

10. Noise (aircraft)

Operation of the proposed airport would result in changes to the pattern of aircraft movements above Western Sydney through the introduction of new flight paths. An increase in aircraft movements would result in potential noise emissions from aircraft during take-off, landing and when in flight. The pattern of noise impacts that would result from operation of the proposed airport is complex, and depends on time of day, season, airport operating modes, weather conditions and potentially other factors.

This assessment of the Stage 1 development is based on indicative flight paths prepared by Airservices Australia to cater for a demand of 10 million annual passengers, equivalent to approximately 63,000 aircraft movements. This level of demand is predicted to occur by around 2030. The noise impact assessment undertaken for this draft EIS has adopted a conservative approach by assuming a Stage 1 fleet mix based on current day aircraft types, without taking account of future likely reductions in noise emissions from aircraft over time. The use of continuous descent approaches (which minimises the use of engine thrust by pilots) has been assumed.

For the loudest aircraft operations (long-range departures by Boeing 747 aircraft or equivalent), maximum noise levels over 85 dBA would be experienced at a small number of rural residential locations close to the airport site in Badgerys Creek. Maximum noise levels of 70–75 dBA could be expected within built-up areas in St Marys and Erskine Park as a result of such worst case operations. The Boeing 747 is, however, being phased out of passenger services by most airlines. Maximum noise levels due to more common aircraft types such as Airbus A320 or equivalent are predicted to be lower at 60–70 dBA in built-up areas around St Marys and Erskine Park, and over 70 dBA in some adjacent areas to the south-west of the airport site, such as Greendale.

During the day, the number of residents experiencing five or more aircraft noise events per day above 70 dBA would be about 1,500. Most recreational areas would not be subject to aircraft overflight noise events exceeding 70 dBA and any exceedance of this level would occur less than once per day on average.

On an average night, aircraft approaching and departing the proposed airport in a south-west to north-east direction are predicted to result in an estimated 48,000 people experiencing more than five events above 60 dBA. With an operating strategy in the opposite direction, approximately 6,000 people are predicted to experience on average more than five events above 60 dBA per night. This number would reduce to 4,000 if a head-to-head operating mode was implemented, in which aircraft would both approach and depart at the south-west end of the runway.

Most recreational areas would not be subject to aircraft overflight noise events with maximum levels exceeding 70 dBA. In recreational areas where this level of noise exposure is predicted, the average number of events above 70 dBA would be less than one event per day. The noise impact associated with take-offs in both directions and aircraft reverse thrust during landing would primarily affect Luddenham and Greendale. Discussion of potential aircraft noise impacts in relation to community health and social impacts are discussed in Chapter 13 and Chapter 23.

Approaches to mitigating aircraft noise generally focus on reducing noise emissions from the aircraft themselves, planning flight paths and airport operating modes in a way that minimises potential noise and environmental impacts, and implementing land use planning or other controls to ensure that future noise-sensitive uses are not located in noise-affected areas. It is expected that land use planning around the proposed airport would be influenced by final Australian Noise Exposure Forecast contours, once flight paths and operating modes are finalised and approved.

The noise impact of different airport operating modes has been considered as part of the assessment and can be seen to have varied impacts on communities surrounding the airport. Future reductions in aircraft noise emission levels are difficult to predict and therefore existing aircraft types have been assumed for the purposes of assessment. In practice, new and quieter aircraft would progressively replace current day aircraft types into the future.

10.1. Introduction

This chapter provides an assessment of potential aircraft noise impacts associated with the operation of Stage 1 of the proposed airport. The chapter draws on a comprehensive aircraft noise assessment undertaken for the proposed airport which is included as Appendix E1. In considering anticipated aircraft noise impacts, the assessment takes into account the projected air traffic volumes, indicative aircraft flight paths and airport operating modes, noise emissions from different aircraft types, and future population densities in areas surrounding the airport site.

The assessment addresses the requirements of the EIS Guidelines, which specifically require consideration of aircraft noise and vibration impacts on everyday activities and on sensitive receptors. For the purposes of assessment aircraft noise has been divided into two main categories generally in line with the regulation of aircraft and airport noise:

- aircraft operation noise (overflight, take-off and landing); and
- ground based noise (including aircraft taxiing, aircraft engine ground running and airport construction).

This chapter assesses noise associated with aircraft operations which is defined as being from the start of roll on departures and until an aircraft exits the runway (e.g. enters a taxiway) on arrivals. This includes noise generated by an aircraft when it is on the ground such as elevated thrust during take-off procedures and reverse thrust during landing procedures.

Ground-based aircraft noise sources such as ground based engine runs and taxiing together with other airport sources is considered separately in Chapter 11.

Assessment of the aircraft noise associated with the longer term development of the proposed airport is included in Chapter 31 of Volume 3.

10.2. Understanding aircraft noise

10.2.1. Nature of noise

Sound is a vibration travelling as a wave of pressure through the air from a source to a receiver, such as the human ear. The frequency of a sound is what gives it a distinctive pitch or tone with the rumble of distant thunder an example of a low frequency sound and a whistle an example of a high frequency sound. The human ear is more sensitive to high frequency sounds.

The loudness of a sound depends on its sound pressure level, which is expressed in decibels. Most sounds we hear in our daily lives have sound pressure levels in the range of 30-90 decibels. A-weighted decibels (dBA) are generally used for the purposes of assessment and have been adjusted to account for the varying sensitivity of the human ear to different frequencies of sound. The main effect of the adjustment is that low and very high frequencies are given less weight.

The sound level in the average residential home is about 40 dBA, the average conversation is about 60-65 dBA. Typical levels for listening to music at home are about 85 dBA, a loud rock band about 110 dBA, and a jet engine at around 100 metres from take-off is about 130 dBA. Figure 10-1 illustrates indicative dBA noise levels in typical situations.

In terms of sound perception, 3 dBA is the minimum change that most people can detect and every 10 dBA increase in sound level is heard as a doubling of loudness. However, individuals may perceive the same sound differently.

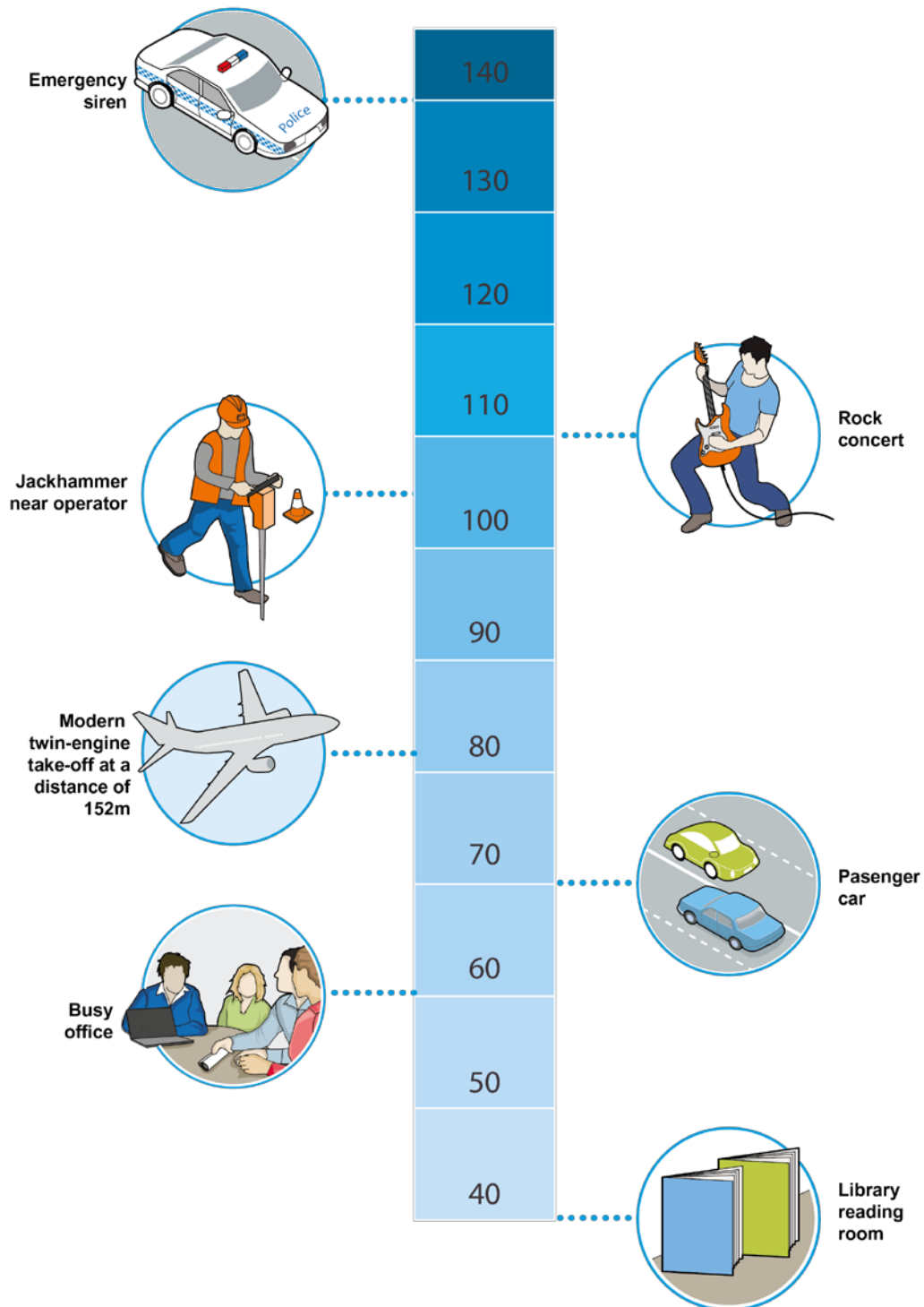


Figure 10–1 – Indicative dBA noise levels in typical situations

10.2.2. Sources of aircraft noise

Operation of the proposed airport would result in changes to the pattern of aircraft movements in the airspace above Western Sydney due to the introduction of new aircraft flight paths.

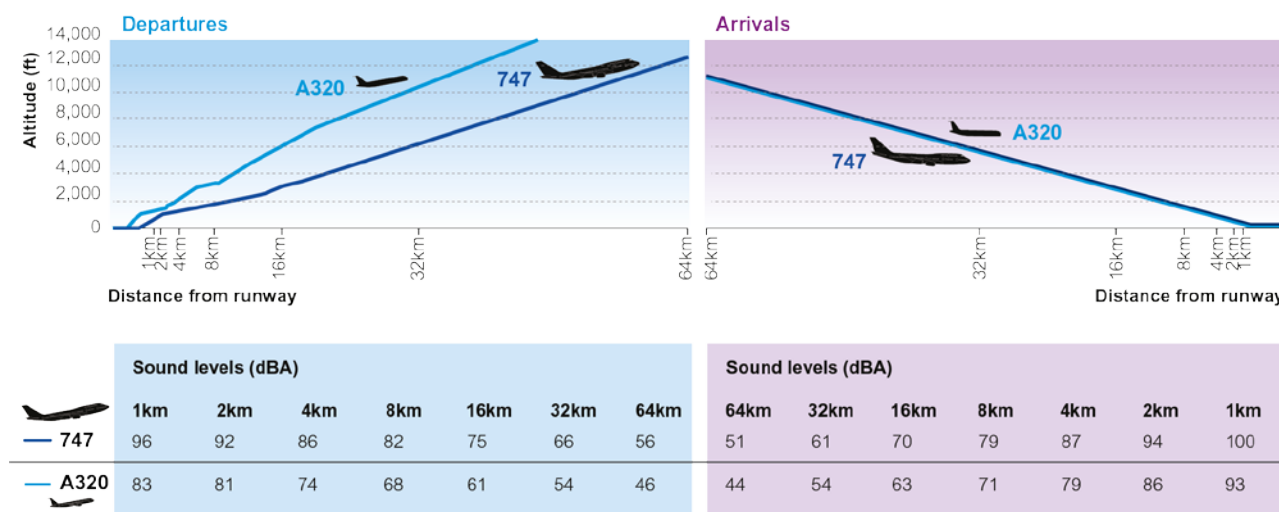
The characteristics of sound from aircraft can vary depending on a range of factors, including the type of engine, the operational stage and the height of the aircraft. While there are many sources of noise from an aircraft, it is the engines that are the dominant source for the majority of a flight cycle.

Engine noise can be particularly pronounced when aircraft are operating on the ground as a result of elevated thrust during take-off and reverse thrust during landing. Reverse thrust noise levels are typically higher than take-off noise levels as a result of the diversion of the engine exhaust to assist with deceleration, which results in a characteristic noise contour bulge surrounding a runway.

The pattern of noise impacts which would result from operation of the Stage 1 development is complex, and depends on time of day, season, airport operating mode and other factors. Each airport operating mode is also predicted to have different impacts on different areas.

The proposed airport would be developed to address aviation passenger demand and does not make specific provisions for general aviation facilities, which may include helicopter flight support and tourist flight facilities. The potential noise impacts of general aviation operations such as helicopters are not assessed in this EIS. Should such provisions be required in the future, they would be subject to separate environment and planning processes under the Airports Act.

Aircraft noise levels would decrease with distance from the proposed airport as departing and arriving aircraft are operating at greater altitudes. Indicative sound levels for Boeing 747 and Airbus A320 aircraft at gradually increasing distances (and altitude) from the runway are shown in Figure 10–2.



This figure provides information on indicative noise levels at certain distances from the end of the runway for A320 and 747 aircraft. The estimates present the height of the aircraft relative to the runway and do not account for local terrain. The indicative noise levels were calculated at the runway height.

Figure 10–2 – Indicative sound levels for B747 and A320 aircraft – departures and arrivals

10.2.3. Responsibilities for airport related noise

A number of organisations have a role in managing aircraft noise. A summary of relevant organisations and their role in managing aircraft noise is provided in Table 10–1. These include the airport lessee company (ALC), the Australian, NSW and local governments, airlines, aircraft and engine manufacturers, and regulators.

Table 10–1 – Responsibilities for managing airport related noise

Organisation	Summary of responsibilities concerning the management of aircraft noise
International Civil Aviation Organization ICAO is a United Nations specialised agency established under the Convention on International Civil Aviation (Chicago Convention) that works with member states and global aviation organisations to develop international standards and recommended practices for adoption in national civil aviation regulations.	<ul style="list-style-type: none">• aircraft and helicopters built today are required to meet the ICAO's strict aircraft noise standards; and• as an ICAO member state, Australia has adopted laws and regulations to reflect these international standards at Australia's airports.
Airservices Australia Airservices Australia would be responsible for managing aircraft movements at the proposed airport.	<ul style="list-style-type: none">• under the Air Services Act 1995, must exercise its powers and perform its functions in a manner that ensures that, as far as is practicable, the environment is protected from the effects of the operation and use of aircraft;• provides air traffic control management and related airside services to the aviation industry;• prepares and publishes jet noise abatement procedures;• determines aircraft flight paths and airport operating procedures;• publishes information on aircraft movements, runway and track usage and noise impacts using a range of noise descriptors;• handles aircraft noise complaints and inquiries (other than ground-based noise complaints which would be handled by the ALC);• operates flight and noise monitoring equipment the vicinity of major airports and publishes results; and• reviews and endorses for technical accuracy the ANEF noise contours for airports.
Australian Government: Aircraft Noise Ombudsman Conducts independent administrative reviews of Airservices Australia's management of aircraft noise-related activities.	<ul style="list-style-type: none">• reviews the handling of complaints or inquiries made to Airservices Australia;• reviews community consultation processes related to aircraft noise; and• reviews the presentation and distribution of aircraft noise-related information.
Airport lessee company This is the airport lessee and the operator of an airport	<ul style="list-style-type: none">• manages operations at the airport and ensures the effective delivery and coordination of airport-related services and facilities;• prepares an airport master plan, including publication of an ANEF and an environment strategy that identifies measures to manage noise impacts;• establishes procedures to control noise generated by engine ground running;• engages with the community; and• handles ground-based noise complaints.
Civil Aviation Safety Authority	<ul style="list-style-type: none">• through the Office of Airspace Regulation, ensure that proposed changes to airspace adequately consider environmental implications.

Organisation

Summary of responsibilities concerning the management of aircraft noise

Airlines and aircraft operators

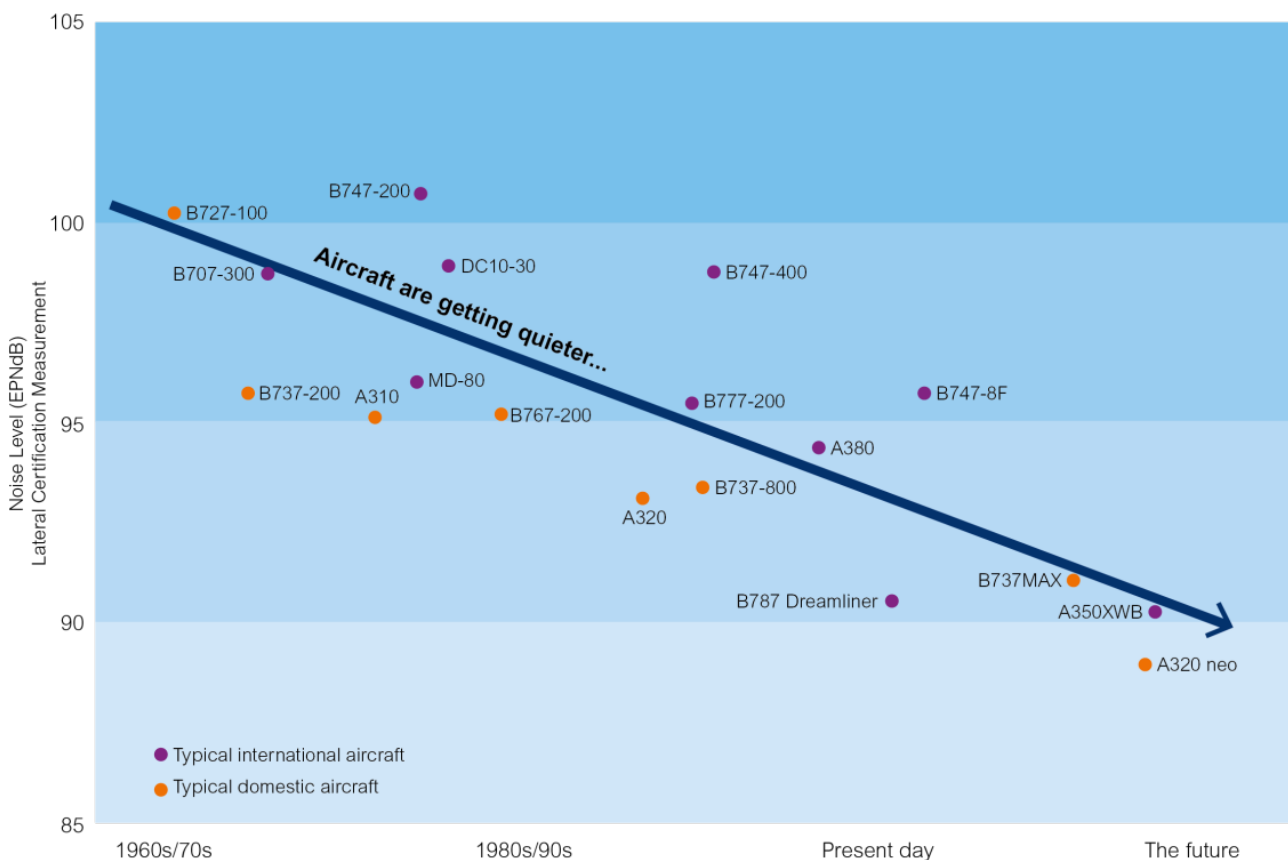
- maintains aircraft fleets and engines that meet the ICAO and Australian standards; and
- implements noise-abatement principles for flight operations, where applicable.

NSW Government and local councils

- the NSW Government and local councils regulate land use planning and development in the vicinity of airports.

10.2.4. Aircraft technology

As new aviation technologies and practices are introduced, aircraft noise tends to reduce. Figure 10–3 shows how aircraft have become progressively quieter with the adoption of new models into service. It is expected that quieter aircraft like the Airbus A350XWB, A320neo, and Boeing 737MAX would be introduced during the operation of the proposed Stage 1 development. Despite the likely introduction of these next-generation aircraft, the assessment of noise impacts has been based on aircraft types that are commonplace today, including the louder Boeing 747 and the Airbus A320. The Boeing 747 is the loudest aircraft anticipated to operate at the proposed airport and airlines are already beginning to retire it from regular passenger services.



Source: ICAO and Federal Aviation Administration (USA) as included in Sydney Airport Master Plan 2033 (SACL 2014)

Figure 10–3 – Reduction in aircraft noise over time

10.3. Airport operations

10.3.1. Indicative flight paths

Airservices Australia undertook a preliminary assessment of airspace implications and air traffic management arrangements for Sydney region airspace associated with the potential commencement of operations at the proposed airport. This assessment of impacts of aircraft overflight noise is based on indicative flight paths prepared by Airservices Australia. A future airspace design process is expected to be undertaken closer to the commencement of operations at the proposed airport.

The principal objective of Airservices Australia's preliminary assessment was to establish whether safe and efficient operations could be introduced at the proposed airport through developing indicative proof-of-concept air traffic management designs. The assessment confirms the basic viability of the proposed airport for both single and parallel runway operations, and shows that the proposed Stage 1 development and Sydney Airport could safely operate independently as high capacity airports. This ensures the selection of runways or operating modes at one airport can be made to suit local conditions without considering the operating mode at the other.

It is important to note that the conceptual design did not consider potential noise abatement opportunities, which will form an essential part of the formal airspace design process. Consultation with airlines and other stakeholders would be undertaken through the design process, which would be subject to separate regulatory assessment processes (see Chapter 3, Volume 1). This process would be undertaken closer to the commencement of operations. Further information on the airspace design process is provided in Chapter 7 of Volume 1 of this EIS.

