Summary of Draft Environmental Impact Statement

Second Sydney Airport Proposal (Badgerys Creek)

COMMONWEALTH DEPARTMENT OF
TRANSPORT AND REGIONAL DEVELOPMENT

PPK
Environment & Infrastructure

Approximate

Approximate Boundaries
Option A
Option B
Option C

Photograph 1

Sites of Badgerys Creek Airport Options (from south-west looking north-east)

Contents

Prepared by:
PPK Environment and Infrastructure
PPK House
PO Box 248
Concord West NSW 2138
ACN 078 004 798
ISBN 0642283923

Prepared for:
Commonwealth Department of
Transport and Regional Development
GPO Box 594
Canberra ACT 2601

December 1997

1. Introduction

The question of where, when and how a second major airport might be developed for Sydney has been the subject of investigation for more than 50 years. A large number of sites have been put forward as possible locations (Figure 1). An extensive site selection program, finalised in 1985, closely examined 10 shortlisted sites and prepared detailed environmental assessments on two, one at Badgerys Creek and Wilton. In 1986 the then Commonwealth Government announced that Badgerys Creek had been selected as the site for Sydney's second major airport.

The Badgerys Creek site, which is about 46 kilometres west of Sydney's central business district and 1,700 hectares in area, was acquired by the Commonwealth Government between 1986 and 1991. A total of $155 million has been spent on property acquisition and preparatory works.

During 1994 and 1995 the then Commonwealth Government announced details of the proposed airport development at Badgerys Creek along with funding commitments for a first stage development that would ensure the new airport would be operating in time for the 2000 Olympics. This decision to accelerate development of the new airport triggered the Commonwealth's environmental assessment procedures. In January 1996 it was announced that an environmental impact statement (EIS) would be prepared for the construction and operation of the new airport.

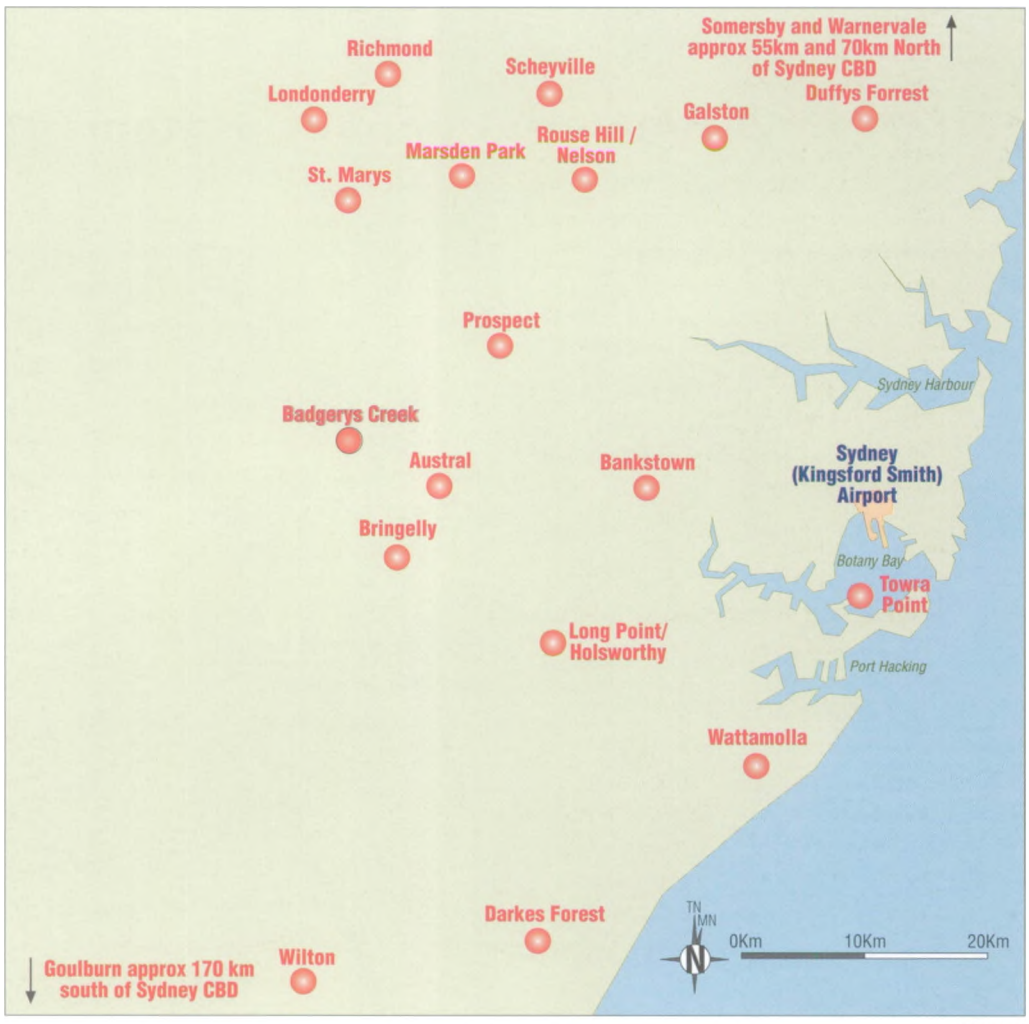


Figure 1
Potential Airport Sites Previously Shortlisted for Consideration In and Around the Sydney Basin
Source: Kinhill Stearns, 1985

