind farm components located on their landholding are obliged to inform the pilots or operating companies invited to conduct aerial applications of the obstacle environment prior to such operations commencing.

Residual Risk Notwithstanding the current level of risk is considered **Tolerable,** the additional Recommended Treatments listed above will enhance aviation safety. The likelihood remains **Possible**, and consequence remains **Minor.** In the circumstances, the risk level of 5 is considered **ALARP.** **It is our assessment that there is an acceptable level of aviation safety risk associated with the potential for operational limitations to affect aircraft operating crew, without obstacle lighting on the Project WTGs and Permanent WMTs in close proximity to a WTG, and with obstacle lighting for temporary WMTs installed prior to WTG installation and WMTs that are not in close proximity to a WTG.**	
Residual Risk	5 – Tolerable

Table 7 Effect of obstacle lighting on neighbours

Risk ID:	*4.* **Effect of obstacle lighting on neighbours**
Discussion This scenario discusses the consequential impact of a decision to install obstacle lighting on the wind farm. Installation and operation of obstacle lighting on WTGs or WMT can have an effect on neighbours' visual amenity and enjoyment, specifically at night and in good visibility conditions. If a proposed object or structure is identified as likely to be an obstacle, details of the relevant proposal must be referred to CASA for CASA to determine, in writing: (a) whether the object or structure will be a hazard to aircraft operations (b) whether it requires an obstacle light that is essential for the safety of aircraft operations. In general, objects outside an OLS and above 100 m would require obstacle lighting unless CASA, in an aeronautical study, assesses it is shielded by another lit object or it is of no operational significance.	
Consequence The worst credible effect of obstacle lighting specifically at night in good visibility conditions would be: • Moderate site impact, minimal local impact, important consideration at local or regional level, possible long-term cumulative effect. Not likely to be decision making issues. Design and mitigation measures may ameliorate some consequences. This would be a Moderate consequence.	
Consequence	Moderate
Untreated Likelihood The likelihood of moderate site impact, minimal local impact is Almost certain - the event is likely to occur many times (has occurred frequently).	
Untreated Likelihood	Almost certain
Current Treatments If the WTGs or WMTs will be higher than 150 m (492 ft) AGL, they must be regarded as obstacles unless CASA assess otherwise. In general, objects outside an OLS and above 100 m would require obstacle lighting unless CASA, in an aeronautical study, assesses it is shielded by another lit object or it is of no operational significance.	
Level of Risk The level of risk associated with an Almost certain likelihood of a Moderate consequence is 8.	
Current Level of Risk	8 - Unacceptable
Risk Decision A risk level of 8 is classified as Unacceptable: Immediate action required by either treating or avoiding risk. Refer to executive management.	

Risk Decision	Unacceptable

Recommended Treatments

Not installing obstacle lighting would completely remove the source of the impact.

As per the above safety risk assessment, the provision of lighting for the WTGs and permanent WMTs is not necessary to provide an acceptable level of safety. For temporary WMTs installed prior to WTG installation and WMTs that are not in close proximity to a WTG, obstacle lighting is recommended to ensure visibility in low light and deteriorating atmospheric conditions.

If CASA or a planning authority decide that obstacle lighting is required there are impact reduction measures that can be implemented to reduce the impact of lighting on surrounding neighbours, including:

- reducing the number of WTGs with obstacle lights
- specifying an obstacle light that minimises light intensity at ground level
- specifying an obstacle light that matches light intensity to meteorological visibility
- mitigating light glare from obstacle lighting through measures such as baffling.
- These measures are designed to optimise the benefit of the obstacle lights to pilots while minimising the visual impact to residents within and around the Project site.

Consideration may be given to activating the obstacle lighting via a pilot activated lighting system.

An option is to consider using Aircraft Detection Lighting Systems (referred in the United States Federal Aviation Administration Advisory Circular AC70/7460-1L CHG1 – *Obstruction Marking and Lighting*). Such a system would only activate the lights when an aircraft is detected in the near vicinity and deactivate the lighting once the aircraft has passed. This technology reduces the impact of night lighting on nearby communities and migratory birds and extends the life expectancy of obstruction lights.

Residual Risk

Not installing obstacle lights would clearly be an acceptable outcome to those potentially affected by visual impact.

