Australian Government

Department of Infrastructure, Transport, Regional Development, Communications and the Arts

Western Sydney International (Nancy-Bird Walton) Airport – Airspace and flight path design

Environmental Impact Statement

Addendum Technical paper 1: Aircraft noise

October 2024

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Terms and abbreviations

Term/abbreviation	Definition
24/7	24-hours/7-days a week (operations)
ABS	Australian Bureau of Statistics
ACP	Airspace Change Proposal
AEDT	Aviation Environmental Design Tool (US FAA)
ANSP	Air Navigation Services Provider (Airservices Australia)
ARP	Aerodrome Reference Point
AWS	Automatic Weather Station
BOM	Bureau of Meteorology
CASA	Civil Aviation Safety Authority
CCO	Continuous climb operation
CDO	Continuous descent operation
CTA	Control zone (three-dimensional airspace boundary)
CTR	Control zone (three-dimensional airspace boundary)
dB(A)	A-weighted decibel (unit of sound)
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Australian Government)
DITRDCA	Department of Infrastructure, Transport, Regional Development, Communications and the Arts (Australian Government)
EIS	Environmental Impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation* (Cth, 1999)
ft	feet (unit of height)
FTA	Flying Training Area
GA	General Aviation
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
LL	Lowest level (altitude)
MNES	Matters of National Environmental Significance (EPBC Act)
MTOW	Maximum Take-Off Weight
N60/N70	Number above (noise metric)

Term/abbreviation	Definition
NADP	Noise Abatement Departure Procedure
NAP	Noise Abatement Procedure
NIPA	Noise Insulation and Property Acquisition (policy)
nm	nautical mile (equivalent of 1.852 kilometres)
NPD	Noise-power-distance (curve chart)
NSR	Noise sensitive receiver
PAL	Planned Activity Level
PANS OPS	Procedures for Air Navigation Services and Operations
PBN	Performance Based Navigation
RAAF	Royal Australian Air Force
RMO	Runway Mode of Operation
RNP	Required navigation performance (air navigation procedure)
RNP AR	Required Navigation Performance Authorisation Required
RRO	Reciprocal Runway Operation (head-to-head mode of operation)
RRO-NAP	Reciprocal Runway Operation-noise abatement procedure. The RRO-NAP involves northbound and westbound departure aircraft maintaining the Runway 23 straight ahead runway heading (230 degrees) flight path for approximately 5 nm (9.3 km) rather than immediately turning as soon as safely possible. This is to avoid communities previously under the preliminary flight paths.
SAL	Suburbs and localities
SARP	Standards and Recommended Practices (ICAO)
SA2	Statistical areas level 2
SID	Standard instrument departure (flight path)
STAR	Standard instrument arrival (flight path)
TCA	Terminal Control Area
TCU	Terminal Control Unit (air traffic control)
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
WSA Co.	Western Sydney Airport Company Limited (airport operator)
WSI	Western Sydney International (Nancy-Bird Walton) Airport

Chapter 1 Introduction

1.1 Background

In response to submissions to the 2023 Draft Environmental Impact Statement (EIS) from the communities of the Blue Mountains and west of Western Sydney International (Nancy-Bird Walton) Airport (WSI), changes to some flight paths have been proposed. These changes aim to minimise community overflight as much as possible at night and, together with the preferred runway modes of operation (RMO), provide the best possible noise outcomes.

The proposed changes introduce new Standard Instrument Departure (SID) flight paths for western and northern jet departures at night, permanently removes the use of a SID for jet departures to Trans-Pacific and Pacific Island destinations at night and implements a Noise Abatement Procedure (NAP) during the Night Reciprocal Runway Operations (RRO) mode. Referred to as RRO-NAP, this procedure will minimise community overflight when traffic allows. Further details are provided in Section 1.4.

This report contains an aircraft noise assessment of the proposed changes.

1.2 Runway modes of operation

For safety and operational performance reasons, aircraft typically land and take-off into the wind. At WSI, during the day, depending on the prevailing wind conditions, aircraft will operate either in a north-easterly (Runway 05) or south-westerly (Runway 23) direction.

Overnight, when air traffic demand and weather conditions permit (winds with less than a 5-knot (9.3 kilometres per hour) tailwind component, and no precipitation), WSI is able to make use of head-to-head operation, or RRO (i.e., landings on Runway 05 and take-offs on Runway 23). As outlined in the 2016 EIS, "the use of head-to-head operations to and from the south-west, when it is safe to do so, is an important preferred option for managing aircraft noise at night." The RRO mode reduces the community overflight and associated noise disturbances.

The five possible RMO for WSI are shown in Table 1.1.

Table 1.1 Runway modes of operation

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. *during 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 Day 05 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 Day 23 flight paths) *(suitable during Sydney (Kingsford Smith) Airport curfew hours only)*

(Table 1.1 is **not** indicating an order of mode allocation preference.)

An appropriate RMO is selected by air traffic control and according to a set of parameters determined by assessing runway orientation and availability against factors including current and forecast meteorological conditions (especially wind direction and strength), runway surface status, aircraft profile and capability, air traffic demand, airspace management procedures, conflicting airport traffic (specifically traffic at Sydney (Kingsford Smith) Airport), and potential impacts on surrounding communities, like aircraft overflight noise.

1.3 WSI – Day versus Night operations

Day SIDs and Standard Instrument Arrivals (STARs) at WSI will be used from 5:30 am to 11 pm local time. This time may vary slightly as the Sydney Terminal Control Unit (TCU) manages the transition into and out of Sydney (Kingsford Smith) Airport curfew mode.

Sydney (Kingsford Smith) Airport is under curfew from 11 pm to 6 am local time. Immediately outside of these hours however, aircraft are permitted to position for a landing at 6 am or to track to their enroute flight path just after a pre-11 pm take-off. This means that aircraft to and from Sydney (Kingsford Smith) Airport are manoeuvring in the Sydney Terminal Control Area (TCA) until approximately 11:15 pm and from 5:30 am. On rare occasions, under adverse weather influences or high late departure demand, Sydney (Kingsford Smith) Airport departures may still operate in the Sydney TCA to 11:45 pm.

The lack of significant operations at Sydney (Kingsford Smith) Airport during the curfew period provides an opportunity for the WSI airspace design to further reduce aircraft overflight noise to communities by exploiting areas that are no longer constrained by Sydney (Kingsford Smith) Airport flight paths.

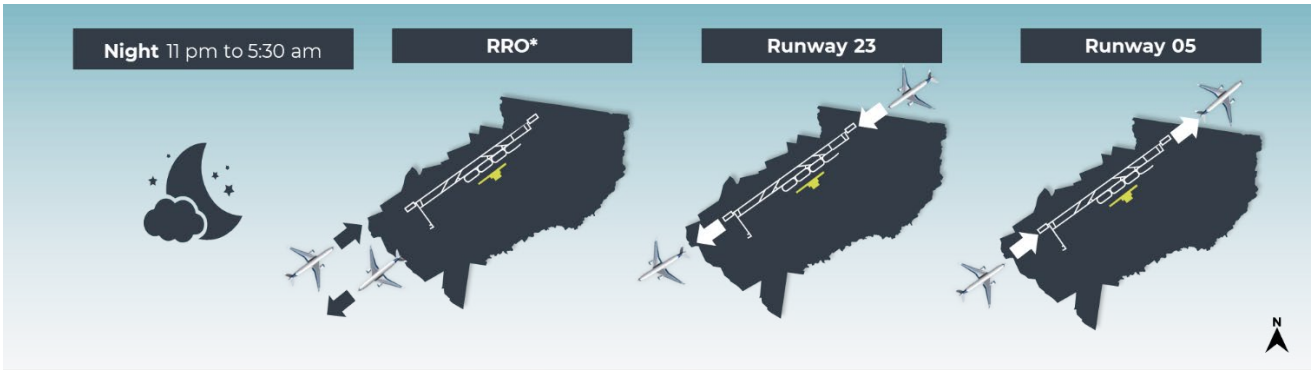
Nominally between 11 pm to 5:30 am local time, specific night-time SIDs and STARs at WSI will be used.

Both the 2016 EIS and 2023 Draft EIS described the possible 'head-to-head' (RRO) operating mode that would involve aircraft both departing to and arriving from the south-west end of the airport at night during the period when aircraft demand is relatively low. These EISs estimated the number of people expected to be impacted by the RRO modes and made comparisons between the expected number of people affected by the use of conventional Night RMOs with preferred Runway 05 and preferred Runway 23 operating strategies.

The RRO mode has been adopted as the preferred "Night" mode of operation but requires certain criteria to operate:

- tailwind component must not exceed 5 knots (9.3 km per hour)
- the runway surface must be dry
- visibility and cloud base criteria applicable to the approach minima within the aircraft and pilot licensed rating parameters
- when traffic demand levels permit safe operations. In practice, this is expected to be when demand levels are less than approximately 20 movements per hour.

Figure 1.1 depicts the proposed Night (11 pm to 5:30 am) RMOs.



*RRO is suitable only at night (11 pm to 5.30 am) when air traffic demand levels and weather conditions permit.

Figure 1.1 WSI Night (11 pm to 5:30 am) runway modes of operation

1.4 Proposed changes to the RRO mode

The 2023 Draft EIS was on public exhibition from 24 October 2023 to 31 January 2024. During this time, community stakeholders were invited to participate in consultation on the materials on display including the preliminary flight paths for WSI, and the draft Noise Insulation and Property Acquisition (NIPA) Policy. Submissions received during the consultation period from the community and key stakeholders were considered. These submissions raised issues such as aircraft overflight noise impacts and other impacts on the community and the environment. In response to submissions on aircraft overflight noise, the Department of Infrastructure, Transport, Regional Development, Communications, and the Arts (the Department) has proposed a change to the Night RRO mode. This results in a change to the flight path design, operating procedures and routing of certain departing flights under light traffic conditions.

The proposed changes to the RRO procedures and flight paths seek to further improve community outcomes resulting from the RRO mode. This Addendum Report provides a description of the proposed changes, and an assessment of operational impacts specifically focused on the noise of overflights from the adjusted RRO procedures.

The proposed change is referred to as a RRO-NAP:

> When traffic allows, air traffic control shall radar vector jet aircraft departing to the north and west along runway heading to remain clear of noise sensitive areas including but not limited to Silverdale and the Blue Mountains. Non-jet aircraft will be permitted to cross the Blue Mountains along the agreed RRO SID path. This procedure will take jets and non-jets for western and northern destinations along the runway heading (227 Degrees magnetic) for approximately 5 nm (9.3 km) before turning north or west. Non-jets, after turning right at 5 nm (9.3 km), can be radar vectored in alignment with the RRO departure flight path (D29) and remain west of noise sensitive areas. Jets will be vectored by air traffic control along a more southern route, staying south of the Great Western Highway before being vectored toward northern and western waypoints. The proposed procedures are described in Section 2.1.

RRO-NAP will supplement the existing procedures available in the Night RRO. It has been designed to minimise community overflight by redistributing traffic and reducing the number of flights that overfly communities along the lower parts of the Great Western Highway corridor around Faulconbridge and Linden, when traffic allows.

In addition to the inclusion of RRO-NAP, the change also discontinues use of the North-East RRO SID by jet aircraft. Jet traffic previously assigned to the North-East RRO SID has been redistributed to the Southern RRO SID as presented in the 2023 Draft EIS design. The reassigned traffic includes all eastern departures to destinations in New Zealand, Pacific Island Countries and the United States of America (USA).

This solution, combined with the noise preferred RMOs, helps to minimise community overflight at night. The RRO-NAP is a change to the flight path design presented in the 2023 Draft EIS as it removes the use of the North-East RRO departure flight path and redistributes jet aircraft via the South-east RRO departure.

Chapter 2 Operational and environmental assessment

2.1 RRO flight paths presented in the 2023 Draft EIS

Figure 2.1 is an extract from the 2023 Draft EIS and presents the preliminary flight paths for RRO Night operations at WSI. These preliminary flight paths were placed on public exhibition as part of the 2023 Draft EIS from 24 October 2023 to 31 January 2024.

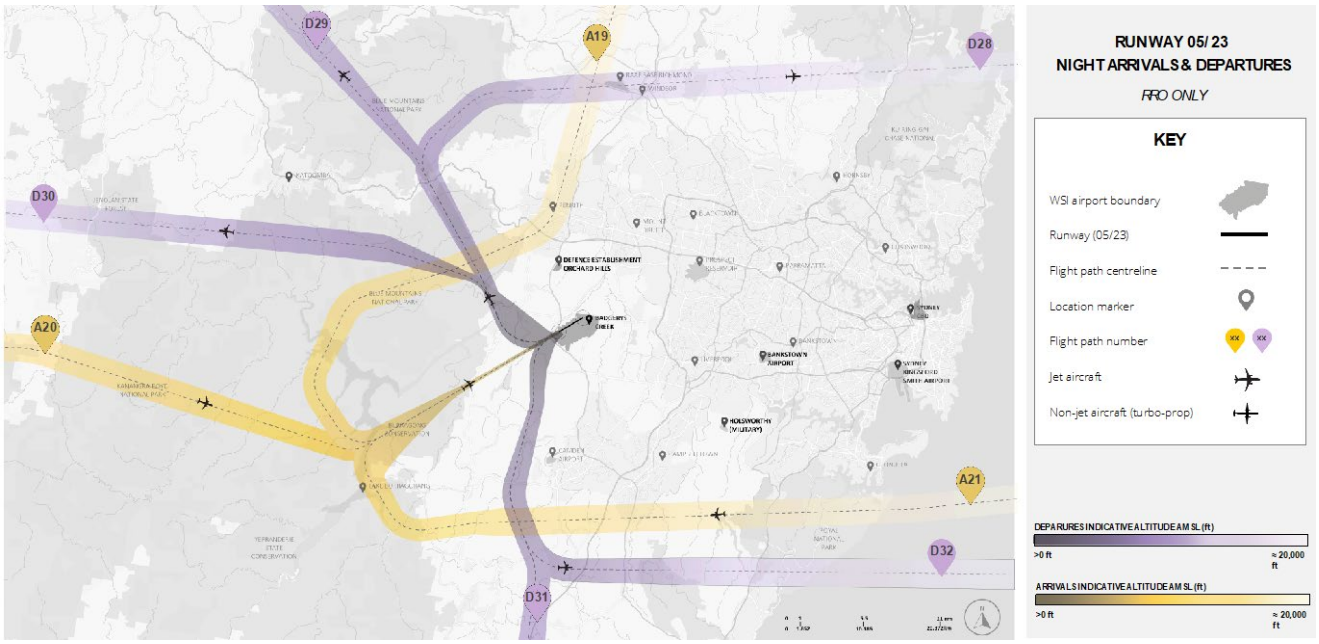


Figure 2.1 Runway 05/23 RRO Night arrivals and departures

The preliminary design of those flight paths comprised:

WSI (RRO) SID RWY 23 NIGHT NORTH EAST DEP ALL (RNP) — D28

This flight path:

- provides access with CCO for departing aircraft to the north-east and east from WSI during the RRO mode between 11 pm to 5:30 am local time
- turns at altitude as soon as safely possible to allow for separation with RRO arrivals
- crosses the Great Western Highway over low residential areas 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
- if in conflict with northern arrivals to WSI, there may be a level segment imposed to ensure separation.

WSI (RRO) SID RWY 23 NIGHT NORTH DEP ALL (RNP) — D29

This flight path:

- provides access with CCO for departing aircraft to the north from WSI during RRO between 11 pm to 5:30 am local time
- turns at altitude as soon as safely possible to allow for separation with RRO arrivals
- crosses the Great Western Highway over low residential areas to minimise aircraft overflight noise to Lower Blue Mountains communities
- if in conflict with northern arrivals to WSI, may have a level segment imposed to ensure separation.

WSI (RRO) SID RWY 23 NIGHT WEST DEP ALL (RNP) — D30

This flight path:

- provides access with CCO for departing aircraft to the west from WSI during RRO between 11 pm to 5:30 am local time
- 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
- may be replaced with a SID radar that reflects Runway 23 Night west departure during periods of low arriving traffic to minimise overflight of residential areas north of Silverdale
- if in conflict with northern arrivals to WSI, may have a level segment imposed to ensure separation.

Night flight paths use a common departure waypoint west of Katoomba. This flight path may be able to be moved further south of Katoomba in future design, resulting in a more direct flight path.

WSI (RRO) SID RWY 23 NIGHT SOUTH DEP ALL (RNP) — D31

This flight path:

- provides access with CCO for departing aircraft to the south from WSI during RRO between 11 pm to 5:30 am local time
- turns at altitude as soon as safely possible to allow for separation with RRO arrivals
- when tracking south aircraft remain clear of Camden, The Oaks, Picton, Tahmoor and Wilton
- if in conflict with eastern arrivals to WSI, may have a level segment imposed to ensure separation.

WSI (RRO) SID RWY 23 NIGHT SOUTH EAST DEP ALL (RNP) — D32

This flight path:

- provides access with CCO for departing aircraft to the south-east from WSI during RRO between 11 pm to 5:30 am local time
- turns at altitude as soon as safely possible to allow for separation with RRO arrivals
- when tracking south aircraft remain clear of Camden, The Oaks, Picton, Tahmoor and Wilton
- crosses the Princes Highway at approximately 18,000 ft above ground level
- if in conflict with eastern arrivals to WSI, may have a level segment imposed to ensure separation.

2.1.1 Reciprocal Runway Operations (RRO) – arrivals – Night (11 pm to 5:30 am)

WSI (RRO) STAR RWY 05 NIGHT NORTH ARR ALL (RNP) — A19

This flight path:

- provides access with continuous descent operations (CDO) for arriving aircraft from the north to WSI during RRO between 11 pm to 5:30 am local time
- crosses over Penrith above 10,000 ft
- downwind leg closer to the airport prioritises CCO for departures to the west, north and north-east
- alignment may be adjusted once south of the Great Western Highway to facilitate the climb of departing aircraft.

WSI (RRO) STAR RWY 05 NIGHT WEST ARR ALL (RNP) — A20

This flight path:

- provides access with CDO for arriving aircraft from the west to WSI during RRO between 11 pm to 5:30 am local time
- remains over uninhabited areas until final approach
- remains south of Silverdale to minimise the aircraft overflight noise for residential areas.

WSI (RRO) STAR RWY 05 NIGHT EAST ARR ALL (RNP) — A21

This flight path:

- provides access with CDO for arriving aircraft from the east to WSI during RRO between 11 pm to 5:30 am local time
- remains south of Bundeena and Camden
- turns to final approach south-west of The Oaks and remains south of Silverdale to minimise the aircraft overflight noise for residential areas.

2.2 Description of proposed changes to Night RRO mode

The proposed changes to RRO reduce community overflight by specific flights, but requires further environmental assessment because it:

- constitutes a change to the distribution of aircraft movements
- introduces a radar vectoring area for aircraft operations around some noise sensitive areas in the Blue Mountains
- introduces operations that are inconsistent with the flight paths and aircraft noise assessment presented in the 2023 Draft EIS and adds track miles to the departure flight paths.

There are no safety or airport efficiency implications and is only used as a “low traffic procedure.”

In addition to the changes to RRO flight paths, NAPs that apply specifically to RRO will be introduced.

NAPs are expected to be available and applied by air traffic control when the departing aircraft is rolling on its take-off roll, and the arriving aircraft is at or beyond 30 nm (56 km), resulting in a 10-minute separation between any departure and a subsequent arrival. Air traffic control may actively manage aircraft sequencing to create this 30 nm (56 km) gap between arrivals thereby reducing the needed time gap. For aircraft noise modelling purposes, it assumes that a minimum requirement of 10-minutes between a departure and the following arrival based on the schedule for the departure to utilise the RRO-NAP flight path.

2.2.1 Revised flight paths and procedures

The 2023 Draft EIS presented flight paths for departures during RRO – these procedures require all departures to turn hard left or right during the RRO mode. The immediate turns expedited separation of arrival and departure traffic and allows air traffic control to utilise the maximum capacity (approximately 20 movements per hour) available in the RRO mode.

In response to community feedback, two key changes are proposed to RRO operations.

Changes to flight path allocation

The proposed change will discontinue jet traffic use of departure flight path **D28** by re-routing all jet traffic to departure flight path **D32.** The North East departure D28 as proposed in the Draft EIS is now for non-jet use only when RRO is used. Trans-Pacific jets for North America and Pacific Island destinations, as a result of this change, will depart to the south to avoid overflying the more populated regions to the north of the airport.

2.2.1.1 Introduction of RRO-NAP flight paths and procedures

RRO-NAP utilises a radar vectoring area that keeps traffic further south of the Great Western Highway and specifically avoids noise sensitive areas including communities along the Great Western Highway and directly west of the WSI airport site. It also keeps aircraft to the south of Warragamba and Silverdale, following a runway heading longer (in distance) than previously identified. The proposed areas to radar vector departure aircraft are shown below in Figure 2.2.

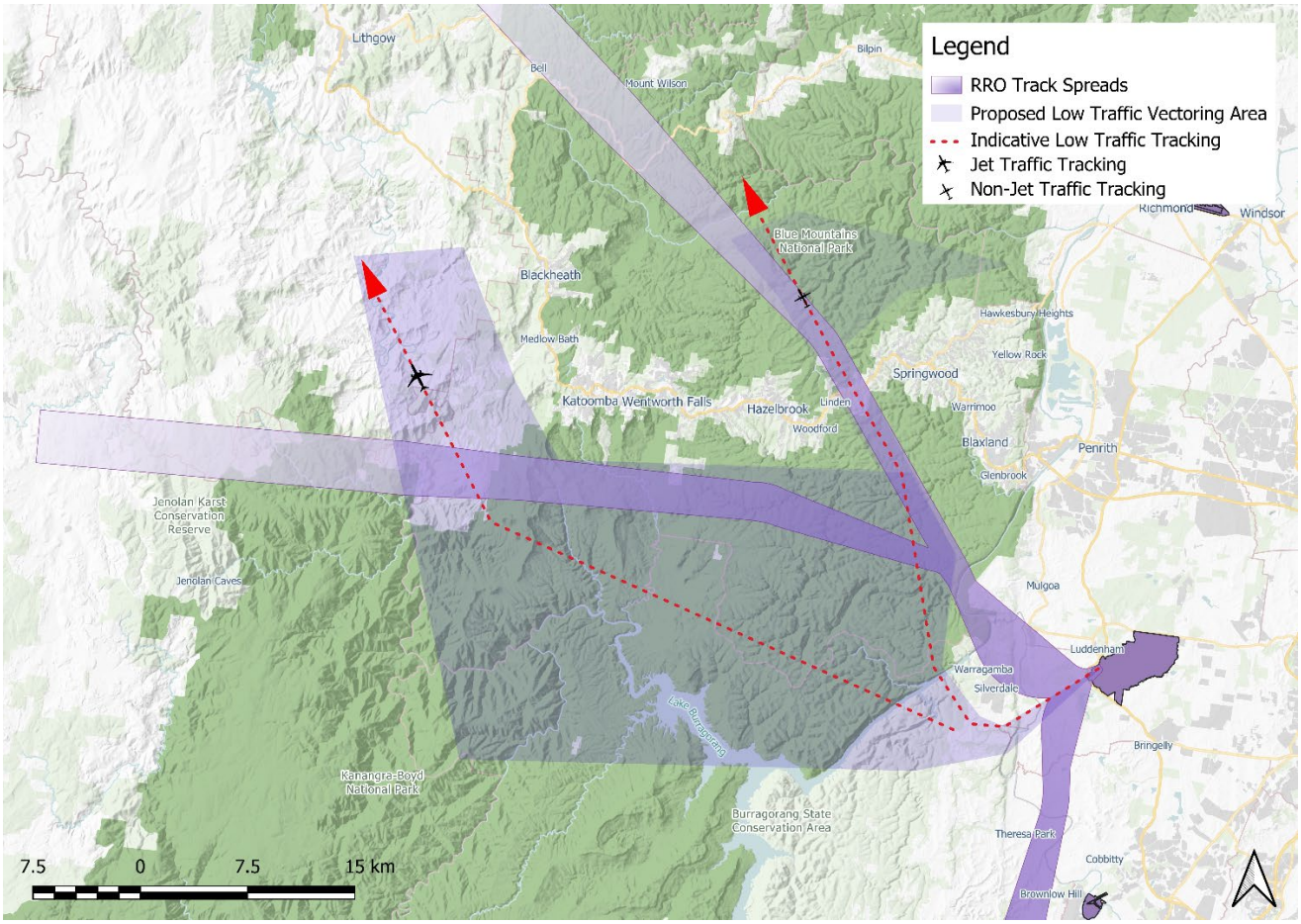


Figure 2.2 Proposed vectoring area

Areas initially identified have been refined to show areas more likely for jet operations. The refined areas were then used to inform noise modelling by placing aircraft in a corridor where traffic is anticipated to operate under RRO-NAP.

2.2.1.2 Use of RRO-NAP

The proposed change offers two alternative departure flight paths within the RRO mode. These two new flight paths are only available at lower traffic levels and are direct alternatives to departure flight path **D29** and Departure flight path **D30.** RRO-NAP will only apply to traffic departing to the west, north and north-west.

Under RRO-NAP, northbound and westbound departure aircraft will maintain the Runway 23 straight ahead runway heading (227 Degrees magnetic) flight path for approximately 5 nm (9.3 km). This is to avoid overflying communities as much as possible, including Warragamba and Wallacia. Once past 5 nm (9.3 km) air traffic control will radar vector northbound and western bound aircraft to their outbound tracks avoiding other communities and noise sensitive areas especially in the Greater Blue Mountains, to the extent practical whenever possible. However, on occasions, the irregular purple shaded area depicted in Figure 2.2 may be utilised by air traffic control to radar vector aircraft to safely separate arriving aircraft, maintaining the throughput rate. This will result in a level of noise distribution across the extent of that shaded zone. As discussed under 'Changes to flight path allocation', jets departing to the east, north-east and south will fly the existing RRO departure SIDs south and southeast – **D31** and **D32**. Trans-Pacific jets for North America and Pacific Island destinations will be directed via the south-east SID (**D32**) with no significant increase in track miles to their respective destinations.

The expected number of non-jet aircraft operations to/from WSI in the Night period (11 pm to 5:30 am) is expected to be low. Non-jet operations to the north will be allocated a Radar SID and track closely to the non-jet flight path centrelines (backbones) shown in Figure 2.3.

To maintain the NAP presented in the RRO mode as long as possible, when night-time (11 pm to 5:30 am) traffic demand exceeds the limited capacity of approximately 12 movements per hour, traffic will revert mostly to the RRO SIDs as presented in the 2023 Draft EIS.

The proposed introduction of RRO-NAP and the adjustment to RRO procedures when combined with the preferred RMO is considered to provide the best possible amenity outcomes to the entire Sydney Basin community.

Figure 2.3 depicts the RRO arrival flight paths and the newly introduced RRO-NAP.

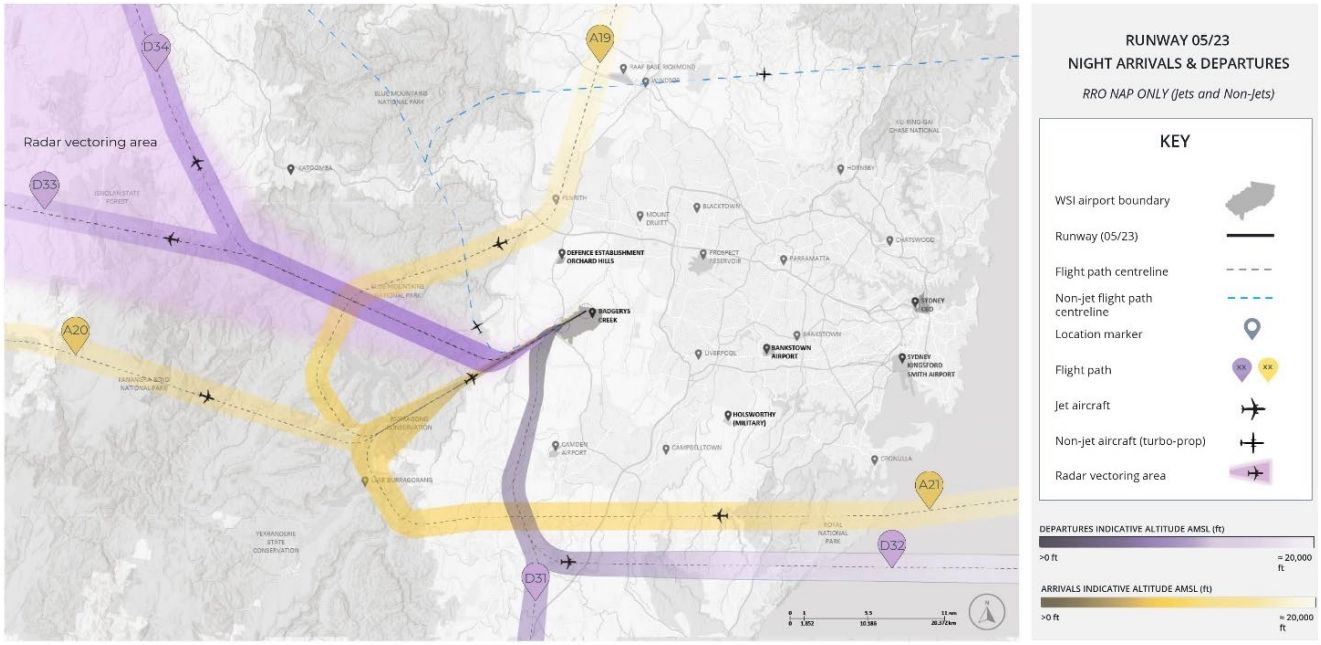


Figure 2.3 RRO-NAP flight paths and vectoring area

WSI (RRO) SID RWY 23 NIGHT NORTH EAST DEP ALL (RNP) — D28 reallocated to D32 for jet aircraft

There are no changes proposed to Departure flight paths D29, D30 and D31.

WSI (RRO) SID RWY 23 NIGHT SOUTH EAST DEP ALL (RNP) — D32

This flight path:

- provides access with CCO for departing aircraft to the north-east and south-east from WSI during RRO between 11 pm to 5:30 am local time
- turns at altitude as soon as safely possible to allow for separation with RRO arrivals
- when tracking south, aircraft remain clear of Camden, The Oaks, Picton, Tahmoor and Wilton
- crosses the Princes Highway at approximately 18,000 ft above ground level
- if in conflict with eastern arrivals to WSI, may have a level segment imposed to ensure separation.

2.2.2 Reason for change

The proposed change to the RRO mode is focussed on reducing to the extent practical, community overflight of areas in the Lower Blue Mountains along the Great Western Highway. The goal is to reduce the number of aircraft overflight and resulting aircraft visual amenity and noise impacts on communities and sensitive sites during night hours (11 pm to 5:30 am).

The proposed RRO-NAP will be published and implemented by Airservices Australia.

It will be used to minimise community overflight when traffic allows. Internal air traffic control instructions are expected to specify that inbound aircraft must be at or outside 30 nm (56 km) from an aircraft departure roll or similar.

Further, noise sensitive areas will be defined on air traffic control systems map (on their display) and the procedure will be described in NAP as follows: “At night, when traffic separation requirements permit, issue radar SID and runway track to western and northern departures. Aircraft to maintain runway track until outside the noise sensitive areas. Jets will be vectored outside the noise sensitive areas, non-jets via the RRO northern SID corridor as described”.

In addition to the RRO-NAP, north-east jet departures will be issued to the South East RRO SID.