10.3.2. Operating strategies

Assessment of aircraft overflight and runway operations noise for the proposed Stage 1 development focuses on the point at which passenger demand reaches 10 million annual passenger movements, currently expected to occur around 2030. At this stage, the airport would comprise a single (northern) runway and would have been operating for approximately five years.

The approximate north-east/south-west or 50/230 degree runway orientation for the Stage 1 development resulted in three primary operating modes being considered:

- Mode 05 – aircraft arrive from the south-west and depart to the north-east;
- Mode 23 – aircraft arrive from the north-east and depart to the south-west; and
- Head-to-head – all landings and take off movements occur in opposing directions, to and from the south-west.

The availability of each operating mode (described in greater detail in Chapter 7) at any given time would depend on meteorological conditions, particularly wind direction and speed, the number of presenting aircraft and the time of day. Due to the relatively low and consistent wind speeds at Badgerys Creek (see Chapter 7) it is likely that the preferred operating mode would be in place over 80 per cent of the time. However, the assumed order for selection of the operating modes has a notable effect on the overall noise impact from the airport. In this context, the preferred operating strategies that were considered as part of the noise impact assessment are described below:

- Prefer 05 strategy – all aircraft would be directed to approach and land from the south-west and directed to take-off to the north-east. If this is not possible for meteorological or operating policy reasons, then second priority would be given to operations in the opposite direction (i.e. the 23 direction);
- Prefer 23 strategy – all aircraft would be directed to approach and land from the north-east and take-off to the south-west. If this is not possible for meteorological or operating policy reasons, then second priority would be given to operations in the opposite direction (i.e. the 05 direction);
- Prefer 05 strategy with head-to-head – as per Prefer 05, except that during the night hours of between 10.00 pm and 7.00 am, head-to-head operating mode to the south-west would be used when:
 - there are no more than a total of 20 aircraft movements in the hour following the relevant time; and
 - wind conditions allow the use of both runway directions;
- Prefer 23 strategy with head-to-head – as per Prefer 05 with head-to-head, except that when head-to-head operating mode is not in use, Prefer 23 applies rather than Prefer 05.

If Prefer 05 or Prefer 23 is in use during the night-time period, the operating mode would revert to head-to-head under the following conditions:

- the use of head-to-head has been allowed for at least two hours before the change time; and
- the use of head-to-head would be allowed for at least two hours after the change time.

10.3.3. Hours of operation

As the proposed airport would operate on a 24 hour basis, this assessment of overflight noise considers the operation of the proposed airport over a range of timeframes, including a full operating day (24-hour) and night-time hours (10.00 pm–7.00 am). This range of timeframes was intended to capture the range of potential noise impacts at sensitive receivers and on particular activities (including the potential for sleep disturbance).

These timeframes were considered in conjunction with the various operating modes discussed in Section 10.3.1 to capture a wide range of potential conditions. Consideration of seasonality was also undertaken as part of the technical paper presented in Volume E1. Minimal variation in noise impacts between summer and winter seasons was evident from this analysis.

10.4. Methodology

10.4.1. Assessing aircraft overflight noise

Aircraft overflight noise is assessed by reference to a number of measures. These measures are described below.

10.4.1.1. ANEF and ANEC

For land use planning around airports, Australia has adopted the Australian Noise Exposure Forecast (ANEF) system, which describes cumulative aircraft noise for an annual period. The ANEF system was developed on the basis of social survey data and is relatively well correlated with the proportion of people who would describe themselves as “seriously affected by noise”. The ANEF system is intended for use as a land use planning tool for controlling encroachment on airports by noise sensitive buildings and underpins *Australian Standard 2021:2015 – Acoustics—Aircraft noise intrusion—Building siting and construction* (AS2021) (Australian Standard 2015). AS2021 contains advice on the acceptability of building sites based on ANEF zones. The acceptability criteria vary depending on the type of land use as shown in Table 10–2 which identifies the recommended development types within ANEF zones, as outlined in AS2021:2015. An aircraft noise exposure level of less than 20 ANEF considered acceptable for the building of new residential dwellings.

Table 10–2 – Building Site Acceptability Based on ANEF zone (AS 2021)

Building Type	ANEF zone of site		
	Acceptable	Conditionally acceptable	Unacceptable
House, home unit, flat, caravan park	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Hotel, motel, hostel	Less than 25 ANEF	25 to 35 ANEF	Greater than 30 ANEF
School, university	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Hospital, nursing home	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than 20 ANEF	20 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other industrial	Acceptable in all ANEF		

An “ANEF chart” is a set of land use planning contours for a specific airport which has been formally endorsed for technical accuracy by Airservices Australia, after a period of public consultation. The production of an ANEF chart for all major airports is a requirement of the Airports Act.

An Australian Noise Exposure Concept (ANEC) is a noise exposure chart produced for a hypothetical future airport usage pattern, and is useful for considering the land use planning consequences of alternative operating strategies. ANEC noise exposure contours are calculated using the same methods as the ANEF. However, they use indicative data on aircraft types, aircraft operations and flight paths and are generally used in environmental assessments to depict and compare noise exposure levels for different flight path options.

10.4.1.2. 1985 EIS ANEC

A series of ANECs¹ were developed for the 1985 *Second Sydney Airport Site Selection Programme Draft Environmental Impact Statement* (1985 Draft EIS) (Kinchill Stearns 1985). These contours have guided subsequent planning controls implemented by the NSW Government and relevant local councils in the vicinity of the airport site.

Planning controls that are implemented based on an ANEF typically serve to limit the types of development permitted to occur within particular noise exposure zones.

The key planning decision made subsequent to the 1985 Draft EIS is the ministerial direction under section 117(2) of the *Environmental Planning and Assessment Act 1979* (NSW). The direction applies to all land within the ANEF in the local government areas of Fairfield, Liverpool, Penrith and Wollondilly and requires that planning instruments do not contain provisions enabling development which could hinder the potential for development of a Second Sydney Airport. The direction has subsequently been given effect through the *Penrith Local Environmental Plan 2010* and *Liverpool Local Environmental Plan 2008*, with the inclusion of provisions aimed at preserving noise related buffers around the airport site (see Chapter 21).


It is expected that an official ANEF would be produced and endorsed by Airservices Australia prior to the commencement of operations at the proposed airport.

10.4.1.3. 'Number Above' measures

'Number Above' measures indicate the average number of aircraft overflights per day (or other specified time period) exceeding a specified noise level. The N70 and N60 are measures commonly used in environmental impact assessments to better inform strategic planning and provide more comprehensive and understandable information on aircraft noise for communities.

- N70 – the average number of aircraft noise events per day with maximum noise levels exceeding 70 dBA. A noise level of 70 dBA outside a building would generally result in an internal noise level of approximately 60 dBA, if windows are partly open. This noise level is sufficient to disturb conversation, in that a speaker would generally need to raise their voice to be understood, or some words may be missed in speech from a television or radio. If external windows are closed, such effects would be experienced inside at an external noise level of approximately 80 dBA; and
- N60 – the average number of aircraft noise events per day with maximum noise levels exceeding 60 dBA during the night-time period 10pm-7am. An external noise level of 60 dBA approximates an internal level of 50 dBA if windows are partly open. An internal noise level of 50 dBA is commonly used as a design criterion for noise in a bedroom, to protect against sleep disturbance. A criterion of 60 dBA was considered appropriate for recreation areas, both passive and active, on the basis that at this level a person may need to raise their voice to be properly heard in conversations.

¹ The 1985 EIS included a scenario-based noise exposure chart in the form of an "ANEF", which we would today term an "ANEC".



Standard calculations of N70 and N60 represent an average over all days (or all days in a specified season), and may potentially not provide a representative measure if the number of events above 70 dBA or 60 dBA varies significantly between days. To overcome this potential shortcoming, this assessment has calculated modified N70 and N60 values (known as 90th percentile N70s and N60s) to identify the upper range of aircraft overflight numbers likely to be experienced. The 90th percentile is a statistical category representing noise values that would be exceeded on only 10 per cent of days. Accordingly, the 90th percentile N70 and N60 values represent days where there would be a particularly high number of movements.

10.4.1.4. Peak noise level

L_{Amax} is the maximum A-weighted noise level predicted or recorded over a period. In this assessment, L_{Amax} denotes the maximum level of noise predicted at a location during a single overflight from a particular aircraft occurring at any time.

10.4.2. Aircraft overflight noise modelling

The modelling of aircraft overflight noise uses information and projections from a number of sources, including projected air traffic volumes, aircraft flight paths, airport operating modes, assumed fleet mix and scheduling, noise emissions from representative aircraft types, and predicted future population densities in areas around the airport. A summary of the modelling process is described below and shown on Figure 10–4. Full details of the noise assessment methodology is included in Chapter 2 of Appendix E1 in Volume 4.

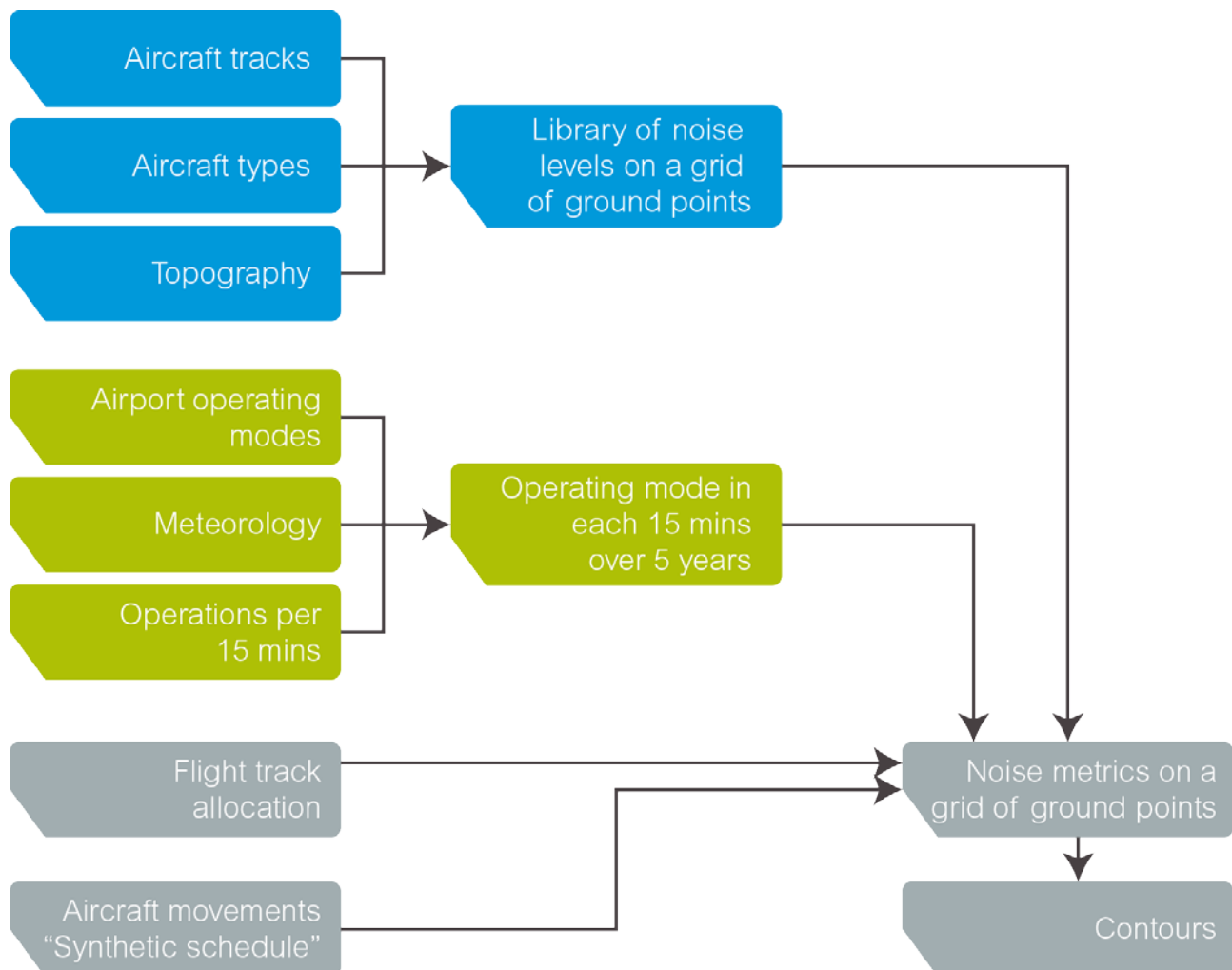


Figure 10–4 – Noise modelling process

The Integrated Noise Model (INM) aircraft noise prediction software, produced by the US Federal Aviation Administration, was used to predict noise levels from each of the 22 aircraft types on the 245 indicative flight paths for the Stage 1 development. The model includes aircraft overflight noise together with departure noise, landing and reverse thrust noise when the aircraft is on the runway.

Predicted future numbers of aircraft movements (one movement consists of an aircraft either taking off or landing) were in the form of ‘synthetic schedules’ which detail a list of aircraft operations for a typical day, including aircraft family, operation type (arrival or departure), time of operation and port of origin or destination for each operation.

Predicted total aircraft movements for a typical busy day for the proposed Stage 1 development (refer to Section 2.5 in Appendix E1) are summarised in Table 10–3 and the predicted number of movements for each hour of the day is shown in Figure 10–5.

Table 10–3 – Predicted daily aircraft movements in 2030 by aircraft family (busy day)

Aircraft	Daily movements
<i>Passenger Movements</i>	
Airbus A320	100
Airbus A330	18
Airbus A380	–
Boeing 737	28
Boeing wide-body general	–
Boeing 777	4
DeHaviland DHC8	8
Saab 340	12
<i>Freight Movements</i>	
Airbus A330	2
Boeing 737	2
Boeing 747	10
Boeing 767	4
Boeing 777-300	–
Small Freight	10

The aircraft types shown in Table 10–3 were used for noise level calculations in the noise modelling software. They were selected to be representative of the aircraft types expected to use the proposed airport which is considered to be conservative as aircraft are predicted to become progressively quieter with the adoption of new models into service.

Aircraft movements per hour

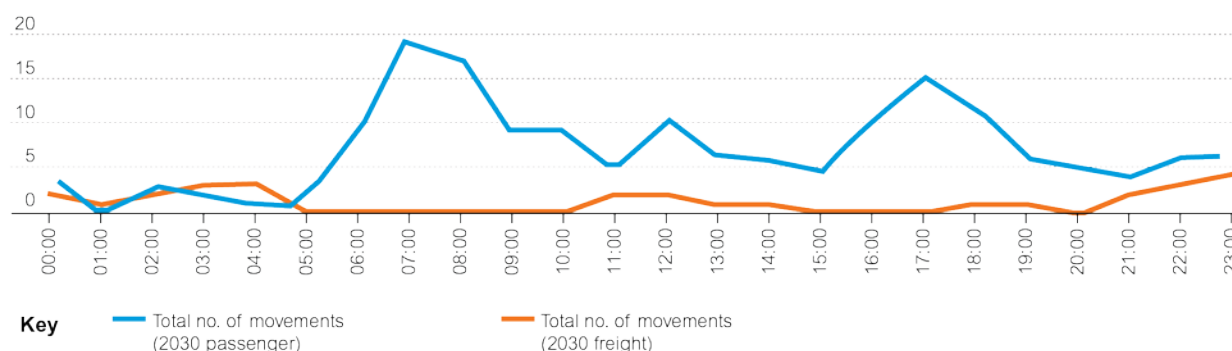


Figure 10–5 – Predicted aircraft movements per hour in 2030

An airport operating mode was assigned for each 15 minute period over the five years covered by the meteorological data, using the rules for operating mode selection described in Section 10.3.2. Aircraft operations occurring in that 15 minute period (taken from the synthetic schedule) were then assigned to flight paths according to meteorological conditions, visual or instrument landing conditions (for arrivals), aircraft type (e.g. assignment of only turboprop aircraft to certain flight paths) and the direction of the destination airport (for departures).

Arrival flight paths were assumed to follow a 'point merge' configuration where all aircraft approaching the airport pass over a single point to the north of the airport then move to a final approach in either of the two runway directions (see Chapter 7).

The point merge is a way of synchronising arriving aircraft and directing them to the runway in a structured manner. By directing aircraft through a series of predictable routes, the vertical and lateral path taken on approach is more accurate and can result in a reduction of the number of level flight segments required during descent. The system may help to reduce fuel consumption, emissions and noise impacts, as it relies on a continuous descent profile and therefore limits use of engine power settings above idle. Figure 10–6 illustrates the concept of continuous descent operation (CDO). The point merge system is discussed in further detail in Chapter 7.

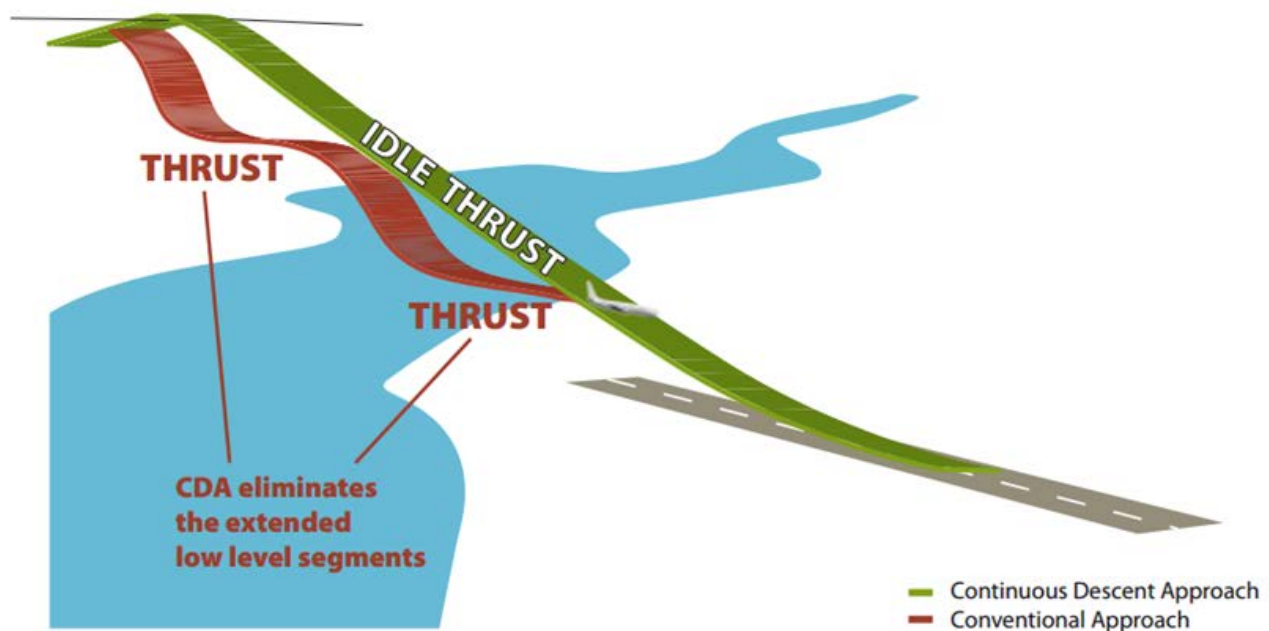


Figure 10–6 – Concept diagram of continuous descent operation

For each aircraft type, track and possible stage length (a measure of distance to destination for departing aircraft), custom-designed software was used to calculate noise levels at each point on a 185x185 metre grid. Maximum noise levels for every aircraft movement within this assessment area were used to form the 'library of noise levels' shown in Figure 10–4.

For N70 and similar units, this library was used to determine the number of events at each grid point exceeding the relevant L_{Amax} threshold, and the results used to produce contours.

10.5. Assessment of aircraft noise impacts

10.5.1. Sensitive receivers

There is potential for aircraft noise to be experienced across a broad geographic area as a result of aircraft arrival and departures operating on the indicative flight paths presented in Chapter 7. Noise contour maps have been produced at a range of scales which represent the geographic extent of exposure for each noise assessment measure adopted as part of the analysis. For example, maximum noise levels during a single overflight from a particular aircraft have the widest potential geographic exposure and have therefore been mapped at a relatively small scale. “Number above” measures affect a comparatively smaller geographic area and therefore the noise contours have been presented in maps with larger scale showing more detailed information.

It is recognised the sensitive receivers located in close proximity to the airport generally have a higher potential to be impacted by exposure to aircraft noise. Maximum single event noise contours have therefore also been produced at a meso scale (zoomed in) to provide higher resolution mapping of noise exposure to represent sensitive receivers in close proximity to the airport site.

Noise-sensitive receivers in the area surrounding the proposed airport are also represented in Figure 10–7. Noise sensitive receivers include residences, recreational areas, schools and other educational facilities, hospitals and other health care facilities. The noise assessment has primarily focussed upon the affected population for each noise assessment measure and impact upon surrounding recreational areas. More detailed consideration of impacts to other potentially affected sensitive receivers such as schools and hospitals is provide in the social assessment in Chapter 23 of this EIS. Consideration of potential impacts upon the Greater Blue Mountains World Heritage Area is presented in Chapter 26.