If lighting is required, consideration of visual impact in the lighting design should enable installation of lighting that reduces the impact to neighbours.

The likelihood of a **Moderate** consequence remains **Likely**, with a resulting risk level of **7 – Tolerable**.

It is our assessment that visual impact from obstacle lights can be negated if they are not installed. If obstacle lights are to be installed, they can be designed so that there is an acceptable risk of visual impact to neighbours.

Residual Risk	7 - Tolerable

2.11. Summary of risks

A summary of the level of residual risk associated with the Project with the Recommended Treatments implemented, is provided in Table 8.

Table 8 Summary of Residual Risks

Identified Risk	*Consequence*	*Likelihood*	*Risk*	*Actions Required*
Aircraft collision with wind turbine generator (WTG)	Catastrophic	Unlikely	7	Acceptable without obstacle lighting (ALARP). Communicate details of the Project WTGs to local and regional operators and make arrangements to publish details in ERSA for surrounding aerodromes before, during and following construction.
Avoidance manoeuvring leads to ground collision	Catastrophic	Unlikely	7	Acceptable without obstacle lighting (ALARP). Communicate details of the Project WTGs to local and regional operators and make arrangements to publish details in ERSA for surrounding aerodromes before, during and following construction.
Effect on crew	Minor	Possible	5	Acceptable without obstacle lighting (ALARP) Communicate details of the Project WTGs to local and regional operators and make arrangements to publish details in ERSA for surrounding aerodromes before, during and following construction.
Visual impact from obstacle lights	Moderate	Likely	7	Acceptable without obstacle lighting (zero risk of visual impact from obstacle lighting). If lights are installed, design to minimise impact.

3. RISK FRAMEWORK

A risk management framework is comprised of likelihood and consequence descriptors, a matrix used to derive a level of risk, and actions required of management according to the level of risk.

The risk assessment framework used by Aviation Projects has been developed in consideration of ISO 31000:2018 *Risk management—Guidelines* and the guidance provided by CASA in its Safety Management System (SMS) for Aviation guidance material, which is aligned with the guidance provided by the International Civil Aviation Organization (ICAO) in Doc 9589 *Safety Management Manual*, Third Edition, 2013. Doc 9589 is intended to provide States (including Australia) with guidance on the development and implementation of a State Safety Programme (SSP), in accordance with the International SARPs, and is therefore adopted as the primary reference for aviation safety risk management in the context of the subject assessment.

Section 2.1 of the ICAO Doc 9589 *The concept of safety* defines safety as follows [author's underlining]:

> *2.1.1 Within the context of aviation, safety is "the state in which the possibility of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and safety risk management."*

Likelihood

Likelihood is defined in ISO 31000:2018 as the chance of something happening. Likelihood descriptors used in this report are as indicated in Table 9.

Table 9 Likelihood Descriptors

No	Descriptor	Description
1	Rare	It is almost inconceivable that this event will occur
2	Unlikely	The event is very unlikely to occur (not known to have occurred)
3	Possible	The event is unlikely to occur, but possible (has occurred rarely)
4	Likely	The event is likely to occur sometimes (has occurred infrequently)
5	Almost certain	The event is likely to occur many times (has occurred frequently)

Consequence

Consequence is defined as the outcome of an event affecting objectives, which in this case is the safe and efficient operation of aircraft, and the visual amenity and enjoyment of local residents.

Consequence descriptors used in this report are as indicated in Table 10.

