Hexham Wind Farm

Chapter 22

Aviation

WIND PROSPECT

22.1 Overview

This chapter is based on the findings of the ***Aviation Impact Assessment*** report prepared by Chiron Aviation Consultants (provided in Appendix O).

The specialist study identified existing aviation operations and activities within 30 nautical miles (or 56 kilometres) of the project site to determine the potential impact to aviation safety. Project design and management measures are proposed to maintain aircraft safety.

There are two certified aerodromes (Hamilton and Warrnambool) and three uncertified aerodromes (Cobden, Derrinallum and Camperdown) within 30 nautical miles of the project site. Of these uncertified aerodromes, Derrinallum and Camperdown are operated as the base for aerial agricultural applications operators. Two uncertified private airstrips are on properties close to the project site and are used occasionally for aerial agricultural operations (spraying and spreading).

The project has the potential to impact on the operation of aerodromes and local airstrips due to the introduction of new obstacles, including wind turbines and meteorological masts. In particular, there is a potential safety risk relating to aircraft operating at low levels in accordance with the Visual Flight Rules, including for aerial agricultural operations and aerial firefighting. Wind turbines can also impact communications, navigation, and surveillance (radar systems) used for air traffic control due to electromagnetic interference. The project would not impact on the performance of navigation aids and communication facilities, or the performance of any surveillance radars and satellite facilities.

Avoidance by design has been the primary measure to limit aviation impacts. This has included establishing buffers around local airstrips in the concept design, incorporating the recommendations of the Country Fire Authority (2025) Design Guidelines and Model Requirements for Renewable Energy Facilities in the project design and management measures, and committing to marking the meteorological monitoring masts in accordance with the National Airports Safeguarding Framework Guideline D: Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation to improve visibility of these structures for pilots of low-flying aircraft.

The project would not impact the Obstacle Limitation Surface or the Procedures for Air Navigation Services – Aircraft Operations surfaces protected airspace of the Instrument Approach Procedures for the Hamilton Aerodrome. The project would also not impact the Obstacle Limitation Surface for the Warrnambool Aerodrome.

While the proposed turbines are beyond the 10 nautical mile Minimum Safe Altitude of the Warrnambool Aerodrome, there are turbines within the five nautical mile buffer zone used to calculate this Minimum Safe Altitude. To enable the proposed maximum wind turbine tip height to be accommodated, the 10 nautical mile Minimum Safe Altitude would need to be raised by 100 feet, from 2,200 feet to 2,300 feet, to ensure minimum factors of safety are maintained for aircraft using the Warrnambool Aerodrome Instrument Approach Procedures.

The project may impact aerial agricultural operations immediately surrounding wind turbines and meteorological monitoring masts, however, these impacts would largely be experienced by stakeholder (participating) landowners. With the implementation of design mitigation measures (i.e., turbines appropriately painted to ensure they are visible by day) the impact to aerial agricultural operations is considered low. It should be noted that aerial agricultural operations are possible within wind farms. Wind turbines are not expected to pose unacceptable risks to aerial firefighting.

Overall, the impact assessment concluded the potential risk to aviation in the project region is low and does not pose a hazard to aircraft safety.

22.2 EES objectives and key issues

The EES scoping requirements specify the evaluation objective and key issues, outlined in Table 22.1, relevant to aviation that have guided this assessment.

Table 22.1 EES evaluation objective and key issues

Evaluation objective	
Land use and socio-economic: *To avoid and minimise adverse effects on land use (including agricultural and residential), social fabric of the community (with regard to wellbeing, community cohesion), local infrastructure, electromagnetic interference, aviation safety and to neighbouring landowners during construction, operation and decommissioning of the project.*	
Key issues	• Potential adverse effects of wind turbines and associated infrastructure from an **aviation** perspective, including but not limited to impacts on aerial safety, air traffic control equipment, obstruction and turbulence. • Potential interference with communication systems that use electromagnetic waves as the transmission medium (e.g. television, radio, mobile reception)

22.3 Legislation, policy and guidelines

Key legislation, policies and guidelines relevant to the ***Aviation Impact Assessment*** (Appendix O) are summarised in Table 22.2.

Table 22.2 Relevant legislation, policies and guidelines

Legislation, policies and guidelines	Description	Relevance to project
Commonwealth		
Civil Aviation Act 1988	The primary aim of the *Civil Aviation Act 1988* is to establish a regulatory framework for maintaining, enhancing and promoting the safety of civil aviation. This Act establishes the Civil Aviation Safety Authority (CASA) and CASA's functions, including conducting safety regulation relating to civil aviation.	The ***Aviation Impact Assessment*** included a review against relevant CASA publications.
Civil Aviation Regulations 1988 and Civil Aviation Safety Regulations 1998	These regulations are made under the *Civil Aviation Act 1988* and provide general aviation safety regulatory controls, including the required safety standards in relation to air traffic control and rules of the air.	The Civil Aviation Safety Regulations 1998 Part 175.E requires that obstacles with a height above 100 metres at ground level (turbines and meteorological monitoring masts) are reported as tall structures for inclusion in the vertical obstacle database and on appropriate aeronautical charts. Part 139 – Aerodromes, Section E of the Civil Aviation Safety Regulations 1998 contains the regulations governing obstacles. These regulations are applicable to the protection of airspace and aircraft operations in the vicinity of certified or military aerodromes. As the wind turbines have a tip height of up to 260 metres (854 feet) above ground level, they must be reported as per the Civil Aviation Safety Regulations 1998 Part 175E.