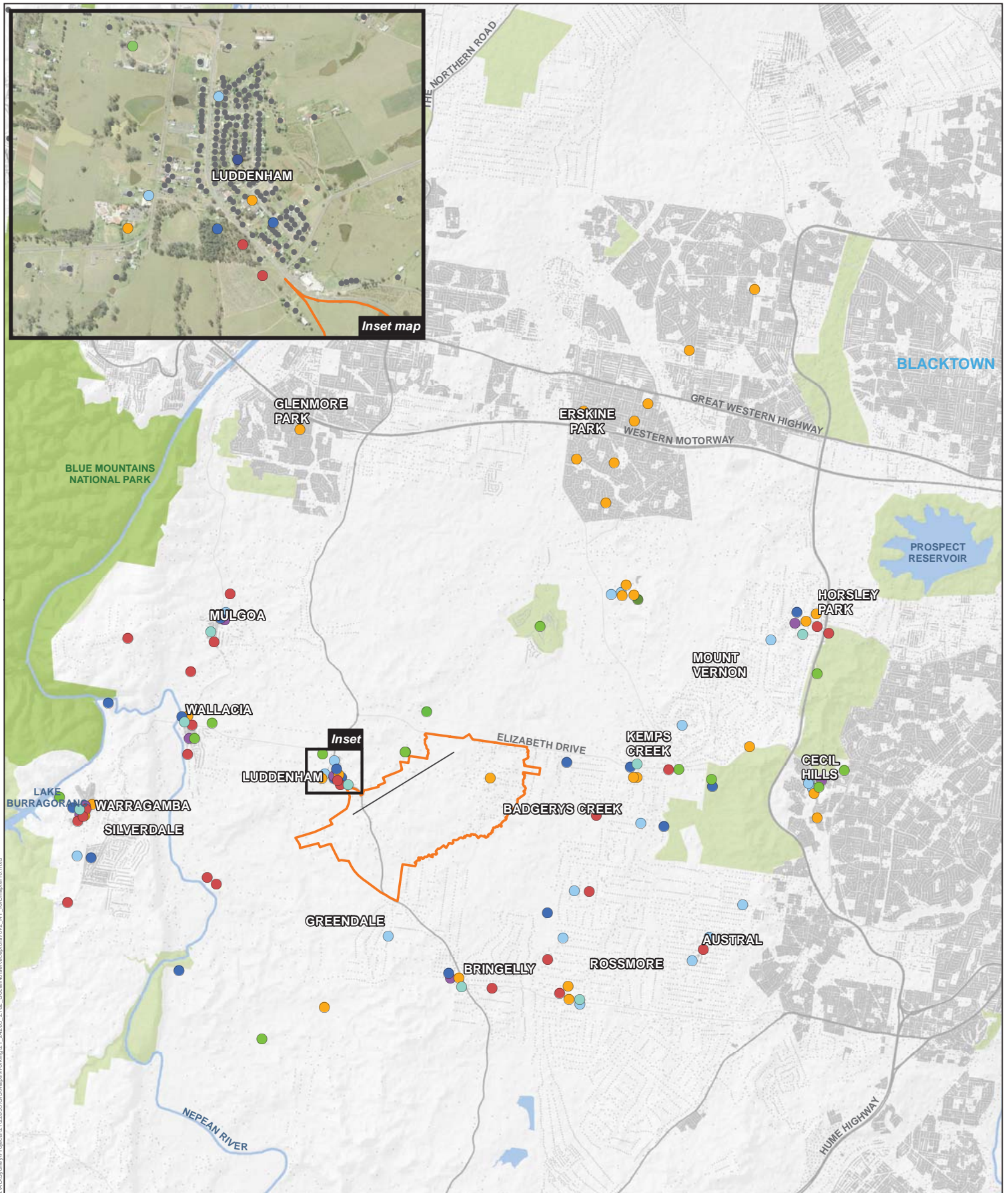


Figure 10-7 - Sensitive Receivers surrounding the airport site

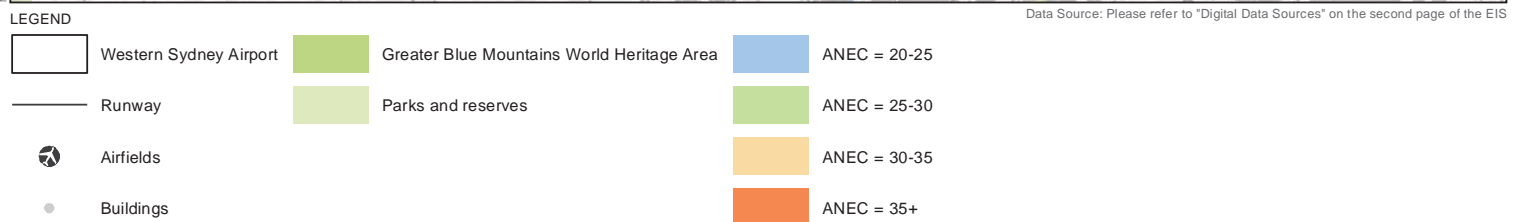
10.5.2. Land use planning implications

ANEC contours have been developed based upon the indicative flight tracks and operating modes to provide an indication of the likely acceptability of building types based upon ANEF zones specified in AS2021. It is expected that an endorsed ANEF noise exposure chart would be produced prior to commencement of operations at the proposed airport. Figure 10–8 and Figure 10–9 show the ANEC contours calculated for the year 2030, for the respective Prefer 05 and Prefer 23 operating modes.

Figure 10–10 and Figure 10–11 show the year 2030 ANEC 20 contour compared to the combined ANEC 20 contour presented in the 1985 Draft EIS (Kinhill Stearns 1985). The 1985 ANEC were prepared for a dual runway airport and have been used for land use planning purposes to date.

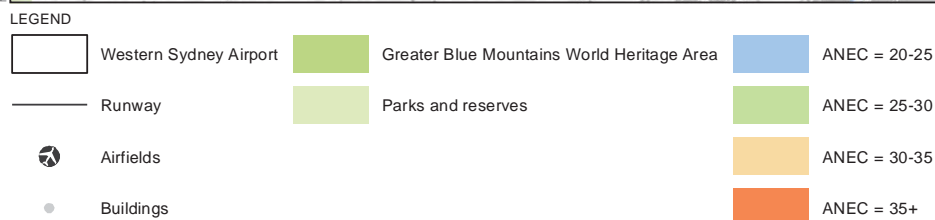
These figures show that the new 2030 ANEC contours are generally less geographically extensive than those developed for the 1985 Draft EIS (Kinhill Stearns 1985). It is important to note that the ANEC figures for the proposed Stage 1 development are not intended to guide future land use planning and are provided primarily for comparative purposes and to provide comprehensive information about predicted noise exposure. Any change to current land use planning instruments would necessarily be based on longer term forecasts of noise exposure.

While there are differences between Prefer 05 and Prefer 23 operating strategies, the introduction of head to head operations at night does not greatly influence the contours (refer to Section 3.6 of Appendix E1). This is because even with an additional 6 dBA weighting for night-time noise events, as included in the ANEF formula, overall noise exposure is still dominated by daytime events.



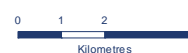
Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

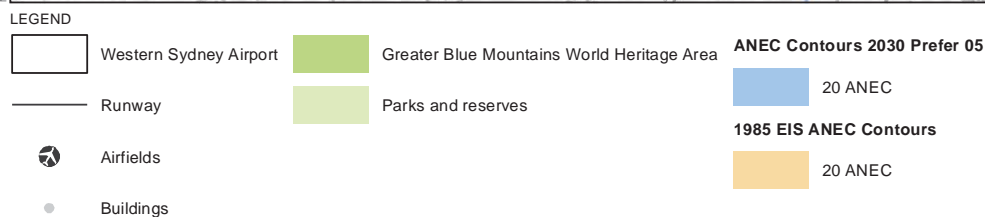
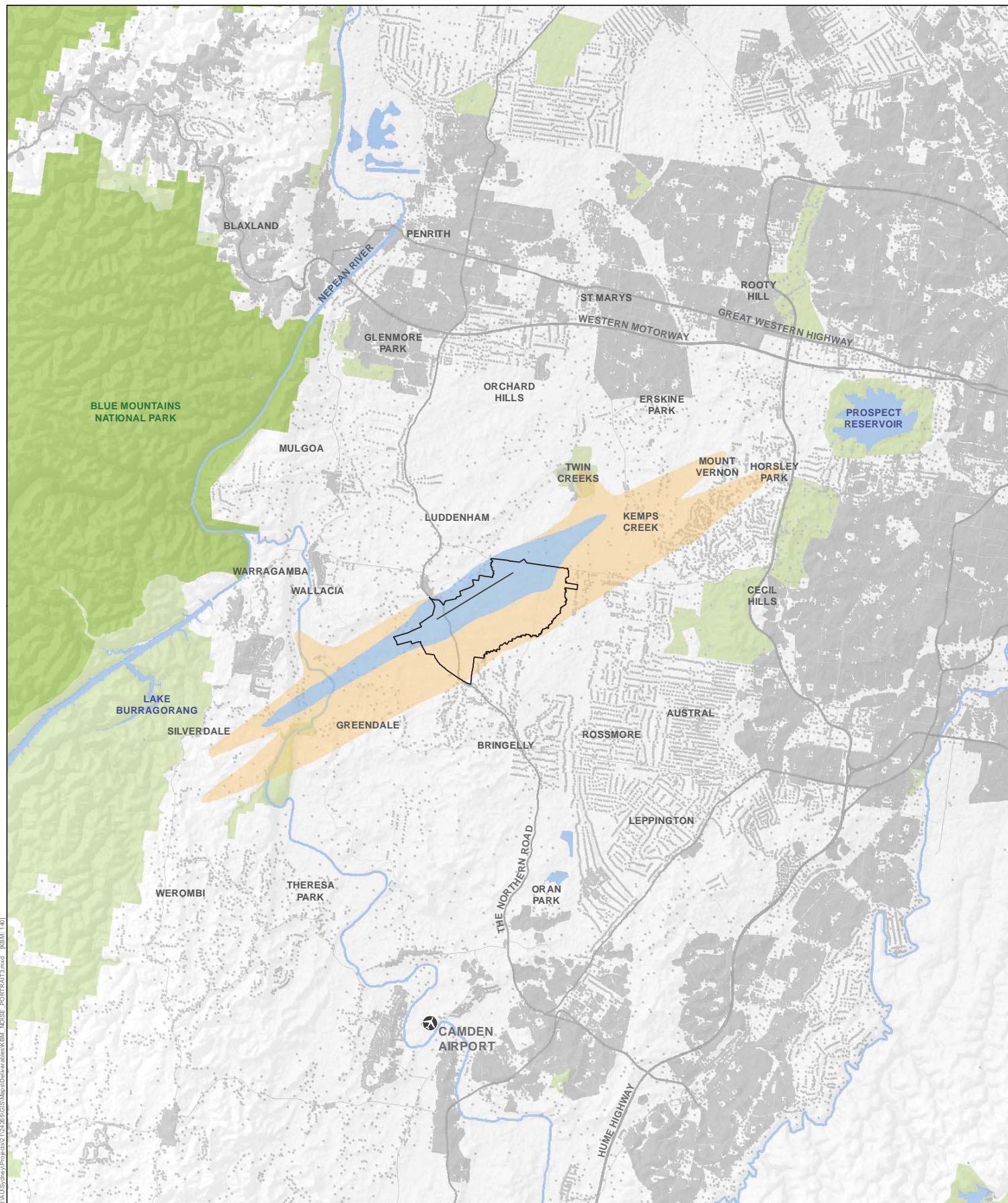
Figure 10-8 - ANEC contours for Prefer 05 operating strategy (2030)



Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

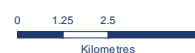
Figure 10-9 - ANEC contours for Prefer 23 operating strategy (2030)

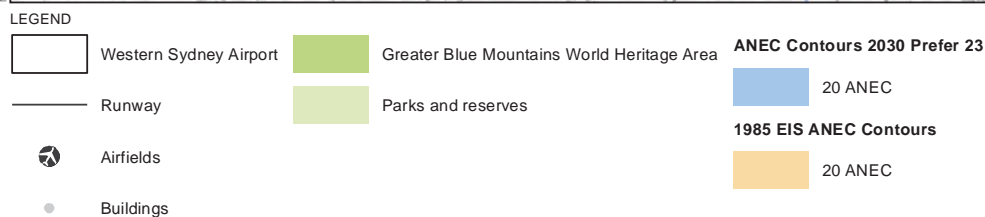
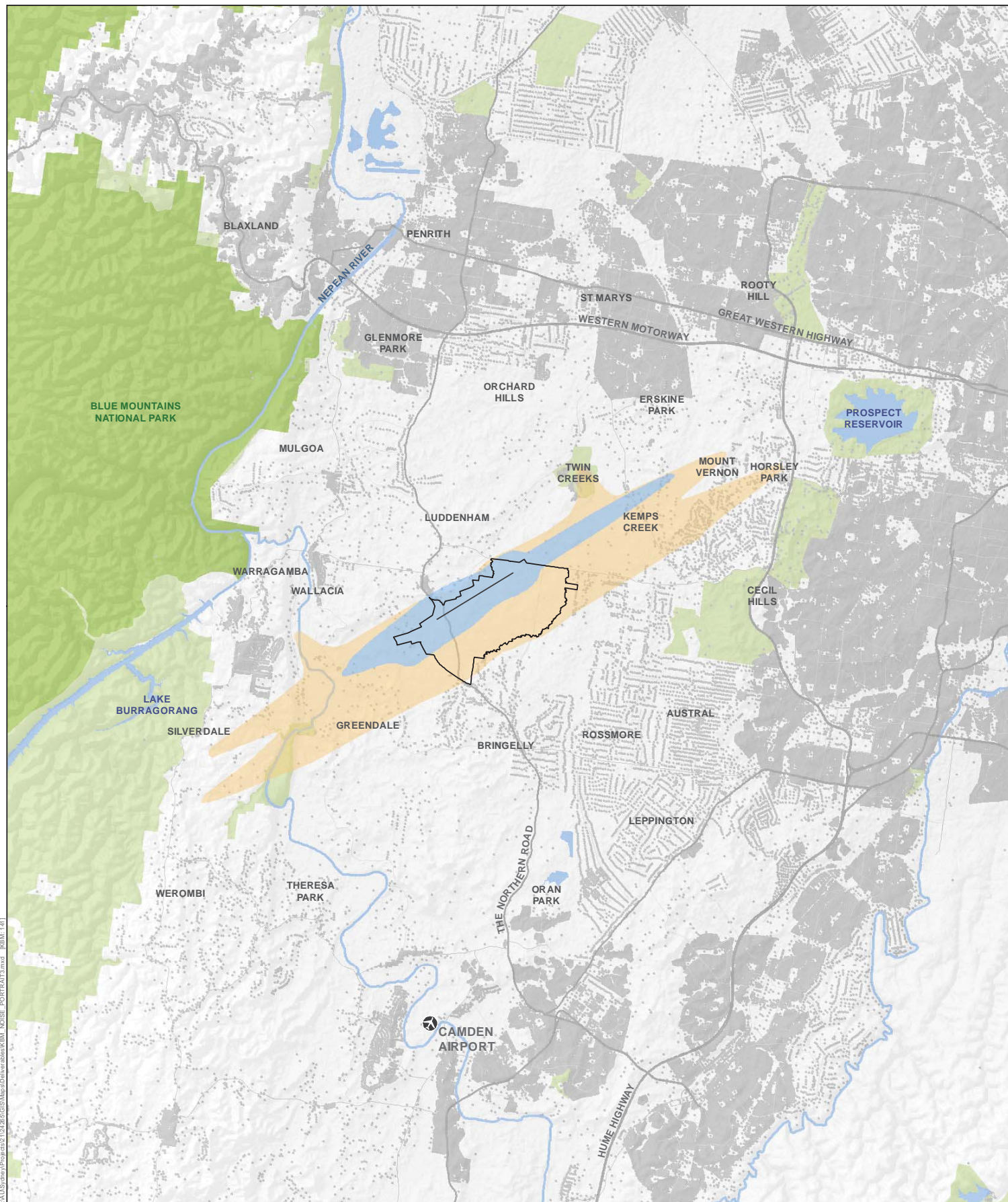




Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

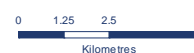
Figure 10-10 1985 Draft EIS combined ANEC contours compared to 2030 Prefer 05





Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Figure 10-11 1985 Draft EIS combined ANEC contours compared to 2030 Prefer 23



10.5.3. Maximum noise levels

Single-event noise contours depict the maximum (L_{Amax}) noise levels resulting from a single operation of a specific aircraft type on all applicable arrival or departure flight paths.

In the Integrated Noise Model, departures by aircraft are defined for several stage lengths, representing different distances to the destination, and hence different assumed fuel loads. Stage 1 is the shortest stage with a length from 1,500 nautical miles, while stage 9 is the longest with a length over 6,500 nautical miles.

Figure 10–12 shows single-event L_{Amax} noise level contours for the loudest noise event predicted to occur at the proposed airport under this scenario – a B747 departure with stage length 5, corresponding to a departure for Singapore. These events are predicted to occur once per day on average, on any of a number of flight paths. Although contours are shown for these events on paths heading south from the airport, it is very unlikely that a stage 5 departure would occur on these paths.

At the most-affected locations close to the airport, L_{Amax} noise levels from these events would be in the range of 80 to 90 dBA. This is clearly demonstrated in the meso scale (zoomed in) version of the single-event L_{Amax} noise level contours for a B747 departure with stage length 5 as shown on Figure 10–13. There are less than 10 existing residences within the 85 dBA L_{Amax} contour for these events, located to the south-west of the proposed airport. When these events occur on the flight path leading north in the 05 operating mode (i.e. departures to the north-east), L_{Amax} noise levels exceeding 70 dBA are predicted over more densely-populated areas around St Marys, with levels above 75 dBA predicted in some parts of Erskine Park.

Figure 10–14 shows L_{Amax} noise levels from a B747 arrival on any flight path. In this case, noise levels of 60 to 70 dBA could be expected over sections of Erskine Park and St Marys, extending to parts of Blacktown as shown on the meso scale figure in Figure 10–15. Noise levels from this event would also reach 60 dBA at Blaxland, beneath the merge point for arrivals. In 2030, there are expected to be five such arrivals per day.

Figure 10–16 to Figure 10–18 show L_{Amax} noise levels for much more common events – departures (stage 4 and stage 1) and arrivals by A320 and similar aircraft types. Stage 3 or 4 departures by A320 aircraft (on any flight path) are predicted to occur 12 times per day in 2030. When these events occur to the north in the 05 operating mode, maximum noise levels in parts of St Marys would be up to 64 dBA. For Stage 1 or 2 departures (for example, to Brisbane or Melbourne), the maximum noise level over built-up areas is not predicted to exceed 60 dBA.

Arrivals by A320 aircraft, when they occur in the 23 operating mode (from the north-east), are predicted to produce L_{Amax} noise levels exceeding 60 dBA over areas between Erskine Park, St Marys and Blacktown. A320 arrivals in the 05 operating mode (from the south-west) would produce L_{Amax} levels exceeding 60 dBA over limited areas in the Blue Mountains National Park and Greater Blue Mountains World Heritage Area.

