Meering West Wind Farm

Aeronautical Impact Assessment

Meering West Wind Farm Pty Ltd as trustee for the Meering West Wind Farm Trust

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Document control record

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Executive Summary

Introduction

Aurecon Australasia Pty Ltd (Aurecon) has been engaged by Meering West Wind Farm Pty Ltd as trustee for the Meering West Wind Farm Trust to facilitate the environmental and planning assessments and approvals for the Meering West Wind Farm Project (the Project), located near Meering West in Northern Victoria. This Project is situated approximately 250 kilometres (km) north of Melbourne and 100 km north of Bendigo. The Project encompasses around 20,000 hectares (ha) of farmland within the Loddon and Gannawarra Local Government Areas.

The Project includes the development of up to 164 wind turbines, complemented by ancillary infrastructure including one permanent meteorological (MET) mast, a Battery Energy Storage System (BESS), a terminal substation, collector stations, underground electricity cables and an internal above ground powerline. A temporary construction compound and two concrete batching plants will be established during the construction phase. The construction phase is expected to span approximately three years, and the Project will have an operational life projected at around 40 years.

Aeronautical Impact Assessment

This Aeronautical Impact Assessment (AIA) includes a review of the Project against regulatory requirements pertaining to the safe operation of aircraft, as well as the consideration of non-regulated impacts to aviation operations for stakeholders in the immediate vicinity of the Project Area.

A review of the Project's impact on nearby certified aerodromes and uncertified aerodromes, relevant Instrument Flight Procedures, airspace classification, designated air routes, low-level navigation routes, other navigational procedures as well as communication, navigation and surveillance (CNS) equipment necessary for the conduct of safe aviation operations has been undertaken.

Following this assessment, it has been determined that the Project presents a minor impact to current aviation operations. Aurecon does not view this impact as a critical flaw to the Project, thus, the Meering West Wind Farm is expected to be viable with respect to aviation considerations.

Key Recommendations

The minor impact identified can be mitigated through effective stakeholder engagement, amendments to existing instrument flight procedures and the Grid lowest safe altitude (LSALT), notification to the Aeronautical Information Services (AIS) and through confirmation of the absence of communication, navigational and surveillance (CNS) systems in the vicinity of the Project Area with Airservices Australia.

Following this, stakeholder engagement activities detailed in this AIA are recommended to ensure that the identified impacts are managed accordingly. This forms important evidence for the Civil Aviation Safety Authority (CASA) – the regulator for aviation safety, if requested in the future.

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Appendix 1 – Project Wind Turbine and Wind Monitoring Tower Coordinates and Heights

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Glossary

Acronym	Definition
AC	Advisory Circular
ADF	Automatic Direction Finder
ADLS	Aircraft Detection Lighting System
AGL	Above Ground Level
AHD	Australian Height Datum
AIA	Aeronautical Impact Assessment
AIS	Aviation Impact Statement
ALA	Aircraft Landing Area
AMSL	Above Mean Sea Level
ARP	Aerodrome Reference Point
ATC	Air Traffic Control
Aurecon	Aurecon Australasia Pty Ltd.
CAR	Civil Aviation Regulations
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulations
CNS	Communication, Navigation and Surveillance
CS	Conical Surface
db	Decibel
db(A)	A-Weighted decibel
DTP	Department of Transport and Planning
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ERC	Enroute Chart
ERSA	En Route Supplement Australia
VFR	Visual Flight Rules
GA	General Aviation
GBAS	Ground Based Augmentation System
GHG	Greenhouse Gases
GNSS	Global Navigation Satellite System
GW	gigawatt
ha	hectares
HF	High Frequency
IAF	Initial Approach Fix
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
IHS	Inner Horizontal Surface
km	Kilometres

kV	Kilovolt
LGA	Local Government Area
LSALT	Lowest Safe Altitude
m	Metres
MAGS	Movement Area Guidance Sign
MET	Meteorological
MOC	Minimum Obstacle Clearance
MOS	Manual of Standards
m/s	Metres per second
MSA	Minimum Safe Altitude
MW	Megawatts
MWh	Megawatt hours
NASF	National Airports Safeguarding Framework
NDB	Non-Directional Beacon
NM	Nautical Mile
OLS	Obstacle Limitation Surface
PANS-Ops	Procedures for Air Navigation Services – Aircraft Operations
PAPI	Precision Approach Path Indicator
Project Area	The area in which construction will take place and for which approvals will be sought.
RAAF	Royal Australian Air Force
RD	Rotor Diameter
RNP	Required Navigation Performance
STE	Serrated Trailing Edges
The Project	Meering West Wind Farm Project
The Proponent	Meering West Wind Farm Pty Ltd as trustee for the Meering West Wind Farm Trust
T-VASIS	Tee Visual Approach Slope Indicator System
VMC	Visual Meteorological Conditions
VNI West	Victoria to New South Wales Interconnector West
VOR	VHF Omnidirectional Range
WTG	Wind Turbine Generator
YBBT	Boort Airport
YCHL	Charlton Airport
YCOH	Cohuna Airport
YGBW	Gunbower Airport
YKER	Kerang Airport
YPYD	Pyramid Hill Airport
YQBK	Quambatook Airport
YSWH	Swan Hill Airport
YWYF	Wycheproof Airport

1 Introduction

Aurecon Australasia Pty Ltd (Aurecon) has been engaged by Meering West Wind Farm Pty Ltd as trustee for the Meering West Wind Farm Trust (the Proponent) to facilitate the environmental and planning assessments and approvals for the Meering West Wind Farm Project (the Project), located near Meering West in Northern Victoria.

1.1 Purpose

This Aeronautical Impact Assessment (AIA) aims to assess and determine the impact to the safety and regularity of flight operations posed by the Project in accordance with relevant legislation and regulations.

In addition to providing the scope required of an Aviation Impact Statement (AIS) advised by Airservices Australia[1] (refer to Section 1.1.1), this AIA documents additional aeronautical constraints applicable to the Project, stakeholder consultation records[2] and corresponding recommendations.

1.1.1 Airservices Australia AIS Minimum Criteria

Airspace Procedures

1. Obstacles
   - Co-ordinates in WGS84 or GDA94 (to 0.1 second of arc or better).
   - Elevations in metres (m) Australian Height Datum (AHD) to 0.3 metres accuracy.
2. Drawings
   - Overlayed on topographical base, at not less than 1:250,000 scale. Details of datum and level of charting accuracy to be noted.
   - Electronic format compatible with MicroStation version V8i.
3. Aerodromes
   - Specify all registered/certified aerodromes that are located within 30 NM (55.56 km) from any obstacle referred to in (1) above.
   - Identify all instrument approach and landing procedures at these aerodromes.
   - Confirm that the proposed development (known as a potential “obstacle”) does not penetrate the Annex 14 Obstacle Limitation Surface (OLS) for any aerodrome. If a potential obstacle does penetrate the OLS, the AIS should clearly specify the extent of the penetration.
4. Air Routes
   - Identify air routes published in Airservices AIP Charts, Enroute Chart – Low (ERC-L) and Enroute Chart – High (ERC-H), which are located near or over any potential obstacle referred to in (3) above.
   - Specify two waypoint names located on the routes that are located on either side of the potential obstacle.
5. Airspace
   - Identify the airspace classification (i.e. A, B, C, D, E, G etc.) where the potential obstacles are located.

[1] https://www.airservicesaustralia.com/industry-info/airport-development-assessments/

[2] This section will be updated following further engagement with stakeholders throughout the approvals phase of the Project.

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. The AIS should follow the guidelines outlined in the latest version of the **EUROCONTROL Guidelines on How to Assess the Potential Impact of Wind Turbines on Surveillance Sensors.**

NOTE: Within the Eurocontrol Guidelines there are specific assumptions about the type of wind turbine for which the guidelines are applicable (i.e. with 3 blades, 30-200m in height, and a horizontal rotation axis). For any deviations to the wind turbine characteristics listed within the Eurocontrol Guidelines, you should include a justification in your application for why these guidelines are still applicable (or use alternative guidelines).

1.2 Methodology

The assessment was conducted in accordance with the following methodology:

- Review provided information/data pertaining to the Project
- Information/data gap analysis and further Request for Information (RFI) without site visits
- Collection of relevant spatial information/data
- Spatial modelling of the Project
- Identification of certified aerodromes (regulated by CASA) in proximity (30NM) to the Project
- Identification of Aircraft Landing Area (ALA) (unregulated) in proximity (30NM) to the Project – desktop study on best effort basis
- Modelling of Obstacles Limitation Surfaces (OLS) for certified aerodromes in proximity (30NM) to the Project
- Identification of Procedures for Air Navigation Services – Aircraft Operations (PANS-Ops) protection services (if applicable)
- Assessment of impact to flight procedures – OLS, Air Routes, Airspace and Communications, Navigation and Surveillance (CNS) assets
- Provide commentary on recommended mitigation measures, where applicable
- Issue draft AIA report
- Publish interim AIA report, with client feedback
- Consult and engage with relevant stakeholders (if required)
- Issue draft AIA report, with stakeholder feedback
- Publish final AIA report, after consideration of client review and feedback.

1.3 Basis of Assessment

The impact of the Project to the regularity of flight operations will be assessed based on published civilian and military operational procedures, which include:

- Aeronautical Information Publication – Airservices Australia
- Civil Aviation Safety Regulations 1998 (CASR) – Civil Aviation Safety Authority
- Civil Aviation Safety Regulations Part 91 – Civil Aviation Safety Authority (January 2025)

- CASA Part 139 (Aerodromes) Manual of Standards 2019 (December 2024)
- Developments at and around airports additional information requirement for Application Submission – Airservices Australia
- National Airports Safeguarding Framework Guideline D: Managing the Risk to Aviation Safety of Wind Turbine Installations (Wind Farms)/ Wind Monitoring Towers – National Airports Safeguarding Advisory Group
- Advisory Circular (AC) 91-02 v1.2 Guidelines for aeroplanes with MTOW not exceeding 5 700 kg - suitable places to take off and land – Civil Aviation Safety Authority
- AC 91-10 v1.6 Operations in the vicinity of non-controlled aerodromes – Civil Aviation Safety Authority
- AC 139.E-05 v1.1 Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome – Civil Aviation Safety Authority
- AC 139.E-01 v1.0 Reporting of tall structures – Civil Aviation Safety Authority
- Airports Act 1996 – Department of Infrastructure, Transport, Regional Development, Communications and the Arts, Australian Government
- Airports (Protection of Airspace) Regulations 1996 – Department of Infrastructure, Transport, Regional Development, Communications and the Arts, Australian Government
- Best Practice Guidelines: For Implementation of Wind Energy Projects in Australia, June 2018 – Clean Energy Council
- Planning Guidelines for Development of Wind Energy Facilities, September 2023 – Victorian Department of Transport and Planning
- National Wind Farm Development Guidelines (Draft), July 2010 – Commonwealth of Australia Environment Protection and Heritage Council (EPHC).

1.4 Relied Upon Information

- Terrain elevation data as derived from MNG's Aerial Laser Scan, MNG Reference: 80680
- 225 m wind turbine rotor diameter as indicated within the '20240717_Meering West Wind Farm RFI.xlsx' RFI register.

1.5 Assumptions and Limitations

The following assumptions and limitations apply to this report:

- This AIA excludes any proposed transmission lines
- This AIA only extends to the wind turbine generators (WTGs) associated with the Project
- This AIA only extends to the existing meteorological (MET) mast that is currently installed. Any future proposed MET masts will need to be assessed upon receipt of pertinent information.

2 The Project

The following section provides an overview of the Project, including highlighting the key infrastructure components, as well as important details regarding construction and operational information for the Project.

2.1 Project Area

The Project is located within the Loddon and Gannawarra municipalities. The Meering West Wind Farm is situated in Northern Victoria, approximately 250 km north of Melbourne and approximately 110 km north of Bendigo and 25 km south-west of Kerang to the centre of the Project.

The Project encompasses approximately 20,000 ha, with most of the area located within the Shire of Gannawarra with a smaller Project component located within the Shire of Loddon. The landscape is predominantly characterised by agricultural land, featuring cropped fields that are well-maintained and utilised mostly for dryland cropping. The environment is largely flat to gently undulating.

2.2 Project Description

The Project includes the following permanent and ancillary infrastructure, further details on the project infrastructure is shown in Figure 2-1:

Permanent core and ancillary infrastructure:

- Up to 164 wind turbines with adjoining hardstand
- An operations and maintenance building, including a car park and an office
- Internal access tracks
- 1000 MW / MWh Battery Energy Storage System (BESS)
- A terminal station connecting to VNI West
- Collector stations
- A permanent meteorological monitoring mast
- Internal above ground power line.

