Chapter 7 The project

This chapter describes the key features of the project, including its air traffic control procedures, runway modes of operation, noise abatement procedures and proposed flight paths when Western Sydney International (Nancy-Bird Walton) Airport (WSI) is opened. The changes to the Sydney Basin airspace required to support WSI operations also form part of the project description and are described in Chapter 8 (Facilitated changes).

The information reflects the flight paths and operating parameters that Department of Infrastructure, Transport, Regional Development, Communication and the Arts (DITRDCA) and Airservices Australia understand would be adopted for operations on the single runway following completion of WSI. Operating parameters not only affect operational and commercial viability, but also the safety of operations and the potential for environmental and social impacts.

The mitigations inherent in the design, in particular the opportunities for noise abatement in the runway modes of operation, are also presented. These are presented in the context of international and Australian standards and recommended practices for the design and operation of airspace for single runways.

Aviation terminology and concepts presented in this chapter are explained in Chapter3 (Introduction to airspace) and the airspace and flight design process (flight path development) is described in Chapter 6 (Project development and alternatives).

The information in this chapter provides, directly and indirectly, the basis for the impact assessments within this Draft EIS.

7.1 Project overview

The project is the development of proposed flight paths and a new controlled airspace volume for single runway operations at WSI, including the associated air traffic control and noise abatement procedures, runway modes of operation and facilitated changes to airspace.

The airspace design is for single runway operations, as approved by the Airport Plan, and has been developed on the requirement for WSI to operate 24-hours, 7 days a week. The airport infrastructure at WSI has been designed to be an all-weather operation. The eventual use is for commercial passenger and freight aircraft.

The scope of airspace operations for the project is restricted to:

- standard instrument arrivals (STARs) from when an inbound aircraft leaves the higher level enroute sector to when it joins its final alignment for landing
- standard instrument departures (SIDs) from when a departing aircraft leaves the runway and is established in a stable configuration to safely execute turns to join the higher level enroute sector for its destination
- taking off (from start of roll for aircraft) or landing (until an aircraft exits runway).

These phases of flight are depicted in Figure 3.11 of Chapter 3 (Introduction to airspace).

The project does not consider the operation of aircraft when performing manoeuvring operations on the runway and taxiway system on their way to or from their parking positions at the terminals (as assessed in the 2016 EIS).

No construction works or changes to the physical ground infrastructure approved and currently under construction are required for the project. This includes the airfield, terminal, landside layout and facilities, navigational aids including instrument landing systems, and lighting systems as outlined in Chapter 4 (Project setting).

Operating a new airport offering domestic, international and freight air services will require changes to the current Sydney Basin airspace and its airspace classification structure – likely the most complex and busiest airspace in Australia (refer to Chapter 4 (Project setting)).

As presented in this chapter, the project would introduce of a new controlled airspace volume (Section 7.2) to contain the WSI air traffic control procedures (Section 7.3) and flight paths (Section 7.5), which determine where and how aircraft arrive and depart the airport's runway.

Consequential changes to the established Sydney Basin airspace system have been minimised to the extent practical and the required adjustments are described in Chapter 8 (Facilitated changes).

The key features presented in this chapter are preliminary and subject to finalisation as described in Chapter 6 (Project development and alternatives). Using preliminary flight paths for identifying and assessing the nature and scale of impacts arising from operations at WSI is considered a valid approach and is generally consistent with the environmental assessment approach for airspace at other airports.

For the purposes of this Draft EIS, the location of the project is the airspace within the Sydney Basin that captures each WSI flight path extending to around 45 nautical miles (nm) (83 kilometres (km)) from the single runway and other airspace changes as presented in Chapter 8 (Facilitated changes). The coordinates for the project extents are presented in Appendix E. Not all this area would be overflown or otherwise affected by WSI flight paths or changes to existing flight paths (refer to Chapter 10 (Approach to impact assessment)).

7.2 Volume of aircraft traffic

An aircraft movement is defined as a single landing or take-off event.

As outlined in Chapter 1 (Introduction), the approval for WSI is limited to single runway operations with the capacity to handle up to 10 million annual passengers and around 81,000 air traffic movements per year by 2033, including freight operations. In the medium to longer term, WSI's airfield and terminal facilities would be expanded incrementally to handle up to 37 million annual passengers and around 226,000 air traffic movements per year in 2055. This includes both jet and non-jet (for example turbo-prop) aircraft.

This phasing of operations is represented by particular years as depicted in Figure 7.1 and forms the basis of the forecast schedules (refer to Section 7.2.1) and assessment years (refer to Chapter 10 (Approach to impact assessment)) for the purpose of this Draft EIS. The years and reasons for selection are:

- **2033** – representing 7 years after opening, when passenger numbers at WSI reach the planned design capacity for the initial Stage 1 terminal development of 10 million passengers per year. The volumes predicted for 2033 provides a more appropriate representation of mature levels of activity (and therefore potential impacts) than those predicted in 2026.
- **2040** – representing continued growth at WSI, at a point when the airport reaches 15 million passengers per year.
- **2055** – representing a year as the single runway approaches capacity. While significant enhancements to aircraft technology are likely by this timeframe, the forecast schedules have not considered technological step changes (for example, upgrading of aircraft fleets) and have instead relied on existing and soon-to-be commissioned aircraft types. This provides a conservative impact assessment.

The number, type and timing of daily aircraft movements expected to operate from WSI influences the runway infrastructure required as well as the way in which the airspace is used by aircraft (refer to Chapter 3 (Introduction to airspace)). The number of aircraft arriving and departing varies throughout the day and between days and months.

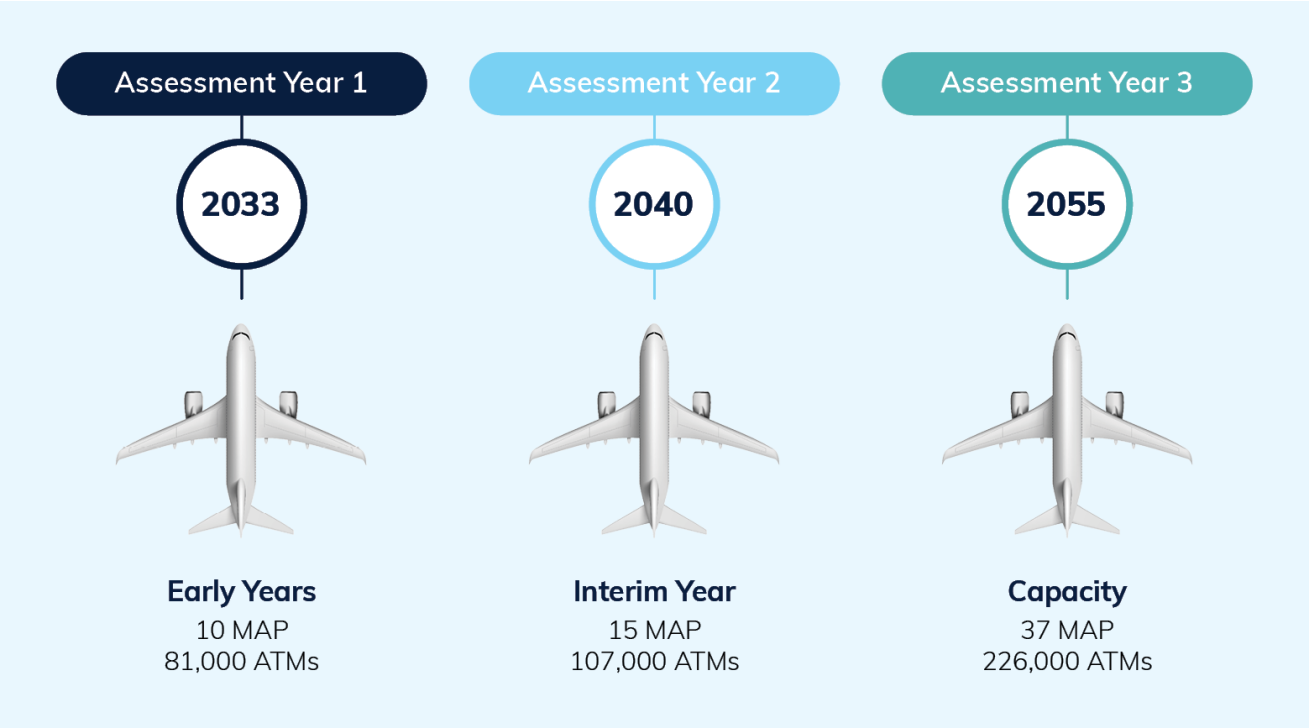

Figure 7.1 Volume of passenger and air traffic movements over single runway operations

7.2.1 Forecast schedules

As a completely new airport facility, WSI does not have access to historic operations and daily aircraft movement profiles to extrapolate into future years of operation. Consequently, Western Sydney Airport Company Limited (WSA Co), as the airport lessee company for WSI, has provided projected demand schedules – or 'forecast schedules' for aircraft movement – for the 3 assessment years.

These projections break down each movement by the type of aircraft, operation type (arrival or departure), time of operation and port of origin or destination. The forecast schedules for 2033 and 2055 form the basis of modelling undertaken to inform the assessment of impacts for this Draft EIS. The forecast schedules for 2040 were used in the aircraft noise assessment (refer to Chapter 11 (Aircraft noise).

All forecast schedules were developed as accurately as possible by WSA Co and are considered sufficient for the purpose of this assessment. They are considered the most reliable source at this time given WSA Co, as the ALC, is the owner of the airport lease granted by the Australian Government, and responsible for the development and operation of WSI.

The forecast schedules are therefore considered sufficient for the purpose of this assessment.

The forecast schedules and many other variables used in the EIS are based on assumptions about future aircraft types, aircraft occupancy rates, technology use and air traffic demand forecasts. While these assumptions are based on accurate sources available to the EIS project team and best-practice methodology, the realisation of these assumptions depends on global events and trends, business decisions of airlines and other industry participants, decisions by international organisations such as ICAO and other factors which are outside the control of any airport developer or operator.

7.2.2 Number of flights

The various runway modes of operation (refer to Section 7.4) and associated air traffic control procedures (refer to Section 7.3) generate a certain movement capacity (the number of aircraft that can safely land or take off in a certain period). Traffic demand (the number of aircraft that wish to land or take off in a certain period) therefore affects which available modes of operation are used. Weather conditions and other weather phenomena such as fog, low cloud and low visibility conditions can also adversely influence runway and airspace movement capacity; however, this can be managed through navigational systems and aids.

Northern Summer (NS)/Northern Winter (NW) is the internationally acceptable method of describing scheduling seasons and the convention adopted by the Australian Aviation industry. The NS/NW convention typically captures the overall local seasonality of flights, considering time change (that is, daylight saving). The forecast schedules provided by WSA Co reflect an average week schedule derived from the NS/NW airline schedule seasons for each future year. The average weekly schedules were "annualised" by taking the relative proportions of days in the NS/NW airline schedule seasons to create a table with 365 days' worth of aircraft movements. This was the basis for the daily and hourly movement data presented Section 7.2.2.1 and Section 7.2.2.2 respectively.

7.2.2.1 Daily movements

Projected total daily movements of freight and passenger aircraft are presented in Table 7.1. The projected aircraft movement numbers represent an average day.

Table 7.1 Total predicted daily aircraft movements at 2033, 2040 and 2055

Single runway operations	Aircraft movements per day (average day)		
	Passenger	Freight	Total
Early years (2033)	195 (88%)	27 (12%)	222
Interim year (2040)	261 (89%)	33 (11%)	294
Approaches capacity (2055)	569 (91%)	53 (9%)	623

By comparison, in 2019 Adelaide Airport (with one main runway), handled on average 291 aircraft movements per day.

Table 7.2 shows the projected daily aircraft movements for the early years (2033), an interim year (2040) and for when the single runway is expected to operate close to capacity (2055) – as summarised in Table 7.1. This breakdown of the aircraft family is based on those currently in service and not all types of aircraft listed in Table 7.2 are expected to be operating in 2055. This is because aircraft technology continues to improve and airlines replace older aircraft with newer models which are generally quieter and more fuel efficient, as has been the trend over previous decades. There are no known plans to accommodate helicopter operations at WSI.

Table 7.2 Predicted average daily aircraft movements by aircraft family at 2033 and 2055

Aircraft family	Aircraft movements per day		
	Early years (2033)	Interim year (2040)	Approaching capacity (2055)
Passenger aircraft movements			
Airbus A220	21	21	19
Airbus A320	46	34	126
Airbus A321	18	28	44
Airbus A330	12	24	45
Airbus A350	2	8	47
Boeing B737	71	100	171
Boeing B777	2	2	32
Boeing B787	6	23	61
Bombardier Dash 8	13	13	13
Saab SF340	4	8	12
Subtotal	195	261	569
Freight aircraft movements			
Airbus A321	11	15	23
Airbus A330	3	3	4
Airbus A350	–	2	3
Boeing B737	9	10	19
Boeing B747	1	1	1
Boeing B777	3	2	3
Subtotal	27	33	53

Figure 2.4 in Chapter 2 (Strategic context and need) provides a comparison of various commercial aircraft, providing some scale for the various aircraft families described above.

7.2.2.2 Hourly movements

Other important metrics in airspace design are periods of concentrated demand including the peak hourly movement rate demand and the peak period durations. These have been estimated from the forecast schedules as described in Section 7.2.2 for the early years (2033), for an interim year (2040) and for when the single runway system is operating close to capacity (2055), as shown in Figure 7.2.

The movement rate demand influences the runway modes of operation which are feasible at various times of the day and night, including the application of the Reciprocal Runway Operations (RRO) mode (refer to Section 7.4).

It is expected that the WSI single runway system (05/23) will be capable of processing around 48 to 49 aircraft movements per hour subject to adverse weather influences and a reasonable balance in arrival and departure demand.

