AVIATION IMPACT STATEMENT
SUPPLEMENTARY TECHNICAL ASSESSMENT 5

ENERGYCONNECT (NSW - EASTERN SECTION)

Prepared for Transgrid

AVIATION PROJECTS

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ACRONYMS

AAAA	Aerial Application Association of Australia
AC	Advisory Circular
AGL	above ground level
AHD	Australian Height Datum
AIA	aviation impact assessment
AIP	Aeronautical Information Publication
AIS	aviation impact statement
ALA	aircraft landing area
AMSL	above mean sea level
ARP	Aerodrome Reference Point
AS	Australian Standards
AsA	Airservices Australia
CAAP	Civil Aviation Advisory Publications
CAO	Civil Aviation Orders
CAR	Civil Aviation Regulation (1988)
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation (1998)
DME	distance measuring equipment
DPE	Department of Planning, and Environment
ERC-L	en-route chart low
ERSA	En Route Supplement Australia
GNSS	global navigation satellite system
IAP	instrument approach procedures
ICAO	International Civil Aviation Organization
IFR	instrument flight rules
IMC	instrument meteorological conditions
LGA	local government area
LSALT	lowest safe altitude

MOS	Manual of Standards
MSA	minimum sector altitude
MTOW	maximum take-off weight
NASAG	National Airports Safeguarding Advisory Group
NASF	National Airports Safeguarding Framework
NDB	non-directional radio beacon
OLS	obstacle limitation surface
PANS-OPS	Procedures for Air Navigation Services - Aircraft Operations
RFDS	Royal Flying Doctor Service
RNAV	area navigation
RPT	regular public transport
RSR	route surveillance radar
VFR	visual flight rules
VOR	VHF omni-directional radio range
VMC	visual meteorological conditions

UNITS OF MEASUREMENT

ft	feet	(1 ft = 0.3048 m)
km	kilometres	(1 km = 0.5399 nm)
m	metres	(1 m = 3.281 ft)
nm	nautical miles	(1 nm = 1.852 km)

DEFINITIONS

Definitions of key aviation terms are included in **Annexure 2**.

EXECUTIVE SUMMARY

Introduction

Transgrid (electricity transmission operator in New South Wales (NSW)) and ElectraNet (electricity transmission operator in South Australia (SA)) are seeking regulatory and environmental planning approval for the construction and operation of a new High Voltage (HV) interconnector between NSW and SA, with an added connection to northwest Victoria. Collectively, the proposed interconnector is known as EnergyConnect.

The NSW portions of EnergyConnect (including the NSW – Eastern Section (the proposal) have been declared to be Critical State significant infrastructure (CSSI) under section 5.13 of the Environmental Planning and Assessment Act 1979 (EP&A Act) and by amendment to Schedule 5, clause 15 of the State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP). As CSSI, the proposal requires approval from the NSW Minister for Planning under Division 5.2, Part 5 of the (NSW) EP&A Act.

An Environmental Impact Statement (EIS) was prepared to support Transgrid's application for approval of the proposal in accordance with the requirements of Division 5.2 of the EP&A Act. The EIS was placed on public exhibition by the NSW Department of Planning and Environment (DPE) (formerly Department of Planning, Infrastructure and Environment) for a period of 28 days, commencing 19 January 2022 and concluding on 15 February 2022.

In response to the public exhibition of the EIS submission, Airservices Australia requested that an aviation impact statement (AIS) be completed for the proposal. This report responds to this submission and documents the outcome of the AIS, with consideration of:

- relevant legislation, regulations, standards and airport masterplans applicable to airport and aircraft operations
- impacts on certified aerodrome/airport operations due to potential intrusions into the obstacle limitation surfaces (OLS) by towers or construction cranes
- impacts on certified aerodrome/airports within 30 nautical miles (nm) of the transmission line due to potential intrusions into the Procedures for Air Navigation Services - Aircraft Operations (PANS-OPS) surfaces by towers or construction cranes
- other potential impacts to (if present near or over the transmission line):
    - non-certified aerodromes and aircraft landing areas (within 3 nm of the transmission line)
    - designated air routes
    - flying operations of the Australian Defence force
    - any navigation aids and air traffic control surveillance systems
    - agricultural aircraft operations and other flow flying operations.
- required mitigation measures or approvals/authorisations that would be required in response to any identified impacts, such as requirements for hazard marking and lighting.

Key features of the proposal

Key features of the proposal that are relevant to this assessment are:

- about 375 kilometres of new 330kV double circuit transmission line between the Buronga substation and the proposed Dinawan 330kV substation (referred to as L2) and about 162 kilometres of new 500kV double circuit transmission line between the proposed Dinawan 330kV substation and the existing Wagga Wagga substation at Wagga Wagga, NSW (referred to as L5)
- the construction of a new Dinawan substation and upgrade of the existing Wagga Wagga substation.

Around 1160 transmission line towers with a maximum overall height of 65 m above ground level (AGL) would be constructed. Construction cranes at each transmission line tower site and substation site would be up to 80 m AGL and 60 m AGL respectively. For:

- Line L2, the transmission line tower on the highest terrain (#43) would have an elevation of 177.5 m Australian Height Datum (AHD) and its construction crane would have a maximum elevation of 192.5 m AHD
- Line L5, the transmission line tower on the highest terrain (#20) would have an elevation of 446.7 m AHD and its construction crane will have a maximum elevation of 461.7 m AHD.

Aviation Impact Statement

The proposal:

- would infringe the Approach Surface (AS) of Wagga Wagga Airport's OLS during construction and operation as a result of the location and height of the proposed transmission line towers and associated construction cranes. The infringement to the AS by the proposed transmission line towers would be tolerable, to a similar extent that is consistent with the infringements by the existing transmission line towers and terrain into the AS at Wagga Wagga Airport
- would not have any structures that would penetrate any Procedures for Air Navigation Services - Aircraft Operations (PANS-OPS) surfaces
- is unlikely to impact upon take-off and landing operations at the two aircraft landing areas (ALAs) in close proximity to the transmission line
- would not have an impact on designated air routes
- would not have an impact on the grid lowest safe altitudes (LSALTs)
- is wholly contained within Class G airspace
- is outside any Special Use Airspace
- is outside the clearance zones associated with aviation navigation aids, radar systems and communication facilities
- Can be compatible with aerial application flight operations when the recommended risk management process is carried out by the pilot and landowner whose property has the transmission line overhead and immediately adjacent to the proposed transmission line.

Hazard lighting and marking

Lighting

"CASA has no authority or powers in relation to a wind farm or tall structure approval outside the vicinity of a certified aerodrome but advice from CASA will inform the planning authority in regard to any decisions or conditions on any approval the planning authority might place on a development." [1]

CASA considers that obstacles lower than 500 ft/152.4 m AGL do not infringe "navigable airspace" and therefore, over areas outside a built-up area, do not require obstacle lights to be fitted.

CASA has not required obstacle lighting for the existing terrain and transmission line that technically infringes the Runway 05 Approach Surface at Wagga Wagga airport which is consistent with the provisions of Section 9.27 of the CASR Part 139 Manual of Standards - Aerodromes (CASR Part 139 MOS).

The transmission line towers (and temporary construction cranes) that infringe the Wagga Wagga Airport Runway 05 Approach Surface component of the OLS would not require obstacle lighting to maintain an acceptable level of safety to aircraft as the infringements identified in this report are beyond 3000 m from the inner edge near the runway threshold.

Obstacle lighting across the length of existing transmission lines has not been required by CASA, as evidenced by the symbology on the aeronautical charts related to power transmission lines across Australia.

Based on this assessment, it is unlikely that obstacle lighting would be required for the transmission towers and is not recommended. However, this would be confirmed by CASA once it has conducted its own safety assessment. This would occur once CASA has received the AIS from the Wagga Wagga airport manager.

Marking

Transmission line towers associated with high-voltage power transmission lines are large structures that are readily identified. They are depicted on a variety of charts, including aeronautical charts of all scales which assists in their identification from airborne aircraft.

The existing transmission line between Buronga and Wagga Wagga passes by similar, if not the same, areas that the proposed new transmission line would.

ALA owners will be familiar with the existing transmission line. The airport management of Wagga Wagga airport will be familiar with the existing transmission line and the lack of impact that it creates to airport operations.

The proposed transmission line, whilst being slightly higher than the existing line, would generally have the same characteristics as the existing transmission line.

At 65 m AGL, the proposed transmission line does not infringe navigable airspace along its route, other than the OLS at Wagga Wagga Airport and it is unlikely that marking would be required. This would be confirmed by CASA once it has conducted its own safety assessment.

[1] CASA AC 139.E05v1.0 - May 2021

Summary of key recommendations

Recommended actions are provided below.

1. The concept design of the transmission line segment that infringes the Wagga Wagga Airport OLS and the AIS should be provided to the Airport Manager to enable the Airport Manager to pass the details to CASA for assessment. Further engagement is to occur if the finalised design of the proposal alters the details supplied to the Airport Manager.
2. It is unlikely that obstacle lighting and marking of the transmission line towers would be required and it is not recommended as a result of this assessment. This would be confirmed by CASA once it has conducted its own safety assessment, which would occur once it has received the AIS from the Wagga Wagga airport manager.
3. The concept design of the transmission line tower coordinates and elevations should be provided to Airservices Australia using the following email address: vod@airservicesaustralia.com. Note also that:
    a. Airservices Australia has been assigned the task of maintaining a database of tall structures, the top measurement of which is:
        i. 30 m or more above ground level—within 30 kilometres of an aerodrome; or
        ii. 45 m or more above ground level elsewhere.
    b. The purpose of notifying Airservices Australia of these structures is to enable their details to be provided in aeronautical information databases and maps/charts etc used by pilots, so that the obstacles can be avoided.
    c. The notification to Airservices Australia should be made as early as possible following the concept design of the proposal for the preliminary design. Aeronautical charts are updated twice per year, in June and December. For example, the cut-off date for the June 2022 chart amendments has passed. The cut-off date for data inclusion in the December 2022 charts is 16 June 2022. The Amendment Cycle is available at :https://www.airservicesaustralia.com/industry-info/aeronautical-information-management/document-amendment-calendar/.

    Further notification is to occur if the finalised design of the proposal alters the details supplied to Airservices Australia.
4. The concept design for the transmission line tower coordinates and elevations should be provided to Department of Defence, using the following email address: land.planning@defence.gov.au. Further notification is to occur if the finalised design of the proposal alters the details supplied to the Department of Defence.
5. Following the finalised design of the proposal Transgrid will provide relevant details of the proposed transmission line to the ALA owners at North Bundy Station and Bon Accord, to enable them to consider the potential impact of the transmission towers and power lines on their operations.
6. To facilitate the flight planning of aerial application operators conducting flight operations on any property near to the proposed transmission line, details of the proposal, including location and height information of the finalised design of the transmission line and towers would be provided to

landowners. This is so that, when asked for hazard information on their property, the landowner may provide the aerial application pilot with all relevant information.

1. INTRODUCTION

1.1. Background and proposal overview

Transgrid (electricity transmission operator in New South Wales (NSW)) and ElectraNet (electricity transmission operator in South Australia (SA)) are seeking regulatory and environmental planning approval for the construction and operation of a new High Voltage (HV) interconnector between NSW and SA, with an added connection to northwest Victoria. Collectively, the proposed interconnector is known as EnergyConnect.

WSP has been engaged by Transgrid to prepare the environmental approval documentation in support of EnergyConnect (NSW – Eastern Section) application, which is for a new transmission line from Buronga to Wagga Wagga in NSW (the proposal). Figure 1 shows the extent of the proposal. (Source: Transgrid EIS Main Report)

The environmental impact statement (EIS) for the proposal was placed on exhibition in early 2022 and submissions received by Department of Planning and Environment. A submission by Airservices Australia requested that an aviation impact statement (AIS) be completed for the proposal. Aviation Projects has been engaged by WSP to prepare the AIS and this is submitted as part of the Submissions Report for the proposal.

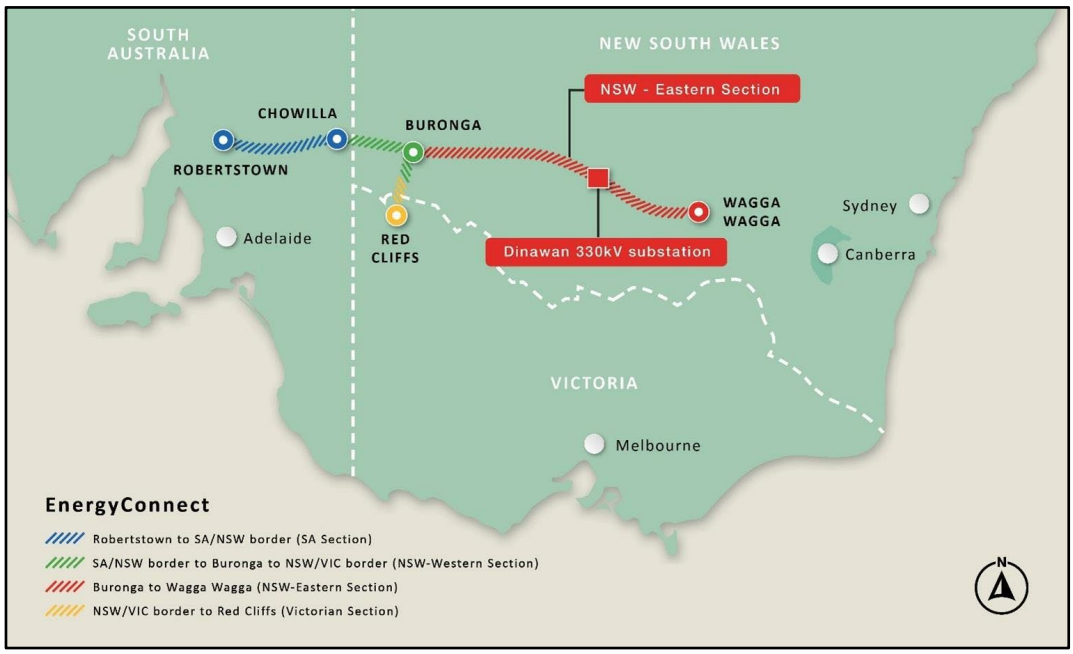

Figure 1 Overview of EnergyConnect

Key features of the proposal that are relevant to this assessment are:

- about 375 kilometres of new 330kV double circuit transmission line between the Buronga substation and the proposed Dinawan 330kV substation (referred to as L2) and about 162 kilometres of new 500kV double circuit transmission line between the proposed Dinawan 330kV substation and the existing Wagga Wagga substation at Wagga Wagga, NSW (referred to as L5)

- the construction of a new Dinawan substation and upgrade of the existing Wagga Wagga substation.