Temporary ancillary infrastructure:

- A construction office and compounds, including site offices, car parking, storage and amenities
- Concrete batching plant
- Temporary civil works
- Concrete batching plant
- Laydown areas.

Table 2-1 Key Parameters

Feature	Parameters	Quantity
Turbines		
Maximum Hub Heights	194 m	164
Maximum Blade Length	84.6 m	
Maximum Tip Height	280 m	
Rotor Swept Area	23,235 m^2	
Minimum Clearance (space between ground and lowest point of blade)	80-104 m	
Indicative Cut-in wind speed	3 m/s	
Indicative Cut-out wind speed	25 m/s	
Ancillary Infrastructure - Permanent		
Permanent MET Monitoring Mast	741319.324 m E 6026593.225 m S	1

**Based on an estimated maximum terrain elevation of 130 m within the Project Area, the maximum total height of a WTG is 410 m AHD (~1345 ft).*

2.3 Construction and Operational information

The construction phase for the Project is anticipated to last for approximately 4 years and the operational life of the Project is expected to be approximately 40 years, further information is provided in Table 2-2.

Table 2-2 Construction and Operational Information

Construction Phase	Proposed timing
A - Establish site offices, compounds and concrete batching batch plants	1-2 weeks
B - Commence gate installation, commence track construction, commence turbine foundation excavations and hard stands	18 months
C - Commence electrical work, cables, collectors, internal powerline, the terminal station	18 months
D - Turbine installation	24 months
E - Final commissioning and site demobilisation	6 months
G - Operation of wind farm	40 years
I - Decommission and make good	12 months

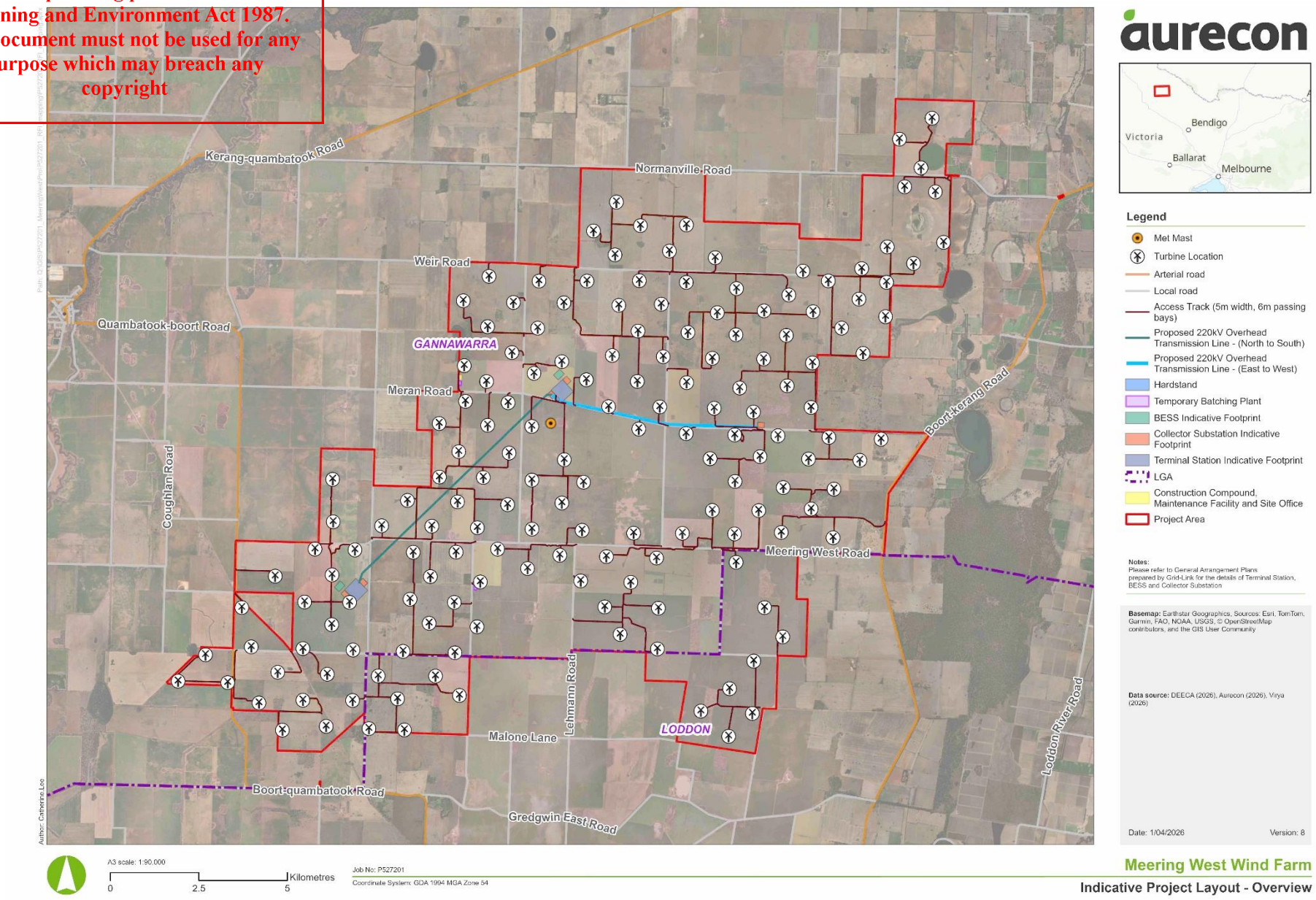

Figure 2-1 Indicative Project Layout

3 Legislative and Policy Context

The following section details the legislation and policies applicable to this report. The impact of the Project to the safety and regularity of flight operations will be assessed based on published civilian and military operational procedures:

- Civil Aviation Regulations 1988 (CAR 1988)
- Civil Aviation Safety Regulations 1998 (CASR 1988)
- National Airports Safeguarding Framework Guideline D – Managing Wind Turbine Risk to Aircraft
- National Airports Safeguarding Framework Guideline G – Communications, Navigation and Surveillance.

3.1 CAR 1988

The CAR 1988 is made under the Civil Aviation Act 1988, and this regulation establishes the foundational rules and principles for civil aviation safety, serving as a basis for safety standards within aviation that apply to, and in relation to:

a) International air navigation within Australian territory;

b) Air navigation in relation to trade and commerce with other countries and among the States;

c) Air navigation within the Territories;

d) Air navigation to or from the Territories;

e) Air navigation in which a Commonwealth aircraft is engaged;

f) Air navigation in controlled air space that is of a kind not specified in paragraph (a), (b), (c), (d), or (e) but directly affects, or may endanger, the safety of persons or aircraft engaged in:

   i. air navigation of a kind specified in paragraph (a), (b), (c), (d), or (e); or

   ii. air navigation in which a military aircraft is engaged; and

g) all air navigation within Australian territory of a kind not specified in paragraph (a), (b), (c), (d), or (e).

3.2 CASR 1988

The CASR 1998 is also made under the Civil Aviation Act 1988. However, it serves as a modernised replacement for the CAR 1988, with major new policies – resulting from CASA's progressive review of the CAR – generally incorporated into it. This regulation provides detailed safety standards that individuals and organisations must comply with. It is worth noting that, in the case of any inconsistency between the CAR 1988 and the CASR 1998, the CASR prevails. Important aspects within the CASR which are directly relevant to this assessment are the rules of flight, as outlined in Section 3.2.1.

3.2.1 Rules of Flight

There are three sets of flight rules – day visual flight rules (VFR), night VFR and instrument flight rules (IFR) (day or night).

The CASR Part 91.267 and MOS 12.02 state that the minimum height for aircraft operations is 500 ft above the highest feature or obstacle within a horizontal radius of 300 m of the point on the ground or water immediately below the aircraft.

The AIP also specifies that VFR flights should be conducted in accordance with the visual meteorological conditions (VMC) criteria as set out in Table 3-1.

Table 3-1 VMC Criteria for All Aircraft in Operating Class A, B, C, E and G Airspace (Source: Visual Flight Rules Guide, CASA v8.1)

Airspace class	Height	Flight visibility	Distance from cloud	Operational requirements
A, B, C, E or G	At or above 10,000 ft AMSL	8,000 m	• 1,500 m horizontal • 1,000 ft vertical	
A, B, C, E or G	Below 10,000 ft AMSL	5,000 m	• 1,500 m horizontal • 1,000 ft vertical	
G	At or below whichever is the higher of: • 3,000 ft AMSL • 1,000 ft AGL	5,000 m	Clear of cloud	In sight of ground or water

In addition to these requirements, night VFR operations also require the aircraft to be equipped with an approved GNSS, or alternatively, an automatic direction finder (ADF) or a VHF omnidirectional range (VOR) system to support navigation. Furthermore, Part 91 of the CASR outlines the minimum altitude requirements for night VFR operations, as detailed below:

- Any published LSALT for the route or route segment
- Any minimum sector altitude published in the AAI
- Any calculated LSALT for the route or the route segment prescribed in the MOS
- 1,000 ft above the highest obstacle on the ground or water within 10 NM ahead of, and to either side of, the aircraft at that point on the route segment.

In contrast, instrument flight rules are used to conduct flights under instrument meteorological conditions (IMC), where reliance on visual references is not possible. These flights must adhere to minimum route altitudes, typically the lowest safe altitude (LSALT) or the minimum safe altitude (MSA) for the specific route segment being flown. Exceptions apply when the aircraft is:

- Conducting a visual approach in accordance with published requirements
- Following a published DME or GNSS arrival procedure, or
- Operating under a specific altitude clearance assigned by air traffic control (ATC).

3.3 National Airports Safeguarding Framework

The National Airports Safeguarding Framework (NASF) provides guidance on planning requirements for development that affects aviation operations. This includes building activity around airports that have the potential to penetrate operational airspace and/or affect navigational procedures for aircraft.

The Framework was developed by the National Airports Safeguarding Advisory Group (NASAG), which includes representatives from: Commonwealth Infrastructure and Defence departments and aviation agencies; state and territory planning and transport departments; and the Australian Local Government Association.

The Framework consists of:

- Principles for National Airports Safeguarding Framework
- Guideline A: Managing Aircraft Noise
- Guideline B: Managing Building Generated Windshear and Turbulence
- Guideline C: Managing Wildlife Strike Risk
- **Guideline D: Managing Wind Turbine Risk to Aircraft**
- Guideline E: Managing Pilot Lighting Distraction

- Guideline F: Managing Protected Airspace Intrusion
- **Guideline G: Communications, Navigation and Surveillance**
- Guideline H: Protecting Strategically Important Helicopter Landing Sites
- Guideline I: Managing the Risk in Public Safety Areas at the Ends of Runways

The relevant guidelines for this assessment are Guideline D and G. Guideline D highlights the risks that wind turbines pose to low-flying aviation operations, such as those conducted by agricultural pilots. It also notes that both temporary and permanent wind monitoring towers – often erected in anticipation of, or in conjunction with, wind farms – can present as hazards to aviation due to their low visibility. In addition to physical risks, these structures may also interfere with the performance of communications, navigation, and surveillance (CNS) equipment operated by Airservices Australia and the Department of Defence. Accordingly, Guideline G provides recommendations to ensure the development of new infrastructure does not adversely affect CNS facilities.

4 Aviation Impact Statement

4.1 Nearby Certified Aerodromes

In accordance with the Airports Act 1996 and the Airports (Protection of Airspace) Regulations 1996, Airservices Australia requires that proposed wind farm developments be assessed by identifying all registered or certified aerodromes located within a 30 NM (55.56 km) radius of the Project Area. Table 4-1 lists the certified aerodromes identified within this area.

Table 4-1 Certified Aerodromes Within 30 NM of the Project Area

Aerodrome	Ident	Easting	Northing	Zone	~Distance (m)	~Distance (NM)
Kerang Airport	YKER	765791.451 m E	6039640.020 m S	54H	13,000	7.0
Swan Hill Airport	YSWH	730083.335 m E	6082331.867 m S	54H	50,000	27.0
Wycheproof Airport	YWYF	702051.866 m E	6007190.897 m S	54H	30,500	16.5

Note: Distance measured from the ARP to the nearest point of the Project Area

Following the identification of the airports, the Obstacle Limitation Surfaces (OLS) are developed for each identified airport to establish and determine the protected airspace that aerodrome operators are responsible for safeguarding against potential infringements by third-party structures. The OLS are established in accordance with the MOS 139 Chapter 7 Division 1.

Additionally, airports equipped with terminal instrument flight procedures have published minimum safe altitudes (MSAs), which form part of their protected PANS-Ops surfaces. The boundaries of these MSAs are also outlined for relevant airports to assess the potential impact of the Project on these procedures.