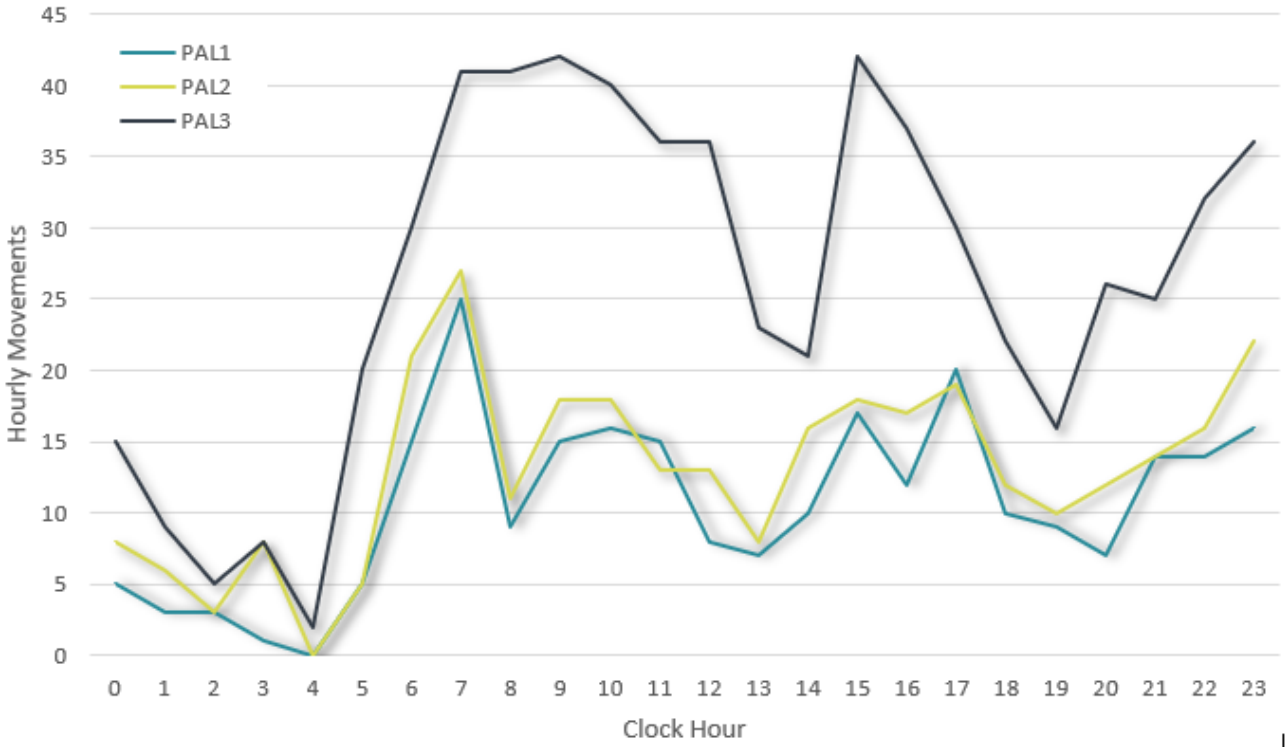

Figure 7.2 Daily predicted aircraft traffic movements over future years 2033, 2040 and 2055

7.3 Air traffic control procedures for WSI

Runway operations are managed by air traffic control using air traffic control procedures to ensure safe and efficient operations of arriving and departing air traffic.

Each controlled airport will also have a set of procedures specific to its operation. The set of procedures WSI is required to have, and the documentation to be made available to pilots and/or air traffic control as presented in this chapter would include:

- Aeronautical Information Package (Section 7.3.1)
- STAR and SIDs (Section 7.3.2)
- standard clearances and coordination (Section 7.3.3)
- weather criteria for visual and instrument landings (Section 7.3.4)
- noise abatement procedures (Section 7.3.4)
- criteria for selecting the operating runway (or the 'nominated' runway) (Section 7.3.6)
- airport specific separation and sequencing requirements for arriving and departing aircraft (Section 7.3.7)
- intersection departures (Section 7.3.8).

Visual and Instrument Flight Rules govern how aircraft are flown and how safe separations are maintained in differing meteorological conditions. All WSI procedures have been or would be designed to be flown under Instrument Flight Rules.

7.3.1 Aeronautical Information Package

The pilot must not commence a flight unless the latest editions of the aeronautical maps, charts and other aeronautical information and instructions, are carried in the aircraft and are readily accessible to the flight crew. These would be published in the Aeronautical Information Package provided by Airservices Australia when the airspace change proposal is approved by the Civil Aviation Safety Authority (CASA). This would occur during the implementation phase of the airspace and flight path design process.

The relevant aeronautical information is that which is applicable:

- to the route to be flown; and
- to any alternative route that may be flown on that flight.

The Aeronautical Information Package is based on weather and visual criteria and comprises:

- Aeronautical Information Publication book
- Aeronautical Information Publication supplements and aeronautical information circulars
- Departure and approach procedures (may designate specific noise abatement procedures at some airports)
- Designated airspace handbook
- Enroute supplement Australia
- Aeronautical charts.

The Aeronautical Information Package can also contain 'Special Procedures' and 'Fly Neighbourly Advice' for areas not associated with specific airports. A Fly Neighbourly Advice is currently published for the Blue Mountains National Park.

The application of these publications is included in relevant sections of this chapter.

7.3.2 STARs and SIDs

To achieve safe segregation of aircraft and minimise the noise effects on the community, aircraft would arrive and depart at WSI according to a set of flight path procedures known as STARs and SIDs. SIDs connect the runway to the enroute flight paths and STARs connect the runway from the enroute flight paths. STARs and SIDs also specify the directional and height limits that pilots are required to observe when flying into and out of a destination. SIDs may also differ depending on the aircraft performance (jet versus non-jet aircraft).

These SIDs and STARs are designed and coded to Performance Based Navigation (PBN) standards (representing satellite-based navigation technologies) whereas conventional technologies employed fixed ground-based beacons to guide aircraft along published routes via waypoints (specified locations used to define positions along an air navigation route).

The application of PBN standards in the preliminary airspace design of WSI SIDs and STARs permits aircraft flight paths to be specified in position both laterally, and vertically. The ability to accurately describe these departure and arrival flight paths has been used in the preliminary design process to strategically de-conflict the flight paths from concurrent and crossing track operations for WSI as well as all other Sydney Basin operations. This airspace design approach delivers robust "Safety by Design" outcomes as per the CASA Manual of Standards Part 172 – Air Traffic Services and increases the reliability and efficiency of operations reducing the level of interaction required by air traffic control to tactically manage aircraft (refer to Section 7.3.7).

The concepts of SIDs, STARs, PBN, waypoints and other navigation specifications such as Required Navigation Performance (RNP) are described in Chapter 3 (Introduction to airspace).

The WSI flight paths are presented in Section 7.5.

7.3.2.1 STARs

WSI STARs have been designed as Closed STARs – a method of processing arrivals that enables aircraft to make its approach and descent using modern aircraft on-board flight management systems with limited air traffic control intervention. The design has used PBN incorporating the RNP rules.

A Closed STAR provides track, speed and altitude guidance from the exit point of the enroute segment of flight to either an intercept of a ground-based approach aid such as the Instrument Landing System (ILS) – shown conceptually by Figure 7.3 – or to the commencement point of an RNP or RNP-Authorisation Required (AR) arrival procedure.

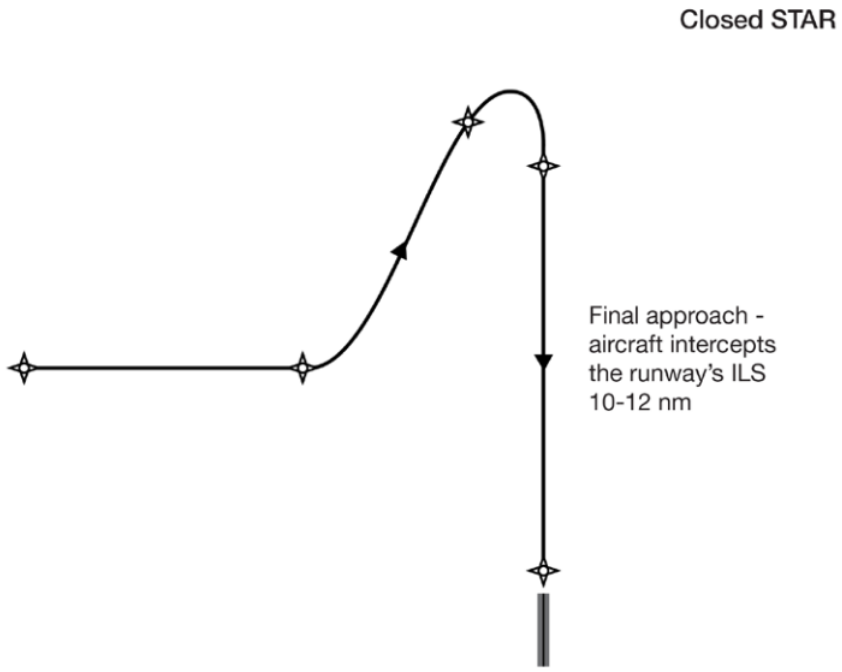

Figure 7.3 Closed STARs arrivals management system using ILS

The WSI STARs design maximises to the extent practical the ability for arriving aircraft to undertake a continuous descent approach, delivering environmental and community benefits through reduced fuel burn, emissions and reduced engine noise (further described in Chapter 3 (Introduction to airspace)).

The Closed STARs model enables accurate fuel time and energy management for aircraft with flight management system capability although it may not provide the flexibility required to maximise runway capacity.

7.3.2.2 SIDs

There is greater flexibility in the design of SIDs to use the latest technology such as PBN-RNP standards. Some SIDs at WSI have multiple turning points so aircraft overfly lower density residential and industrial areas, open space and urban green space. SIDS assigned to jet aircraft will describe the full route from the runway to the enroute airspace structure.

Other SIDs allocate more track nautical miles for heavy aircraft on hot days to climb to a higher altitude over open space and urban green space before flying over a populated area.

Non-jet departures would be managed via SIDs for the initial segments, then processed by air traffic control to join the enroute airspace structure. This form of processing allows air traffic control to separate non-jets from the faster jet operations. Non-jet night departures would utilise Jet SIDs.

The WSI SID design also applies continuous climb operations to the extent practical to deliver environmental and community benefits. Such benefits include reduced fuel burn and emissions and reduced engine noise. This is achieved by minimising intermediate level segments, which require increased levels of engine thrust, to the extent possible (refer to Chapter 3 (Introduction to airspace) for further explanation).

7.3.3 Standard clearances and coordination

To manage large volumes of air traffic that operate in the Sydney Basin safely and predictably, air traffic control issues clearances and coordinates internally using a series of pre-coordinated, standard clearances and procedures. These standard clearances define the way air traffic control process aircraft onto SIDs and STARs and determine the number of aircraft that will fly along specific flight paths.

The method of using pre-coordinated, standard clearances and procedures would continue to be used by air traffic control to manage WSI flight paths. Both WSI and Sydney (Kingsford Smith) Airport can operate independently regardless of which runway direction is in operation at either airport.

7.3.4 Weather criteria for visual and instrument landings

A set of generic weather criteria is applied by air traffic control at Australian airports and adjusted to suit individual airport conditions to determine whether an instrument or visual approach is prescribed. Broadly the criteria are as follows:

- where most of the cloud cover is below 2,500 feet (ft) (760 metres (m)) above ground level and the visibility is 5 km or less – an instrument approach will be nominated on the computerised automatic terminal information service; or
- where most of the cloud cover is above 2,500 ft (760 m) above ground level and the visibility is 5 km or more – a visual approach may be nominated.

Similar approach nomination criteria would apply once WSI is operational. For WSI, whenever there is cloud or reduced visibility on the approach path below the Initial Approach Fix (IAF) level, an instrument approach will be expected. This is likely to be 4,000 ft (1.2 km) for Runway 05 and 2,500 ft (760 m) for Runway 23. Given the STARs are only designed to connect to instrument approaches, it is possible that the primary instrument approach will be nominated all the time (to be decided in consultation with WSI Tower air traffic control in the detailed design phase).

7.3.5 Noise abatement procedures

The purpose and limitations on the use of noise abatement procedures along with some generic examples are described in Chapter 3 (Introduction to airspace).

Noise abatement procedures are published for an airport in the Aeronautical Information Package (enroute supplement Australia component) and implemented by air traffic control, airports or airport owners. They contain instructions to pilots and air traffic control on the runways, flight paths and procedures that should be followed to minimise the impacts of aircraft overflight noise on the community. The departure and approach procedures charts may designate more specific noise abatement procedures for some approaches and departures.

For a major airport like WSI, noise abatement procedures typically evolve over time, with Airservices Australia as the national Air Navigation Services Provider developing and reviewing the procedures in consultation with stakeholders. Stakeholders include aircraft operators, airlines, the airport operator, and Community Aviation Consultation Groups (CACGs). A CACG managed by WSA Co will replace the current Forum on Western Sydney Airport (FOWSA) closer to WSI opening.

Noise abatement procedures included in the preliminary design for WSI include the use of noise preferential flight paths which, where possible, direct aircraft operations away from noise sensitive areas. This includes the use of different flight paths between 11 pm and 5.30 am, when additional airspace flexibility is available as a result of substantially diminished Sydney (Kingsford Smith) Airport operations during this period.

Other noise abatement procedures which may be included in the final airspace design include:

- preferred runway modes of operation which give preference to runway operating directions which minimise the population exposed to significant level of aircraft noise (refer to Section 7.4.2)
- the use of noise abatement departure procedure climb profiles (discussed in Section 11.2 of Technical paper 1).

These noise abatement procedures for WSI would be developed or continue to be developed as part of detailed design following further community and stakeholder consultation including responses to this Draft EIS.

In deciding on a preferred order of runway use, WSI is limited in that it would be a single runway airport in Stage 1. As such, the possibility of developing crossing runway modes of operation in use at Sydney (Kingsford Smith) Airport, or dedicated use of one parallel runway over another such as in use at Brisbane Airport would not exist at WSI.

Only 2 runway directions are available (Runway 05 or Runway 23) to incorporate into a set of 'runway modes of operation' as part of the WSI specific noise abatement procedures.

The runway modes of operation for WSI are presented in Section 7.4.

7.3.6 Nominated runway

Air traffic control operating procedures require the selection of a runway direction for use, known as the 'nominated runway'. The nominated runway is advised to pilots by air traffic control and all aircraft are expected to use this runway unless there is an operational requirement to use another. Air traffic control must consider a set of specific conditions relating to weather, operational conditions and noise abatement procedures before nominating the runway for use.

The Aeronautical Information Publication book outlines the application of noise abatement procedures when nominating runways at Australian airports at ENR 1.5 section 9.1. Specifically:

- noise abatement procedures normally apply to all jet-propelled aircraft and other aircraft having a maximum take-off weight exceeding 5,700 kilograms (kg) (so not applicable to non-jet aircraft with a weight of less than 5,700 kg)
- where noise abatement procedures are prescribed, and air traffic control traffic management permits, the runway nomination provisions of the Aeronautical Information Publication book will be applied
- notwithstanding this, noise abatement as prescribed in the noise abatement procedures will not be a determining factor in runway selection under the circumstances outlined in Figure 7.4 (unless required by noise abatement legislation).