Around 1160 transmission line towers with a maximum overall height of 65 m AGL would be constructed. Construction cranes at each transmission line tower site and substation site would be up to 80 m AGL and 60 m AGL respectively.

The proposal would be located across a number of local government area (LGAs) which consist of the following: Wentworth, Balranald, Murray River, Edward River, Hay, Murrumbidgee, Federation, Lockhart and Wagga Wagga LGAs.

The proposed alignment has been designed to maximise the route running parallel to existing transmission lines as far as possible in consideration of other constraints and operational requirements. The proposed alignment of the proposal easement would be parallel to existing lines for around 407 kilometres of the full approximately 537-kilometre route.

Construction of the transmission line is expected to commence in late-2022 (enabling works phase), subject to NSW Government and Commonwealth planning approvals. The main construction works phase for the transmission lines and substation facilities would take around 18 months. The upgraded Wagga Wagga substation and proposed Dinawan 330kV substation are expected to be operational by August 2024. Removal and re-instatement of construction compounds and associated works and remediation would extend around six months beyond the commissioning phase, with estimated completion in March 2025.

1.2. Proposal description

330kV transmission line between the Buronga substation and proposed Dinawan 330kV substation

This component of the proposal comprises of a new double circuit 330kV transmission line from the existing Buronga substation (as proposed to be upgraded by the approved EnergyConnect (NSW – Western Section) project) to a proposed new Dinawan 330kV substation located along Kidman Way, around halfway between Coleambally and Jerilderie. The nominal distance of this line would be about 375 kilometres.

From the existing 330kV Buronga substation, the transmission line would run parallel to the existing 220kV transmission line (on the northern side of existing easement) for about 55 kilometres in a generally south-east direction (the first 6.5 kilometres of which are proposed to be upgraded as part of EnergyConnect (NSW – Western Section). At this point the alignment would continue in a parallel alignment in a predominantly east-west direction for a further 66 kilometres. At this point the alignment would cross the Sturt Highway and then continue in a south-east direction parallel to the existing 220kV transmission line towards the existing Balranald substation (a distance of around 27 kilometres). It is not proposed to connect the transmission line to the existing 220kV Balranald substation.

From the 220kV Balranald substation, the transmission line would continue in a generally east-west alignment (parallel on the northern side of the existing 220kV transmission line) for around 196 kilometres to a point along Four Corners Road at Mabins Well (around 25 kilometres to the east of the road's intersection with Kidman Way). This section of the alignment would cross and/or be located parallel to a number of key north-south roadways including Yanga Way; Balranald Road; Maude Road; Booroorban- Tchelery Road; the Cobb Highway; Jerilderie Road; Carathool and Conargo Roads and Four Corners Road.

From the point along Four Corners Road, the alignment would deviate from a parallel alignment to the existing transmission line infrastructure and would continue in a generally south-east alignment for around 31 kilometres towards Kidman Way. At this point, the alignment would cross Kidman Way and connect to the proposed Dinawan 330kV substation.

The 330kV transmission line towers would be typically spaced between 450 and 600 m apart, however shorter distances may be required in limited circumstances. The number and exact type of each towers required would be confirmed as part of the finalisation of the proposed infrastructure locations.

The tower types for this section would consist of (refer to Figure 2):

- suspension towers for intermediate/straight sections of the transmission line, comprised of either:
    - a guyed steel tower – which consist of a thinner tower design with guy wires and ground anchors attached to provide stability. Typical height would be between around 40 and 60 metres. These tower types would have a typical permanent base footprint area of around 48 m by 51 m (or around 2,448 square m) including the area to the guywire extents, noting that not all of this area would be directly impacted/require clearing. Only a radial area of around 20 m around the guy pole and a radial area of around five m around each guywire extent would be required to be cleared of vegetation)
    - as free-standing tower (also referred to a suspension towers) – which consist of a wider base and are self-supporting (that is, the tower does not require other supporting infrastructure such as guy wires). A typical height would be between around 40 and 60 m. These tower types would have a typical permanent base footprint area of around 14 m by 14 m (or around 196 square metres). A radial area of around 20 m from the structure would also be required for vegetation clearing
- strain towers – which consist of a wider base and are self-supporting. This type of tower is used for the first and last tower of the transmission line, at major road or river crossings, and where there is a change in direction. This type of tower can also be used for structural reasons to break up long runs of suspension towers. Typical height would be between around 40 and 65 m. These tower types would have a typical permanent base footprint area of between around 24 m by 24 m (576 square metres). A radial area of around 20 m from the structure would also be required for vegetation clearing.

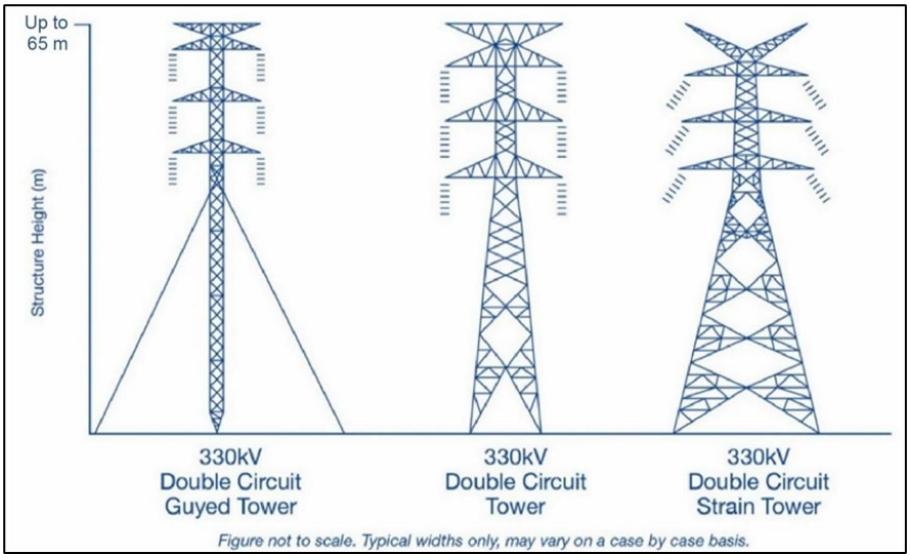

Figure 2 330 kV Towers – Concept design

500kV transmission line between the proposed Dinawan 330kV substation and the Wagga Wagga 330kV substation

This component of the proposal comprises of a new double circuit 500kV transmission line from the proposed Dinawan 330kV substation to the existing Wagga Wagga substation. The nominal distance of this line would be about 162 kilometres.

This section of line would initially only be operated at a 330kV capacity and not the full 500kV capacity. In the future – once other network upgrades and their associated planning approvals are completed (including potentially the upgrade of the Dinawan 330kV substation to a 500kV facility) – this line would operate at its 500kV capacity. This section of line is being proposed to be built now with the physical infrastructure components required for a future 500kV operating capacity. This will allow for future proofing of this section of the network and prevent any future disruptions and impacts to landholders by removing the need for additional future construction activities (post EnergyConnect (NSW – Eastern Section)).

From the proposed Dinawan 330kV substation, the alignment would travel in a typically south-east direction for around 19 kilometres, generally following the alignments of Bundure Road and Thurrowa Road to a crossing point with the Newell Highway.

From this point, the alignment would have a generally east-west alignment for around 45 kilometres, generally following the alignments of a section of transmission line parallel to the existing (disused) Narrandera-Tocumwal Railway (a distance of around 10.5 kilometres); Coonong Road, West Gums Road and Gums Road to Boree Creek Road, west of Lake Cullivel.

From Boree Creek Road, the alignment would be located to the south of Lake Cullivel through to Urana- Lockhart Road. At this point, the alignment would generally follow the alignments of Urana-Lockhart Road, Tenison Lane and Kings Lane to the Lockhart–The Rock Road. This alignment would be located to the south of the township of Lockhart. The distance of this section of the transmission line would be around 36 kilometres.

The sections of transmission line between the proposed Dinawan 330kV substation and the Lockhart–The Rock Road would be located within a new transmission line easement and would not be parallel to any existing high voltage electrical infrastructure.

From the point at which the transmission line crosses the Lockhart–The Rock Road, the alignment would be located parallel to an existing 132kV transmission line for around 39 kilometres (south side of existing easement). This section of the alignment would cross a series of key roadways including County-Boundary Road, Bullenbong Road and The Rock-Collingullie Road.

At this point, the alignment would continue parallel (south side of existing easement) to an existing 330kV transmission line for around 24 kilometres to connect with the existing Wagga Wagga substation.

Similar to the 330kV line, the 500kV transmission line would be supported on a series of transmission line towers. These would be typically spaced between 450 and 600 m apart, however shorter distances may be required in limited circumstances. The number and exact type of each towers required would be confirmed as part of the finalisation of the proposed infrastructure locations.

The tower types for this section would consist of:

- suspension towers – This type of tower is used for the intermediate/straight sections of the transmission line and are self-supporting. Typical height would be between around 40 and 65 m. These tower types would have a typical base footprint of around 22 m by 22 m (or around 484 square metres). A radial area of around 20 m from the structure would also be required for vegetation clearing

- strain towers – which consist of a wider base and are self-supporting. This type of tower is used for the first and last tower of the transmission line, at major road or river crossings, and where there is a change in direction. This type of tower can also be used for structural reasons to break up long runs of suspension towers. Typical height would be between around 40 and 65 m. These tower types would have a typical base footprint of around 26 m by 26 m (or 676 square metres). A radial area of around 20 m from the structure would also be required for vegetation clearing.

Depending on local circumstances, the tower heights for both forms of towers could be up to 65 m above ground level (AGL) (refer to Figure 3).

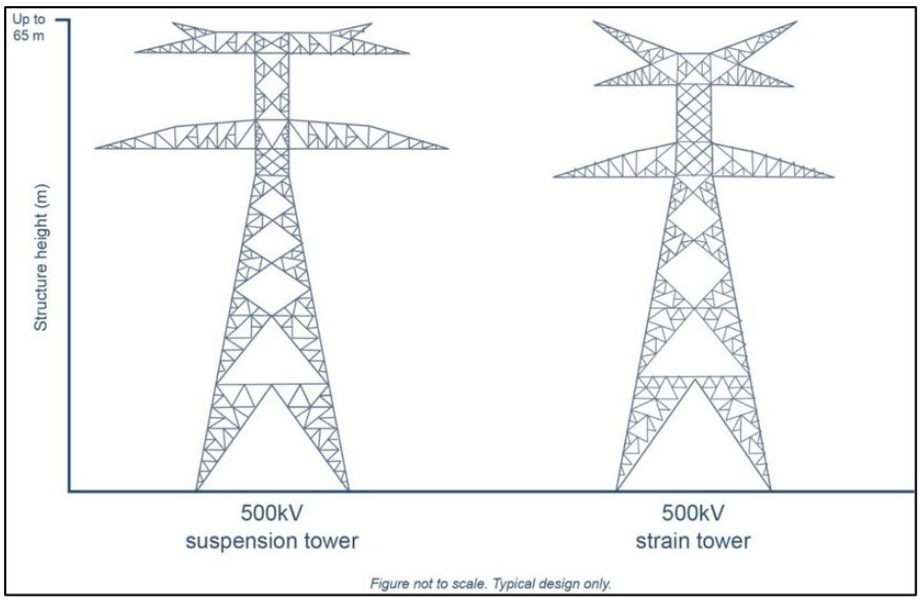

Figure 3 500kV towers - Concept design

Cranes used for construction of the transmission towers are proposed at a maximum height of 80 m AGL.

Construction is scheduled to commence in December 2022 and be complete by July 2024.

Table 1 presents an indicative program for all proposed construction phases.

Table 1 Indicative proposal timetable

Activity	Duration	Q4 Oct 2022	Nov 2022	Dec 2022	Q1 Jan 2023	Feb 2023	Mar 2023	Q2 Apr 2023	May 2023	Jun 2023	Q3 Jul 2023	Aug 2023	Sep 2023	Q4 Oct 2023	Nov 2023	Dec 2023	Q1 Jan 2024	Feb 2024	Mar 2024	Q2 Apr 2024	May 2024	Jun 2024	Q3 Jul 2024	Aug 2024	Sep 2024
330kV transmission line - Buronga substation to Dinawan substation																									
Enabling works phase	2																								
Earthworks and civil construction works	15																								
Tower assembly	13																								
Tower erection	16																								
Tower stringing and clipping	14																								
Commissioning/energisation	1																								
Final completion (remediation works)	1																								
330kV/500kV transmission line - Dinawan substation to the existing Wagga Wagga 330kV substation																									
Enabling works phase	4																								
Earthworks and civil construction works	10																								
Tower assembly	8																								
Tower erection	14																								
Tower stringing and clipping	14																								
Commissioning/energisation	1																								
Final completion (remediation works)	1																								
Construction of the Dinawan 330kV substation																									
Enabling works phase	9																								
Earthworks and civil construction works	14																								
Electrical construction works	13																								
Pre-commissioning	12																								
Commissioning/energisation	3																								
Final completion (remediation works)	0																								
Upgrade and expansion of the Wagga Wagga substation																									
Enabling works phase	0																								
Earthworks and civil construction works	17																								
Electrical construction works	15																								
Pre-commissioning	13																								
Commissioning/energisation	1																								
Final completion (remediation works)	0																								

1.3. Purpose and Scope

The purpose and scope of work is to prepare an AIS for consideration by Airservices Australia. The AIS includes the details of the currently available OLS and PANS-OPS surfaces at the relevant airports, that are published in the Aeronautical Information Publication (AIP) effective 24 March 2022.

The Wagga Wagga Airport Masterplan 2010 includes a Future Obstacle Limitation Surface. This OLS is no longer a “future OLS” due to the implementation of the Runway 23 Instrument Landing System which requires an Outer Horizontal Surface under CASR Part 139 MOS.

This AIS can also be used for information purposes for the Civil Aviation Authority (CASA) and Department of Defence.

The assessment specifically responds to the:

- Airservices Australia guidance regarding the content of an Aviation Impact Statement
- Civil Aviation Regulations (CAR) 1988
- Civil Aviation Safety Regulations (CASR) 1998
- CASR Part 139 Manual of Standards - Aerodromes
- CASR Part 173 Manual of Standards – Standards applicable to Instrument Flight Procedure Design
- National Airports Safeguarding Framework (NASF) Guideline F: Managing the Risk of Intrusions into the Protected Operational Airspace of Airports.