2.2.3 Capacity implications

2.2.3.1 During RRO

RRO has an estimated throughput rate of around 20 movements per hour. The actual hourly throughput will vary tactically with the actual demand and disposition of arriving and departing aircraft. A bias towards a particular period for either departure or arrival operations due to demand may lead to an increase in the hourly throughput as several consecutive arrivals and/or departures may be processed closer together.

For planning purposes an even balance of arrival and departure demand has been assumed, resulting in a throughput of 10 arrivals and 10 departures in a rolling 1-hour period.

2.2.3.2 During RRO-NAP

Northern and western departing aircraft will maintain the Runway 23 departure flight path for approximately 5 nm (9.3 km) before being turned right and given radar vectoring instructions by air traffic control. The increased time on the runway heading will have a reductive effect on the capacity of RRO and hence its available times of use. RRO-NAP requires a departing aircraft to be rolling on its take-off run before the next arriving aircraft reaches 30 nm (56 km) from touchdown. To achieve this in a period of balanced arrival and departure demand, a nominal period of 10 minutes will be required between landings to allow a departure to take place between each landing.

Similarly to the normal RRO mode, this throughput rate may vary when the demand is not balanced and a bias towards either departures or arrivals exists.

For planning purposes, an even balance of arrival and departure demand has been assumed resulting in a throughput of 6 arrivals and 6 departures in a rolling 1-hour period.

2.3 Aircraft noise

The assessment of aircraft noise impacts uses the same methodology highlighted in Technical paper 1: Aircraft noise (TP1). However, because of the nature of RRO-NAP, the focus of this assessment was specifically on night time operations (11 pm to 5:30 am). To clearly highlight the benefits of this procedure on absolute noise levels, number-above events have been modelled, analysed and presented as a comparison against figures from the baseline study presented in Technical paper 1.

2.3.1 Flight path movement and respite charts

The flight path movement charts and respite charts were updated to reflect the inclusion of the proposed RRO-NAP. These charts in Figures 2.4 to 2.9 present the RRO-NAP flight paths, as well as the variation in aircraft movements along the RRO night-time flight paths. Additional detailed charts are provided in Appendix E.

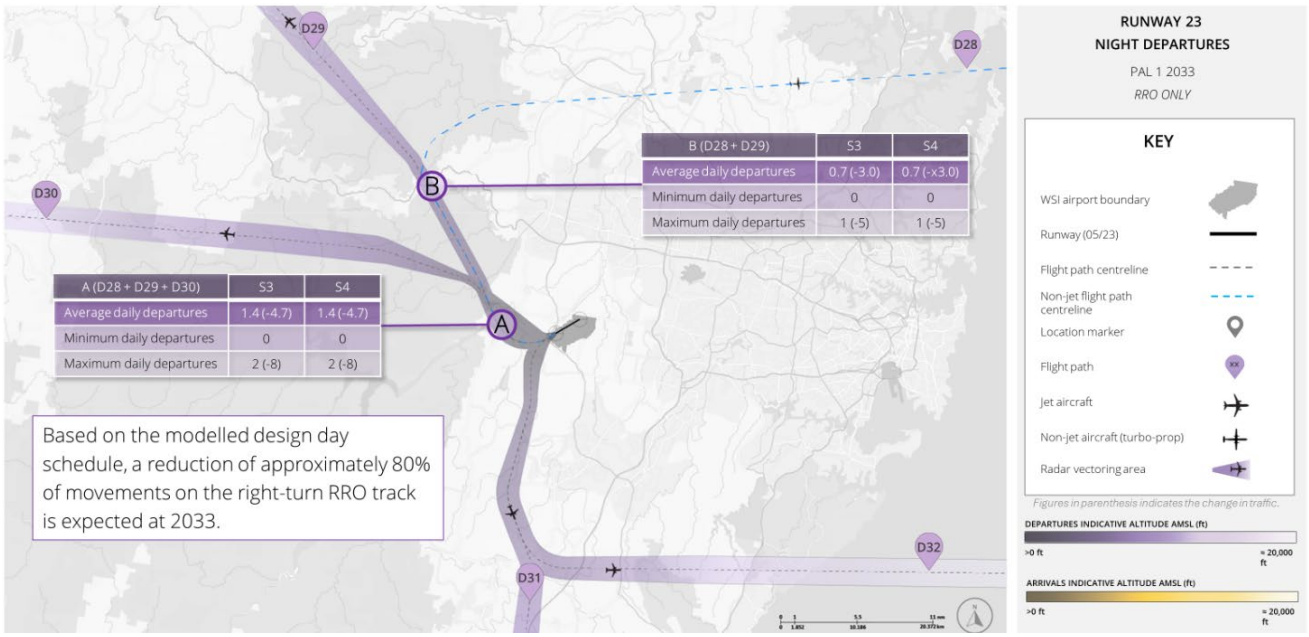


Figure 2.4 Flight path movement chart – PAL 1 – RRO only

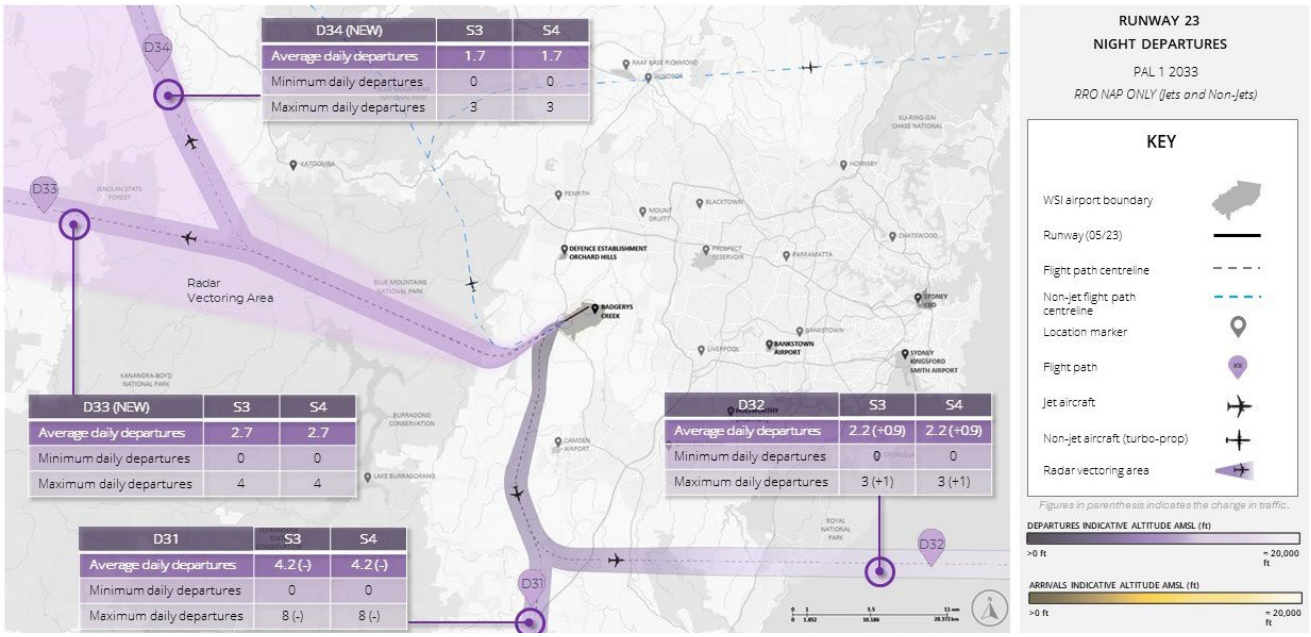


Figure 2.5 Flight path movement chart – PAL 1 – RRO-NAP flight paths

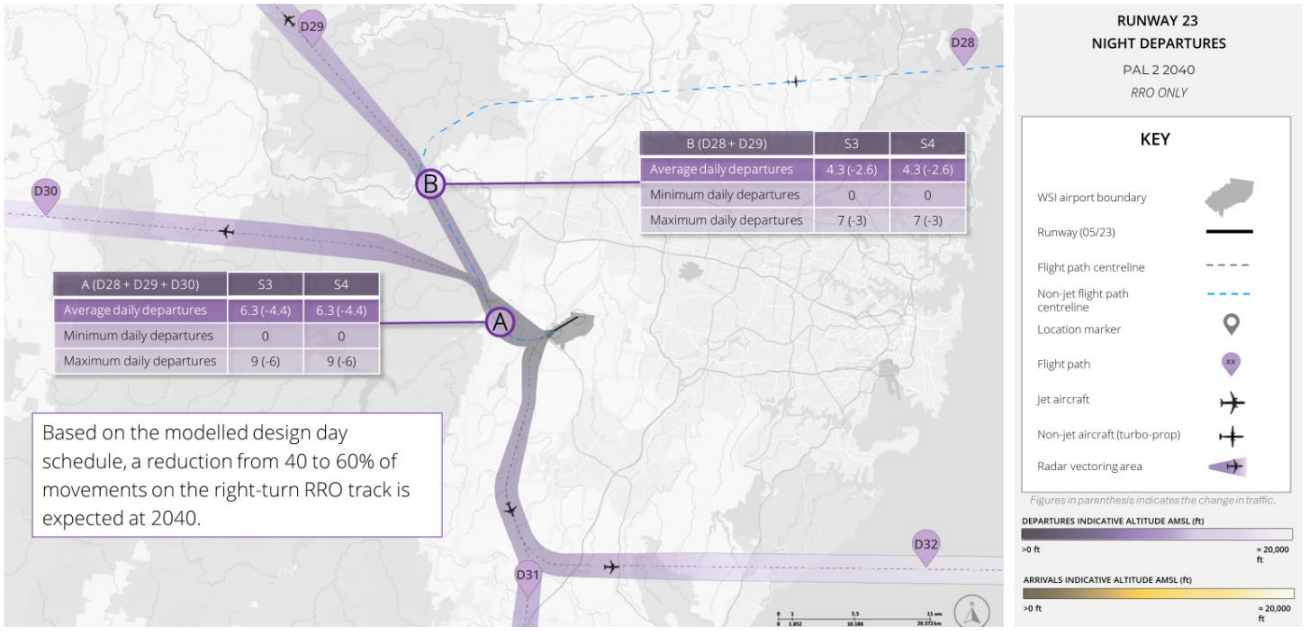


Figure 2.6 Flight path movement chart – PAL 2 – RRO only

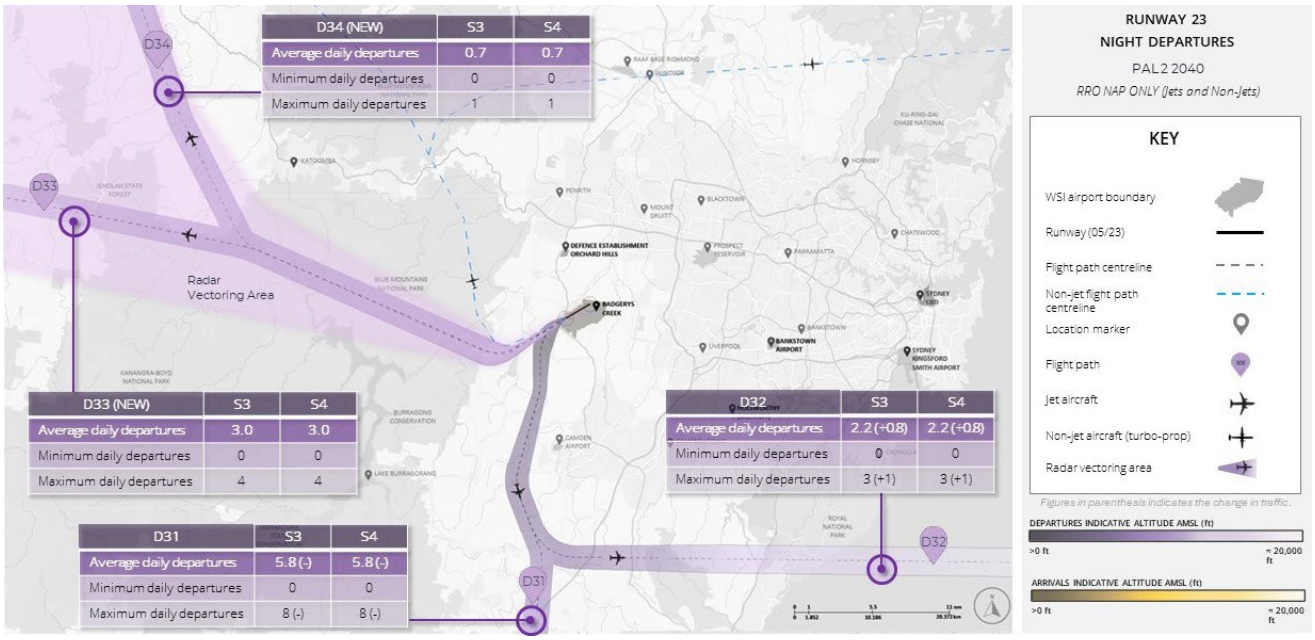


Figure 2.7 Flight path movement chart – PAL 2 – RRO-NAP flight paths

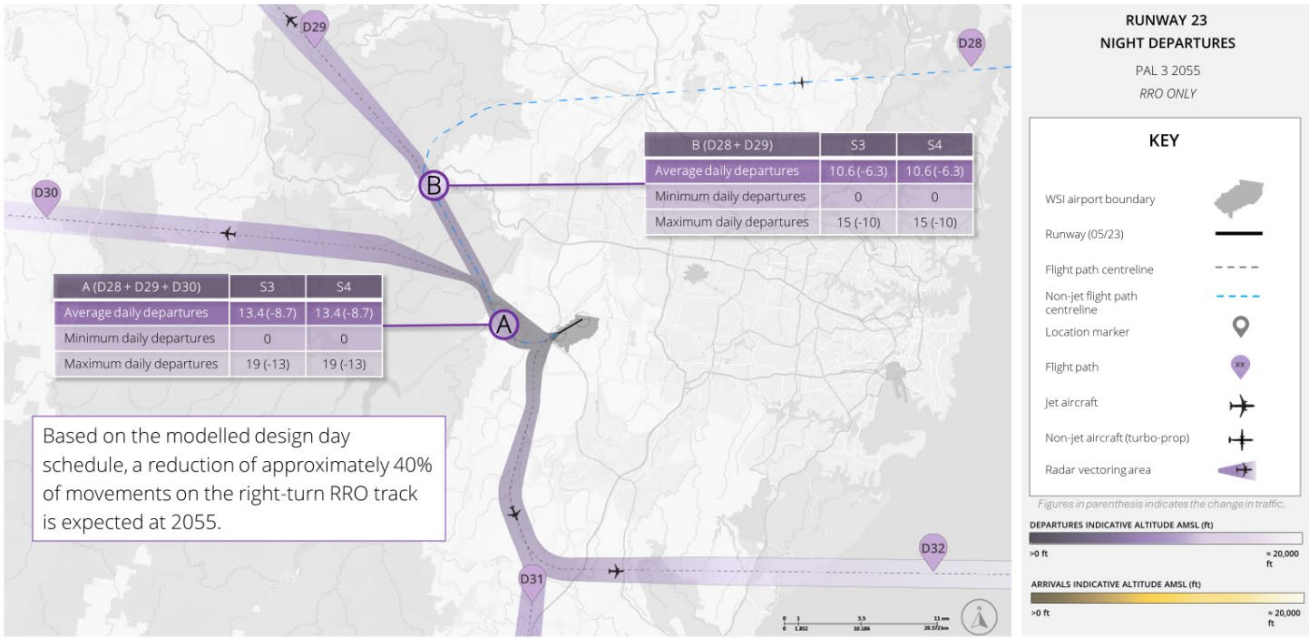


Figure 2.8 Flight path movement chart – PAL 3 – RRO only

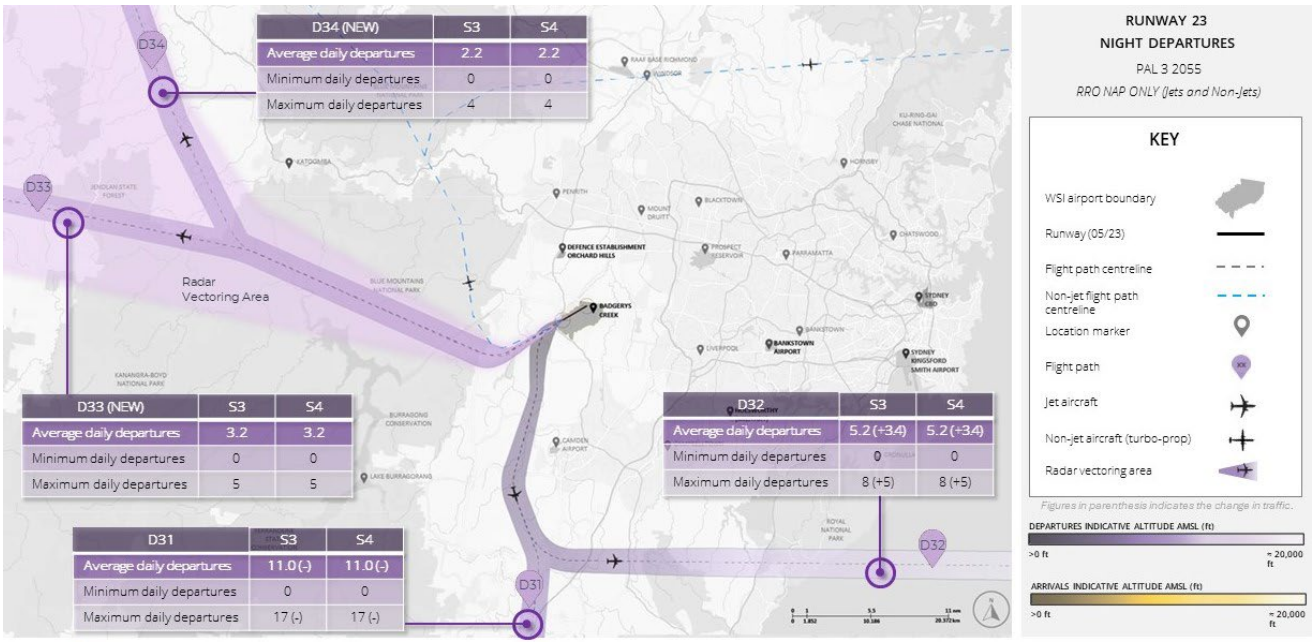


Figure 2.9 Flight path movement chart – PAL 3 – RRO-NAP flight paths

Overall, these charts highlight that RRO-NAP could divert up to 80% of movements away from the northbound flight paths in the model of PAL 1 – 2033 RRO mode. As demand grows, this ratio decreases to approximately 40% of movements by 2055 when RRO mode is used. While dependent on the exact number of scheduled operations, it does indicate a substantial benefit in spreading aircraft noise. The impact of this strategy is quantified further in the subsequent sections of this report.

The respite charts in Figures 2.10 to 2.15 show some benefits initially (PAL 1 – 2033) with an increased proportion of nights without any movements on the RRO flight paths. As demand grows, changes to respite associated with the implementation of RRO-NAP decrease mostly because some movements will still use the RRO flight paths during night-time when demand exceeds the capacity of RRO-NAP. Additional detailed charts are provided in Appendix F.

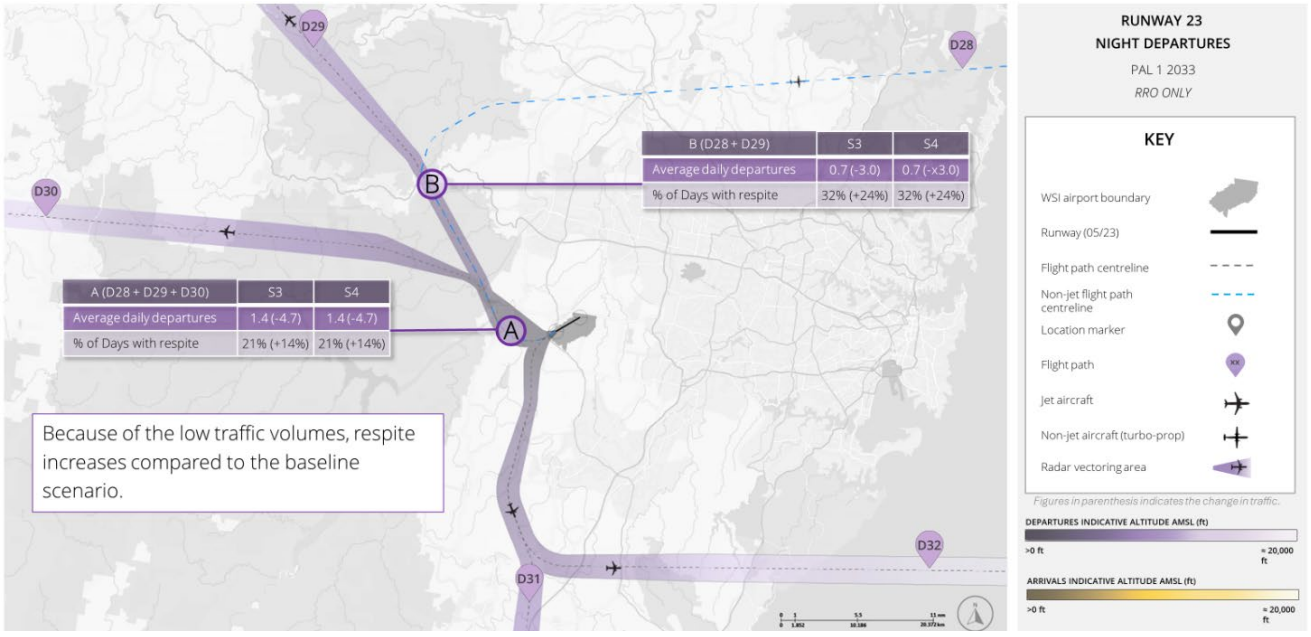


Figure 2.10 Respite chart – PAL 1 – RRO only

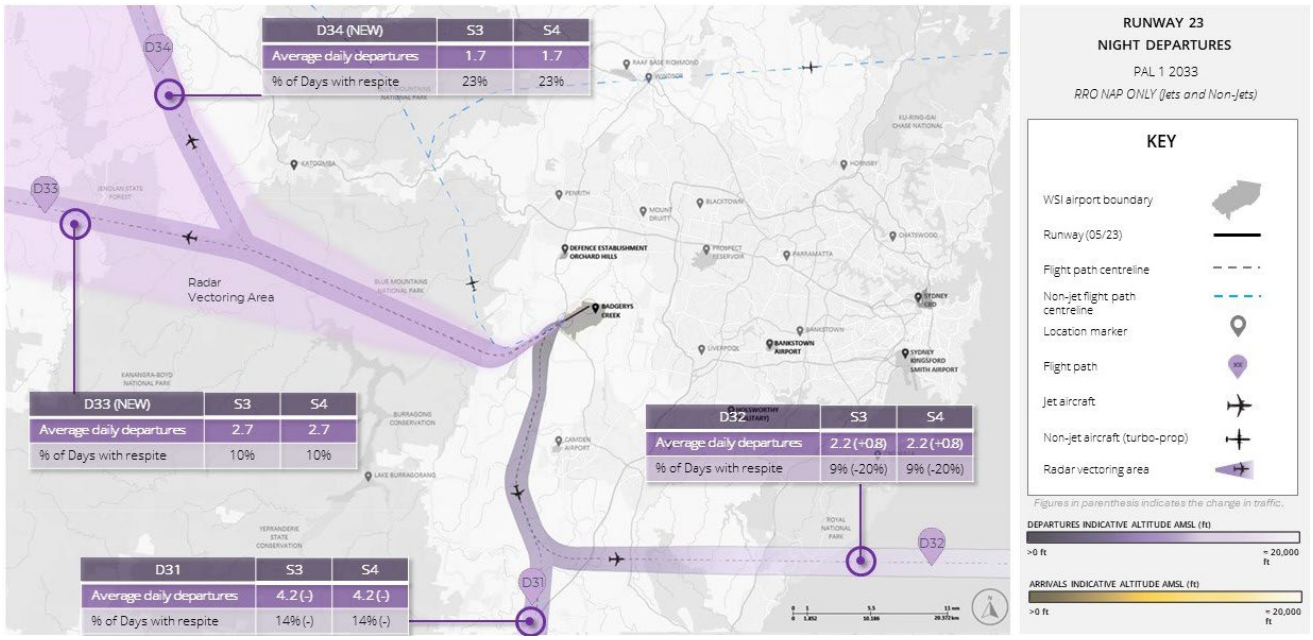


Figure 2.11 Respite chart – PAL 1 – RRO-NAP flight paths

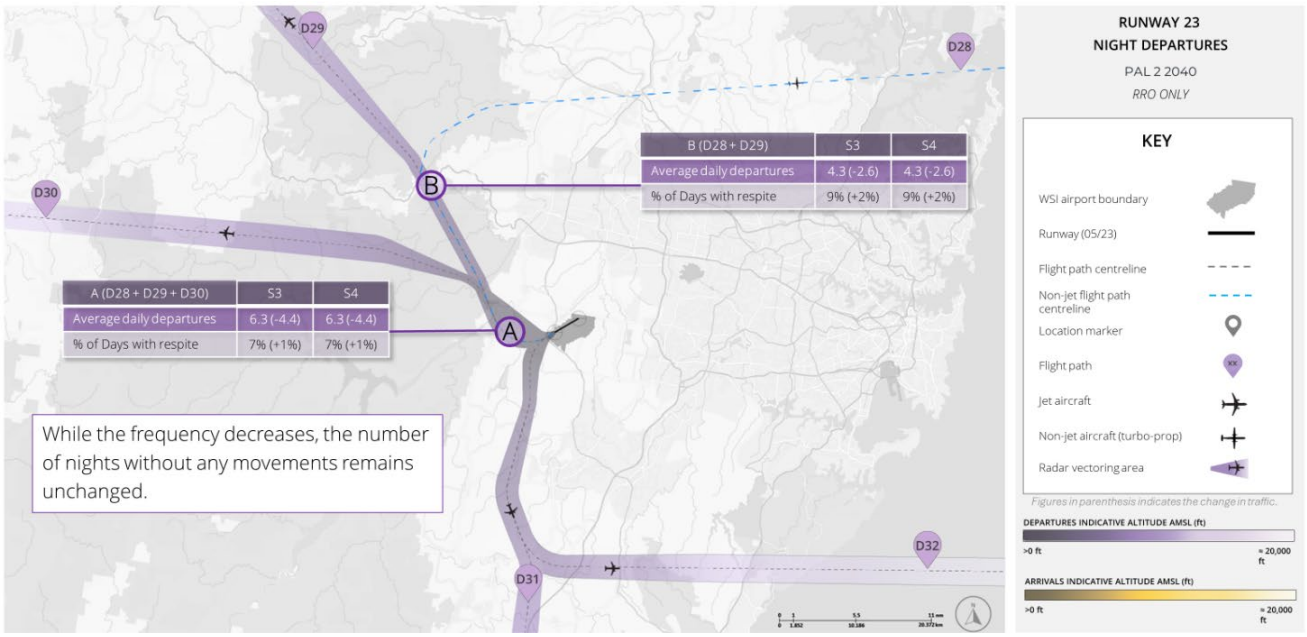


Figure 2.12 Respite chart – PAL 2 – RRO only

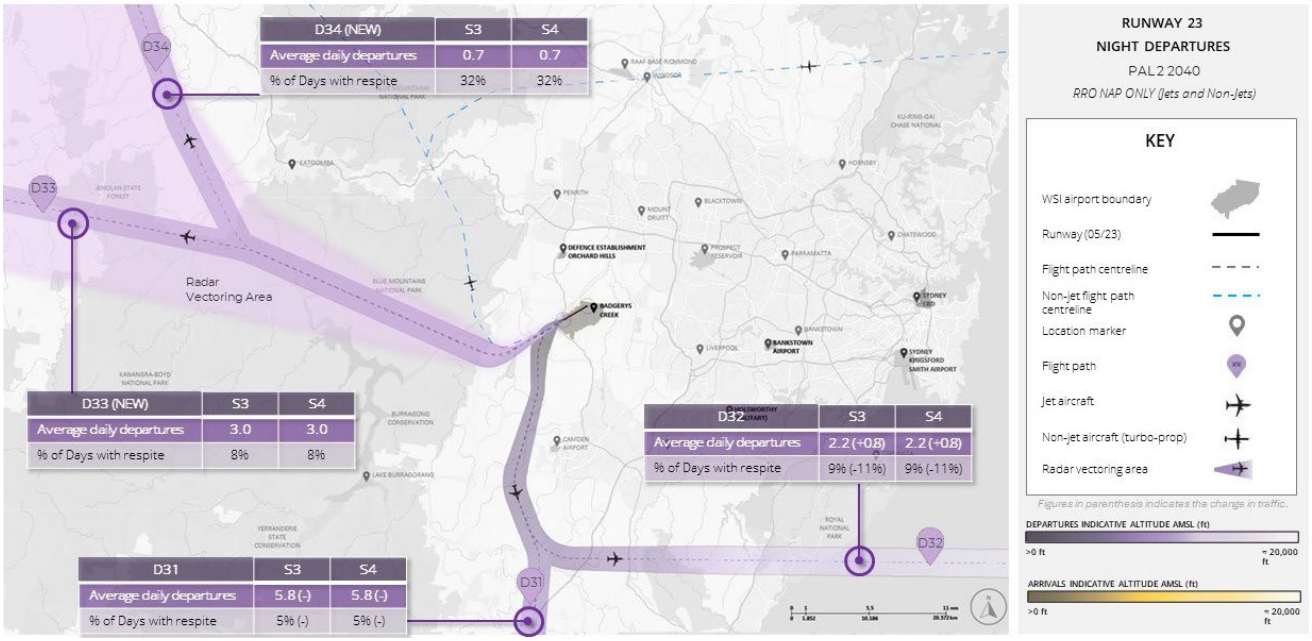


Figure 2.13 Respite chart – PAL 2 – RRO-NAP flight paths

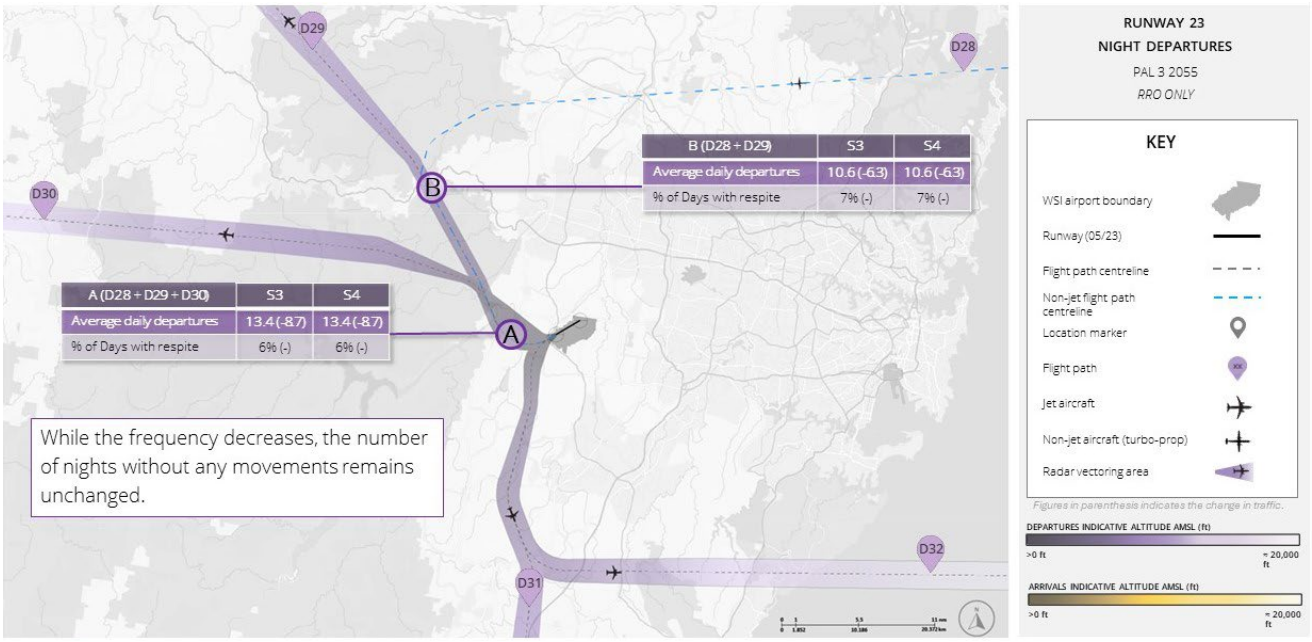


Figure 2.14 Respite chart – PAL 3 – RRO only

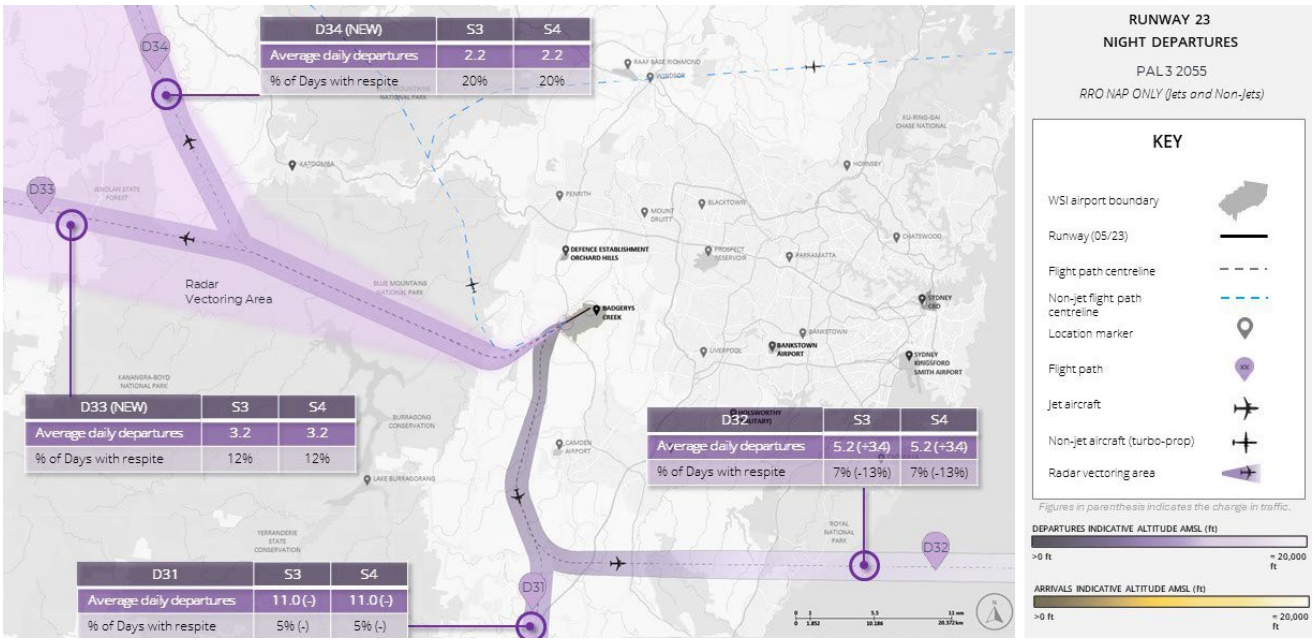


Figure 2.15 Respite chart – PAL 3 – RRO-NAP flight paths

2.3.2 Single event contours

The introduction of RRO-NAP will expose new areas to aircraft noise. However, while the single-event contours based on the maximum sound level (LAmax) may increase in size under the RRO mode, RRO-NAP flight paths are similar to the night time flight paths when operations are in the Runway 23 direction.