Legislation, policies and guidelines	Description	Relevance to project
Victorian		
Planning and Environment Act 1987	The Moyne Planning Scheme contains Victoria Planning Provisions within the Particular Provisions relevant to aviation.	The aim of Particular Provision Clause 52.32 Wind Energy Facility is *"to facilitate the establishment and expansion of wind energy facilities, in appropriate locations, with minimal impact on the amenity of the area."* 52.32-5 Decision Guidelines of this Clause states that *"Before deciding on an application, in addition to the decision guidelines of Clause 65, the responsible authority must consider, as appropriate:* *- The impact of the facility on aircraft safety."*
Guidelines		
Advisory Circular AC 139.E-05 v1.1: Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome (CASA, 2022)	This advisory circular provides guidance on matters to be considered in the assessment of a wind farm development and mitigation measures to manage potential safety risks to aviation. The Advisory Circular recommends that an aeronautical study be conducted by the wind farm proponent, including a risk analysis to identify aviation safety risks using AS/NZS ISO 31000:2018 Risk Management – Guidelines.	The aeronautical impact risk assessment was undertaken in accordance with the risk standard and process outlined in the Advisory Circular.
Advisory Circular AC 139.E-01 v1.0: Reporting of tall structures (CASA, 2021)	This advisory circular outlines the procedure for reporting tall structures, in accordance with the Civil Aviation Safety Regulations 1998. Tall structures refers to *"any obstacle, or parts thereof, that are 100 m or more above ground level".*	The wind turbines and meteorological monitoring towers are required be reported to the Vertical Obstacle Database, managed by Airservices Australia, in accordance with AC 139.E-01 v1.0 because they are taller than 100 m above ground level.
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, 2012)	This framework seeks to enhance the safety, viability and development of aviation operations in Australia. This Framework contains various guidelines relating to the management of airports, including the risk of wind farms as physical obstacles to air navigation. Guideline D of the framework contains guidance for the siting and marking of turbines and meteorological monitoring towers associated with wind farms.	The project is 30 kilometres from a certified aerodrome and the NASF Guideline D considers 30 kilometres (16.2 nm) from a certified aerodrome to be "in the vicinity", therefore making it applicable as per Guideline D The ***Aviation Impact Assessment*** (including obstacle lighting review) was done in accordance with National Airports Safeguarding Framework Guideline D.
Design Guidelines and Model Requirements Renewable Energy Facilities (CFA, 2025)	This document outlines fire safety, risk and emergency management measures and processes to be considered in the design, construction and operation of renewable energy facilities. These guidelines contain specific conditions to be complied with for the siting, and operation and maintenance of wind energy facilities.	The project design has incorporated the design conditions outlined in Section 4.6.2 of the guidelines (Design Specific to Facility Type). The conditions relating to the operation and maintenance of the wind farm have been included as management measures (refer to Section 22.7.3).

Legislation, policies and guidelines	Description	Relevance to project
Planning guidelines for the development of wind energy facilities (Planning Guidelines) (DTP, 2023a)	These guidelines provide a set of consistent operational performance standards to inform the assessment and operation of a wind energy facility project, as well as guidance as to how planning permit application requirements might be met.	The Planning Guidelines recommend that aircraft safety issues should be addressed when developing a wind farm, including considering the proximity of the proposed site to airports, aerodromes or landing strips. The ***Aviation Impact Assessment*** has included an assessment of all certified and known uncertified aerodromes within 30 nautical miles (55.6 kilometres) of the project site to determine potential aviation safety issues during project operation.
Aeronautical Information Publication Australia (Airservices Australia, 2025)	This publication is a mandatory worldwide distribution system for the communication of aviation rules, procedures, and information.	Aeronautical Information Publication Australia contains documents relating to the safe and efficient operation of national and international air navigation within Australia. It is updated every three months.
EUROCONTROL Guidelines: How to Assess the Potential Impact of Wind Turbines Surveillance Sensors (EUROCONTROL, 2014)	These guidelines provide guidance on assessing the potential impact of wind turbines on existing communications, navigation and surveillance services. They also outline potential mitigation measures to avoid or minimise impacts to these services.	The ***Aviation Impact Assessment*** considered the potential impacts to communications, navigation and surveillance facilities in accordance with the EUROCONTROL Guidelines, as requested by Airservices Australia.

22.4 Investigation area

The investigation area for aviation included the project site and a buffer of 30 nautical miles (55.6 kilometres) of the project site to encompass all certified and known uncertified aerodromes within this area, as per the Airservices Australia requirements for an Aviation Impact Statement. The investigation area is shown in Figure 22.1.