4.1.1 Kerang Airport

Kerang Airport (YKER) is a two-runway airport located approximately 13,000 m (7.0 NM) from the Project Area. The airport is equipped with terminal instrument flight procedures, specifically, non-precision instrument approach procedures for RWY 14/32 as indicated in Table 4-2.

Table 4-2 Instrument Approach Types for YKER Runways

Aerodrome	Runway	Approach Type	Source
YKER	RWY 14/32	Non-precision	• Aerodrome Chart: Kerang, VIC (YKER), published 5 SEP 2024 • RNP RWY14: Kerang, VIC (YKER), published 20 MAR 2025 • RNP RWY32: Kerang, VIC (YKER), published 20 MAR 2025
	RWY 05/23	Non-instrument	

Source: Airservices Australia

OLS

The Conical Surface of the OLS is located approximately 8,000 m from the Project Area (refer to Figure 4-1). Therefore, the Project is unlikely to pose any operational implications for aircraft during take-off or landing at Kerang Airport.

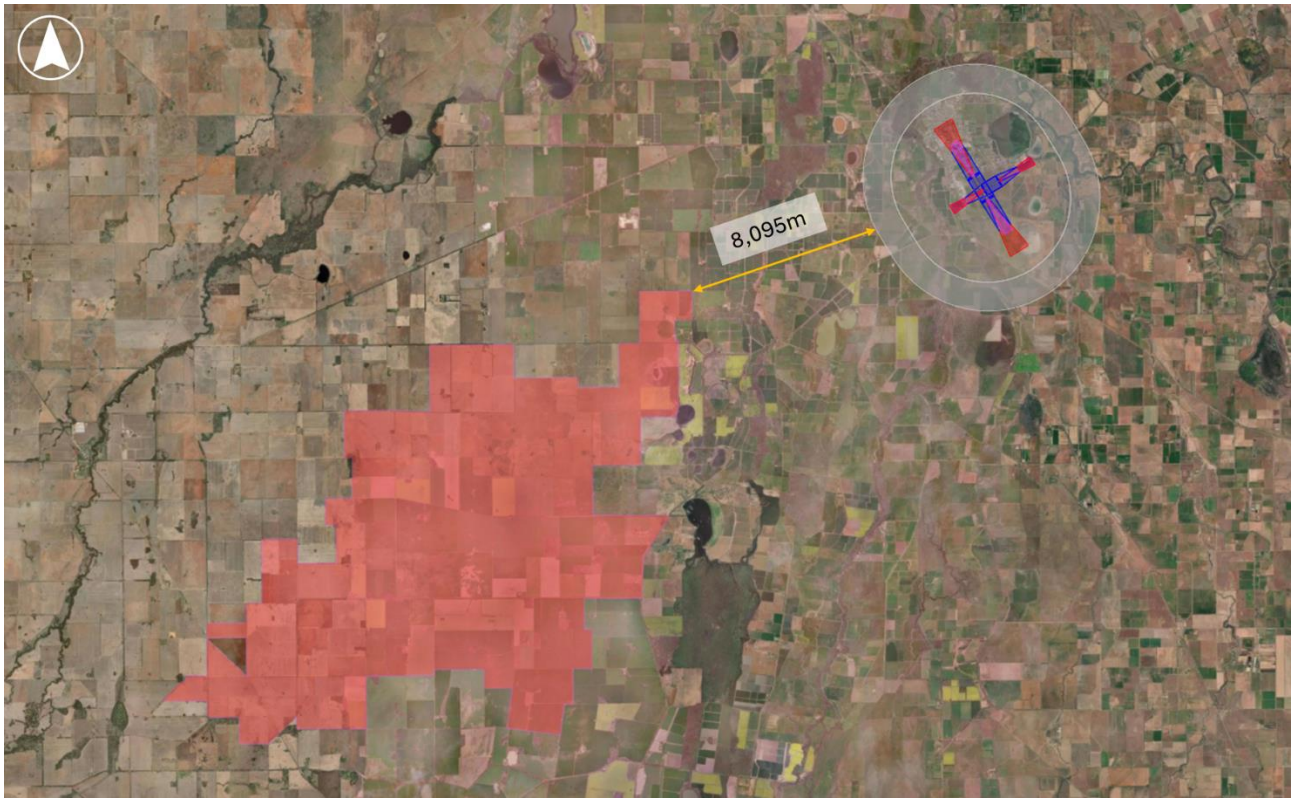

Figure 4-1 OLS at Kerang Airport – Not to scale (Source: Adapted from ArcGIS Earth)

Instrument Procedures

The published MSAs associated with the instrument procedures at Kerang Airport which are measured from the Aerodrome Reference Point (ARP) are presented in Table 4-3. The Project Area lies within both MSA boundaries, as illustrated in Figure 4-2.

Table 4-3 MSA for RNP Approach at YKER

RNP	Distance from ARP	MSA
RWY 14	10 NM	1,800 ft
	25 NM	2,000 ft
RWY 32	10 NM	1,800 ft
	25 NM	2,000 ft

Source: Airservices Australia, published 20 March 2025

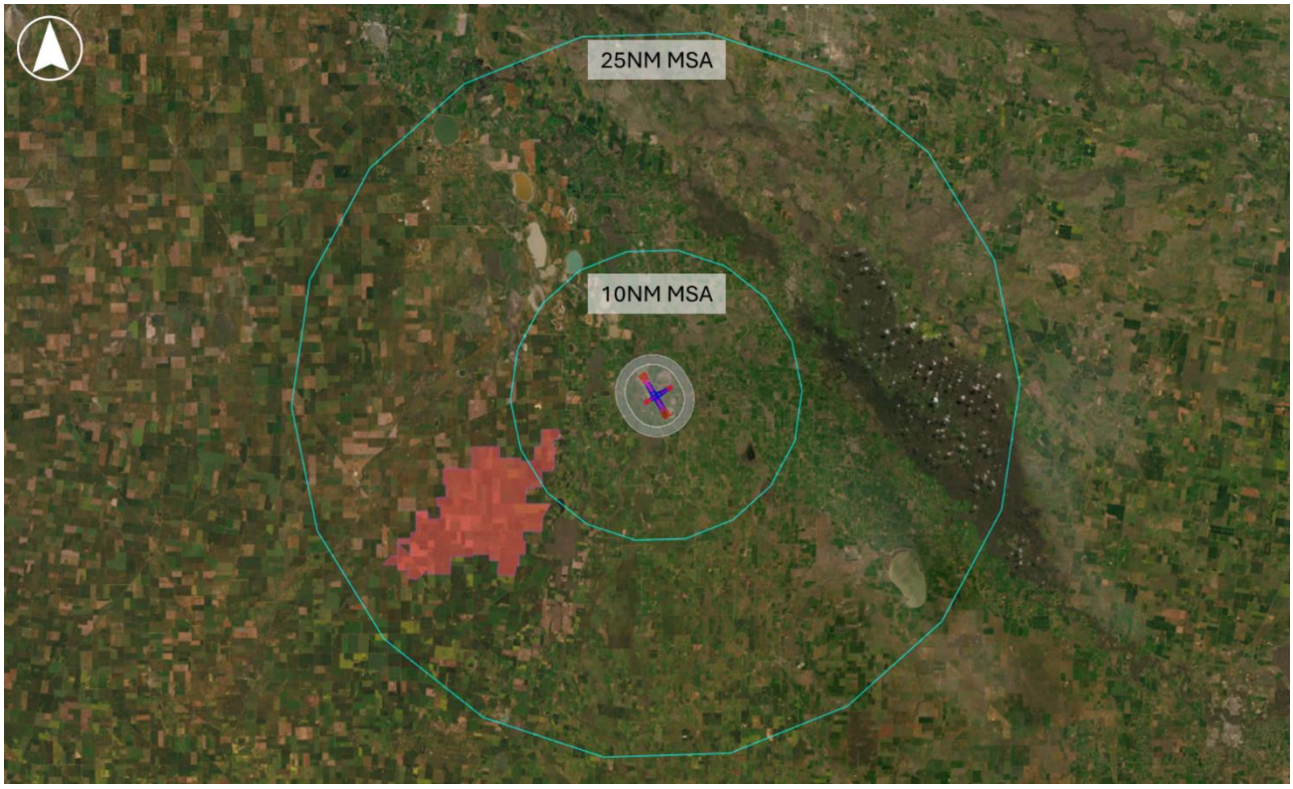

Figure 4-2 10 NM and 25 NM MSA boundaries from Kerang Airport – Not to scale (Source: Adapted from ArcGIS Earth)

10 NM MSA Boundary

The highest Project Area ground elevation within the 10 NM MSA boundary is 90 m AHD, which occurs at the location of WTG 2 (refer to Figure 4-3). With consideration to the WTG's maximum blade tip height of 280 m and the required minimum obstacle clearance of 304.8 m – based on the 1,000 feet minimum specified by CASA under Part 173 of the MOS and ICAO Doc 8168, a 500 ft infringement of the MSA would be realised (refer to Table 4-4 for detailed calculations). Thus, consultation with Kerang Airport is required to request an amendment to the 10 NM MSA from 1,800 ft to 2,300 ft.

Table 4-4 Infringement assessment of Project Area in relation to YKER's 10NM MSA boundary

Item	Height (m)	Height (ft)
Highest ground elevation within infringement zone (AHD)	90	295.3
Blade tip height	280	918.6
Minimum obstacle clearance	304.8	1,000
Total blade tip height (AHD)	**674.8**	**2213.9**
Existing published Minimum Safe Altitude	**548.6**	**1800**
Infringement	126.2	413.9
Infringement (rounded to nearest 100 ft)	N/A	500

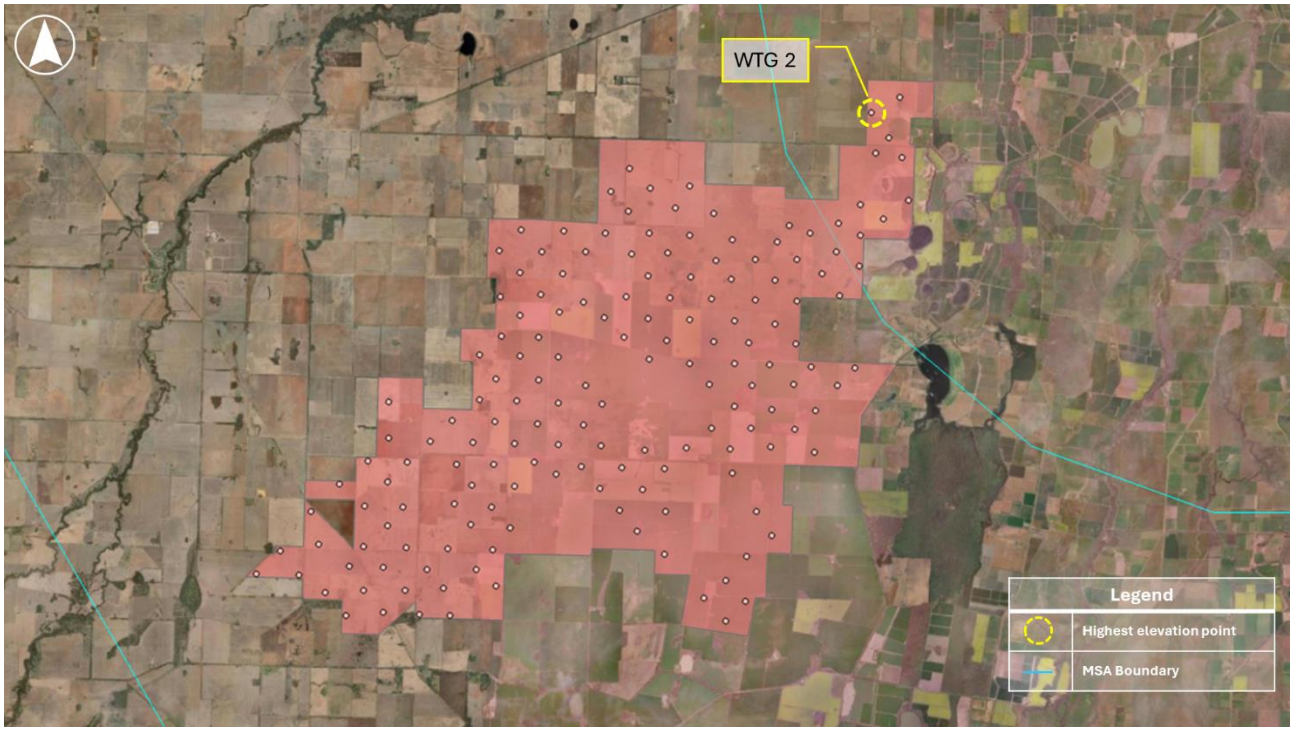

Figure 4-3 Location of WTG 2 and the highest ground elevation within the 10 NM MSA boundary – Not to scale (Source: Adapted from ArcGIS Earth)

25 NM MSA Boundary

The highest ground elevation within the Project Area between the 10 NM and 25 NM boundaries, is located in the southwestern corner of the site, at WTG155 (refer to Figure 4-4). With consideration to the WTG's 280 m blade tip height and the 304.8 m minimum obstacle clearance, a 400 ft infringement of the MSA would be realised (refer to Table 4-5 for detailed calculations). Thus, consultation with Kerang Airport is required to request an amendment to the 25 NM MSA from 2,000 ft to 2,400 ft between radial 180º to 270º.