While the new flight paths are proposed to follow a similar trajectory as the departure flight paths used in the Runway 23 mode, this analysis has highlighted the change to the L_{Amax} specifically for the RRO mode. To generate traffic along the RRO-NAP flight paths for this L_{Amax} analysis, the schedule was used to generate a list of all potential operations that could operate along the RRO-NAP flight paths. For each of the identified potential RRO-NAP departure operations, a new L_{Amax} model was run combining the previously modelled aircraft with the new anticipated RRO-NAP flight path. Single event contours are presented in Appendix B.

The single-event contours are based on the additional traffic that is anticipated to operate using RRO-NAP. These show the maximum noise level a particular aircraft can be anticipated to produce assuming the aircraft follow the expected flight path centreline and operates in line with the modelled profiles. In practice, traffic may be spread over a vectoring area that could expose other areas to noise events. Vectoring will benefit areas of the GBMWHA that would otherwise consistently be overflown.

2.3.3 Cumulative noise contours

In addition to the maximum anticipated noise level presented in the single-event L_{Amax} analysis, the other key metric identified in the study was the change in the night time movements above the 60 dB(A) threshold. This analysis identifies the frequency with which aircraft overfly communities and produce more noise than a typical conversation. The contours generated in this analysis are presented in Appendix D and are in line with the standard contours required under the Commonwealth *Environment Protection and Biodiversity Conservation* (EPBC) *Act 1999* of two movements overnight and/or 10 movements in 24-hours.

Other cumulative contours such as the N60 24-hour and N70 24-hour contours were updated to highlight the potential materiality of the proposed change. Since the changes to RRO are only occurring at night, there were minimal impacts to the N60 24-hour and N70 24-hour contours, as highlighted in Appendix D.

2.3.4 Changes in potential noise impacts

2.3.4.1 Comparative contours – N60 Night

To describe the impact of the changes being proposed to RRO, a set of simplified graphical representations of the impacts of the redistributed traffic have been generated. These figures show the areas that benefit and the areas that are impacted by the change in traffic. The areas shown as newly overflown refer to those that are overflown by the proposed changes that were not overflown by the preliminary flight paths.

The comparative contours generated in this analysis are drawn using the contours presented in the N60 Night (11 pm to 5:30 am) metrics lowest contour (2-movements – representing the area that can anticipate observing at least 2-movements that generate above 60 dB(A) overnight). This analysis clearly shows the areas expected to receive less or more overflights from the proposed changes to the flight paths flown under RRO. Population and dwelling estimates (based on the Australian Bureau of Statistics (ABS) 2021 Census), were then assessed to quantify the impact.

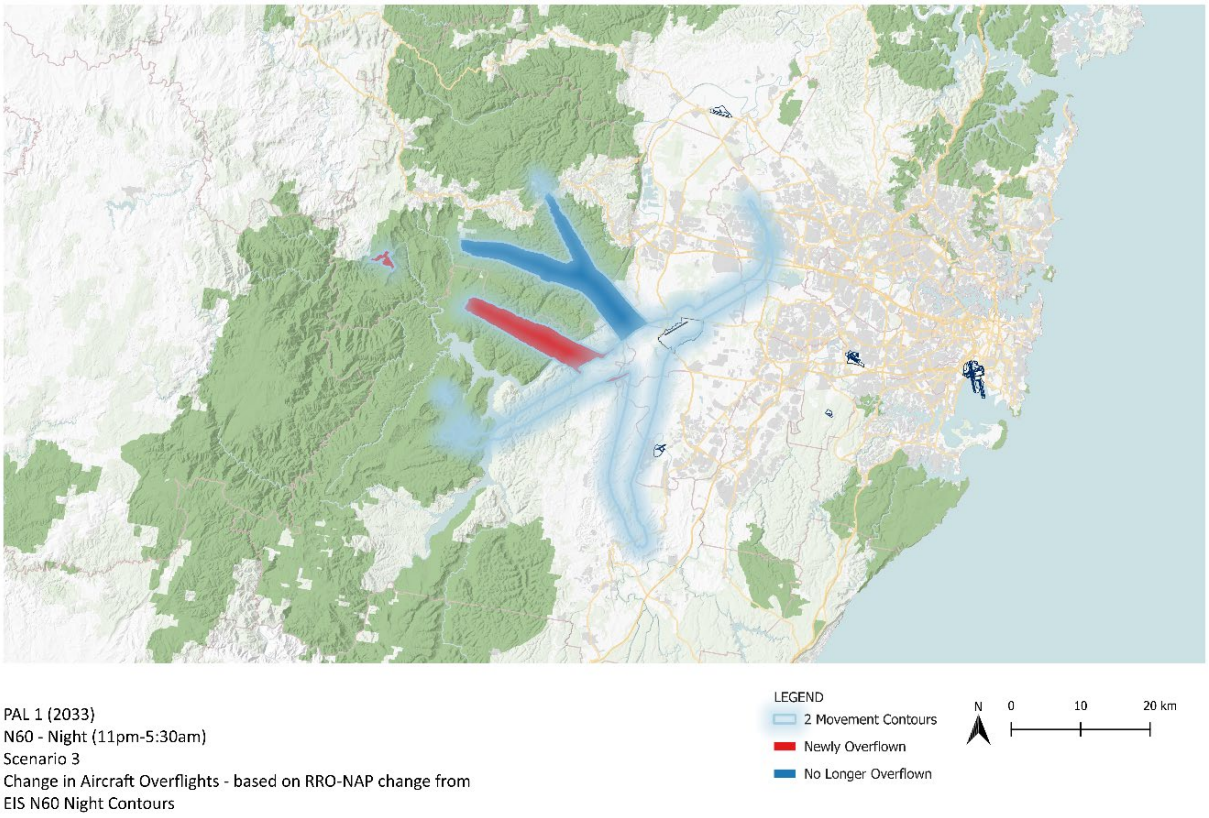
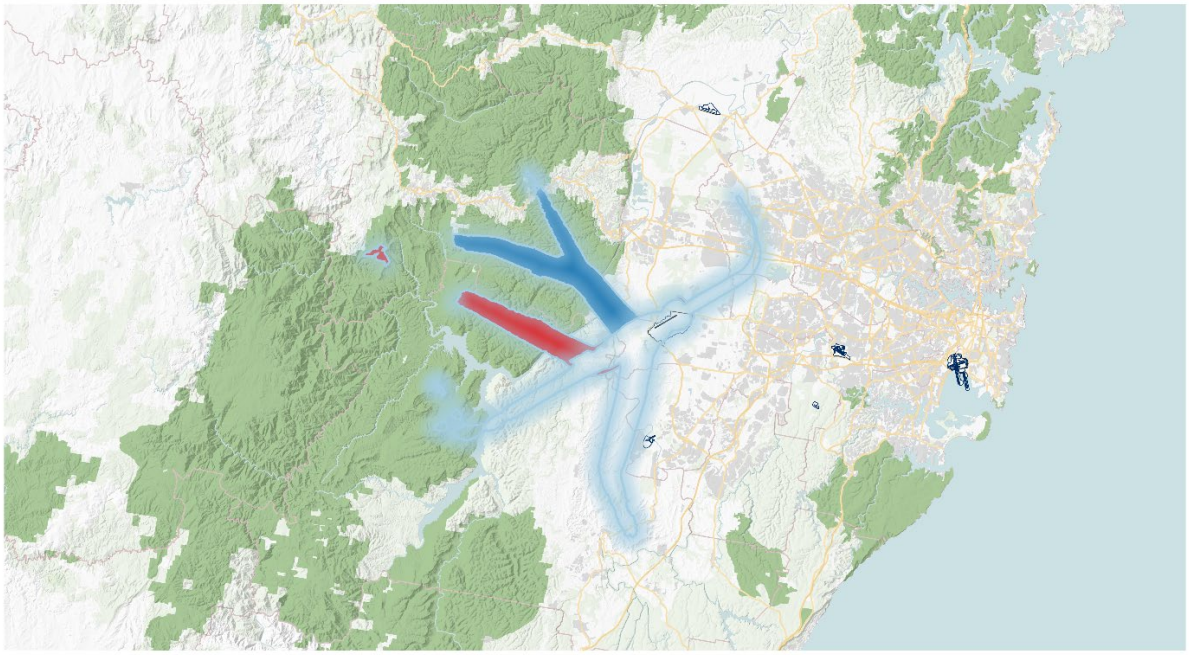
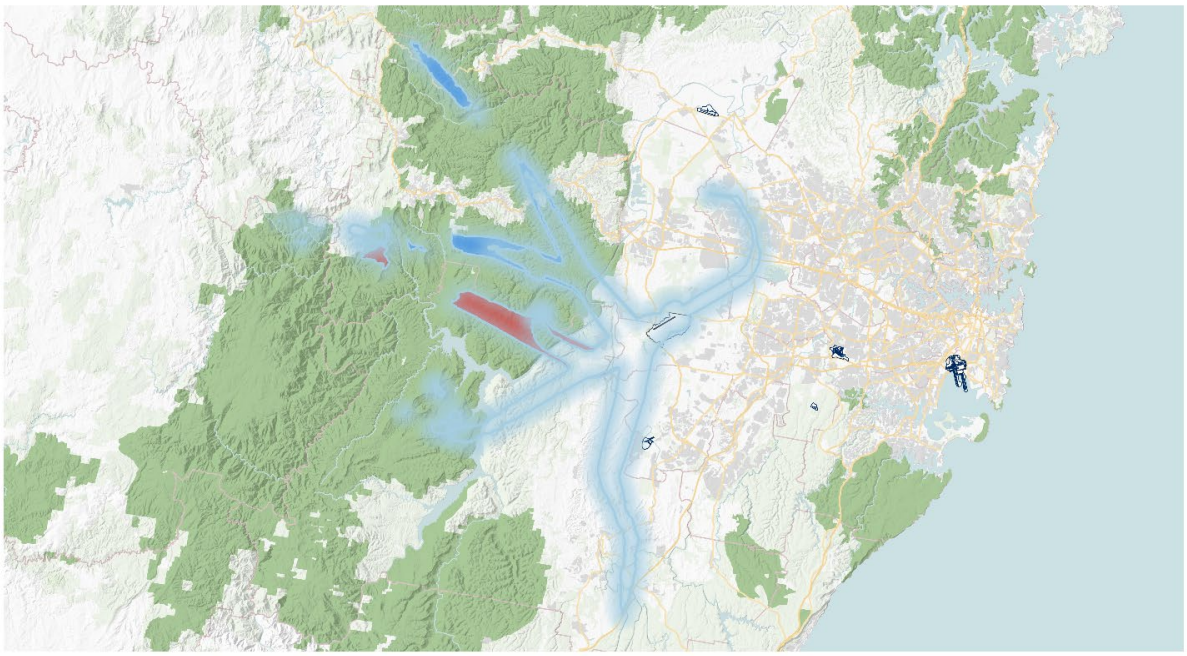


Figure 2.16 Comparative contours – N60 Night (11 pm to 5:30 am) – PAL 1 – Scenario 3 – 2-movements



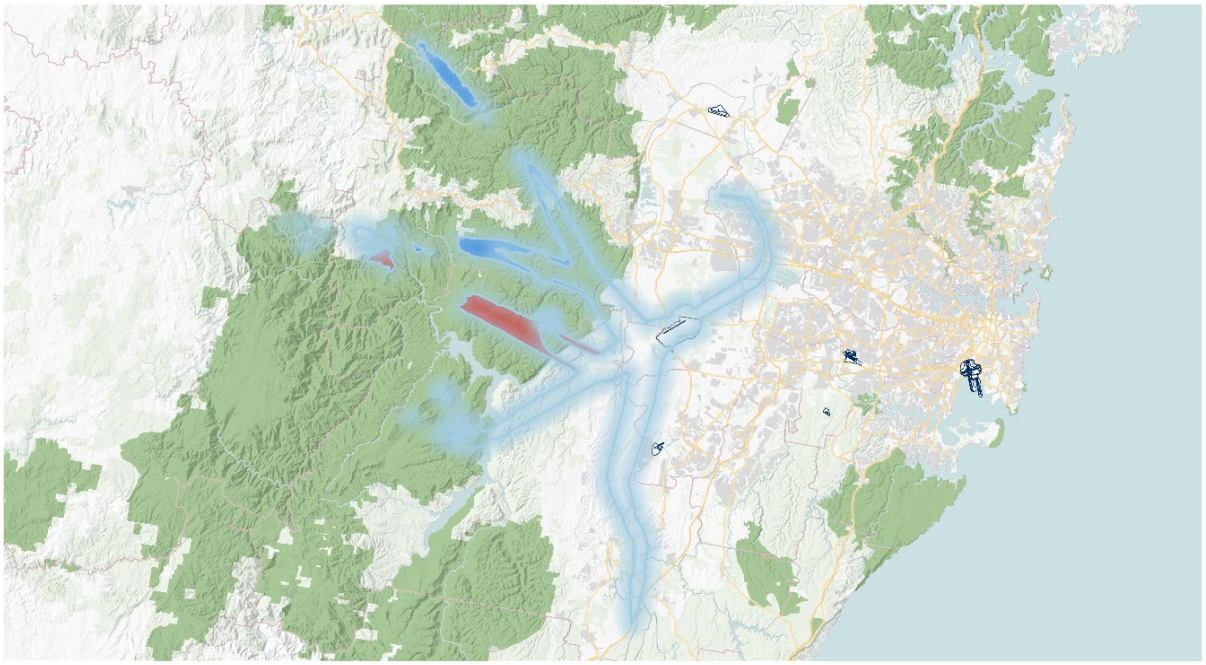
PAL 1 (2033)
N60 - Night (11pm-5:30am)
Scenario 4
Change in Aircraft Overflights - based on RRO-NAP change from EIS N60 Night Contours

Figure 2.17 Comparative contours – N60 Night (11 pm to 5:30 am) – PAL 1 – Scenario 4 – 2-movements



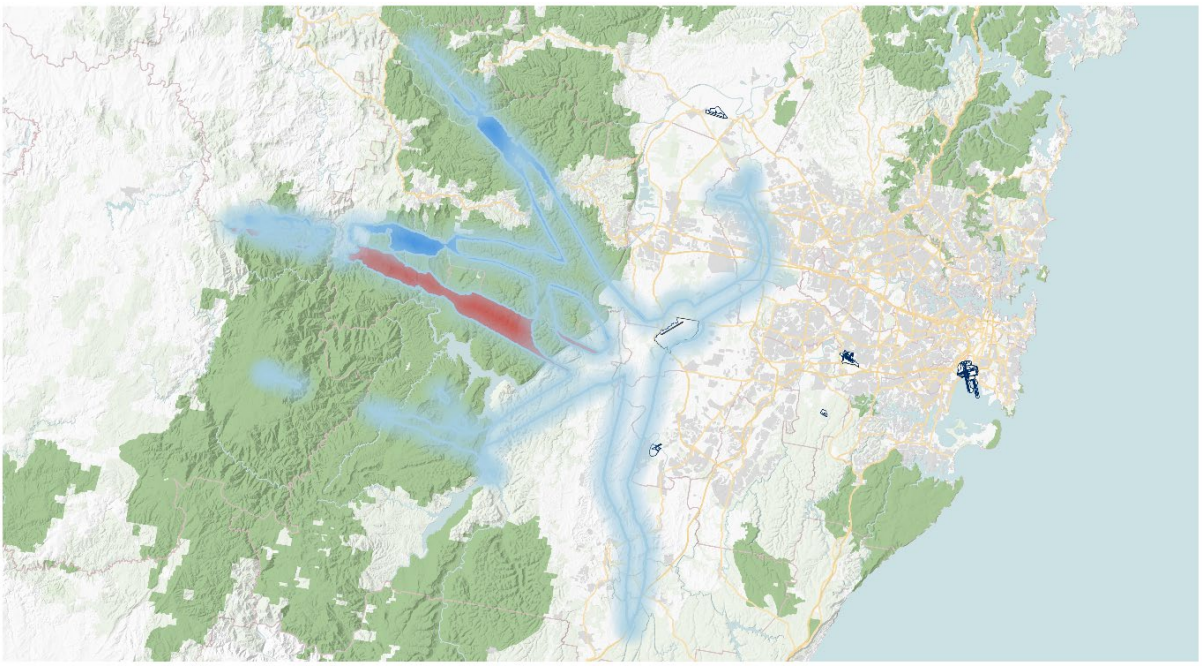
PAL 2 (2040)
N60 - Night (11pm-5:30am)
Scenario 3
Change in Aircraft Overflights - based on RRO-NAP change from EIS N60 Night Contours

Figure 2.18 Comparative contours – N60 Night (11 pm to 5:30 am) – PAL 2 – Scenario 3 – 2-movements



PAL 2 (2040)
N60 - Night (11pm-5:30am)
Scenario 4
Change in Aircraft Overflights - based on RRO-NAP change from EIS N60 Night Contours

Figure 2.19 Comparative contours – N60 Night (11 pm to 5:30 am) – PAL 2 – Scenario 4 – 2-movements



PAL 3 (2055)
N60 - Night (11pm-5:30am)
Scenario 3
Change in Aircraft Overflights - based on RRO-NAP change from EIS N60 Night Contours

Figure 2.20 Comparative contours – N60 Night (11 pm to 5:30 am) – PAL 3 – Scenario 3 – 2-movements

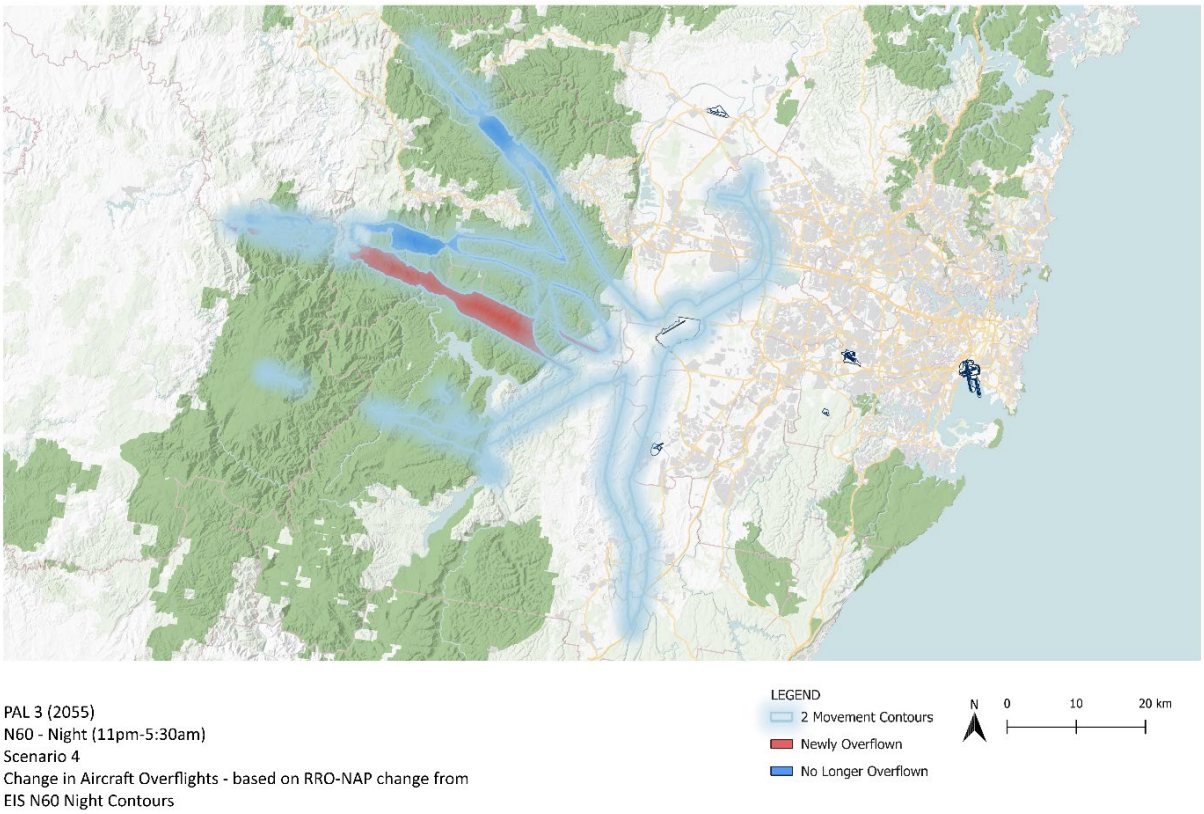


Figure 2.21 Comparative contours – N60 Night (11 pm to 5:30 am) – PAL 3 – Scenario 4 – 2-movements

The contours primarily highlight impacts to the Blue Mountains, with areas near Linden, Faulconbridge, Wallacia, and some parts of Silverdale experiencing a reduction in exposure to at least 2 events above 60 dB(A) per night, with areas further south now exposed to an increased frequency of aircraft movements above 60 dB(A).

This assessment provides an indicative area of impact associated with at least 2 movements per night on average above a threshold of 60 dB(A). Differential contours provide a more granular assessment of communities impacted by an increase or decrease in the frequency of aircraft movements and are provided in the following section.

2.3.4.2 Differential contours

To supplement the analysis of the difference in N60 night contours, additional analysis considered the absolute difference in the number of overflights. This better communicates the extent of the impacts, especially near the WSI airport site, where the proposed changes are expected to have the greatest impact.

This analysis involved calculating the difference in the number of movements observed at each point along a square grid of receptors spaced at 0.1 nm (0.185 km) centred on WSI's aerodrome reference point (ARP) stretching for 25 nm (46.3 km) in each direction. The mathematical difference has then been used to generate a set of concentric contours to show the difference in the number of movements expected by the change to north-east departures and subsequent inclusion of the new RRO-NAP flight paths.

The differences in the number of overflights anticipated for PAL 1 (2033), PAL 2 (2040) and PAL 3 (2055) under Scenario 3 (Runway 05 preference) and Scenario 4 (Runway 23 preference) are shown below.

Each of these contours was used to calculate the area and the number of dwellings and population anticipated to be impacted by each contour (number of movements: more or less).

The results of this analysis have been aggregated into two results tables following each figure. Table 2.1 identifies the communities that will experience a change of at least one movement. The communities listed are based on census area blocks and are aggregated based on Suburbs and Localities (SAL). This aggregation means that several contours can intersect with a statistical block which means that some communities will see both benefits and detriments. The second table shows an aggregated number of dwellings and population that are impacted based on one aircraft increment. This aggregation is looking across communities and provides a better breakdown of the quantity of movements to help quantify the impacts to homes and population more clearly than the counts within the larger statistical blocks. The counts within each of these tables do not represent the population exposed to any increase or decrease in movements compared to the Draft EIS but rather the difference in the number of people within the N60 Night 2 movement contours.

It is important to note that while some communities may experience more movements as detailed below, aircraft overflight will occur at higher altitudes and therefore, the noise impact will be more moderate than those communities that will see less movements.

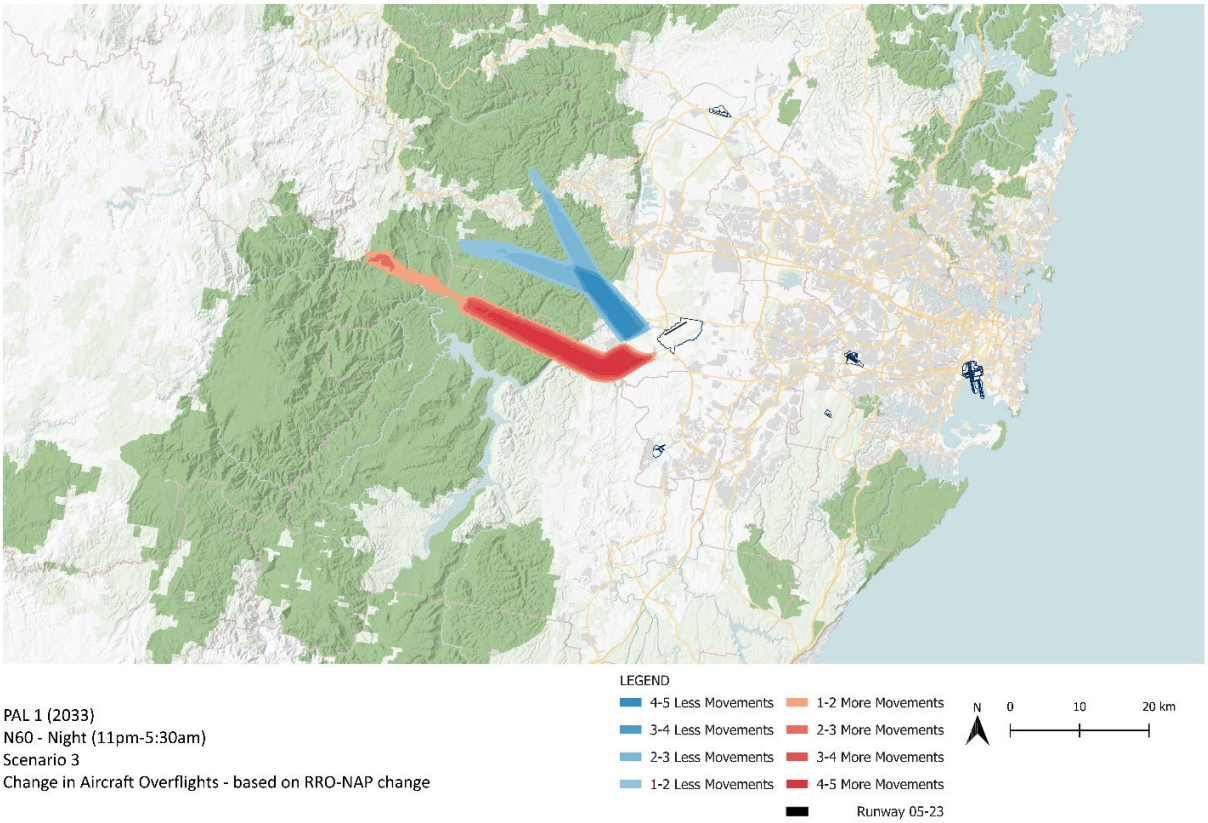


Figure 2.22 Differential contours – N60 Night (11 pm to 5:30 am) – PAL 1 – Scenario 3 – 2-movements

Table 2.1 Difference by census area (SAL) – N60 Night (11 pm to 5:30 am) – PAL 1 – Scenario 3

PAL1 Scenario 3	Increase exposure 2+ mvts per day		Decreased exposure 2+ mvts per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Wallacia			511	1,421	-80%	-86%
Mulgoa			101	306	-100%	-100%
Silverdale (NSW)	88	307			27%	29%
Linden (NSW)			75	163	-100%	-100%
Hassall Grove			25	82	-4%	-4%
Warragamba			24	56	-100%	-100%
Oakhurst			21	67	-5%	-5%
Sum	93	320	773	2,142		

Table 2.2 Difference by number of movements – N60 Night (11 pm to 5:30 am) – PAL 1 – Scenario 3

Change in movements	More movements			Less movements		
	Area	Dwellings	Population	Area	Dwellings	Population
1-2	53.3	126	348	46.1	128	409
2-3	54.4	108	273	25.0	99	320
3-4	10.7	117	347	23.5	84	279
4-5	27.6	478	1326	46.9	143	465