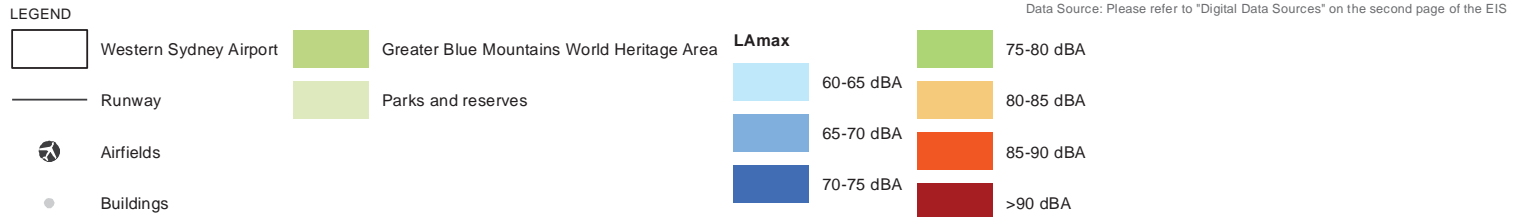
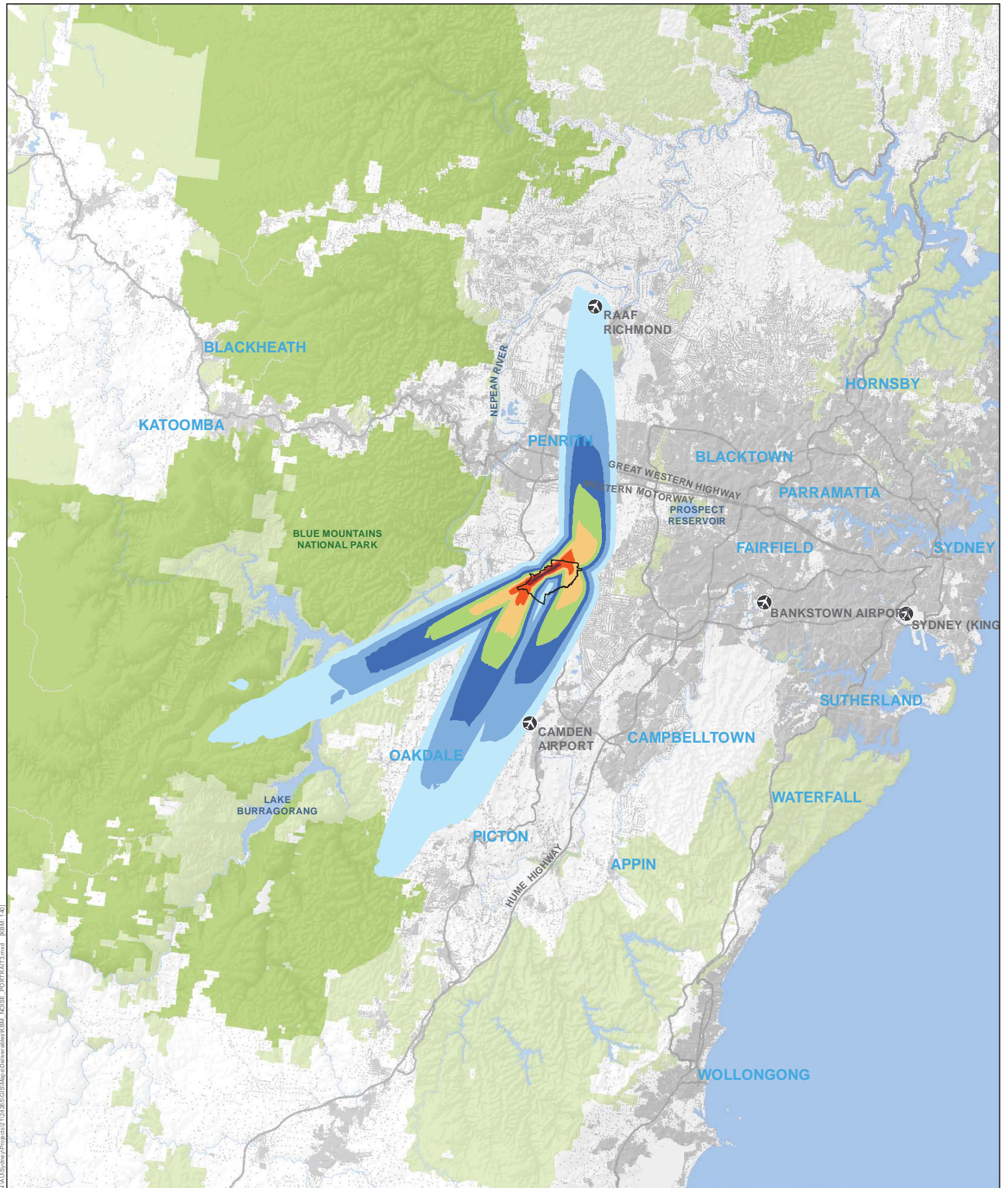


Figure 10-12 - Single event B747 departure - stage 5 - on all flight paths

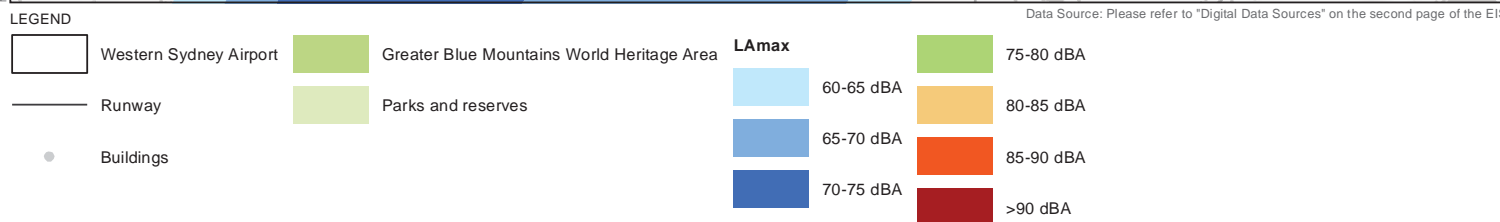
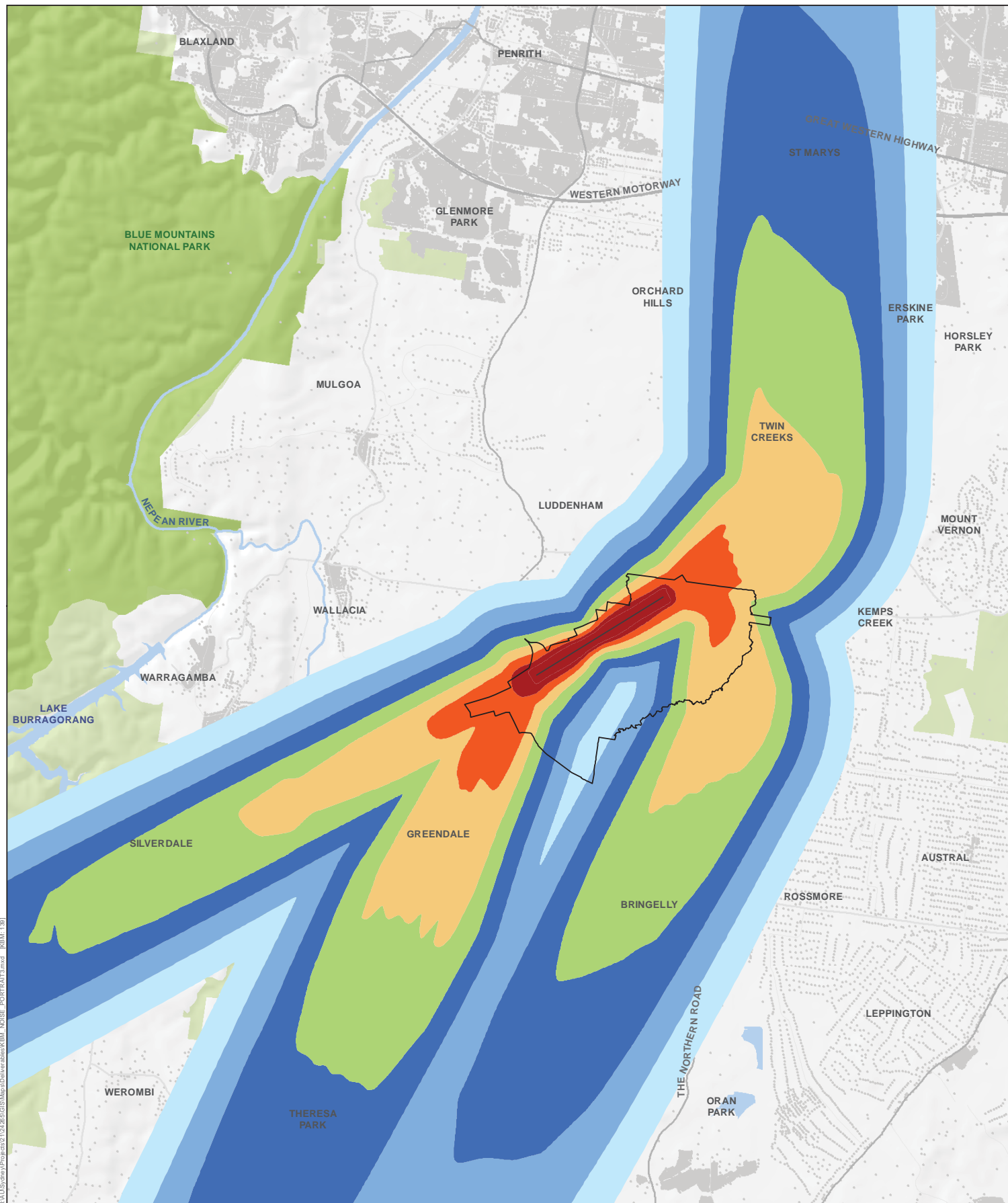


Figure 10-13 - Single event B747 departure - stage 5 - on all flight paths (meso scale)

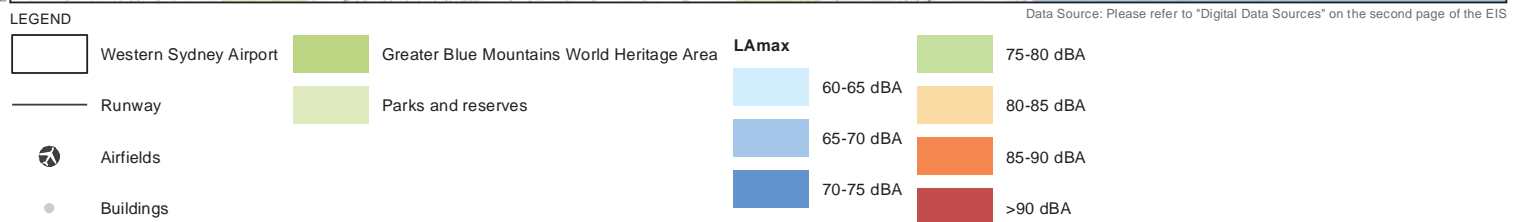
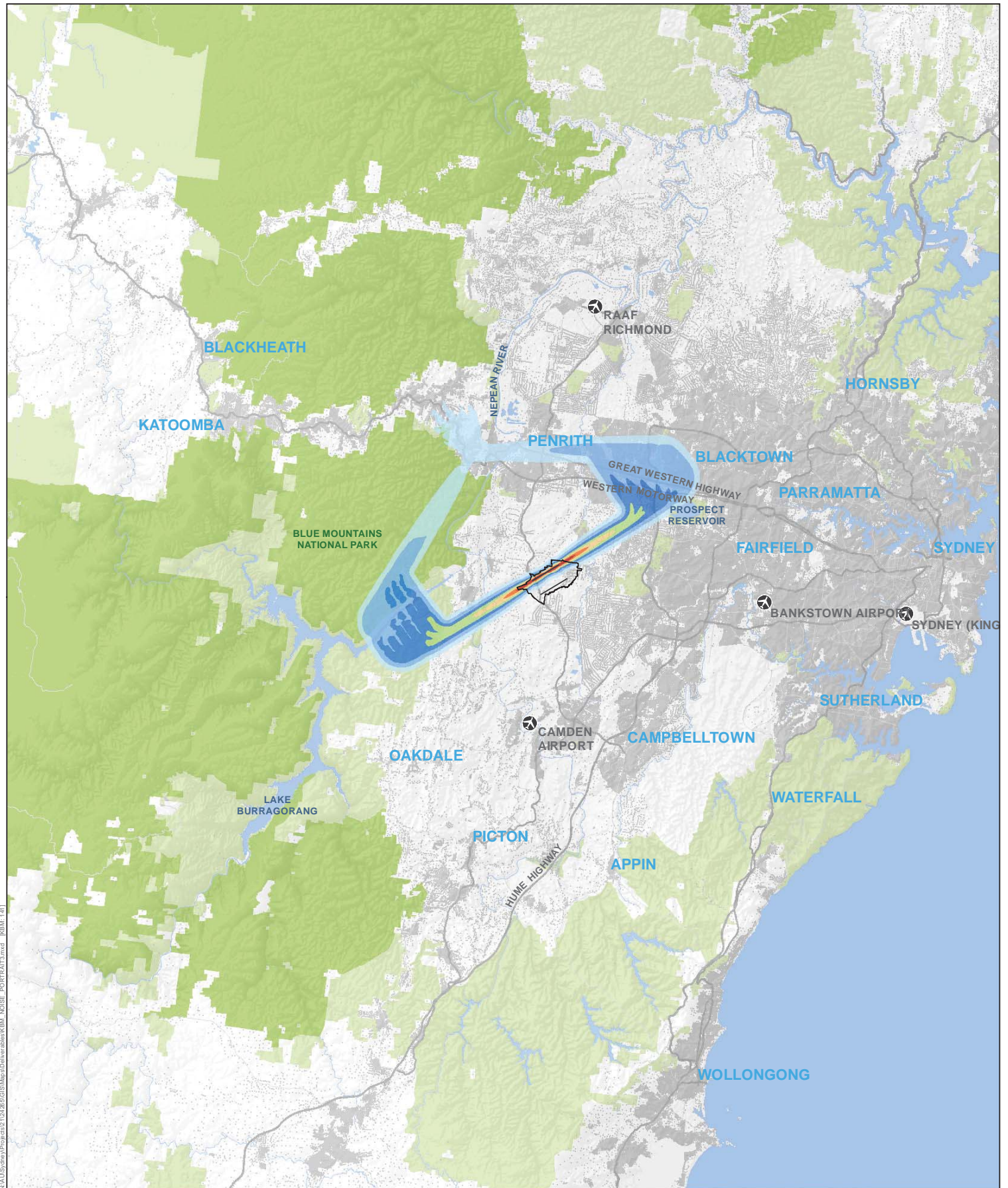
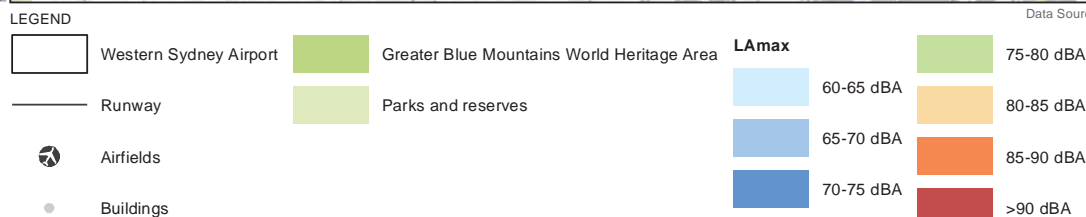
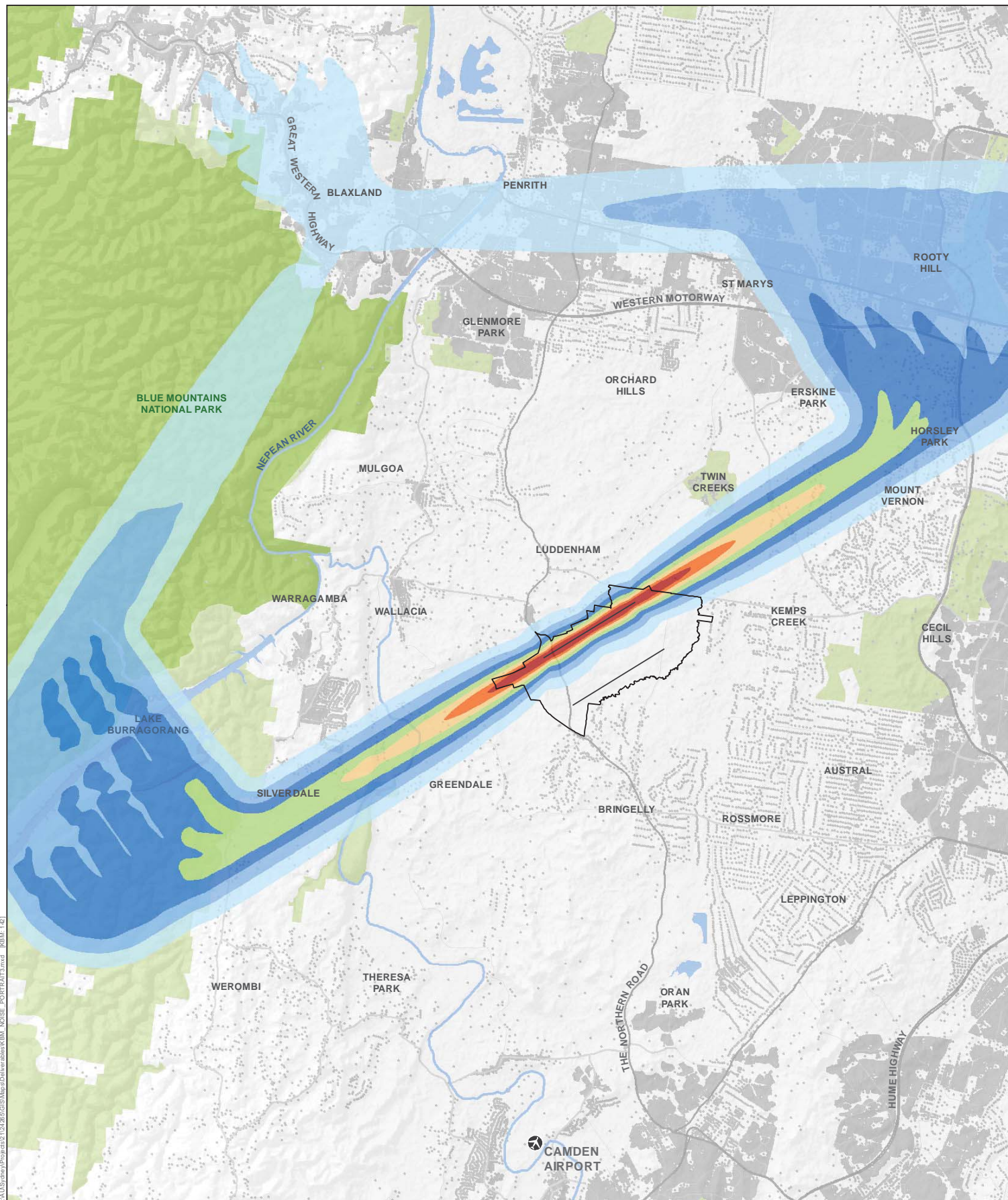
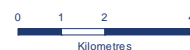


Figure 10-14 Single event B747 arrival on all flight paths



Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Figure 10-15 Single event B747 arrival on all flight paths (meso scale)



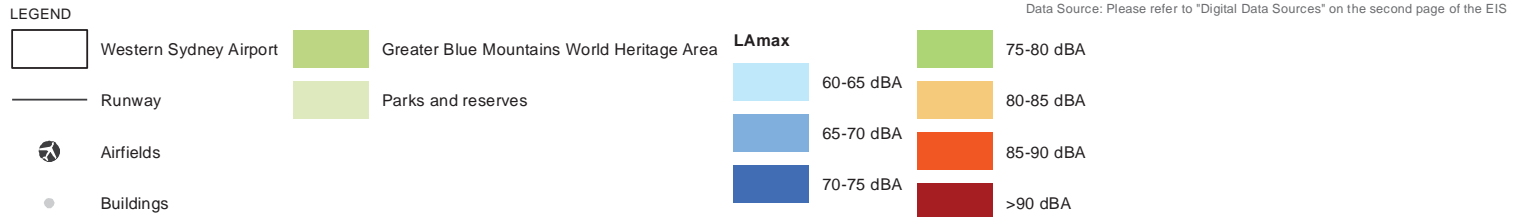
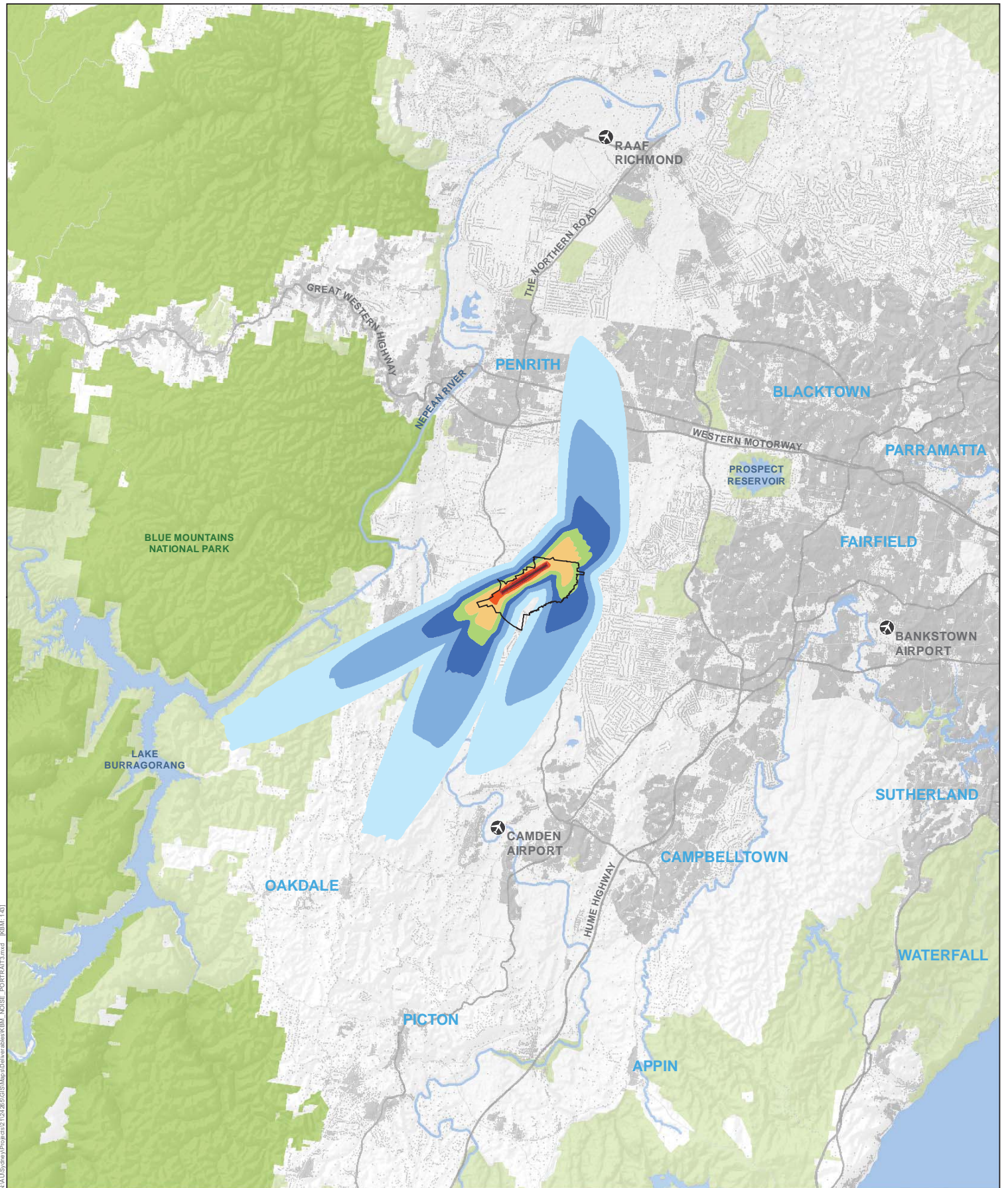
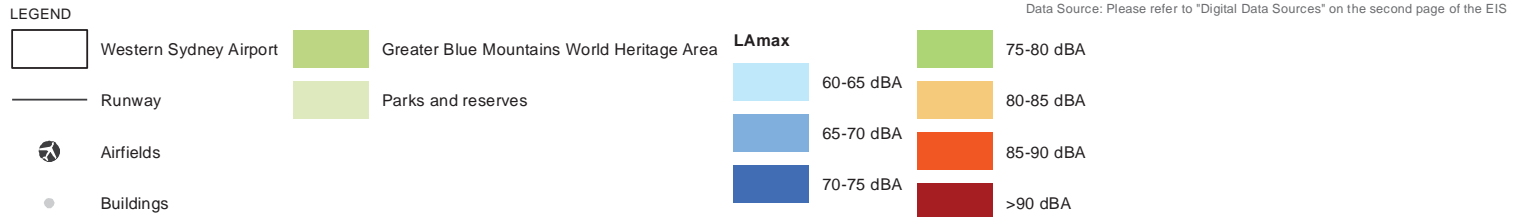
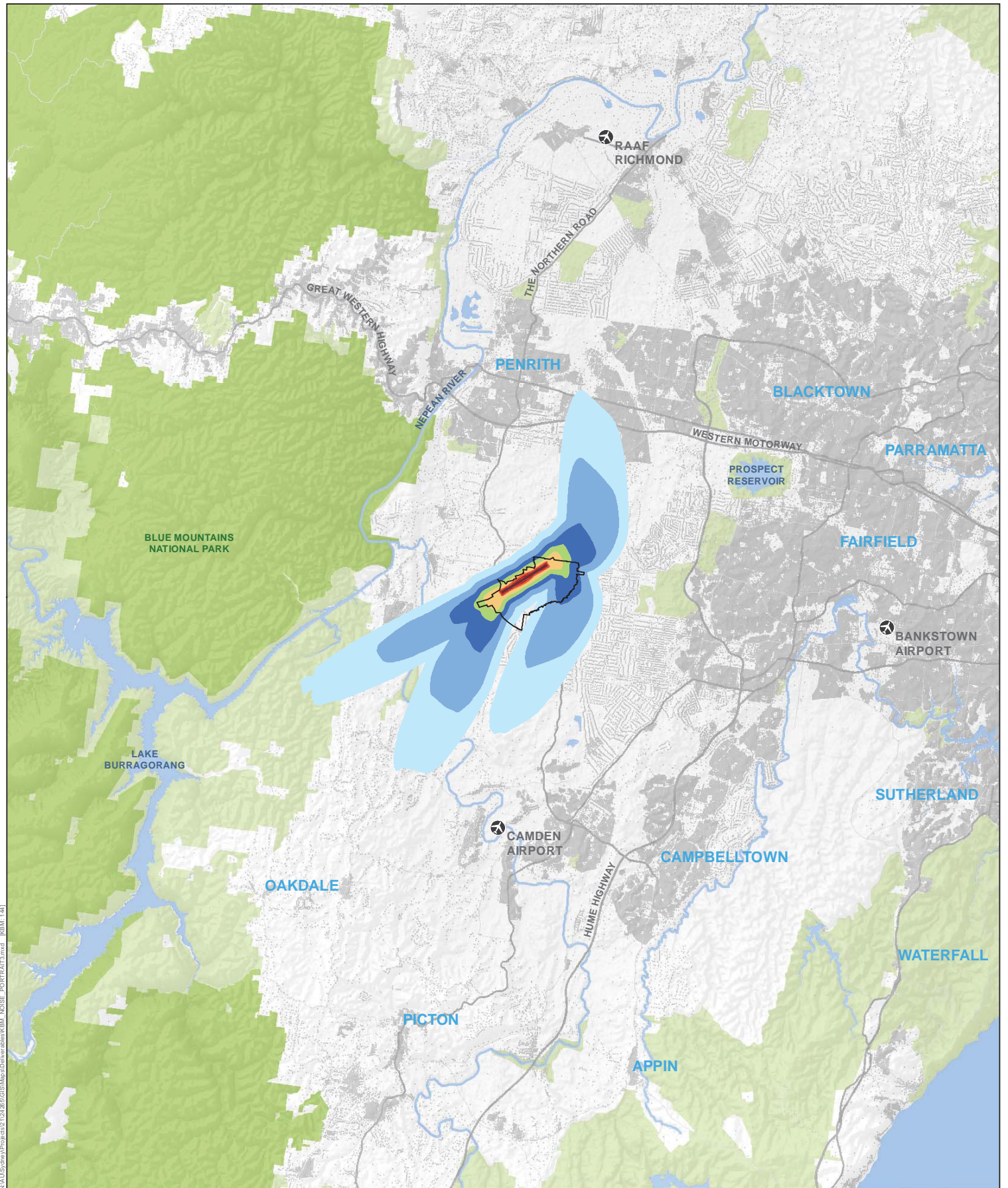