This report responds to the submission submitted by Airservices Australia in response to the exhibition of the EIS. It documents the outcome of the AIS, with consideration of:

- relevant legislation, regulations, standards and airport masterplans applicable to airport and aircraft operations
- impacts on certified aerodrome/airport operations due to potential intrusions into the obstacle limitation surfaces (OLS) by towers or construction cranes
- impacts on certified aerodrome/airports within 30 nautical miles (nm) of the transmission line due to potential intrusions into the Procedures for Air Navigation Services - Aircraft Operations (PANS-OPS) surfaces by towers or construction cranes
- other potential impacts to (if present near or over the transmission line):
    - non-certified aerodromes and aircraft landing areas (within 3 nm of the transmission line)
    - designated air routes
    - flying operations of the Australian Defence force
    - any navigation aids and air traffic control surveillance systems
    - agricultural aircraft operations and other flow flying operations.
- required mitigation measures or approvals/authorisations that would be required in response to any identified impacts, such as requirements for hazard marking and lighting.

1.4. Methodology

Aviation Projects conducted the AIS in accordance with the following methodology:

1. Review the proposal and establish the appropriate compliance framework
2. Assess the OLS and PANS-OPS surfaces to determine if any infringements occur through desktop studies

3. Assess the impacts of infringements to the Obstacle Limitation Surfaces (OLS) and PANS-OPS surfaces
4. Assess the likely impacts of infringements into air route protection surfaces
5. Assess likely impacts to aeronautical navigation aids and air traffic control surveillance systems
6. Determine possible mitigation measures and likely cost/timing implications if such infringements occur
7. Identify relevant civil aviation safety requirements/standards with respect to existing aerodrome conditions and whether these standards are met, especially in relation to whether obstacle lighting may or may not be required
8. Document the process and findings.

This report is to be supplied to the Wagga Wagga Airport manager to confirm the findings of this report. The airport manager is responsible for engagement with CASA on the matters identified in this report.

Given the findings of this assessment, consultation with other stakeholders to inform this assessment has not been identified.

2. PROPOSAL CONTEXT

This chapter provides a summary of the context for the assessment.

2.1. National Airports Safeguarding Framework

The National Airports Safeguarding Advisory Group (NASAG) was established by the Commonwealth Department of Infrastructure and Transport to develop a national land use planning framework called the National Airports Safeguarding Framework (NASF). The purpose of this framework is to enhance the current and future safety, viability, and growth of aviation operations at Australian airports through:

- the implementation of best practice in relation to land use assessment and decision making in the vicinity of airports
- assurance of community safety and amenity near airports
- better understanding and recognition of aviation safety requirements and aircraft noise impacts in land use and related planning decisions
- the provision of greater certainty and clarity for developers and landowners
- improvements to regulatory certainty and efficiency
- the publication and dissemination of information on best practice in land use and related planning that supports the safe and efficient operation of airports.

NASF Guideline F: *Managing the Risk of Intrusions into the Protected Operations Airspace of Airports*, provides guidance to State/Territory and local government decision makers as well as airport operators to jointly address the issue of intrusions into the operational airspace of airports by tall structures, such as buildings and cranes, as well as trees in the vicinity of airports.

The risk assessment will have regard to all potential aviation activities within the vicinity of the proposal site including recreation, commercial, civil (including for agricultural purposes) and military operations.

The AIS of this report identifies high level risks, risk mitigation measures and development constraints that are likely to be applicable to the aviation risk assessment.

2.2. Aircraft operations at non-controlled aerodromes

There are several uncontrolled aerodromes[2] (including aircraft landing areas (ALAs)) in the region of the proposal. Advisory Circulars (ACs) provide advice and guidance from CASA to illustrate a means, but not necessarily the only means, of complying with the Regulations, or to explain the regulatory requirements.

For aircraft that are arriving at the certified airports with instrument approach procedures, in poor weather conditions where the pilot cannot necessarily maintain visual contact with the ground or water, the PANS-OPS

[2] International Civil Aviation Organisation (ICAO) and CASA definition of Aerodrome is generic to all types of areas that are suitable for the arrival, departure and surface movement of aircraft. In Australia those aerodromes that are not certified are called non-certified aerodromes and can include an ALA that is just a mown paddock on private or council property, or it can be equipped with a fully sealed runway(s).

surfaces protect them from obstacles and terrain that they cannot necessarily see to avoid, by specifying a vertical margin between the terrain or obstacle.

For aircraft that are arriving in good weather conditions, and not conducting an instrument approach procedure, the pilots must comply with the visual flight rules and conduct a conventional circuit pattern.

A conventional circuit pattern and heights are provided in AC 91-10 v1.1 *Operations in the vicinity of non-controlled aerodromes*, effective November 2021. The standard circuit consists of a series of flight paths known as legs when departing, arrival or when conducting circuit practice. Illustrations of the standard aerodrome traffic circuit procedures are provided in Figure 4 and Figure 5.

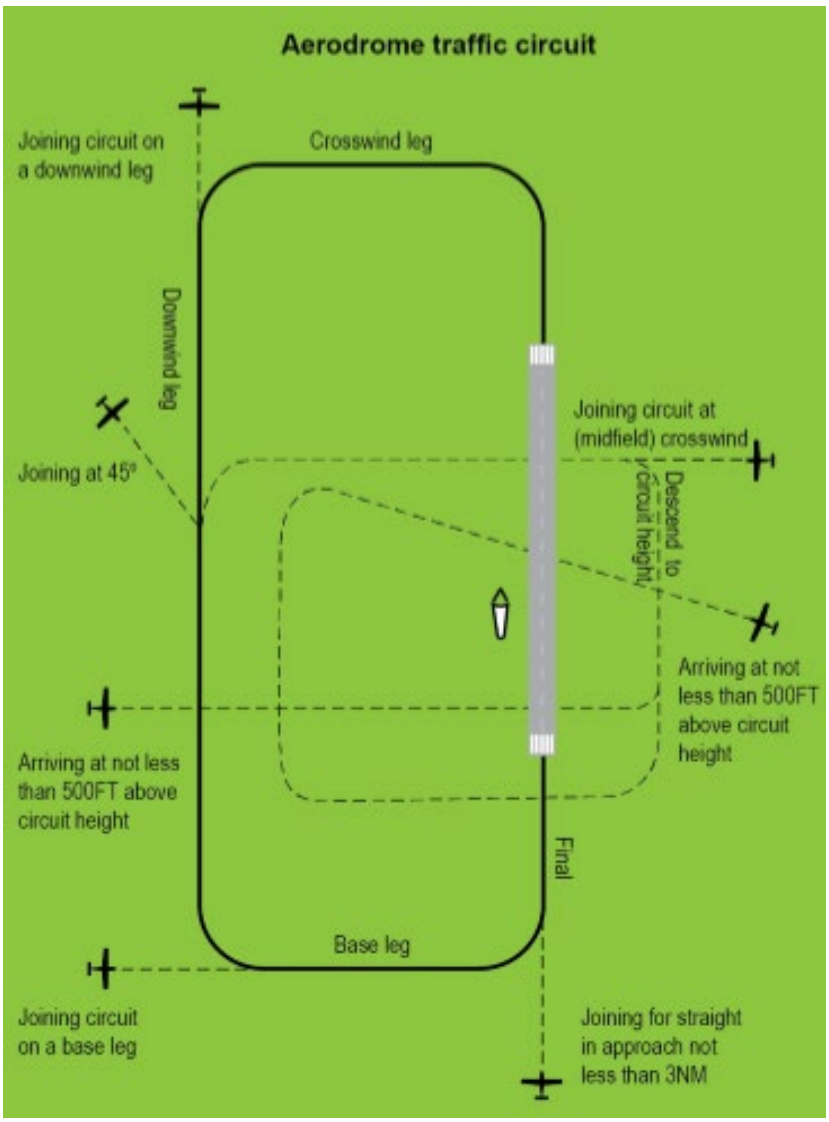

Figure 4 Aerodrome standard traffic circuit, showing arrival and joining procedures

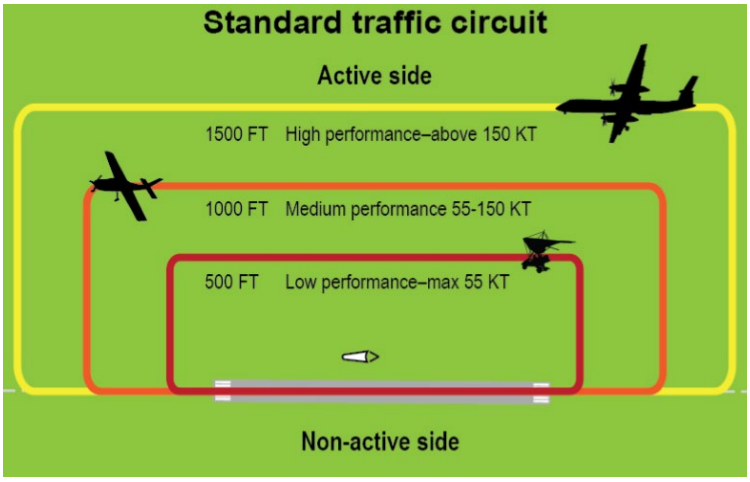

Figure 5 Lateral and vertical separation in the standard aerodrome traffic circuit

AC 91-10 v1.1. paragraph 7.10 makes reference to a distance that is "normally" well outside the circuit area and where no traffic conflict exists, which is at least 3 nm (5556 m). The paragraph is copied below:

> *7.10 Departing the circuit area*
>
> *7.10.1 Aircraft should depart the aerodrome circuit area by extending one of the standard circuit legs or climbing to depart overhead. However, the aircraft should not execute a turn to fly against the circuit direction unless the aircraft is well outside the circuit area and no traffic conflict exists. This will normally be at least 3 NM from the departure end of the runway but may be less for aircraft with high climb performance. In all cases, the distance should be based on the pilot's awareness of traffic and the ability of the aircraft to climb above and clear of the circuit area.*

2.3. Rules of flight

Flight under Day Visual Flight Rules (VFR)

According to AIP, the meteorological conditions required for visual flight in the applicable (Class G)[3] airspace at or below 3000 ft AMSL or 1000 ft AGL whichever is the higher are: flight visibility at least 5000 m, clear of clouds and in sight of ground or water for fixed wing aircraft.

For helicopters operating below 700 ft over land, the flight visibility must be at least 800 m, clear of clouds, by day, at a speed that allows the pilot to see obstructions or other traffic in sufficient time to avoid a collision and if not more than 10 nm from an aerodrome with an IAP – in a way that ensures the flight maintains a separation of at least 500 ft vertically from any aircraft that is less than 10 nm from the aerodrome that is conducting an IFR operation.

Civil Aviation Safety Regulation (1998) 91.267 (Minimum height rules—other areas) prescribes the minimum height for flight. Generally speaking, and unless otherwise approved, aircraft are restricted to a minimum height of 500 ft AGL above the highest point of the terrain and any object on it within a radius of 300 m in visual flight

[3] Class G airspace exists from ground level to the base of controlled airspace above it, across the entire length of the project.

during the day when not in the vicinity of built-up areas, and 1000 ft AGL over built up areas (within a horizontal radius of 300 m of the point on the ground or water immediately below the aeroplane or helicopter).

These height restrictions do not apply if through stress of weather or any other unavoidable cause it is essential that a lower height be maintained.

Flight below these height restrictions is also permitted in certain other circumstances.

Pilots who regularly fly in the area will already be cognisant of the existing transmission line.

Night VFR

With respect to flight under the VFR at night, Civil Aviation Safety Regulations (1998) 91.277 requires that the pilot in command of an aircraft flying VFR at night must not fly below the following heights (unless during take-off and landing operations, within 3 nm of an aerodrome, or with an air traffic control clearance):

- the published lowest safe altitude for the route or route segment (if any)
- the minimum sector altitude published in the authorised aeronautical information for the flight (if any)
- the lowest safe altitude for the route or route segment
- 1,000 ft above the highest obstacle on the ground or water within 10 nautical miles ahead of, and to either side of, the aircraft at that point on the route or route segment
- the lowest altitude for the route or route segment calculated in accordance with a method prescribed by the Part 91 Manual of Standards for the purposes of this paragraph.

Instrument Flight Rules (Day or night) (IFR)

According to CASR Part 91, flight under the instrument flight rules (IFR) requires an aircraft to be operated at a height clear of obstacles that is calculated according to an approved method. Obstacle lights on structures not within the vicinity of an aerodrome are effectively redundant to an aircraft being operated under the IFR.

2.4. Aircraft operator characteristics

Flying training may be conducted under either the instrument flying rules (IFR) or visual flying rules (VFR). Other general aviation operations under either IFR or VFR are also likely to be conducted at various aerodromes in the area. Recreational aircraft flight operations are conducted in VMC by day only.

In VMC, the transmission line towers will be shown on appropriate aeronautical charts to allow pilots to consider the impact upon their flight operations in the area around the transmission line. It is also expected that the transmission line towers would be sufficiently visually conspicuous to pilots conducting VFR operations within the vicinity of the proposal to enable appropriate obstacle avoidance manoeuvring. Briefings and detailed risk management action by aerial application pilots enable them to be aware of a potential hazard and plan their flight accordingly.

IFR and Night VFR (which are required to conform to IFR applicable altitude requirements) aircraft operations are addressed in Section 3.

The inclusion of the transmission line on aeronautical charts, via the Airservices Australia's Aeronautical Database, provides pilots with visual information about the transmission lines presence in the area of their

intended flight operation. Figure 6 (Source: Airservices Australia) shows such presentations on an aeronautical chart used by aircraft flying in Class G airspace.