In May 1996 the present Commonwealth Government decided to broaden the environmental assessment process. It put forward a new proposal involving consideration of 'the construction and operation of a second major international/domestic airport for Sydney at either Badgerys Creek or Holsworthy Military Area on a site large enough for future expansion of the airport if required.' A major airport was defined as being 'capable of handling up to 360,000 aircraft movements and 30 million passengers per year.'

The Government also indicated that 'Badgerys Creek at this time remains the preferred site for Sydney's second major airport subject to the favourable outcome of the EIS, while Holsworthy is an option to be considered as an alternative.'

Following the substantial completion of the environmental assessment of the Badgerys Creek and Holsworthy Airport options, the Government eliminated the Holsworthy Military Area as a potential site for Sydney's second major airport. The environmental assessment had shown that the Badgerys Creek site was significantly superior to the Holsworthy Military Area. As a result a Draft EIS was prepared examining only the Badgerys Creek site. The present document provides a summary of the results of that Draft EIS. For a more complete understanding of the potential impacts of the Second Sydney Airport proposal, reference should be made to the Draft EIS and, if required, to the supporting technical papers prepared during the assessment process.

2. The Draft Environmental Impact Statement

Environmental Assessment Process

The Commonwealth Department of Transport and Regional Development is the proponent for the Second Sydney Airport. The environmental assessment is being conducted in accordance with the Administrative Procedures of the Environment Protection (Impact of Proposals) Act 1974. The environmental assessment process established by this legislation is shown in Figure 2.

The preparation of a Draft EIS is an important stage in that process. The Draft EIS examines:

- the existing and potential future environment of the proposed airport sites and the surrounding region;
- the potential impacts of the construction and operation of a major airport; and
- the measures that could be instituted to minimise those potential impacts.

The Draft EIS will be placed on public exhibition for a period to be determined by the Minister for the Environment. Interested persons, groups and authorities are invited to make a submission on the Draft EIS to Environment Australia, the Commonwealth authority responsible for administering the assessment process. Information on how to make a submission is contained in Section 14 of this Summary.

The Draft EIS has been prepared by PPK Environment & Infrastructure Pty Ltd (formerly Rust PPK) and specialist sub-consultants retained by PPK. Fifteen technical papers were also prepared. These papers contain reference material which supports the Draft EIS. The technical papers are available for public review, however they do not form part of the Draft EIS. A wide range of inputs from a variety of organisations was required for the preparation of the Draft EIS; important among these was airport planning work undertaken by a