Table 4-5 Infringement assessment of Project Area in relation to YKER's 25NM MSA boundary

Item	Height (m)	Height (ft)
Highest ground elevation within infringement zone	130	426.5
Blade tip height	280	918.6
Minimum obstacle clearance	304.8	1,000
Total blade tip height (AHD)	**714.8**	**2345.1**
Existing published Minimum Safe Altitude	**609.6**	**2000**
Infringement	105.2	345.1
Infringement (rounded to nearest 100 ft)	N/A	400

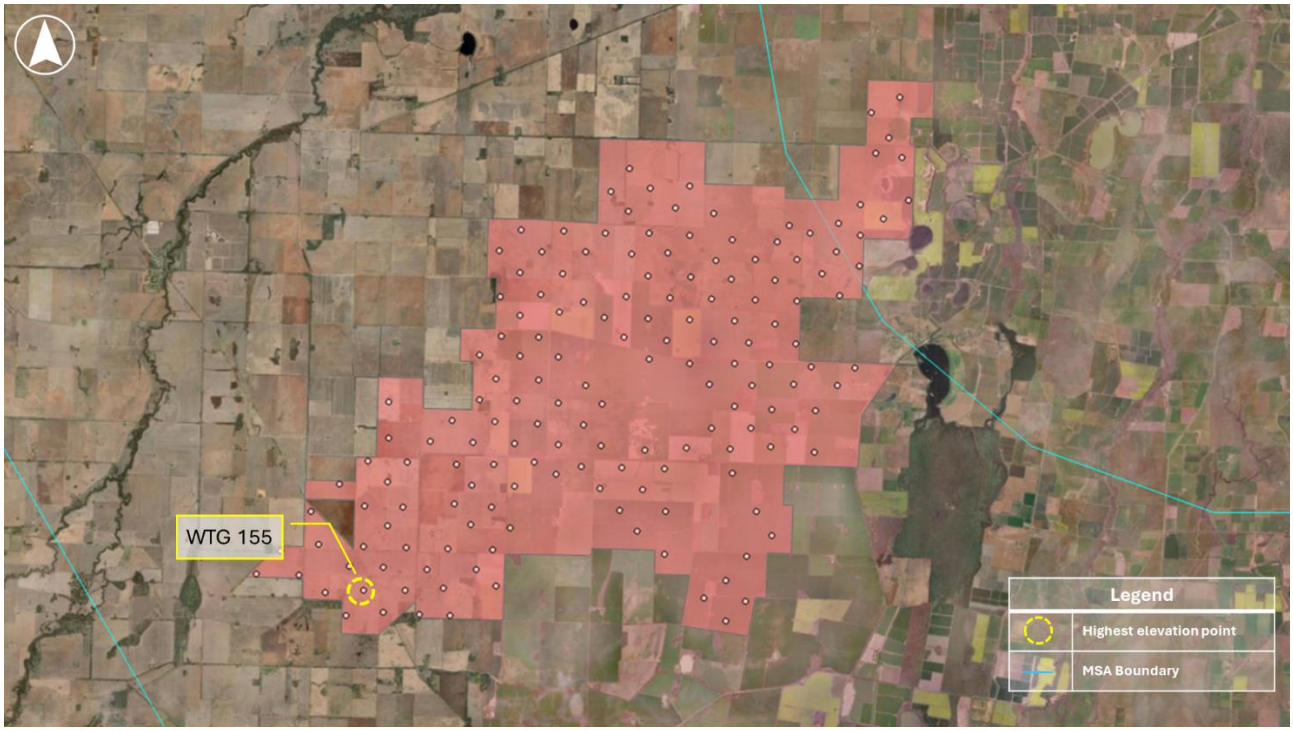

Figure 4-4 Location of WTG 155 and the highest ground elevation within the 10 NM and 25 NM MSA boundary – Not to scale (Source: Adapted from ArcGIS Earth)

4.1.2 Swan Hill Airport

Swan Hill Airport (YSWH) is a two-runway airport located approximately 50,000 m from the Project Area. Runway 08 is equipped with instrument approach procedures while the remaining runways are non-instrument runways, as outlined in Table 4-6.

To evaluate potential airspace impacts, an OLS and corresponding MSAs were developed. Referring to Figure 4-5, the assessment determined that the Project Area lies beyond the 25 NM MSA boundary. Therefore, the Project does not infringe Swan Hill Airport's protected airspace.

Table 4-6 Instrument Approach Types for YSWH Runways

Aerodrome	Runway	Approach Type	Source
YSWH	RWY 08	Non-instrument	• Aerodrome Chart: Swan Hill, VIC (YSWH), published 15 JUN 2023 • RNP RWY 26: Swan Hill, VIC (YSWH), published 15 JUN 2023 • NDB-A: Swan Hill, VIC (YSWH), published 17 JUN 2021
	RWY 26	Non-precision	
	RWY 04/22	Non-instrument	

Source: Airservices Australia

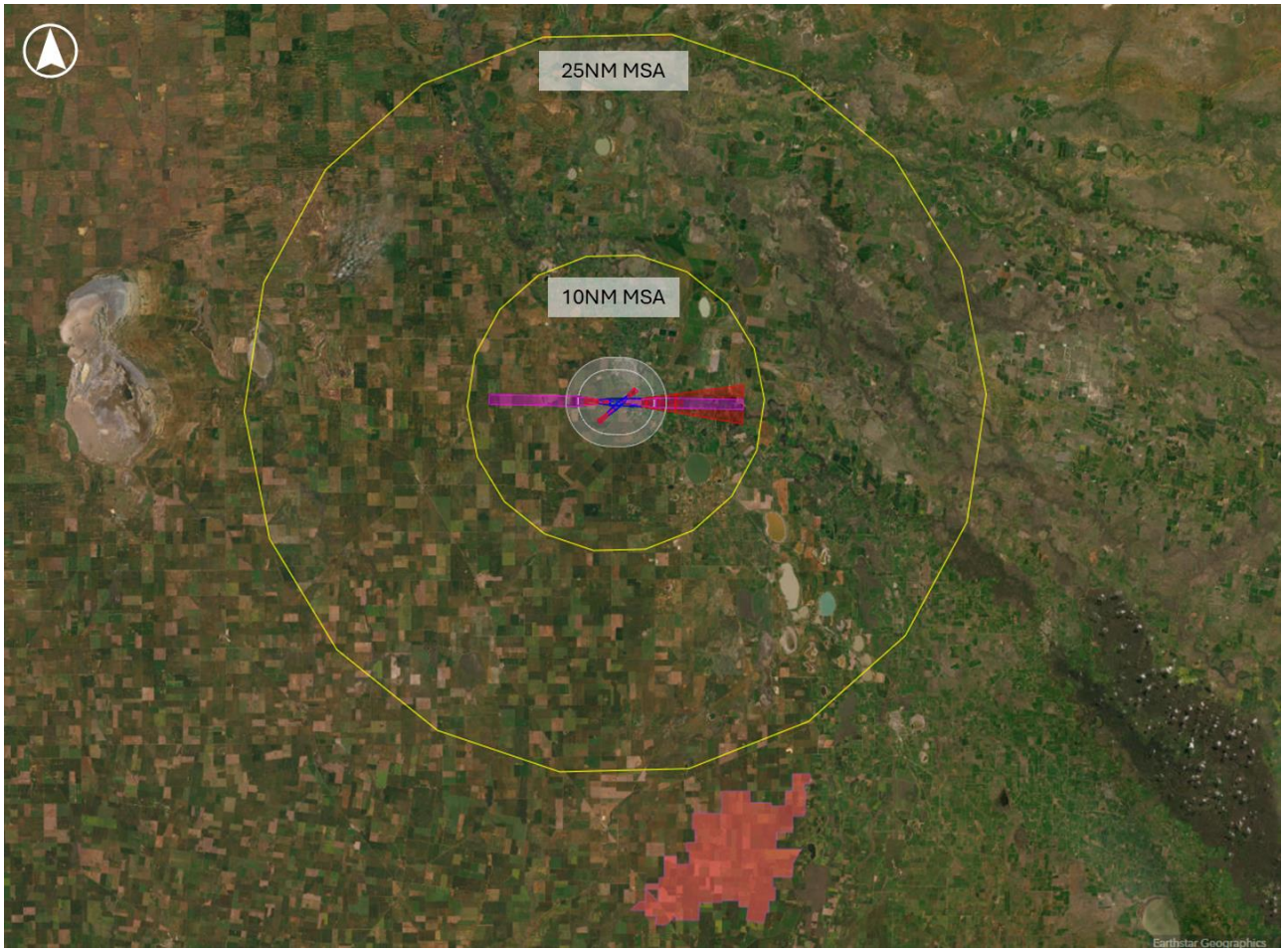

Figure 4-5 10 NM and 25 NM MSA boundaries from Swan Hill Airport's NDB – Not to scale (Source: Adapted from ArcGIS Earth)

4.1.3 Wycheproof Airport

Wycheproof Airport (YWYF) is a two-runway, non-instrument airport located approximately 30,500 m from the Project Area. The OLS is located approximately 27,000 m from the project boundary (refer to Figure 4-6). As the airport does not have terminal instrument flight procedures (refer to Table 4-7), MSAs are not applicable. Hence, the Project will not impact existing aircraft operations at Wycheproof Airport.

Table 4-7 Instrument Approach Types for YWYF Runways

Aerodrome	Runway	Approach Type	Source
YWYF	RWY 17/35	Non-instrument	ERSA, Published 20 MAR 2025
	RWY 08/26	Non-instrument	

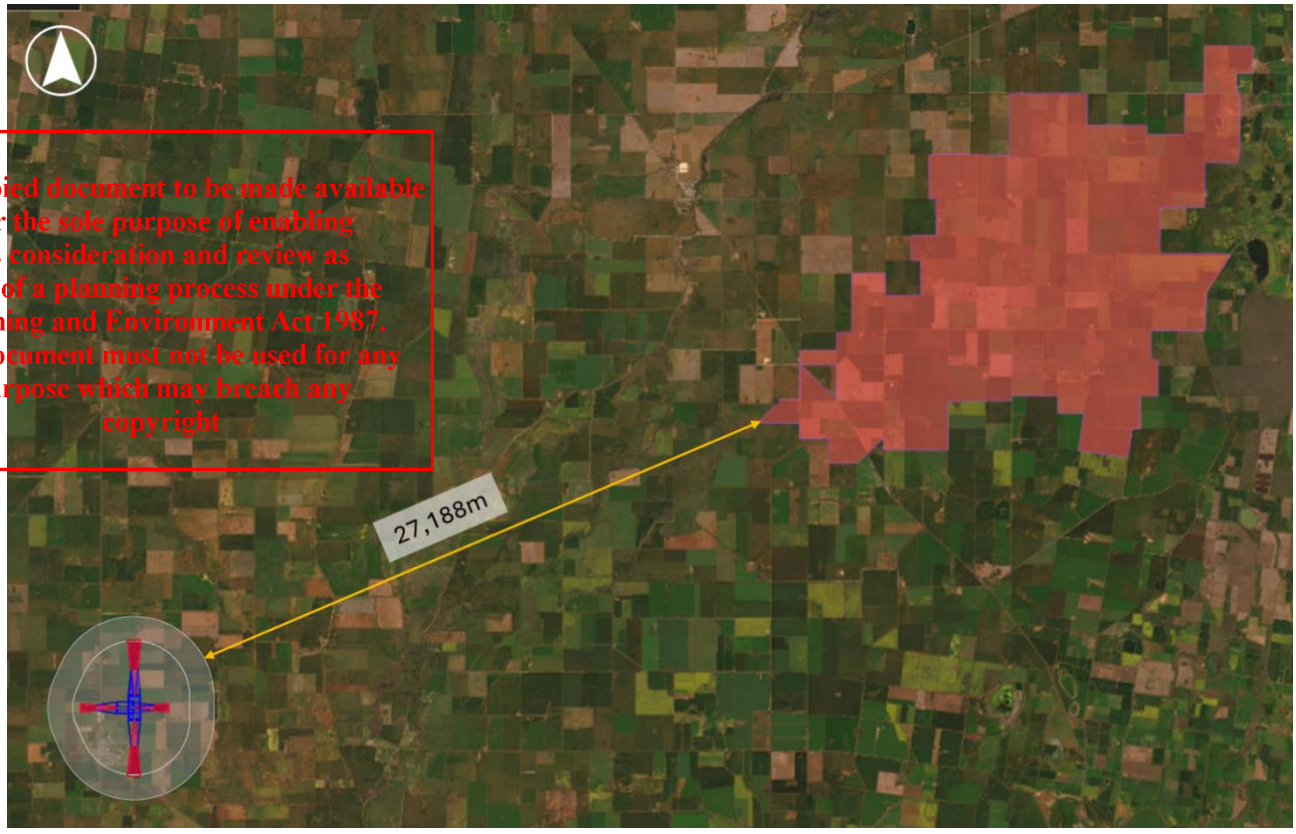

Figure 4-6 Distance between Wycheproof Airport and the Project Area – Not to scale (Source: Adapted from ArcGIS Earth)

4.2 Nearby Uncertified Aerodromes

Following the identification of certified aerodromes within 30 NM of the Project Area in Section 4.1, this Section focuses on identifying uncertified aerodromes – commonly referred to as Aircraft Landing Areas (ALAs), located within the same 30 NM radius. Uncertified aerodromes do not have formally established protection surfaces under current regulations. However, Aurecon considers that aircraft operations at aerodromes located within 15 km of the Project Area may be at risk. As outlined in Table 4-8, most uncertified airports are located at least 15 km from the Project Area, with the exception of Quambatook Airport. As such, an OLS was developed for Quambatook Airport, despite not being a regulatory requirement, to assess whether any potential conflict may occur.