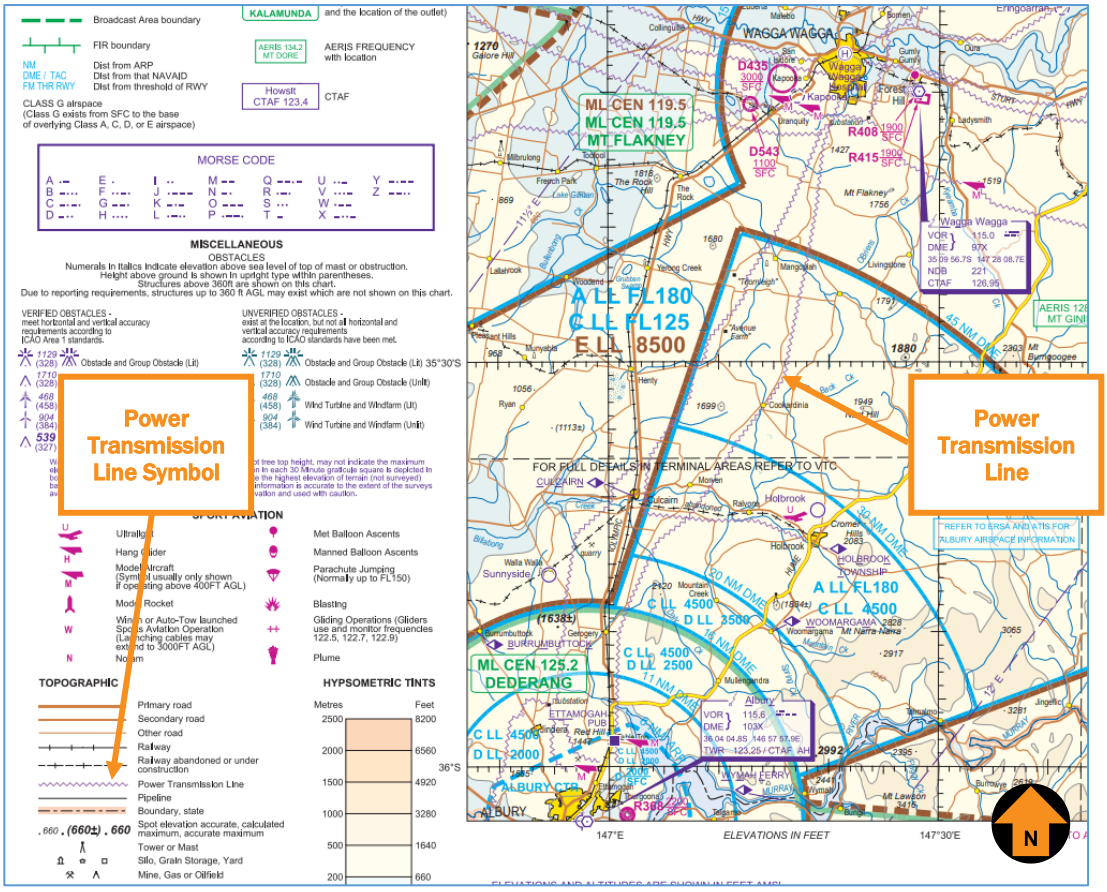

Figure 6 Visual Navigation Chart – Sydney, with Power Transmission Line Symbols

2.5. Passenger transport operations

Scheduled and non-scheduled passenger transport operations are generally operated under the IFR throughout the area encompassed by the proposed and existing transmission line route.

Scheduled passenger transport services regularly operate into Wagga Wagga Airport from Canberra, Melbourne and Sydney. These services also regularly operate into Mildura Airport from Melbourne, Adelaide and Broken Hill.

All certified airports in Australia may support non-scheduled passenger transport operations.

2.6. Private operations

Private operations are regularly conducted throughout the area surrounding the proposed and existing transmission line route. They are generally conducted under day or night VFR, with some IFR.

2.7. Military operations

Wagga Wagga Airport is also co-located with a Defence Force apprentice training school. Military aircraft of various types regularly visit Wagga Wagga Airport, all of which comply with the instrument flight rules or the visual flight rules, depending on weather conditions and type of operation of the aircraft. For their operations at Wagga Wagga Airport, they operate essentially the same as a civilian aircraft.

There may be some high-speed low-level military jet aircraft and helicopter operations conducted in the area away from Wagga Wagga Airport. Detailed planning of these flights will include a review of obstacles along the planned route. The existing transmission line is shown on aeronautical charts.

2.8. Aerial application operations

Aerial application operations including such activities as fertiliser, pest and crop spraying are generally conducted under day VFR below 500 ft AGL, usually between 6.5 ft (2 m) and 100 ft (30.5 m) AGL.

Aerial application operations are conducted in the area.

Due to the nature of the operations conducted, aerial agriculture pilots are subject to rigorous training and assessment requirements to obtain and maintain their licence to operate under these conditions.

The Aerial Application Association of Australia (AAAA) has a formal risk management program which is recommended for use by its members.

The inclusion of the transmission line on aeronautical charts will enable the pilots conducting an aerial application flight operation to be aware of the presence of the transmission line so that they consider its impact during the planning of their low-level flights. When combined with the briefing carried out with the land holder prior to any such flights, and the AAAA formal risk management program, the pilot will have the best possible knowledge about the obstacle environment around the intended flight(s). These briefings will be no different to those conducted today in areas where there are large transmission lines above or near to areas where these low-level flight operations are conducted.

Aerial Application Association of Australia

The AAAA has initiated a Powerline Safety Program and identified that *"powerlines have been a significant safety issue since the electrification of rural areas and wirestrikes have been a major threat to aerial application since the late 1940s when the industry began in Australia.*

> *While training and ongoing professional development play a significant role in preparing pilots to manage the risks associated with low level operations around powerlines, there are two key initiatives that can support and improve safety for the sector:*
>
> - *The provision of mapping information on powerline networks*
> - *The marking of powerlines*
>
> *Over recent years, AAAA has worked to reshape the Australian Standard on the marking of powerlines (AS 3891 Parts 1 & 2), has developed and delivered world-leading human factor training courses, and has worked with powerline companies to develop mapping and marking systems and make them available to pilots and business owners.*

AAAA has now launched its Powerline Safety Program that aims to encourage and facilitate power companies improving aviation safety, and provide a way of both aviation businesses and rural landholders engaging in meaningful safety actions to improve safety.

Wirestrikes account for approximately 57% of all aerial application accidents/incidents. While this is only a fraction of the total safety problem surrounding contact between all vehicles and farm implements with power infrastructure, it is a significant cost to the industry and a personal impact on pilots involved in wirestrikes.

AAAA acknowledges that not all aerial application companies will be able to participate in the program due to the following practical restrictions that are not under the control of the company or AAAA:

- *Availability of energy network mapping that is region specific, clean data that is easily uploadable, useable and updateable. Availability is entirely dependent on energy companies providing the mapping in the same or similar way as Essential Energy already does*
- *Availability of an energy company marking request and action system similar to Essential Energy's system. There are a range of contributing elements including the Australian Standard rewrite, availability of good markers, and a reasonable price for fitting and installation.*

Those States/Territories and energy companies that are unable to deliver the two requirements above will not be able to participate in the program, but AAAA will seek to work with them to achieve these relatively straight forward requirements.

Currently, Essential Energy in NSW is fully compliant, Ergon Energy in Queensland is working on achieving these systems and has advised it already has a marking system in place, but further work is required on simplifying access and the provision of mapping."[4]

The provision of the transmission line tower locations to Airservices Australia will ensure that they are marked on aeronautical charts, enabling pilots to be aware of them and to be compliant with a key AAAA initiative. Similarly, the provision of the data to Department of Defence will ensure that their low-level charts include them and that the military pilots are aware of them when planning and conducting low level flight operations.

2.9. Emergency services - Royal Flying Doctor Service/Air Ambulance

Royal Flying Doctor Service (RFDS) and other emergency services operations are generally conducted under the IFR, except when arriving/departing a destination that is not serviced by instrument approach aids or procedures.

Most emergency aviation services organisations have formal risk management programs to assess the risks associated with their operations and implement applicable treatments to ensure an acceptable level of safety can be maintained.

For example, pilots and crew require specific training and approvals, additional equipment is installed in the aircraft, and special procedures are developed.

If a helicopter emergency medical service is required at a location other than an aerodrome, ALA or helicopter landing site, the pilot will engage with local emergency services personnel and/or landowners to discover what local hazards are in the vicinity of the proposed landing site and take appropriate mitigation action.

[4] AAAA Powerline Safety Program www.aaaa.org/aaaa-powerliine-safety-program/

3. AVIATION IMPACT STATEMENT

This Aviation Impact Statement (AIS) considers the following aspects of publicly available information from the AIP effective 24 March 2022, searches using National Maps GIS system (www.nationalmap.gov.au), OzRunways aeronautical program and Google Earth as of 30 March 2022.

3.1. Certified aerodromes within 30 nm of the transmission line

Table 2 details the certified aerodromes that were identified within 30 nm (55.56 km) of the transmission line.

Table 2 Certified Aerodromes within 30 nm

Certified Aerodrome Name	*Distance from transmission line (km)*	*OLS overhead the transmission line*	*PANS-OPS Surface overhead the transmission line*
Wentworth	33	No	No
Mildura	21	No	**Yes**
Robinvale	14.3	No	No
Balranald	14.2	No	No
Hay	30.7	No	**Yes**
Wagga Wagga	7.5	Yes	**Yes**

3.2. PANS-OPS Assessments

Some certified aerodromes have been provided with instrument approach procedures (IAPs) that guide suitably equipped aircraft to the runway at the aerodrome in weather conditions that preclude the pilot maintaining visual contact with ground or water until close to the runway where visual contact may be made with the landing environment. They provide a prescribed minimum obstacle clearance (MOC) above terrain and obstacles within a lateral tolerance either side of the IAP's flight path.

The specifications for the IAPs are prescribed in International Civil Aviation Organisation (ICAO) *Document 8168 – Procedures for Navigation, Operations* and within CASR Part 173 MOS for Australian specific criteria.

The assessments and results for the PANS-OPS surfaces for each aerodrome are detailed in the following Table 3, Table 4 and Table 5.

The assessment was completed using the most up to date transmission line design information available at the time this report was written.

Transmission line tower height and location data within the lateral area of each IAP was assessed to determine whether the towers and construction cranes infringed any PANS-OPS surfaces.

The PANS-OPS assessments are based on AIP effective 24 March 2022.

Mildura Airport

Mildura Airport is located approximately 21 km (11.3 nm) from the proposed transmission line. It is an uncontrolled aerodrome located in Class G airspace (uncontrolled).

Transmission line towers numbers L2 688 – 800 are located within the PANS-OPS surfaces associated with the IAPs for Mildura Airport (Refer to Figure 7).

The highest transmission line tower near Mildura Airport is L2 #772 at 143.2 m AHD and construction crane at 158.2 m AHD.

Table 3 Mildura Airport PANS-OPS assessment

IAP Title	*Lowest PANS-OPS Surface Elevation (m AHD)*	*Result*
25 nm Minimum Safe Altitude (MSA)	304.8	No Infringement
10 nm MSA	244	No Infringement
DME-GNSS Arrival	304.8	No Infringement
RNAV-Z (GNSS) RWY 09 (missed approach area)	>304.8	No Infringement
RNAV-Z (GNSS) RWY 18	Outside lateral protection area	No Infringement
RNAV-Z (GNSS) RWY 27	304.8	No Infringement
RNAV-Z (GNSS) RWY 36	Outside lateral protection area	No Infringement
NDB-A	Outside lateral protection area	No Infringement
VOR-Z RWY 09 (missed approach area)	>304.8	No Infringement
VOR-Y RWY 27	Outside lateral protection area	No Infringement
VOR-Z RWY 27	Outside lateral protection area	No Infringement
VOR-Y RWY 09 (missed approach area)	>304.8	No Infringement
Holding at MIA VOR	304.8	No Infringement
RNAV (GNSS) Holding at all waypoints	304.8	No Infringement
Circling Procedure (CAT D)	Outside lateral protection area (5.28 nm)	No Infringement

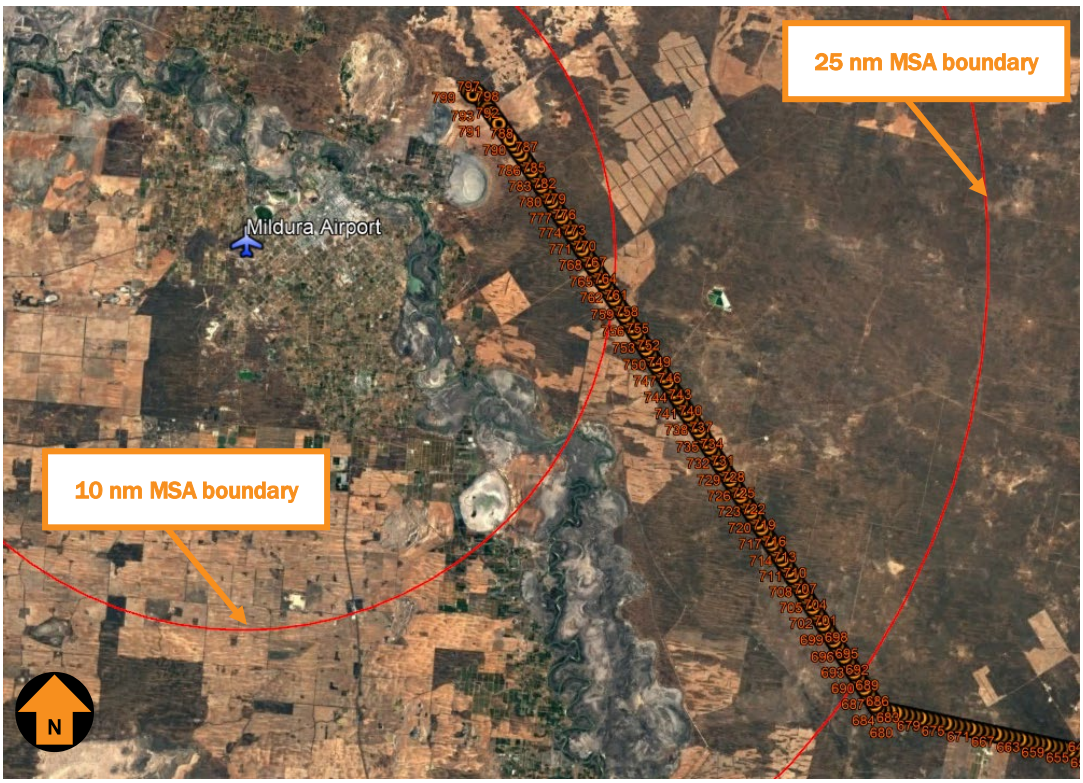

Figure 7 Mildura Airport PANS-OPS assessment area

Summary

The proposed transmission line towers and cranes to be used during construction do not infringe the PANS-OPS surfaces at Mildura Airport.

The proposed transmission line towers would not have an impact upon flight operations at Mildura Airport. No further action is required.

Hay Airport

Hay Airport is located approximately 30.7 km (16 nm) from the proposed transmission line. It is an uncontrolled aerodrome located in Class G airspace (uncontrolled).

Transmission line towers numbers L2 124 – 311 are located within the PANS-OPS surfaces associated with the IAPs for Hay Airport (Refer to Figure 8).

The highest transmission tower near Hay Airport is L2 #135 at 167.5 m AHD and construction crane at 182.5 m.