Aeronautical Information Publication Book ENR s1.5-42

Section 9.1.2 *a) in conditions of low cloud, thunderstorms and/or poor visibility;*

b) for runway conditions that are completely dry:

*(1) when the crosswind component, including gusts, exceeds 20 knots (kt) (37 km per hour)**

(2) when the tailwind component, including gusts, exceeds 5 kt (9 km per hour)

c) for runway conditions that are not completely dry:

*(1) when the crosswind component, including gusts, exceeds 20 kt (37 km per hour)**

(2) when there is a tailwind component;

d) when wind shear has been reported

e) when, in the opinion of the pilot in command, safety would be prejudiced by runway conditions or any other operational consideration.

*Note: when an airport has only a single runway, the continued operation in a crosswind is only limited by the certified crosswind capability of the operating aircraft types.

Figure 7.4 Extract from Section 9.1.2 of Aeronautical Information Publication Book ENR 1.5-42 (02 December 2022) (Airservices Australia, 2022a)

These requirements are applicable to all airports with a set of noise abatement procedures and controlled by air traffic control.

These conditions are further described in Section 7.4.

7.3.7 Aircraft separation and sequencing

CASA's Manual of Standards Part 172 – Air Traffic Services sets the minimum separation requirements for aircraft (vertical or lateral) which are applied in the design of SIDs and STARs. These build separation assurance into the system or "Safety by Design".

It is the responsibility of air traffic control to monitor aircraft compliance with expected aircraft trajectories. They would intervene where known severe air turbulence exists or where there are indications separation would cease to exist as planned.

Separation assurance has not been provided in the design where:

- 'open' (radar vectored (radar)) procedures are used, for example some non-jet SIDs
- tactical air traffic control measures would be more efficient
- sufficient separation is expected to exist in the normal climb and descent performance of the aircraft types involved in the procedure.

Where separation assurance is not currently provided in the preliminary airspace design, this will continue to be reviewed for safety outcomes through the airspace detailed design phase and may be incorporated if required (without materially changing the expected aircraft trajectories). A core element of Safety by Design is to deliver standardised procedures wherever possible and the introduction of variability in procedure must balance efficiency against safety.

WSI operations would also establish the sequence of arriving and departing aircraft by requiring them to adjust flight operation, as necessary, to achieve proper spacing.

Aircraft separation and sequencing requirements are further explained in Chapter 3 (Introduction to airspace).

7.3.8 Intersection departures

Air traffic control would permit intersection departures at WSI. This concept and its benefits are introduced in Chapter 3 (Introduction to airspace).

A number of runway/taxiway intersections are available at WSI in either runway direction to enable aircraft that do not operationally require the full length of the runway to safely take-off.

Figure 7.5 presents the basic configuration of WSIs single runway system and connecting taxiway network.

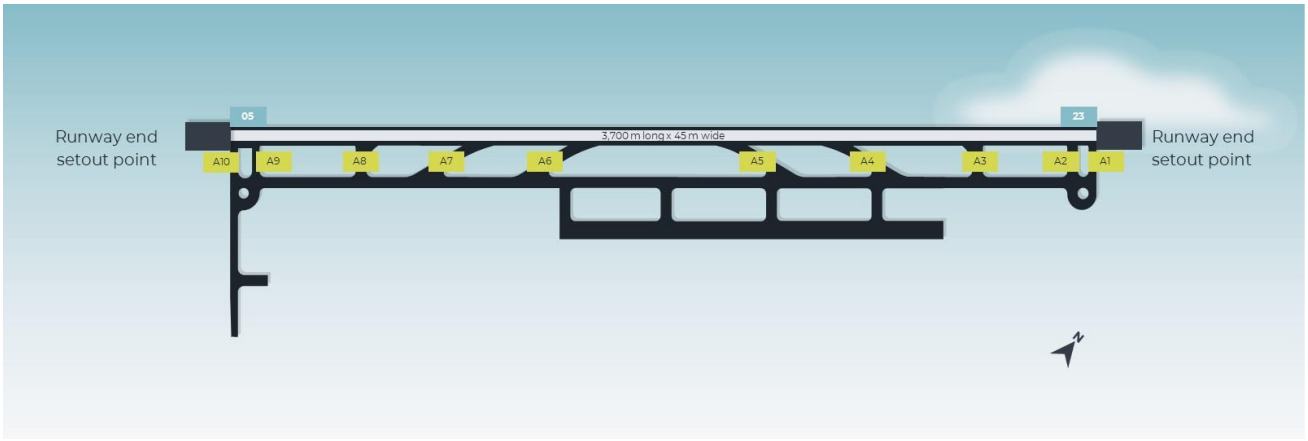

Figure 7.5 WSI Runway 05/23 and connector taxiways schematic layout

WSI intersection departures and their level of use would be part of the final airspace design.

Taxiways A1 and A2, A9 and A10 are 'full length' runway holding points and available to all types at all times. Taxiways A3 and A8 are 90 degree 'intersection' runway holding points and their availability is subject to aircraft payload and performance. Rapid exit taxiways are not expected to be used for departure under normal operating scenarios.

7.4 Runway modes of operation

Runway modes of operation refer to the direction in which aircraft take off and land. This section provides information on the different runway modes of operation available for WSI and in what situation these modes are applied. The concept of runway modes of operation is explained in Chapter 3 (Introduction to airspace).

The choice of a runway mode of operation is primarily informed by the weather (especially wind direction and strength) (refer to Sections 7.3.6 and 7.4.3). Other factors include the runway surface status, aircraft performance profile and capability, air traffic demand and airspace management procedures and potential impacts on surrounding communities, such as noise.

7.4.1 Description of runway modes of operation

The runway modes of operation for WSI are described in Table 7.3 and depicted in Figure 7.6. These include those for day (5:30 am to 11 pm) and night (11 pm to 5:30 am), with the reason for these time periods explained in Section 7.4.1.1.

Table 7.3 Runway modes of operation[1]

Time	Hours of operation	Runway mode	Description
Day	5:30 am to 11 pm	05	All aircraft arrive from the south-west and take-off to the north-east
		23	All aircraft arrive from the north-east and take-off to the south-west
Night	11 pm to 5:30 am	RRO	All aircraft arrive from the south-west onto Runway 05 and take-off to the south-west off Runway 23 *(suitable only:* 1. dur*ing Sydney (Kingsford Smith) Airport curfew hours* 2. *when traffic demand levels permit* 3. *when weather conditions permit).*
		05	All aircraft arrive from the south-west and take-off to the north-east (a variation to Runway 05 day flight paths) *(suitable during Sydney (Kingsford Smith) Airport curfew hours only)*
		23	All aircraft arrive from the north-east and take-off to the south-west (a variation to Runway 23 day flight paths) *(suitable during Sydney (Kingsford Smith) Airport curfew hours only)*

Table does not indicate an order of preference for runway mode of operation.

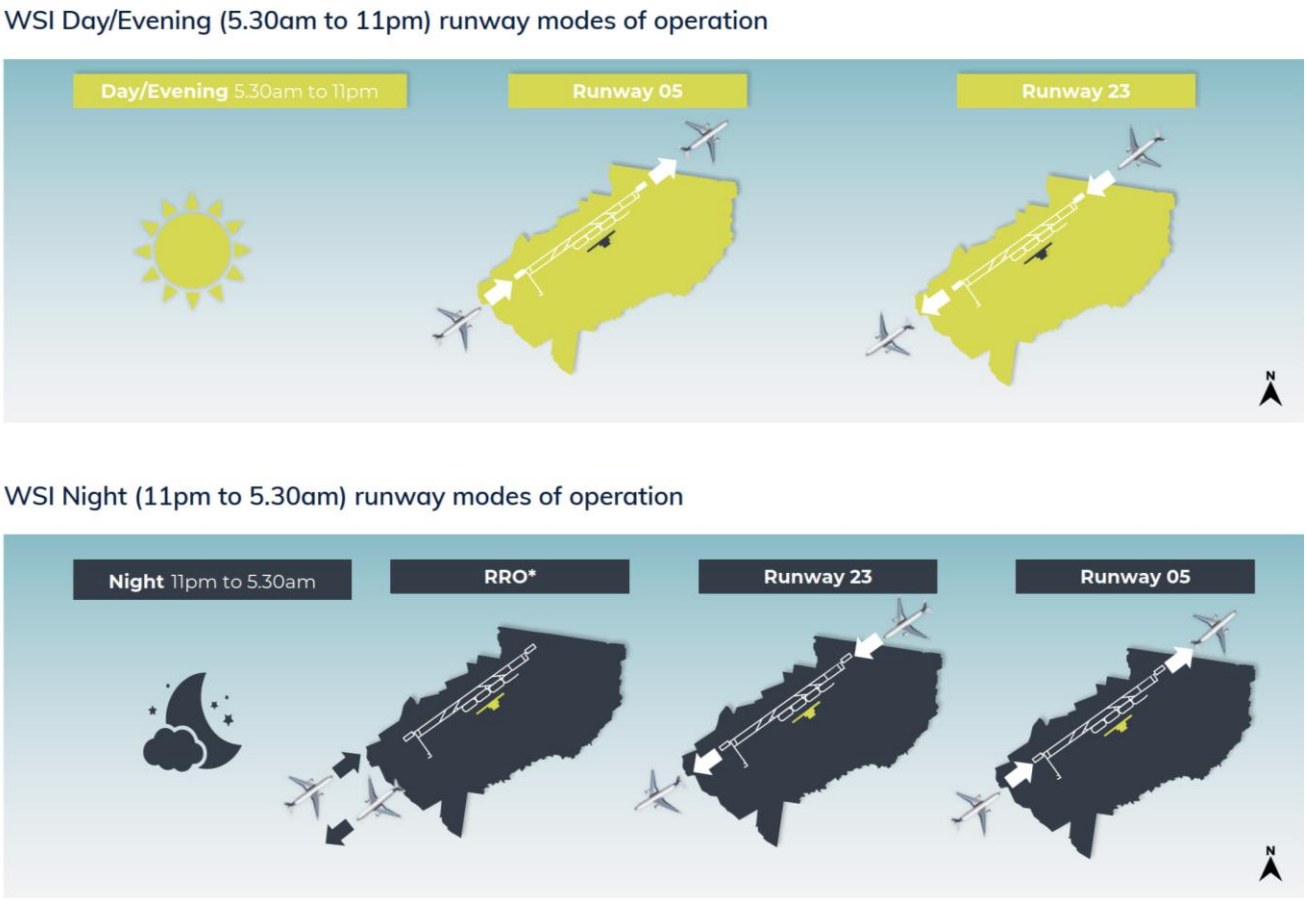

Figure 7.6 WSI runway mode selection

Aircraft generally land and take-off into the wind. Depending on the prevailing wind conditions at WSI, the 2 principal runway modes of operation (for day and night) are:

- Runway 05 – whereby all aircraft would be directed to approach the airport to land from the south-west and directed to take off to the north-east, before redirecting towards their ultimate destination.
- Runway 23 – whereby all aircraft would be directed to approach the airport to land from the north-east and take-off to the south-west, before redirecting to their ultimate destination.

A third operating mode, head-to-head or Reciprocal Runway Operations (RRO), is an additional mode that would be used when conditions permit. This would involve all take-offs and landings occurring in opposing directions, to and from the south-west of the airport. RRO requires the following criteria to operate:

- tailwinds (including gusts) must not exceed 5 knots (kt) (9 km per hour (km/h))
- runway surface must be dry
- visibility and cloud base criteria would need to be met for the aircraft approach within the licensed pilot training and aircraft parameters, and
- when air traffic demand levels permit safe operations (due to the significantly increased separation required between an arriving and departing aircraft). In practice, this is expected to be when air traffic demand levels are less than around 20 movements per hour (refer to Figure 7.2).

RRO modes have been used safely at Brisbane Airport for 30 years prior to the introduction of the parallel runway in 2020, and at Sydney (Kingsford Smith) Airport since the 1970's curfew constraints on runway use.

7.4.1.1 Time periods

The selection of hours 11 pm to 5.30 am for the WSI night period is based on additional airspace availability during the Sydney (Kingsford Smith) Airport curfew (11 pm to 6 am). This allows greater flexibility in the WSI flight paths, for which a suite of proposed night flight paths have been developed, including those proposed for the RRO mode. These WSI night flight paths vary to those of the WSI day period.

The additional airspace available during the 11 pm to 5:30 am period has also allowed the development of a RRO mode at WSI when air traffic demand and weather conditions are suitable.

WSI flights will be required to be established on the day period flight paths from 5.30 am, to ensure aircraft positioning to land at Sydney (Kingsford Smith) Airport at 6 am can be safely segregated from WSI flights. However, the switchover times from day to night flight paths (and vice-versa) for WSI may vary slightly day-by-day as air traffic control manages the transition into and out of Sydney (Kingsford Smith) Airport curfew mode.

7.4.2 Preferred runway modes of operation

Preferred runway modes of operation are where preference is given to where, if wind conditions, and air traffic demand allows, a particular runway mode of operation would be used to move aircraft as efficiently as possible while reducing the noise impact over residential areas.

Operationally there is no major difference between the runway directions. Both provide similar length, similar climb gradient requirements for departing aircraft, similar approach angle and length of final approach for landing aircraft, and similar movement capacities in either direction.

However, the preliminary design of the ‘day’ and ‘night’ flight paths have taken advantage of the additional flexibility that is available due to the reduced activity within the Sydney Basin airspace at night, including activity from Sydney (Kingsford Smith) Airport. This has provided an alternative suite of proposed ‘night’ SIDs and STARs as well as an option for an RRO over the lower density rural and rural residential zones to the immediate south-west of WSI (when conditions permit as per Section 7.4.1).

With respect to community overflight, there are some benefits for certain flight paths to be used in order to provide a level of respite and to share the noise in some areas impacted by higher aircraft volumes during the day, and reduce the number of dwellings or size of the population within certain noise criteria at night (particularly when RRO mode can be used).

Noise abatement procedures contain a time element as part of their criteria and day-time preferred runway modes may vary based on WSI’s noise abatement procedures. Any specific option for preferred runway mode of operation would be informed by the outcomes of engagement on the preliminary airspace design.

7.4.3 Influence of meteorological conditions

Each runway operating mode is only available under certain weather conditions, including prevailing wind direction and speed on a seasonal and temporal basis. These weather conditions are outlined in Chapter 3 (Introduction to airspace).

Based on 10 years of Bureau of Meteorology (BoM) data (1 January 2012 to 31 December 2021) from the Badgerys Creek weather station, it is anticipated the single Runway 05/23 orientation could be used approximately 99.9 per cent of the time based solely on the ICAO standard crosswind limitation of 20 kts (37 km/h) for runway nomination. The ICAO standard of maximum 20 kt (37 km/h) crosswind applies where there are other runways that could be nominated. As there is only a single runway at WSI, the runway can be nominated at all times (that is, aircraft can land at WSI with more than 20 kt (37 km/h) crosswind). However, if the crosswind is over 20 kt (37 km/h) (around 0.1 per cent of the time), a pilot in command may seek an alternative such as delaying operation until conditions ease.