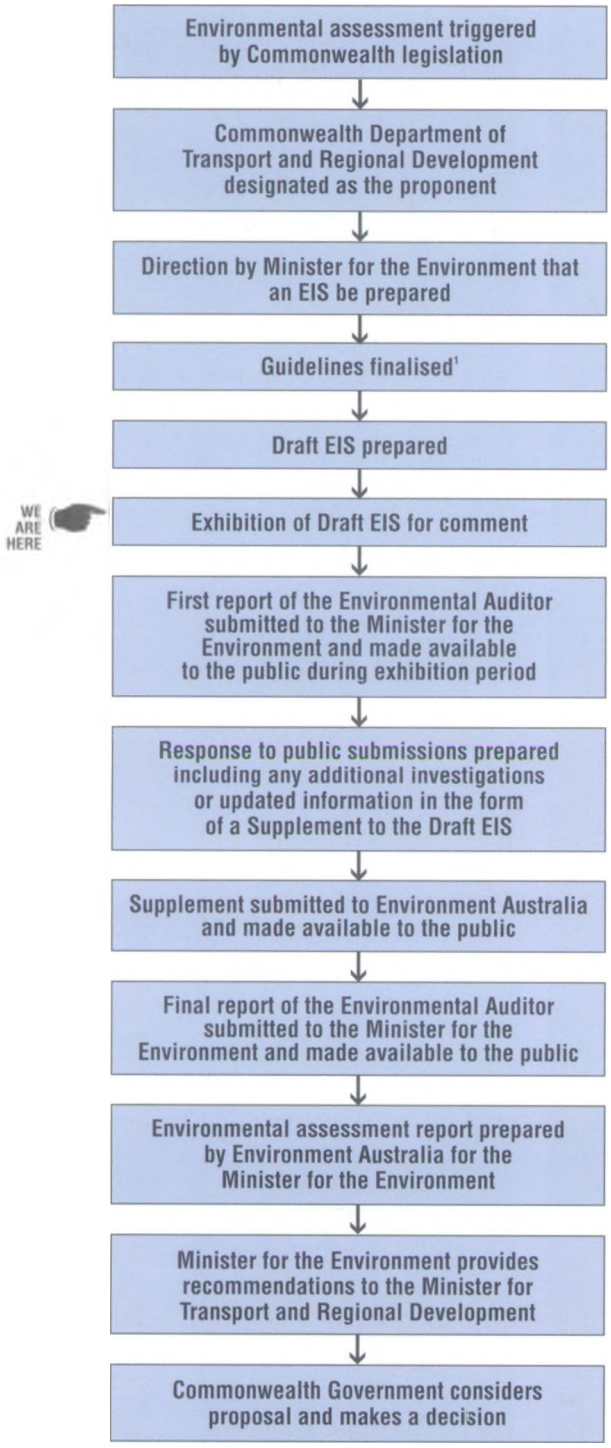


Figure 2
Environmental Assessment Process
Note: 1.Guidelines are based on those issued in November 1996 for the proposal to construct an airport at Badgerys Creek or Holsworthy Military Area and the public submissions on the Guidelines received during 1996.

consortium of companies retained by the Department of Transport and Regional Development, called the Second Sydney Airport Planners.

The Commonwealth Government has supplemented the standard EIS process by adopting the findings of the 1995 Senate Select Committee on Aircraft Noise in Sydney. The Committee's recommendations included the need for extensive consultation, and a transparent and independent audit of the EIS process.

SMEC Australia Pty Ltd was appointed as the independent auditor of the EIS process by the Minister for the Environment in November 1996. The auditor is required to report on the appropriateness and adequacy of the data and methodologies used in both the Draft EIS and the Supplement to the Draft EIS. The auditor's initial report will be made available to the public early in the exhibition period of the Draft EIS.

Consultation During the Preparation of the Draft EIS

Extensive consultation was undertaken during the preparation of environmental studies which examined both the Badgerys Creek and Holsworthy sites. It included identifying the interests of communities, developing appropriate information, communicating that information, consulting with the community and seeking feedback. The issues raised then provided a direct input to the studies.

Ten separate information documents were released (Figure 3) during the consultation period and over 400,000 copies distributed to the communities. More than 140 advertisements were placed in metropolitan and local newspapers. In addition non-English language documents were produced in 14 languages. Direct contact and two way exchange of information with the community

occurred through meetings, information days (Photograph 2), displays at shopping centres, a telephone information line, the internet and by responding to written submissions.

In relation to the Badgerys Creek airport options the key issues were:

- *the planning process.* Almost 30 percent of submissions focussed on the whole proposal rather than individual aspects. Most respondents expressed the view that the Second Sydney Airport should not be located within the Sydney basin;
- *potential aircraft noise impacts.* Aircraft noise was one of the most significant issues. This concern was compounded by the anticipation of a no-curfew airport;
- *air quality impacts, especially adverse effects on community health.* There was community apprehension over the possible relationship between air pollution and asthma. Similar concerns were expressed about aircraft emissions and their potential to cause or predispose susceptible individuals to cancer;
- *water quality issues.* A high value was placed on protecting clean drinking water supplies, stream habitats and water quality;

Photograph 2
Information Day at Penrith

- *loss of lifestyle and amenity.* Communities now located in regions surrounding the airport options have created and maintained an outdoor lifestyle with an emphasis on recreational activities. These communities consider that the airport options and resulting noise, air pollution, and extra traffic would effectively destroy this keenly sought lifestyle;
- *hazards and risks.* The risk of a plane crash into urban areas or onto facilities such as Warragamba Dam was a major source of concern; and
- *decision making.* The history of decision making in relation to the Badgerys Creek proposals has led to long-term uncertainty. While an airport was proposed at Badgerys Creek over 10 years