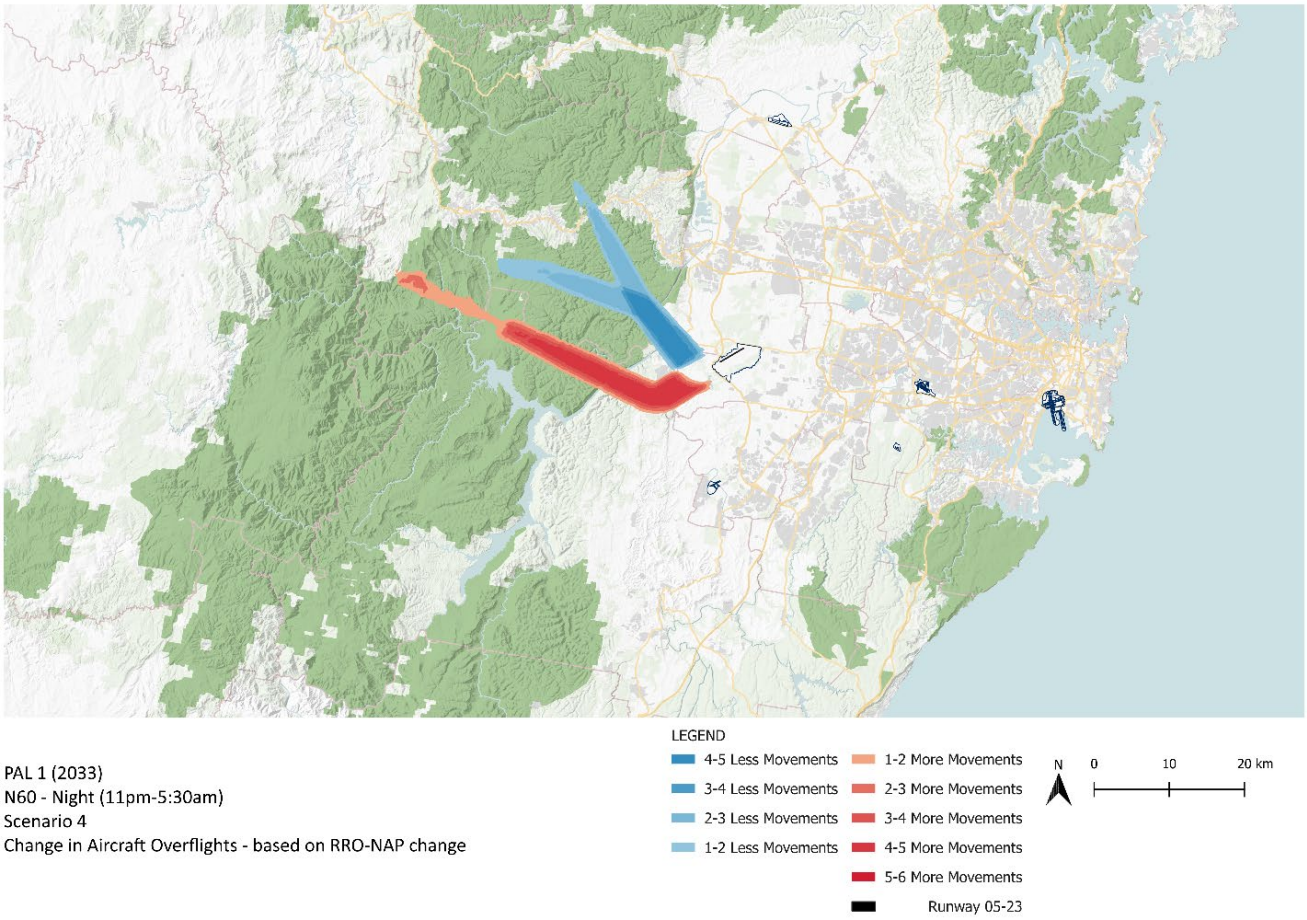


Figure 2.23 Differential contours – N60 Night (11 pm to 5:30 am) – PAL 1 – Scenario 4 – 2-movements

Table 2.3 Difference by census area (SAL) – N60 Night (11 pm to 5:30 am) – PAL 1 – Scenario 4

PAL1 Scenario 4	Increase exposure 2+ mvts per day		Decreased exposure 2+ mvts per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Wallacia			511	1,421	-88%	-86%
Mulgoa			101	305	-100%	-100%
Silverdale (NSW)	86	299			26%	28%
Linden (NSW)			75	163	-100%	-100%
Hassall Grove			24	56	-100%	-100%
Warragamba			24	77	-6%	-5%
Oakhurst			21	67	-3%	-3%
Sum	89	308	769	2,130		

Table 2.4 Difference by number of movements – N60 Night (11 pm to 5:30 am) – PAL 1 – Scenario 4

Change in movements	More movements			Less movements		
	Area	Dwellings	Population	Area	Dwellings	Population
1-2	53.2	126	346	46.2	128	409
2-3	54.4	108	273	25.0	99	320
3-4	10.7	117	347	23.4	84	279
4-5	27.6	478	1326	47.1	143	465

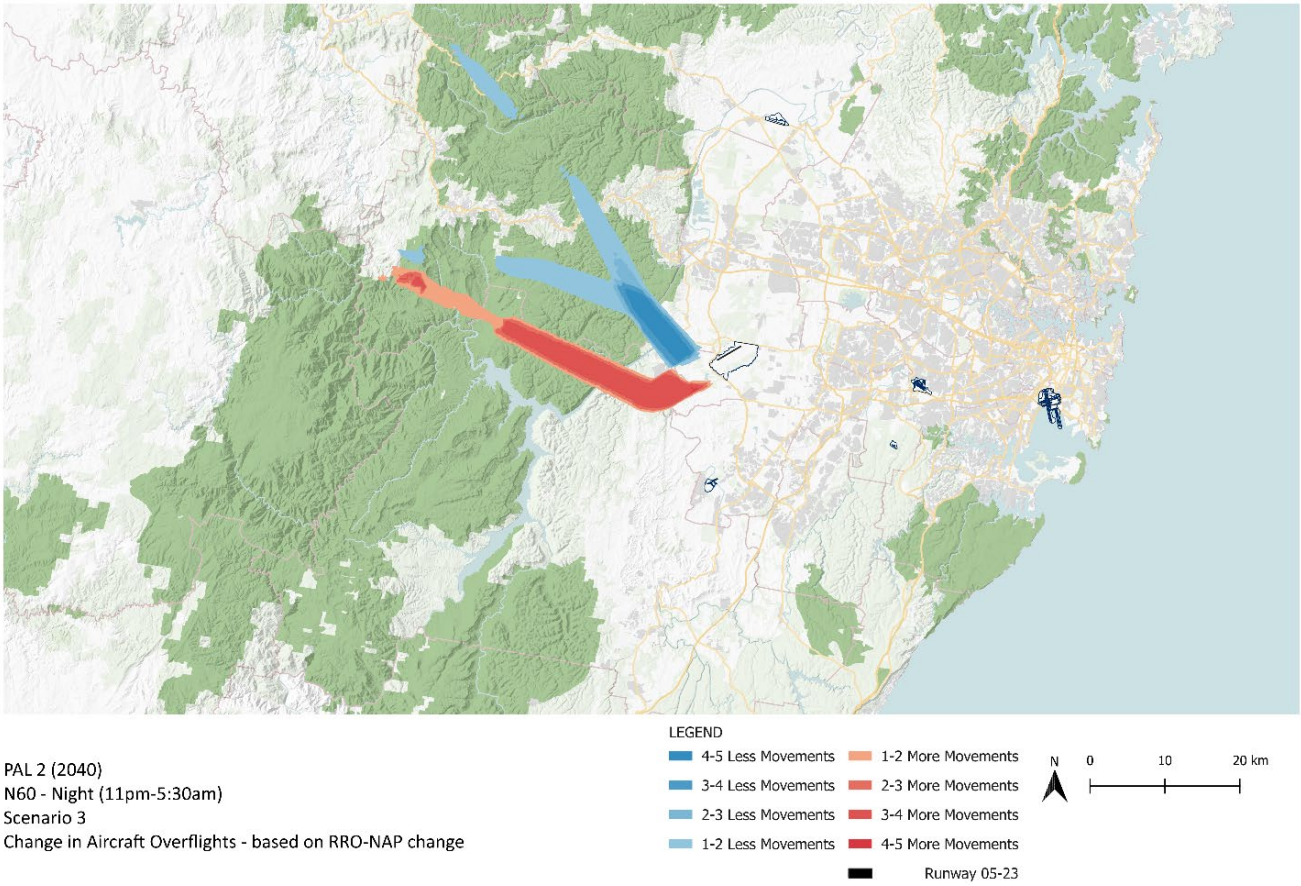


Figure 2.24 Differential contours – N60 Night (11 pm to 5:30 am) – PAL 2 – Scenario 3 – 2-movements

Table 2.5 Difference by census area (SAL) – N60 Night (11 pm to 5:30 am) – PAL 2 – Scenario 3

PAL2 Scenario 3	Increase exposure 2+ mvts per day		Decreased exposure 2+ mvts per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Silverdale (NSW)	87	289			20%	21%
Warragamba			55	130	-53%	-54%
Linden (NSW)			43	111	-36%	-40%
Oakhurst (NSW)	16	49			2%	2%
Hassall Grove	14	42			2%	1%
Mulgoa			9	29	-9%	-9%
Faulconbridge			7	21	-98%	-97%
Wallacia			7	21	-1%	-1%
Bidwell (NSW)			6	15	-10%	-11%
Glendenning			5	16	-3%	-3%
Plumpton (NSW)			4	11	-3%	-3%
Sum	125	409	140	370		

Table 2.6 Difference by number of movements – N60 Night (11 pm to 5:30 am) – PAL 2 – Scenario 3

Change in movements	More movements			Less movements		
	Area	Dwellings	Population	Area	Dwellings	Population
1–2	50.6	101	321	128.8	272	705
2–3	24.5	102	326	15.0	42	125
3–4	78.2	272	892	15.9	82	263
4–5	0.4	1	3	27.1	523	1,438

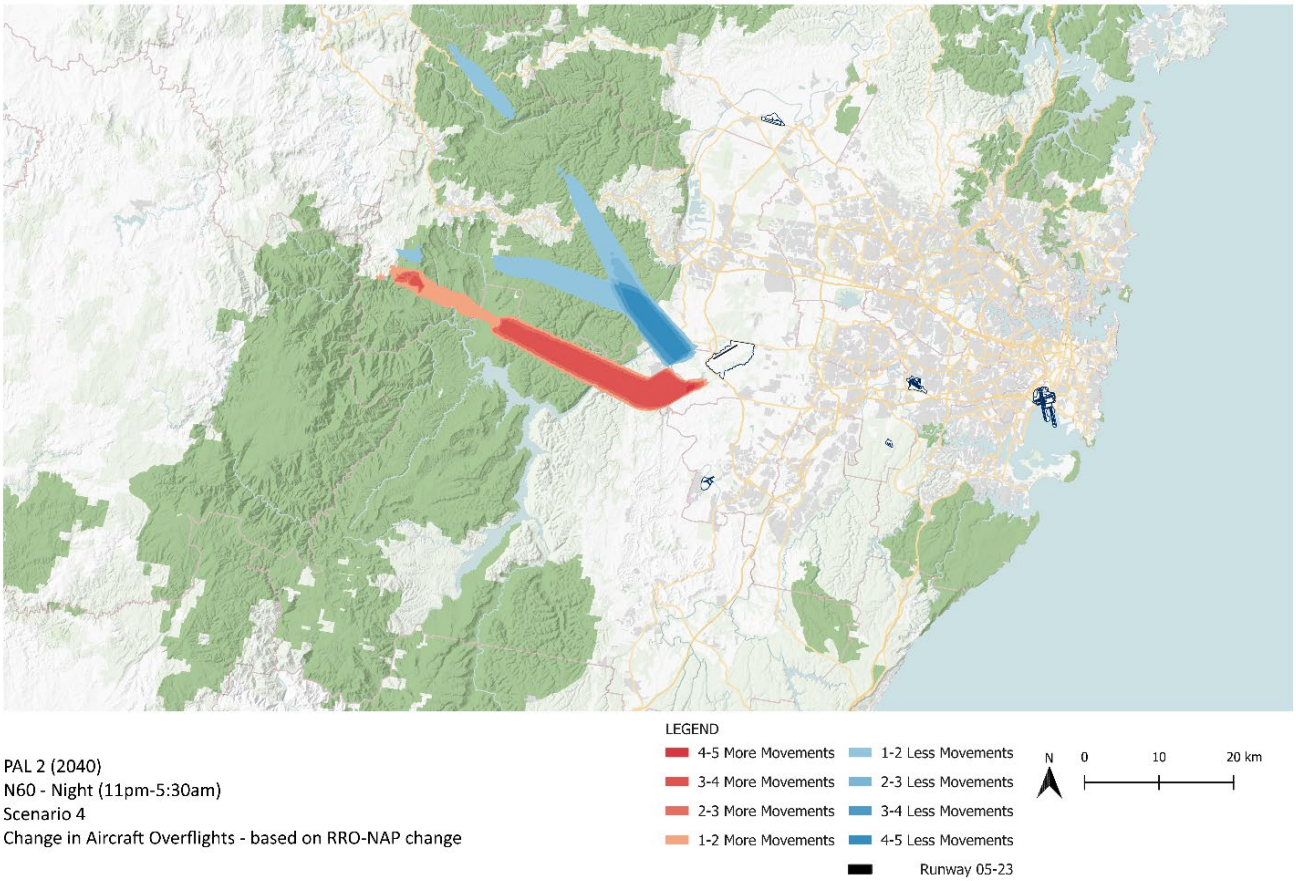


Figure 2.25 Differential contours – N60 Night (11 pm to 5:30 am) – PAL 2 – Scenario 4– 2-movements

Table 2.7 Difference by census area (SAL) – N60 Night (11 pm to 5:30 am) – PAL 2 – Scenario 4

PAL2 Scenario 4	Increase exposure 2+ mvts per day		Decreased exposure 2+ mvts per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Silverdale (NSW)	78	261			17%	18%
Warragamba			55	130	-53%	-54%
Linden (NSW)			43	111	-36%	-40%
Oakhurst (NSW)	18	54			3%	2%
Hassell Grove	13	39			1%	1%
Mulgoa			9	30	-9%	-9%
Bidwell (NSW)			7	19	-12%	-12%
Faulconbridge			7	21	-98%	-97%
Wallacia			7	21	-1%	-1%
Plumpton (NSW)			5	14	-4%	-3%
Minchinbury	4	14			10%	10%
Sum	117	385	140	370		

Table 2.8 Difference by number of movements – N60 Night (11 pm to 5:30 am) – PAL 2 – Scenario 4

Change in movements	More movements			Less movements		
	Area	Dwellings	Population	Area	Dwellings	Population
1–2	50.7	100	320	128.4	269	696
2–3	24.1	100	317	14.9	42	123
3–4	78.4	279	915	15.9	82	264
4–5	0.8	2	7	27.3	524	1,440

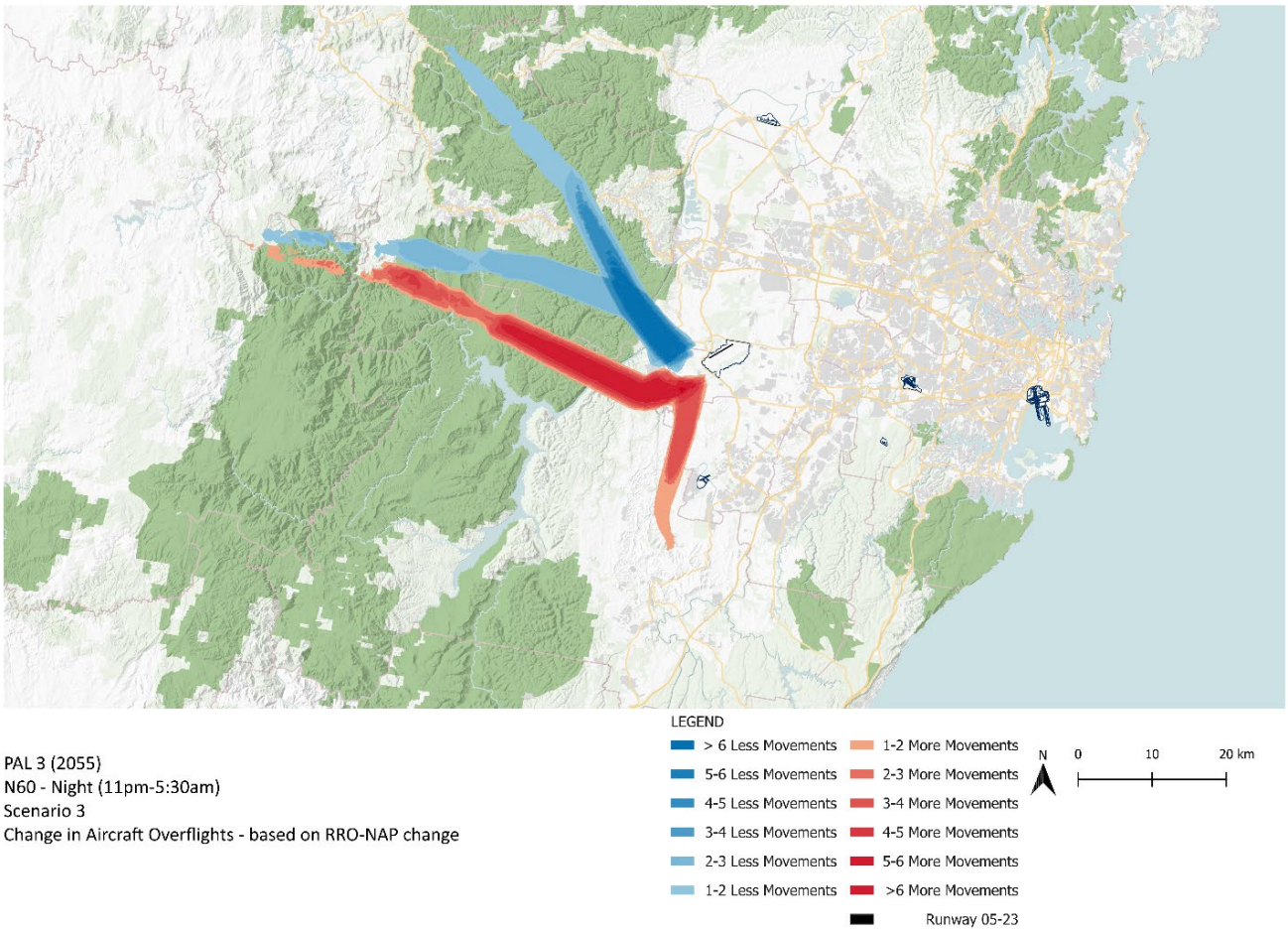


Figure 2.26 Differential contours – N60 Night (11 pm to 5:30 am) – PAL 3 – Scenario 3– 2-movements

Table 2.9 Difference by census area (SAL) – N60 Night (11 pm to 5:30 am) – PAL 3 – Scenario 3

PAL3 Scenario 3	Increase exposure 2+ mvts per day		Decreased exposure 2+ mvts per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Warragamba			264	610	-65%	-64%
Faulconbridge			137	383	-98%	-98%
Linden (NSW)			63	134	-31%	-28%
Oakhurst (NSW)	13	42			1%	1%
Razorback	11	33			6%	6%
Bringelly	9	30			68%	68%
Wallacia			9	26	-1%	-2%
Mulgoa			7	23	-7%	-7%
Doonside	7	18			71%	66%
Plumpton (NSW)			5	23	-2%	-2%
Cobbitty	5	15			5%	5%
Bidwell (NSW)			4	11	-2%	-2%
Hassall Grove			4	12	0%	0%
Minchinbury	3	11			7%	7%
Glendenning			3	11	-1%	-1%
Sum	64	196	505	1,257		

Table 2.10 Difference by number of movements – N60 Night (11 pm to 5:30 am) – PAL 3 – Scenario 3

Change in movements	More movements			Less movements		
	Area	Dwellings	Population	Area	Dwellings	Population
1–2	67.2	291	921	126.9	545	1,483
2–3	44.0	147	485	119.3	365	952
3–4	61.0	241	776	11.9	79	205
4–5	30.9	96	320	25.8	106	267
5–6	55.6	112	361	9.0	24	76
6–7	3.5	9	28	41.6	583	1,630

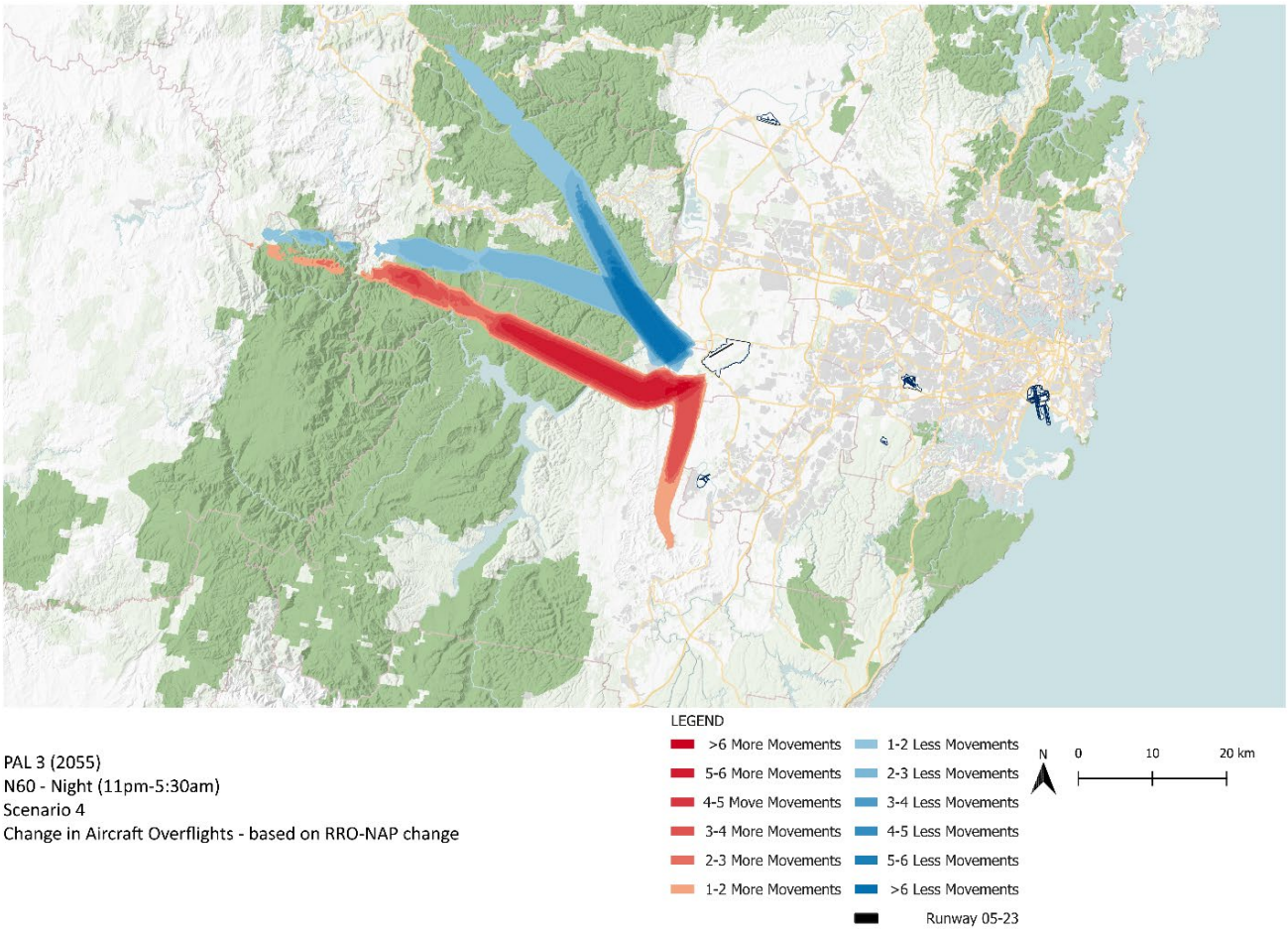


Figure 2.27 Differential contours – N60 Night (11 pm to 5:30 am) – PAL 3 – Scenario 4– 2-movements

Table 2.11 Difference by census area (SAL) – N60 Night (11 pm to 5:30 am) – PAL 3 – Scenario 4

PAL3 Scenario 4	Increase exposure 2+ mvts per day		Decreased exposure 2+ mvts per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Warragamba			264	610	-65%	-64%
Faulconbridge			137	383	-98%	-98%
Linden (NSW)			63	132	-30%	-28%
Oakhurst (NSW)	13	41			1%	1%
Razorback	11	33			6%	6%
Bringelly	9	30			68%	68%
Wallacia			9	26	-1%	-2%
Doonside	9	24			58%	57%
Mulgoa			8	25	7%	8%
Plumpton (NSW)			5	25	-2%	-2%
Cobbitty	5	15			5%	5%
Glendenning			4	14	-2%	-2%
Hassell Grove			4	13	0%	0%
Bidwell (NSW)			4	11	-2%	-2%
Minchinbury	3	11			7%	7%
	64	198	512	1,283		

Table 2.12 Difference by number of movements – N60 Night (11 pm to 5:30 am) – PAL 3 – Scenario 4

Change in movements	More movements			Less movements		
	Area	Dwellings	Population	Area	Dwellings	Population
1–2	83.1	468	1,476	141.4	578	1,566
2–3	49.0	197	646	115.3	343	907
3–4	61.6	213	686	12.0	87	228
4–5	31.8	104	344	22.3	104	261
5–6	51.4	83	271	13.3	28	85
6–7	6.1	35	113	41.6	583	1,629

The results of these analyses show several areas that will likely experience both benefits and drawbacks from the changes to RRO.

Suburbs located under the RRO flight path heading north will benefit from improvements at each PAL, including Wallacia, Mulgoa and Falconbridge, when compared with the Draft EIS. In PAL 1 (2033), the N60 night contours for 2 movements (60 dBA and above) show overflights in Wallacia dropping below this threshold with the introduction of RRO-NAP.

For PAL 2 (2040), the N60 night contours for 2 movements (60 dBA and above) show benefits in Falconbridge. However, the differential contours do highlight the extended benefits (in blue) over Wallacia and Mulgoa when compared to the Draft EIS.

For PAL 3 (2055), the N60 night contours for 2 movements (60 dBA and above) show benefits mostly above the GBMA. The differential contours highlight again the reduction in movements (in blue) over Wallacia, Mulgoa and Falconbridge, when compared to the EIS. The increase in overflights of the communities to the south of WSI is expected to areas between The Oaks and Camden Airport. This area is overflown by more departing aircraft as they climb in altitude before turning east to track towards various Trans-Pacific destinations.

Details of the geographic spread of each statistical area (SAL) are illustrated in Figure A.1 of Appendix A.

2.3.5 N-above 24-hour contours

The most observable impacts of the proposed changes are the increase in the maximum noise level over parts of the Sydney Basin and the increase in the number of movements above 60 dB(A) overnight. To confirm the assumption that other metrics are less likely to change, the Number above 24-hour metrics have also been assessed at both the 60 dB(A) and the 70 dB(A) thresholds.

Figures 2.24 to 2.27 indicate minor contractions around the sharp right turn as flown on the RRO flight paths. This contraction is aligned with anticipated results as traffic is being diverted along a flight path that follows the extended runway centreline for 5 nm (9.3 km) before turning toward the west.

Overall, the impact of the implementation of the changes has minimal impacts on 24-hour noise exposure.

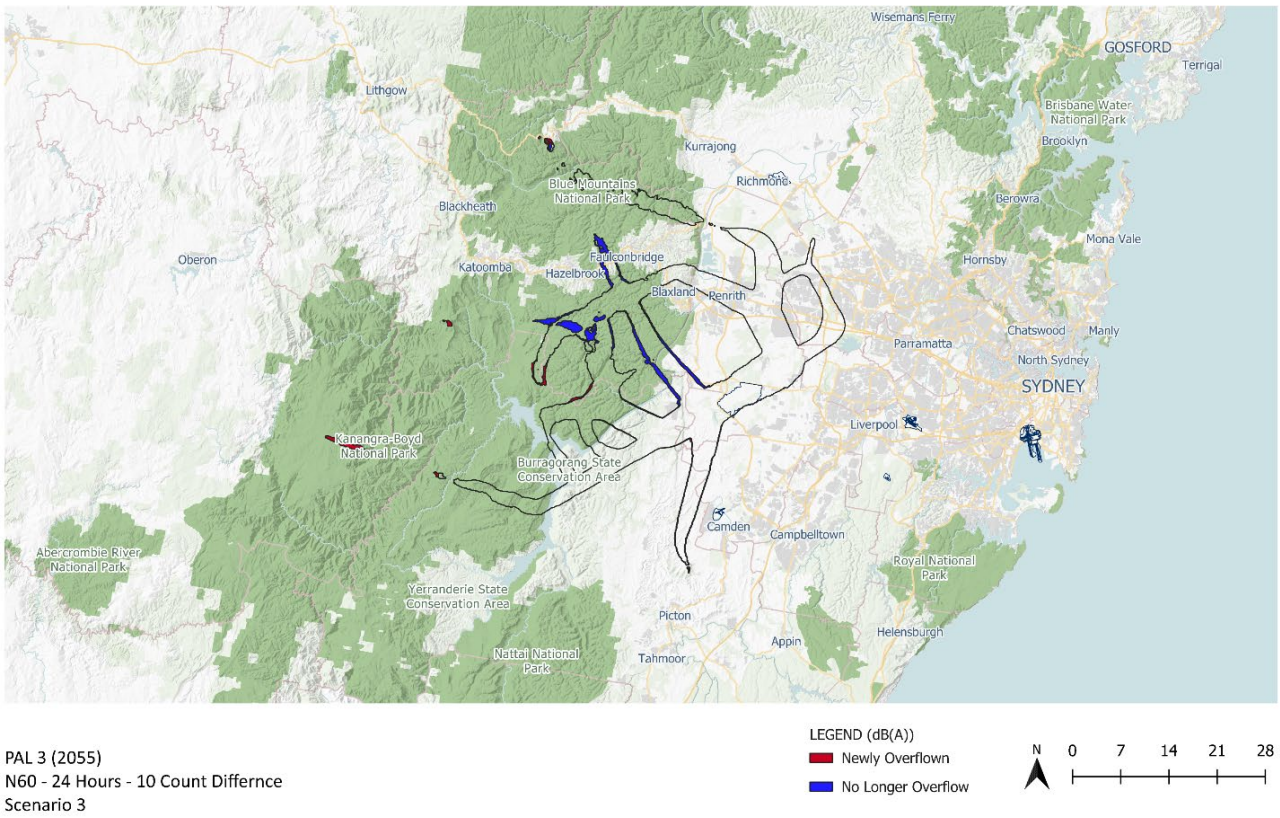
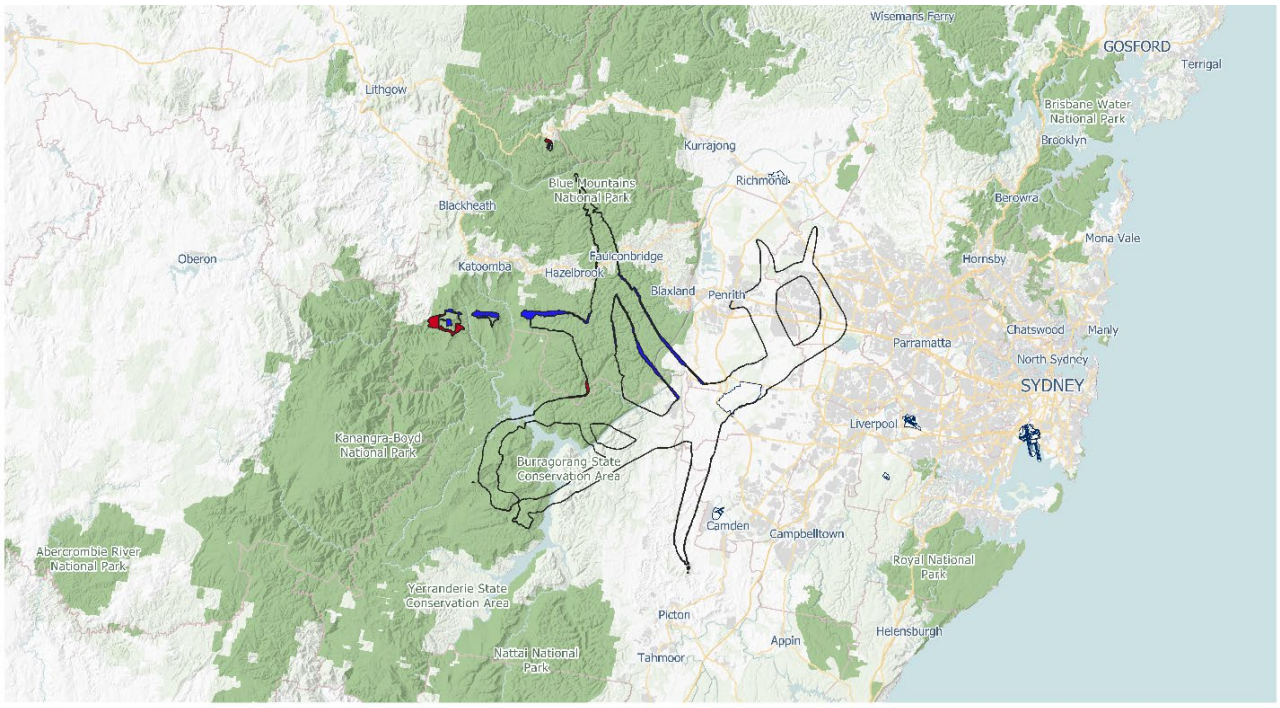
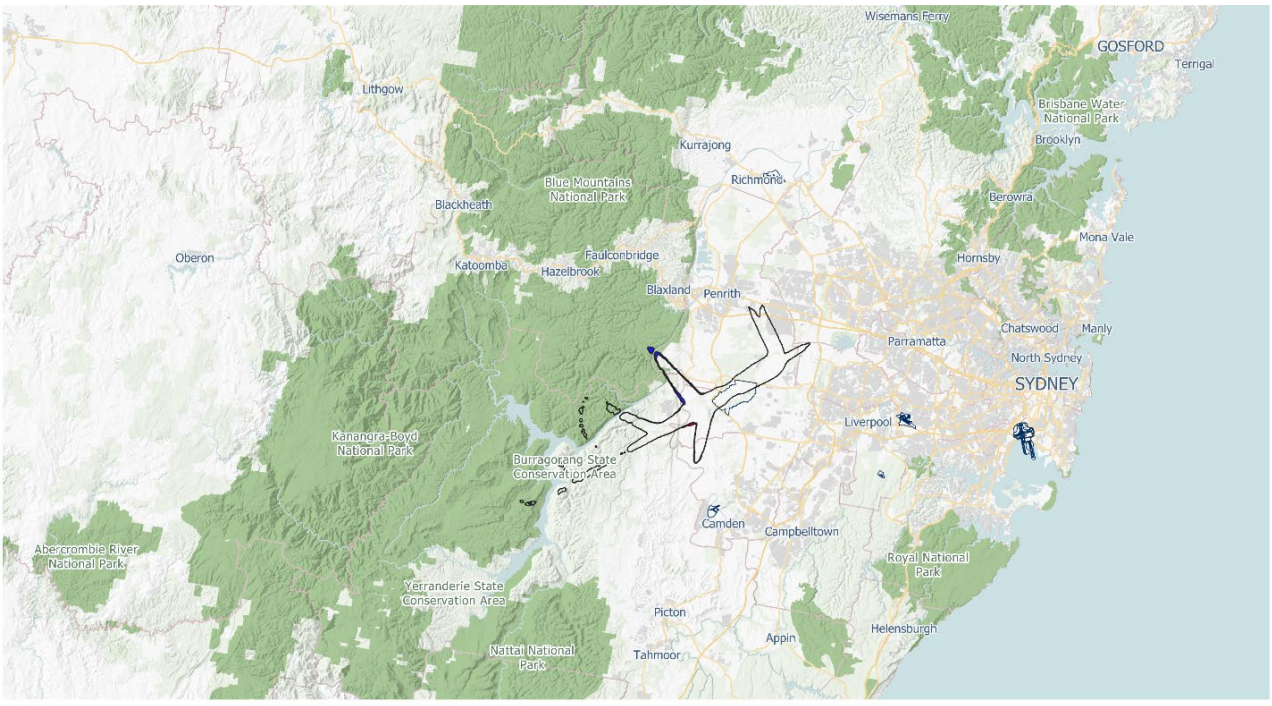