22.5 Method

The ***Aviation Impact Assessment*** (Appendix O) included the following scope of works:

- Review of the Australian Aeronautical Information Publication, Civil Aviation Safety Regulations and CASA publications to identify physical and operational aviation issues that may impact on the requirement for lighting of the wind farm.
- Review of topographical maps and Google Earth to assess the local terrain and identify local certified aerodromes and uncertified airstrips.
- Consultation with relevant stakeholders including:
  - Airservices Australia (see Appendix B of the ***Aviation Impact Assessment*** (Appendix O) for the response received from this stakeholder)
  - State Government Police Air Wing
  - Fixed Wing Air Ambulance (Pelair)
  - Fire Services
  - Helicopter Emergency Medical Service
  - Department of Defence (see Appendix C of the ***Aviation Impact Assessment*** (Appendix O) for the response received from this stakeholder)
  - Warrnambool City Council
  - Air Apply
  - Rohan Flying Services
  - Border Air
  - Field Air.
- Preparation of an Aviation Impact Statement, as required by Airservices Australia. The Aviation Impact Statement includes identification of:
  - all certified and known uncertified aerodromes within 30 nautical miles of the project site
  - published instrument approach and landing procedures at the certified aerodromes
  - any published air routes over or near the project site
  - airspace classification over or near the project site
  - air traffic communications, navigation and surveillance (radar) facilities near the project site.
- Obstacle lighting review in accordance with the National Airports Safeguarding Framework Guideline D: Managing the risk to aviation safety of wind turbine installations (wind farms)/wind monitoring towers. This provides guidance for the siting and marking of the wind turbines and associated meteorological monitoring towers.
- Identification and assessment of potential impacts to flying training areas, recreational aviation, approved low-flying activities (including aerial agricultural operations), emergency services (Police Air Wing, Helicopter Emergency Medical Services, fixed-wing Air Ambulance) and aerial firefighting operations.

22.6 Existing conditions

22.6.1 Aerodromes

Aerodromes

Aerodromes fall into three categories:

- Military (or combined military and civilian): operated by the Department of Defence, suitable for the operation of military aircraft.
- Certified: regulated under Civil Aviation Safety Regulations 1998.
- Uncertified: any other aerodrome, aeroplane landing area or airstrip, which can range in capability and size (e.g., sealed runway or grass paddock).

Military and certified aerodromes are listed in the Aeronautical Information Publication (AIP). Uncertified aerodromes are not required to be listed in the AIP, so information about them is not necessarily held on the public domain and may not be available through aeronautical publications and charts. For the ***Aviation Impact Assessment*** (Appendix O), all known aerodromes and airstrips within 30 nautical miles of the project site are considered.

Certified and known Uncertified aerodromes within 30 nautical miles of the project site are summarised in Table 22.3. There are no military aerodromes within 30 nautical miles of the project site.

Table 22.3 **Certified and known Uncertified aerodromes within the project investigation area**

Aerodrome	Usage	Approx. distance from nearest wind turbine	Direction from wind turbine
Certified aerodromes			
Warrnambool		12 nautical miles (22 kilometres)	South-west
Hamilton		30 nautical miles (56 kilometres)	North-west
Uncertified aerodromes			
Cobden	Home base for approximately 12 light aircraft	23 nautical miles (43 kilometres)	South-east
Derrinallum	Base of an aerial agricultural applications operator	28 nautical miles (52 kilometres)	East
Camperdown	Base of an aerial agricultural applications operator	24 nautical miles (45 kilometres)	East

22.6.2 Uncertified airstrips

There are two uncertified private airstrips on properties close to the project site (Table 22.4).

Table 22.4 **Uncertified airstrips within the project investigation area**

Uncertified airstrip identifier no.	Usage	Approx. distance from nearest wind turbine	Direction from wind turbine
1	Used occasionally for aerial agricultural applications	3 nautical miles (6 kilometres)	North-north-east
2	Used occasionally for aerial agricultural applications	5 nautical miles (10 kilometres)	North-north-east

The location of certified and known uncertified aerodromes and airstrips close to the project site are shown in Figure 22.1.