Table 4 Hay Airport PANS-OPS Assessment

IAP Title	*Lowest PANS-OPS Surface Elevation (m AHD)*	*Result*
25 nm Minimum Safe Altitude (MSA)	213.3	No Infringement
10 nm MSA	Outside lateral protection area (15 nm)	No Infringement
RNAV-Z (GNSS) RWY 04	213.3	No Infringement
RNAV-Z (GNSS) RWY 22 (missed approach area)	> 213.3	No Infringement
Holding at HXXSB Waypoint	304.8	No Infringement
Circling Procedure (CAT C)	Outside lateral protection area (4.2 nm)	No Infringement

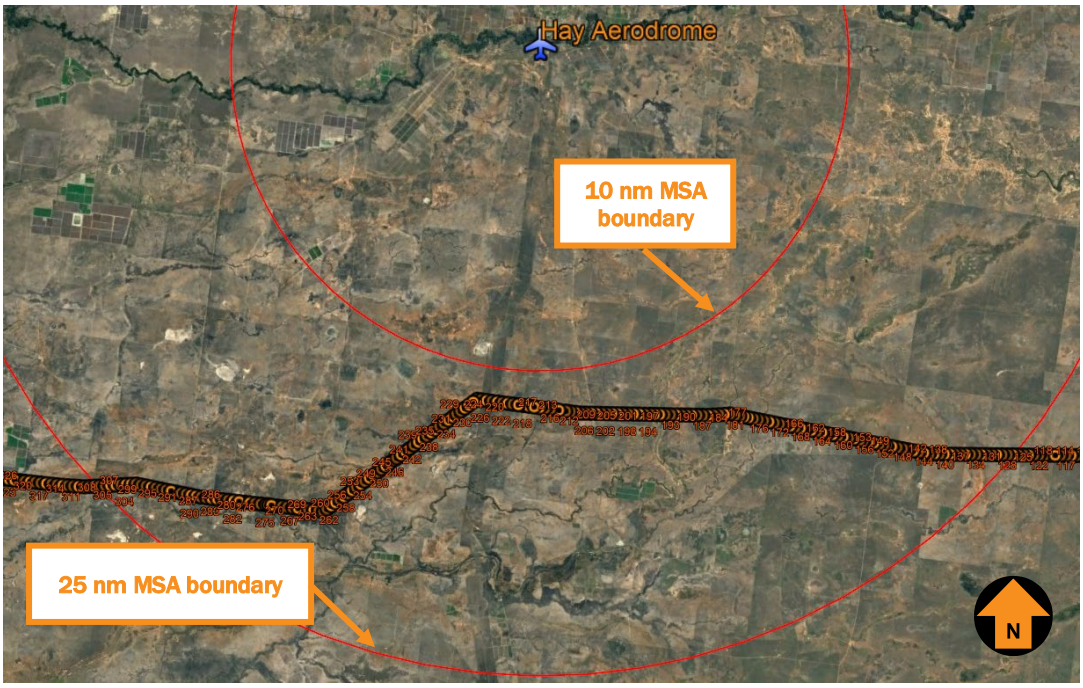

Figure 8 Hay Airport PANS-OPS assessment area

Summary

The proposed transmission line towers and cranes to be used during construction do not infringe on the PANS-OPS surfaces at Hay Airport.

The proposed transmission line towers would not have an impact upon flight operations at Hay Airport. No further action is required.

Wagga Wagga Airport

Wagga Wagga Airport is located approximately 7.5 km (4.1 nm) from the proposal. It is an uncontrolled aerodrome located in Class G airspace (uncontrolled).

Transmission line towers numbers L5 1 - 118 are located within the PANS-OPS surfaces associated with the IAPs for Wagga Wagga Airport (Refer to Figure 9).

The highest transmission tower near Wagga Wagga Airport is L5 #20 at 446.7 m AHD and construction crane at 461.7 m AHD.

Table 5 Wagga Wagga Airport PANS-OPS assessment

IAP Title	*Highest relevant Structure (#/Structure/Crane m AHD)*	*Lowest PANS-OPS Surface Elevation (m AHD)*	*Result*
25 nm Minimum Safe Altitude (MSA)	#20/446.7/461.7	640.1	No Infringement
10 nm MSA	#20/446.7/461.7	609.6	No Infringement
DME-GNSS Arrival	#20/446.7/461.7	519.7	No Infringement
RNAV-Z (GNSS) RWY 05	#2/297.8/312.8	348.7	No Infringement
RNAV-Z (GNSS) RWY 23 (missed approach area)	#20/446.7/461.7	>470.3	No Infringement
RNAV (GNSS) Holding at all waypoints	#20/446.7/461.7	975.4	No Infringement
ILS-Y or LOC-Y RWY 23 ILS-Z or LOC-Z RWY23 (missed approach area) (OAS Calculation)	#20/446.7/461.7	838	No Infringement
Holding at WG VOR and BOGUD Waypoint for ILS Procedures	#20/446.7/461.7	975.4	No Infringement
NDB-A or VOR-A (missed approach area)	Nil	Outside lateral protection area. No circling in sector south of RWY 05/23 and RWY 12/30 beyond 3.5nm.	No Infringement
Holding at WG VOR or WG NDB for VOR or NDB procedure	#20/446.7/461.7	609.6	No Infringement
VOR RWY 05	#2/297.8/312.8	580.3	No Infringement

VOR RWY 23 (missed approach area)	#20/446.7/461.7	1033	No Infringement
Circling Procedure (CAT ABCD)		Outside lateral protection area. No circling in sector south of RWY 05/23 and RWY 12/30 beyond 3.5nm.	No Infringement

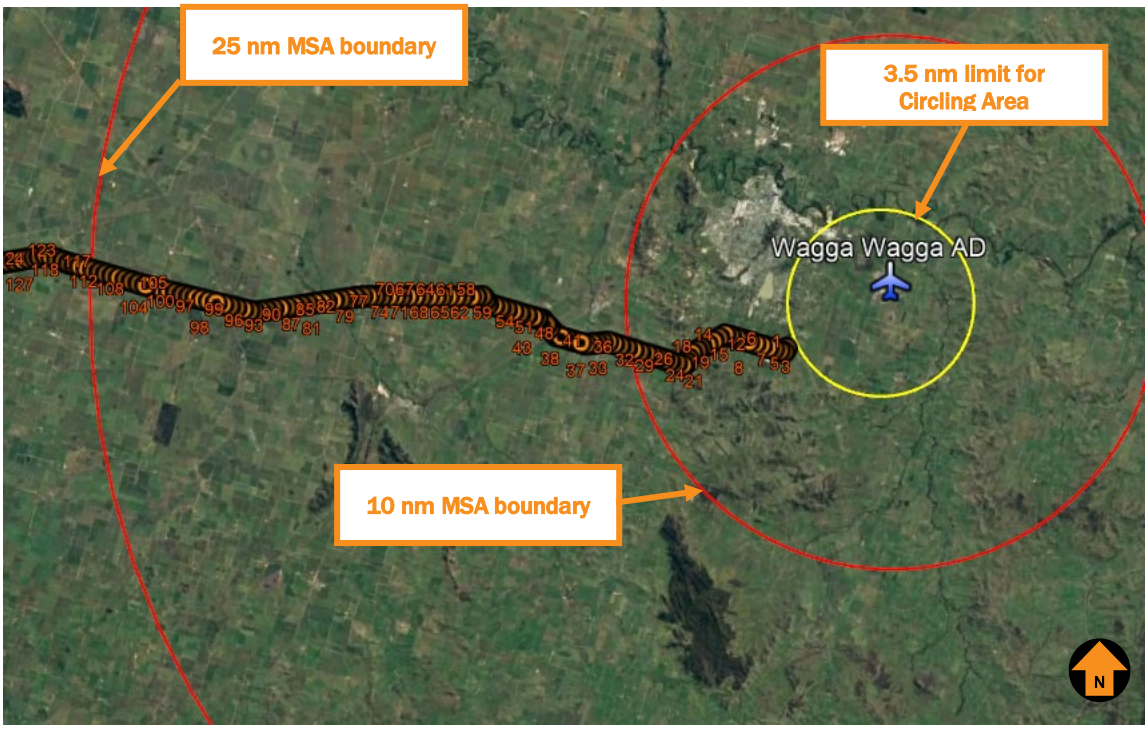

Figure 9 Wagga Wagga Airport PANS-OPS assessment area

Construction cranes within the substation, (with a maximum height of 60 m AGL) would not infringe the PANS-OPS surfaces at Wagga Wagga Airport.

Summary

The proposed transmission line towers and construction cranes, including those within the Wagga Wagga substation, to be used during construction do not infringe the PANS-OPS surfaces at Wagga Wagga Airport.

The proposed transmission line towers and construction cranes would not have an impact upon flight operations at Wagga Wagga Airport. No further action is required.

3.3. Obstacle limitation surfaces

The extent of OLS at certified aerodromes is dependent upon the Code number allocated to the relevant runway, which is determined by the type of operations (VFR or IFR) using the runway and the length of the runway.

CASR Part 139 MOS details the specifications for these OLS.

Table 6 details the dimensions and the assessment result for the OLS at each aerodrome/airport and Table 7 details the OLS assessment specifically for Wagga Wagga Airport.

Table 6 OLS Assessment

Airport/Aerodrome	*Largest relevant OLS dimension (m)*	*Assessment relevant to Transmission Line*
Wentworth	3 km radius from runway ends	Beyond OLS limit. No Infringement
Mildura	<4.5 km radius from runway ends	Beyond OLS limit. No Infringement
Robinvale	3 km radius from runway ends	Beyond OLS limit. No Infringement
Balranald	3 km radius from runway ends	Beyond OLS limit. No Infringement
Hay	<4.5 km radius from runway ends	Beyond OLS limit. No Infringement
Wagga Wagga	15 km radius of aerodrome reference point (ARP)	Within OLS limit. Tolerable infringements to Approach Surface and Outer Horizontal Surface.

Table 7 Wagga Wagga Airport OLS Assessment

Wagga Wagga Airport OLS segment	*Highest relevant L5 Structure (# Structure/Crane m AHD)*	*Elevation of surface in relation to relevant transmission line location (m AHD)*	*Assessment result*
Approach Surface RWY 05	#1 295.2/310.2 to #15 326.3/341.3 #16 367.8/382.8 #17 390.7/405.7 #18 421.7/436.7 #19 419.5/434.5 #20 446.7/461.7 #21 429.2/444.2 #22 395.4/410.4 #23 379.9/394.9	366.7 (Calculated by Aviation Projects)	No Infringement No Infringement Crane Infringement by 16.1 m Both Infringe by 24/39 m Both Infringe by 55/70 m Both infringe by 52.8/67.8 m Both infringe by 80/95 m Both Infringe by 62.5/77.5 m Both Infringe by 28.7/43.7 Both Infringe by 13.2/28.2
Take Off Climb Surface RWY 23	#1 295.2/310.2 to #17 390.7/405.7 #18 421.7/436.7 #19 419.5/434.5 #20 446.7/461.7 #21 429.2/444.2 #22 395.4/410.4 #23 379.9/394.9	360.5 478.5 486.4 492.6 497.4 503.2 510.6 519.3	No Infringement
Inner Horizontal Surface	Nil	Laterally outside IHS	No Infringement
Outer Horizontal Surface	#1 - #15 326.3/341.3 to #15 326.3/341.3 #16 367.8/382.8 #17 390.7/405.7 #18 421.7/436.7 #19 419.5/434.5 #20 446.7/461.7 #21 429.2/444.2	363 (ref WG Masterplan 2010 – Future OLS diagram)	No Infringement No Infringement Both Infringe by >4.8/19.8 Both Infringe by > 27.7/42.7 Both infringe by > 58.7/73.7 Both Infringe by > 56.5/71.5 Both Infringe by >83.7/98.7 Both infringe by > 66.2/81.2

Wagga Wagga City Council provided a letter to Transgrid (dated 10 March 2022) that the future transmission line towers do not infringe into the OLS for the airport. This letter is provided at **Annexure 3**.

The elevations of the individual segments of the OLS, calculated by Aviation Projects are referenced to ICAO Annex 14 2018 and CASR Part 139 MOS 2020.

Infringements to the Approach Surface and the Outer Horizontal Surface were discovered. Please refer to Table 7 for details.

The runway configuration at Wagga Wagga Airport has changed since 2010 with the deletion of the runway crossing RWY 05/23.

Figure 10 shows the OLS diagram in relation to the Wagga Wagga substation, from the Wagga Wagga Airport Masterplan 2010, which shows the then "future OLS" comprising an Outer Horizontal Surface. The 'future OLS' is now in place due to the promulgation of the Instrument Landing System (ILS) approach procedures to Runway 23, so there is no need to consider the older 'existing' OLS diagram within the Masterplan.

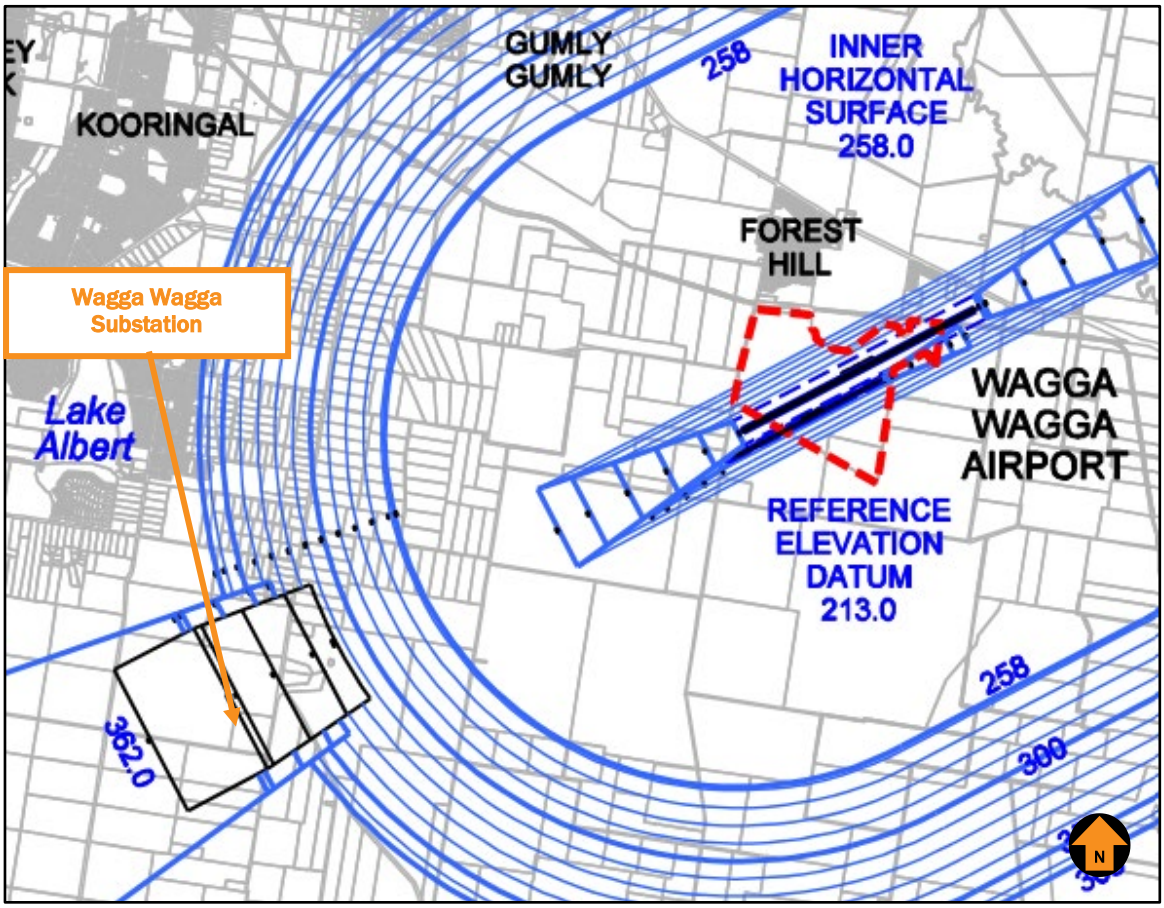

Figure 10 Location of the proposal relative to the Wagga Wagga Airport OLS

The obstacles identified in Table 7 that infringe the Runway 23 approach surface (AS) component of the Wagga Wagga Airport OLS are located beneath the horizontal surface of the AS which commences at 6.6km from the Inner Edge of the AS. The closest transmission line tower to the inner edge is located 7.06 km from the inner edge.