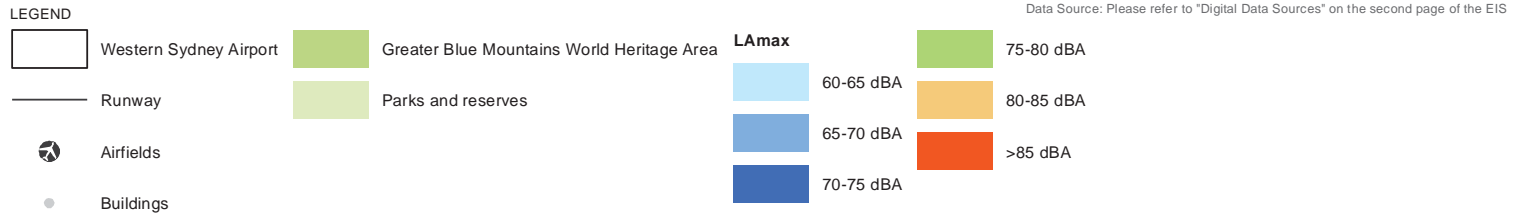
Figure 10-16 - Single event A320 departure - stage 4 - on all flight paths



Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Figure 10-17 - Single event A320 departure - stage 1 - on all flight paths





Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Figure 10-18 - Single event noise level for an A320 arrival (left) and departure (right)

10.5.4. Noise over 24 hours

10.5.4.1. N70 population exposure estimates

Aircraft noise impact over a full day can be described by the number of noise events exceeding 70 dBA, or N70 (refer to Section 10.2.1). Table 10–4 shows the population estimated to be affected by noise above 70 dBA in 2030 on an average day for each operating strategy. The number of people experiencing five or more aircraft noise events per day above 70 dBA would be roughly 1,500–1,600 and would depend very little on which operating strategy is adopted. The Prefer 23 operating strategy results in fewer people being affected at lower noise levels (generally to the north of the proposed airport), but this is offset by more people being affected at higher noise levels, generally located in rural residential areas to the south and west of the airport site. Head-to-head operations are expected to only occur in favourable meteorological conditions during the night hours of 10.00 pm and 7.00 am. Because night-time movements would represent a relatively small component of the overall daily number of aircraft operations in 2030, the inclusion of a head-to-head operating mode does not affect substantially the number of residents predicted to experience noise levels above 70 dBA.

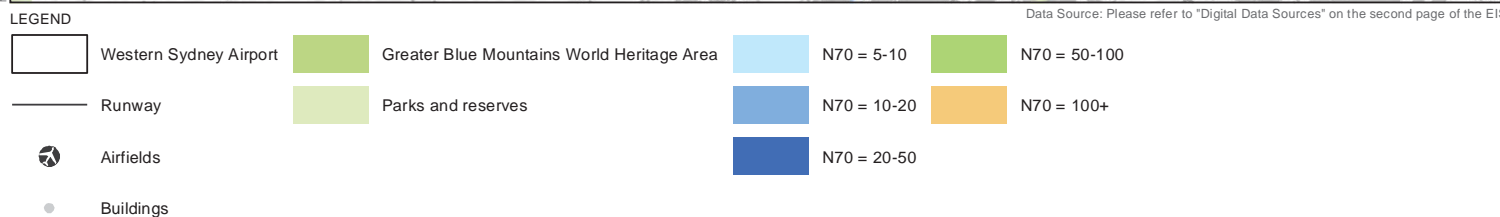
Table 10–4 – Estimated population within N70 contours (2030)

N70	Operating strategy			
	Prefer 05	Prefer 23	Prefer 05 + head-to-head	Prefer 23 + head-to-head
5–10	563	399	852	405
10–20	581	450	326	439
20–50	192	426	258	431
50–100	152	192	167	178
100–200	5	0	10	10
>200	0	0	0	0
Total	1,493	1,468	1,614	1,464

10.5.4.2. N70 contours

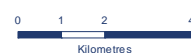
Calculated N70 noise contours for each of the four airport operating strategies described in Section 10.3.1 are shown on Figure 10–19 to Figure 10–22. These represent the predicted annual average number of movements per day with L_{Amax} noise levels exceeding 70 dBA.

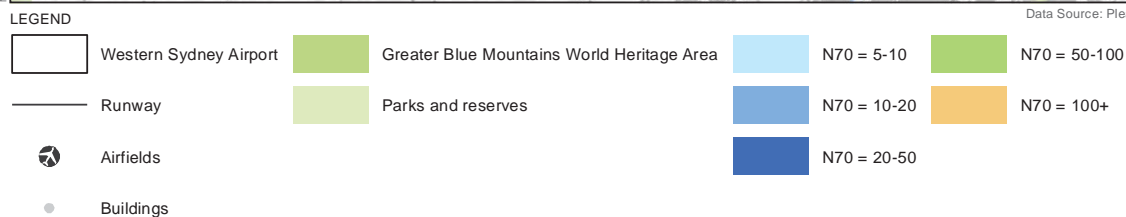
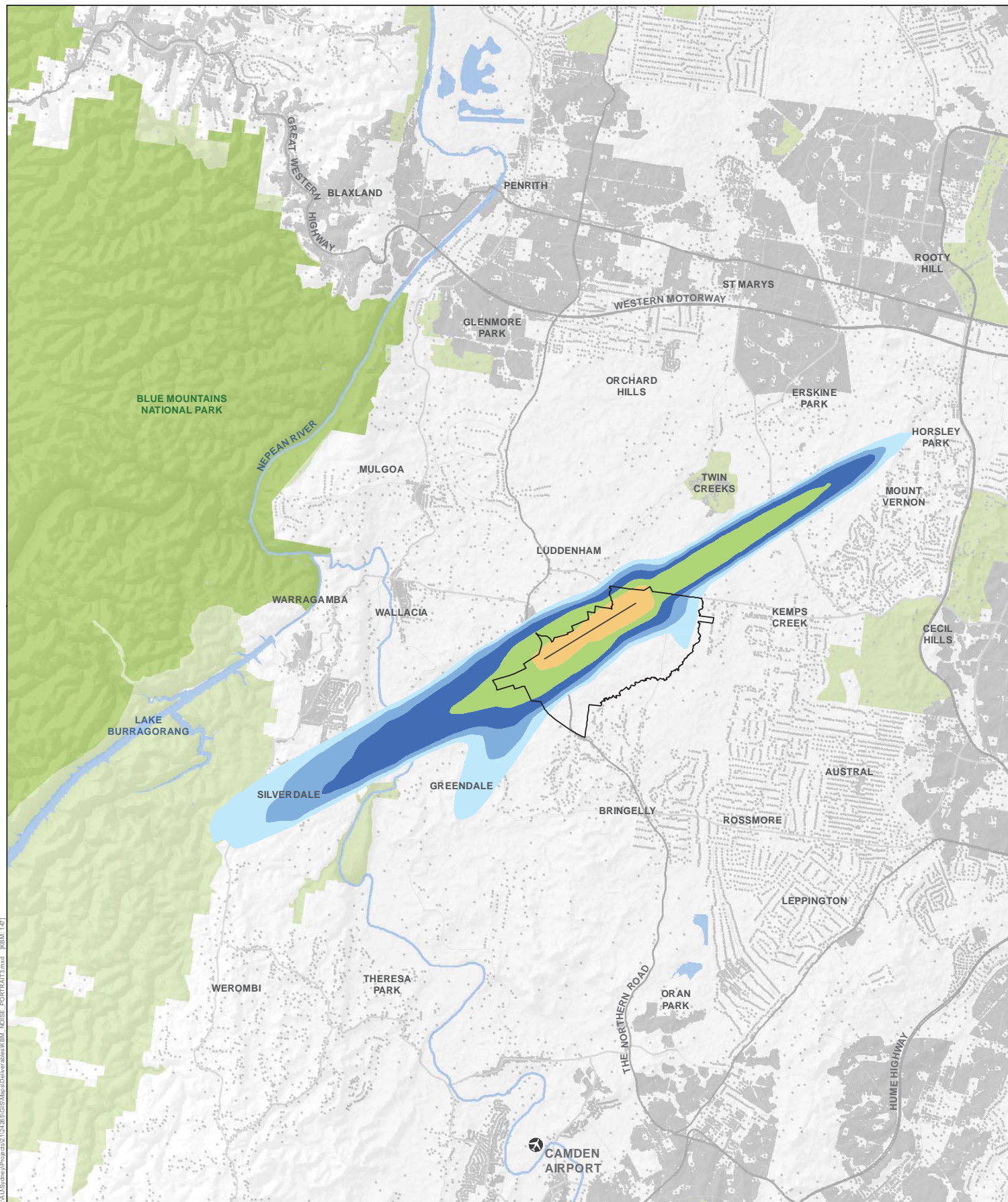
There are significant differences in the number of residents affected between operating strategies. In particular, the Prefer 05 operating strategy results in greater impacts on residents in areas north-east of the proposed airport. However in 2030, no densely-populated residential areas are predicted to experience more than five events per day above 70 dBA (Figure 10–19).



Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

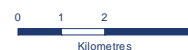
Figure 10-19 - N70 contours - 2030 - Prefer 05

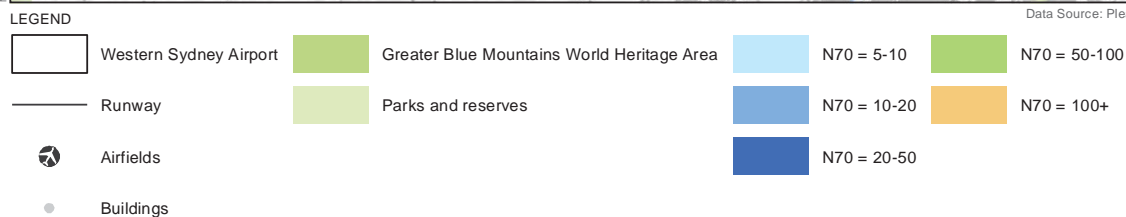




Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

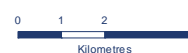
Figure 10-20 - N70 contours - 2030 - Prefer 23





Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Figure 10-21 - N70 contours - 2030 - Prefer 05 with head-to-head



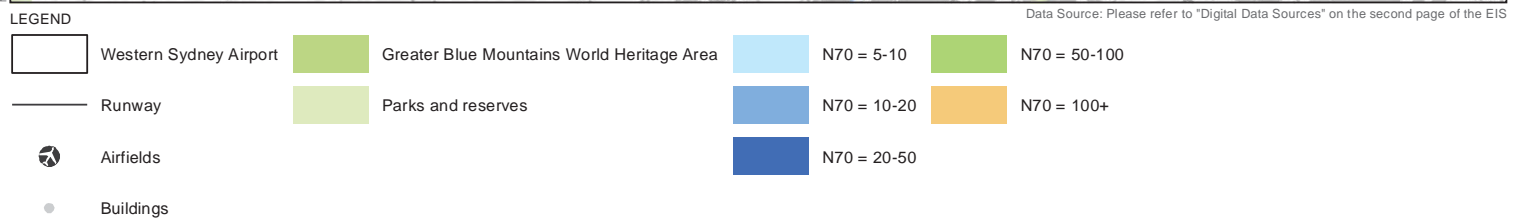
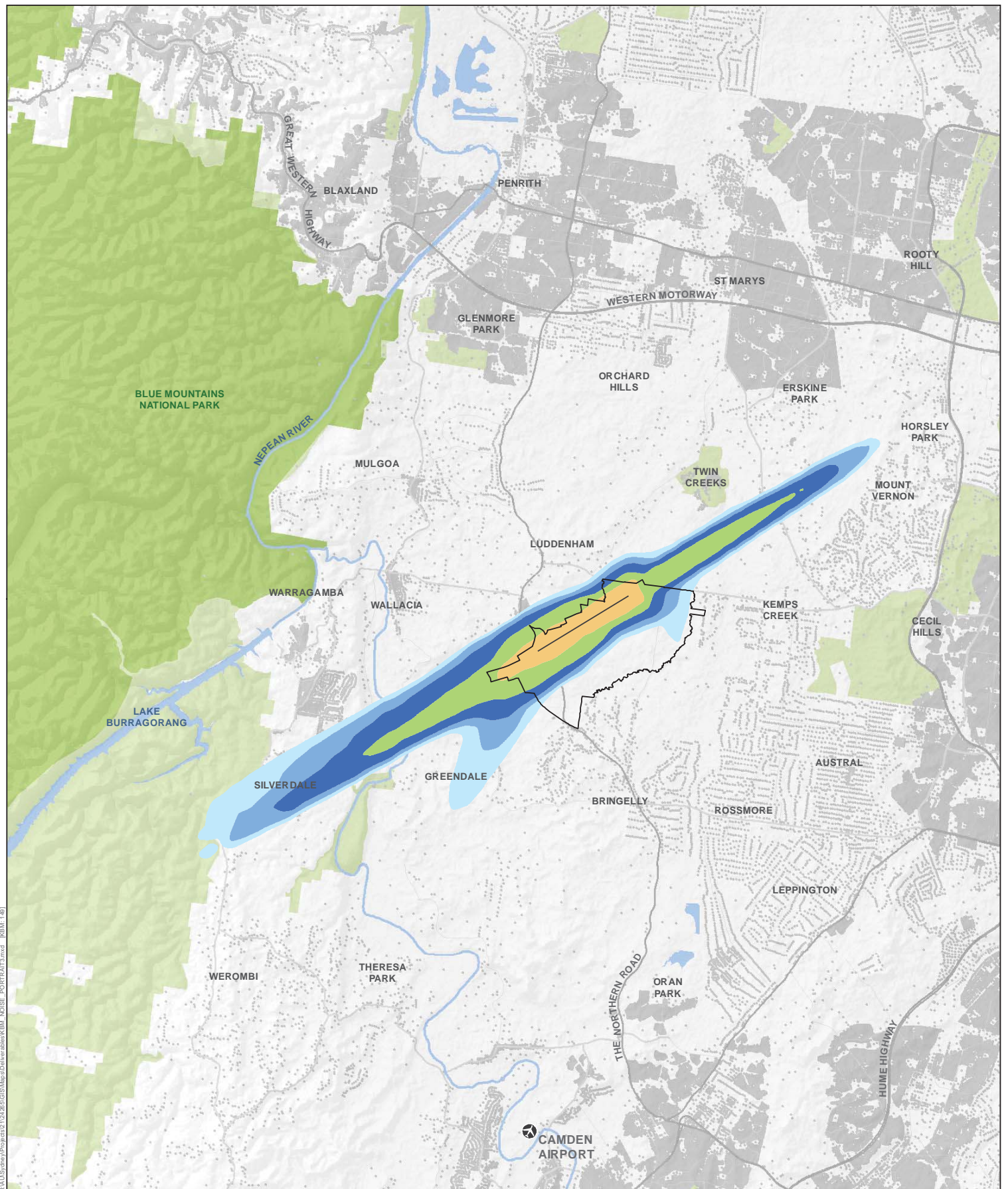


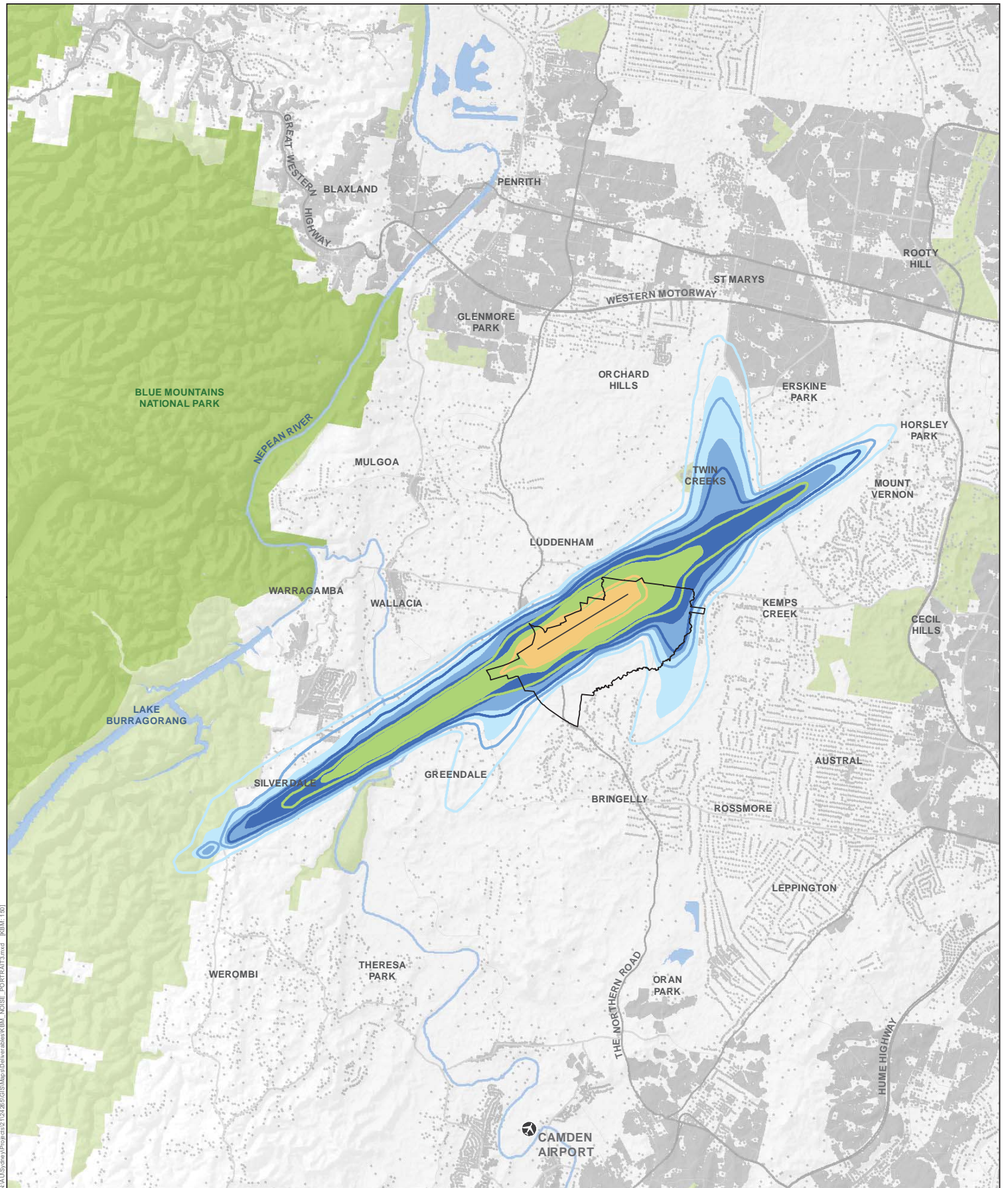
Figure 10-22 - N70 contours - 2030 - Prefer 23 with head-to-head



10.5.4.3. 90th percentile N70 results (worst case day)

Figure 10–23 and Figure 10–24 show 90th percentile values of N70 calculated over all days. These figures show the number of daily aircraft noise events over 70 dBA that would be exceeded on only 10 per cent of days. This can be thought of as a typical worst case day. Head-to-head operations are not shown as this operating strategy makes very little difference to the results.