Figure 2.28 Comparative contours – N60 24-hour – PAL 3 – Scenario 3 – 10-movements



PAL 3 (2055)
N60 - 24 Hours - 10 Count Differnce
Scenario 4

Figure 2.29 Comparative contours – N60 24-hour – PAL 3 – Scenario 4 – 10-movements



PAL 3 (2055)
N70 - 24 Hours - 5 Count Differnce
Scenario 3

Figure 2.30 Comparative contours – N70 24-hour – PAL 3 – Scenario 3 – 5-movements

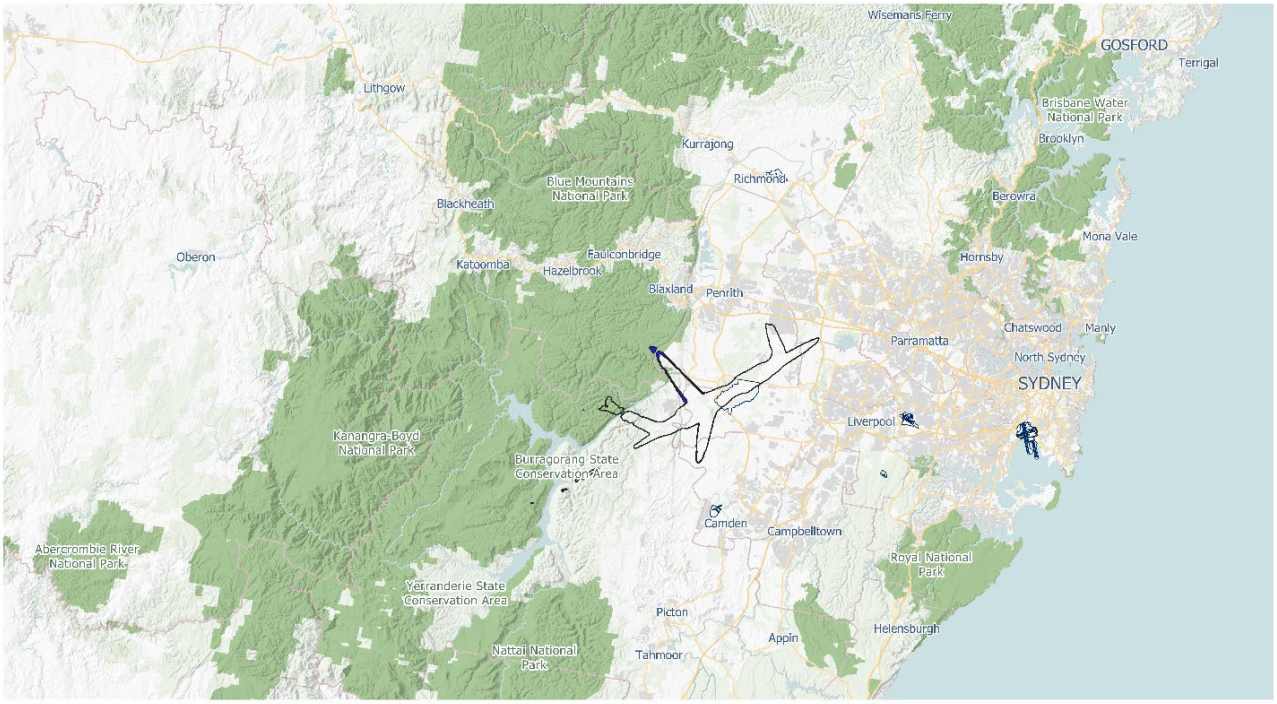


Figure 2.31 Comparative contours – N70 24-hour – PAL 3 – Scenario 4 – 5-movements

2.3.6 Noise sensitive receptors

Beyond the use of flight path and respite charts as well as noise contours, a review has been undertaken of the variation in cumulative exposure at several noise sensitive receptors (NSRs) across the Sydney Basin and the Greater Blue Mountains Area. For the L_{Aeq} night (11 pm to 5:30 am) noise metric, the extent of the variation of any NSR is highlighted with a L_{Aeq} at or above 30 dB(A), and with a L_{Amax} at or above 50 dB(A). For L_{Amax}, only the locations are highlighted that have experienced a change compared with the 2023 Draft EIS.

The potential benefits in average noise levels are shown along the path of the northbound RRO flight path and Faulconbridge/Linden. For L_{Amax}, the impacts are limited to the centreline of the runway towards the south-west (and the north-east flight path) since generally aircraft will keep operating along RRO flight paths even when RRO-NAP is in use.

Figures 2.32 to 2.35 illustrate these results.

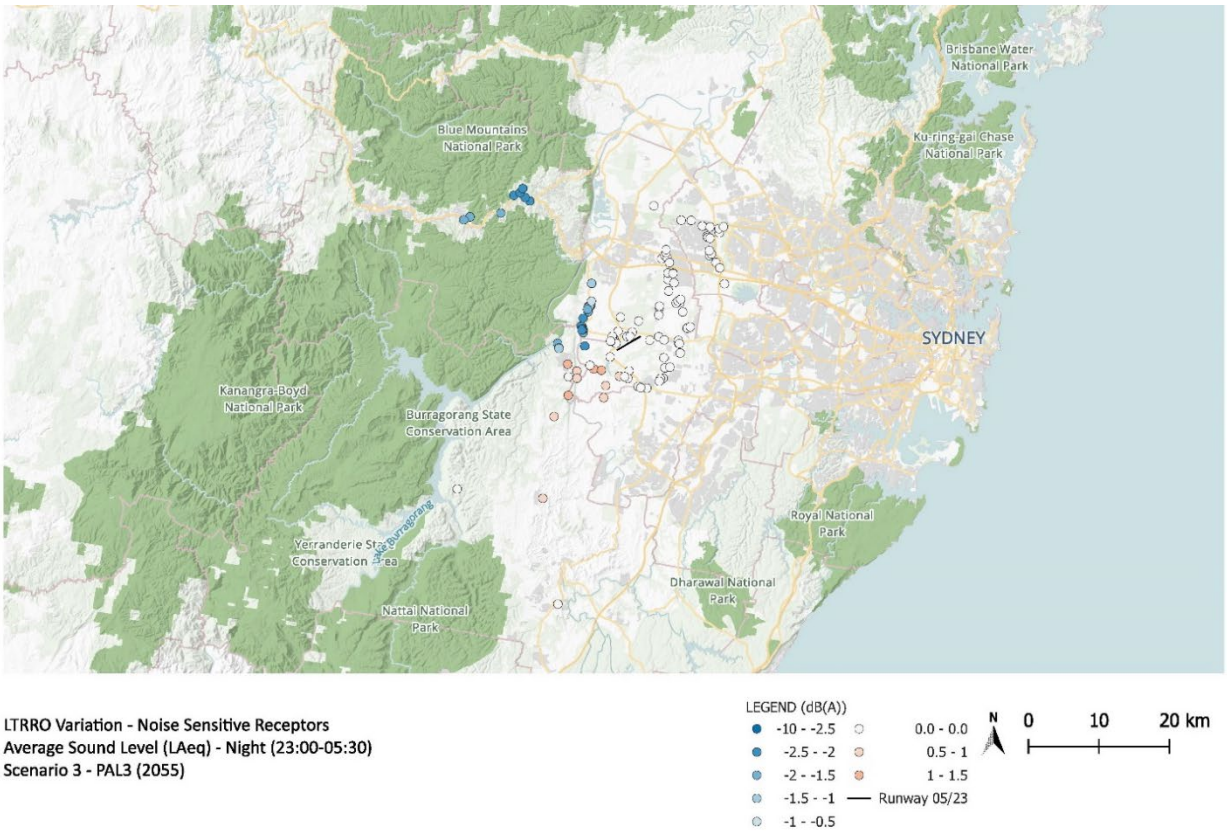


Figure 2.32 Noise sensitive receptors – L_{Aeq} Night (11 pm to 5:30 am) variation – PAL 3 – Scenario 3

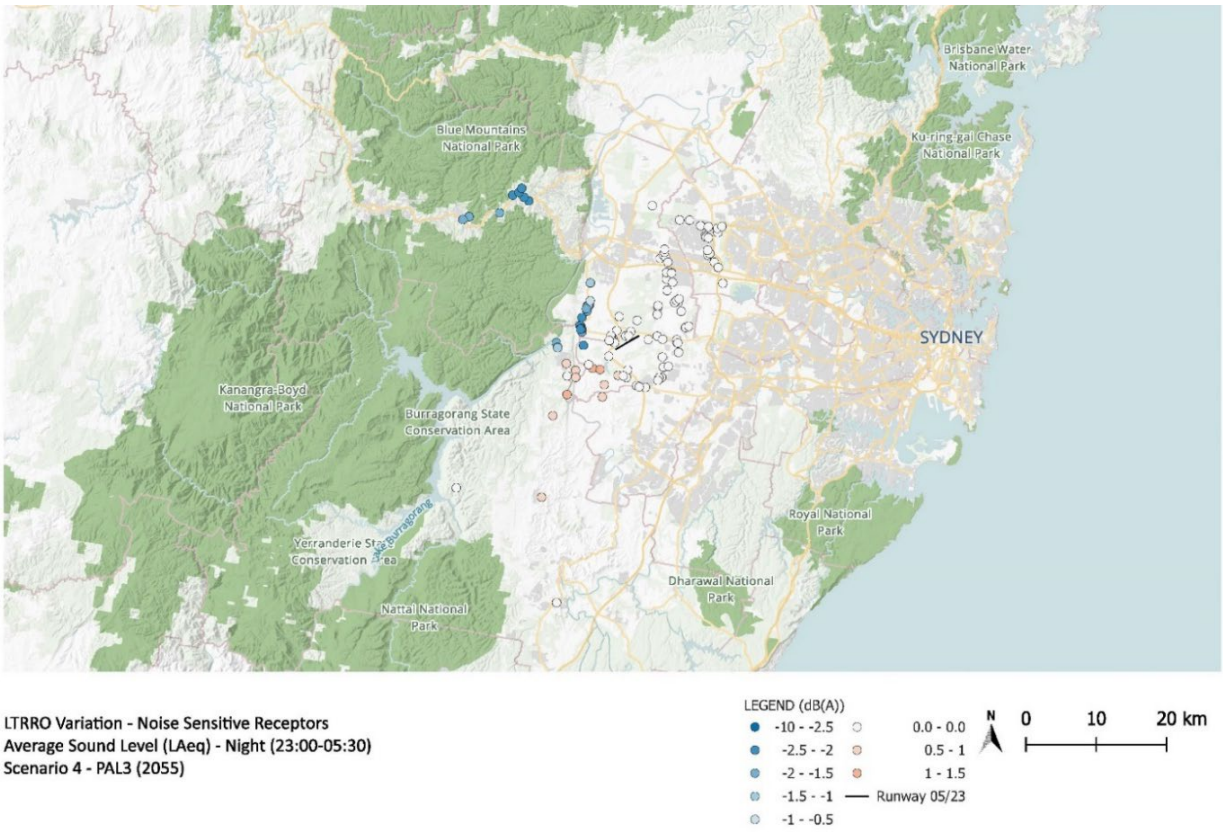


Figure 2.33 Noise sensitive receptors – L_{Aeq} Night (11 pm to 5:30 am) variation – PAL 3 – Scenario 4

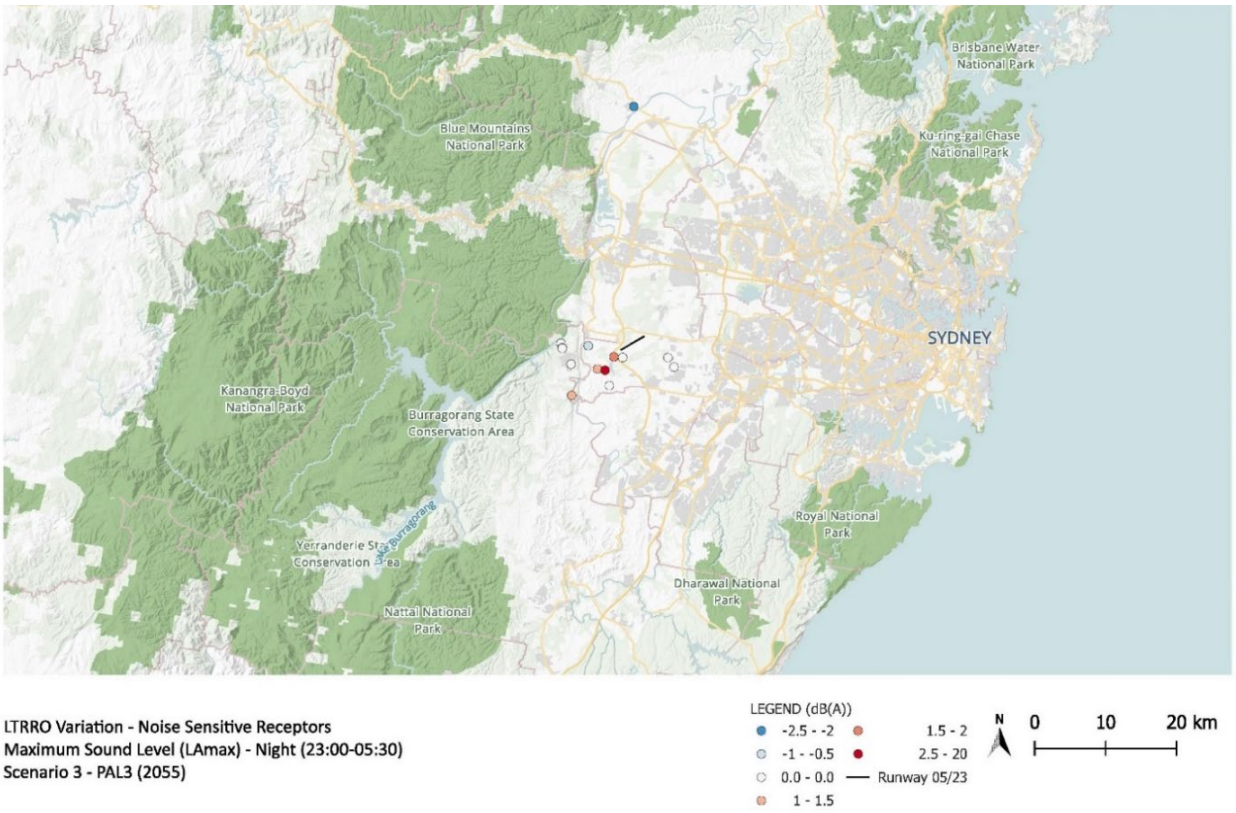


Figure 2.34 Noise sensitive receptors – L_{Amax} Night (11 pm to 5:30 am) variation – PAL 3 – Scenario 3

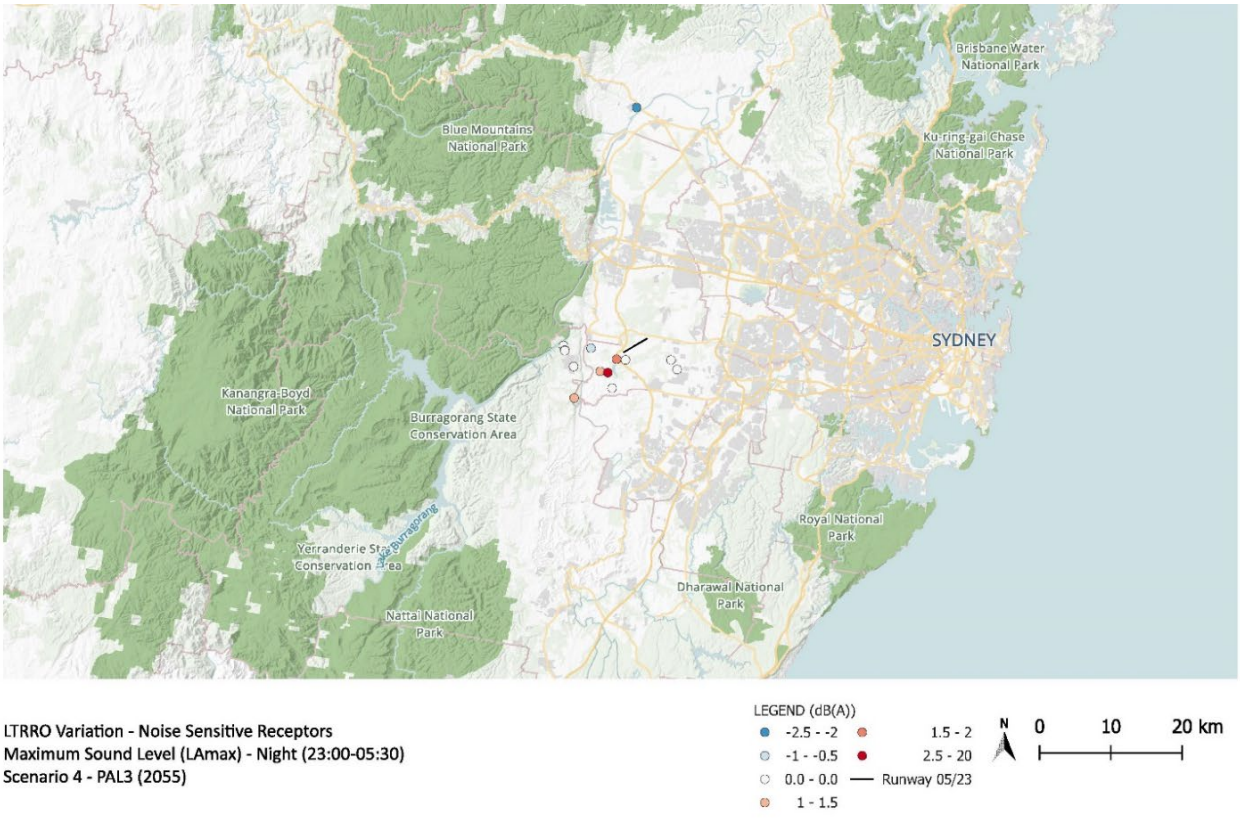


Figure 2.35 Noise sensitive receptors – L_{Amax} Night (11 pm to 5:30 am) variation – PAL 3 – Scenario 4

2.3.7 Potential impact on Greater Blue Mountains Area

The changes proposed in the RRO flight paths potentially impact the Greater Blue Mountains Area (GBMA). The proposed changes redistribute a portion of the traffic further south over a different part of the Lower Blue Mountains because aircraft fly along an extended runway centreline.

The redistribution of aircraft producing at least 60 dB(A) is shown in Figure 2.36. Blue areas represent an average decrease of at least 2 less movements per night; red areas show an average increase of at least 2 more movements of at least 60 dB(A) (compared to the Draft EIS).

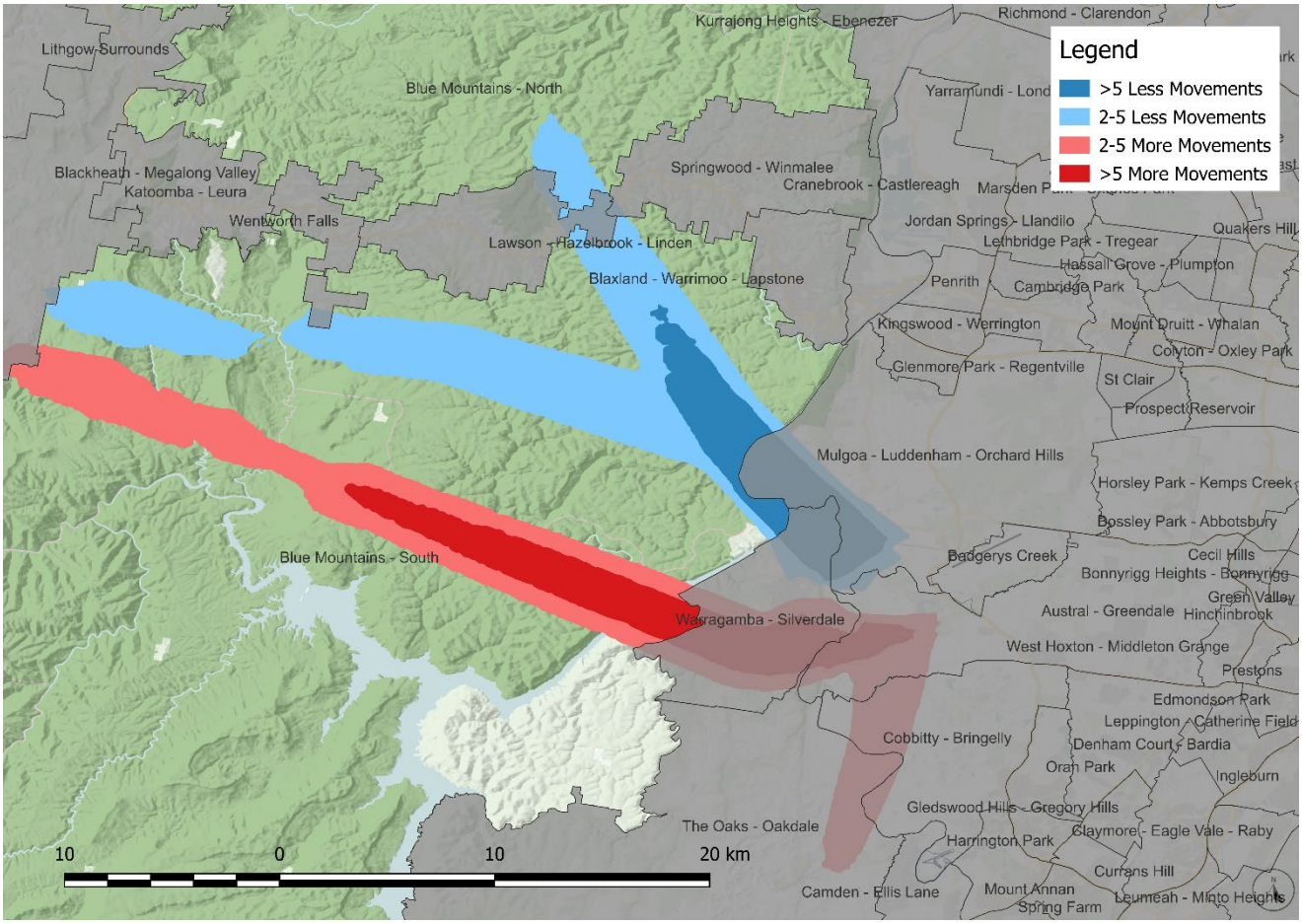


Figure 2.36 Differential contours – N60 Night (11 pm to 5:30 am) – PAL 3 – Scenario 3

Table 2.13 provides the areas exposed to an increase (red) or decrease (blue) of at least one movement per night on average at PAL 3 (2055). This highlights the noticeable impact of the implementation of RRO-NAP in redistributing movements over the GBMA. Scenario 3 is shown in both Figure 2.36 and Table 2.13, noting the modelled noise impacts are virtually the same for both Scenario 3 and Scenario 4. Results in Table 2.13 are shown by the statistical area level 2 (SA2) rather than SAL due to the size of the area and relative population.

Table 2.13 Area difference by census area – N60 Night (11 pm to 5:30 am) – PAL 3 – Scenario 3

SA2 census area	Total area (km^2)	Less movements			More movements		
		>5	2–5	1–2	1–2	2–5	>5
Blue Mountains – North	595.0	–	10.1	69.9	–	–	–
Blue Mountains – South	2456.9	24.3	122.4	28.7	22.5	76.3	34.5

2.4 Interaction with other Sydney Basin operations

2.4.1 Sydney (Kingsford Smith) Airport

Operations and facilitated airspace changes will not be impacted at all, as the proposed WSI RRO departure flight path changes occur during the Sydney (Kingsford Smith) Airport curfew period between 11 pm and 6 am local time. Under the *Sydney Airport Curfew Act 1995,* a limited number of aircraft types can operate at Sydney (Kingsford Smith) Airport during the curfew, either as allowed planned operations by mostly propeller driven aircraft or light jets, emergency operations exemptions, or very rarely because of a dispensation under the *Sydney Airport Curfew Act 1995*. Any possible interaction from these allowed Sydney (Kingsford Smith) Airport movements and the proposed RRO-NAP for northern and western departure traffic will be managed by air traffic control. Air traffic control will apply vertical or lateral separation or radar vectors to aircraft to ensure separation safety is always maintained. As the majority of Sydney (Kingsford Smith) Airport traffic during the curfew period (11 pm to 6am local time) is processed on flight paths east of the coast and the proposed WSI RRO departures are designed to proceed west of the Nepean River, the interaction of Sydney (Kingsford Smith) Airport and WSI traffic during the Sydney (Kingsford Smith) Airport curfew period is expected to be confined to periods of bad weather (e.g., thunderstorm activity) and even then will be an extremely remote possibility.

The move of north-eastern WSI departures to the Runway 23 Southern SID (**D32**) will not impact any Sydney (Kingsford Smith) Airport aircraft as this WSI departure already exists in the design.

2.4.2 RAAF Base Richmond Airport

The only possible impact could be with the STAR from the west to RAAF Base Richmond Airport. The existing RRO RWY 23 northern and western departure flight paths are already designed to cross above this RAAF Base Richmond Airport STAR thereby ensuring vertical separation at the point of crossing. The proposed RRO-NAP northern and western departures will have slightly more track miles to run than the existing departure flight path before crossing the western RAAF Base Richmond Airport STAR and therefore will be able to meet the altitude requirement more readily to safely separate aircraft on these procedures. The existing published statement that the RAAF Base Richmond Airport **"STAR is separated with all WSI and other Sydney Basin flight paths"** will still be accurate.

All other STARs and SIDs facilitated changes at RAAF Base Richmond Airport are clear of the proposed new RRO-NAP flight paths.

2.4.3 Bankstown Airport

No impact on the new Bankstown Airport SIDs as those SIDs all end in a requirement for aircraft to be radar vectored prior to any interaction with the proposed RRO-NAP departures changes taking place. The proposed western STAR into Bankstown Airport is well south of the proposed new RRO-NAP and will not be impacted.

2.4.4 Camden Airport

The vertical profile of the north-west STAR to Camden Airport is designed to allow WSI departures to readily meet a requirement to climb above it between waypoints NB059 and NB210. RRO-NAP departures will also allow aircraft to readily climb above the Camden Airport STAR. On the very rare occasion, where conflict between aircraft on these procedures is anticipated (e.g., thunderstorm activity), one or both aircraft will be managed by air traffic control to ensure separation is maintained.

2.4.5 Western Transit Route

This Transit Route is designed as a low level (10,000 ft or below) route to allow non-pressurised aircraft to cross the Sydney Basin Airspace well clear of the congested airspace east of the Nepean River. All WSI flight paths, both arrivals and departures, have been designed to ensure vertical separation exists when crossing this low-level route. The existing published statement will continue to apply to overflights during RRO-NAP departure procedures. The publication states that aircraft on this route that may be **".... inside CTA, will be separated by Air Traffic Control."**

2.4.6 Sydney Basin Visual Flight Rules (VFR) Operations

No impact.

2.4.7 Conclusion

Implementation of the proposed changes to RRO will not impact the facilitated changes associated with other tracks in the Sydney Basin during normal operations. Emergency response and/or weather activity may require any possible interaction to be managed by air traffic control.