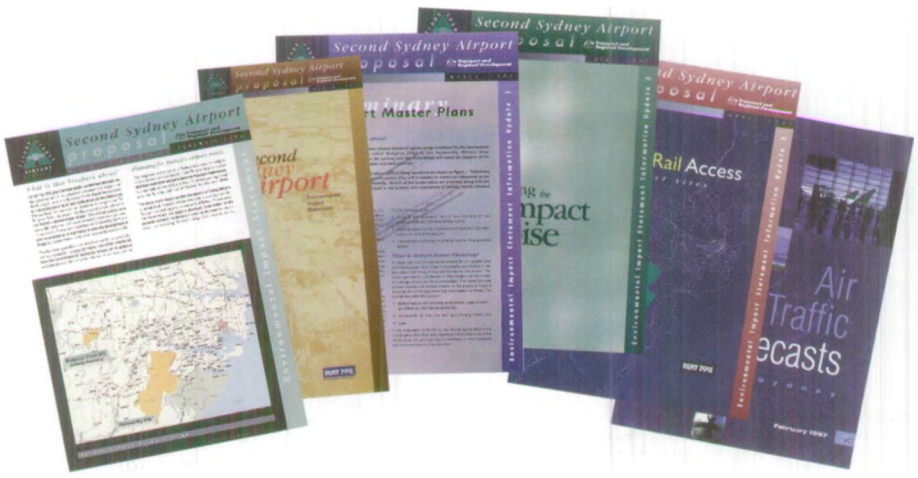


Figure 3
Some of the Consultation Material Released

ago, no substantial development has yet commenced; it was claimed that this uncertainty has had considerable impact on community stability. Many community members are seeking a decision to enable them to plan their future. In addition, the introduction of new airport proposals at Badgerys Creek exposed new populations to uncertainty regarding potential impacts of an airport development.

3. Need for a Second Major Airport for Sydney

Over the past 30 years, as air travel has become more affordable, world demand has grown at a substantial rate. Australia and Sydney, in particular, have shared in this growing demand. Passenger movements through Sydney Airport have increased from 2.6 million in 1965/66 to over 20 million in 1995/96.

The Department of Transport and Regional Development is currently forecasting that total passenger movements into and out of Sydney will reach 40.4 million in 2009/10 and 63.2 million in 2024/25 (Figure 4).

There has been a similar growth in aircraft movements, and this is forecast to continue. In 1965/66 there were about 70,000 scheduled aircraft movements at Sydney Airport and by 1995/96 this had grown to 245,000. Total scheduled aircraft movements using a major airport in the Sydney basin are forecast to reach 426,000 in 2009/10 and 565,000 in 2024/25 (Figure 5).

Development of a new airport and/or the expansion of existing airport facilities is needed to accommodate forecast growth in air passengers and aircraft movements. Although the timing of development can be influenced to some extent by the application of air traffic management measures, if suppression and diversion of air travel demand is to be avoided, additional airport facilities will be needed.

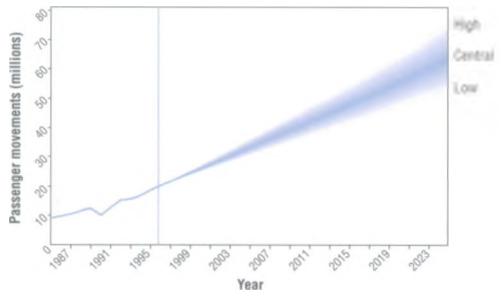


Figure 4
Forecasts of Passenger Movements for the Sydney Basin 2024/25 (Unconstrained Outlook)
Source: Department of Transport & Regional Development, 1997a

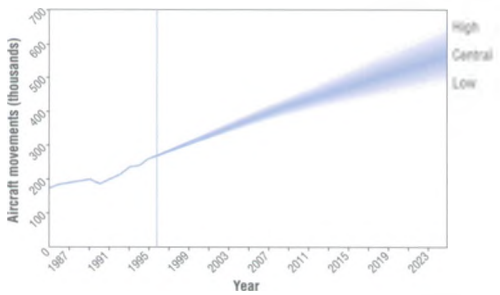


Figure 5
Forecasts of Aircraft Movements for the Sydney Basin 2024/25 (Unconstrained Outlook)
Source: Department of Transport & Regional Development, 1997a

4. Alternatives to the Second Sydney Airport Proposal at Badgerys Creek

Many alternatives for providing significant additional aviation capacity for Sydney have been the subject of considerable debate by the community during the preparation of the Draft EIS. Studies carried out over the last 50 years have examined most of these alternatives which can be broadly described as:

- expanding the capacity of Sydney Airport;
- considering another site or sites for a second major airport; or
- literally *doing nothing*.

The Government has a stated commitment to reducing the environmental impacts caused by Sydney Airport as much as possible. Actions arising from this commitment have included introducing a cap on the number of aircraft movements permitted per hour and airspace management procedures aimed at sharing the noise caused by the operation of the airport.

Alternative sites for the Second Sydney Airport have been the subject of intensive investigation over a number of years. Recently, the potential for the Holsworthy Military Area to accommodate a second major airport for Sydney has been the subject of detailed assessment. It was found that options available within the Military Area would be environmentally unacceptable.

There would also be major disadvantages with sites outside of Sydney such as Goulburn. These disadvantages would include the relatively time consuming, costly and inconvenient trips passengers would need to make to and from the city area or to connect with Sydney's existing airport.

Each alternative to providing the Second Sydney Airport at Badgerys Creek would have a range of advantages and disadvantages. While the proposal at Badgerys Creek would result in a variety of environmental impacts, as summarised in the remainder of this document the alternatives to proceeding with the proposal would also have environmental consequences. In many cases these alternatives would involve redistribution of both adverse impacts and benefits of a major airport from one region of Sydney, NSW or Australia to another region. In the case of some of the alternatives, economic benefits may be lost from Australia as a whole, especially if air travel demand is significantly suppressed.