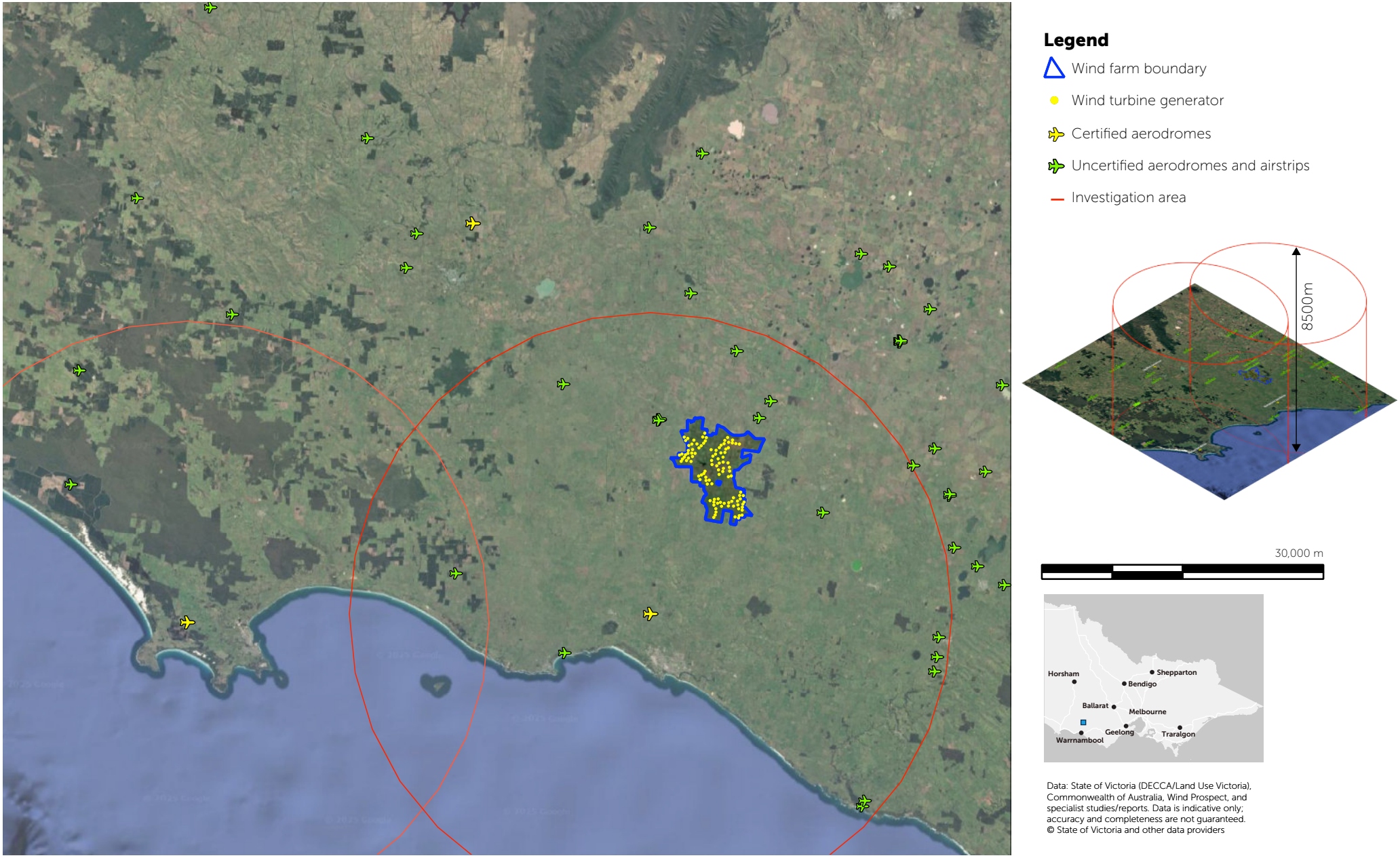

Figure 22.1 Aviation assessment investigation area

22.6.3 Airspace and air routes

The project is within Class G airspace. Class G airspace refers to airspace that is uncontrolled (i.e., does not require air traffic control clearance). Within Class G airspace, aircraft may operate in accordance with both Instrument Flight Rules and Visual Flight Rules.

Air routes are published to facilitate the safe and efficient flow of aircraft operating under Instrument Flight Rules. A lowest safe altitude is defined for each air route segment to ensure terrain and obstacle clearance.

Two air routes pass over the project site. These air routes and their lowest safe altitudes are:

- one-way from Portland Aerodrome to Melbourne Aerodrome (V279), with published lowest safe altitude of 2,700 feet for the segment over the project
- one-way from Melbourne Airport via ESDIG (Cape Clear) to Portland Aerodrome (V126), with published lowest safe altitude of 3,000 feet for the segment over the project.

Other nearby published air routes are outside the applicable Required Navigation Performance standard safety buffer and are not affected by the project.

For flights operating under Visual Flight Rules within Class G airspace, aircraft must not fly lower than 500 feet above the highest obstacle on the terrain in accordance with Civil Aviation Safety Regulations, Part 91D, regulation 91.267 Minimum Height Rules – other areas. For this project, with a tip height of 260 metres (853 feet), this equates to 1,353 feet above ground level. CASA-authorised low flying aircraft, such as aerial applications operations, are permitted to operate below this level.

22.6.4 Existing aviation operations

There are four known aerial applications operators, used for spraying and spreading, that work in the general area of south-western Victoria. Other aviation activities in the project investigation area may include recreational aviation and aerial emergency services. Recreational Aviation Australia registered recreational and sport aircraft are limited to daytime flight in accordance with the Visual Flight Rules. Police Air Wing, Helicopter Emergency Medical Service, and fixed-wing Air Ambulance are capable of Instrument Flight Rules flight. The Police Air Wing helicopters and Helicopter Emergency Medical Service aircraft are equipped with Night Vision Imaging Systems allowing them to fly low level in reduced light night operations.