Appendix A

SAL blocks used to identify impacts

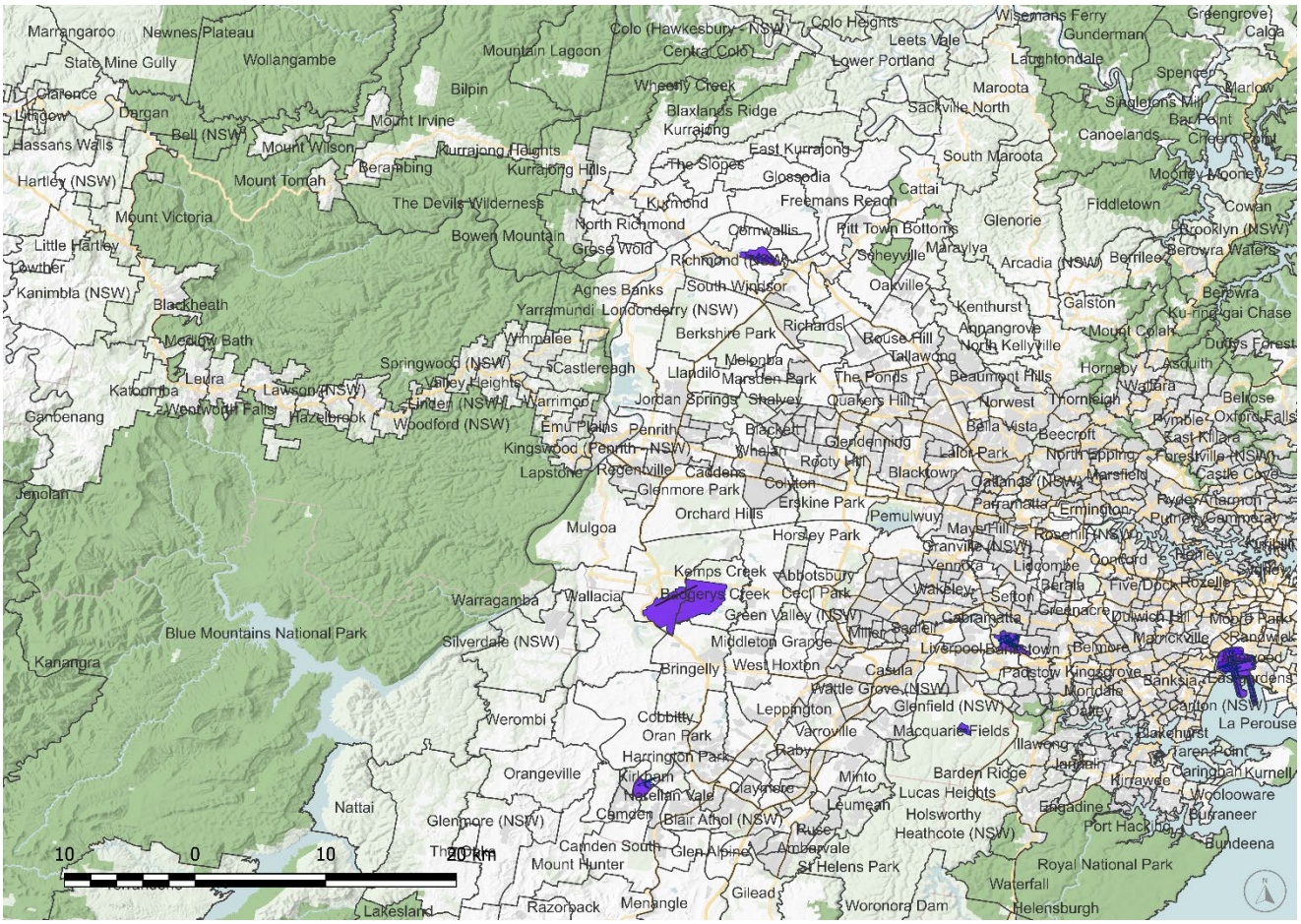


Figure A.1 Suburbs and Localities (SAL) blocks and community names used to identify impacts

Table A.1 Difference by census area (SAL) – N60 Night (11 pm to 5:30 am) – PAL 1 – Scenario 3

SAL name	Increase exposure 2+ movements per day		Decrease exposure 2+ movements per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Badgerys Creek		0			1%	1%
Bidwill (NSW)			5	13	-42%	-42%
Blue Mountains National Park					0%	0%
Bringelly			1	4	-33%	-33%
Brownlow Hill			1	4	-1%	-1%
Bungarribee					0%	0%
Cawdor (NSW)			0	0	0%	0%
Cobbitty			1	3	-1%	-1%
Doonside				0	0%	-5%
Eastern Creek	0	0			0%	0%
Faulconbridge			0	0	-100%	-100%
Glendenning			4	11	-5%	-6%
Glenmore (NSW)			0	1	-2%	-2%
Greendale (Liverpool - NSW)	1	5			2%	2%
Hassall Grove			25	82	-4%	-4%
Horsley Park			0	1	-1%	-1%
Kemps Creek			0	1	0%	0%
Linden (NSW)			75	163	-100%	-100%
Luddenham	0			0	0%	0%
Marsden Park			1	1	0%	0%
Minchinbury	0	1			1%	1%
Mount Hunter			0	1	0%	0%
Mount Vernon			0	1	-3%	-3%
Mulgoa			101	306	-100%	-100%
Nattai					0%	0%
Oakhurst (NSW)			21	67	-5%	-5%
Orangeville			1	3	-2%	-2%
Plumpton (NSW)	2	7			5%	5%

SAL name	Increase exposure 2+ movements per day		Decrease exposure 2+ movements per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Razorback			0	1	0%	0%
Rooty Hill		0			0%	9%
Silverdale (NSW)	88	307			27%	29%
Theresa Park			1	2	-1%	-1%
Wallacia			511	1,421	-88%	-86%
Warragamba			24	56	-100%	-100%
Wentworth Falls				0	0%	-100%
Werombi	0	0			2%	2%
Sum	**93**	**320**	**773**	**2,142**		

Table A.2 Difference by census area (SAL) – N60 Night (11 pm to 5:30 am) – PAL 1 – Scenario 4

SAL name	Increase exposure 2+ movements per day		Decrease exposure 2+ movements per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Badgerys Creek	0	0			1%	0%
Bidwill (NSW)			5	11	-31%	-31%
Blue Mountains National Park					0%	0%
Bringelly			1	4	-33%	-33%
Brownlow Hill			1	4	-1%	-1%
Bungarribee					0%	0%
Cawdor (NSW)			0	0	0%	0%
Cobbitty			1	3	-1%	-1%
Doonside				0	0%	-4%
Eastern Creek	0	1			5%	84%
Faulconbridge			0	0	-100%	-100%
Glendenning			2	6	-3%	-3%
Glenmore (NSW)			0	1	-2%	-2%
Greendale (Liverpool - NSW)	1	4			2%	2%
Hassall Grove			21	67	-3%	-3%
Horsley Park			0	1	-1%	-1%
Kemps Creek			0	0	0%	0%
Linden (NSW)			75	163	-100%	-100%
Luddenham	0			0	0%	0%
Marsden Park			1	1	0%	0%
Minchinbury	0	1			1%	1%
Mount Hunter			0	1	0%	0%
Mount Vernon			0	1	-2%	-2%
Mulgoa			101	305	-100%	-100%
Nattai					0%	0%
Oakhurst (NSW)			24	77	-6%	-5%
Orangeville			1	3	-2%	-2%
Plumpton (NSW)	1	4			2%	2%

SAL name	Increase exposure 2+ movements per day		Decrease exposure 2+ movements per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Razorback			0	0	0%	0%
Rooty Hill				0	0%	-2%
Silverdale (NSW)	86	299			26%	28%
Theresa Park			1	2	-1%	-1%
Wallacia			511	1,421	-88%	-86%
Warragamba			24	56	-100%	-100%
Wentworth Falls				0	0%	-100%
Werombi	0	0			3%	3%
Sum	**89**	**308**	**769**	**2,130**		

Table A.3 **Difference by census area (SAL) – N60 Night (11 pm to 5:30 am) – PAL 2 – Scenario 3**

SAL name	Increase exposure 2+ movements per day		Decrease exposure 2+ movements per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Badgerys Creek	1	3			10%	34%
Bell (NSW)					0%	0%
Bidwill (NSW)			6	15	-10%	-11%
Blue Mountains National Park					0%	0%
Bringelly			0	0	-8%	-10%
Brownlow Hill			0	0	0%	0%
Bungarribee					0%	0%
Cawdor (NSW)			0	0	0%	0%
Cobbitty	0	1			1%	1%
Doonside				0	0%	-13%
Eastern Creek	2	7			20%	29%
Faulconbridge			7	21	-98%	-97%
Ganbenang					0%	0%
Glendenning			5	16	-3%	-3%
Glenmore (NSW)			0	0	0%	0%
Greendale (Liverpool - NSW)	1	2			1%	1%
Hassall Grove	14	42			2%	1%
Horsley Park			1	3	-2%	-2%
Jenolan					0%	0%
Kemps Creek			0	1	-1%	-1%
Linden (NSW)			43	111	-36%	-40%
Luddenham			2	6	-1%	-1%
Maldon (NSW)	0	0			33%	33%
Marsden Park			0	0	0%	0%
Megalong Valley			0	0	-8%	-8%
Minchinbury	3	12			9%	9%
Mount Hunter	0	0			0%	0%
Mount Vernon	0	1			2%	2%

SAL name	Increase exposure 2+ movements per day		Decrease exposure 2+ movements per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Mulgoa			9	29	-9%	-9%
Nattai					0%	0%
Oakhurst (NSW)	16	49			2%	2%
Orangeville	0	1			1%	1%
Pheasants Nest			1	3	-3%	-3%
Plumpton (NSW)			4	11	-3%	-3%
Razorback	0	0			0%	0%
Rooty Hill		0			0%	3%
Shanes Park					0%	0%
Silverdale (NSW)	87	289			20%	21%
Theresa Park			0	0	0%	0%
Wallacia			7	21	-1%	-1%
Warragamba			55	130	-53%	-54%
Wentworth Falls				0	0%	-100%
Werombi			0	0	-9%	-9%
Wilton (NSW)	0	0			0%	0%
Sum	**125**	**409**	**140**	**370**		

Table A.4 **Difference by census area (SAL) – N60 Night (11 pm to 5:30 am) – PAL 2 – Scenario 4**

SAL name	Increase exposure 2+ movements per day		Decrease exposure 2+ movements per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Badgerys Creek	1	3			10%	33%
Bell (NSW)					0%	0%
Bidwill (NSW)			7	19	-12%	-12%
					0%	0%
Bringelly			0	0	-8%	-10%
Brownlow Hill			0	0	0%	0%
Bungarribee					0%	0%
Cawdor (NSW)			0	0	0%	0%
Cobbitty	0	1			0%	1%
Doonside				0	0%	-12%
Eastern Creek	2	6			16%	21%
Faulconbridge			7	21	-98%	-97%
Ganbenang					0%	0%
Glendenning			3	9	-2%	-2%
Glenmore (NSW)			0	0	0%	0%
Greendale (Liverpool - NSW)	1	2			1%	1%
Hassall Grove	13	39			1%	1%
Horsley Park			1	3	-2%	-2%
Jenolan					0%	0%
Kemps Creek			0	1	-1%	-1%
Linden (NSW)			43	111	-36%	-40%
Luddenham			2	6	-1%	-1%
Maldon (NSW)	0	0			33%	33%
Marsden Park	0	0			0%	0%
Megalong Valley			0	0	-8%	-8%
Minchinbury	4	14			10%	10%
Mount Hunter	0	0			0%	0%
Mount Vernon	0	1			2%	2%

SAL name	Increase exposure 2+ movements per day		Decrease exposure 2+ movements per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Mulgoa			9	30	-9%	-9%
Nattai					0%	0%
Oakhurst (NSW)	18	54			3%	2%
Orangeville	0	1			1%	1%
Pheasants Nest			1	3	-3%	-3%
Plumpton (NSW)			5	14	-4%	-3%
Razorback	0	0			0%	0%
Rooty Hill		0			0%	3%
Shanes Park					0%	0%
Silverdale (NSW)	78	261			17%	18%
Theresa Park			0	0	0%	0%
Wallacia			7	21	-1%	-1%
Warragamba			55	130	-53%	-54%
Wentworth Falls				0	0%	-100%
Werombi			0	0	-8%	-8%
Wilton (NSW)	0	0			0%	0%
Sum	**117**	**385**	**140**	**370**		

Table A.5 Difference by census area (SAL) – N60 Night (11 pm to 5:30 am) – PAL 3 – Scenario 3

SAL name	Increase exposure 2+ movements per day		Decrease exposure 2+ movements per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Angus	0	1			15%	15%
Badgerys Creek			1	2	-2%	-2%
Bell (NSW)					0%	0%
Bidwill (NSW)			4	11	-2%	-2%
Blue Mountains National Park					0%	0%
Bringelly	9	30			68%	68%
Brownlow Hill	2	7			2%	2%
Bungarribee				0	0%	-37%
Cawdor (NSW)	2	5			8%	8%
Cobbitty	5	15			5%	5%
Doonside	7	18			71%	66%
Eastern Creek			3	8	-10%	-12%
Faulconbridge			137	383	-98%	-98%
Ganbenang			0	0	-100%	-100%
Glendenning			3	11	-1%	-1%
Glenmore (NSW)	1	3			7%	7%
Greendale (Liverpool - NSW)	1	4			1%	1%
Hampton (NSW)					0%	0%
Hassall Grove			4	12	0%	0%
Horsley Park			1	3	-1%	-1%
Jenolan	0	0			0%	0%
Kanangra					0%	0%
Kemps Creek			0	1	-1%	-1%
Linden (NSW)			63	134	-31%	-28%
Luddenham	0	1			0%	0%
Maldon (NSW)			0	0	-2%	-2%
Marsden Park	1	2			0%	0%
Megalong Valley	1	1			15%	16%

SAL name	Increase exposure 2+ movements per day		Decrease exposure 2+ movements per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Minchinbury	3	11			7%	7%
Mount Hunter	3	8			1%	1%
Mount Tomah					0%	0%
Mount Vernon			0	0	-1%	-1%
Mulgoa			7	23	-7%	-7%
Nattai			0	0	-20%	-20%
Oakdale (NSW)				0	0%	-19%
Oakhurst (NSW)	13	42			1%	1%
Orangeville	1	5			3%	3%
Pheasants Nest	1	4			3%	3%
Plumpton (NSW)			5	23	-2%	-2%
Razorback	11	33			6%	6%
Rooty Hill		0			0%	2%
Shanes Park			0	0	-5%	-5%
Silverdale (NSW)	0	2			0%	0%
Theresa Park	1	4			1%	1%
Wallacia			9	26	-1%	-2%
Warragamba			264	610	-65%	-64%
Wentworth Falls				1	0%	-74%
Werombi			0	1	-5%	-5%
Wilton (NSW)			0	1	-1%	-1%
Woodford (NSW)			3	7	-100%	-100%
Sum	**64**	**196**	**502**	**1,250**		

Table A.6 **Difference by census area (SAL) – N60 Night (11 pm to 5:30 am) – PAL 3 – Scenario 4**

SAL name	Increase exposure 2+ movements per day		Decrease exposure 2+ movements per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Angus	1	1			15%	14%
Badgerys Creek			1	2	-2%	-2%
Bell (NSW)					0%	0%
Bidwill (NSW)			4	11	-2%	-2%
Blue Mountains National Park					0%	0%
Bringelly	9	30			68%	68%
Brownlow Hill	2	7			2%	2%
Bungarribee				0	0%	-28%
Cawdor (NSW)	2	5			8%	8%
Cobbitty	5	15			5%	5%
Doonside	9	24			58%	57%
Eastern Creek			3	9	-11%	-13%
Faulconbridge			137	383	-98%	-98%
Ganbenang			0	0	-100%	-100%
Glendenning			4	14	-1%	-1%
Glenmore (NSW)	1	3			7%	7%
Greendale (Liverpool - NSW)	1	4			1%	1%
Hampton (NSW)					0%	0%
Hassall Grove			4	13	0%	0%
Horsley Park			1	3	-1%	-1%
Jenolan	0	0			0%	0%
Kanangra					0%	0%
Kemps Creek			0	1	-1%	-1%
Linden (NSW)			63	132	-30%	-28%
Luddenham	0	2			0%	0%
Maldon (NSW)			0	0	-2%	-2%
Marsden Park			2	9	-1%	-1%
Megalong Valley	1	1			15%	16%

SAL name	Increase exposure 2+ movements per day		Decrease exposure 2+ movements per day		Change in population	
	Dwellings	Population	Dwellings	Population	Dwellings	Population
Minchinbury	3	11			7%	7%
Mount Hunter	3	8			1%	1%
Mount Tomah					0%	0%
Mount Vernon			0	0	-1%	-1%
Mulgoa			8	25	-7%	-8%
Nattai			0	0	-20%	-20%
Oakdale (NSW)				0	0%	-20%
Oakhurst (NSW)	13	41			1%	1%
Orangeville	1	5			3%	3%
Pheasants Nest	1	4			3%	3%
Plumpton (NSW)			5	25	-2%	-2%
Razorback	11	33			6%	6%
Rooty Hill		0			0%	2%
Shanes Park			0	0	-2%	-2%
Silverdale (NSW)			3	9	0%	0%
Theresa Park	1	4			1%	1%
Wallacia			9	26	-1%	-2%
Warragamba			264	610	-65%	-64%
Wentworth Falls				1	0%	-74%
Werombi			0	1	-5%	-5%
Wilton (NSW)			0	1	-1%	-1%
Woodford (NSW)			3	7	-100%	-100%
Sum	**64**	**198**	**508**	**1,276**		

Appendix B

Maximum sound levels (L_{Amax})

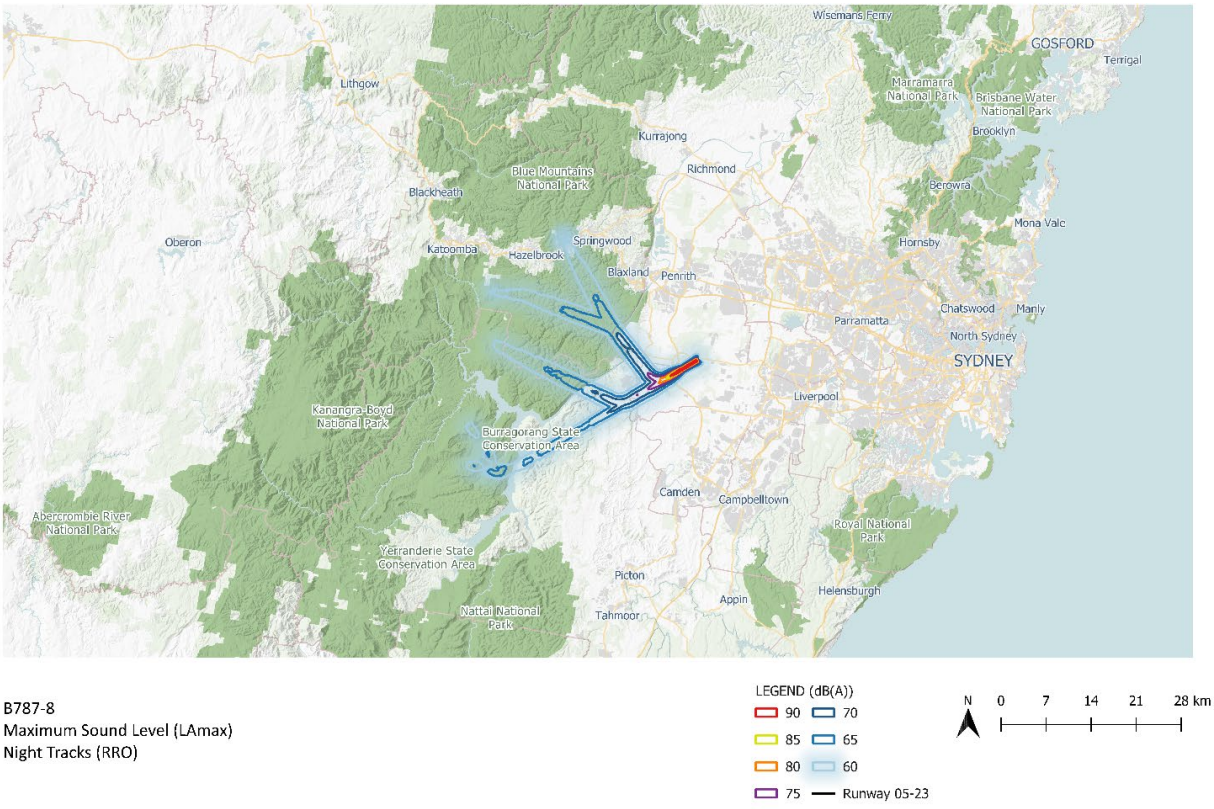


Figure B.1 Single Event Noise Contours – L_{Amax} – Night RRO flight paths – B787-8

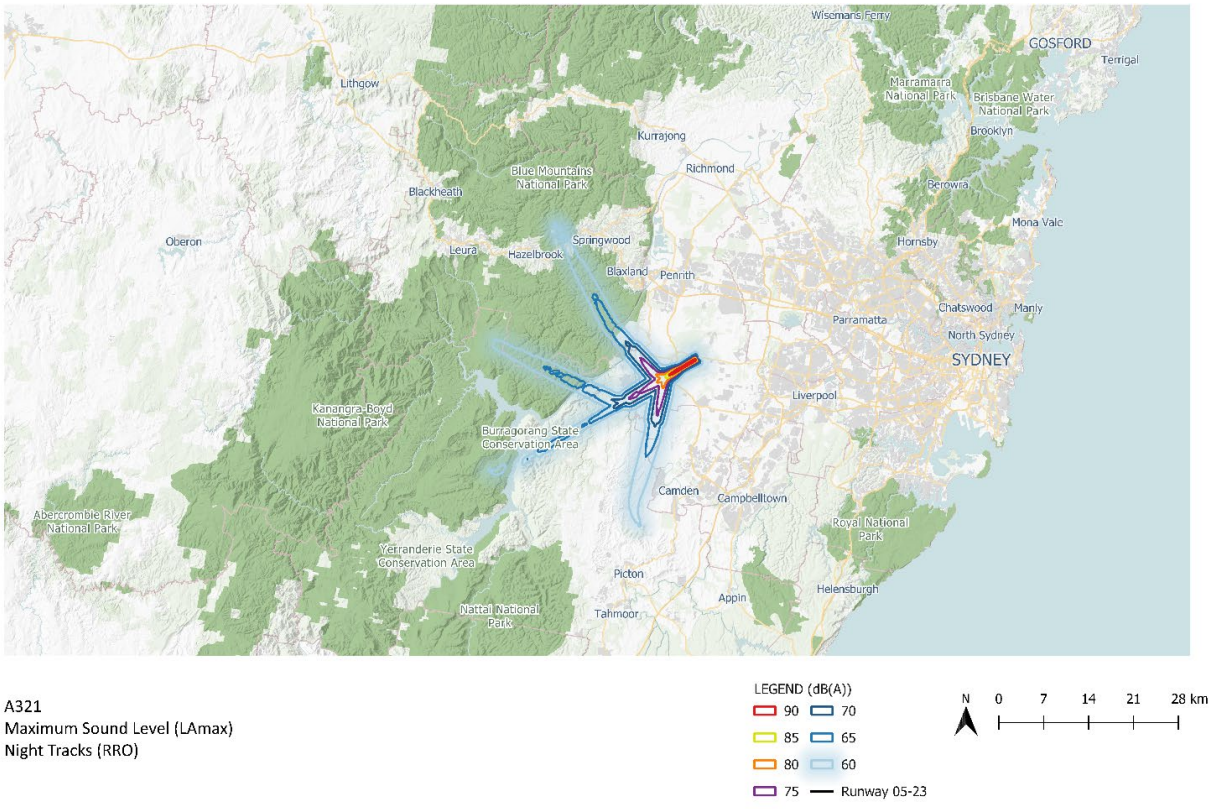


Figure B.2 Single Event Noise Contours – L_{Amax} – Night RRO flight paths – A321

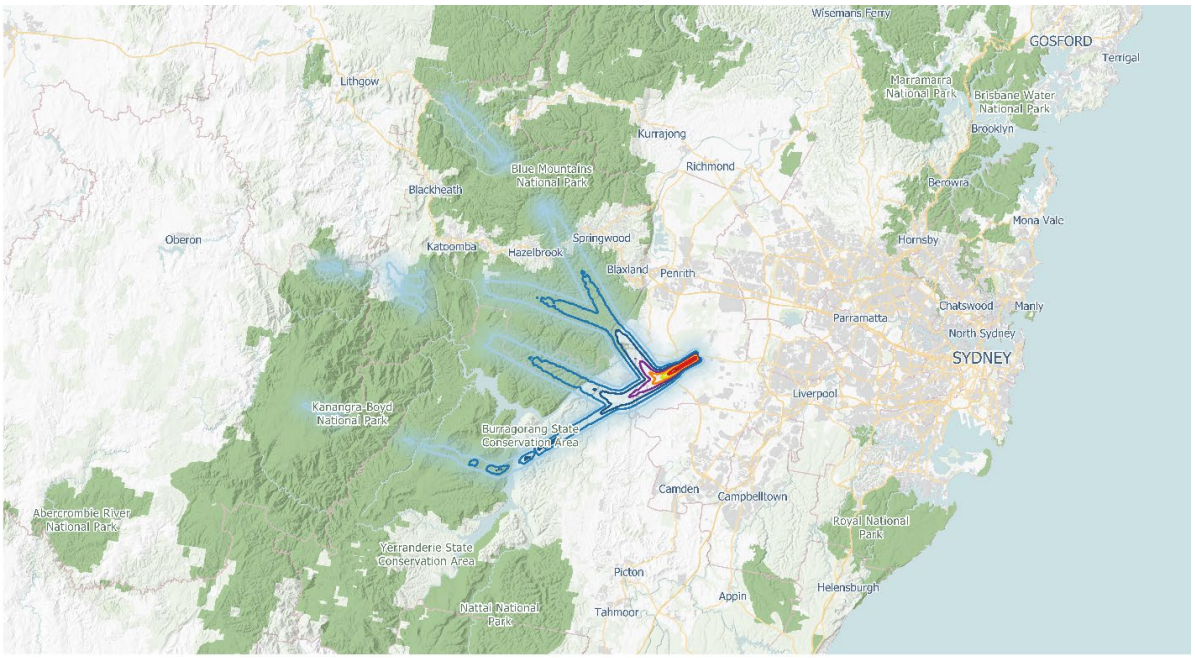


Figure B.3 Single Event Noise Contours – L_{Amax} – Night RRO flight paths – A330-300

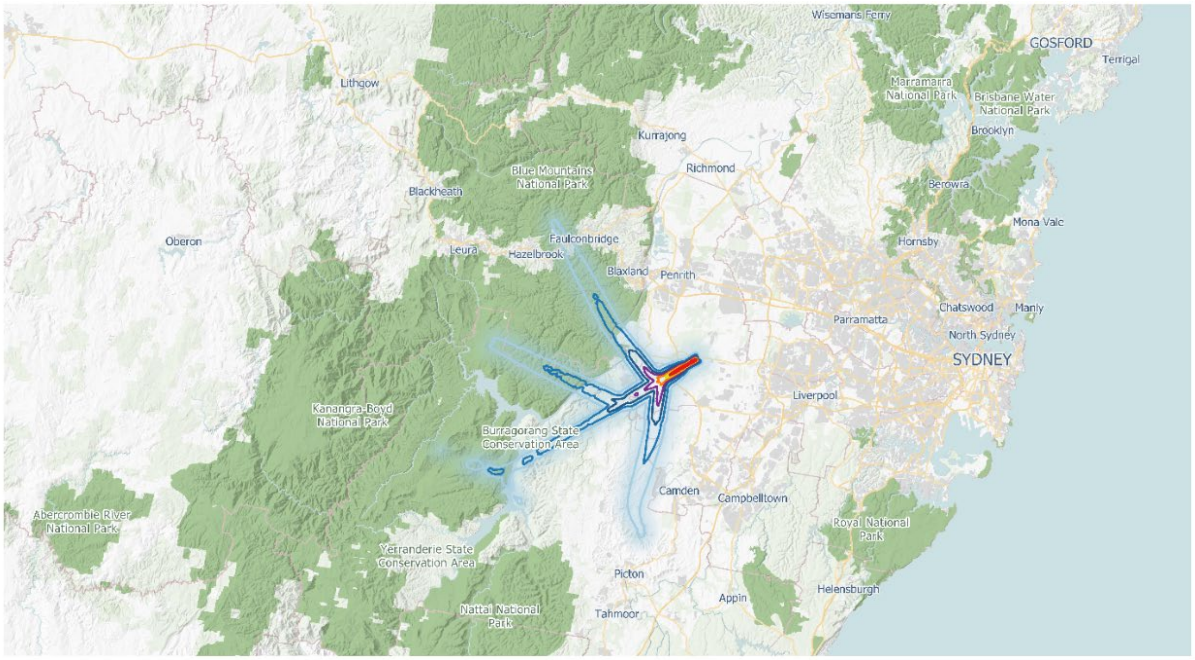
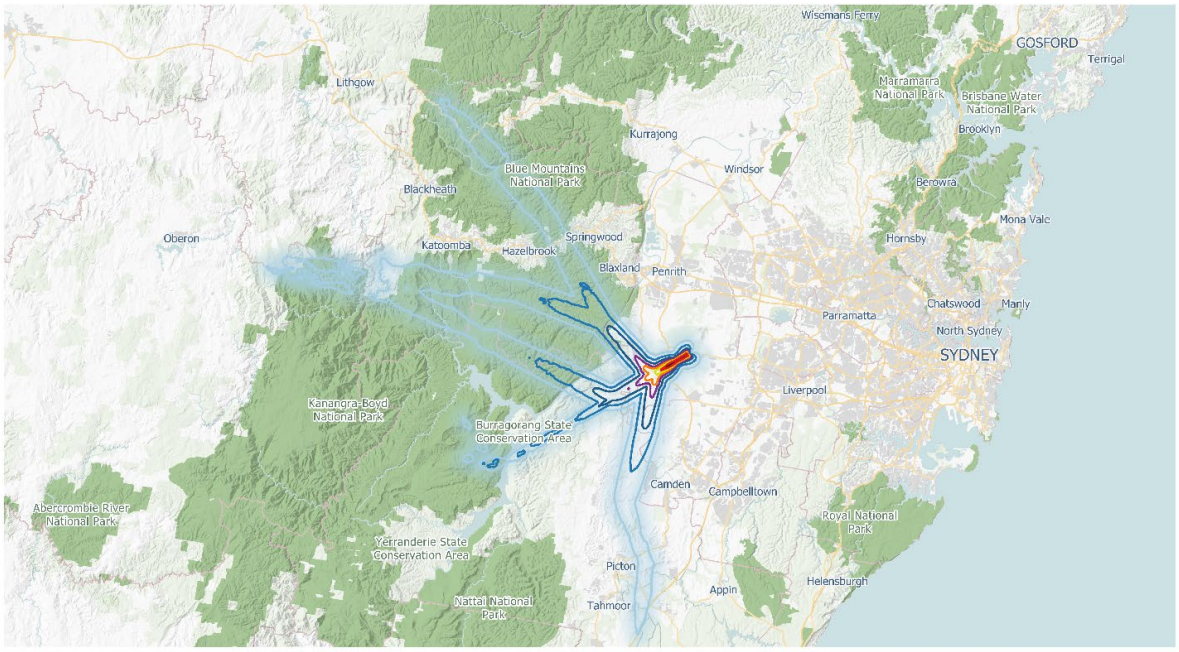