5. Potential Role of the Second Sydney Airport

Cities around the world which have developed second major airports have responded to their particular needs in different ways. For example, the original airport in Dallas, United States, is now used for short range traffic that does not connect with other flights. Second airports in New York and Washington serve as hubs for particular airlines. In Taipei, Taiwan, smaller domestic aircraft use the downtown airport and larger international flights use a newer airport 40 kilometres from the city.

It is clear that each metropolitan area around the world has unique characteristics, and the development of multi-airport systems respond to particular local circumstances. The precise role and the consequential staging of development of the Second Sydney Airport would be the subject of future Government decisions. To assist in developing a realistic assessment of the potential impacts of the Second Sydney Airport, three sets of air traffic forecasts for the airport were developed.

Each forecast assumes a major airport would be developed, but that there would be different rates of growth.

The three potential air traffic scenarios considered for the Second Sydney Airport were:

- *Air Traffic Forecast 1* where the Second Sydney Airport would provide only for demand which cannot be met by Sydney Airport. This is an overflow forecast, but would nevertheless result in a significant amount of air traffic at the second airport. The proportion of international and domestic air traffic is assumed to be similar at both airports. This assumption is shown in Figure 6;
- *Air Traffic Forecast 2* where the Second Sydney Airport would be developed to cater for 10 million passengers a year by 2006, with all further growth after this being directed to the second airport rather than Sydney Airport. The proportion of international and domestic traffic is also assumed to be similar at both airports. This assumption is shown in Figure 7; and
- *Air Traffic Forecast 3*, which is similar to Forecast 2 but with more international flights being directed to the Second Sydney Airport. This would result in the larger and comparatively noisier aircraft being directed to the second airport, which would accommodate about 29.3 million passengers by 2016. This assumption is shown in Figure 8.

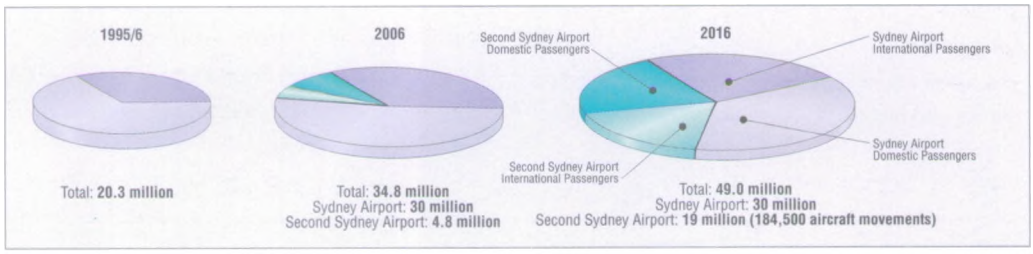


Figure 6
Passenger Movements for Air Traffic Forecast 1

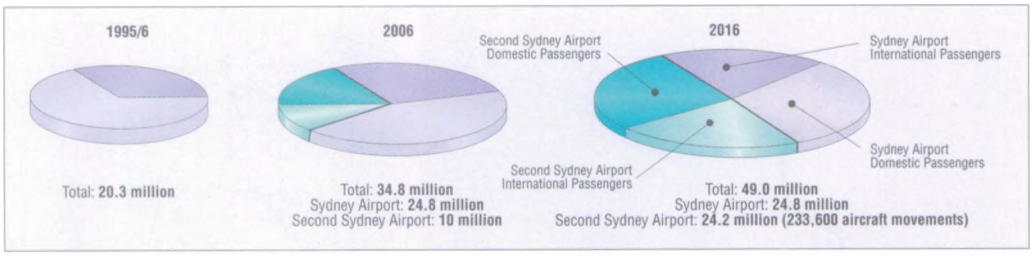


Figure 7
Passenger Movements for Air Traffic Forecast 2

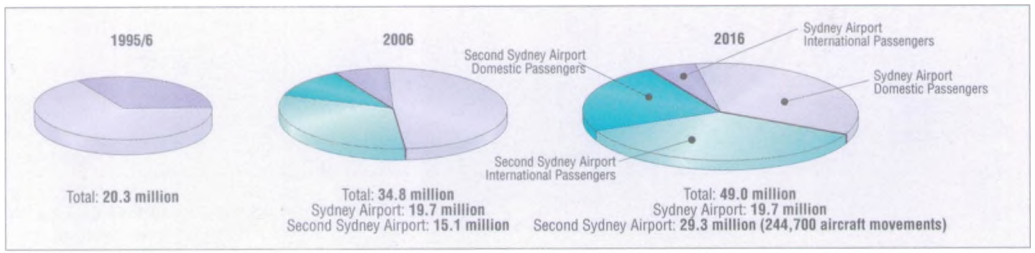


Figure 8
Passenger Movements for Air Traffic Forecast 3

6. The Proposals

Airport Options

A stated objective of the Commonwealth Government is the building of a second major airport in the Sydney region to a full international standard, subject to the results of an EIS. The Government's view is that Sydney needs a second major airport to handle the growing demand for air travel, and to control the level of noise experienced by Sydney residents. Government policy indicates that Sydney's second airport would be more than just an overflow airport and would, in time, play a major role in serving Sydney's air transport needs.