Aerial firefighting is conducted at low level using specialist aircraft flown in accordance with the Visual Flight Rules. As such, aerial firefighting can only operate during daylight hours, and aircraft must remain clear of smoke to maintain visibility of the ground and obstacles. The use of aerial firefighting can also be restricted by turbulence, smoke, strong wind, fire induced thunderstorm cloud (pyrocumulonimbus) or erratic fire behaviour. Through engagement with the Country Fire Authority as part of the Fire Risk Assessment (refer to Chapter 23 – ***Fire risk*** and Appendix P – ***Fire risk Impact Assessment***), no concerns were raised about potential impacts of the project on firefighting operations.

There are no published flying training areas in the investigation area. There are also no 'special user airspace,' or 'prohibited', 'restricted' or 'danger' areas, identified in the Aeronautical Information Publication, in the project investigation area.

Flight rules

Visual Flight Rules: rules applicable to flight under visual meteorological conditions. That is, rules that allow a pilot to operate an aircraft in visual meteorological conditions, i.e. weather conditions clear enough the pilot can remain clear of cloud and see the terrain and where the aircraft is going. If the weather is worse than the Visual Meteorological Conditions minimum criteria, pilots must revert to instrument flight rules or land at the nearest aerodrome.

Visual Meteorological Conditions: require a forward visibility of 5,000 metres and operating clear of cloud for aircraft operating below 3,000 feet.

Instrument Flight Rules: rules applicable to the conduct of flight under instrument meteorological conditions and where flight by visual reference is not possible. Flying by Instrument Flight Rules relies on instruments in the flight deck and navigation by electronic signals.

22.6.5 Air traffic communications, navigation and surveillance

The nearest Airservices Australia air traffic control communications facility is located at Mt William, about 52 nautical miles (96 kilometres) to the north of the project site at an elevation of 3,740 feet (1,140 metres).

The Non-Directional Beacon at Hamilton Aerodrome, a low frequency (203 kilohertz) radio transmitter with a range of 45 nautical miles (or about 83 kilometres), is the closest ground-based navigation aid to the project site.

The closest civil aviation surveillance facility is a Secondary Surveillance Radar located at Mount Macedon, about 99 nautical miles or 184 kilometres north-east of the project site. The closest Primary Surveillance Radar is located at Gellibrand Hill (Tullamarine airport), about 108 nautical miles or 200 kilometres north-east of the project site.

Primary Surveillance Radar: uses radio waves that reflect off aircraft (or other objects). This can be used to detect the position, height and airspeed of an aircraft within a range (radius) of around 250 nautical miles, or 463 kilometres). It does not require an aircraft to have a transponder.

Secondary Surveillance Radar: requires an aircraft to carry a transponder, which transmits a data signal to a ground station. This radar can detect aircraft in an airspace radius of up to 250 nautical miles (463 kilometres) and up to 100,000 feet.

22.7 Impact assessment

22.7.1 Impact pathways

Wind turbines have the potential to impact on the operation of aerodromes and local airstrips due to the introduction of new obstacles. For certified aerodromes, this can result in impacts to Obstacle Limitation Surfaces and Procedures for Air Navigation Services – Aircraft Operations surfaces associated with Instrument Approach Procedures. A schematic of the potential obstacles to aircraft flight paths (take-off climb and approach descent) surrounding an aerodrome is shown in Figure 22.2.

There is a potential safety risk to Visual Flight Rules for aircraft operating at low levels in the vicinity of project wind turbines, including aerial agriculture operations and firefighting. This is particularly the case for wind monitoring towers, which can be difficult to see from the air due to their slender construction and use of guy wires.

Wind turbines can also impact communications, navigation and surveillance (radar systems) used for air traffic control due to electromagnetic interference. The project has been assessed by Airservices Australia and would not impact the air traffic control communications facility at Mount William. The project would also not impact the Non-Directional Beacon radio transmitter at Hamilton Aerodrome, or the Mount Macedon and Gellibrand Hill radars as the project is beyond the line of sight of these radars. This is further discussed in Chapter 24 – ***Electromagnetic interference***. The project will not impact future development of the Warrnambool Aerodrome as outlined in the aerodrome master plan.