Once operational, more movements will operate during day-time so prevailing day-time winds have a larger impact on the distribution of movements by runway.

Historical wind data indicates that RRO, if prioritised, may be available for up to 78 per cent of the 11 pm to 5:30 am period.

7.5 Flight paths

This section presents the preliminary flight paths for WSI. The structure includes:

- connection to enroute flight paths – provides an overview of the flight-path integration with Sydney (Kingsford Smith) Airport (Section 7.5.1)
- flight altitude – outlines the presentation of flight altitude which has been used to evaluate the level of environmental impact in the Draft EIS (Section 7.5.2)
- air traffic management – provides a generic outline of arrivals and departures management (Section 7.5.3)
- day flight paths – depicts day arrivals and departures along the nominated STARs and SIDs for Runway 05 and Runway 23 modes of operation (Section 7.5.4)
- night flight paths – depicts night arrivals and departures flight paths along the nominated STARs and SIDs for Runway 05 and Runway 23 modes of operation (Section 7.5.5)
- RRO Night flight paths – depicts night arrivals and departures flight paths along the nominated STARs and SIDs for the RRO mode of operation (Section 7.5.6).

The section also describes:

- off-procedure manoeuvring areas – describes the safety or similar operational reasons where air traffic control is required to take an aircraft off the published SID or STAR (Section 7.5.7)
- missed approach procedures – go-arounds – outlines the procedure where an aircraft misses or aborts the landing (Section 7.5.8).

Sections 7.5.4 to 7.5.6 provide:

- a figure depicting the flight path corridor for each group of flight path track along with a flight path number and indicative altitude (above mean sea level (AMSL) in ft)
- tables with individual flight path descriptions, including the flight path name.

The flight path name corresponds to the name used in the online WSI Aircraft Overflight Noise Tool. Each flight path name includes the includes runway number (RWY 05 or RWY 23), the compass direction of the flight path (arriving from or departing to) (for example 'Arrival North'), the operation type (if non-jet only, otherwise all jet) and the time of day (Day, Night or RRO).

The area navigation tracking type (RNP; RNP-AR; or Radar) is described at the introduction of each table.

These flight paths are subject to finalisation as outlined in Chapter 6 (Project development and alternatives).

7.5.1 Connection to enroute flight paths

The location of WSI in the western part of the Sydney Basin and the availability of airspace to the north-west, west and south-west for the development of the WSI SIDs and STARs has also allowed the designers the opportunities to segregate some Sydney (Kingsford Smith) Airport and WSI traffic in the enroute phase of flight. While arrivals to WSI from the north will be segregated from traffic inbound to Sydney (Kingsford Smith) Airport about halfway from Brisbane in the enroute phase, arrivals from the east will share the enroute phase of flight with traffic bound for Sydney (Kingsford Smith) Airport, with variations only in the latter stages of descent. Aircraft arrivals to WSI from the immediate north, west and south will do so from the enroute structure in the west of New South Wales (NSW) via new tracks.

Departures from WSI will connect to the existing Sydney (Kingsford Smith) Airport shared route structure when heading for eastern, southern and western destinations, but those bound for northern destinations will depart to the north-west and connect with the enroute airspace already established in the west of NSW.

7.5.2 Flight altitude

A presentation and description of the altitude of an aircraft as part of flight paths and arrival and departures management is provided in this section and Sections 7.5.3 – 7.5.6.

Within the 45 nm (83 km) study area boundary, aircraft are expected to operate up to approximately 20,000 ft (6 km) and higher.

The altitude and dispersion of aircraft are presented in coloured overlays on the flight path figures in Sections 7.5.4 to 7.5.5. The 2-dimensional charts with altitude and dispersion as developed for this project are common and accepted practice (including for Australian Airport Master Plans).

The flight paths also have vertical separation at cross-over points which cannot be discerned from these 2-dimensional images. However, the difference in flight path altitude at a distance from the airport is indicated by the fading of the flight path colour shading from dark (lower altitude) to light (higher altitude).

7.5.3 Air traffic management

This section provides an overview of arrivals and departures management. It incorporates concepts and terms introduced in Chapter 3 (Introduction to airspace) and expands the discussion of flight altitude (Section 7.5.2).

7.5.3.1 Arrivals management

Air traffic control is responsible for the routing of aircraft once airborne. All arrival aircraft at WSI would normally be cleared by air traffic control to join a pre-determined STAR that provides standard vertical and lateral tracking guidance from the enroute cruise phase of flight to their landing runway. Air traffic control would monitor aircraft from the top of descent to their arrival on the runway, for compliance with STAR and approach requirements. When short-term demand exceeds capacity in busy air traffic conditions or when capacity decreases due to reduced visibility or low cloud, several options exist to manage the resultant delay to arriving aircraft. If the capacity disruption is expected to be of a long duration, then arriving aircraft can be subject to ground holding at their departure point. Aircraft already airborne can be speed controlled or have their path stretched or ultimately be subject to enroute holding to manage and sequence traffic flow to the runway. Consistent with practice at other major Australian airports, holding patterns for arrival aircraft would typically be beyond 40 nm (74 km) from WSI and above 10,000 ft (3 km).

Some aircraft in extremely rare instances, in line with safety requirements, could be required to enter a lower altitude holding pattern at 4,000 ft (1.2 km) if there is an unplanned major issue (for example, wind changes forcing a runway change) at WSI or a technical issue with the aircraft.

STARs commence at a Feeder Fix (FF) waypoint or at a transition waypoint that leads to a FF waypoint. Air traffic control would nominate a published STAR in accordance with an agreed set of options, depending on the nominated runway at WSI.

Arriving aircraft would generally be processed to join the final approach path following agreed instrument flight procedures such as making an ILS approach. Where the STAR track aligns with the ILS track, aircraft would seamlessly join the ILS track and glide path at the IAF for the runway. These STARs intercept the ILS directional track at about 9 nm (17 km) from touchdown and at an approximate height of 2,700 ft (800 m). On occasions, some aircraft may join the final approach closer (that is, approximately 6 nm (11 km)) for traffic management reasons.

The glideslope (vertical profile used during a final approach) associated with the ILS at WSI is expected to be set at 3-degrees, but this may vary a small amount to comply with safety standards. This is the angle recommended by the ICAO for commercial aviation for safety reasons and adopted universally at major Australian airports. On intercepting the ILS, or flying an RNP approach, aircraft, irrespective of type or size, would descend at steady rate along the final flight path to the runway. At the same distance from touchdown on the runway, each aircraft would be at about the same height.

All non-jet arrivals would be initially cleared via the same STARS as jet arrivals. For safety or traffic management reasons some non-jets would have their STAR cancelled and be radar vectored to final approach.

7.5.3.2 Departures management

All departure aircraft from WSI would fly a SID with an initial track extending in the direction of the take-off runway, either Runway 05 or Runway 23.

Air traffic control would assign SIDs from the nominated runway applicable to the aircraft's planned route and in accordance with agreed air traffic control procedures. All jet departures would normally be assigned an altitude restriction of 4,000 ft (1.2 km) and non-jets an altitude restriction of 3,000 ft (1 km) by default. This altitude limit would ensure separation from the airspace immediately above WSI, which is reserved for the very limited number of aircraft required to transit overhead. It will also separate departing aircraft with WSI arrivals on a conflicting STAR (termed a "paper stop" altitude restriction). Aircraft would level off at 3,000/4,000 ft (1 km – 1.2 km) in the infrequent event of an interaction conflict with a transiting flight. Where no conflict exists, departing aircraft would be cleared for further climb and handed off to the next controlling air traffic control unit.

The PBN based design of the SIDs and STARs would then require the aircraft's flight management system to automatically manage altitude requirements, ensuring separation at any SID and STAR crossover points. Depending on the climb and descent profile of any conflicting aircraft, some short periods of level flight may occur if air traffic control is unable to avoid conflict of the aircraft by track adjustment. Once safely established above terrain as well as other airspace and air traffic constraints, either at pilot request or air traffic control instigation to save track miles and emissions aircraft may be permitted to leave the SID in conformance with local Noise Abatement Procedures and fly a more direct course to intercept the main air traffic routes (enroute airspace).

On occasions where an aircraft is unable to meet the climb gradient required on the normal SID to its planned route, an alternate SID with a lesser climb gradient would be issued.

Aircraft do not fly in the same way as a train running on a linear railway track. Once in flight, the aircraft is subject to dispersion (as described in Chapter 3 (Introduction to airspace)), which would influence where the aircraft would be in relation to the SID flight path, hence the flight paths are depicted as a flight path corridor (Sections 7.5.4 – 7.5.6). The corridor shows the flight path widening to notionally 2 km either side of the nominal centreline of the SID flight path, transitioning to 5 km as the aircraft join the enroute flight network.

All non-jet departures will be processed on the initial SIDs. Once they are separated from other departures and arrivals they will be radar vectored by air traffic control to join their planned route to destination. This tactical radar vectoring is expected to take place within the shaded areas (radar vectoring areas) shown on relevant figures in Sections 7.5.4 to 7.5.6.

7.5.4 Day (5:30 am to 11 pm) flight paths

7.5.4.1 Runway 05 arrivals

The day arrival flight paths for Runway 05 and their indicative altitudes are shown on Figure 7.7 landing from the south-west. Descriptions for these 5 flight paths are provided in Table 7.4. The flight paths are for use by jet and non-jet aircraft. Flight path numbers A1-A4 require a RNP arrival procedure and flight path number A5 requires an RNP-AR arrival procedure.

Table 7.4 Runway 05 – Day arrivals – description of flight paths

Flight path no.	Flight path name	Flight path description
A1	RWY05 Arrival North Day	This flight path provides access for arriving aircraft from the north to WSI when Sydney (Kingsford Smith) Airport is using Runway 34 (34L or 34R) or Runway 25 directions as it: • turns towards WSI above the Hills District allowing aircraft departing Sydney (Kingsford Smith) Airport to climb beneath aircraft arriving at WSI • shares arrival path with eastern arriving traffic overhead WSI to minimise airspace complexity.
A2	RWY05 Arrival North.2 Day	This flight path: • remains further west than A1 and provides access for arriving aircraft from the north to WSI when Sydney (Kingsford Smith) Airport Runway 16 or 07 directions are in use • allows aircraft departing Sydney (Kingsford Smith) Airport to climb above aircraft arriving at WSI.
A3	RWY05 Arrival West Day/RWY05 Arrival West Night	This flight path: • provides access for arriving aircraft from the south and west to WSI • transits south of the main branch of Lake Burragorang • joins final descent at 16 nm (30 km) from touchdown, remaining south and east of Silverdale.
A4	RWY05 Arrival East Day	This flight path: • passes overhead Sydney (Kingsford Smith) Airport to minimise airspace complexity • passes overhead WSI to avoid descent through Camden Airport flying training area • shares the same arriving flight path as Sydney (Kingsford Smith) Airport aircraft until crossing the coast • remains above 10,000 ft (3 km) until passing overhead Cabramatta • shares arrival path with northern arriving traffic to minimise airspace complexity.
A5	RWY05 Arrival North.2 (RNP) Day	• This flight path provides quicker access for suitably equipped arriving aircraft from the north, and east to WSI without increasing residential overflight. • Aircraft must be capable of RNP AR operations to be eligible for this procedure.

7.5.4.2 Runway 05 departures

The day departure flight paths for Runway 05 and their indicative altitudes are shown on Figure 7.7, taking-off to the north-east.

The SIDs to the north and west are designed to go under the STAR from the north (flight path number (no. A2) when the Runway 16 direction is in use at Sydney (Kingsford Smith) Airport. When the runway direction at Sydney (Kingsford Smith) Airport is the Runway 34 direction, then the alternate STAR from the north (flight path no. A1) is used for WSI traffic which does not conflict with the WSI Runway 05 northern and western SIDS. The Runway 16 and Runway 34 directions at Sydney (Kingsford Smith) Airport are almost equally used.

Descriptions for these 9 flight paths are provided in Table 7.5. Flight path numbers D1-D6 are for jet aircraft under a RNP departure procedure. Flight path numbers D7-D9 are for non-jet aircraft under a radar vectoring procedure.

Table 7.5 Runway 05 – Day departures – description of flight paths

Flight path no.	Flight path name	Flight path description
D1	RWY05 Departure North Day	This flight path: • may impose a level segment (meaning aircraft flying at a constant altitude) on some aircraft if in conflict with a Sydney (Kingsford Smith) Airport departure • transits in a left turn past the Orchard Hills Restricted Area • has been designed to reduce residential overflight noise north of WSI by tracking as far west as possible of St Clair.
D2	RWY05 Departure West Northwest Day	This flight path: • transits in a left turn around Orchard Hills Restricted Area • has been designed to reduce residential overflight noise north of WSI by tracking as far west as possible of St Clair • remains to the north of the Great Western Highway to minimise the aircraft overflight noise for residential areas in the Lower Blue Mountains and along the Great Western Highway.
D3	RWY05 Departure West Day	This flight path: • may impose a level segment on some aircraft if in conflict with a Sydney (Kingsford Smith) Airport departure • transits in a left turn around Orchard Hills Restricted Area • has been designed to reduce residential overflight noise north of WSI by tracking as far west as possible of St Clair • transits north of the existing Sydney (Kingsford Smith) Airport flight path to the west • remains to the north of the Great Western Highway to minimise the aircraft overflight noise for residential areas in the Lower Blue Mountains and along the Great Western Highway.
D4	RWY05 Departure South Day	This flight path: • transits in a left turn around Orchard Hills Restricted Area • has been designed to reduce residential overflight noise north of WSI by tracking as far west as possible of St Clair • transits in a left turn to minimise impacts to Bankstown flying training areas • climbs above WSI arriving aircraft from the south and west • climbs above Sydney (Kingsford Smith) Airport arriving aircraft from the south and west.