The Government proposes the development of a second major airport for Sydney capable of handling up to 30 million domestic and international passengers a year. By comparison, Sydney Airport handled about 20 million passengers in 1995/96.

The assumptions made in the Draft EIS about how the Second Sydney Airport would operate, and the master plans setting out the broad framework for its future physical development, are based on an operational limit of about 30 million passengers a year. The general features of an airport that would operate at this level include parallel runways with the majority of facilities provided between the runways. As the Government has not yet made a decision on whether the airport would operate with or without a curfew at night, the noise assessment undertaken for the Draft EIS examines both possibilities.

Three airport options located at Badgerys Creek are considered in the Draft EIS, along with the implications of not proceeding with the proposal. Master plans have been developed for each option and are shown in Figures 9 to 11. The facilities shown in these master plans would be developed progressively over a long period of time, possibly more than 20 years. Potential Stage 1 developments of each of the options involving the construction of one runway only are shown in Figures 12 to 14.

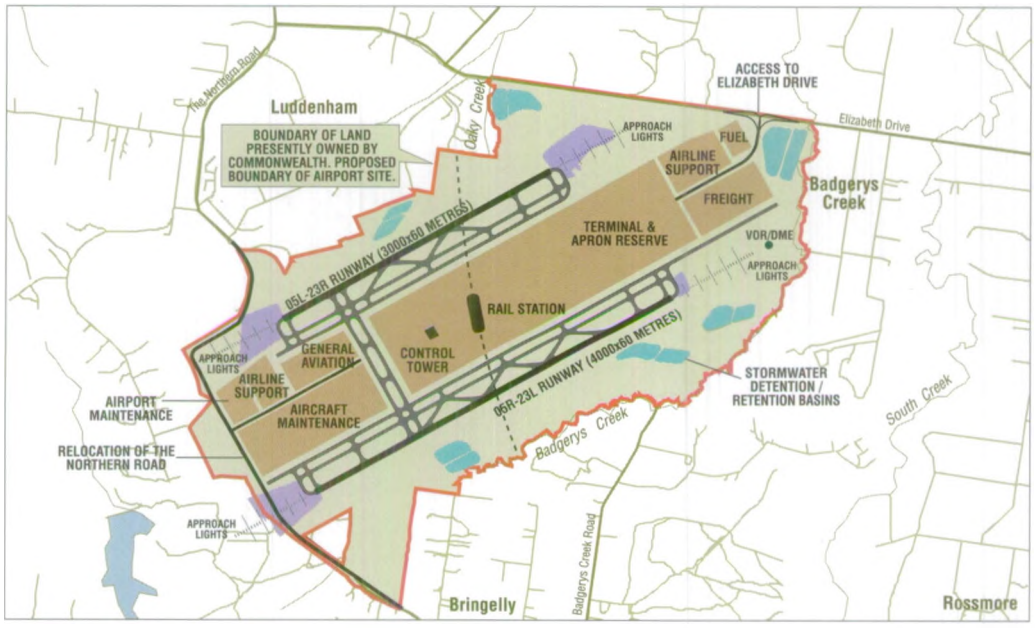


Figure 9
Master Plan of Option A
Source: Second Sydney Airport Planners, 1997a

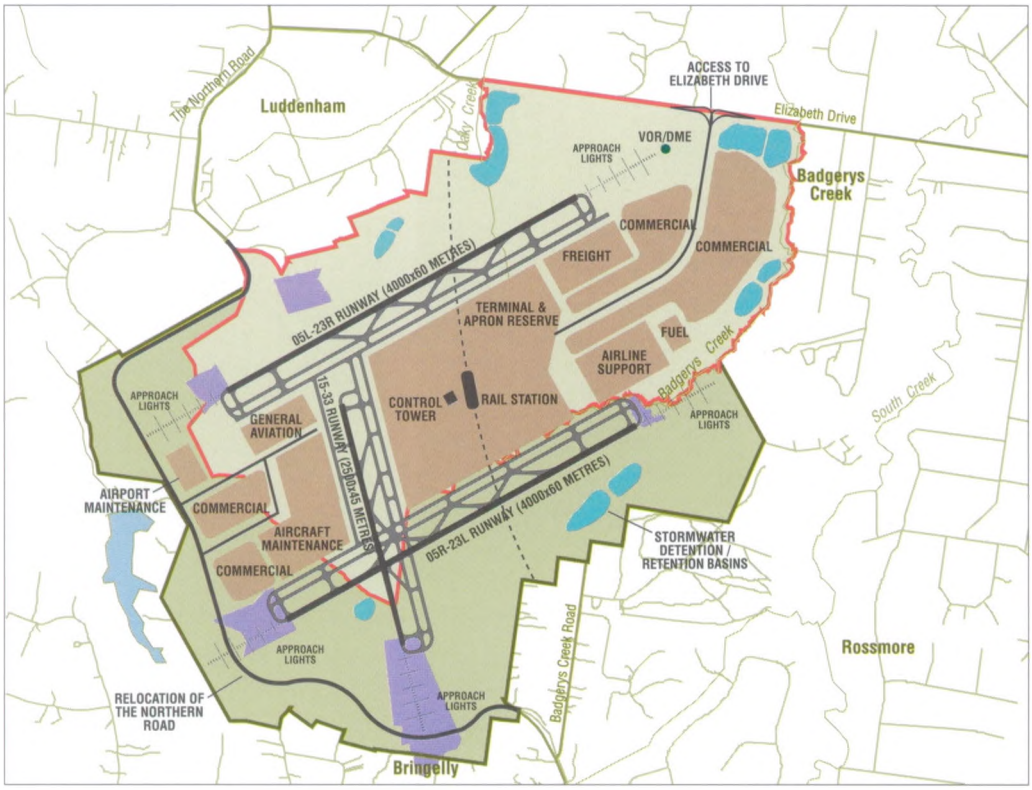
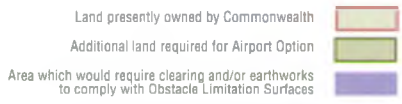


Figure 10
Master Plan of Option B
Source: Second Sydney Airport Planners, 1997a



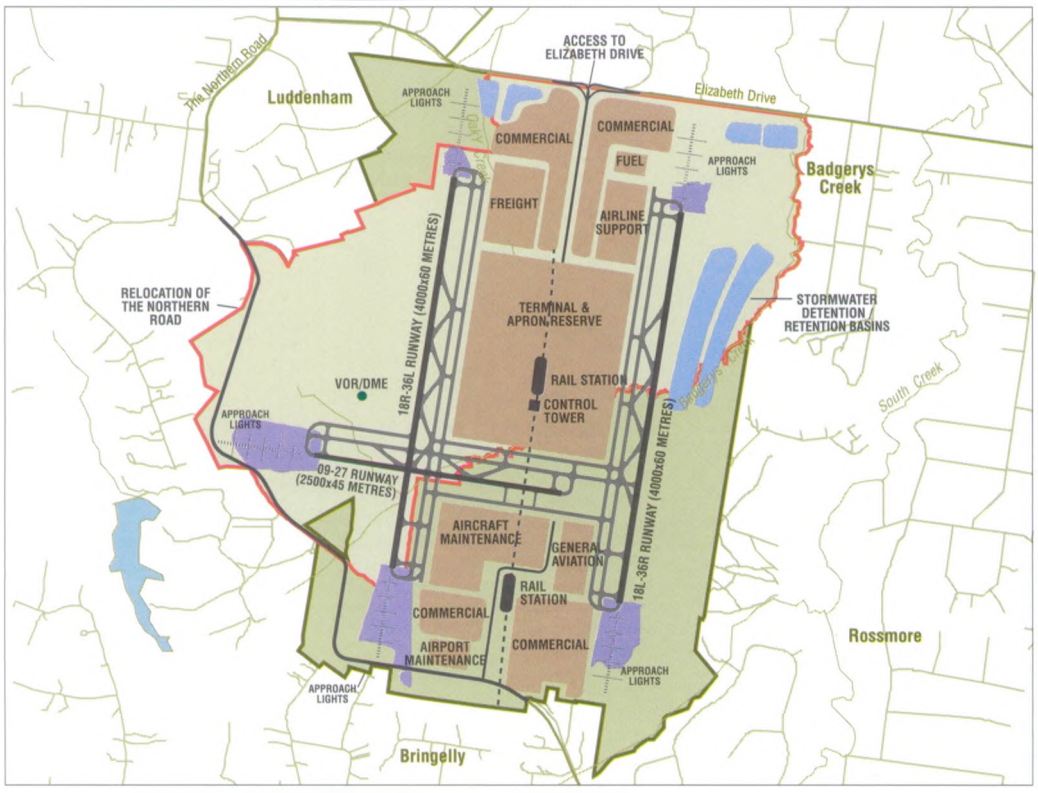
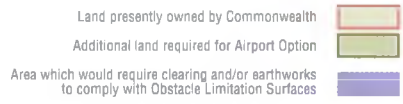