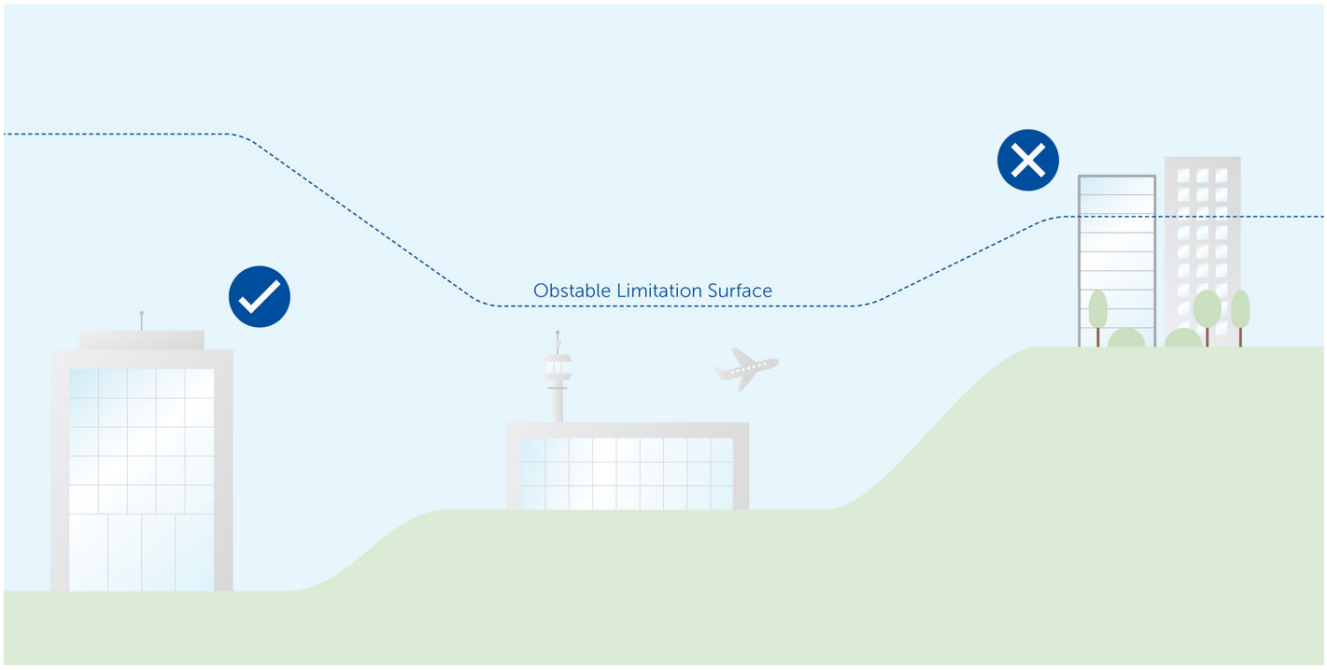

Figure 22.2 Aircraft obstacle limitation surface

22.7.2 Design mitigation

Avoidance by design has been the primary measure to limit aviation impacts. This has been an iterative process whereby the specialist aviation consultant assessed potential impacts related to aviation based on the concept design and provided recommendations in relation to position of local airstrips and required changes to Instrument Approach Procedures. These recommendations were incorporated into the reference design.

Key measures that have been incorporated into the project design to minimise or avoid impacts to aviation operations area outlined in Table 22.5 below.

Table 22.5 Aviation design mitigation measures

Potential aviation impact	Design mitigation measures
Firefighting	The project design has incorporated the following recommendations outlined in the Country Fire Authority (2025) Design Guidelines and Model Requirements Renewable Energy Facilities [AVID01]: • for aerial firefighting, a minimum distance of 300 m between turbines has been applied to allow for adequate distance for the operation of aircraft around the project wind turbines • wind turbines will be provided with automatic shut-down, and the ability to be completely disconnected from the power supply in the event of fire • for ground-based firefighting, the access tracks have been designed to the following specifications: - minimum of four metres in trafficable width - four metre vertical clearance - all-weather surface - capable of accommodating a 15-tonne vehicle - provision of multiple access points, to ensure safe and efficient access to and egress.

22.7.3 Environmental management measures

Where possible, design measures have been included to avoid potential impacts to aviation operations. To further minimise potential impacts to aviation operations in the investigation area, management measures would be carried out during construction and operation of the project. For a full description of management measures for the project, refer to Chapter 28 – ***Environmental management framework***. Committed management measures relevant to Aviation are outlined in Table 22.6.

Table 22.6 Aviation management measures

Aviation impact	Project phase	Management measures	Number
Potential to impact local aerial operations (including aerial agricultural operations and emergency services)	Construction Operation	**Marking of meteorological monitoring masts** 1. Maintain marking of meteorological monitoring masts in accordance with the National Airports Safeguarding Framework Guideline D: Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation and marking on the base around the outer guy wires to improve visibility of these structures for low-flying aircraft such as aerial agricultural operations. During the day, large wind turbines are sufficiently conspicuous due to their shape and size, provided the colour of the turbine is of a contrasting colour to the background (NASF Guideline D, page 4 paragraph 30, July 2012).	AVI01
	Construction	**Stakeholder Engagement and Communications Plan - Airservices Australia notification** 1. Provide notification to relevant stakeholders about the location and heights of wind turbines and meteorological monitoring masts, including: a. updating the Vertical Obstacle Database, managed by Airservices Australia, as per the procedure for reporting tall structures contained in Civil Aviation Safety Authority (CASA) Advisory Circular: AC 139, E-01 v1.0 Reporting of tall structures December 2021. b. ensuring an Aeronautical Information Publication Supplementary (AIP SUP) is issued providing the height and location of the wind turbines and meteorological monitoring masts. This is done by Airservices Australia when they are notified of the commencement of construction and the wind farm design. The wind farm location will be included in aeronautical charts.	AVI02