Table 4-8 Uncertified aerodromes within 30 NM of the Project Area

Aerodrome	Ident	Easting	Northing	Zone	~Distance (m)	~Distance (NM)
Boort Airport	YBBT	744799.964 m E	5997402.538 m S	54H	20,000	10.8
Charlton Airport	YCHL	709341.554 m E	5981302.523 m S	54H	43,000	23.2
Cohuna Airport	YCOH	248315.479 m E	6031662.141 m S	55H	37,000	20.0
Gunbower Airport	YGBW	263839.932 m E	6016608.363 m S	55H	54,000	29.2
Pyramid Hill Airport	YPYD	241200.571 m E	6005420.795 m S	55H	35,500	19.2
Quambatook Airport	YQBK	727036.176 m E	6029338.507 m S	54H	8,500	4.6

Note: Distance measured from the ARP to the nearest boundary of the Project Area

Referring to Figure 4-7, the theoretical conical surface of the airport's OLS is located approximately 5,000 m from the Project Area. Based on this assessment, the Project is not expected to impact existing aircraft operations at Quambatook Airport.

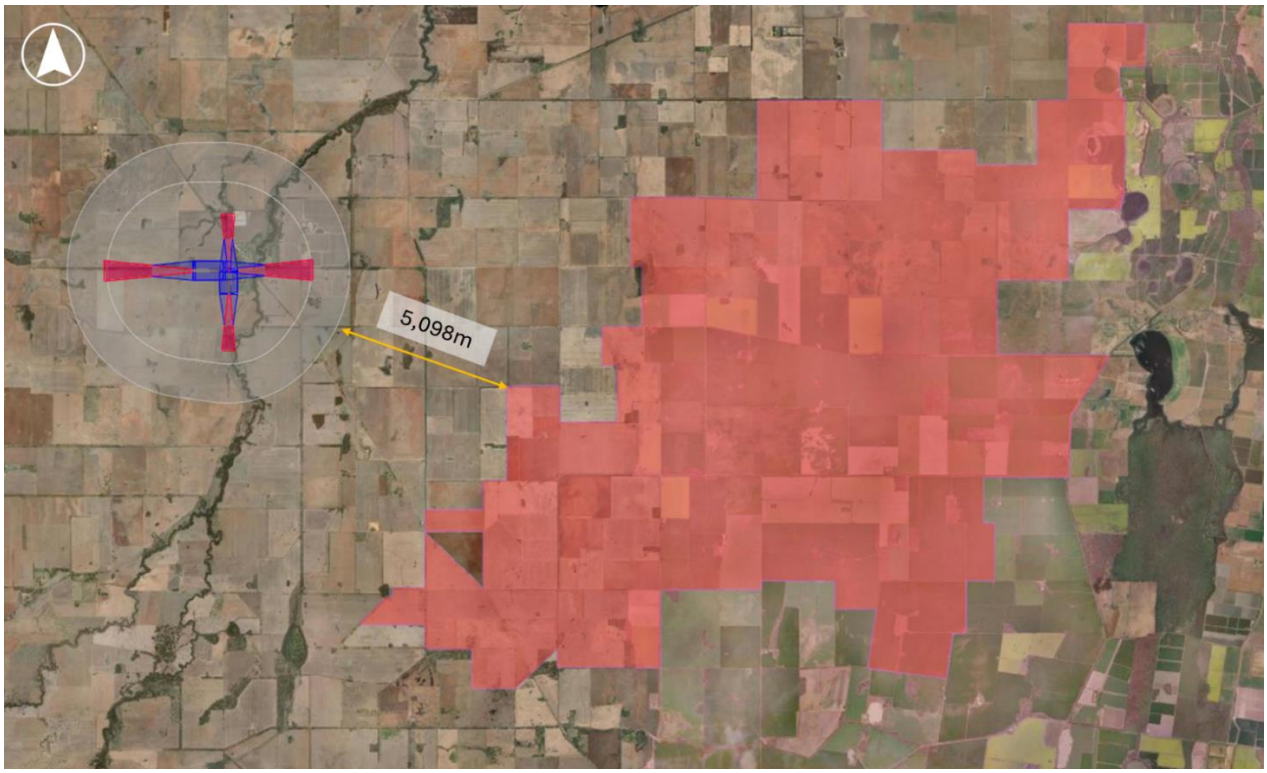

Figure 4-7 Distance between Quambatook Airport and the Project Area – Not to scale (Source: Adapted from ArcGIS Earth)

4.3 Potential Wake Turbulence Impacts

Whilst the effect of turbulence generated by WTGs is not well understood, two notable documents which publish information around the potential impact of wake turbulence associated with wind farms include the NASF Guideline D and the CASA AC 139.E-05 v1.1.

Both NASF Guideline D and the AC state that wind turbines may create turbulence noticeable up to 16 rotor diameters (RDs) from the turbine. The wind turbines proposed for this project have an RD of 225 m. Applying a conservative 16 RD downwind distance equates to potential turbulence extending up to approximately 3,600 m from the Project Area. As such, a 3,600-metre buffer was delineated beyond the Project Area to represent the most likely turbulence influence zone (refer to Figure 4-8). The nearest airport, Quambatook Airport, is located approximately 1,500 m beyond the demarcated area.

Based on this assessment, the Project is unlikely to generate adverse turbulence impacts on the surrounding identified aerodromes.

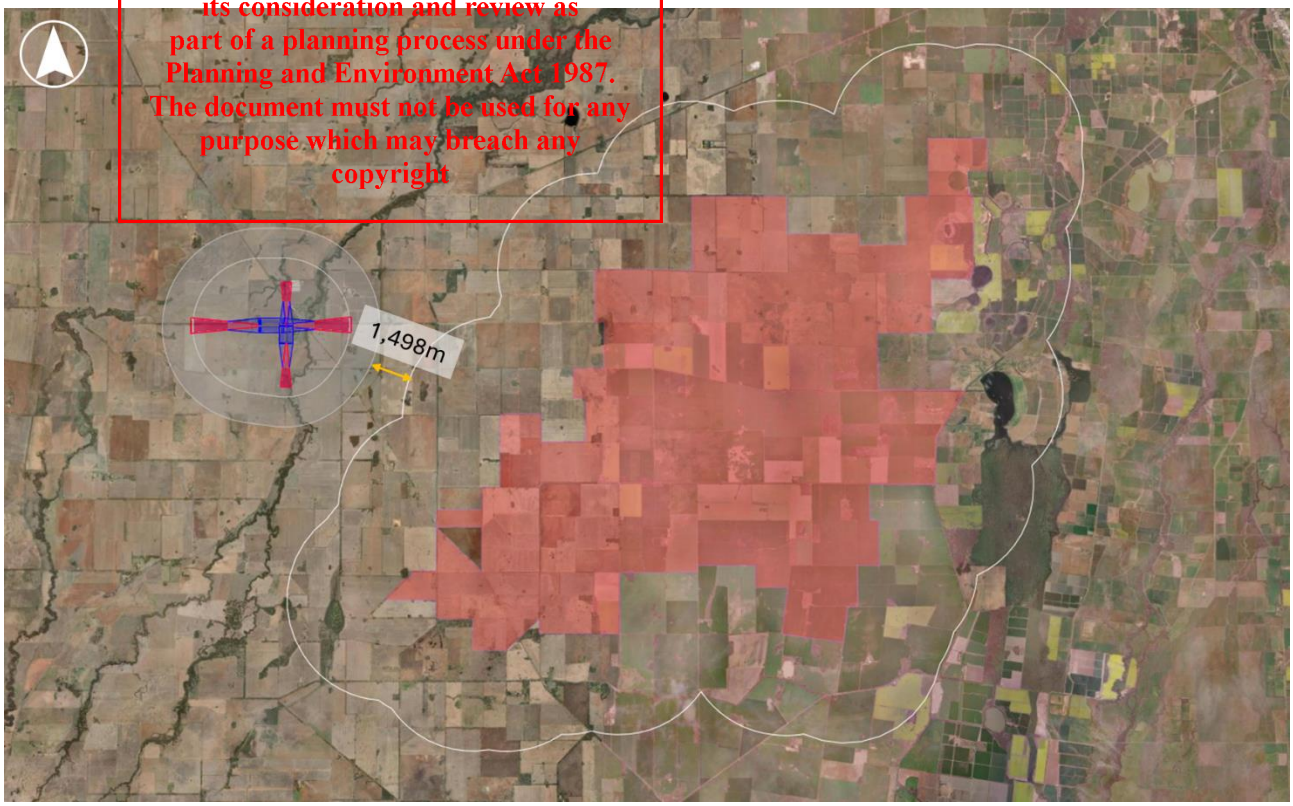

Figure 4-8 3,600 m boundary from the Project Area – Not to scale (Source: Adapted from ArcGIS Earth)

4.4 Air Routes and LSALT

Pilots can choose from a variety of methods to determine the LSALT applicable to their route. Aircraft that are capable of operating with RNP 2 authorisation can make use of the LSALT attached to designated air routes that are published on Enroute Charts (ERCs). These designated air routes consider a tolerance of 5 nm. Aircraft that are unable to operate with RNP 2 authorisation must use Grid LSALT[3]. Grid LSALT is also published on the ERCs.

As per Part 173 of the MOS, the LSALT considers a minimum obstacle clearance of 1000 ft. Therefore, based on the maximum WTG blade tip height of 1,345 ft AHD outlined in Table 2-1, the LSALT must not be less than 2400 ft to avoid impact.

4.4.1 Air Routes

Four air routes have been identified within the vicinity of the Project Area (refer to Table 4-9 and Figure 4-9 to Figure 4-10), all of which have a LSALT above 2500 ft. Therefore, the Project will not impact any existing air routes.

Table 4-9 Designated Air Routes

Air Route	Chart	Waypoints	LSALT	Impact to Air Route
V173	ERC-Low	ASWAN – CANTY	4700 ft	Nil
H119	ERC-Low	NATYA – SALRI – CANTY	4000 ft	Nil
W720	ERC-Low	SWH NDB – TELIP	2600 ft	Nil
H336	ERC-High	KEPPA – NATYA	4500 ft	Nil

[3] Whilst LSALT can also be determined manually by drawing the intended track and required tolerance area on aeronautical charts (pilot calculated LSALT), Grid LSALT is often the preferred method for simplicity.