Flight path no.	Flight path name	Flight path description
D5	RWY05 Departure South (Hot) Day	This flight path: • provides alternative option for high-temperature days for slow climbing aircraft by allowing additional track miles for aircraft to reach vertical navigation requirements • transits in a left turn around Orchard Hills Restricted Area • has been designed to reduce residential overflight noise north of WSI by tracking as far west as possible of St Clair • transits in a left turn to minimise impacts to Bankstown flying training areas • climbs above WSI arriving aircraft from the south and west • climbs above Sydney (Kingsford Smith) Airport arriving aircraft from the south and west.
D6	RWY05 Departure East Day	This flight path: • transits in a left turn around Orchard Hills Restricted Area • has been designed to reduce residential overflight noise north of WSI by tracking as far west as possible of St Clair • transits in a left turn to minimise impacts to Bankstown flying training areas • climbs above WSI arriving aircraft from the south and west • climbs above Sydney (Kingsford Smith) Airport arriving aircraft from the south and west.
D7	RWY05 Departure Northeast (Non-Jet) Day	This flight path provides more flexibility for traffic management for air traffic control by providing an alternative flight path for aircraft with different performance capacities than jet aircraft.
D8	RWY05 Departure North (Non-Jet) Day	This flight path: • provides access for departing non-jet aircraft to the north and north-east, from WSI in all Sydney (Kingsford Smith) Airport Day modes • provides more flexibility for traffic management for air traffic control by providing an alternative flight path for aircraft with different performance capacities than jet aircraft.
D9	RWY05 Departure South (Non-Jet) Day	This flight path: • delays the initial right turn until above Bankstown operations • tracks southbound initially below flight paths of aircraft departing from Sydney (Kingsford Smith) Airport • provides more flexibility for traffic management for air traffic control by providing an alternative flight path for aircraft with different performance capacities than jet aircraft.

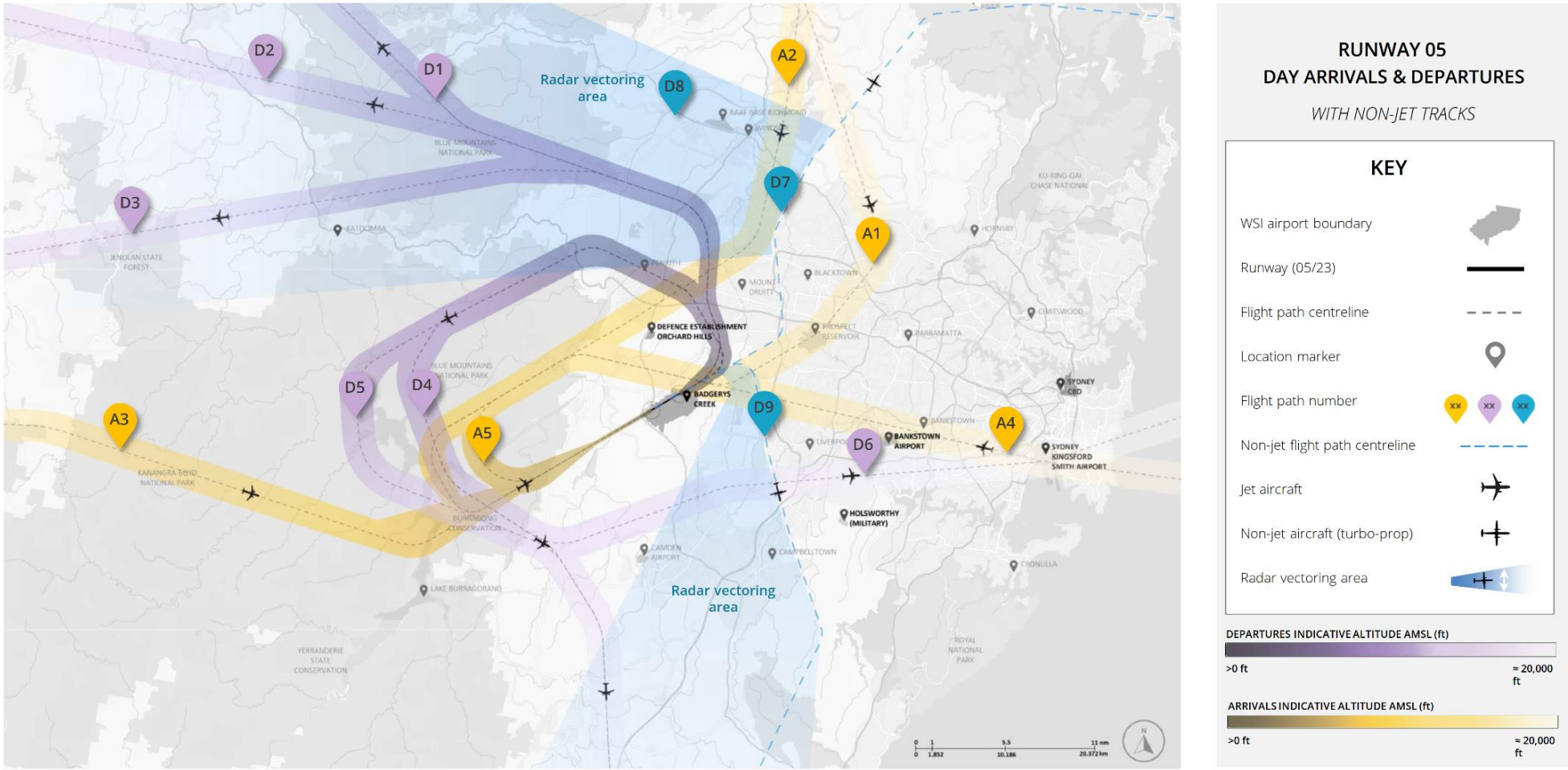

Figure 7.7 Runway 05 – Day arrivals and departures – flight paths

7.5.4.3 Runway 23 arrivals

The day arrival flight paths for Runway 23 and indicative altitudes are shown on Figure 7.8, landing from the north-east.

Descriptions for these 4 flight paths are provided in Table 7.6. The flight paths are for use by jet and non-jet aircraft. Flight path numbers A6-A8 require a RNP arrival procedure and flight path number A9 requires a RNP- AR arrival procedure.

Table 7.6 Runway 23 – Day arrivals – description of flight paths

Flight path no.	Flight path name	Flight path description
A6	RWY23 Arrival North Day	Is positioned to fly over green and light commercial areas at Marsden Park.
A7	RWY23 Arrival West Day	This flight path remains north of Lake Burragorang and clear of the Lower Blue Mountains residential areas for as long as operationally practicable.
A8	RWY23 Arrival East Day	This flight path: • passes overhead Sydney (Kingsford Smith) Airport to minimise airspace complexity • follows existing Sydney (Kingsford Smith) Airport eastern arrival flight paths until approximately 5.4 nm (10 km) west of Sydney (Kingsford Smith) Airport • transits overhead WSI before descending to join with the flight path for western arrivals.
A9	RWY23 Arrival All (RNP-AR) Day All arrivals	This flight path: • provides access for suitably equipped arriving aircraft to track the green corridor and minimise direct overflight of built up areas • provides noise respite to Bungarribee and Eastern Creek.

7.5.4.4 Runway 23 departures

The day departure flight paths from Runway 23 and their indicative altitudes are shown on Figure 7.8, taking-off to the south-west.

The SIDs to the north, north-west and west are designed to go under the WSI STAR from the west (flight path number A7). There is a requirement on these SIDs for aircraft to maintain 5,000 ft (1.5 km) until clear of the possible conflict with the STAR.

Descriptions for the 7 flight paths are provided in Table 7.7. Flight path numbers D10-D14 are for jet aircraft under a RNP departure procedure. Flight path numbers D15-D16 are for non-jet aircraft under a radar vectoring procedure.

Table 7.7 Runway 23 – Day departures – description of flight paths

Flight path no.	Flight path name	Flight path description
D10	RWY23 Departure North Day	This flight path: • crosses the Great Western Highway at an area of low population density, and • delays the initial turn off runway heading until past Silverdale to minimise overflight noise in that area.
D11	RWY23 Departure West Day	This flight path: • has a delayed right turn off runway heading until south of Silverdale to minimise residential overflight • transits south of the existing Sydney (Kingsford Smith) Airport flight path to the west which passes overhead Leura and Katoomba in the Blue Mountains • avoids aircraft overflight of residential areas along the Great Western Highway.
D12	RWY23 Departure South Day	This flight path: • delays a turn to the south to minimise effects on the Camden/Bankstown Airport flying training areas • has a delayed right turn until south of Silverdale to minimise residential overflight • initially transits west to gain height above Sydney (Kingsford Smith) Airport arriving aircraft from the south-west • to accommodate the safe operation of aircraft during warm weather events and strong winds, high altitudes of this flight paths west of The Oaks may need to be realigned approximately 3 km further south and east of the flight path displayed.
D13	RWY23 Departure South (Hot) Day	This flight path: • shares the same track as the RWY23 Departure South (Non-Jet) Day (flight path number D16) • provides access for slow climbing aircraft departing to the south from WSI by allowing the aircraft to remain low and below Sydney (Kingsford Smith) Airport arriving aircraft • delays a turn to the south to minimise effects on the Camden/Bankstown Airport flying training areas.

Flight path no.	Flight path name	Flight path description
D14	RWY23 Departure East Day	This flight path: • delays a turn to the south to minimise effects on the Camden/Bankstown Airport flying training areas • initially transits west to gain height above Sydney (Kingsford Smith) Airport arriving aircraft from the southwest • has a delayed right turn until south of Silverdale to minimise residential overflight.
D15	RWY23 Departure North (Non-Jet) Day	This flight path: • turns immediately to the west to clear the departure flight path of jet aircraft • provides more flexibility for traffic management for air traffic control by providing an alternative flightpath for aircraft with different performance capacities then jet aircraft.
D16	RWY23 Departure South (Non-Jet) Day	This flight path: • shares the same track as the south departure on high temperature days – RWY23 Departure South (Hot) Day (flight path number D13) • delays the initial turn until above Camden Airport flying training areas • initially tracks south below flight paths of aircraft arriving to Sydney (Kingsford Smith) Airport from the south-west • despite sharing the initial 6 nm (11 km) upwind track with jet departures, this track provides more flexibility for traffic management for air traffic control by providing an alternative flight path for aircraft with different performance capacities than jet aircraft.

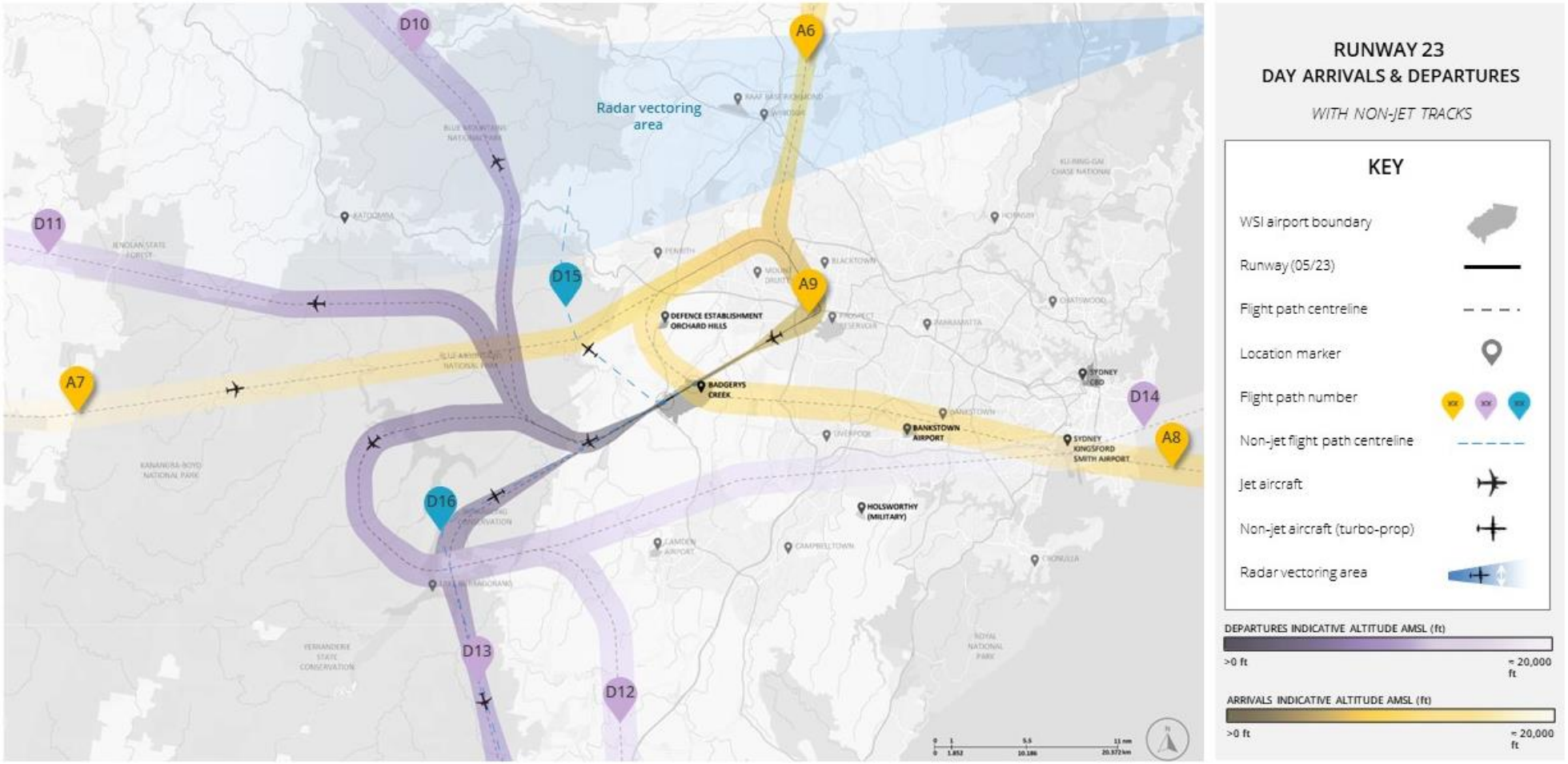

Figure 7.8 Runway 23 – Day arrivals and departures – flight paths

7.5.5 Night (11 pm to 5:30 am) flight paths

The flight paths in the night modes at WSI are different from those in the day modes to:

- take advantage of the increased airspace available during the Sydney (Kingsford Smith) Airport curfew hours of 11 pm to 6 am
- to further minimise the number of residences exposed to noise.

Non-jet aircraft utilise WSI jet SIDs and STARs at night. Non-jets that cannot meet the altitude restrictions or requirements of the SID may require radar departures.

7.5.5.1 Runway 05 arrivals

The night arrivals flight paths for Runway 05 and their indicative altitudes are shown on Figure 7.9, landing from the south-west.

Descriptions for these 4 flight paths are provided in Table 7.8. These flight paths are for use by jet and non-jet aircraft. Flight path numbers A10-A12 require a RNP arrival procedure and flight path number A13 requires a RNP- AR arrival procedure.