Figure B.4 Single Event Noise Contours – L_{Amax} – Night RRO flight paths – A350-900



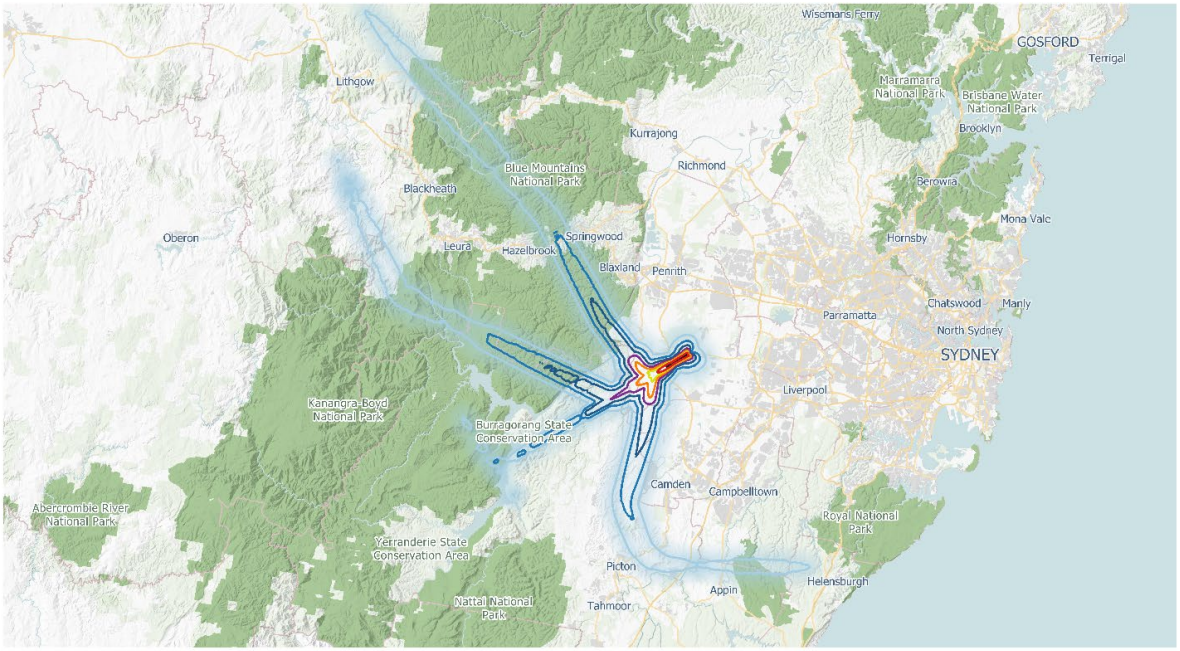
B737-800
Maximum Sound Level (LAmax)
Night Tracks (RRO)

LEGEND (dB(A))
90 70
85 65
80 60
75 Runway 05-23

N 0 7 14 21 28 km

*Revised May 2024

Figure B.5 Single Event Noise Contours – L_{Amax} – Night RRO flight paths – B737-800



B777-300
Maximum Sound Level (LAmax)
Night Tracks (RRO)

LEGEND (dB(A))
90 70
85 65
80 60
75 Runway 05-23

N 0 7 14 21 28 km

Figure B.6 Single Event Noise Contours – L_{Amax} – Night RRO flight paths – B777-300

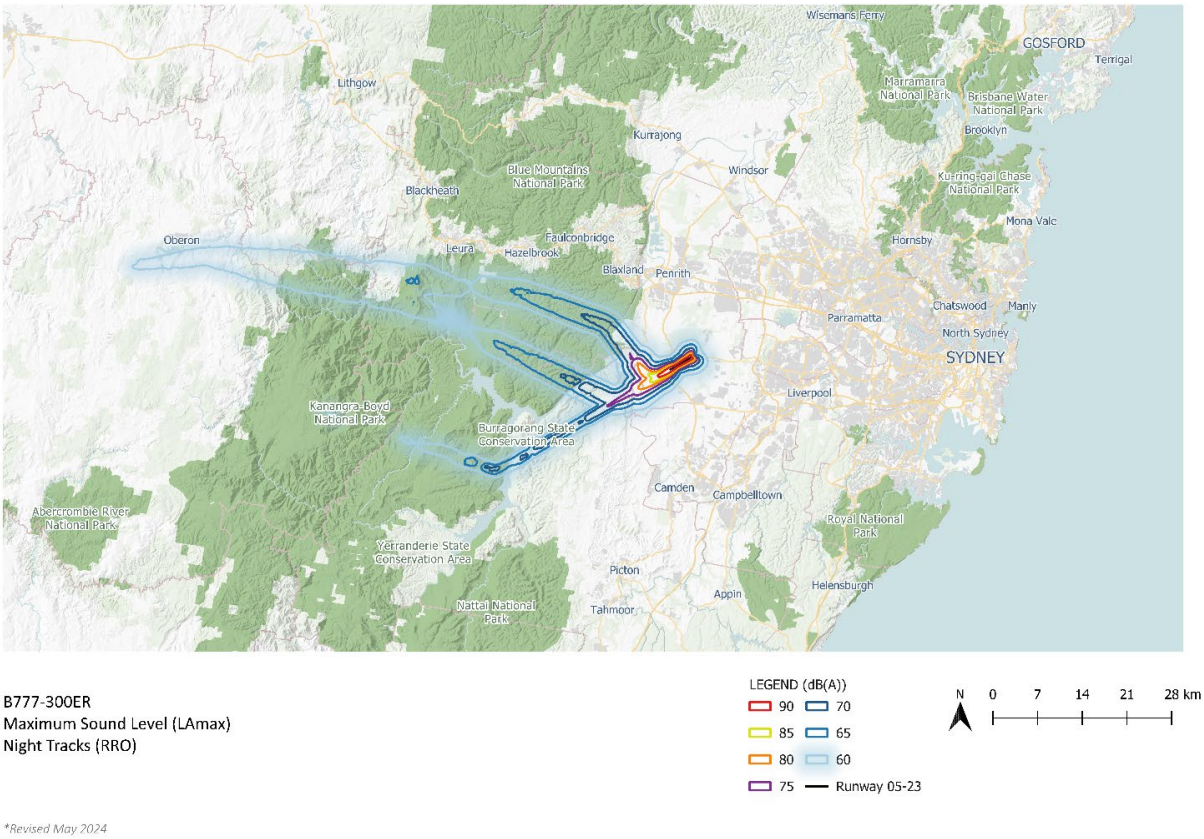


Figure B.7 Single Event Noise Contours – L_{Amax} – Night RRO flight paths – B777-300ER

Appendix C

N60 night contours

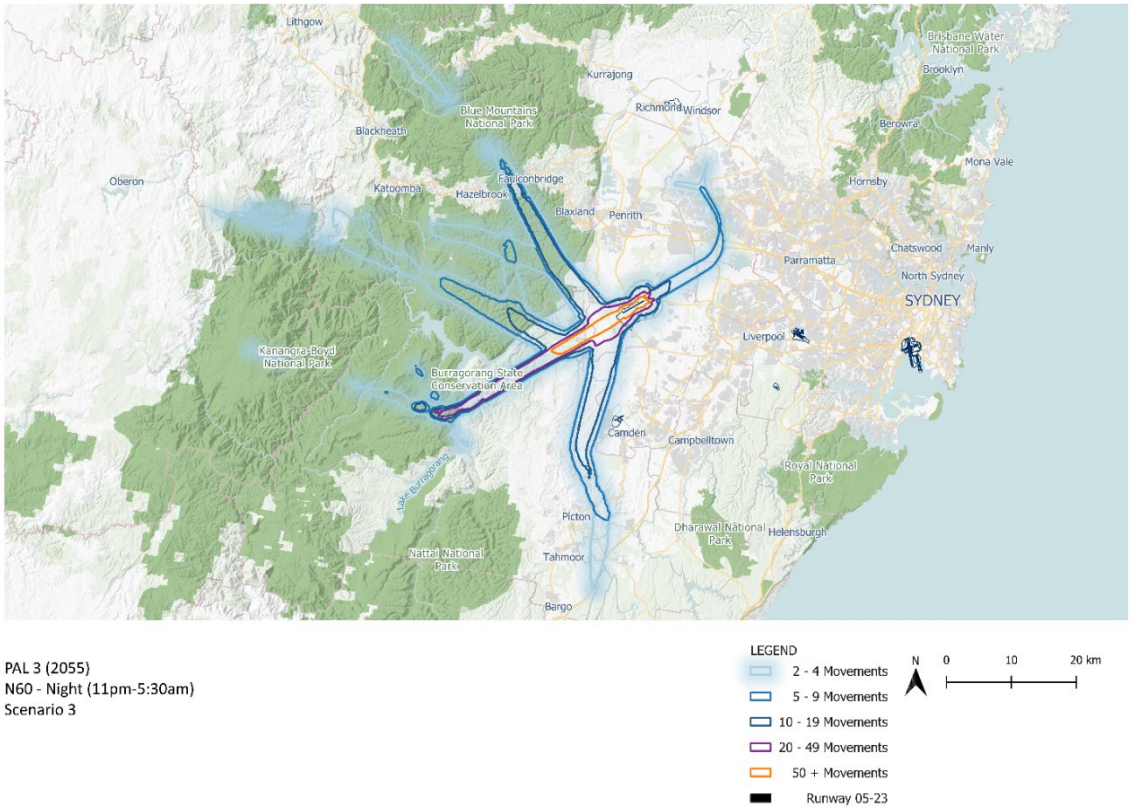


Figure C.1 N-Above Noise Contours – N60 Night (11 pm to 5:30 am) – PAL 3 (2055) – Scenario 3

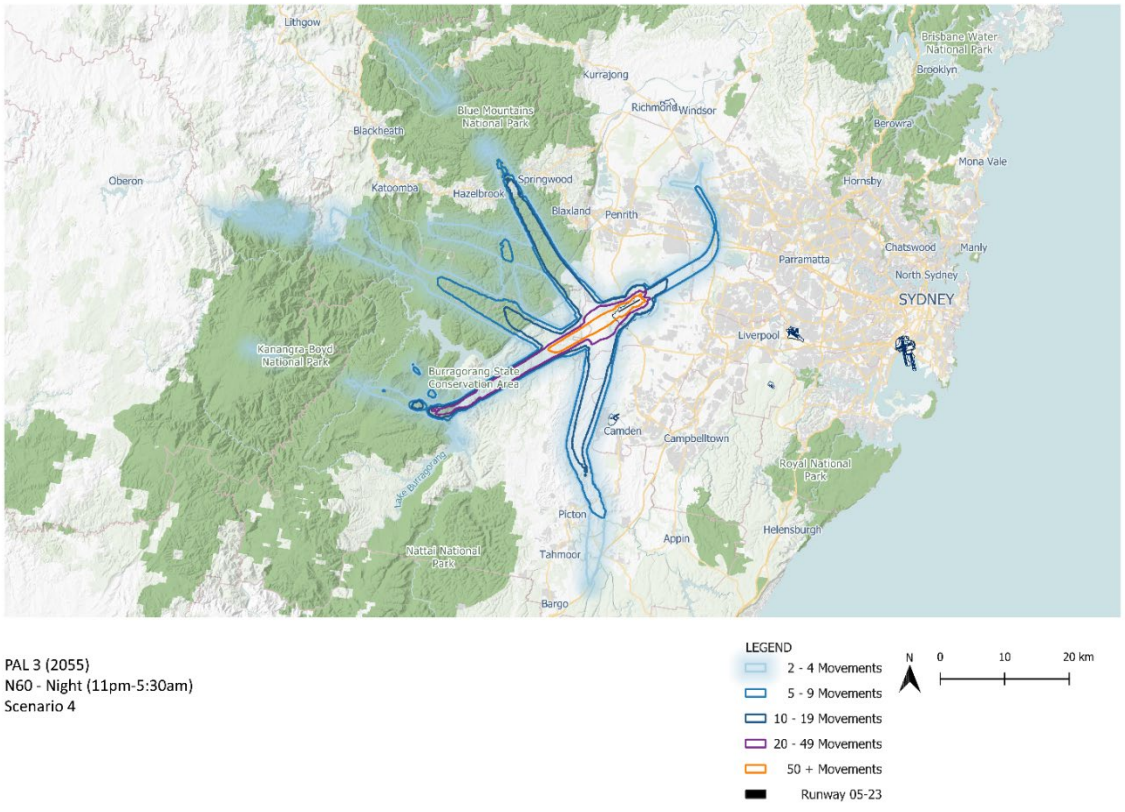


Figure C.2 N-Above Noise Contours – N60 Night (11 pm to 5:30 am) – PAL 3 (2055) – Scenario 4

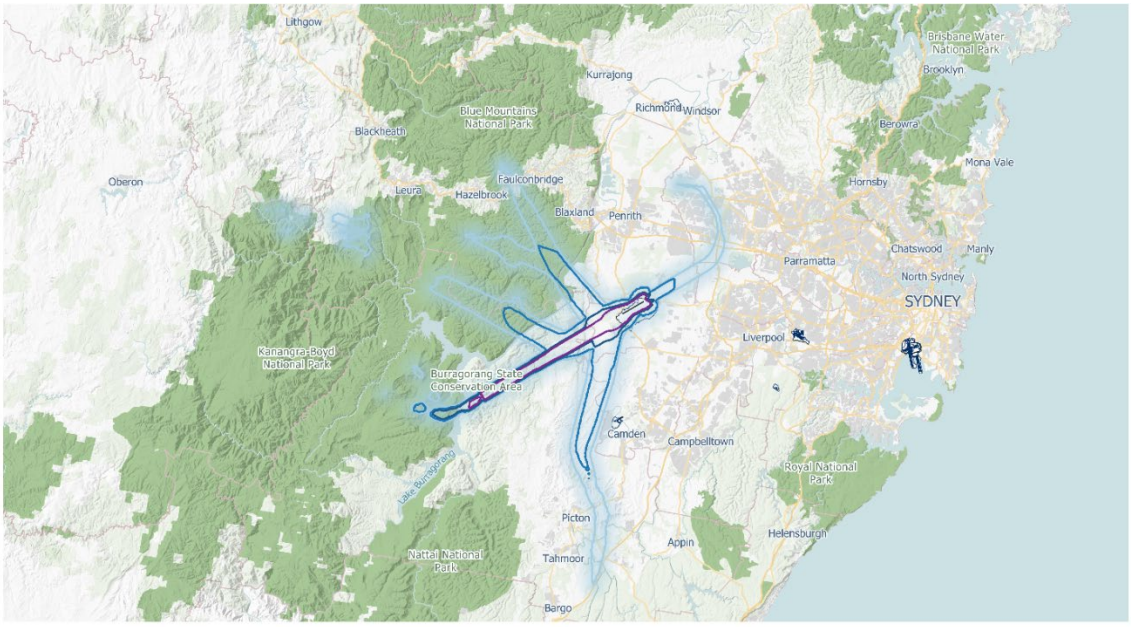


Figure C.3 N-Above Noise Contours – N60 Night (11 pm to 5:30 am) – PAL 2 (2040) – Scenario 3

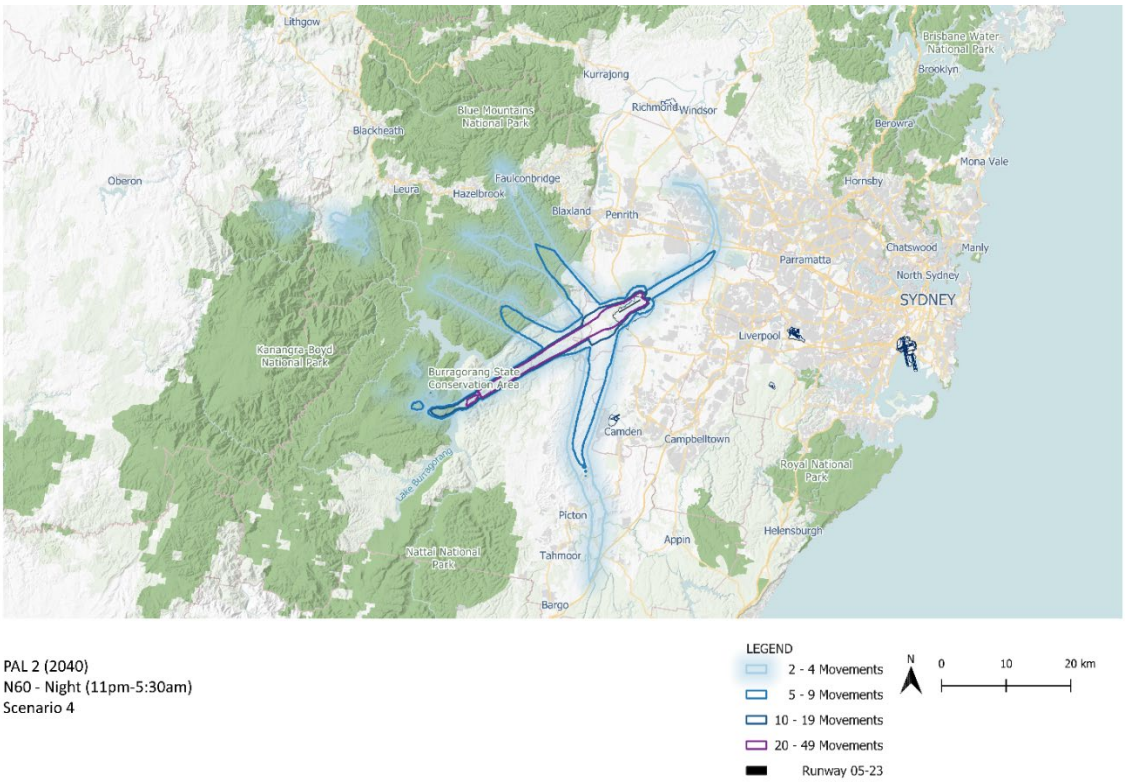


Figure C.4 N-Above Noise Contours – N60 Night (11 pm to 5:30am) – PAL 2 (2040) – Scenario 4

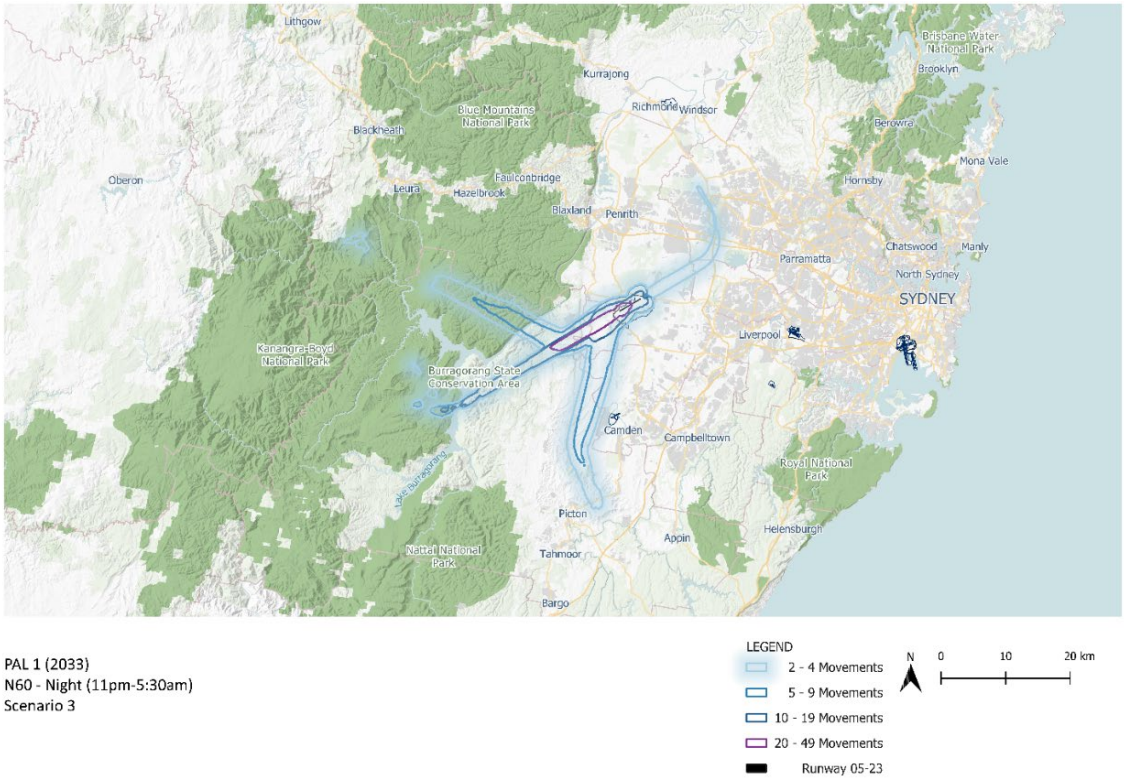


Figure C.5 N-Above Noise Contours – N60 Night (11 pm to 5:30 am) – PAL 1 (2033) – Scenario 3

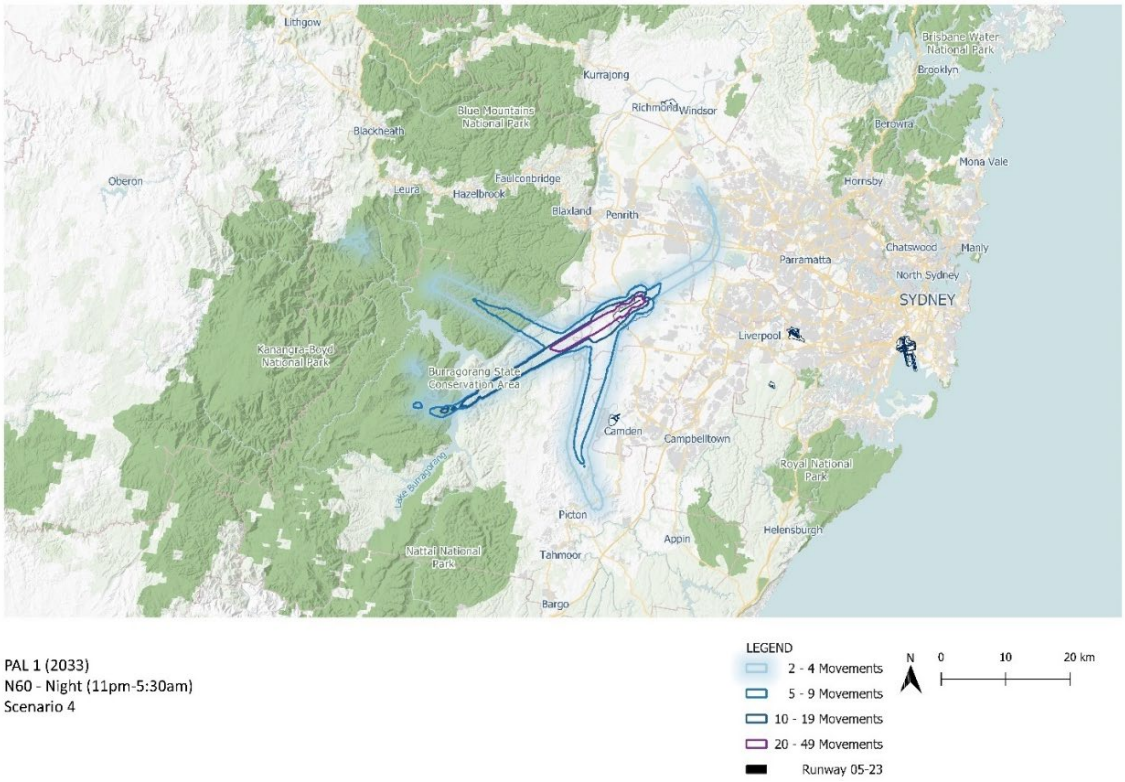


Figure C.6 N-Above Noise Contours – N60 Night (11 pm to 5:30 am) – PAL 1 (2033) – Scenario 4