Infringements of the horizontal component of the AS can be approved by CASA provided that obstacle clearance criteria for the PANS-OPS surfaces is maintained. In this case the PANS-OPS surfaces are not infringed.

The same applies to the terrain that infringes the AS in the areas surrounding tower # 20.

The image at Figure 11 shows an extract of the future OLS for Wagga Wagga Airport set at a height of 362.0 m AHD to indicate where the outer horizontal surface and approach surface are penetrated by terrain.

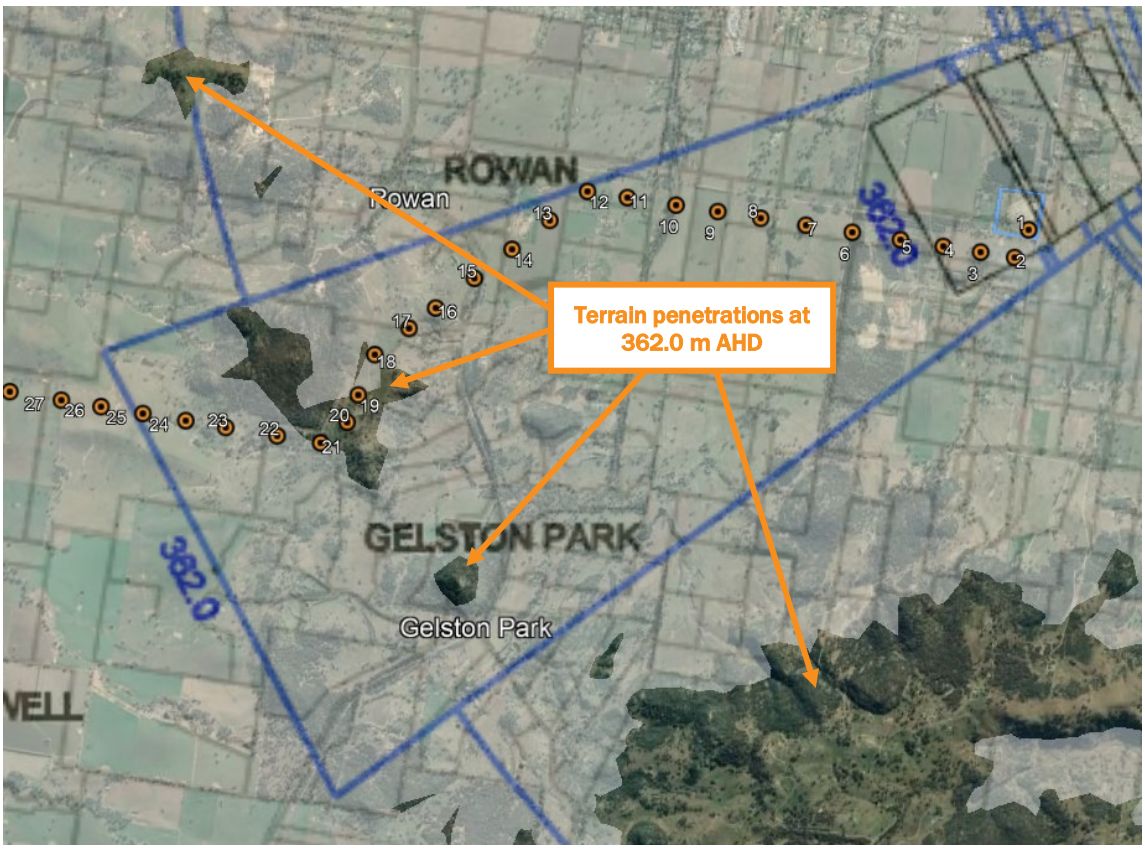

Figure 11 Indicative terrain penetrations of Wagga Wagga Airport OLS near transmission line

Summary

The proposed transmission line towers and cranes to be used during construction infringe the Approach Surface of the OLS and the Outer Horizontal Surface of the "future" OLS that is now in place (published in the 2010 Masterplan for Wagga Wagga Airport).

Terrain in the area surrounding tower # 20 also infringes the Approach Surface for Runway 05 and the Outer Horizontal Surface of Wagga Wagga Airport's OLS.

To assist in characterising the scale and impact of these infringements, CASR Part 139 MOS, Section 9.27 notes that an object or structure that extends above the approach or transitional surface within 3000 m of the inner edge of the approach surface would require obstacle lighting if the runway was intended to be used at night.

Since these infringements are beyond 3000 m from the inner edge of the threshold for Runway 05, they would not require obstacle lighting. They therefore can be tolerated due to the location of the obstacles and existing terrain within the horizontal section of the approach surface and concurrent Outer Horizontal Surface, whilst

remaining below the PANS-OPS surfaces to Runway 05 at Wagga Wagga Airport. They are also below the normal 3-degree approach path for straight in approaches to Runway 05 at which point the aircraft would normally be above 2000ft AHD. The Wagga Wagga substation is also located outside the normal base leg of the circuit area for aircraft landing on Runway 05 and outside the crosswind leg for aircraft taking off from Runway 23.

There are no obstacles listed for the area surrounding the Wagga Wagga substation, in the AIP ERSA entry for Wagga Wagga Airport.

3.4. Nearby aircraft landing areas

As a guide, an area of interest within a 3 nm radius of an aircraft landing area (ALA) is used to assess potential impacts of proposed developments on aircraft conducting taking off and landing operations at or within the vicinity of the ALA. The 3nm area of interest generally contains the area in which aircraft manoeuvre after takeoff while climbing to intercept their outbound track until above a height of approximately 1000 ft or 1500 ft AGL, or maneuvering to align themselves with the landing runway, in accordance with CASA guidance for operations at such aerodromes and descending below 1000 ft or 1500 ft AGL.

A search on OzRunways, which sources its data from AIP, discovered 11 nearby ALAs within approximately 5 nm from the proposal transmission line. Two (2) of these are within the 3nm area of interest. The aeronautical data provided by OzRunways is approved under CASA CASR Part 175. The ALAs outside of the 3 nm area of interest were assessed and considered to not be impacted by the proposed transmission line.

Approach and Take-Off surfaces

The analysis of approach and take-off surfaces is based on the guidance previously published in the CASA Civil Aviation Advisory Publication (CAAP) 92-1(1) *Guidelines for aeroplane landing areas*. This CAAP has been withdrawn but remains the only source for the reasonable identification and protection of the surrounding airspace for ALAs.

CASA's Advisory Circular 91-02, *Guidelines for aeroplanes with MTOW not exceeding 5700 kg – Suitable places to land or take-off*, provides appropriate guidance to pilots operating at ALAs although it does not include the protection area diagrams. It is therefore apparent that CASA relies upon pilot knowledge and competence to be enable them to judge a suitably safe location for the landing or take-off operation, considering the runway's suitability and the ability to manoeuvre safely while approaching to land and after take-off.

The guidance provided in the obsolete CAAP 92-1(1) for the protection areas is referred to, for information related to the ALAs in very close proximity to the transmission line, to show that either an infringement occurs, or that the transmission line is clear of those areas.

The purpose of the CAAP 92-1(1) guidance is described as follows:

> *These guidelines set out factors that may be used to determine the suitability of a place for the landing and taking-off of aeroplanes. Experience has shown that, in most cases, application of these guidelines will enable a take-off or landing to be completed safely, provided that the pilot in command:*
>
> *a. has sound piloting skills; and*
>
> *b. displays sound airmanship.*

A copy of CAAP 92-1(1) Figure 2A – *Single engine and Centre-Line Thrust Aeroplanes not exceeding 2000 kg MTOW (day operations),* which shows the physical characteristics that may be applicable to the circumstances, is provided in Figure 12 (source: CAAP 92-1(1) Guidelines for aeroplane landing areas).

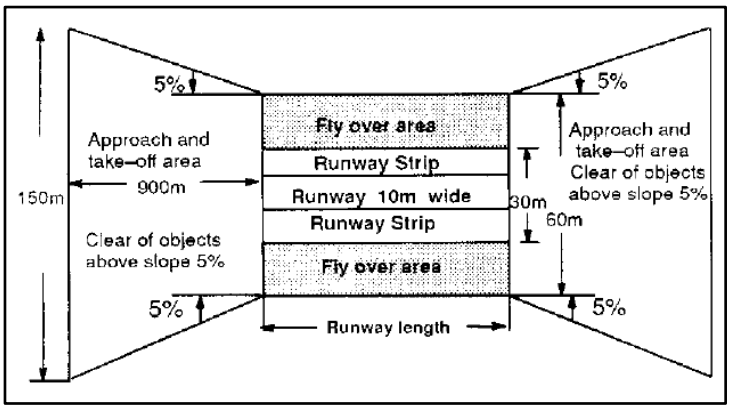

Figure 12 CAAP 92-1(1) Figure 2A

For these operations, the approach and take-off surfaces for each runway end commence at the runway end (threshold) at a distance of 30 m either side of the runway centreline and diverge at a rate of 5% to a distance of 900 m. The surfaces increase in height at a rate of 5%, or 5 m in every 100 m.

For aerial application operations, the physical characteristics and OLS are considerably less restrictive.

A copy of CAAP 92-1(1) Figure 4 – *Dimensions – agricultural day,* which shows the physical characteristics applicable to aerial application operations, is provided in Figure 13, (source: CAAP 92-1(1) Guidelines for aeroplane landing areas).

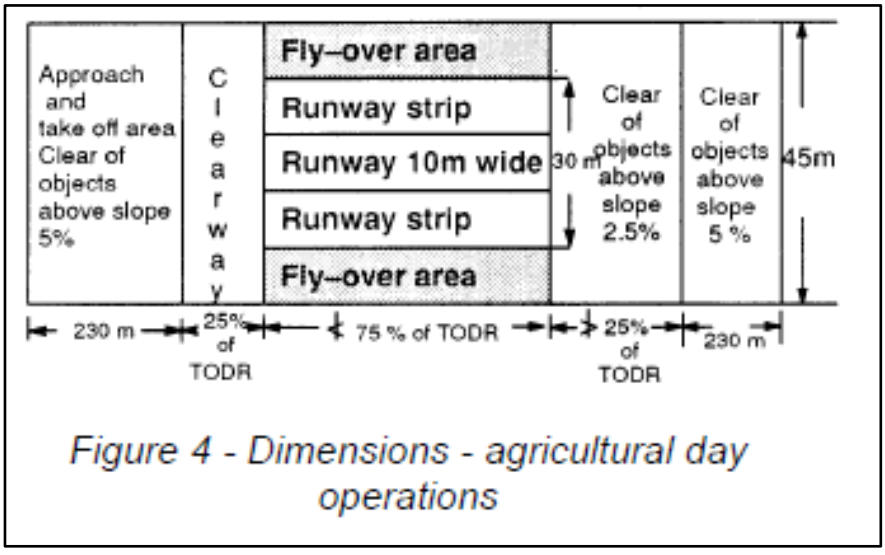

Figure 13 CAAP 92-1(1) Figure 4

For the purposes of the flight circuit analysis, the following design parameters have been adopted:

- Left hand circuit direction unless otherwise published in AIP
- 1 nm upwind to achieve at least 500 ft AGL

- 1 nm abeam the runway for downwind spacing
- 45° relative position from the threshold for the turn from downwind onto the base leg; and
- Roll out at 1 nm final, not below 500 ft AGL.

Aerial application operators will most likely conduct smaller circuits than this nominal arrangement for commercial reasons and pilot experience.

The ALAs within 3nm of the transmission line are listed in Table 8.

Table 8 ALAs within 3 nm of the transmission line

ALA Name	*Location*	*Distance from Transmission line*
North Bundy Station	Immediately south of Forest Creek, 54 km southwest of Hay township	1990 m
Bon Accord	5.2 km South of Uranquinty township	1800 m

North Bundy Station

North Bundy Station has an ALA catering for fly-in farm stay visitors. (www.northbundy.com)

Visitors are required to contact the owner prior to flying to the ALA. The owner will provide pilots with details about the ALA which includes details of the existing transmission line. (Source: www.northbundy.com)

The ALA elevation is 300 ft AHD. Aircraft taking off from Runway 06 are required to reach 500 ft above the ALA prior to turning in any direction. Such a climb could take up to 1nm (1852 m) (which would be in proximity to towers #291 to #294).

The approximate circuit area as per Figure 4.

Figure 14 shows the ALA details provided to pilots intending to fly to North Bundy Station, by the ALA owners.

At 500 ft above the ALA the aircraft would be at a height of approximately 800 ft/243 m AHD and therefore above the proposed transmission line.

Aircraft landing to the south would need to identify and consider the transmission line towers as they commence descent to the runway.

Aerial application flight operations from North Bundy Station ALA would also be provided with information via charts and through contact with the ALA owners about the existing transmission line, along with information about any other transmission lines in the vicinity.

The maximum height of transmission line towers and associated construction cranes at those sites is 524.3 ft/159.8 m AHD.