The most noticeable aspect of these figures is that generally the difference between noise impact on average and typical worst case days is not large. This is due to the relatively low and consistent wind speeds at the airport site, which means that the proposed airport's preferred operating strategy could be selected over 80 per cent of the time.



LEGEND

- Western Sydney Airport
- Runway
- Airfields
- Buildings
- Greater Blue Mountains World Heritage Area
- Parks and reserves

N70 90th Percentile

- N70 = 5-10
- N70 = 10-20
- N70 = 20-50
- N70 = 50-100
- N70 = 100+
- N70 = 5
- N70 = 10
- N70 = 20
- N70 = 50
- N70 = 100

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Figure 10-23 - 90th percentile N70 contours - 2030 Prefer 05

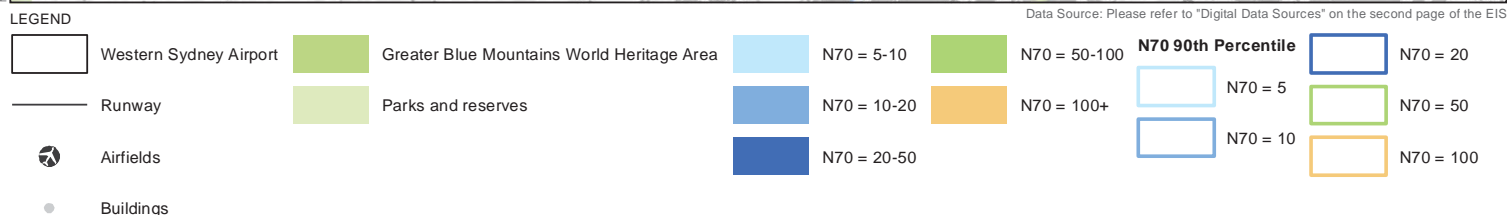
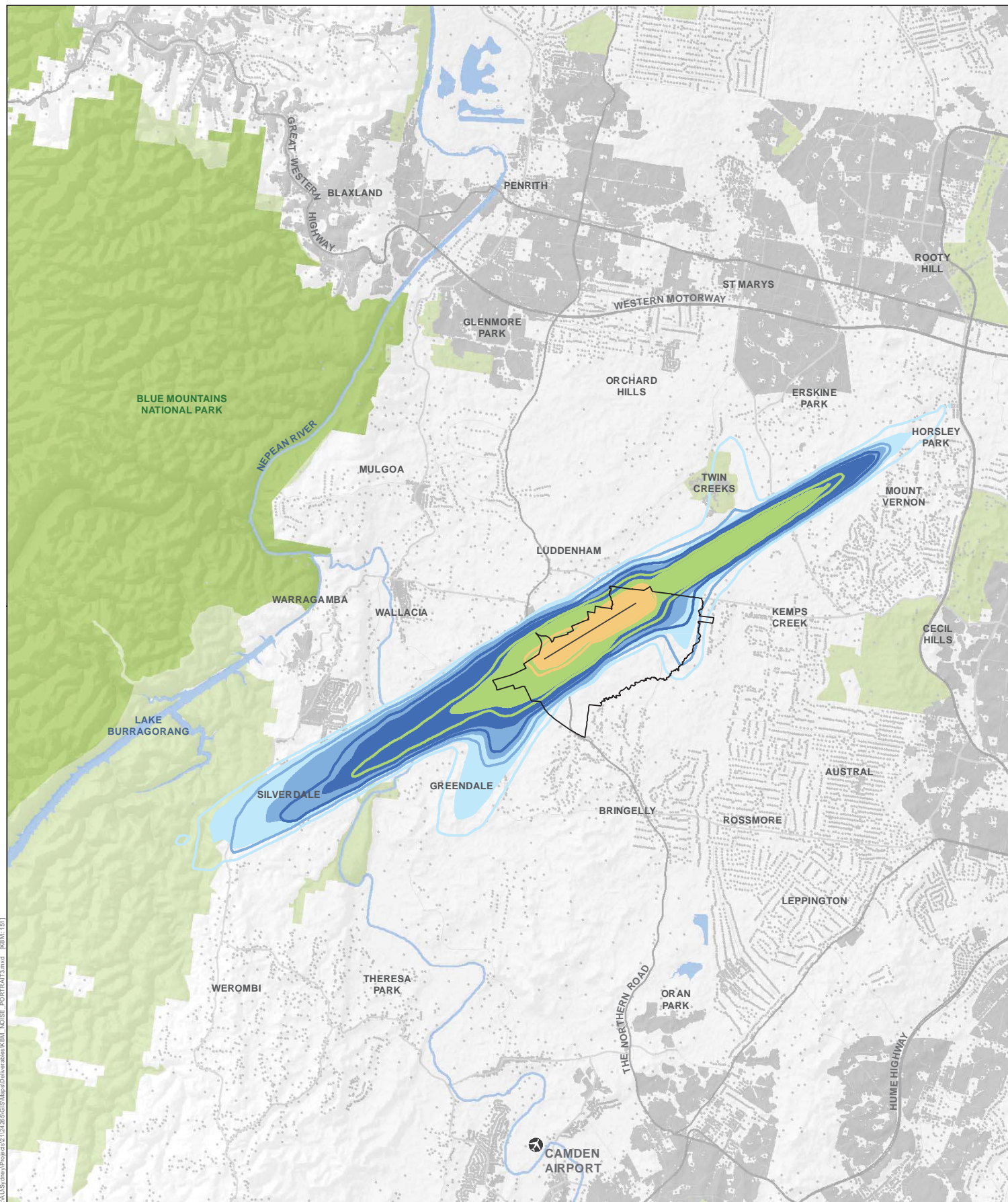


Figure 10-24 - 90th percentile N70 contours - 2030 Prefer 23



10.5.5. Night-time noise

10.5.5.1. N60 population exposure estimates

The number of noise events exceeding 60 dBA (N60) has been used to describe the impact of noise at night.

Table 10–5 shows the population estimated to be affected by night time noise above 60 dBA in 2030. A Prefer 05 operating strategy is predicted to result in an estimated 48,000 people experiencing more than five events above 60 dBA on an average night. This is predicted to reduce to approximately 6,000 with a Prefer 23 operating strategy, or about 4,000 if head-to-head operations are combined with either Prefer 05 or Prefer 23 operating strategies. However, a Prefer 23 or either head-to-head strategy would result in slightly more people experiencing a higher number of night time noise events in rural residential areas to the south and west of the airport site compared to the Prefer 05 strategy.

Table 10–5 – Estimated population within N60 contours (2030)

N60	Operating strategy			
	Prefer 05	Prefer 23	Prefer 05 + head-to-head	Prefer 23 + head-to-head
5-10	46,731	3,436	2,245	2,287
10-20	1,065	1,474	841	844
20-50	609	1,269	1,200	1,200
50-100	0	0	0	0
>100	0	0	0	0
Total	48,405	6,179	4,286	4331

10.5.5.2. N60 contours

N60 values have been predicted for the standard night-time period 10.00 pm–7.00 am. Figure 10–25 to Figure 10–28 show 2030 values for the four operating strategies considered.

The difference between Prefer 05 and Prefer 23 operating strategies is substantial. Prefer 05 is predicted to have a greater impact on built-up areas around St Marys, while Prefer 23 is predicted to have a greater impact on rural residential areas around Greendale and Silverdale. Under Prefer 23, this level of impact would be experienced only in rural residential areas and a small area to the south of Blacktown. Both strategies would impact Luddenham to the north of the runway; however, the Prefer 23 strategy is predicted to affect a larger area of the village.

The number of night-time noise events in densely populated areas could be reduced by use of the head-to-head operations where available. As demonstrated in Figure 10–27 and Figure 10–28, this would result in no built-up residential areas being exposed on average to more than five events per night above 60 dBA.

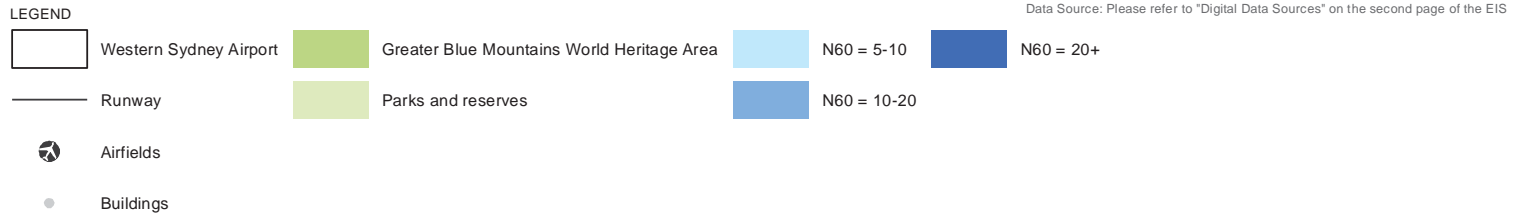
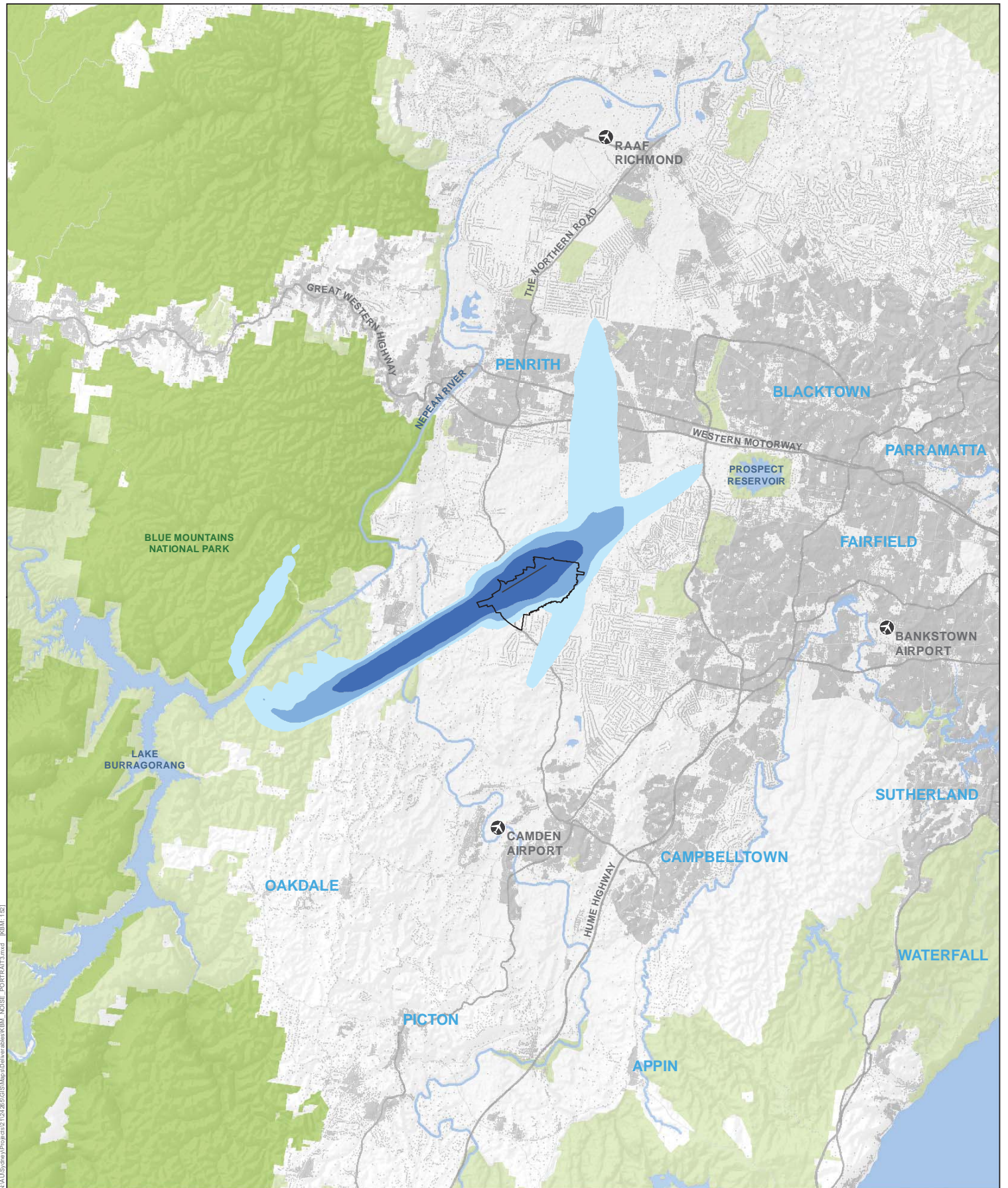
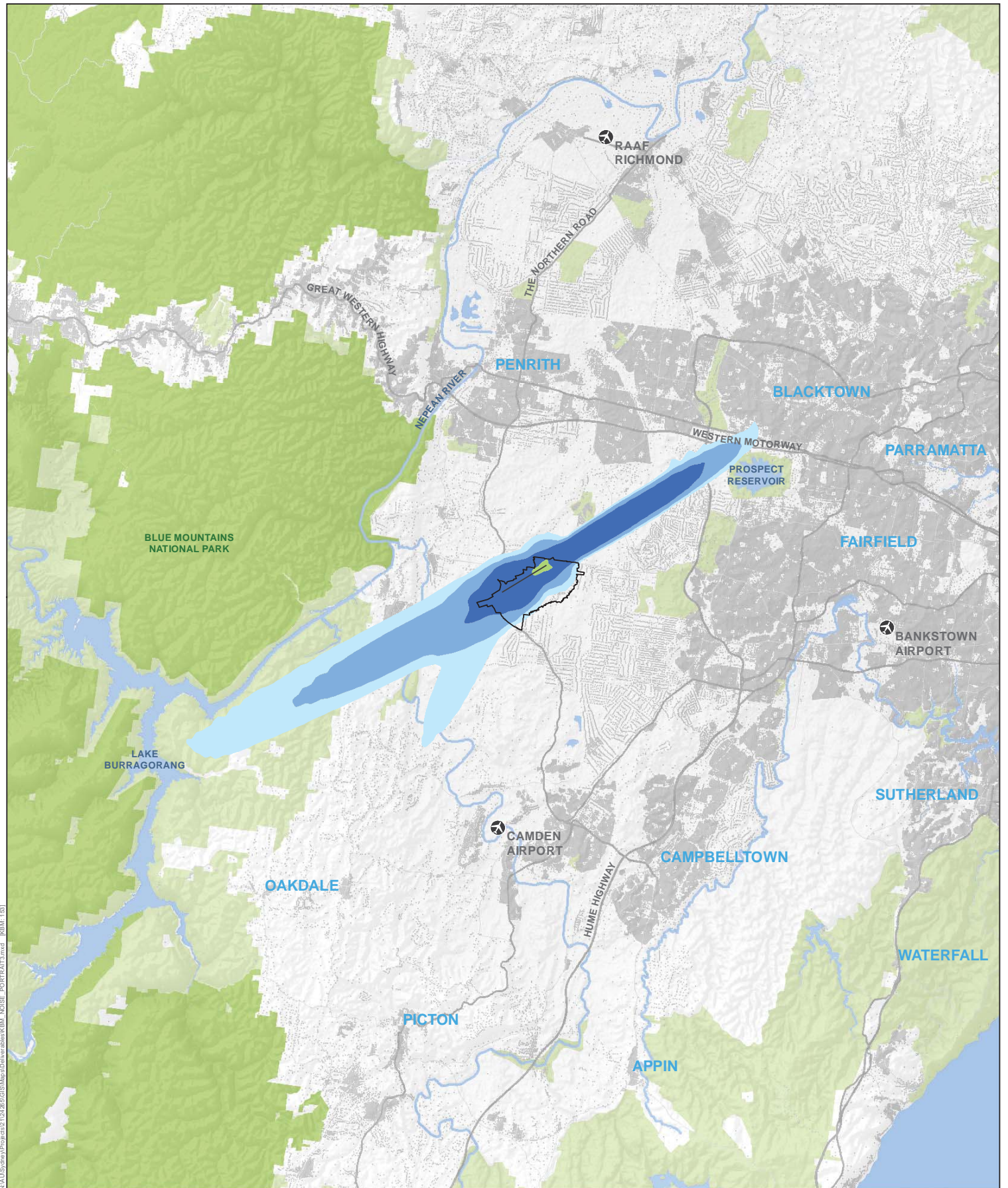


Figure 10-25 - N60 contours - 2030 Prefer 05



LEGEND

Western Sydney Airport

Runway

Airfields

Buildings

Greater Blue Mountains World Heritage Area

Parks and reserves

N60 = 5-10

N60 = 10-20

N60 = 20-50

N60 = 50+

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Figure 10-26 - N60 contours - 2030 Prefer 23

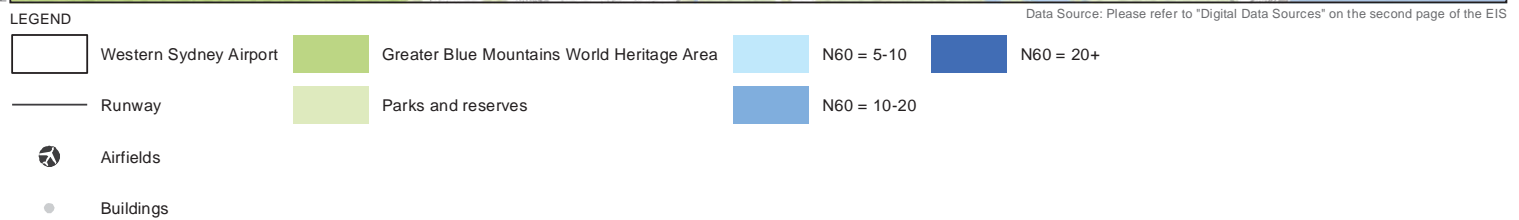
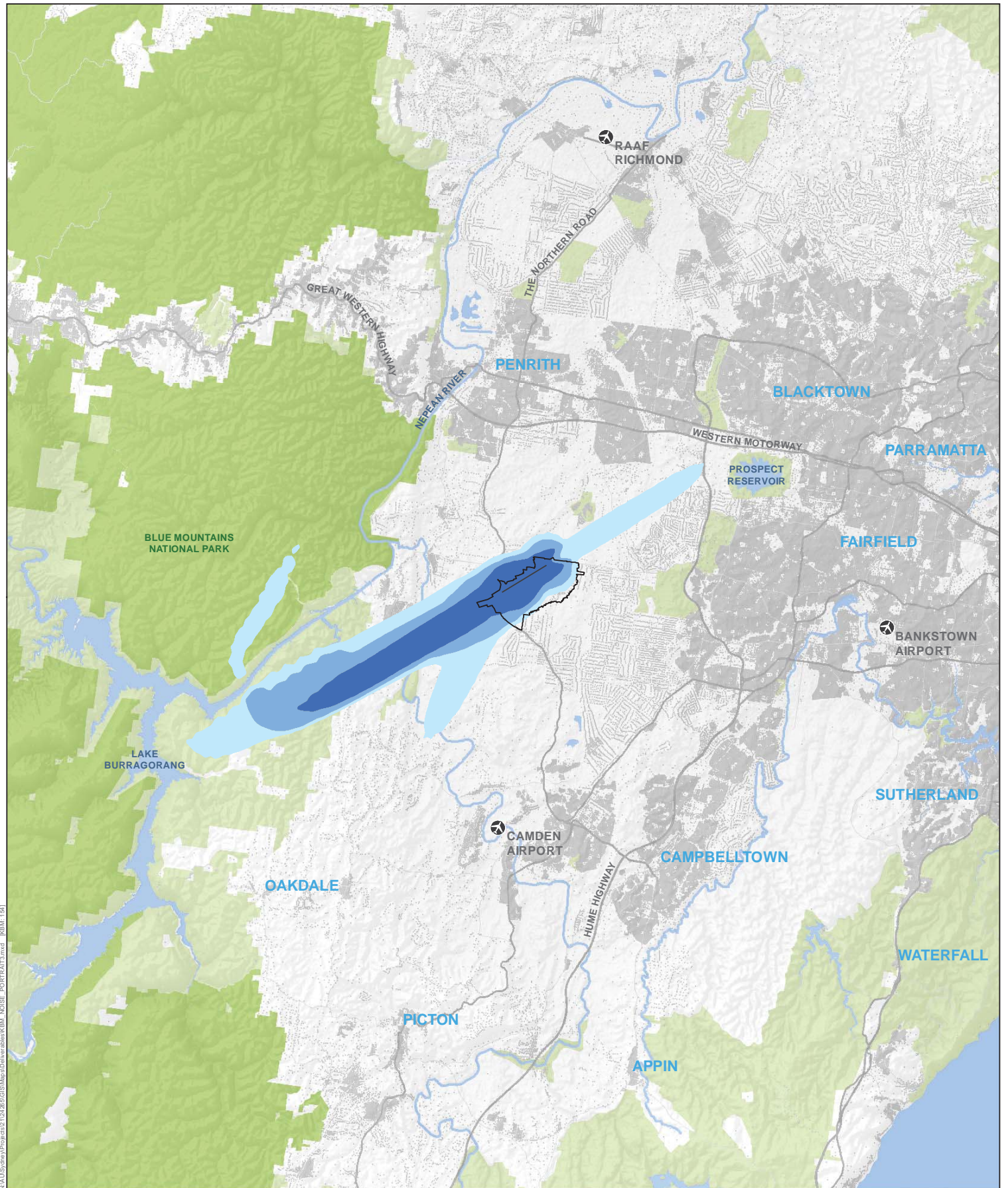
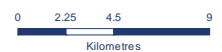