Table 7.8 Runway 05 – Night arrivals – description of flight paths

Flight path no.	Flight path name	Flight path description
A10	RWY05 Arrival North Night	This flight path: • crosses the Great Western Highway where the lowest number of dwellings would be overflown • turns to join the final approach and remains south of Silverdale to minimise the aircraft overflight noise for residential areas. The alignment of this flight path may be adjusted once south of the Great Western Highway to facilitate the climb of departing aircraft.
A11	RWY05 Arrival West Day/RWY05 Arrival West Night	This flight path: • is the same for both day and night modes • remains over uninhabited areas until final approach • turns to join final approach and remains south of Silverdale to minimise the aircraft overflight noise for residential areas.
A12	RWY05 Arrival East Night	This flight path: • remains south of Bundeena and Camden • turns to final approach south-west of The Oaks and remains south of the Silverdale to minimise aircraft overflight noise for residential areas.
A13	RWY05 Arrival (RNP) North Night	This flight path: • provides access for suitably equipped arriving aircraft from the north to WSI to reduce track miles and increase efficiency • crosses the Great Western Highway where the lowest number of dwellings would be overflown • will position aircraft over the Great Western Highway lower than flight path A10 • turns to join final approach and remains south of Silverdale to minimise the aircraft overflight noise for residential areas.

7.5.5.2 Runway 05 departures

The night departure flight paths for Runway 05 and their indicative altitudes are shown on Figure 7.9 departing to the north-east.

Descriptions for these 5 flight paths are provided in Table 7.9. These flight paths are for use by jet and non-jet aircraft under a RNP departure procedure.

Table 7.9 Runway 05 – Night departures – description of flight paths

Flight path no.	Flight path name	Flight path description
D17	RWY05 Departure Northeast Night	This flight path: • turns at altitude to fly over the western side of Twin Creeks providing reduced aircraft overflight noise at St Clair • is positioned to fly between residential areas • crosses the coastline at approximately 18,000 ft (5.5 km).
D18	RWY05 Departure North Night	This flight path: • turns at altitude to fly over the western side of Twin Creeks providing reduced aircraft overflight noise at St Clair • is positioned to fly between residential areas.
D20	RWY05 Departure West Night	This flight path: • may impose a level segment on some aircraft if in conflict with northern arrivals to WSI • turns as soon as safely practicable after take-off to provide respite and remain west of St Clair • remains south of the Great Western Highway to minimise the aircraft overflight noise for residential areas along the highway.
D21	RWY05 Departure South Night	This flight path: • turns as soon as safely practicable after take-off to provide respite and remain west of St Clair • remains west of populated areas when tracking south.
D22	RWY05 Departure Southeast Night	This flight path: • turns as soon as safely practicable after take-off to provide respite and remain west of St Clair • remains clear of Picton, The Oaks, Tahmoor, and Wilton when tracking south • remains over populations of low density when turning east • crosses the Princes Highway at approximately 20,000 ft (6 km).

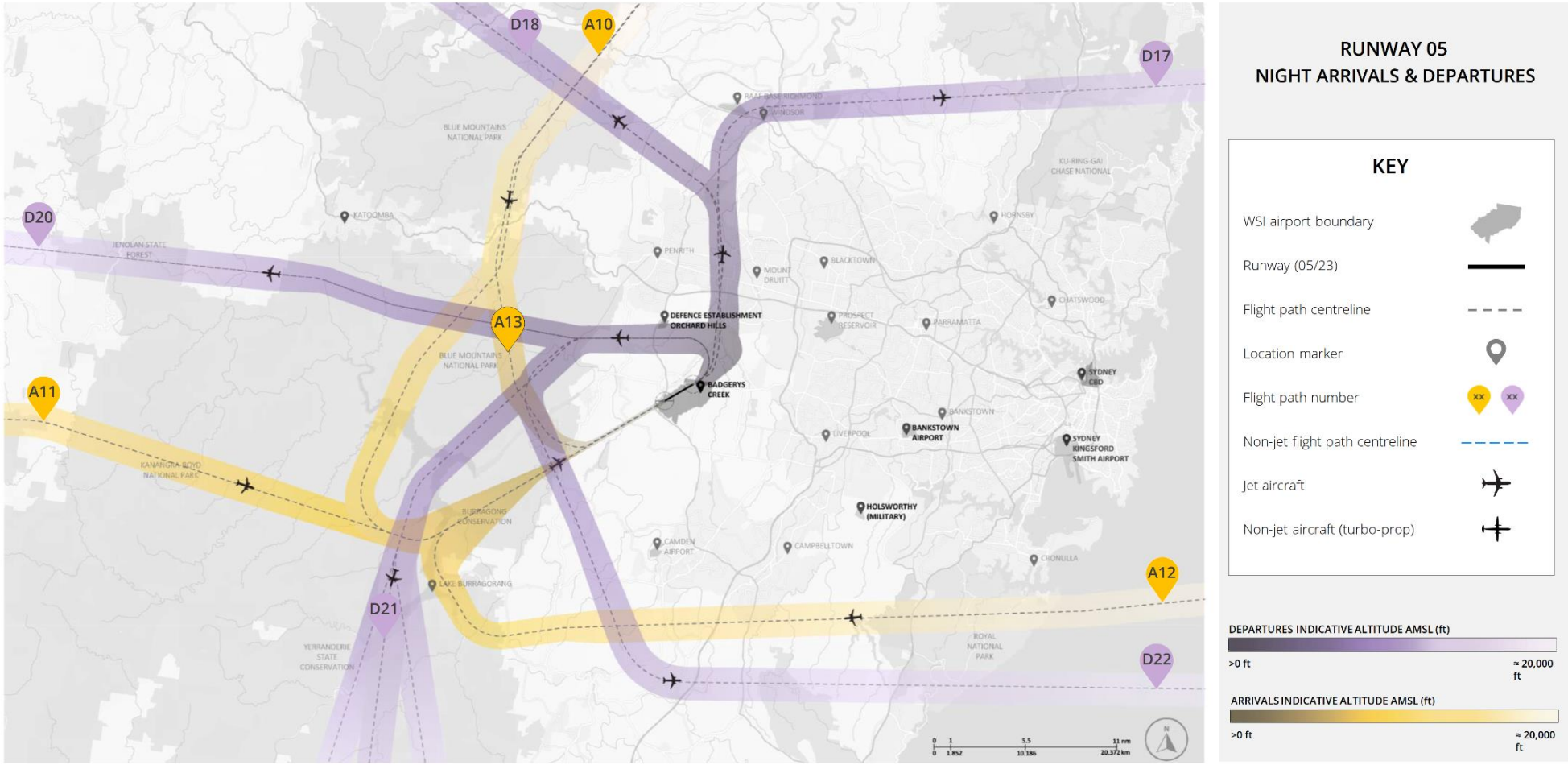

Figure 7.9 Runway 05 – Night arrivals and departures – flight paths

7.5.5.3 Runway 23 arrivals

The night arrival flight paths for Runway 23 and their indicative altitudes are shown on Figure 7.10, arriving from the north-east.

Descriptions for these 5 flight paths are provided in Table 7.10. These flight paths are for use by jet and non-jet aircraft. Flight path numbers A14-A17 require a RNP arrival procedure and flight path number A18 requires a RNP- AR arrival procedure.

Table 7.10 Runway 23 – Night arrivals – description of flight paths

Flight path no.	Flight path name	Flight path description
A14	RWY23 Arrival North Night	This flight path provides the same tracking as the Runway 23 Day North arrival.
A15	RWY23 Arrival West Night	This flight path: • provides access to WSI from the west, south, and northwest using continuous descent operations • crosses the Great Western Highway at a point of lower residential population between Blaxland and Springwood • is designed to minimise overflight of residential areas as the aircraft approach Marsden Park • provides respite to residential communities that are overflown during day operations until waypoint NB107 (located north of Bidwill/Oakhurst and west of Colebee).
A16	RWY23 Arrival Northwest Night	This flight path will be used as a tactical option to reduce crossings of residential areas of the Great Western Highway for aircraft arriving from the north-west.
A17	RWY23 Arrival East Night	This flight path: • minimises residential areas overflown for aircraft arriving from the east by adding additional track miles • provides respite to residential communities that are overflown during Day operations until waypoint NB107 (located north of Bidwill/Oakhurst and west of Colebee).
A18	RWY23 Arrival All (RNP-AR) Night	This flight path: • provides access for suitably equipped arriving aircraft to track the green corridor and minimise direct overflight of built up areas • provides noise respite to Bungarribee and Eastern Creek.

7.5.5.4 Runway 23 departures

The night departure flight paths for Runway 23 and their indicative altitudes are shown on Figure 7.10, departing to the south-west.

Descriptions for these 5 flight paths are provided in Table 7.11. These flight paths are for use by jet and non-jet aircraft under a RNP departure procedure.

Table 7.11 Runway 23 – Night departures – description of flight paths

Flight path no.	Flight path name	Flight path description
D23	RWY23 Departure Northeast Night	This flight path: • provides for continuous climb operations for departing aircraft to the northeast and east from WSI • aircraft to be above 13,000 ft (4 km) at the coast crossing • positions aircraft south and west of Silverdale and Wallacia prior to turning north • crosses the Great Western Highway over an area of lower population density to minimise aircraft overflight noise to lower Blue Mountains communities.
D24	RWY23 Departure North Night	This flight path: • positions aircraft south and west of Silverdale and Wallacia prior to turning north • crosses the Great Western Highway over low residential area to minimise aircraft overflight noise to lower Blue Mountains communities.
D25	RWY23 Departure West Night	This flight path: • for continuous climb operations for departing aircraft to the west from WSI • positions aircraft south and west of Silverdale and Wallacia prior to turning north • remains south of the Great Western Highway until west of Katoomba to minimise the aircraft overflight noise for residential areas along the Great Western Highway.
D26	RWY23 Departure South Night	This flight path provides efficient tracking to enroute transitions and reduces unnecessary overflight of residential areas.
D27	RWY23 Departure Southeast Night	This flight path: • remains clear of populated areas when turning to the east off runway centreline • aircraft remain south of Camden, Menangle, and Bundeena when tracking east • crosses the coast at approximately 18,000 ft (5.5 km).

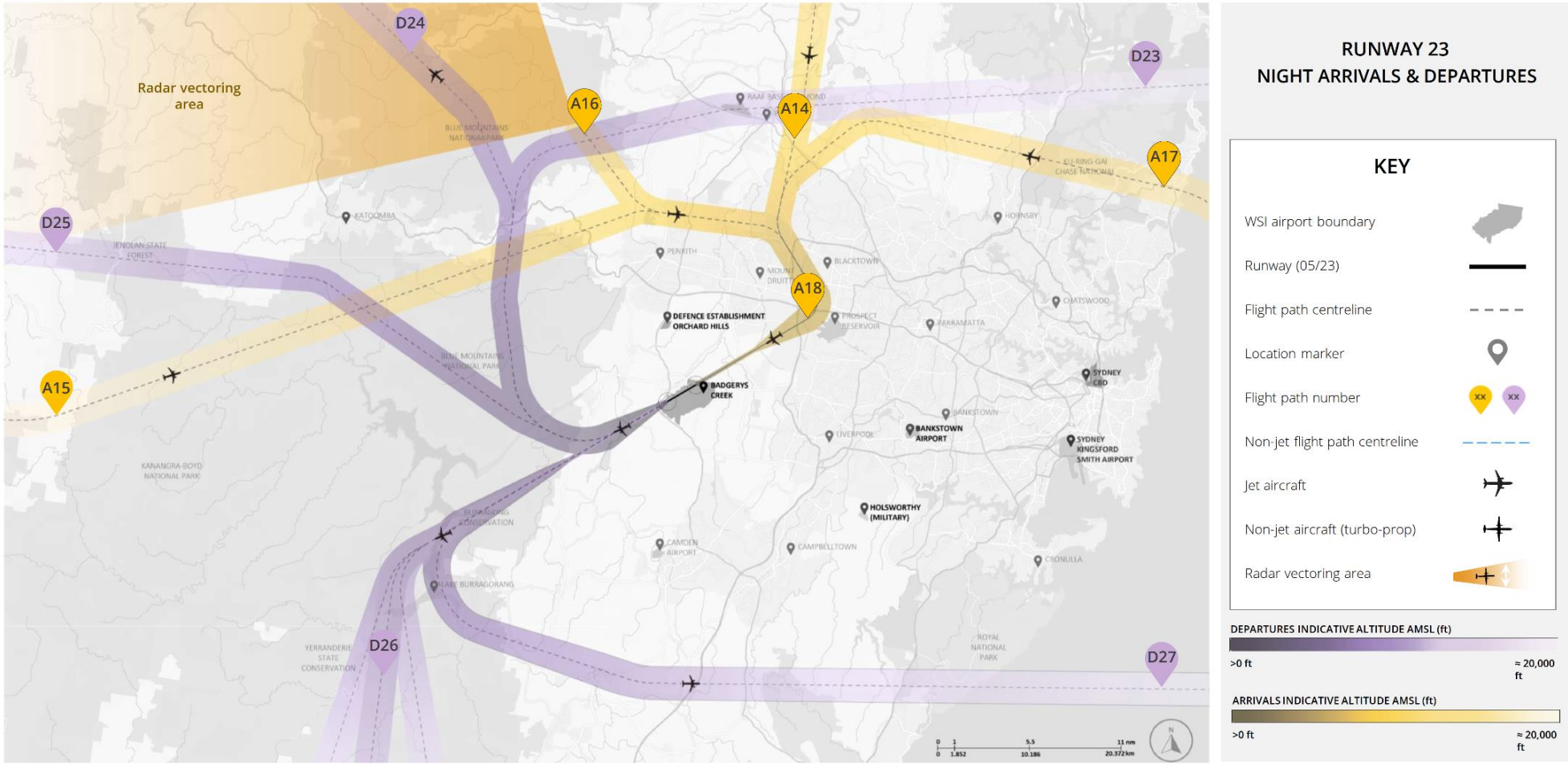

Figure 7.10 Runway 23 – Night arrivals and departures – flight paths

7.5.6 RRO – Night (11 pm to 5:30 am flight paths)

WSI Night procedures may use a RRO runway mode when it is safe to do so (refer to Section 7.4).

7.5.6.1 RRO arrivals

The night arrivals flight paths for RRO Runway 05 and their indicative altitudes are shown on Figure 7.11, landing from the south-west.

Descriptions for these 3 flight paths are provided in Table 7.12. These flight paths are for use by jet and non-jet aircraft under a RNP arrival procedure.

Table 7.12 RRO arrivals – description of flight paths

Flight path no.	Flight path name	Flight path description
A19	RWY05 Arrival North Night (RRO)	This flight path crosses overhead Penrith above 10,000 ft (3 km).
A20	RWY05 Arrival West Night (RRO)	This flight path: • remains over uninhabited areas until final approach, and • remains south of the Silverdale to minimise the aircraft overflight noise for residential areas.
A21	RWY05 Arrival East Night (RRO)	This flight path: • remains south of Bundeena and Camden • turns to final approach southwest of The Oaks and remains south of the Silverdale to minimise the aircraft overflight noise for residential areas.