Appendix D

N60 and N70 – 24-hour contours

PAL 3 (2055)
N70 - 24 Hours
Scenario 3

Figure D.1 N-Above Noise Contours – N70 24-hour – PAL 3 (2055) – Scenario 3

PAL 3 (2055)
N70 - 24 Hours
Scenario 4

Figure D.2 N-Above Noise Contours – N70 24-hour – PAL 3 (2055) – Scenario 4

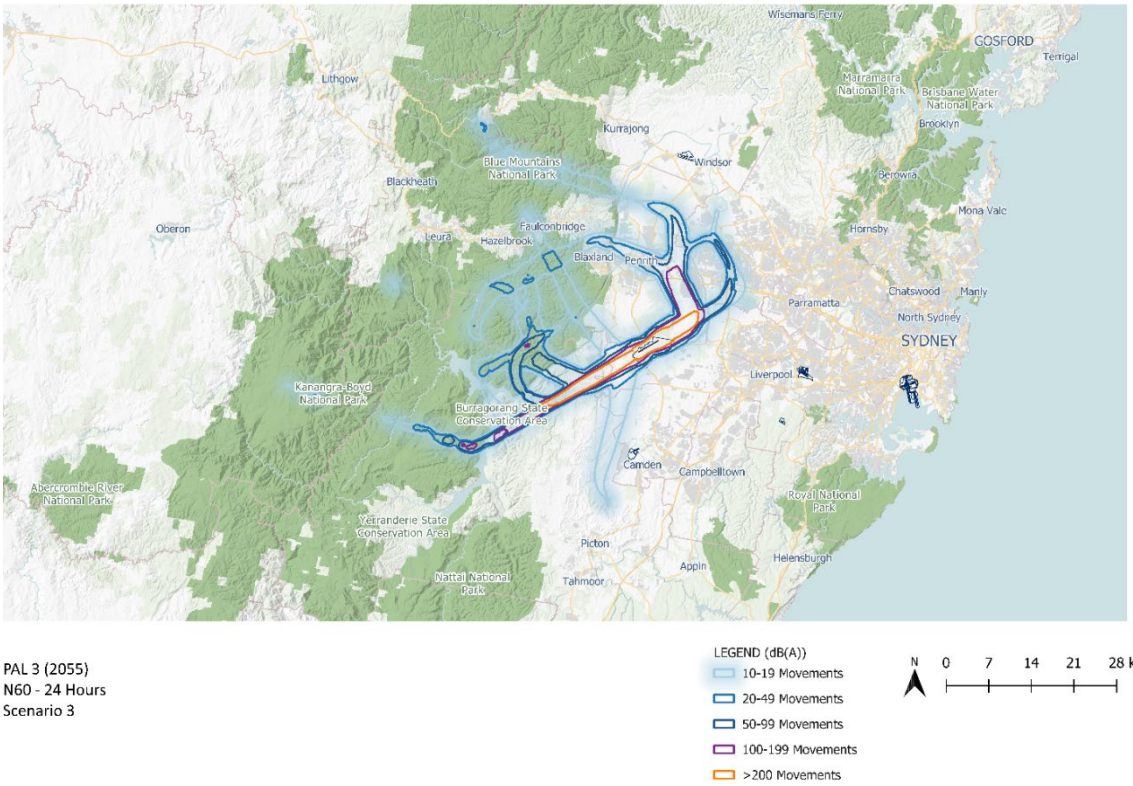


Figure D.3 N-Above Noise Contours – N60 24-hour – PAL 3 (2055) – Scenario 3

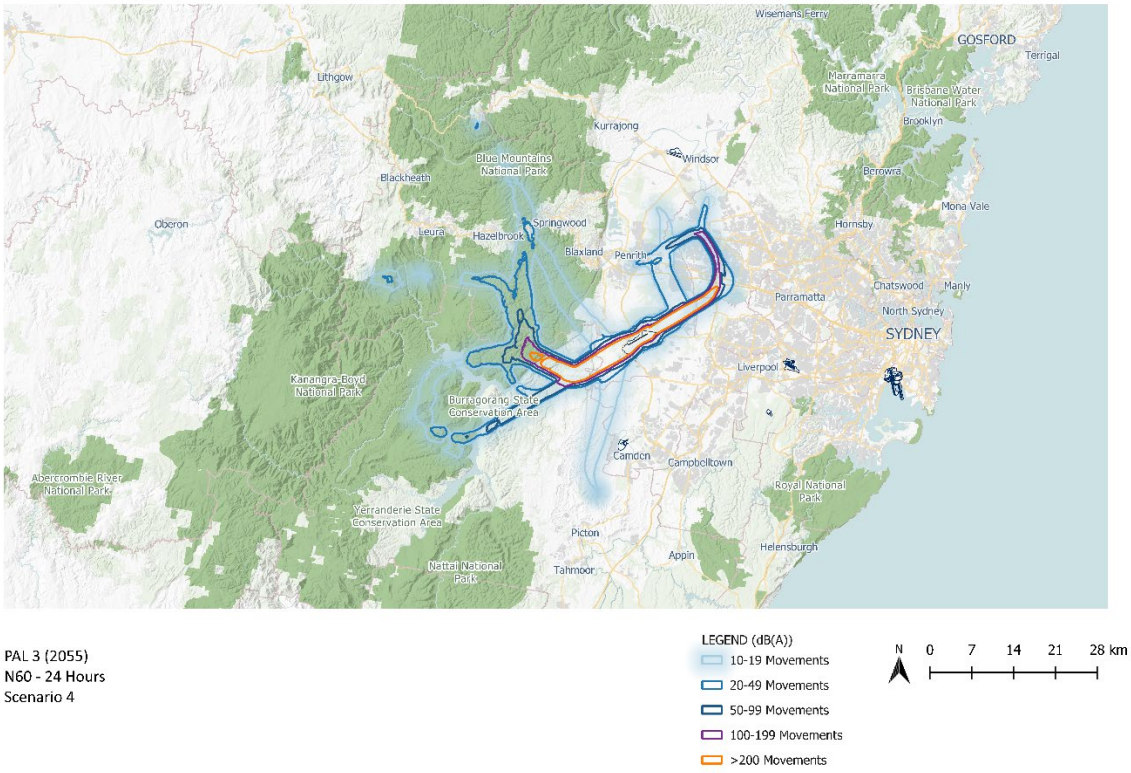


Figure D.4 N-Above Noise Contours – N60 24-hour – PAL 3 (2055) – Scenario 4

Appendix E

Flight path movement charts

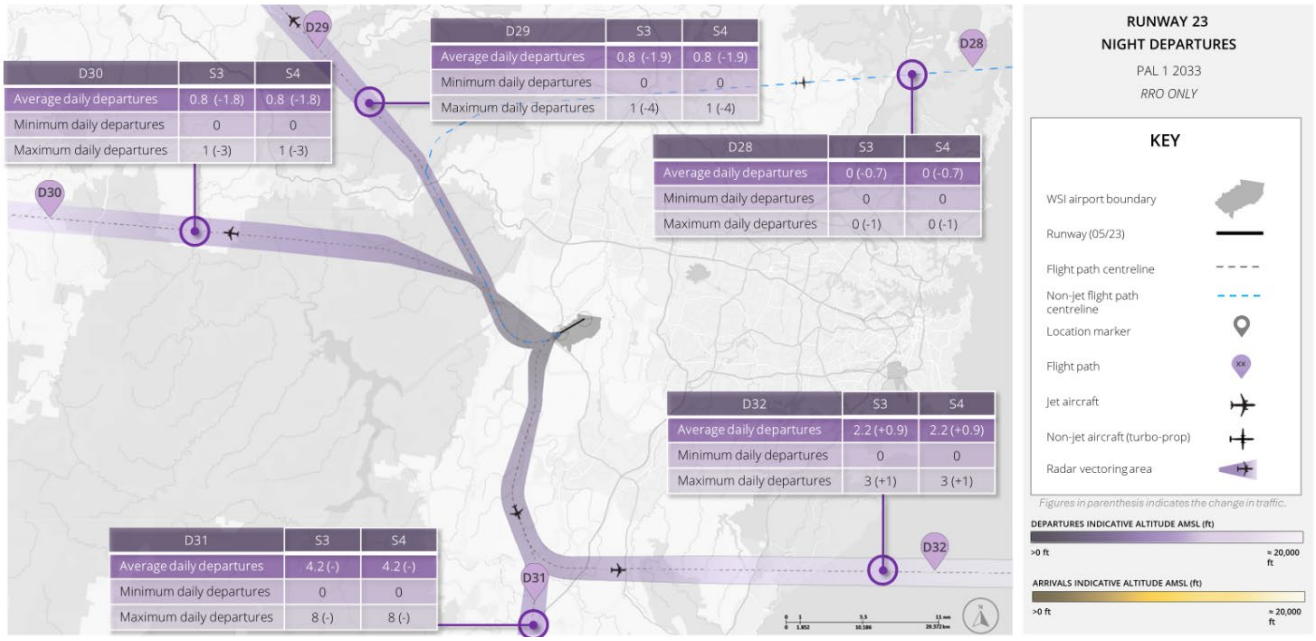


Figure E.1 Flight path movement chart – PAL 1 (2033) – RRO only

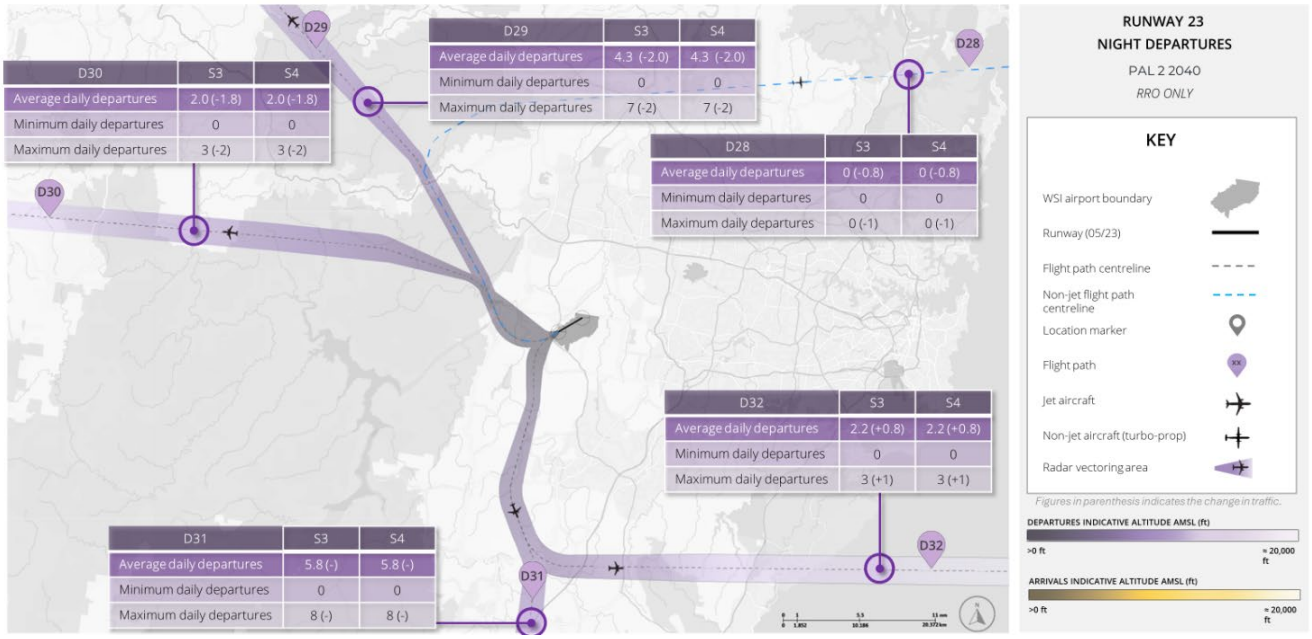


Figure E.2 Flight path movement chart – PAL 2 (2040) – RRO only

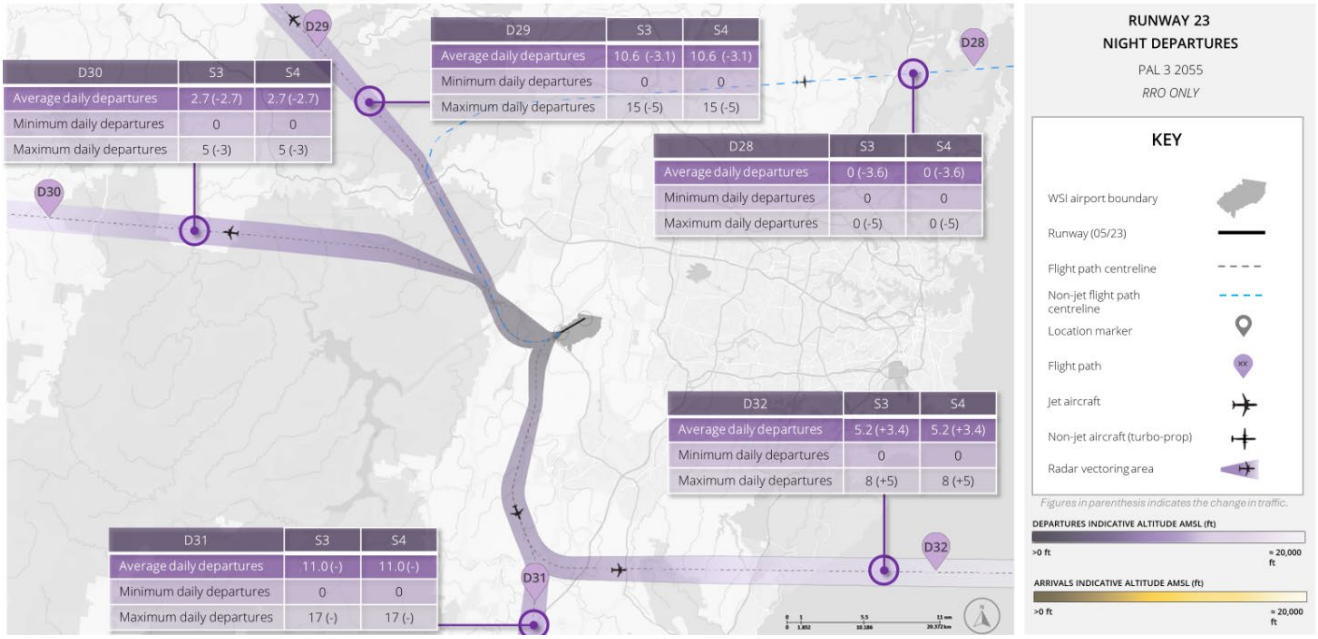


Figure E.3 Flight path movement chart – PAL 3 (2055) – RRO only

Appendix F

Respite charts

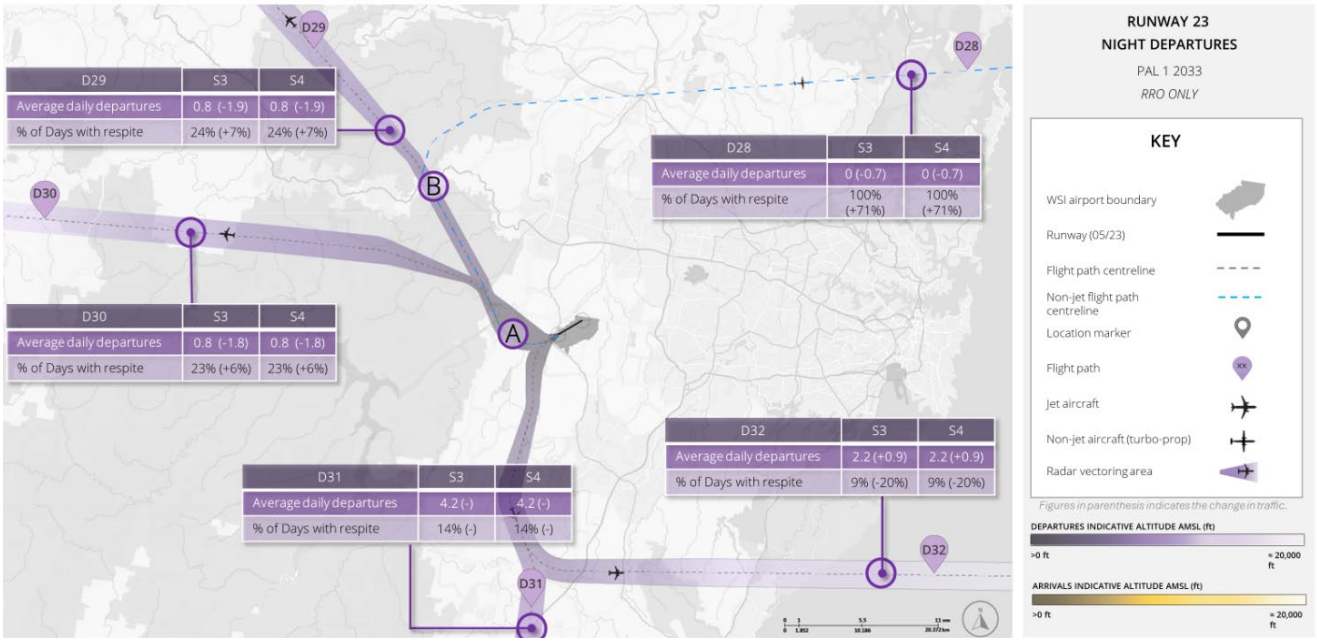


Figure F.1 Respite chart – PAL 1 (2033) – RRO only

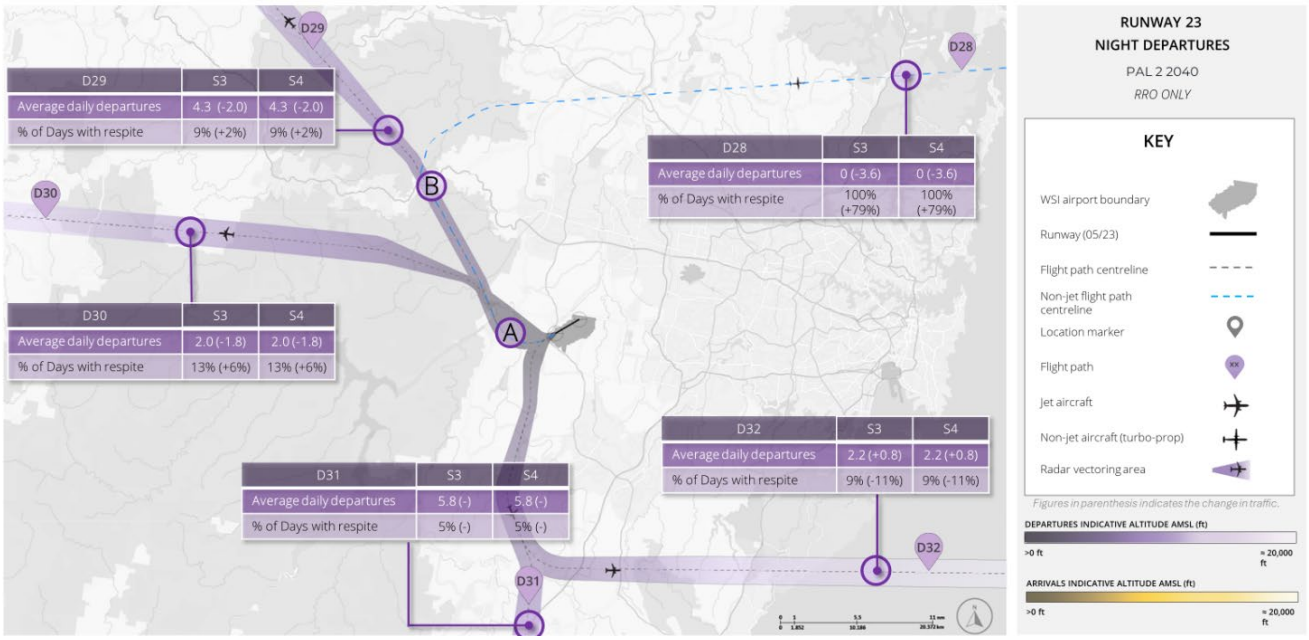


Figure F.2 Respite chart – PAL 2 (2040) – RRO only

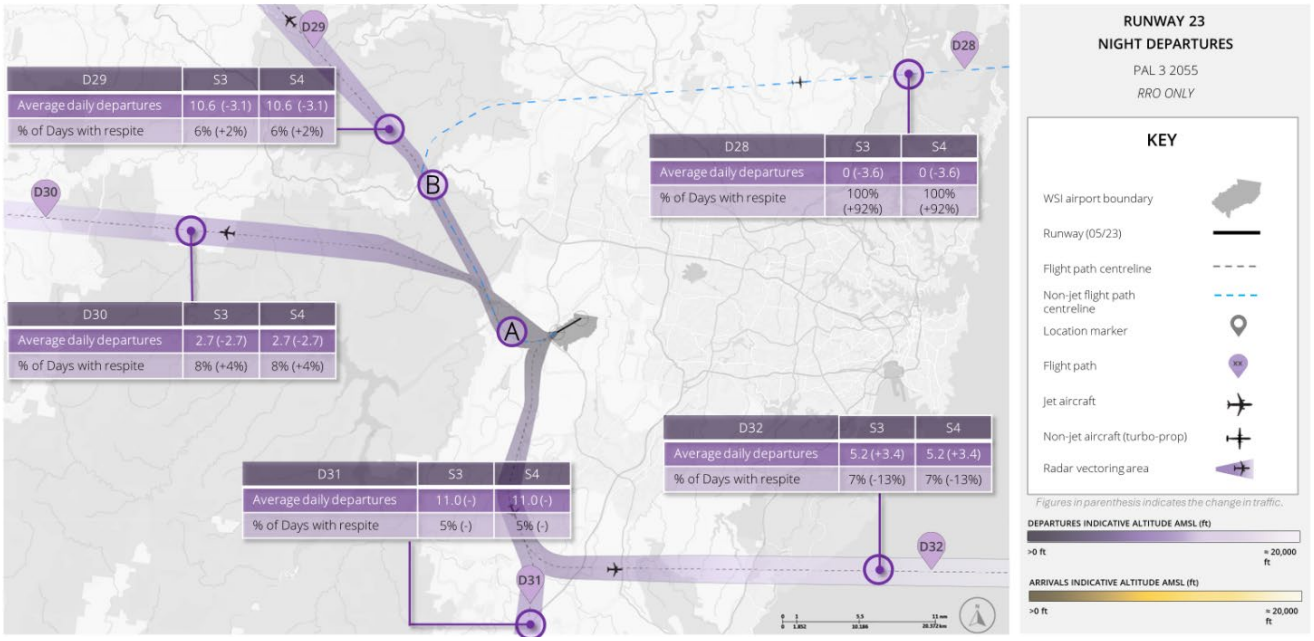


Figure F.3 Respite chart – PAL 3 (2055) – RRO only

Appendix G

Noise sensitive receptors

Table G.1 Noise Sensitive Receptors – L_{Aeq} Night (11 pm to 5:30 am) Variation – PAL 3 (> 30 dB(A) L_{Aeq})

ID	Area	L_{Aeq} Night (2023 EIS)		L_{Aeq} Night (TWG885)		L_{Aeq} Night (Variation)	
		S3	S4	S3	S4	S3	S4
M01	South West Departure (Wallacia)	56.1	56.1	56.8	56.8	0.7	0.7
M02	North East Departure	50.2	50.4	50.2	50.4	0.0	0.0
M03	North East Runway	34.2	33.7	34.1	33.7	-0.1	-0.1
M04	Twin Creeks	42.9	42.2	42.9	42.2	0.0	0.0
M06	Mount Vernon	31.4	31.5	31.4	31.4	0.0	-0.1
M08	Luddenham	38.4	38.3	38.1	38.0	-0.3	-0.3
M12	St. Marys	34.6	34.1	34.6	34.0	0.0	-0.1
M13	Rooty Hill	35.5	35.7	35.5	35.7	0.0	0.0
M14	St. Clair	33.6	33.1	33.6	33.1	0.0	0.0
M17	Wallacia	48.0	48.0	46.0	46.0	-2.0	-2.0
M18	Warragamba	40.9	40.9	39.0	39.0	-1.9	-1.9
M19	Greendale	55.4	55.4	56.7	56.8	1.3	1.4
M20	Bringelly	37.1	37.1	37.6	37.6	0.5	0.5
M21	Bents Basin	53.6	53.7	54.5	54.6	0.9	0.8
M22	Silverdale	56.5	56.5	57.0	57.0	0.5	0.5
M23	Werombi	33.5	33.5	34.3	34.3	0.8	0.8
M25	Linden	44.0	44.0	42.3	42.3	-1.8	-1.7
M28	The Oaks	31.6	31.6	32.4	32.4	0.8	0.8
M29	Lake Burragorang (Natai, Brownlow Hill)	30.1	30.1	30.1	30.1	0.0	0.0
M30	Tahmoor	30.7	30.7	30.8	30.8	0.1	0.1
R1	Bringelly	31.8	31.8	32.2	32.2	0.4	0.4
R2	Luddenham	42.6	42.6	42.3	42.3	-0.3	-0.3
R3	Greendale, Greendale Road	56.0	56.0	57.2	57.2	1.2	1.2
R6	Kemps Creek	37.6	37.3	36.1	35.7	-1.5	-1.6
R7	Wallacia	48.8	48.8	46.8	46.8	-2.0	-2.0
R8	Twin Creeks, Cnr Twin Ck Drive & Humewood Place	45.1	44.5	45.1	44.5	0.0	0.0
R14	Lawson Road, Badgerys Creek	41.4	41.3	41.4	41.2	0.0	-0.1
R15	Mersey Rd, Greendale	39.2	39.2	39.5	39.5	0.3	0.3

ID	Area	L_{Aeq} Night (2023 EIS)		L_{Aeq} Night (TWG885)		L_{Aeq} Night (Variation)	
		S3	S4	S3	S4	S3	S4
R17	Luddenham Road	44.5	44.5	44.5	44.4	0.0	-0.1
R18	Cnr Adams & Elizabeth Drive	51.8	51.8	51.7	51.7	-0.1	-0.1
R19	Cnr Adams & Anton Road	50.6	50.6	50.4	50.4	-0.2	-0.2
R21	Cnr Willowdene Ave and Vicar Park Lane	65.1	65.1	65.3	65.3	0.2	0.2
R22	Rossmore, Victor Ave	35.1	35.1	35.1	35.0	-0.1	-0.1
R23	Wallacia, Greendale Road	56.1	56.1	54.0	54.0	-2.1	-2.1
R24	Badgerys Creek 1 NE	48.8	48.7	48.7	48.7	-0.1	0.0
R27	Greendale, Dwyer Rd	41.4	41.4	42.1	42.1	0.6	0.6
R31	Mt Vernon residential	30.7	30.8	30.7	30.8	0.0	-0.1
R34	Emmaus Residential Aged Care	34.9	34.9	34.8	34.9	-0.1	0.0
R35	Mamre After School and Vacation Care	36.0	36.0	35.9	36.0	-0.1	0.0
R37	Schoolies at Mulgoa	48.8	48.8	48.5	48.5	-0.3	-0.3
R40	Little Smarties Childcare Centre	36.1	36.1	36.0	36.1	-0.1	0.0
R41	The Grove Academy	30.7	30.7	30.7	30.7	0.0	0.0
R44	Bringelly Child Care Centre	38.9	38.9	39.4	39.4	0.5	0.5
R46	Chementson Drive Early Educational Centre	32.3	32.3	32.3	32.3	0.0	0.0
R49	Luddenham Child Care Centre	46.1	46.0	45.8	45.8	-0.3	-0.2
R54	Mulgoa Preschool	37.2	36.6	36.3	35.6	-0.9	-1.0
R55	Jillys Educational Childcare Centre	30.4	30.4	30.5	30.5	0.1	0.1
R59	Bringelly Community Centre	32.4	32.4	32.9	32.9	0.5	0.5
R63	Luddenham Progress Hall	49.4	49.4	49.2	49.2	-0.2	-0.2
R64	Mulgoa Hall	37.2	36.7	36.2	35.6	-1.1	-1.1
R65	Emmaus Catholic College	37.1	37.2	37.1	37.2	0.0	0.0
R66	University of Sydney Farms	50.0	50.0	50.9	50.9	0.9	0.9
R68	Christadelphian Heritage College Sydney	31.7	31.7	31.6	31.6	-0.1	-0.1
R69	Mamre Anglican School	36.0	36.0	36.0	36.0	0.0	0.0
R73	Luddenham Public School	50.1	50.1	49.9	49.9	-0.2	-0.2

ID	Area	L_{Aeq} Night (2023 EIS)		L_{Aeq} Night (TWG885)		L_{Aeq} Night (Variation)	
		S3	S4	S3	S4	S3	S4
R74	Kemps Creek Public School	31.8	31.8	31.8	31.8	0.0	0.0
R75	Trinity Catholic Primary School	35.2	35.3	35.2	35.3	0.0	0.0
R76	Bringelly Public School	32.0	32.0	32.4	32.4	0.4	0.4
R78	Mulgoa Public School	37.3	36.9	36.2	35.6	-1.1	-1.3
R80	Wallacia Public School	47.6	47.6	45.6	45.6	-2.0	-2.0
R84	Bringelly Park	32.6	32.6	33.1	33.1	0.5	0.5
R85	Bents Basin State Conservation Reserve and Gulguer Nature Reserve	41.4	41.5	42.8	42.8	1.4	1.3
R86	Blaxland Crossing Reserve	47.7	47.7	45.6	45.6	-2.1	-2.1
R87	Bill Anderson Reserve	32.2	32.1	32.1	32.1	-0.1	0.0
R91	Western Sydney Parklands	40.8	41.0	40.8	41.0	0.0	0.0
R93	Rossmore Grange	30.8	30.8	30.9	30.9	0.1	0.1
R94	Freeburn Park	48.1	48.1	47.9	47.9	-0.2	-0.2
R95	Overett Reserve	38.0	37.9	38.0	37.9	0.0	0.0
R97	Mulgoa Park	37.2	36.8	36.2	35.6	-1.0	-1.2
R98	Wallacia Bowling and Recreation Club	50.7	50.7	48.8	48.8	-1.9	-1.9
R99	Hubertus Country Club	53.6	53.6	53.4	53.4	-0.2	-0.2
R100	Sugarloaf Cobbitty Equestrian Club	48.2	48.2	49.0	49.0	0.8	0.8
R102	Panthers Wallacia (country club)	48.7	48.7	46.7	46.7	-2.0	-2.0
R103	Twin Creeks Gold and Country Club	42.5	41.8	42.5	41.8	0.0	0.0
R108	Luddenham Showground	44.6	44.6	44.2	44.2	-0.4	-0.4
R110	St James Luddenham	51.5	51.5	51.4	51.4	-0.1	-0.1
R111	Lin Ying Temple	31.3	31.3	31.3	31.3	0.0	0.0
R112	Vat Ketanak Khmer Kampuchea Krom	30.4	30.4	30.5	30.5	0.1	0.1
R115	Anglican Parish of Mulgoa	36.9	36.3	36.2	35.5	-0.7	-0.8
R117	Bringelly Vineyard Church	30.7	30.7	31.0	31.0	0.3	0.3
R123	St Marys Church	37.7	37.5	36.0	35.8	-1.7	-1.7
R124	Wallacia Christian Church	48.8	48.8	46.8	46.8	-2.0	-2.0
R126	St Francis Xavier Church	60.3	60.3	60.8	60.8	0.5	0.5
R127	Luddenham Uniting Church	49.6	49.6	49.4	49.4	-0.2	-0.2

ID	Area	L_{Aeq} Night (2023 EIS)		L_{Aeq} Night (TWG885)		L_{Aeq} Night (Variation)	
		S3	S4	S3	S4	S3	S4
R132	Bringelly shops	31.8	31.8	32.2	32.2	0.4	0.4
R134	Kemps Creek shops	32.2	32.1	32.1	32.1	-0.1	0.0
R135	Luddenham shops	53.1	53.1	53.0	53.0	-0.1	-0.1
R136	Mulgoa shops	37.6	37.3	36.1	35.7	-1.5	-1.6
R138	Wallacia Shops	49.2	49.2	47.3	47.3	-1.9	-1.9
R140	Holy Family Catholic Primary and Church	48.9	48.9	48.6	48.6	-0.3	-0.3
R141	Edmund Rice Retreat and Conference Centre	41.7	41.7	39.4	39.4	-2.3	-2.3
N1	CATHOLIC HEALTHCARE EMMAUS VILLAGE	34.9	34.9	34.9	34.9	0.0	0.0
N3	REGAL OAKS VILLAGE	49.9	49.9	48.0	48.0	-2.0	-2.0
N8	KEMPS CREEK CHILDRENS COTTAGE	30.7	30.7	30.7	30.7	0.0	0.0
N10	MindChamps Early Learning & Preschool @ Kemps Creek	30.7	30.7	30.7	30.7	0.0	0.0
N11	MY FIRST SCHOOL CHILDCARE CENTRE	33.9	33.3	33.8	33.3	-0.1	0.0
N12	SILVERDALE CHILD CARE CENTRE	43.9	44.0	45.0	45.0	1.1	1.0
N13	WARRAGAMBA PRE-SCHOOL	40.2	40.2	38.7	38.7	-1.5	-1.5
N21	Holy Family Church	48.7	48.7	48.4	48.4	-0.3	-0.3
N23	Holy Spirit Parish	30.2	29.8	30.1	29.7	-0.1	-0.1
N39	BANKS PUBLIC SCHOOL	33.3	32.8	33.3	32.8	0.0	0.0
N42	BIDWILL PUBLIC SCHOOL	35.2	35.4	35.2	35.3	0.0	-0.1
N48	BLACKWELL PUBLIC SCHOOL	30.4	30.1	30.3	30.0	-0.1	-0.1
N56	CHIFLEY COLLEGE BIDWILL CAMPUS	34.8	35.0	34.8	35.0	0.0	0.0
N61	CHRISTADELPHIAN HERITAGE COLLEGE SYDNEY	31.7	31.7	31.6	31.6	-0.1	-0.1
N67	EASTERN CREEK PUBLIC SCHOOL	40.5	40.5	38.0	38.0	-2.5	-2.5
N68	EASTERN CREEK PUBLIC SCHOOL PRESCHOOL	38.9	39.1	38.9	39.1	0.0	0.0
N74	GLENDENNING PUBLIC SCHOOL	37.3	37.4	37.3	37.4	0.0	0.0
N77	GOOD SHEPHERD PRIMARY SCHOOL	34.1	34.2	34.1	34.2	0.0	0.0
N79	HASSALL GROVE PUBLIC SCHOOL	38.5	38.7	38.5	38.7	0.0	-0.1

ID	Area	L_{Aeq} Night (2023 EIS)		L_{Aeq} Night (TWG885)		L_{Aeq} Night (Variation)	
		S3	S4	S3	S4	S3	S4
N82	HOLY SPIRIT PRIMARY SCHOOL	30.3	29.9	30.3	29.8	-0.1	-0.1
N97	LLANDILO PUBLIC SCHOOL	35.1	35.1	35.0	35.0	-0.1	-0.1
N112	NEPEAN CHRISTIAN SCHOOL	31.4	31.1	30.4	30.0	-1.0	-1.2
N118	OUR LADY OF THE ROSARY PRIMARY SCHOOL	33.2	32.7	33.2	32.7	0.0	0.0
N127	PLUMPTON HIGH SCHOOL	34.2	34.4	34.2	34.4	0.0	0.0
N128	PLUMPTON PUBLIC SCHOOL	35.6	35.8	35.6	35.8	0.0	0.0
N130	ROOTY HILL HIGH SCHOOL	30.7	30.8	30.6	30.8	-0.1	0.0
N131	ROOTY HILL PUBLIC SCHOOL	32.0	32.2	32.0	32.2	0.0	0.0
N134	SHALVEY PUBLIC SCHOOL	31.8	31.9	31.7	31.9	-0.1	0.0
N136	ST AIDAN'S PRIMARY SCHOOL	31.0	31.2	31.0	31.2	0.0	0.0
N142	ST FRANCIS OF ASSISI PRIMARY SCHOOL	35.8	35.9	35.7	35.9	-0.1	0.0
N146	ST MARYS PUBLIC SCHOOL	34.3	33.8	34.3	33.7	0.0	-0.1
N147	ST MARYS SENIOR HIGH SCHOOL	33.3	32.8	33.3	32.7	0.0	-0.1
N148	ST MARYS SOUTH PUBLIC SCHOOL	32.1	31.6	32.0	31.5	-0.1	-0.1
N158	WARRAGAMBA PUBLIC SCHOOL	40.0	40.0	38.6	38.6	-1.4	-1.4
N164	WILLIAM DEAN PUBLIC SCHOOL	31.6	31.7	31.5	31.7	-0.1	0.0
N165	WILLMOT PUBLIC SCHOOL	30.7	30.7	30.6	30.6	-0.1	-0.1
N172	WINGARA HAMLET	33.0	33.0	30.8	30.9	-2.2	-2.1
N173	CHILDRENS HOUSE MONTESSORI CHILD CARE	37.3	37.4	35.2	35.3	-2.1	-2.1
N175	KEMPS CREEK CHILDRENS COTTAGE	30.7	30.7	30.7	30.7	0.0	0.0
N184	UNITING	33.9	33.9	31.7	31.7	-2.2	-2.2
N185	BLUE MOUNTAINS STEINER SCHOOL	34.0	34.0	32.2	32.2	-1.8	-1.8
N187	FAULCONBRIDGE PUBLIC SCHOOL	34.9	34.9	32.7	32.7	-2.2	-2.2
N188	HAZELBROOK PUBLIC SCHOOL	32.1	32.1	30.3	30.3	-1.9	-1.8
N199	SPRINGWOOD HIGH SCHOOL	33.7	33.7	31.3	31.4	-2.4	-2.3

Table G.2 Noise Sensitive Receptors – L_{Amax} Night (11 pm–5:30 am) Variation – PAL3 (> 50 dB(A) L_{Amax})

ID	Area	L_{Amax}		L_{Amax} Night (TWG885)		L_{Amax} Night Variation	
		S3	S4	S3	S4	S3	S4
M18	Warragamba	66.8	66.8	66.5	66.5	-0.3	-0.3
M19	Greendale	81.8	81.8	82.9	82.9	1.1	1.1
M26	North Richmond	56.9	56.9	54.6	54.6	-2.2	-2.2
R3	Greendale, Greendale Road	81.4	81.4	84.3	84.3	2.9	2.9
R21	Cnr Willowdene Ave and Vicar Park Lane	91.6	91.6	93.4	93.4	1.8	1.8
R22	Rossmore, Victor Ave	54.7	54.7	54.7	54.7	0.0	0.0
R23	Wallacia, Greendale Road	81.8	81.8	81.3	81.3	-0.5	-0.5
R25	Badgerys Creek 2 SW	76.3	76.3	76.5	76.5	0.2	0.2
R66	University of Sydney Farms	77.2	77.2	77.5	77.5	0.4	0.4
R85	Bents Basin State Conservation Reserve and Gulguer Nature Reserve	63.7	63.7	65.1	65.1	1.4	1.4
R111	Lin Ying Temple	50.3	50.3	50.3	50.3	0.0	0.0
N12	SILVERDALE CHILD CARE CENTRE	69.0	69.0	68.9	68.9	-0.1	-0.1
N13	WARRAGAMBA PRE-SCHOOL	66.0	66.0	65.8	65.8	-0.2	-0.2
N158	WARRAGAMBA PUBLIC SCHOOL	65.7	65.7	65.5	65.5	-0.2	-0.2

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