Aircraft operating on the shorter Runway 15/33 will either remain between the runway and the existing and proposed transmission line or would have climbed well above them prior to overflying them. They would also ensure that they are clearly above the existing and proposed transmission lines while on descent to land on the crossing Runway 15/33.

Prior to construction, consultation will occur with the owner of North Bundy Station to provide details of the proposal, including location and height information of the finalised design of the transmission line and towers to provide an understanding of potential hazards for aircraft using its facility.

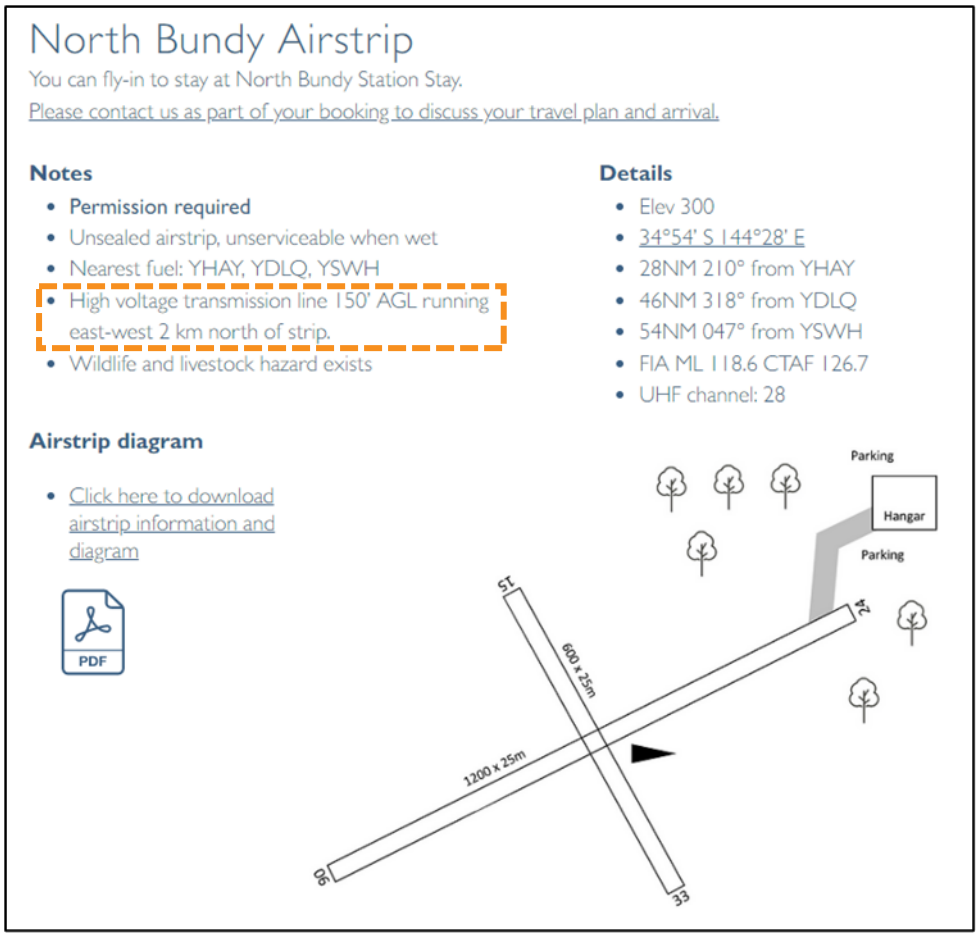

Figure 14 North Bundy Airstrip details

Figure 15 North Bundy Station ALA, left hand circuit Runway 06

Summary

Aircraft operating at North Bundy Station ALA are provided with information about the existing transmission line by the owner and they would be expected to be remain above the proposed transmission line during normal take-off and landing operations when in proximity to the existing and the proposed transmission line and towers.

Consultation with the operator will occur prior to the commencement of construction.

Bon Accord

An ALA was identified on Google Earth at a property called Bon Accord. It is also show on nationalmap.gov.au. Searches of aeronautical databases and online resources failed to find any details of this ALA. It is long enough to be used by light aircraft.

Civil Aviation Regulation (CAR)166A prescribes that aircraft operate left-hand circuits at all aerodromes, including ALAs in Australia, unless obstacles, populous areas or terrain preclude the left-hand circuit. In this case a right-hand circuit must be published in AIP ERSA to inform pilots of the different situation at that ALA.

An aircraft taking off to the southeast is required to reach at least 500 ft above the airfield before turning left in the circuit area, in this case toward the transmission line. When the aircraft reaches at least 500 ft above the airfield it will be at 723 ft AHD and usually still climbing. The highest transmission line tower #41 has a maximum elevation of 178.8 m (586.6 ft) AHD.

The aircraft still has 1 nm to go before reaching the transmission line and should comfortably be able to climb safely above the transmission line towers. The short duration of the construction activity should not cause any further impact.

Aircraft landing to the southeast would need to identify and consider the transmission towers as they commence descent to the runway.

The existing transmission line would be well known to the operators of the Bon Accord ALA, if it is indeed an ALA. Consultation with the owner is required to confirm its status. The new transmission line would only have an additional minor impact, if any, to flight operations at Bon Accord airfield.

Figure 16 shows the left-hand circuit from the runway toward the southeast.

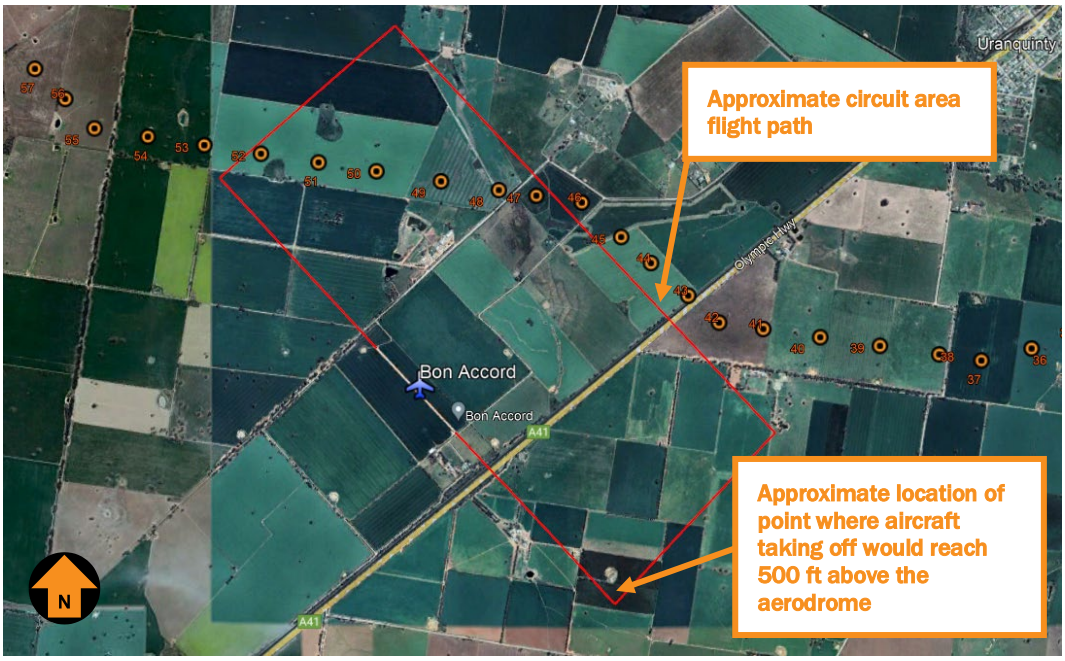

Figure 16 Bon Accord circuit area overhead the transmission line

Consultation with the operator will occur prior to the commencement of construction, including location and height information of the finalised design of the transmission line and towers to provide an understanding of potential hazards for aircraft using its facility.

3.5. Summary of ALA analysis

The two identified ALAs within 3 nm of the proposed transmission line would most likely be used by aerial application operators.

AC 91-10 v1.1- *Operations in the vicinity of non-controlled aerodromes* provides guidance on standard aerodrome traffic. Except, according to paragraph 3.6.2, aerial application operators may not conform to the standard aerodrome circuit.

> *3.6.2 Aerial application operations frequently involve low-level manoeuvring after take-off and prior to landing. These low-level manoeuvres are not required to conform to the standard traffic circuit.*

Following the finalised design of the proposal Transgrid will provide relevant details of the proposed transmission line to the ALA owners at North Bundy Station and Bon Accord, to enable them to consider the potential impact of the transmission towers and power lines on their operations.

To facilitate the flight planning of aerial application operators conducting flight operations on any property near to the proposed transmission line, details of the proposal, including location and height information of the finalised design of the transmission line and towers would be provided to landowners . This is so that, when asked for hazard information on their property, the landowner may provide the aerial application pilot with all relevant information.

3.6. Air routes LSALT and Grid LSALT

Air routes between airports are provided with a Lowest Safe Altitude (LSALT), which is the lowest altitude that an aircraft can fly in Instrument Meteorological Conditions, i.e., where they can't necessarily maintain visual contact with the ground or water to avoid obstacles.

CASR Part 173 MOS prescribes a minimum obstacle clearance of 1000 ft below the published lowest safe altitude (LSALT) is maintained along each air route.

There are 13 air routes above the length of the transmission line, each is listed in Table 9.

A Grid LSALT is provided for IFR aircraft that are not flying along a published air route. The grid is a 1 degree by 1 degree grid along the whole number latitude and longitude graticule.

Figure 17 shows an area of the Enroute Low Chart Low 2 published by Airservices Australia as a component of the AIP.

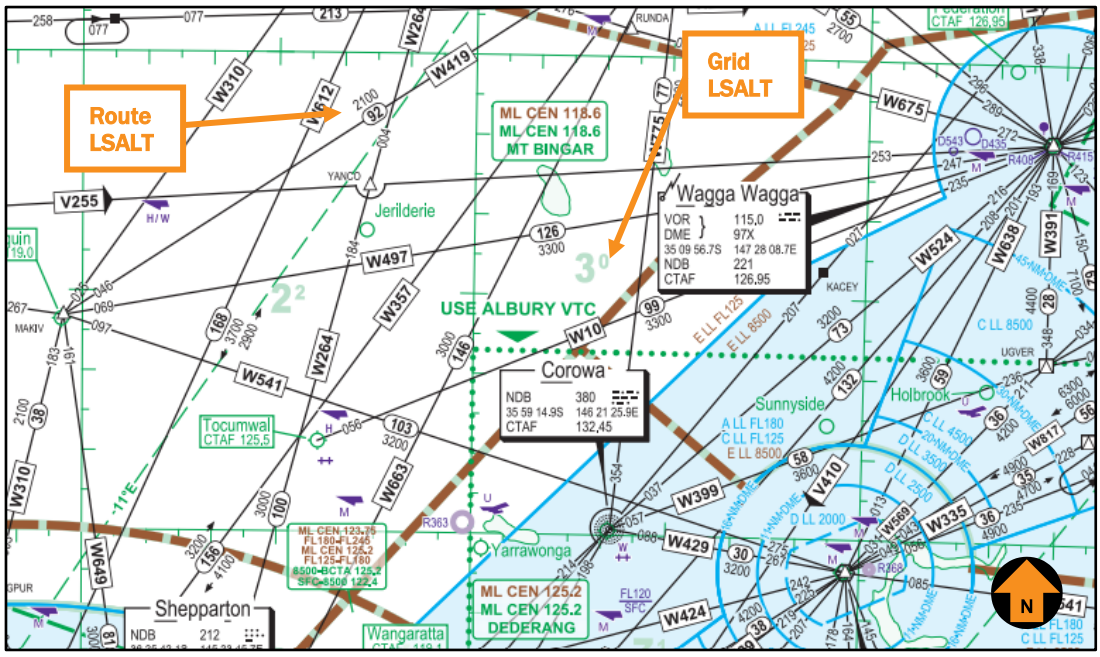

Figure 17 Enroute Chart L2 air routes

The lowest Grid LSALT above the transmission line is in the area surrounding Hay Airport at 1700 ft AHD. The protection surface has an elevation of 700 ft/213.36 m AHD. The highest transmission line tower and crane operations is at tower #43 with an elevation of 177.5m and 192.5 m AHD respectively. These structures are below the protection surface and the transmission line towers would not impact the Grid LSALT.

Table 9 Air Route data

Air Route	*Route Definition*	*LSALT (ft AHD)*	*Protection Surface (ft/m AHD)*	*Result IAW Highest Tower*
H66	Corowa – Mudgee	6100	5100	All Below protection area
H102	Mildura VOR – NATYA	1800	800/243.8	TWR L2 #670 133 m AHD Cranes 148 m AHD Below protection area
H247	NATYA – TOBOB	2000	1000/300	TWR L2 #180 160.2 m AHD Cranes 175.2 m AHD Below protection area.
J19	UVUPU – NATYA	2000	1000/300	TWR L2 #586 133.8 m AHD Cranes 148.8 m AHD Below protection area.
W10	Tocumwal – Wagga Wagga	3300	2300/701	All Below protection area

Air Route	Route Definition	LSALT (ft AHD)	Protection Surface (ft/m AHD)	Result IAW Highest Tower
W310	Deniliquin – Griffith	2300	1300/396	TWR L2 #43 177.5 m AHD Cranes 192.5 m AHD Below protection area.
W357	CANTY – Narrandera	2900	1900/579	All Below protection area
W391	UGVER – Wagga Wagga	4400	3400/1036	All Below protection area
W497	Deniliquin – Griffith	3300	2300/701	All Below protection area
W524	Corowa – Wagga Wagga	3200	2200/670	All Below protection area
W638	Albury – Wagga Wagga	3600	2600/792	All Below protection area
W762	NATYA – TREST	2100	1100/335	TWR L2 #180 160.2 m HAD Cranes 175.2 m AHD Below protection area
Grid LSALTs	Lowest (Hay Airport area	1700	700 ft/213.36 m	TWR L2 #43 177.5m AHD Cranes 192.5 m AHD Below Protection Area

3.7. Airspace

The proposal is wholly located within Class G airspace and does not enter Special Use Airspace published in AIP.

3.8. Aviation navigation facilities

The following aviation navigation facilities were identified as the closest to the proposal:

- ATC Radio Transmitters, NDB, DME and VOR located at Mildura Airport, approximately 20 km (11 nm) southwest of the nearest transmission line tower and Buronga substation.

  Note: Buronga substation is an existing substation that would be upgraded by the NSW Western section of EnergyConnect (i.e., not the subject of the current proposal))

- ATC Radio Transmitter, NDB, DME and VOR located at Wagga Wagga Airport, approximately 7 km (4 nm) northeast of the transmission line and Wagga Wagga substation, which will be upgraded.