7.5.6.2 RRO departures

The night departure flight paths for RRO off Runway 23 and their indicative altitudes are shown on Figure 7.11, departing to the south-west.

Descriptions for these 5 flight paths are provided in Table 7.13. These flight paths are for jet and non-jet aircraft under a RNP departure procedure.

Table 7.13 RRO – Night departures – description of flight paths

Flight path no.	Flight path name	Flight path description
D28	RWY23 Departure Northeast Night (RRO)	This flight path: • turns at altitude as soon as safely possible to allow for separation with RRO arrivals • crosses the Great Western Highway over areas of lower population densities to minimise aircraft overflight noise to Lower Blue Mountains communities • tracks north of the Sydney Metropolitan Area to cross the coast north of Barrenjoey Head.
D29	RWY23 Departure North Night (RRO)	This flight path: • turns at altitude as soon as safely possible to allow for separation with RRO arrivals • crosses the Great Western Highway over areas of lower population densities to minimise aircraft overflight noise to lower Blue Mountains communities.
D30	RWY23 Departure West Night (RRO)	This flight path: • turns at altitude as soon as safely possible to allow for separation with RRO arrivals • remains south of the Great Western Highway until west of Katoomba.
D31	RWY23 Departure South Night (RRO)	This flight path: • turns at altitude as soon as safely possible to allow for separation with RRO arrivals • remains clear of Camden, The Oaks, Picton, Tahmoor and Wilton when tracking south.
D32	RWY23 Departure Southeast Night (RRO)	This flight path: • turns at altitude as soon as safely possible to allow for separation with RRO arrivals • remains clear of Camden, The Oaks, Picton, Tahmoor and Wilton when tracking south • crosses the Princes Highway at approximately 18,000 ft (5.5 km) above ground level.

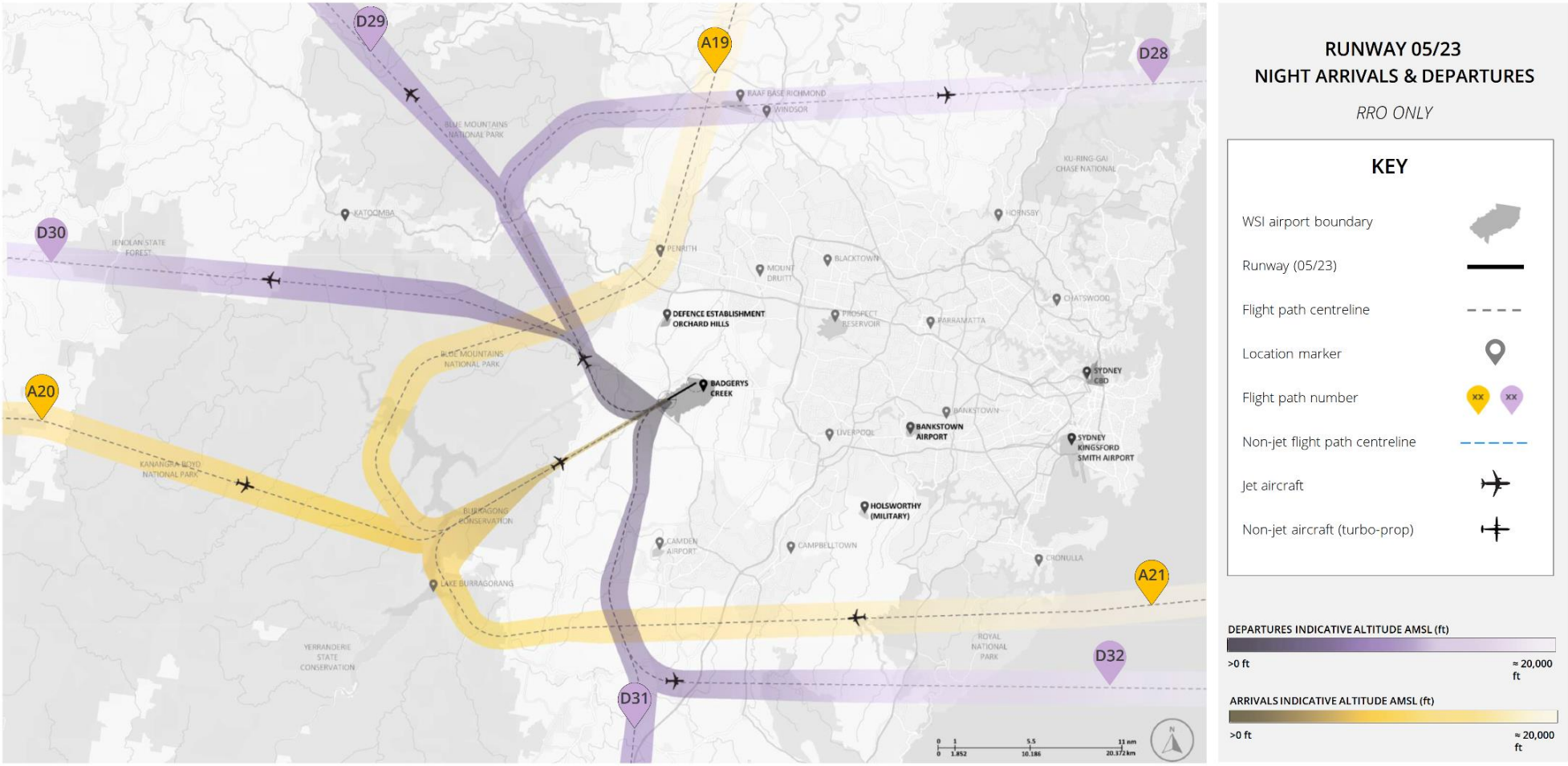

Figure 7.11 RRO – Night arrivals and departures flight paths

7.5.7 Off-procedure manoeuvring operations

This section outlines the reasons for aircraft flying off the flight paths published within the Aeronautical Information Package, describes the proportion of operations where this is likely to occur and presents the proposed off-procedure manoeuvring areas.

7.5.7.1 Reasons for aircraft flying off-procedure

By far the great majority of aircraft arriving and departing WSI at lower altitudes (operations below 10,000 ft (3 km)) are expected to remain on the published flight paths where operational predictability and safe assurance of separation from other aircraft is built into the procedure design. However, under certain circumstances some aircraft would operate away from published flight paths and may fly over areas that do not normally experience regular aircraft overflight. This may be at the request of a pilot or initiated by air traffic control. The options would be different for day and night modes arriving and departing aircraft and would require the development of off-procedure manoeuvring areas.

Pilots generally request a deviation from a SID or STAR:

- to avoid hazardous airspace conditions – such as severe weather, storm cells, smoke hazards
- the pilot has declared an emergency and requires priority routing.

Air traffic control may cancel the tracking and altitude requirements of a SID or STAR and provide the pilot with instructions to leave the published route either by the use of radar vectoring or direct tracking to an off-procedure waypoint:

- to maintain separation with preceding or following aircraft – for example, when 2 aircraft on the same flight path are getting too close to each other and speed control is not expected to resolve the closing speed issue, one of the aircraft will be turned away from their flight path until the required separation is achieved
- to manage an aircraft needing to safely avoid and maintain separation to another aircraft which in turn was not able to operate on its intended flight path
- if the intended flight path is blocked by priority operations (for example, search and rescue, MEDEVAC, bushfire surveillance and control such as water bombing, military activity)
- when military activity requires, whereby aircraft departing WSI will be issued a SID Radar and vectored clear of the military activity.
- if the aircraft has unusually low operating performance and is unable to comply with the intended flight path design requirements
- if WSI is transitioning between changed runway operating modes that require different approach and/or departure flight paths
- if a flight-planned runway mode/direction is unexpectedly unavailable
- if the aircraft is conducting local air work (for example: training, surveys))
- if specific noise abatement procedure promotes aircraft divergence from a published flight path as soon as safely practicable
- to maintain safety and separation compliance with other Sydney Basin interacting operations such as military activities at RAAF Base Richmond
- to provide track shortening, resulting in fuel and emissions savings during low demand operating periods.

As well as the above reasons applicable to both off SID and off STAR manoeuvring, air traffic control may cancel the tracking and altitude requirements of a STAR:

- to expedite and resolve sequencing in high arrival demand peak-periods to maintain the optimised landing sequence in a safe and orderly manner, and
- to address backlog arrivals recovery from broader system impacting events such as a weather closure of a major east coast airport.

Other common reasons aircraft may be noticed operating away from a published WSI flight path include:

- the pilot has aborted their attempt at landing (missed approach procedure – refer to Figure 7.14) and is repositioning their aircraft for another approach
- the aircraft is not flying to or from WSI at all but is operating on one of the many existing flight paths to or from the other major Sydney Basin airports, or the several smaller airports, or possibly crossing the Sydney Basin airspace.

7.5.7.2 Off-procedure manoeuvring areas

It is not feasible to predict, depict, nor quantitively assess the impact of the low proportion of operations that will need to deviate from published flight paths. However, with respect to aircraft arriving WSI, broad indicative areas where air traffic control may need to clear aircraft off their published STAR can be approximated based on early air traffic control simulation of the preliminary airspace design. While the use of these areas is expected to evolve with experience and the natural growth of the airport, even in its early years of operation, WSI morning and evening peak demand periods may generate enough demand to require some aircraft to be manoeuvred away from published STARs.

During day operations (5:30 am to 11 pm) it is expected that off STAR manoeuvring operations could occur for around 10 per cent of WSI arrival flights. During night operations (11 pm to 5:30 am) off STAR manoeuvring will be minimised over Sydney Basin and built up areas in the Greater Blue Mountains Area.

When necessary, off STAR manoeuvring will be facilitated by air traffic control through the application of radar vectoring and is expected to mostly be contained within the indicated zones in Figure 7.12 and Figure 7.13, to allow aircraft to join the final approach manoeuvre to land on the allocated runway. The missed approach vectoring area also shown in Figure 7.12 and Figure 7.13 may be used 24-hours a day where an aircraft conducts a missed approach (as described in Section 7.5.8).

It is not possible to predict any level of, or location of any off departure manoeuvring by departing aircraft from WSI as each occurrence would be a result of pilot request or air traffic control intervention. This could occur at any point on the SID track and would be subject to the separation requirements of safely interacting with all Sydney Basin flight movements at that time.

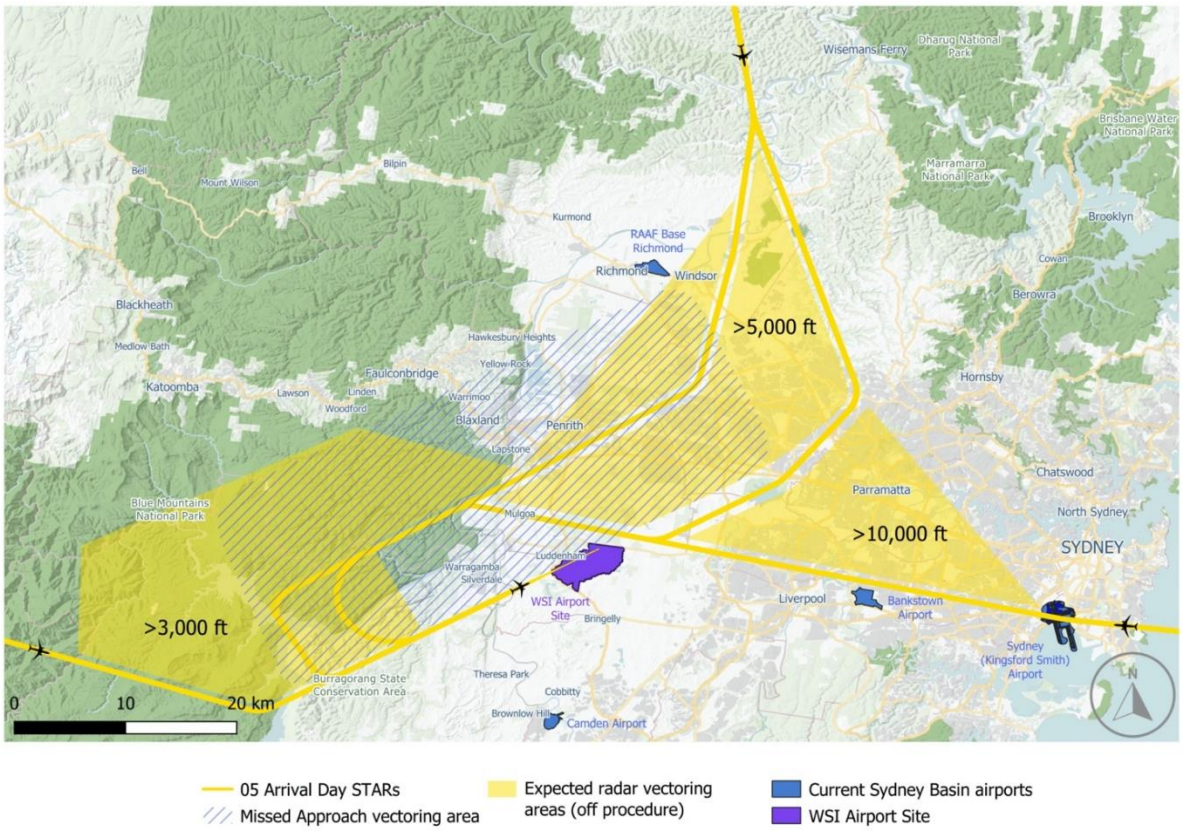

Figure 7.12 Runway 05 Day – off-procedure manoeuvring areas (5.30 am to 11 pm)