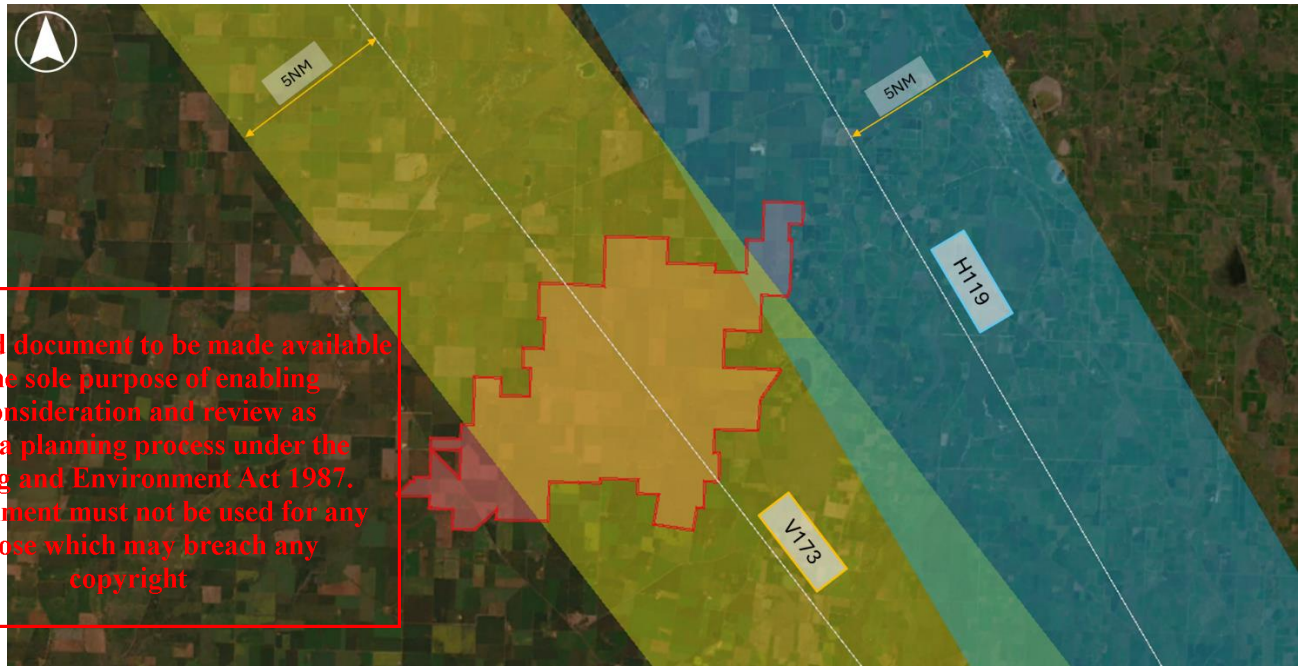

Figure 4-9 Designated air routes: Part 1 – V173, H119 and 5 NM buffers – Not to scale (Source: Adapted from ArcGIS Earth)

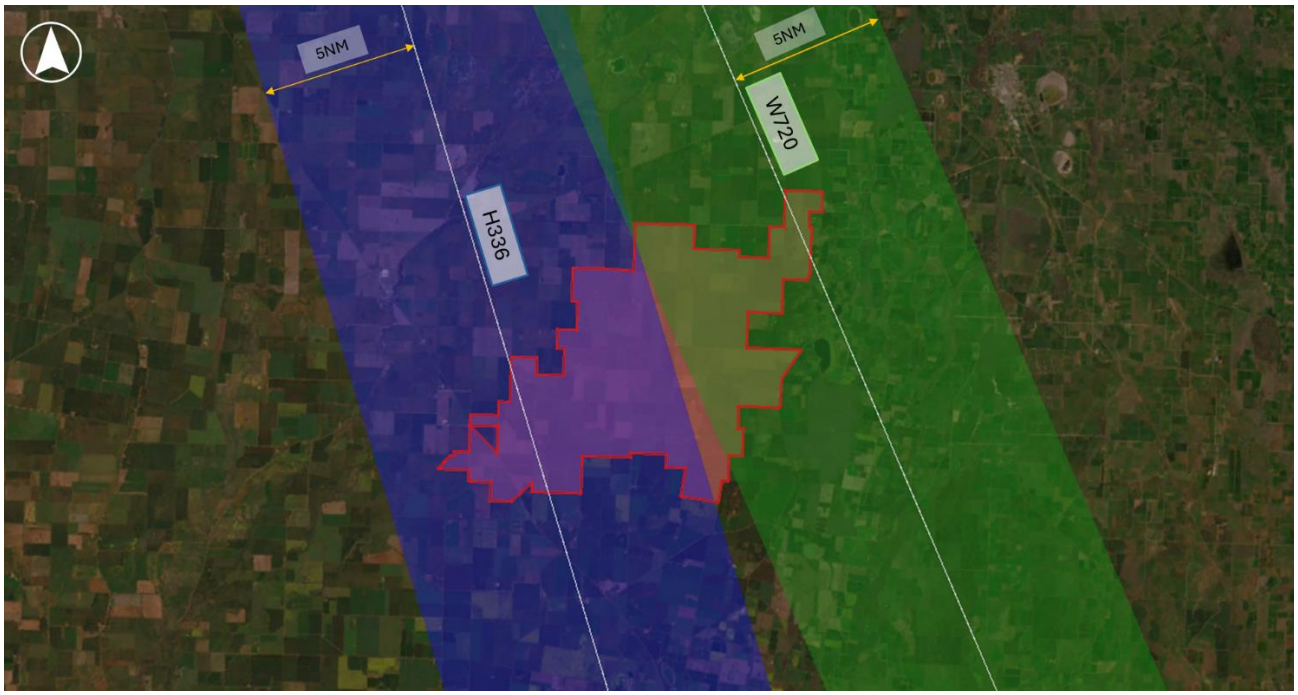

Figure 4-10 Designated air routes: Part 2 – H336, W720 and 5 NM buffers – Not to scale (Source: Adapted from ArcGIS Earth)

4.4.2 Grid LSALT

The Project Area falls within the grid that has been assigned with a LSALT of 2000 ft (refer to Figure 4-11). Therefore, with consideration to the maximum WTG blade tip height of 1,345 ft and the minimum obstacle clearance of 1000 ft, consultation with Airservices Australia to request an amendment to the Grid LSALT from 2,000 ft to 2,400 ft is required.

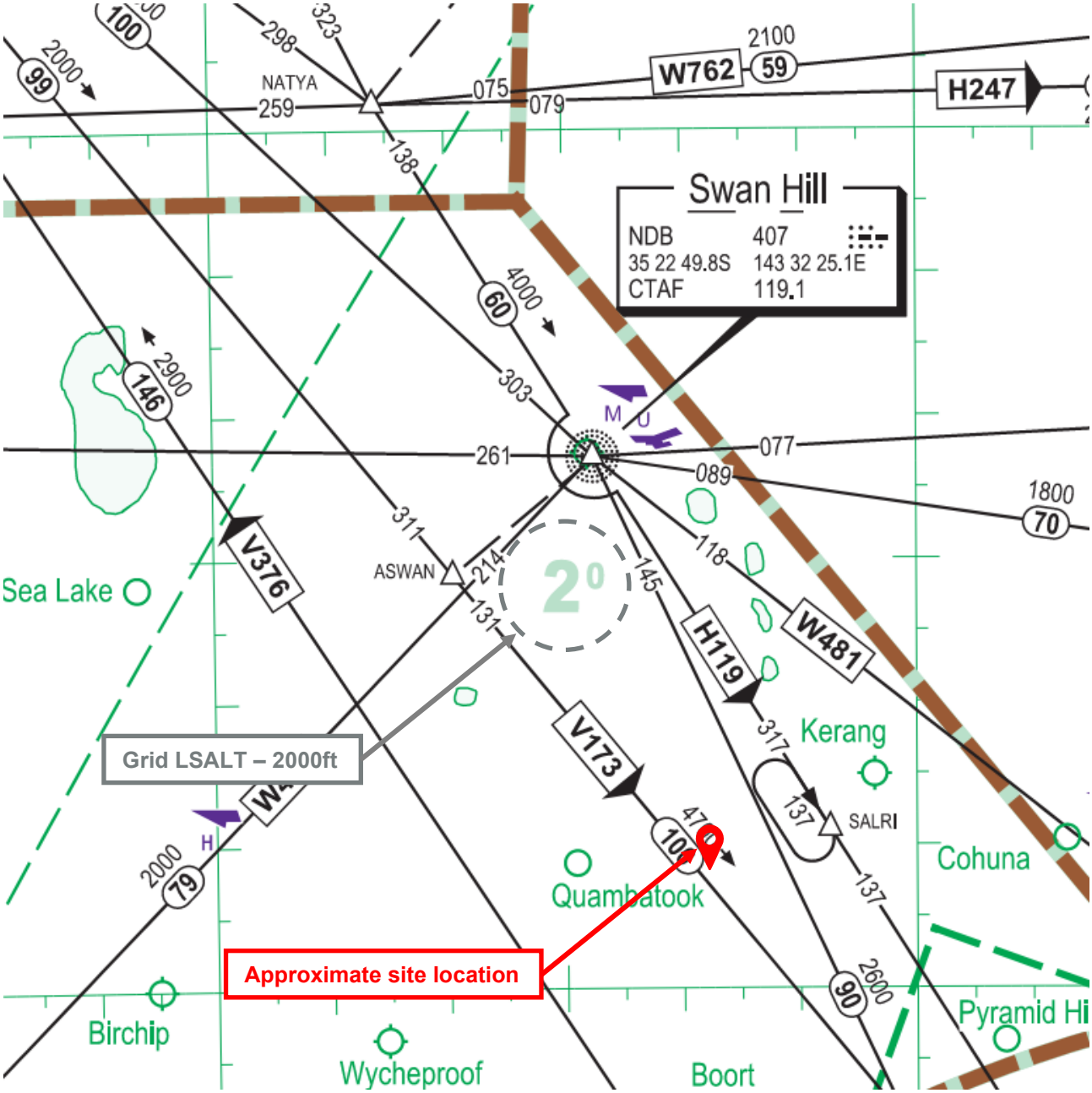

Figure 4-11 ERC-Low 2 chart effective 28 NOV 2024 (Source: Adapted from Airservices Australia)

4.4.3 VFR Routes

The Project Area is not located in the vicinity of any designated VFR lanes or VFR reporting points (refer to Figure 4-12).

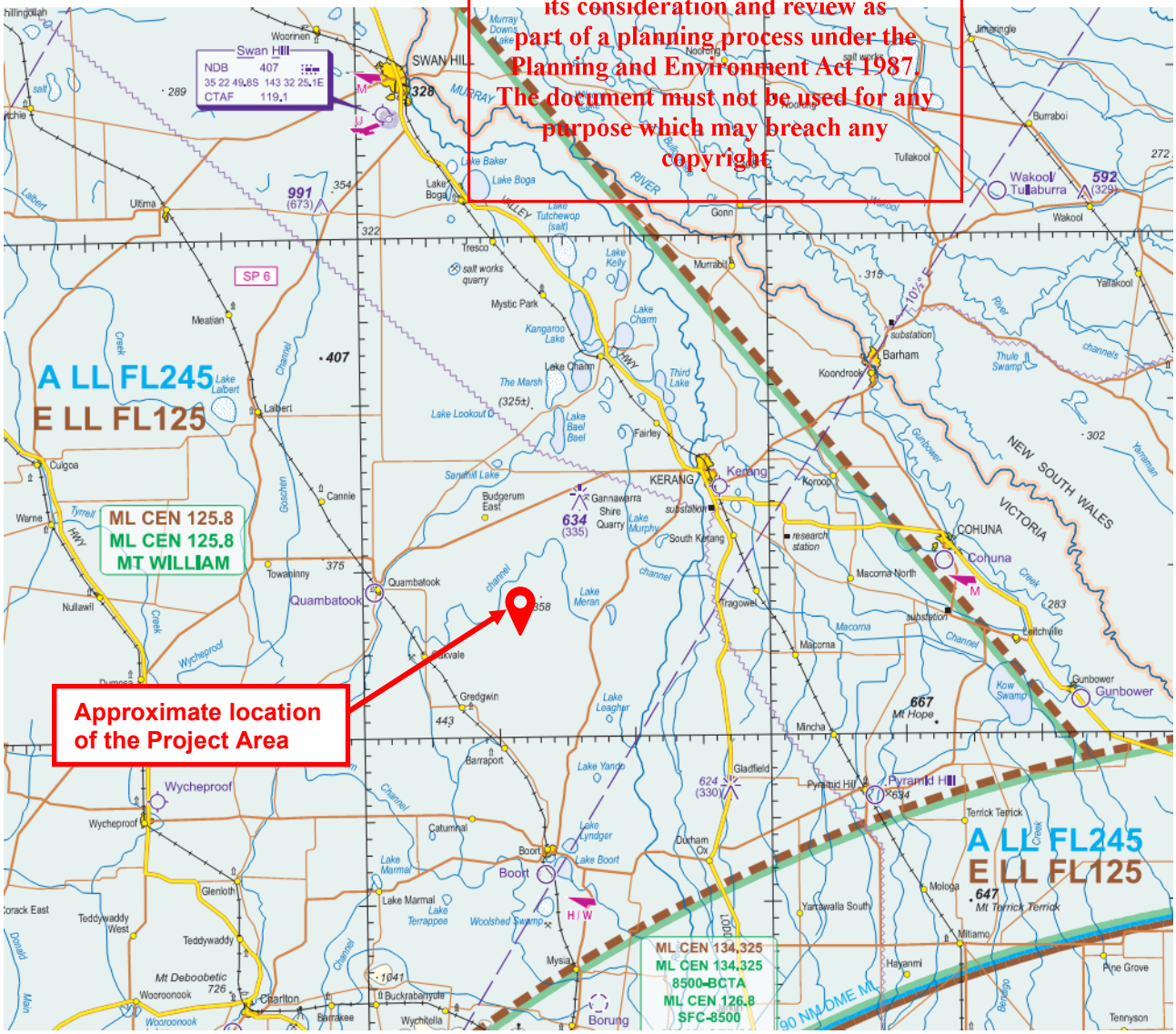

Figure 4-12 Project Area overlaid with the Deniliquin Visual Navigation Chart effective 28 NOV 2024 (Source: Adapted from Airservices Australia)

4.5 Airspace Protection

The Project Area is situated in Class G (uncontrolled) airspace (refer to Figure 4-12). Class A and E controlled airspace in the vicinity of the Project Area is well clear, beginning at Flight Level 245 (24,500 ft) and Flight Level 125 (12,500 ft) respectively. The Project Area is also not located near any Prohibited, Restricted, Danger or Military Operating Areas. Therefore, the Project will not impact the current airspace classification.