Table 10 Consequence Descriptors

No	Descriptor	People Safety	Property/Equipment	Effect on Crew	Environment
1	Insignificant	Minor injury – first aid treatment	Superficial damage	Nuisance	No effects or effects below level of perception
2	Minor	Significant injury – outpatient treatment	Moderate repairable damage – property still performs intended functions	Operations limitation imposed. Emergency procedures used.	Minimal site impact – easily controlled. Effects raised as local issues, unlikely to influence decision making. May enhance design and mitigation measures.
3	Moderate	Serious injury - hospitalisation	Major repairable damage – property performs intended functions with some short-term rectifications	Significant reduction in safety margins. Reduced capability of aircraft/crew to cope with conditions. High workload/stress on crew. Critical incident stress on crew.	Moderate site impact, minimal local impact, and important consideration at local or regional level, possible long-term cumulative effect. Not likely to be decision making issues. Design and mitigation measures may ameliorate some consequences.
4	Major	Permanent injury	Major damage rendering property ineffective in achieving design functions without major repairs	Large reduction in safety margins. Crew workload increased to point of performance decrement. Serious injury to small number of occupants. Intense critical incident stress.	High site impact, moderate local impact, important consideration at state level. Minor long-term cumulative effect. Design and mitigation measures unlikely to remove all effects.
5	Catastrophic	Multiple Fatalities	Damaged beyond repair	Conditions preventing continued safe flight and landing. Multiple deaths with loss of aircraft	Catastrophic site impact, high local impact, national importance. Serious long-term cumulative effect. Mitigation measures unlikely to remove effects.

Risk matrix

The risk matrix, which correlates likelihood and consequence to determine a level of risk, used in this report is shown in Table 11.

Table 11 Risk Matrix

		CONSEQUENCE				
		INSIGNIFICANT 1	MINOR 2	MODERATE 3	MAJOR 4	CATASTROPHIC 5
LIKELIHOOD	ALMOST CERTAIN 5	6	7	8	9	10
	LIKELY 4	5	6	7	8	9
	POSSIBLE 3	4	5	6	7	8
	UNLIKELY 2	3	4	5	6	7
	RARE 1	2	3	4	5	6

Actions required

Actions required according to the derived level of risk are shown in Table 12

Table 12 Actions Required

8-10	Unacceptable Risk	Immediate action required by either treating or avoiding risk. Refer to executive management.
5-7	Tolerable Risk	Treatment action possibly required to achieve As Low As Reasonably Practicable (ALARP) - conduct cost/benefit analysis. Relevant manager to consider for appropriate action.
0-4/5	Broadly Acceptable Risk	Managed by routine procedures, and can be accepted with no action.

4. REFERENCES

References used or consulted in the preparation of this report include:

- Airservices Australia, Aeronautical Information Package effective 13 June 2024
- Civil Aviation Safety Authority:
    - Civil Aviation Regulations 1988 (CAR)
    - Civil Aviation Safety Regulations 1998 (CASR)
    - CASR Part 139 (Aerodromes) Manual of Standards 2019, dated 10 February 2024
    - CASR Part 173 Manual of Standards– *Standards Applicable to Instrument Flight Procedure Design*, version 1.5, dated March 2016
    - Advisory Circular (AC) 91-10 v1.1: *Operations in the vicinity of non-controlled aerodromes*, dated November 2021
    - AC 139.E-01 v1.0—*Reporting of Tall Structures* , dated December 2021
    - AC 139.E-05 v1.0 Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome
- Department of Infrastructure, Transport, Regional Development and Communications, Australian Government, National Airport Safeguarding Framework, Guideline D *Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation*, dated June 2013
- International Civil Aviation Organization (ICAO) Doc 8168 Procedures for Air Navigation Services—Aircraft Operations (PANS-OPS)
- ICAO Standards and Recommended Practices, Annex 14—*Aerodromes*
- OzRunways, aeronautical navigation charts extracts, dated 13 June 2024

5. CONCLUSION

The proposed Mumblin Wind Farm development located approximately 8 km west of Cobden township, in central southwest Victoria, with WTGs to a maximum height of 383.73 m / 1258.96 ft AMSL:

- will not infringe the OLS for any airport or airstrip;
- will not infringe the LSALT protection surfaces of any IFR air route or Grid LSALT;
- will not have an adverse impact upon take-off and landing operations at any airport or known aerodrome;
- will not infringe the PANS-OPS surface of any airport;
- will not have an adverse impact upon the operation of aviation navigation aids;
- will not have an adverse impact upon any ATC Surveillance radar system;
- is located sufficiently far enough away from Cobden and all other aerodromes in the area and may not require obstacle lighting to be installed; and
- will provide a prominent visual navigation feature in the area.

If you wish to clarify or discuss the contents of this correspondence, please contact me on 0424 110 501.

kind regards

ADVERTISED PLAN

Peter White

Airspace Safeguarding Consultant

17 July 2024