The maximum protection area associated with above navigational aids is 4 km. The proposal is not located in any protection area associated with these aviation facilities.

3.9. ATC Radar Facilities

The closest aviation radar facility is the Mount Bobbara Route Surveillance Radar (RSR), which is located approximately 124 km (67 nm) northeast of Wagga Wagga.

The second closest radar facility is Mount Majura RSR, located approximately 163 km (88 nm) east of the proposal.

The open lattice construction of the transmission line towers is known not to interfere with ATC surveillance systems.

3.10. Obstacle Lighting

CASA's Advisory Circular AC 139.E-05 v1.0; *Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome*, effective from May 2021, refers to tall structures that might infringe navigable airspace.

Navigable airspace is defined within the AC is that airspace above the minimum flight altitudes for VFR and IFR flight, including airspace required to ensure the safety for the take-off and landing of an aircraft. Generally, minimum flight altitude limits equate to 500 ft (152 m) AGL, for VFR flight, other than licenced low-level operations, known obstacles and terrain within 300 m laterally from the aircraft. The PANS-OPS and LSALTs protect IFR aircraft.

Aviation Projects has assessed that the proposal would not require obstacle lighting to maintain an acceptable level of safety to aircraft due to the height of the transmission towers not exceeding 65 m AGL.

3.11. AIS summary

Based on the assessment of the overall transmission line pathway and the heights of the components of the transmission line that are beneath the indicated protection surfaces, the transmission line towers and associated temporary construction cranes:

- would infringe the Approach Surface (AS) of Wagga Wagga Airport's OLS during construction and operation as a result of the location and height of the proposed transmission line towers and associated construction cranes. The infringement to the AS by the proposed transmission line towers would be tolerable, to a similar extent that is consistent with the infringements by the existing transmission line towers and terrain into the AS at Wagga Wagga airport.
- would not have any structures that would penetrate any Procedures for Air Navigation Services - Aircraft Operations (PANS-OPS) surfaces
- is unlikely to impact upon take-off and landing operations at the two aircraft landing areas (ALAs) in close proximity to the transmission line
- would not have an impact on designated air routes
- would not have an impact on the grid lowest safe altitudes (LSALTs)
- is wholly contained within Class G airspace
- is outside any Special Use Airspace

- is outside the clearance zones associated with aviation navigation aids, radar systems and communication facilities.
- can be compatible with aerial application flight operations when the recommended risk management process is carried out by the pilot and landowner whose property has the transmission line overhead and immediately adjacent to the proposed transmission line.

4. CONCLUSIONS

The results of this study are summarised as follows:

4.1. Key features of the proposal

Key features of the proposal that are relevant to this assessment are:

- about 375 kilometres of new 330kV double circuit transmission line between the Buronga substation and the proposed Dinawan 330kV substation (referred to as L2) and about 162 kilometres of new 500kV double circuit transmission line between the proposed Dinawan 330kV substation and the existing Wagga Wagga substation at Wagga Wagga, NSW (referred to as L5)
- the construction of a new Dinawan substation and upgrade of the existing Wagga Wagga substation.

Around 1160 transmission line towers with a maximum overall height of 65 m above ground level (AGL) would be constructed. Construction cranes at each transmission line tower site and substation site would be up to 80 m AGL and 60 m AGL respectively. For:

- Line L2, the transmission line tower on the highest terrain (#43) would have an elevation of 177.5 m Australian Height Datum (AHD) and its construction crane would have a maximum elevation of 192.5 m AHD
- Line L5, the transmission line tower on the highest terrain (#20) would have an elevation of 446.7 m AHD and its construction crane would have a maximum elevation of 461.7 m AHD.

4.2. Aviation Impact Statement

The proposal:

- would infringe the Approach Surface (AS) of Wagga Wagga Airport's OLS during construction and operation as a result of the location and height of the proposed transmission line towers and associated construction cranes. The infringement to the AS by the proposed transmission line towers would be tolerable, to a similar extent that is consistent with the infringements by the existing transmission line towers and terrain into the AS at Wagga Wagga airport
- would not have any structures that would penetrate any Procedures for Air Navigation Services - Aircraft Operations (PANS-OPS) surfaces
- is unlikely to impact upon take-off and landing operations at the two aircraft landing areas (ALAs) in close proximity to the transmission line
- would not have an impact on designated air routes
- would not have an impact on the grid lowest safe altitudes (LSALTs)
- is wholly contained within Class G airspace
- is outside any Special Use Airspace
- is outside the clearance zones associated with aviation navigation aids, radar systems and communication facilities

- can be compatible with aerial application flight operations when the recommended risk management process is carried out by the pilot and landowner whose property has the transmission line overhead and immediately adjacent to the proposed transmission line.

4.3. Hazard lighting and marking

Lighting

"CASA has no authority or powers in relation to a wind farm or tall structure approval outside the vicinity of a certified aerodrome but advice from CASA will inform the planning authority in regard to any decisions or conditions on any approval the planning authority might place on a development." [5]

CASA considers that obstacles lower than 500 ft/152.4 m AGL do not infringe "*navigable airspace*" and therefore, over areas outside a built-up area, do not require obstacle lights to be fitted.

CASA has not required obstacle lighting for the existing terrain and transmission line that technically infringes the Runway 05 Approach Surface at Wagga Wagga airport which is consistent with the provisions of Section 9.27 of the CASR Part 139 Manual of Standards - Aerodromes (CASR Part 139 MOS).

The transmission line towers (and temporary construction cranes) that infringe the Wagga Wagga Airport Runway 05 Approach Surface component of the OLS would not require obstacle lighting to maintain an acceptable level of safety to aircraft as the infringements identified in this report are beyond 3000 m from the inner edge near the runway threshold.

Obstacle lighting across the length of existing transmission lines has not been required by CASA, as evidenced by the symbology on the aeronautical charts related to power transmission lines across Australia.

Based on this assessment, it is unlikely that obstacle lighting would be required for the transmission towers. However, this would be confirmed by CASA once it has conducted its own safety assessment. This would occur once CASA has received the AIS from the Wagga Wagga airport manager.

Marking

Transmission line towers associated with high-voltage power transmission lines are large structures that are readily identified from the ground and from airborne aircraft. They are depicted on a variety of charts, including aeronautical charts of all scales.

The existing transmission line between Buronga and Wagga Wagga passes by similar, if not the same, areas that the proposed new transmission line will.

ALA owners will be familiar with the existing transmission line. The airport management of Wagga Wagga airport will be familiar with the existing transmission line and the lack of impact that it creates to airport operations. The proposed transmission line, whilst being slightly higher than the existing line, will generally have the same characteristics as the existing transmission line.

At 65 m AGL, the proposed transmission line does not infringe navigable airspace along its route, other than the OLS at Wagga Wagga Airport and it is unlikely that marking would be required. This would be confirmed by CASA once it has conducted its own safety assessment.

[5] CASA AC 139.E05v1.0 - May 2021

5. RECOMMENDATIONS

Recommended actions resulting from the conduct of this assessment are provided below.

1. The concept design of the transmission line segment that infringes the Wagga Wagga Airport OLS and the AIS should be provided to the Airport Manager to enable the Airport Manager to pass the details to CASA for assessment. Further engagement is to occur if the finalised design of the proposal alters the details supplied to the Airport Manager.
2. It is unlikely that obstacle lighting and marking of the transmission line towers would be required and it is not recommended as a result of this assessment. This would be confirmed by CASA once it has conducted its own safety assessment, which would occur once it has received the AIS from the Wagga Wagga airport manager.
3. The concept design of the transmission line tower coordinates and elevations should be provided, using the following email address: vod@airservicesaustralia.com. Note also that:
    a. Airservices Australia has been assigned the task of maintaining a database of tall structures, the top measurement of which is:
        i. 30 m or more above ground level—within 30 kilometres of an aerodrome; or
        ii. 45 m or more above ground level elsewhere.
    b. The purpose of notifying Airservices Australia of these structures is to enable their details to be provided in aeronautical information databases and maps/charts etc used by pilots, so that the obstacles can be avoided.
    c. The notification to Airservices Australia should be made as early as possible following the concept design of the proposal for the preliminary design. Aeronautical charts are updated twice per year, in June and December. For example, the cut-off date for the June 2022 chart amendments has passed. The cut-off date for data inclusion in the December 2022 charts is 16 June 2022. The Amendment Cycle is available at https://www.airservicesaustralia.com/industry-info/aeronautical-information-management/document-amendment-calendar/.

    Further notification is to occur if the finalised design of the proposal alters the details supplied to Airservices Australia.
4. The concept design for the transmission line tower coordinates and elevations should be provided to Department of Defence, using the following email address: land.planning@defence.gov.au. Further notification is to occur if the finalised design of the proposal alters the details supplied to the Department of Defence.
5. Following the finalised design of the proposal Transgrid will provide relevant details of the proposed transmission line to the ALA owners at North Bundy Station and Bon Accord, to enable them to consider the potential impact of the transmission towers and power lines on their operations.
6. To facilitate the flight planning of aerial application operators conducting flight operations on any property near to the proposed transmission line, details of the proposal, including location and height information of the finalised design of the transmission line and towers would be provided to

landowners . This is so that, when asked for hazard information on their property, the landowner may provide the aerial application pilot with all relevant information.

6. ANNEXURES

1. References
2. Definitions
3. Letter to Transgrid from City of Wagga Wagga re: OLS not infringed

ANNEXURE 1 – REFERENCES

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

- Airservices Australia, Aeronautical Information Publication; including AIP Book, Departure and Approach Procedures and En Route Supplement Australia dated 24 March 2022
- Airservices Australia, Designated Airspace Handbook, effective 2 December 2021
- Civil Aviation Safety Authority, Civil Aviation Regulations 1998 (CAR)
- Civil Aviation Safety Authority, Civil Aviation Safety Regulations 1998 (CASR)
- Civil Aviation Safety Authority, Civil Aviation Advisory Publication (CAAP) 92-1(1): Guidelines for aeroplane landing areas, dated July 1992
- Civil Aviation Safety Authority, Civil Aviation Advisory Circular AC 91-10 v1.1: Operations in the vicinity of non-controlled aerodromes, dated November 2021
- Civil Aviation Safety Authority, Manual of Standards Part 173 – Standards Applicable to Instrument Flight Procedure Design, version 1.5, dated March 2016
- Civil Aviation Safety Authority, *Part 139 (Aerodromes) Manual of Standards 2019*, dated 5 September 2019
- Civil Aviation Safety Authority, Advisory Circular (AC) 139.E-01v1.0: *Reporting of Tall Structures*, dated December 2021
- Department of Infrastructure and Regional Development, Australian Government, National Airport Safeguarding Framework, National Airports Safeguarding Framework (NASF) Guideline F: Managing the Risk of Intrusions into the Protected Operational Airspace of Airports.
- International Civil Aviation Organization (ICAO) Doc 8168 Procedures for Air Navigation Services—Aircraft Operations (PANS-OPS)
- ICAO Standards and Recommended Practices, Annex 14—Aerodromes
- OzRunways, aeronautical navigation charts extracts, dated 30 March 2022
- Standards Australia, ISO 31000:2018 Risk management – Guidelines
- Wagga Wagga Airport Masterplan 2010.

ANNEXURE 2 – DEFINITIONS

Term	*Definition*
Aerial Agricultural Operator	Specialist pilot and/or company who are required to have a commercial pilot's licence, an agricultural rating and a chemical distributor's licence
Aerodrome Aircraft Landing Area (ALA)	A defined area on land or water (including any buildings, installations, and equipment) intended to be used either wholly or in part for the arrival, departure, and surface movement of aircraft.
Aerodrome facilities	Physical things at an aerodrome which could include: a. the physical characteristics of any movement area including runways, taxiways, taxilanes, shoulders, aprons, primary and secondary parking positions, runway strips and taxiway strips b. infrastructure, structures, equipment, earthing points, cables, lighting, signage, markings, visual approach slope indicators.
Aerodrome reference point (ARP)	The designated geographical location of an aerodrome.
Aeronautical Information Publication (AIP)	Details of regulations, procedures, and other information pertinent to the operation of aircraft
Aeronautical Information Publication En-route Supplement Australia (AIP ERSA)	Contains information vital for planning a flight and for the pilot in flight as well as pictorial presentations of all certified aerodromes. Other aerodromes, also known as Aircraft Landing Areas (ALA) may be included in ERSA with limited information.
Ancillary infrastructure	Supporting infrastructure for: • construction (temporary) e.g., compounds, batching plants etc. • operational (permanent) e.g., operations and maintenance facilities, access tracks etc.
Civil Aviation Safety Regulations 1998 (CASR)	Contain the mandatory requirements in relation to airworthiness, operational, licensing, enforcement.
Class G Airspace	A category of airspace in which an ATC separation service is not provided, i.e., uncontrolled airspace.

Term	*Definition*
Instrument meteorological conditions (IMC)	Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, less than the minimum specified for visual meteorological conditions.
Manual of Standards (MOS)	The means CASA uses in meeting its responsibilities under the Act for promulgating aviation safety standards
National Airports Safeguarding Framework (NASF)	Framework has the objective of developing a consistent and effective national framework to safeguard both airports and communities from inappropriate on and off airport developments.
Obstacles	All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.
Runway	A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.
Runway strip	A defined area including the runway and stopway, if provided, intended: a. to reduce the risk of damage to aircraft running off a runway b. to protect aircraft flying over it during take-off or landing operations.
Safety Management System	A systematic approach to managing safety, including organisational structures, accountabilities, policies and procedures.
Transport routes	Public roads that are to be used for delivery of plant and equipment

ANNEXURE 3 – LETTER FROM WAGGA WAGGA COUNCIL

City of Wagga Wagga

Civic Centre
cnr Baylis & Morrow sts
PO Box 20
Wagga Wagga NSW 2650

abn 56 044 159 537
p 1300 292 442
f 02 6926 9199
e council@wagga.nsw.gov.au
w www.wagga.nsw.gov.au

Joseph Ters
Project Integration Manager
Transgrid

10 March 2022

Re: PROPOSED TRANSMISSION LINES – WAGGA WAGGA AIRPORT OLS ASSESSMENT

Dear Mr Ters,

With reference to your correspondence in this regard received 25 February 2022, it is herewith confirmed that your intended construction of the power lines will, under the latest MOS 139 standards, not intrude into the Wagga Wagga Airport Obstacle Limitation Surfaces.

Please do not hesitate to contact Leon Burger on 02 6926 9267 if you require any additional information.

Yours sincerely,

Leon Burger
Airport Facility Manager
City of Wagga Wagga

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