Aviation impact	Project phase	Management measures	Number
Potential to impact firefighting operations	Operation	**Firefighting** 1. As per the CFA's Design Guidelines and Model Requirements – Renewable Energy Facilities (Country Fire Authority, 2025), the following will apply for the operation of the wind farm to manage potential impacts to firefighting operations: a. fuel management measures during the Fire Danger Period, including maintaining grass levels at or below 100 millimetres in height and maintaining a fire break area of at least 10 metre width around electricity compounds and substations b. a fire break of at least 10 metres around the base of wind turbines and battery energy storage system, which has been incorporated into the design c. constructed roads developed during construction of the facility must be maintained post-commissioning and throughout the operational life of the facility to allow access to each turbine for maintenance and emergency purposes d. a fire protection system to allow adequate response to the risks and hazards at the facility, in consultation with the Country Fire Authority (CFA) e. inclusion of a static fire water storage tank of at least 45,000 L effective capacity at each site entrance (there are 11), regularly monitored to ensure water level adheres to CFA guidelines wind energy facility emergency management plan, provided within the emergency information book, which includes the maximum (safe) operational wind speed and temperature conditions and operating procedures to limit fire risk. f. aerial firefighting can be used if it is considered appropriate and available. The pilot will ensure the safety of the aircraft and determine where they can safely operate within and around the wind farm.	BF02

22.7.4 Residual impacts

After the development of design measures and management measures, an assessment of residual effects and impacts was completed describing the changes to the environment brought about by the construction, operation and eventual decommissioning of the project, and rating the significance of these effects.

Aerodromes

The project would not impact the Obstacle Limitation Surface or the Procedures for Air Navigation Services – Aircraft Operations surfaces protected airspace of the Instrument Approach Procedures for the Hamilton Aerodrome. The project would also not impact the Obstacle Limitation Surface for the Warrnambool Aerodrome.

While the proposed turbines are beyond the 10 nautical mile Minimum Safe Altitude for the Warrnambool Aerodrome, there are several turbines within the five nautical mile buffer zone used to calculate this Minimum Safe Altitude. To enable the proposed maximum blade tip height, the Warrnambool Aerodrome 10 nautical mile Minimum Safe Altitude would need to be raised by 100 feet from 2,200 feet to 2,300 feet.

The non-precision Instrument Approach Procedure is used by aircraft flying to the Instrument Flight Rules when landing at Warrnambool Aerodrome during poor weather conditions. Raising the 10 nautical mile Minimum Safe Altitude does not affect the operation of Instrument Flight Rules aircraft using the published Instrument Approach Procedure. The Minimum Safe Altitude is determined by adding safety margins to the geography and built environment elevations within the area to ensure safe operations at Warrnambool Aerodrome. The majority of Instrument Flight Rule aircraft arriving at Warrnambool will execute the relevant Instrument Approach Procedure to ensure safe descent to the Minimum Decision Altitude, at which point the aircraft will continue to land or, if the runway is not in sight, execute a missed approach.

If a planning permit is granted for the project, consultation with the aerodrome operator and the Instrument Approach Procedure designer (Airservices Australia) by the project team is required prior to construction to have the recommended amendments made to the non-precision Instrument Approach Procedure.

Obstacle Limitation Surfaces

The Obstacle Limitation Surface is a series of planes, associated with each runway at a certified aerodrome, that define the desirable limits to which objects or structures may project into the surrounding airspace (i.e., the aerodrome airspace to be kept free of obstacles such as vegetation, buildings, large structures or transmission lines). This surface provides airspace protection for the safe operations of aircraft at the aerodrome.

Procedures for Air Navigation Services – Aircraft Operations surfaces

These surfaces, protect the Instrument Approach Procedures flight paths. They extend further and are higher than the Obstacle Limitation Surface. They provide obstacle protection for pilots flying using Instrument Flight Rules during non-visual conditions (i.e., inclement weather). In this situation, suitably endorsed pilots flying suitably equipped aircraft use published Instrument Approach Procedures for the approach and landing. The pilot relies on ground or satellite navigation systems.

Minimum Safe Altitude

The Minimum Safe Altitude is determined by geography and the built environment to provide an altitude above which there are no obstacles.

Airstrips

The two known airstrips within the investigation area are considered sufficiently distant (i.e., more than three nautical miles, or 5.6 kilometres) from the nearest project turbine that the project would not impact on their continued operation.

Airspace and air routes

The tallest proposed project wind turbine is T24, at 401 metres (or around 1,316 feet) AHD. With a minimum obstacle clearance altitude of 1,000 feet, the lowest safe altitude for airspace over the project site is around 2,316 feet (or around 706 metres). Rounding up to the nearest hundred feet, this gives a lowest safe altitude over the project site of 2,400 feet. This is below the published lowest safe altitudes for the nearby air routes. As such, the project would not affect the lowest safe altitude for air routes in the project investigation area.

The project is not considered to be a hazard to aircraft safety. As such, the obstacle lighting review concluded that wind turbines would not need obstacle lighting. However, the project wind turbines and meteorological monitoring masts are considered to be tall structures and therefore should be reported to the Vertical Obstacle Database, managed by Airservices Australia.

Existing aviation operations

Aerial agricultural operations

The project would result in some limitations on aerial agricultural operations immediately surrounding wind turbines and meteorological monitoring masts. These limitations, however, would largely be experienced by stakeholder landowners.