Although the Project Area does not conflict with Military Operating Areas, the Aeronautical Information Service of the Royal Australian Air Force (RAAF AIS) maintains a database of tall structures in the country. In line with NASF Guideline D, the RAAF AIS should be notified of all obstacles 30 m or taller that will be constructed as part of the Project.

4.6 Aviation Operations

The Project Area is located within an area of agricultural land and adjacent to Leaghur State Park. Thus, nearby aerial firefighting, aerial spraying operations, aerial mustering and aerial surveying could take place. Aeromedical operations are also highly variable, which can see the requirement to land helicopters almost anywhere. Flight training operations and other general aviation (GA) activities in the vicinity of the Project Area are likely.

The Project is expected to create obstacles that pilots of these operations would need to consider in their flight planning to ensure flight safety. Measures that the Project can take to mitigate associated risks could include:

- Liaise with Airservices Australia to ensure that the WTGs are published on relevant aeronautical charts and in other publications as necessary
- Provide obstacle lighting on the WTGs (refer to Section 4.9)
- Follow the recommendations provided in the Australasian Fire and Emergency Service Authorities Council Limited (AFAC) Wind Farms and Bushfire Operations Guideline, such as developing emergency protocols/plans and providing details of windfarm infrastructure and other pertinent information to relevant authorities
- Consult with nearby aerodrome operators (certified and uncertified) and aircraft operators to determine if any flying operations will likely be impacted by the Project.

4.7 CNS and MET Facilities

The operation of communication, navigation, surveillance (CNS) and meteorological (MET) facilities both on and off airport land may be adversely affected by the presence of obstacles. Any proposal for development should consult relevant guidelines to assess the potential impact. This assessment has considered the guidelines presented in the MOS 139, NASF Guideline G and the 'EUROCONTROL Guidelines on assessing the potential impact of wind turbines on surveillance sensors' (EUROCONTROL-GUID-130).

4.7.1 Communication Facilities

The most stringent impact zone for 'on airport' communication facilities is a radius of 10,000 m assigned to protect High Frequency (HF) communication equipment. Quambatook airport is the only airport located within 10,000 m of the Project Area. However, given it is a small airport and not published in the ERSA, it is not expected to have HF facilities. Therefore, the Project is not expected to adversely impact 'on airport' communication facilities.

Based on the location of known establishments, Aurecon also does not anticipate adverse impact to 'off airport' communication facilities. However, an exhaustive repository of these facilities is not publicly available, thus Airservices Australia should be consulted to provide confirmation.

4.7.2 Navigation Facilities

The most stringent impact zone for 'on airport' navigation facilities is a radius of 3,000 m assigned to protect Ground Based Augmentation Systems (GBAS). There are no airports located within 3,000 m of the Project Area. Therefore, the Project is not expected to adversely impact 'on airport' navigation facilities.

Based on the location of known establishments, Aurecon also does not anticipate adverse impact to 'off airport' navigation facilities. However, an exhaustive repository of these facilities is not publicly available, thus Airservices Australia should be consulted to provide confirmation.

4.7.3 Surveillance

Airservices Australia requires the AIS to assess the impact of WTGs on radar facilities using EUROCONTROL-GUID-130. This guideline outlines a top-level assessment which is reproduced in Table 4-10 and Table 4-11. However, this assessment considers WTGs with a height between 30-200 m. Yet, the WTGs proposed by the Project extend to a height of 280 m. Despite this, the nearest primary surveillance radar (PSR) facility is estimated to be located at Gellibrand Hill which is ~210 km (~115 nm) from the Project Area. It is understood that the range of this radar is 60 nm. Thus, whilst the height of the WTG deviates from the EUROCONTROL-GUID-130 criteria, the Project is categorised as Zone 4, thus not requiring an assessment, given the Project Area is located beyond the radar's range.

Similarly, the nearest secondary surveillance radar (SSR) facility is estimated to located at Mount Macedon which is 175 km from the Project Area. This suggests that the Project Area can be classified as Zone 4, thus not requiring an assessment. Whilst the 16 km separation criteria in the EUROCONTROL-GUID-130 may not be expressly applicable due to the taller WTGs associated with the Project, given the Project Area is situated beyond this distance criteria by a factor of more than 10, the classification is anticipated to remain valid.

Based on this analysis, no impact to PSR and SSR facilities is anticipated. However, Airservices Australia should be consulted to validate these findings, and to offer further guidance on Defence surveillance facilities which are not intended for the public domain.

Table 4-10 Primary surveillance radar recommended assessment ranges (Source: EUROCONTROL-GUID-130)

Zone	Zone 1	Zone 2	Zone 3	Zone 4
Description	0 – 500m	500 m – 15 km and in radar line of sight	Further than 15 km but within maximum instrumented range **and in** radar line of sight	Anywhere within maximum instrumented range but **not in** radar line of sight or outside the maximum instrumented range
Assessment Requirements	Safeguarding	Detailed assessment	Simple assessment	No assessment

Table 4-11 Secondary surveillance radar recommended assessment ranges (Source: EUROCONTROL-GUID-130)

Zone	Zone 1	Zone 2	Zone 4
Description	0 – 500 m	500 m – 16 km but within maximum instrumented range **and in** radar line of sight	Further than 16 km **or not** in radar line of sight
Assessment Requirements	Safeguarding	Detailed assessment	No assessment

4.7.4 MET Facilities

NASF Guideline G and EUROCONTROL-GUID-130 do not expressly cover the impact of wind farms on MET facilities. However, the MOS 139 provides guidance for 'on airport' establishments, which stipulate that a 30 m by 30 m buffer zone needs to be provided for MET facilities. As the nearest aerodrome (Quambatook Airport) to the Project Area is more than 8 km away, no impact to 'on airport' MET facilities is anticipated.

Note, as per the National Wind Farm Development Guidelines – Draft (2010), the Bureau of Meteorology (BOM) should also be notified of all wind farm developments to enable them to assess any potential impact to their radar facilities.

4.8 Meteorological Mast

There is an existing MET mast located within the Project Area at coordinates 741319.324 m E and 6026593.225 m S (Zone 54H). Note, the Proponent has advised that a Vertical Obstruction Data (VOD) Form has been submitted for the MET mast. NASF Guideline D recommends that the top 1/3 of the MET mast should be painted in contrasting bands of colour – Aurecon recommends that the entirety of a MET mast is painted in contrasting bands of colour as per the specifications in Para 8.110 (5) of the MOS 139, to

enhance its visibility to pilots conducting low-level operations. NASF Guideline D also states that marker balls or high visibility flags/sleeves should be placed on the outside guy wires and that guy wire ground attachments points should have contrasting colours to the surrounding environment. Note, the Proponent has advised that the upper third of the mast is painted in orange / white banding and aviation marker balls are installed on the outer guy wires at a height of approximately 105 m.

The location of the MET mast should also be included with the details provided to AFAC as previously discussed in Section 4.6, as aerial firefighting may need to take place in between WTGs and the MET mast is unlikely to be clearly visible to pilots.

Table 4-12 MET Mast Height

MET Mast 1 (Existing)	Height (m)	Height (ft)
Ground elevation	107	351.1
Height of structure	120	393.7
Total MET Mast 1 height (AHD)	227	744.8

4.9 Obstacle Lighting and Marking

As the Project Area is outside the limits of the Obstacle Limitation Surfaces (OLS) of certified aerodromes (Kerang Airport, Swan Hill Airport and Wycheproof Airport), the relevant planning authority (Victorian Department of Transport and Planning) is responsible for determining whether a wind farm requires lighting or marking. However, CASA may offer advice to planning authorities and as per Section 2.6 of AC 139.E-05 v1.1 – Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome, their preference is to recommend aviation hazard lighting on tall structures and the use of aircraft detection lighting systems (ADLS) for wind farms, which control when the lights are active. Note, the Proponent has advised that the MET mast has a steady low intensity red light installed at approximately 115 m above ground level (AGL).

Unless an aviation safety risk assessment of the Project recommends otherwise, Aurecon recommends the provision of obstacle lighting and an associated ADLS, for the following reasons:

- To align with international best practices, namely ICAO Annex 14, Volume 1, Chapter 6.2, which as per AC 139.E-05 v1.1, states that obstacles penetrating navigable airspace (which starts at the minimum flight attitude of 500 ft AGL) outside of a built-up area, should be equipped with 2000 candela medium intensity obstacle lights. Note, AC 139.E-05 v1.1 also states that CASA has accepted the use of 200 candela lighting in some circumstances due to a lack of back lighting in rural and remote areas.
- To mitigate the risks to aviation activities, specifically low-level flying activities (below 500 ft AGL) and other VFR flying activities – pilots of aircraft operating under the VFR are permitted to fly as low as 500 ft AGL and may have the potential to drift off their planned tracks, may be forced lower due to weather or may not be fully situational aware for various reasons.
- The increasing legislated requirement for an ALDS in the global context. For instance, Germany has recently mandated that all wind turbines exceeding 100 m in height and commissioned after 2005 are equipped with an ADLS (Section 9(8) of the Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz, EEG).
- Adoption of ADLS to minimise visual amenity impacts on neighbouring property owners, as recommended by the Planning Guidelines for Development of Wind Energy Facilities document (Victorian Government Department of Transport and Planning, revision September 2023).

Note, NASF Guideline D states that the rotor blades, nacelle and upper 2/3 of the supporting mast of the WTGs should be painted white, unless otherwise indicated by an aeronautical study. Aurecon supports this recommendation.

4.10 Stakeholder Engagement

This section will be updated following further engagement with stakeholders throughout the approvals phase of the Project.

5 Recommendations

It is recommended that the following stakeholders/authorities outlined in Table 5-1 are consulted to address identified concerns to ensure a comprehensive evaluation of the Project's impact to aviation activities.

Table 5-1 List of recommendations

Stakeholder/Authority	Concerns	Actions
Time to Initiate – Now		
Nearby aerodrome/Aircraft Operators	Possible aerial firefighting, aerial spraying operations, aerial mustering, aerial surveying and flight training activities within the vicinity of the Project Area.	Consult with other nearby aerodromes identified in Table 4-1 and Table 4-8 and aircraft operators to determine if any flying operations will likely be impacted by the Project.
Airport Developments, Airservices Australia	Based on the location of known establishments, Aurecon does not anticipate adverse impact to 'off airport' communication, navigation and surveillance facilities. However, an exhaustive repository of these facilities is not publicly available, thus Airservices Australia needs to be consulted to provide confirmation.	Request for confirmation by the Airport Development Team, Airservices Australia of the assessment on the Project's impact to communication, navigation and surveillance facilities.
BOM	As per the National Wind Farm Development Guidelines – Draft (2010), the BOM should be notified of all wind farm developments.	The Proponent has requested with BOM to confirm whether the Project impacts their radar facilities. BOM has advised no impact is expected.
The Proponent	As the Project Area is outside the vicinity of a certified aerodrome, planning authorities (Victorian Department of Transport and Planning) are responsible for making the final determination on whether a wind farm requires lighting or marking.	As per Section 4.9, Aurecon recommends providing obstacle markings and lighting equipped with an ADLS, as it can assist in mitigating the risk of a catastrophic incident. Unless an aviation safety risk assessment of the Project recommends otherwise, the lighting extent, type and mode of operation should be determined in a separate risk assessment.