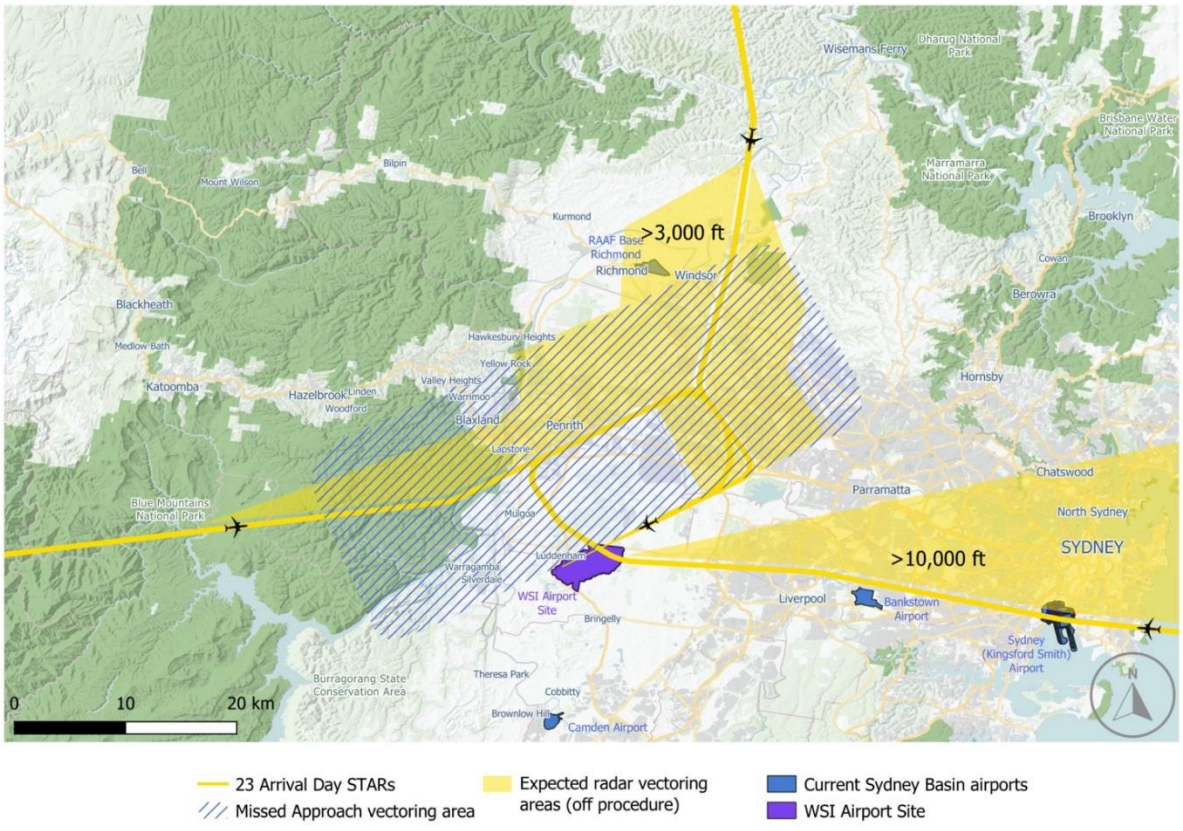

Figure 7.13 Runway 23 Day – off-procedure manoeuvring areas (5.30 am to 11 pm)

7.5.8 Missed approach procedures – go-arounds

A go-around or missed approach (also sometimes referred to as an aborted landing), is a safe and well-practised manoeuvre that sees an aircraft discontinue its approach to the runway and may be employed at WSI. This standard manoeuvre does not constitute any sort of emergency or threat to safety but may cause passengers or witnesses to become anxious.

During a go-around, the pilot would apply full take off power to the engine(s), adopt a nose-up take-off attitude, retract the landing gear and flaps, and climb into the traffic pattern to circle around for another approach. A go-around may be initiated by the pilot, or the pilot may be directed to go-around by air traffic control.

The causes are usually adverse weather conditions including strong winds experienced by the aircraft on final approach, and flying training. Other causes include debris on the runway (for example, tyre fragments), an aircraft that has been slow to take-off or an aircraft (or vehicle) that has not yet cleared the runway. In these circumstances, a go-around is the safest approach.

Figure 7.14 provides a schematic of a missed approach procedure. The missed approach area for WSI is depicted on Figure 7.12 and Figure 7.13.

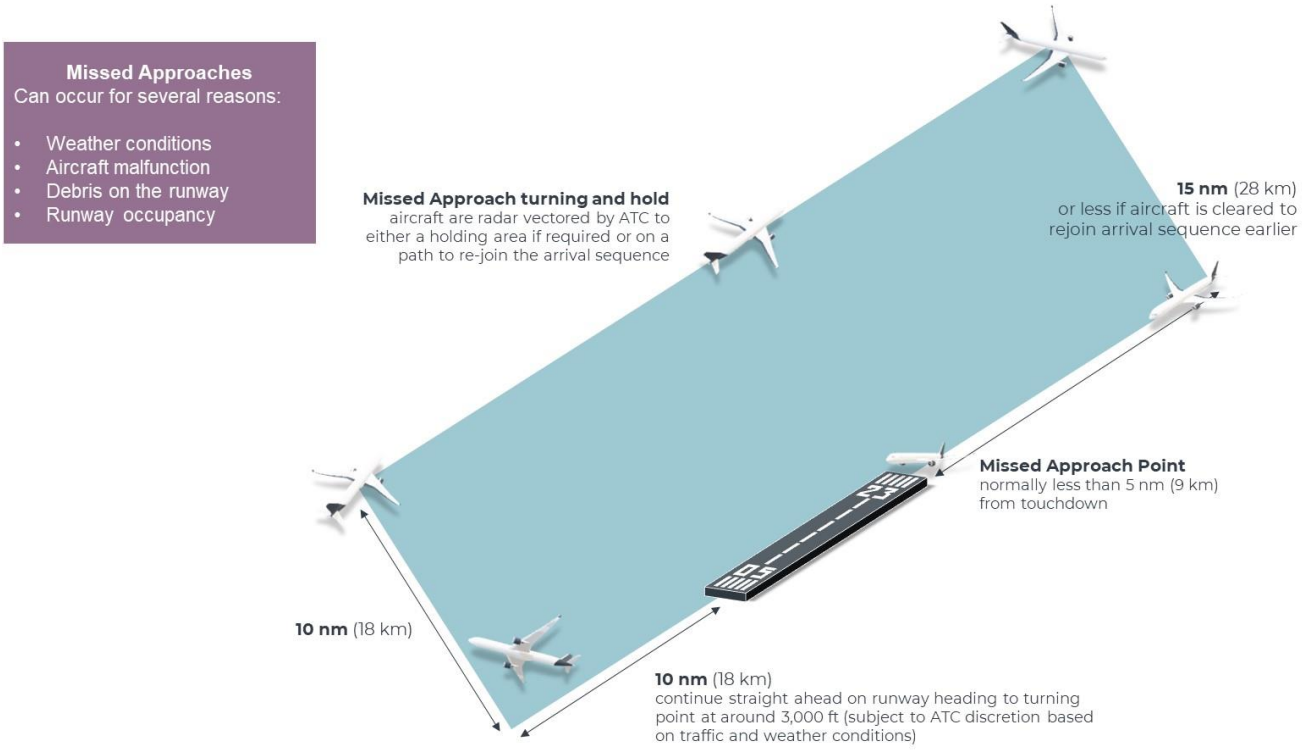

Figure 7.14 Missed approach procedure schematic

7.6 Airspace classification

The WSI would have a control zone and control area under an appropriate airspace classification. This classification would provide a level of control appropriate for the type and volume of air traffic proposed to operate at the airport. This airspace also provides containment for the flight paths and STARs and SIDs of arriving and departing aircraft in accordance with buffers prescribed by CASA, to safely separate them from other aircraft operating in the airspace and from terrain.

The proposed adjustments to the existing airspace structure in the Sydney Basin to accommodate the project are reflected in the change from the current arrangement (refer to Figure 7.15) compared to the proposed arrangement (refer to Figure 7.16), including the Lower Level (LL) of controlled airspace.

The existing control zones are further explained in Chapter 4 (Project setting) and key changes to the airspace structure are explained in Chapter 6 (Project development and alternatives). The changes required for other airspace users and associated proposed airspace structure is described in Chapter 8 (Facilitated changes). These proposed adjustments would be refined, prepared and submitted as part of the final airspace design. Possible training areas have also been identified but are subject to a separate change proposal.

The containment for WSI would vary during the hours of Sydney (Kingsford Smith) Airport's curfew, driven by the differing operational requirements both at Sydney (Kingsford Smith) Airport (curfew) and WSI (noise abatement). An additional control area is required to contain procedures supporting night flight paths at WSI including the facilitation of RRO.

During the day, this integration of WSI control area with the existing Sydney control area provides a logical, safe and workable solution balancing the need to provide equitable access to various airspace users.

As the new areas of containment would be controlled airspace, a clearance from air traffic control to transit, or to land or take off from a private airport within this airspace will be required.

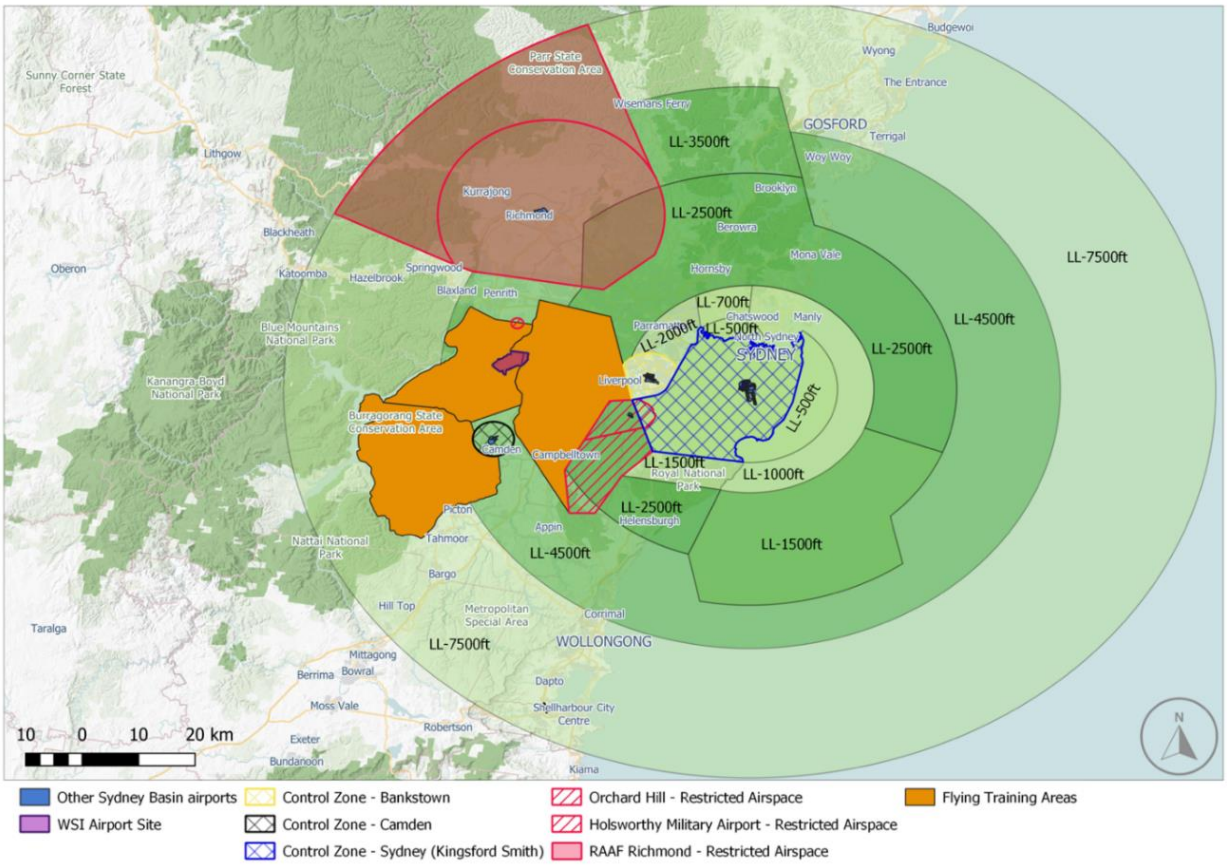

Figure 7.15 Current Sydney Basin control area and control zone boundaries including the Lower Level (LL) of controlled airspace

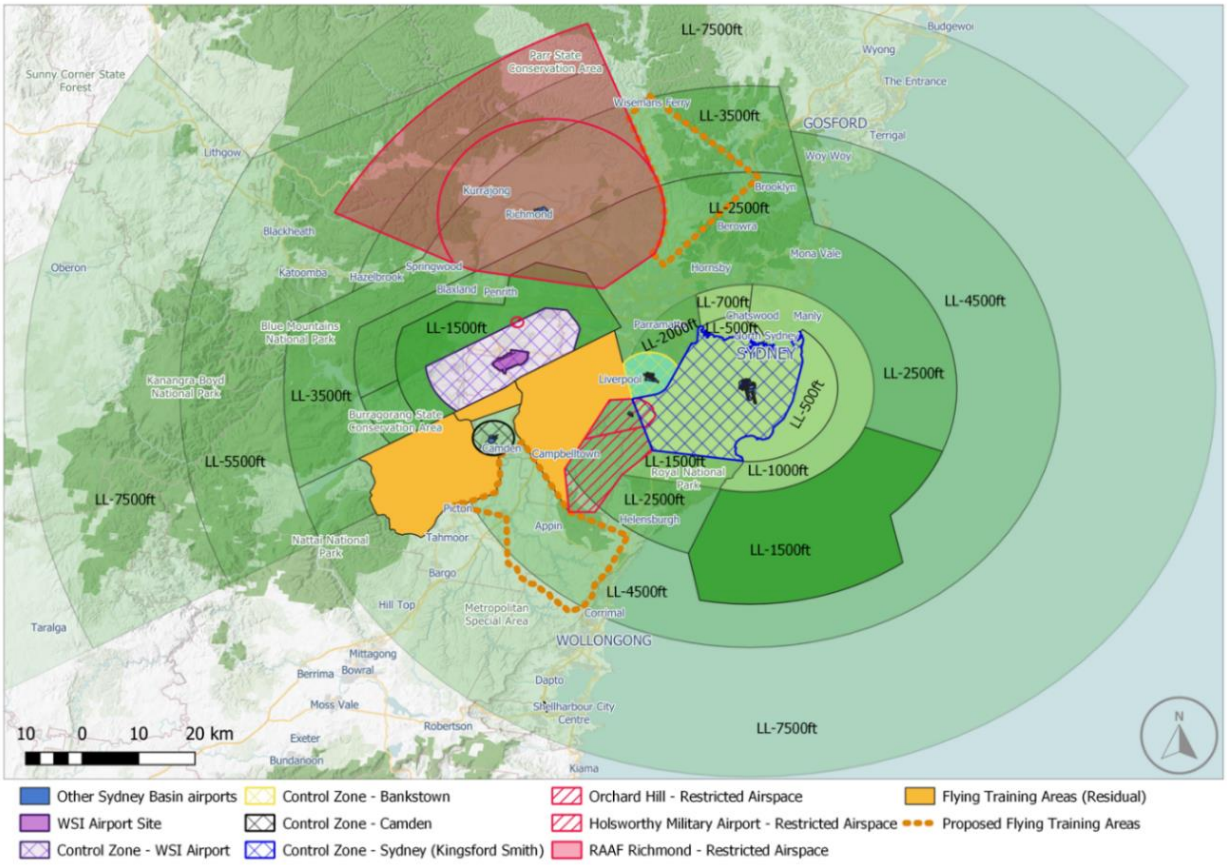

Figure 7.16 Proposed Sydney Basin control area and control zone boundaries including the Lower Level (LL) of controlled airspace