Consultation with pilots that apply fertilisers and weed and pest control via aerial application (e.g., Figure 22.3) identified that wind farms would impose some limitations on aerial applications, however, their knowledge of operating near or within wind farms has improved and they are aware of how to operate safely in their vicinity. The main issue is meteorological monitoring masts as they are more difficult to see. To manage this potential impact, masts would be marked in accordance with the National Airports Safeguarding Framework Guideline D: Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation (excluding the recommendation for a strobe light which is considered by aerial agricultural pilots to be ineffective; Appendix O), and the base around the outer guy wires would be marked in a contrasting colour to the ground.

Recreational aviation

As recreational and sport aircraft are limited to daytime flight in accordance with the Visual Flight Rules, they must remain clear of cloud and at minimum of 500 feet above the ground or highest obstacle. The cruising speed of ultralight aircraft is generally lower than for a general aviation aircraft, allowing more time to see and avoid obstacles. The project site is not known to be used by recreational pilots, the risk of impact to recreation aviation is considered low.

Aerial emergency services

As per aerial agricultural operations, aerial emergency service operators have indicated the presence of a wind farm would not stop aerial emergency service operations, with pilots aware of wind farms and how to operate safely in their vicinity. The project is not predicted to affect fixed-wing Air Ambulance operations due to their use of Instrument Flight Rules during operations.

Figure 22.3
Aerial spraying operations

Figure 22.4
Aerial firefighting near a wind farm
(Source: The Ballarat Courier, 2018)

Firefighting

Firefighting aircraft (e.g., Figure 22.4) operate to the Visual Flight Rules. As such, these aircraft can only operate during daylight hours and must remain clear of smoke to maintain the required visibility of the ground and obstacles such as wind turbines, trees, power lines, radio masts and houses. The Wind Farms and Bushfire Operations Position Paper (Australian Fire and Emergency Service Authorities Council, 2018) identifies that wind turbines are not expected to pose unacceptable risks to aerial firefighting. Some firefighting helicopters are permitted to use Night Vision Imaging Systems and are capable of night operations.

Access for fire trucks and personnel to fight a fire within a wind farm is improved by the access tracks built for the construction and maintenance of the turbines, in accordance with the Country Fire Authority Guidelines. These roads also act as fire breaks which can slow or contain the fire spread across the open ground. The area around the base of each tower is kept clear of vegetation, which offers a refuge for fire fighters and their vehicles. The project design also includes water tanks in strategic positions around the wind farm that would be designed to meet the requirements of the Country Fire Authority.

22.7.5 Impact assessment summary

Overall, the potential risk to aviation in the project region is assessed as low and does not pose a hazard to aircraft safety.

A summary of the ***Aviation Impact Assessment*** is shown in Table 22.7 below, with the full assessment presented in Appendix O.

Table 22.7 Aviation impact assessment summary

Impact pathway	Asset, value or receptor	Project phase	Likely impact (considering magnitude, extent and duration)	Impact rating and justification
Potential for wind turbines to impact aviation operations	Aerodromes	Operation	The 10 nautical miles Minimum Safe Altitude for Instrument Approach Procedures at Warrnambool Aerodrome is affected by the project.	**Impact not expected** With an increase of the Warrnambool Instrument Approach Procedure 10 nautical miles Minimum Safe Altitude by 100 feet, no impact to aircraft safety and procedures is anticipated.
	Airstrips – take-off / landing	Operation	The project would not impact the operation of the two known airstrips.	**Impact not expected** The known airstrips are located more than 2 nautical miles from the nearest project turbine.
	Airspace and air routes	Operation	Within project investigation area there is no impact to the lowest safe altitude for air routes, and there are no published flying training areas, or no 'special user airspace', 'prohibited', 'restricted' or 'danger' areas.	**Impact not expected** The project does not require obstacle lighting as it is not considered to be a hazard to aircraft safety.
	Aerial agricultural operations	Operation	Four known aerial applications operators work in the general area of south-western Victoria. The project turbines may impact existing aerial agricultural aircraft operations within in the area immediately surrounding the project turbines.	**Low** The project turbines would be appropriately painted, as per the design mitigation measures, to ensure they are visible by day.
	Firefighting	Operation	Wind turbines are not expected to pose unacceptable risks to aerial firefighting. Access tracks built for the construction and maintenance of the turbines can improve ground-based firefighting access and can also act as fire breaks.	**Low** With the implementation of design and management measures, impacts of the project to firefighting efforts are considered low.

22.8 Conclusions

Wind turbines have the potential to impact on the operation of local unregulated airstrips as they can present as aviation obstacles.

The ***Aviation Impact Assessment*** (Appendix O) identified the project would not impact on the Obstacle Limitation Surface or the Procedures for Air Navigation Services – Aircraft Operations surface associated with the Instrument Approach Procedures at Hamilton Aerodrome, or the lowest safe altitude for published air routes above the project site. However, changes to the 10 nautical mile Minimum Safe Altitude for the Warrnambool Aerodrome would be required.

Overall, the study concluded the project represents a low risk to aviation in the project region and does not pose a hazard to aircraft safety. As such, obstacle lighting is not needed. However, as wind turbines and meteorological monitoring masts are considered to be tall structures, they should be reported to the Vertical Obstacle Database managed by Airservices Australia.