Time to Initiate – Before Construction		
Kerang Airport	Infringement of MSA at 10 NM and 25 NM boundaries. – 10 NM MSA to be changed from 1,800 ft to 2,300 ft. – 25 NM MSA to be changed from 2,000 ft to 2,400 ft between radial 180º to 270º. *Note: Minimal impact to operations. The amendment is expected to be accepted without objection.*	Request for an amendment to the instrument approach procedures by the instrument flight procedures designer for Kerang Airport. *Note: Kerang Airport will in all likelihood request that the instrument flight procedure designer's amendment fee is borne by the Project. Estimated to be less than $10K.*
AIS, Airservices Australia	Infringement of Grid LSALT. – Grid LSALT to be changed from 2,000 ft to 2,400 ft. *Note: Minimal impact to operations. The amendment is expected to be accepted without objection.*	Request an amendment to the Grid LSALT through the AIS, Airservices Australia.
RAAF AIS	In line with the NASF Guideline D, the RAAF AIS should be notified of all obstacles 30 m or taller that will be constructed as part of the Project.	Notify the RAAF AIS of obstacles 30 m or taller that will be constructed as part of the Project.
▪ Airservices Australia ▪ Australasian Fire and Emergency Service Authorities Council Limited (AFAC)	Possible aerial firefighting, aerial spraying operations, aerial mustering, aerial surveying and flight training activities within the vicinity of the Project Area.	▪ Liaise with the AIS, Airservices Australia to ensure that the WTGs are published on relevant aeronautical charts and in other publications as necessary. ▪ Develop emergency protocols/plans and provide details of windfarm infrastructure and other pertinent information to relevant authorities.

6 Conclusion

This AIA has determined that development of the Project presents a minor impact to current aviation operations. However, Aurecon does not view this impact as a critical flaw to the Project. Through effective stakeholder engagement, changes to existing operational procedures are anticipated to be accommodated to support development of the Meering West Wind Farm. Therefore, the Project is expected to be viable with respect to aviation considerations.

Appendix 1 – Project Wind Turbine and Wind Monitoring Tower Coordinates and Heights

Wind Turbine Generator / MET Mast	Easting (GDA94)	Northing (GDA94)	Terrain Elevation (m AHD)	WTG Elevation (m AHD)
MET Mast 1	741319.324	6026593.225	106.6	386.6
WTG 1	752122.27	6035222.32	82.02	362.0
WTG 2	751201.01	6034631.95	89.94	369.9
WTG 3	751810.19	6033823.33	82.31	362.3
WTG 4	751348.06	6033290.84	84.87	364.9
WTG 5	752216.20	6033148.27	80.96	361.0
WTG 6	743209.58	6032860.58	95.71	375.7
WTG 7	745187.68	6032217.83	100.09	380.1
WTG 8	743886.04	6032199.59	97.15	377.2
WTG 9	742561.09	6032048.51	96.75	376.8
WTG 10	752448.03	6031728.43	80.82	360.8
WTG 11	750856.74	6031599.26	81.40	361.4
WTG 12	744704.95	6031482.44	102.95	383.0
WTG 13	743169.35	6031375.54	96.98	377.0
WTG 14	745998.88	6031294.73	104.42	384.4
WTG 15	748476.03	6030918.11	92.54	372.5
WTG 16	751599.91	6031134.77	82.43	362.4
WTG 17	750134.08	6030986.96	82.49	362.5
WTG 18	739612.24	6030769.17	96.32	376.3
WTG 19	741022.29	6030636.35	96.99	377.0
WTG 20	743856.53	6030647.95	102.69	382.7
WTG 21	749193.07	6030641.56	88.00	368.0
WTG 22	742377.45	6030637.97	98.25	378.3
WTG 23	750837.20	6030600.51	81.45	361.5
WTG 24	745181.34	6030599.06	109.07	389.1
WTG 25	746600.09	6030423.92	105.06	385.1
WTG 26	748077.74	6030244.10	94.52	374.5
WTG 27	738884.65	6030081.99	91.68	371.7
WTG 28	750058.38	6030127.49	81.22	361.2
WTG 29	740300.69	6030033.89	96.21	376.2

WTG 30	741724.80	6030023.58	98.43	378.4
WTG 31	744474.90	6029984.61	110.03	390.0
WTG 32	743275.83	6029953.26	99.95	380.0
WTG 33	747377.69	6029796.86	101.05	381.1
WTG 34	748762.41	6029774.66	89.51	369.5
WTG 35	746057.99	6029745.04	109.99	390.0
WTG 36	750808.88	6029634.88	81.43	361.4
WTG 37	739571.73	6029354.36	94.28	374.3
WTG 38	749568.63	6029315.14	82.08	362.1
WTG 39	740986.60	6029314.00	99.72	379.7
WTG 40	743820.10	6029231.14	103.73	383.7
WTG 41	745230.89	6029192.78	114.15	394.2
WTG 42	746583.93	6029127.82	109.97	390.0
WTG 43	748007.89	6029110.68	99.88	379.9
WTG 44	740259.01	6028626.82	94.49	374.5
WTG 45	750172.96	6028602.04	82.32	362.3
WTG 46	738911.70	6028257.55	93.97	374.0
WTG 47	743092.53	6028543.78	100.00	380.0
WTG 48	744531.75	6028508.68	110.66	390.7
WTG 49	745918.07	6028465.20	114.52	394.5
WTG 50	747366.83	6028445.71	109.20	389.2
WTG 51	748744.48	6028334.16	89.57	369.6
WTG 52	741667.62	6028370.65	101.67	381.7
WTG 53	740881.68	6028040.43	99.21	379.2
WTG 54	739544.04	6027809.53	94.35	374.4
WTG 55	742360.96	6027858.83	102.96	383.0
WTG 56	743799.65	6027812.38	107.22	387.2
WTG 57	745193.15	6027777.69	112.73	392.7
WTG 58	746689.83	6027627.69	111.45	391.5
WTG 59	748030.52	6027689.51	102.58	382.6
WTG 61	738946.56	6027251.12	94.96	375.0
WTG 62	740151.40	6027213.29	95.91	375.9
WTG 63	742989.03	6027101.97	110.01	390.0
WTG 64	744434.04	6027095.02	111.81	391.8
WTG 65	745971.44	6027055.05	112.59	392.6

WTG 66	747078.61	6026950.00	107.24	387.2
WTG 67	748704.90	6027081.17	89.93	369.9
WTG 68	738203.86	6026626.96	96.86	376.9
WTG 69	739573.05	6026575.46	97.74	377.7
WTG 70	740819.06	6026544.90	99.99	380.0
WTG 71	743840.90	6026472.23	111.66	391.7
WTG 72	745178.41	6026345.80	115.78	395.8
WTG 73	746549.36	6026306.96	110.90	390.9
WTG 74	747771.87	6026283.72	101.61	381.6
WTG 75	749208.23	6026239.21	89.98	370.0
WTG 76	750682.90	6026187.38	87.75	367.8
WTG 77	738756.14	6025837.88	99.16	379.2
WTG 78	740178.20	6025797.29	101.04	381.0
WTG 79	745853.83	6025639.47	116.14	396.1
WTG 80	748634.78	6025629.63	98.52	378.5
WTG 81	741736.65	6025609.23	108.90	388.9
WTG 82	747265.43	6025697.30	109.22	389.2
WTG 83	750083.54	6025593.05	89.69	369.7
WTG 84	738210.34	6025121.61	100.16	380.2
WTG 85	739450.62	6025110.11	103.94	383.9
WTG 86	735195.92	6025056.10	100.33	380.3
WTG 87	740822.93	6025035.80	108.61	388.6
WTG 88	742280.84	6024974.54	110.26	390.3
WTG 89	746558.52	6024998.98	111.60	391.6
WTG 90	747919.95	6024825.44	102.90	382.9
WTG 91	749352.14	6024781.43	94.76	374.8
WTG 92	737308.27	6024463.33	109.36	389.4
WTG 93	738723.04	6024422.93	108.10	388.1
WTG 94	740136.69	6024343.72	107.80	387.8
WTG 95	741669.25	6024391.06	109.99	390.0
WTG 96	745917.25	6024180.91	110.04	390.0
WTG 97	747227.57	6024177.17	105.14	385.1
WTG 98	748707.85	6024221.22	97.52	377.5
WTG 99	735211.45	6023861.36	99.89	379.9
WTG 100	736580.39	6023748.20	109.99	390.0

WTG 101	737996.29	6023737.20	107.48	387.5
WTG 102	739283.43	6023693.75	109.99	390.0
WTG 103	740824.98	6023654.94	110.01	390.0
WTG 104	742239.94	6023620.54	111.55	391.6
WTG 105	747864.17	6023561.03	101.48	381.5
WTG 106	745072.18	6023536.47	108.72	388.7
WTG 107	746544.48	6023519.07	106.67	386.7
WTG 108	743694.77	6023539.26	111.52	391.5
WTG 109	749326.92	6023411.85	104.10	384.1
WTG 110	734697.17	6023094.81	99.23	379.2
WTG 111	735824.83	6023070.74	109.39	389.4
WTG 112	739854.11	6023093.03	111.81	391.8
WTG 113	738682.63	6023008.16	112.07	392.1
WTG 114	737471.78	6023003.23	109.95	390.0
WTG 115	741610.02	6022921.16	115.81	395.8
WTG 116	742926.84	6022883.95	110.00	390.0
WTG 117	744341.60	6022843.54	108.23	388.2
WTG 118	746588.78	6022723.27	106.03	386.0
WTG 119	740699.96	6022547.87	116.75	396.8
WTG 120	735179.28	6022368.50	102.79	382.8
WTG 121	733574.02	6022332.16	103.01	383.0
WTG 122	737955.05	6022320.98	111.70	391.7
WTG 123	739366.05	6022168.96	114.89	394.9
WTG 124	742199.34	6022199.77	112.45	392.5
WTG 125	743614.11	6022159.37	108.31	388.3
WTG 126	737381.02	6021682.34	115.88	395.9
WTG 127	734403.68	6021604.09	102.44	382.4
WTG 128	738631.34	6021593.71	116.59	396.6
WTG 129	735673.84	6021594.58	110.73	390.7
WTG 130	742879.25	6021465.31	109.34	389.3
WTG 131	732630.93	6021447.49	109.82	389.8
WTG 132	747391.43	6021445.42	106.87	386.9
WTG 133	744395.24	6021429.10	110.07	390.1
WTG 134	737919.88	6021004.08	117.10	397.1
WTG 135	735170.50	6020965.87	110.69	390.7

WTG 136	739271.91	6020905.34	117.45	397.5
WTG 137	743312.92	6020691.98	109.82	389.8
WTG 138	747906.32	6020620.87	107.65	387.7
WTG 139	732897.39	6020339.65	120.77	400.8
WTG 140	734357.28	6020290.89	115.22	395.2
WTG 141	735771.09	6020251.95	120.39	400.4
WTG 142	737185.51	6020213.25	118.37	398.4
WTG 143	738648.22	6020173.42	116.48	396.5
WTG 144	731606.49	6020116.67	98.77	378.8
WTG 145	744366.80	6020280.83	113.35	393.4
WTG 146	747086.91	6019940.05	107.98	388.0
WTG 147	733645.64	6019626.85	121.41	401.4
WTG 148	735044.71	6019572.26	125.13	405.1
WTG 149	736482.94	6019524.00	119.98	400.0
WTG 150	738100.59	6019520.49	116.79	396.8
WTG 151	730832.27	6019376.98	96.98	377.0
WTG 152	732233.00	6019336.23	107.67	387.7
WTG 153	746404.77	6019164.46	101.02	381.0
WTG 154	737030.05	6018879.77	118.64	398.6
WTG 155	734355.73	6018839.56	130.82	410.8
WTG 156	735759.05	6018832.11	123.86	403.9
WTG 157	738776.54	6018974.93	117.99	398.0
WTG 158	733115.44	6018762.02	114.46	394.5
WTG 159	745594.07	6018534.11	99.58	379.6
WTG 160	747048.25	6018466.89	98.99	379.0
WTG 161	735013.30	6018103.67	128.77	408.8
WTG 162	736220.27	6018041.26	123.63	403.6
WTG 163	733777.10	6017995.90	127.88	407.9
WTG 164	737223.04	6018002.71	118.25	398.3
WTG 165	746378.18	6017823.61	95.20	375.2

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