Figure 10-27 - N60 contours - 2030 Prefer 05 with head-to-head



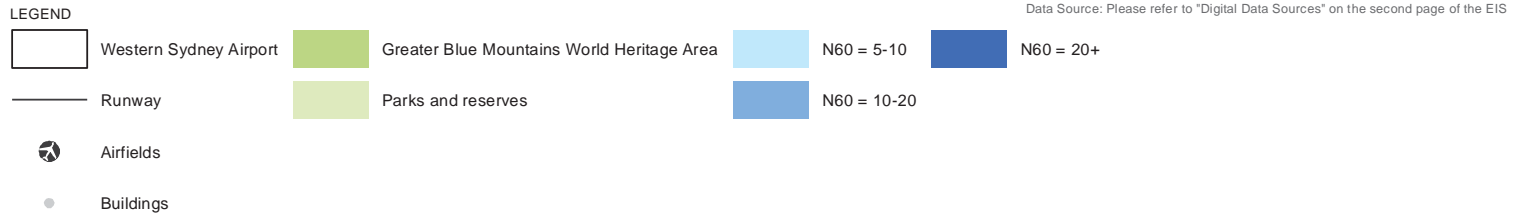
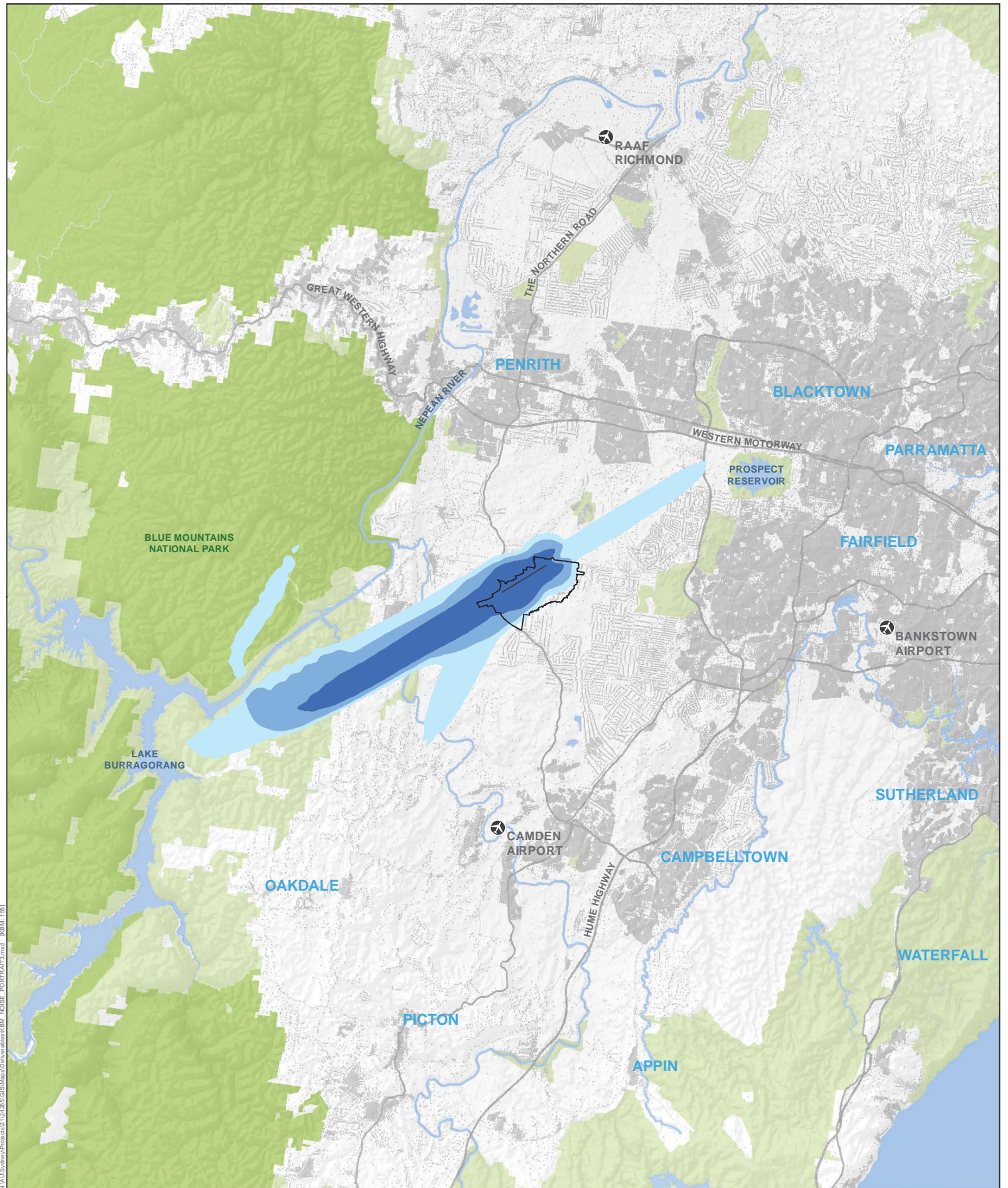
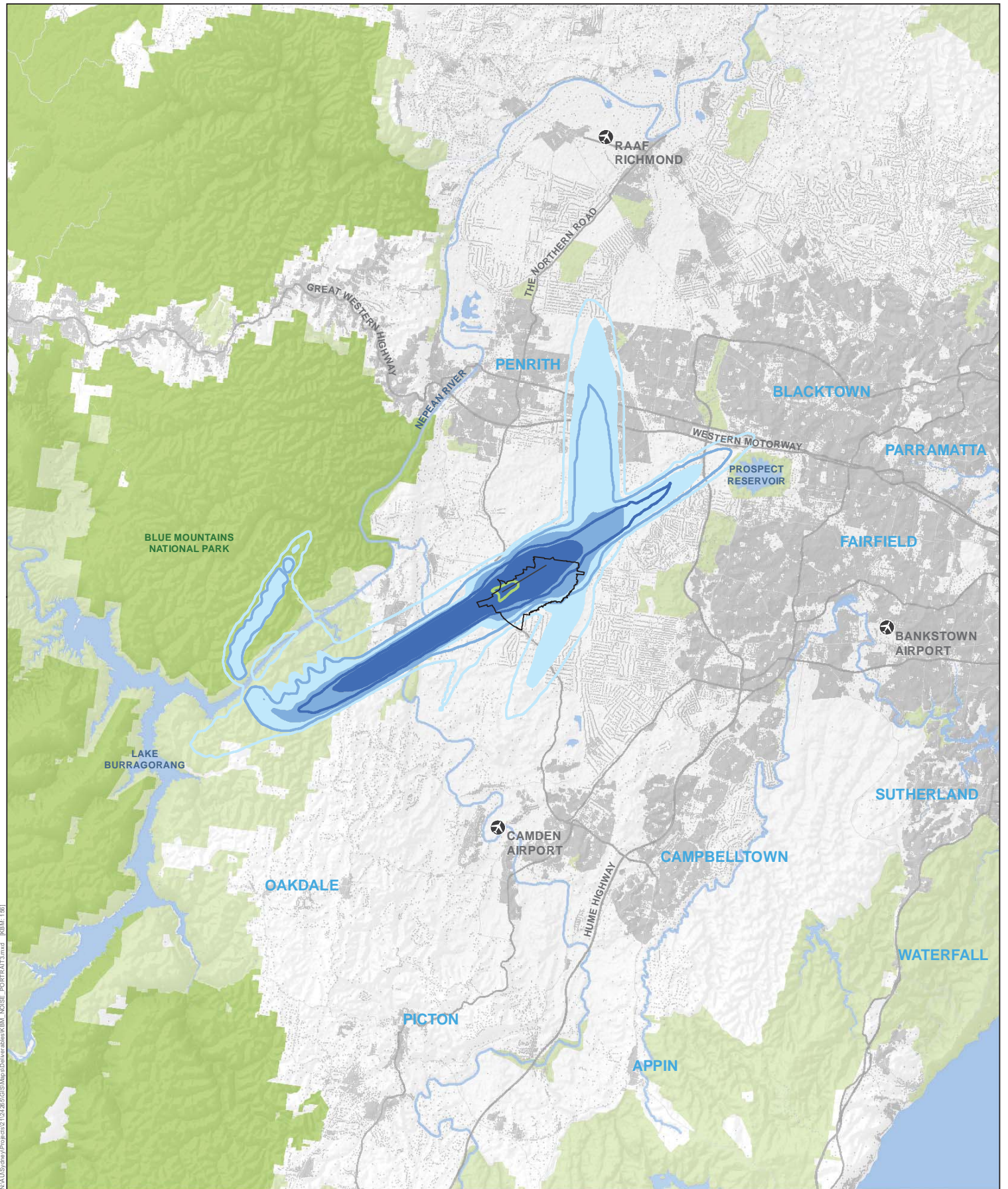


Figure 10-28 - N60 contours - 2030 Prefer 23 with head-to-head



10.5.5.3. 90th percentile N60 results (worst case)

Figure 10–29 to Figure 10–32 show 90th percentile night-time N60 values for 2030. These figures give an indication of the number of events per night exceeding 60 dBA on a typical worst case night compared to an average night. As for the N70 90th percentile results, differences between ‘average’ and ‘typical worst-case’ days are generally not large.



LEGEND

Western Sydney Airport

Runway

Airfields

Buildings

Greater Blue Mountains World Heritage Area

Parks and reserves

N60 = 5-10

N60 = 10-20

N60 = 20+

N60 = 5

N60 = 10

N60 = 20

N60 = 50

N60 90th Percentile

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

Figure 10-29 - 90th percentile N60 contours - 2030 - Prefer 05

0 2.25 4.5 9

Kilometres

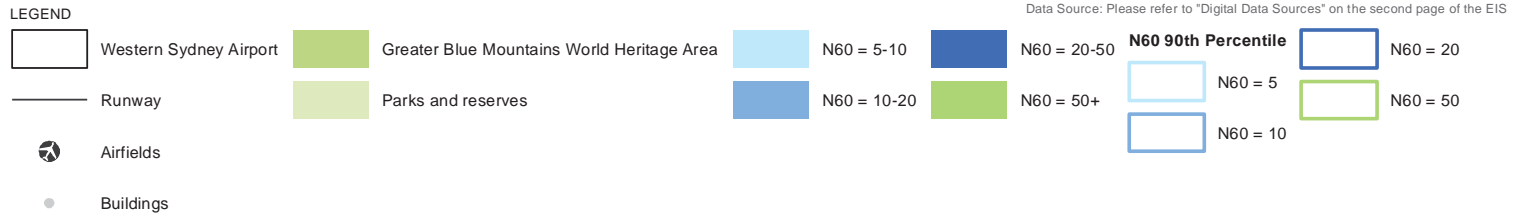
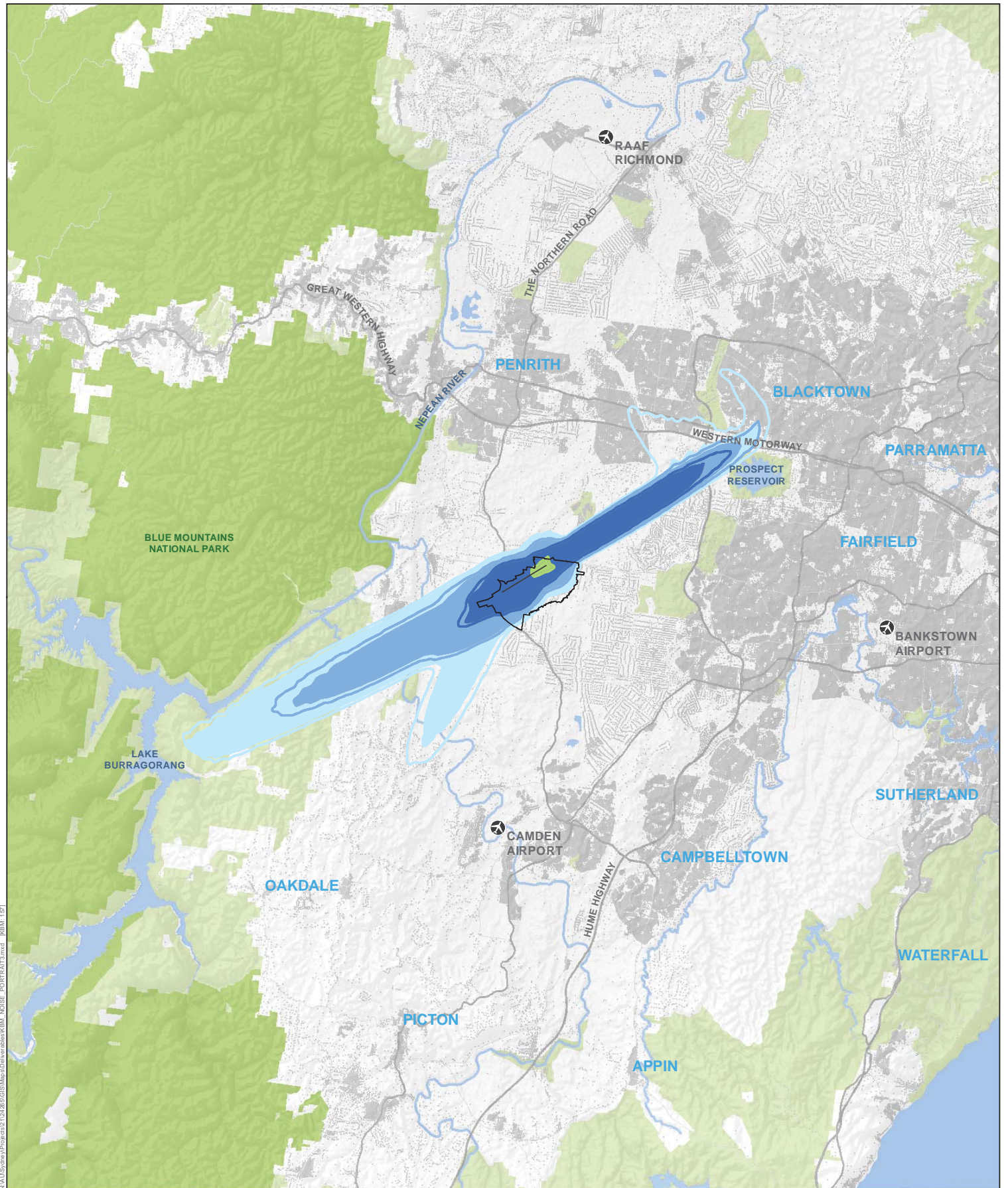


Figure 10-30 - 90th percentile N60 contours - 2030 - Prefer 23

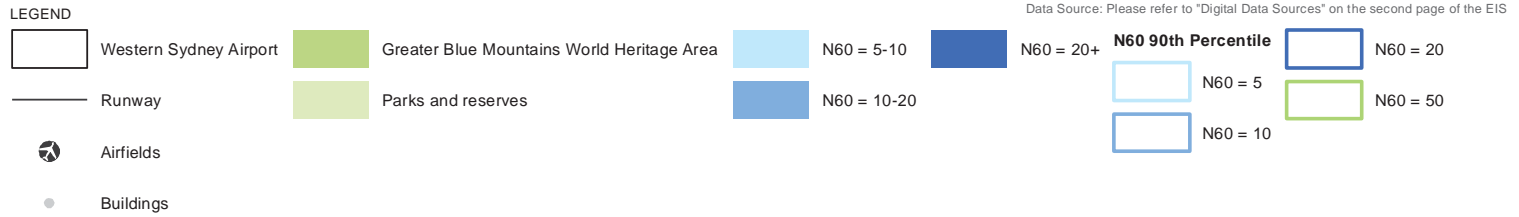
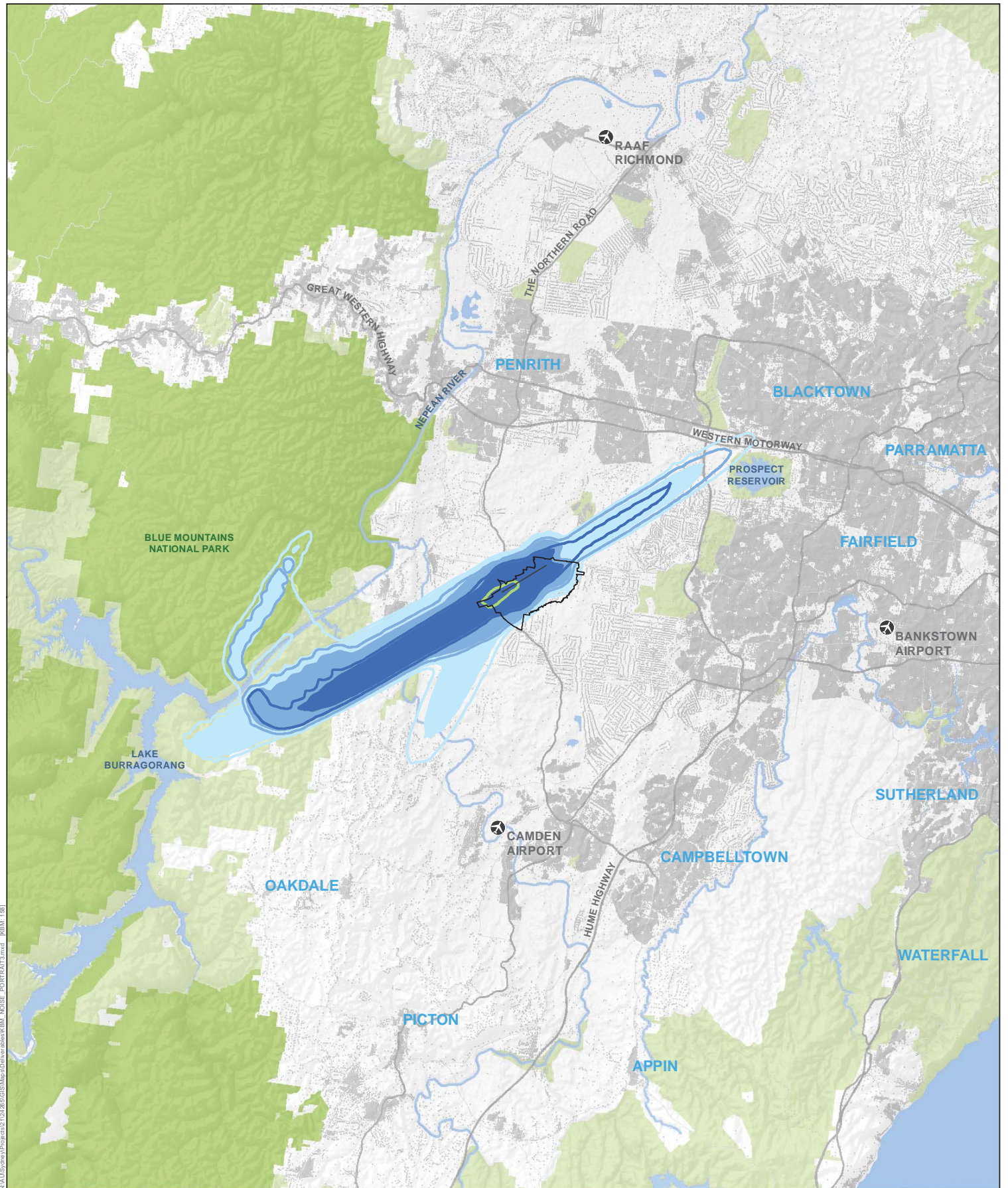


Figure 10-31 - 90th percentile N60 contours - 2030 - Prefer 05 with head-to-head

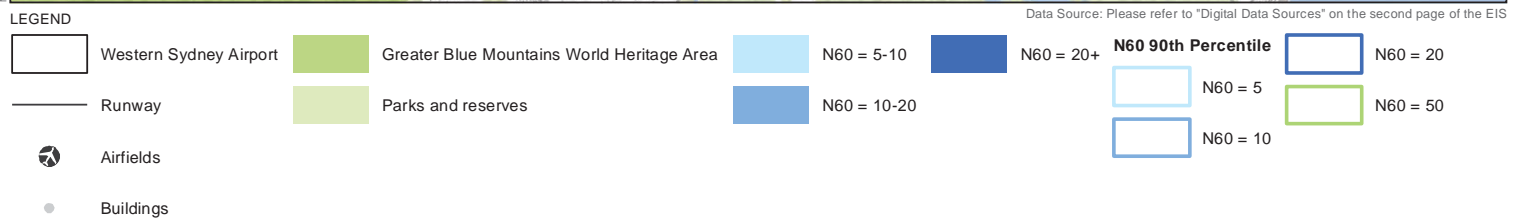
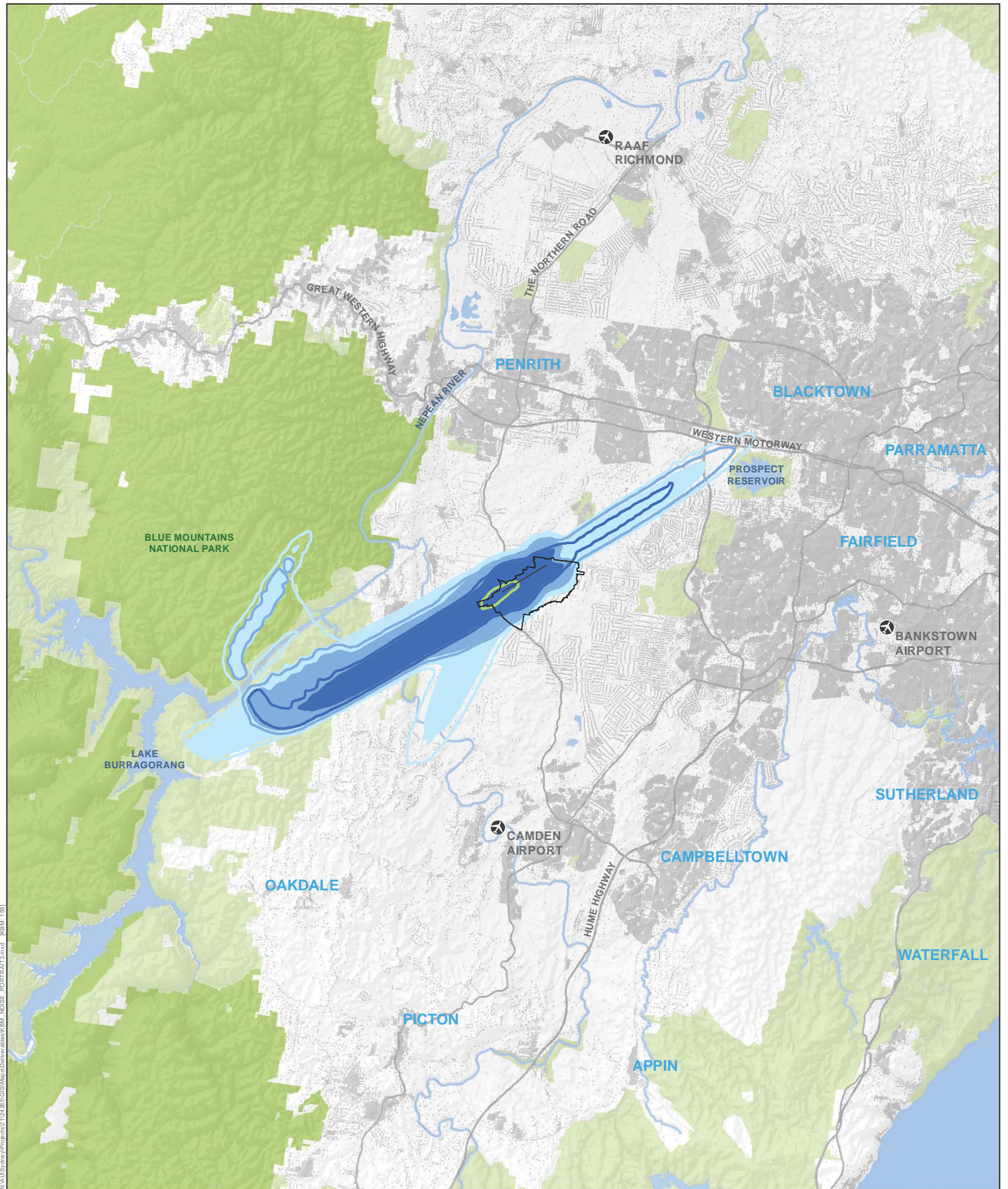


Figure 10-32 - 90th percentile N60 contours - 2030 - Prefer 23 with head-to-head

10.5.6. Recreational areas

A number of recreational areas, located close to the proposed airport, have been identified within the area potentially affected by aircraft overflight noise. These range from sports areas used for active pursuits such as horse riding, bowling or golf to nature reserves which may be used for more passive activities.

The impact of aircraft noise in recreational areas can be quantified by calculating the number of events per day, exceeding maximum noise levels of 60 dBA and 70 dBA. Where a noise level exceeds 60 dBA, a person may need to raise their voice to be properly heard in conversation but this level would be unlikely to cause disruption to active sporting pursuits. However, it would be noticeable and could impact on the acoustic amenity of areas used for passive recreation for the duration of the aircraft overflight. Noise levels above 70 dBA would require increased voice effort (although not shouting) for conversation to be understood, and would likely be considered to be acoustically intrusive in passive recreation areas for the duration of the aircraft overflight.

Table 10–6 and Table 10–7 show the identified recreation areas and the predicted values of N60 and N70 for the Prefer 05 and Prefer 23 operating strategies. The values shown are for the period 7.00 am–6.00 pm, representing the times when these areas would most likely be used.

Table 10–6 – Average number of daily noise events with L_{Amax} exceeding 60 dBA (N60) at recreational areas

Recreational area	2030 noise events	
	Prefer 05	Prefer 23
Bents Basin State Conservation Reserve & Gulguer Nature Reserve	7	13
Kemps Creek Nature Reserve	0	0
Rossmore Grange	3	1
Horsley Park Reserve	0	0
Twin Creeks Golf & Country Club	23	6
Sydney International Equestrian Centre	0	0
Whalan Reserve, St Marys	1	2

Table 10–7 – Average number of daily noise events with L_{Amax} exceeding 70 dBA (N70) at recreational area

Recreational area	2030 noise events	
	Prefer 05	Prefer 23
Bents Basin State Conservation Reserve & Gulguer Nature Reserve	0	0
Kemps Creek Nature Reserve	0	0
Rossmore Grange	0	0
Horsley Park Reserve	0	0
Twin Creeks Golf & Country Club	5	1
Sydney International Equestrian Centre	0	0
Whalan Reserve, St Marys	0	0

The results indicate that most of the identified recreational receivers would not be subject to aircraft overflight noise events with maximum levels exceeding 70 dBA, or their exposure would be less than one event per day on average.

Aircraft noise levels at Twin Creeks Golf and Country Club would be noticeable and at times a raised voice would be required for effective communication. At this location, predicted noise exposure would be significantly reduced under a Prefer 23 operating strategy.

Bents Basin State Conservation Reserve and Gulguer Nature Reserve would be subject to a number of flyover event noise levels exceeding 60 dBA, which would be noticeable to passive users of these areas. Bents Basin State Conservation Reserve is used for camping, and would on average be subject to less than five night-time noise events exceeding 60 dBA per day. At this location noise exposure would be lower under a Prefer 05 operating strategy.

10.5.7. Noise induced vibration

At high noise levels, the low frequency components of aircraft noise can result in vibration of loose elements in buildings, notably windows.

Even at the highest expected noise levels, the levels of vibration due to low frequency noise would be well below those which may cause structural damage to buildings. With typical light building structures, noise induced vibration may begin to occur where the maximum external noise level reaches approximately 90 dBA. The effect is more common on take-offs than for landings because the noise spectrum for a take-off close to the airport has stronger low frequency components.

Figure 10–33 shows 85 dBA and 90 dBA noise level contours for a B747 aircraft departure (stage length 5). Only areas within the 90 dBA contour could expect to experience any noise-induced vibration of building structures, and even then only during a departure of a B747 aircraft with maximum stage length 5. For 2030, there are no existing residences within this contour.

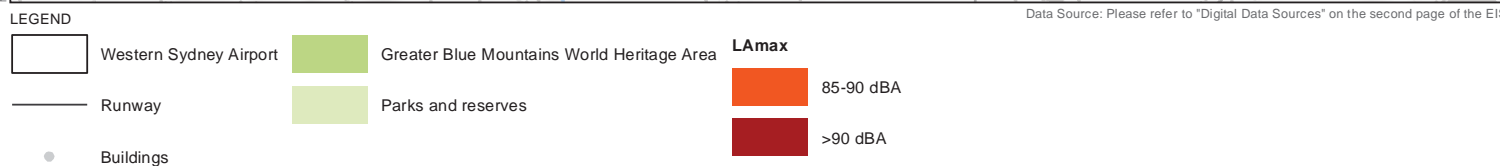
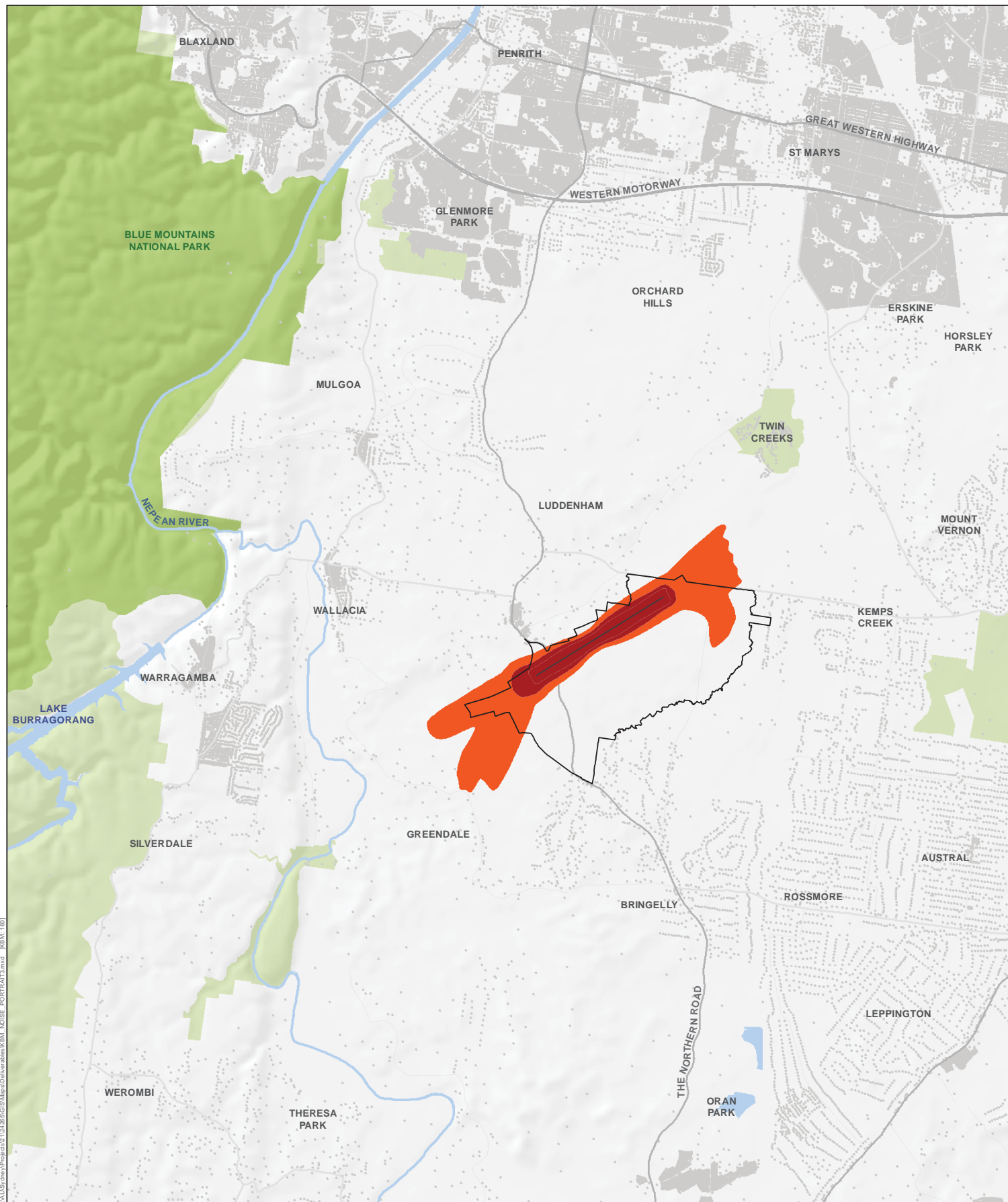


Figure 10-33 - 85 dBA and 90 dBA L_{max} contours - stage 5 B747 departure - Stage 1 development

10.6. Mitigation and management measures

10.6.1. Mitigation and management of aircraft overflight noise

There are three main options for mitigation of aircraft noise:

- reduce noise emissions from the aircraft themselves;
- plan flight paths and airport operating modes to achieve lower impacts over noise-sensitive areas; and
- develop land use planning or other controls to ensure that future noise-sensitive uses are not located in noise-affected areas.

10.6.1.1. Improvements in aircraft technology

It is difficult to predict future reductions in aircraft noise emission levels because this is primarily the role of aircraft designers and manufacturers. Even without further technological advances, it is reasonable to assume that total airport noise emissions would decrease over time as quieter new generation aircraft make up a greater share of the airport's traffic mix. For example, Singapore Airlines has already removed the Boeing 747 from passenger services. Qantas has reduced the size of its Boeing 747 fleet and is expected to retire its remaining Boeing 747s by the time operations commence at the proposed airport. Aircraft types assumed for the purposes of assessment are based on those currently in service and the approach can therefore be considered conservative. Future noise levels are expected to be lower than assumed in the modelling.

10.6.1.2. Airport operating strategies

The noise impact of different airport operating strategies has been considered as part of the assessment and it is one of the key factors affecting the pattern of noise impacts as presented in this assessment. The determination of operating strategies would be particularly important for consideration of night time noise impact and providing respite periods for affected communities. The use of continuous descent approaches (which minimises the use of engine thrust by pilots) has also been assumed as part of the noise assessment. The reduction in noise level as a result of this measure depends on the aircraft type and the location of the receiver, but is estimated to be in the order of zero to five dBA.

10.6.1.3. Land use planning

Land use planning controls around airports in Australia are based on the recommendations of AS 2021. It is expected that land use planning around the proposed airport would be based on future ANEF contours that are produced and endorsed by Airservices Australia prior to the commencement of airport operations.

It is noted that ANECs developed for the 1985 Draft EIS (Kinhill Stearns 1985) have guided interim planning controls implemented by the NSW Government and relevant local councils. These earlier ANECs are broadly consistent with the ANECs presented in this EIS. In addition to the use of these interim planning controls, the Western Sydney Employment Area being developed to the north of the airport site would also provide a buffer between the airport and residential areas.



The National Airport Safeguarding Framework (NASF) is a further initiative that addresses land use planning and aircraft noise. NASF is a national land use planning framework, agreed to by Commonwealth, State and Territory ministers in 2012 that establishes planning principles and guidelines in order to:

- improve community amenity by minimising aircraft noise-sensitive developments near airports including through the use of additional noise metrics and improved noise-disclosure mechanisms; and
- improve safety outcomes by ensuring aviation safety requirements are recognised in land use planning decisions through guidelines being adopted by jurisdictions on various safety-related issues.

Further detail on the NASF is included in Chapter 21 of Volume 2 of this EIS.

10.6.1.4. Communication and coordination

One important form of mitigation for aircraft noise impacts would be the provision of information to both existing and potential residents in areas likely to be affected by noise. For example, this would allow people to be properly informed before deciding whether or not to move into an area predicted to experience aircraft noise.

The Australian Government also expects federally leased airports to operate Community Aviation Consultation Groups (CACGs). There are guidelines for CACGs which specify that they be independently chaired and should engage broad community representation. While they are not decision making bodies, CACGs provide for effective and open discussion of airport operations and their impacts on nearby communities.

Major capital city airports are also required to establish Planning Coordination Forums. The purpose of Planning Coordination Forums is to support a strategic dialogue between the airport operator and local, state and federal government agencies responsible for town planning and infrastructure investment. Effective discussions in Planning Coordination Forums support better integration of planning for an airport and for the surrounding urban and regional community.

10.6.2. Monitoring of noise

Noise impacts associated with the proposed airport would likely be monitored using the noise and flight path monitoring system operated by Airservices Australia. Consistent with the practice at other major airports, a number of permanent monitors would be installed at locations that are representative of noise impacts at surrounding communities and monthly monitoring results would be made publicly available.

Noise monitoring is undertaken by Airservices Australia to:

- determine the contribution aircraft noise makes to the overall noise to which a community is exposed;
- provide information to the community;
- help local authorities make informed land use planning decisions;
- inform impact estimates resulting from changes in air traffic control procedures – including changes to reduce aircraft noise impacts;
- validate noise modelling;
- inform the determination of aviation policy by government; and
- assist the government in implementing legislation.

10.6.3. Mitigation and management measures

Table 10–8 outlines the broad mitigation and management measures that are proposed to address the potential aircraft noise impacts associated with the proposed Stage 1 development.

Table 10–8 – Mitigation and management measures – aircraft noise

ID	Issue	Mitigation/management measure	Timing
10.1	Noise management plan	<p>A noise management plan would be prepared for aircraft operations prior to the commencement of airport operations. To the extent practicable, development and implementation of the noise management plan would be integrated with and draw on the outcomes of future detailed airspace and airport operations design undertaken by Airservices Australia and the Civil Aviation Safety Authority (CASA). This formal design process would provide an opportunity to optimise flight paths on the basis of safety, efficiency, noise and environmental considerations, as well as minimising changes to existing regional airspace arrangements. Establishing airspace management arrangements for the proposed airport, including the determination of flight paths, is expected to involve additional formal environmental assessment and community and stakeholder engagement.</p> <p>Development and implementation of the noise management plan would involve the airport lessee company, Airservices Australia, CASA, the Department of Infrastructure and Regional Development, other Australian Government agencies, State and local government, the airline industry, and community representatives. Terms of reference would be prepared for the plan. These would specify the objectives of the plan, identify the matters and actions to be considered, establish planning horizons, guide the participation of stakeholders and outline decision-making processes for determining preferred actions.</p> <p>Issues to be addressed in the plan would include but not be limited to:</p> <ul style="list-style-type: none"> • options for flight paths and airport operating modes for day and night operations, having regard to environmental impacts, operation efficacy and safety considerations; • the number of aircraft overflights, levels of noise exposure predicted to be experienced by communities, and the impacts on amenity in conservation and recreation areas, and at other noise sensitive locations; • opportunities for the provision of periods of respite from aircraft noise; • the control of the loudness of noise events, including noise abatement departure and arrival procedures (e.g. the use of reverse thrust); • the management of noise at night; • the possible insulation or acquisition of buildings exposed to the highest noise levels having regard to Australian Standard 2021, including mechanisms for funding potential noise amelioration works and property acquisitions; • the design and installation of a noise and flight path monitoring system; • arrangements for noise enquiries and complaints; • identification of responsibilities for implementing individual actions; and • land use planning policies and instruments for areas surrounding the airport taking account of predicted noise exposure levels. 	Pre-operation

10.7. Conclusion

This chapter provides an assessment of potential aircraft noise impacts associated with the operation of the proposed Stage 1 development at the point at which passenger demand reaches 10 million annual passenger movements, which is anticipated to occur around 2030.

The assessment is based on indicative flight paths prepared by AirServices Australia, as part of a preliminary assessment of airspace implications and air traffic management arrangements for Sydney region airspace associated with the potential commencement of operations at the proposed airport. A future airspace design process is expected to be undertaken closer to the commencement of operations at the proposed airport and further noise impact assessment would be carried out at that time.

The current assessment indicates that for the loudest aircraft operations (long-range departures by Boeing 747 aircraft or equivalent), maximum noise levels over 85 dBA would be experienced at a small number of residential locations close to the airport site in Badgerys Creek. Maximum noise levels of 70–75 dBA could be expected within built-up areas in St Marys and Erskine Park as a result of worst case operations. Maximum noise levels due to more common aircraft types such as Airbus A320 or equivalent are predicted to be lower at 60–70 dBA in built-up areas around St Marys and Erskine Park, and over 70 dBA in some adjacent areas to the south-west of the airport site, notably in Greendale.

On a typical busy day, about 1,500 residents are expected to experience five or more aircraft noise events per day above 70 dBA.


At night, the Prefer 05 operating strategy is predicted to result in an estimated 48,000 people experiencing more than five events above 60 dBA during the night time period. With a Prefer 23 operating strategy, approximately 6,000 people are predicted to experience more than five events above 60 dBA on an average night. This is predicted to reduce to about 4,000 residents if a head-to-head strategy (both approaches and departures to the south-west) is included.

Most recreational areas would not be subject to aircraft overflight noise events with maximum levels exceeding 70 dBA. In recreational areas where this level of noise exposure is predicted, the average number of events above 70 dBA would on average be less than one event per day.

Approaches to mitigating aircraft noise generally focus on reducing noise emissions from the aircraft themselves, planning flight paths and airport operating modes in a way that minimises potential noise and environmental impacts, and implementing land use planning or other controls to ensure that future noise-sensitive uses are not located in noise-affected areas.

In this case, the noise impact of different airport operating strategies has been considered as part of the assessment. The use of continuous descent approaches (which minimises the use of engine thrust by pilots) has been assumed. Future reductions in aircraft noise emission levels are difficult to predict and therefore existing aircraft types have been conservatively assumed for the purposes of assessment. It is expected that land use planning around the proposed airport would be influenced by the final ANEF contours once flight paths and operating modes are finalised and approved.

Noise impacts associated with the proposed airport would be monitored using a noise and flight path monitoring system.



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