Figure 11
Master Plan of Option C
Source: Second Sydney Airport Planners, 1997a



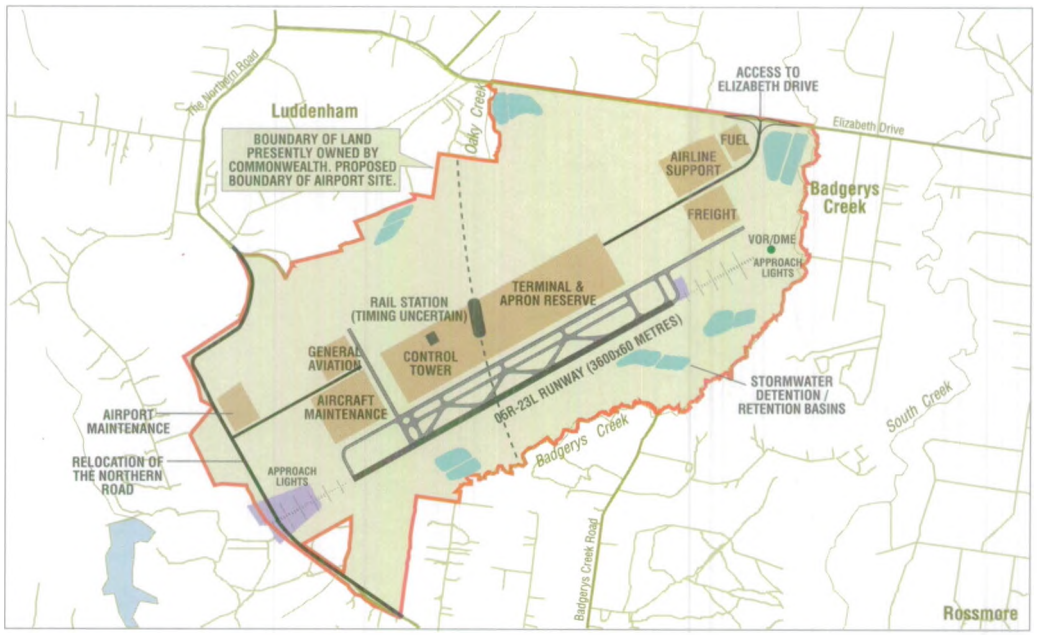


Figure 12
Stage 1 Development of Option A
Source: Second Sydney Airport Planners, 1997a

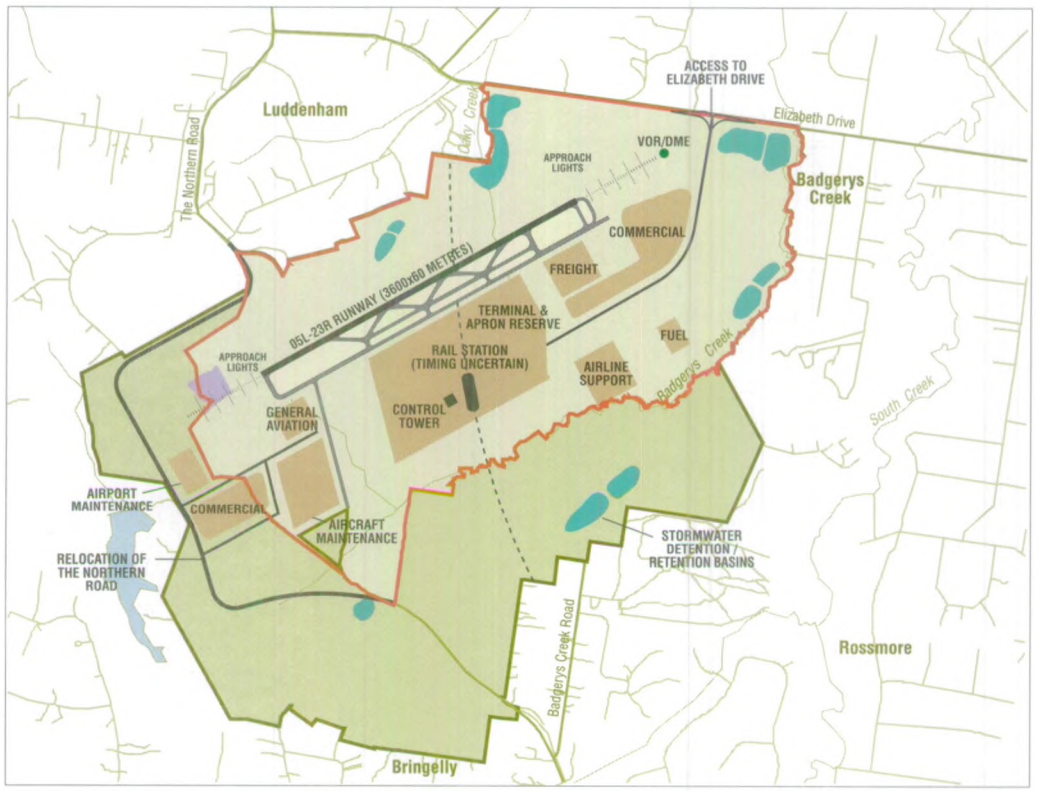


Figure 13
Stage 1 Development of Option B
Source: Second Sydney Airport Planners, 1997a

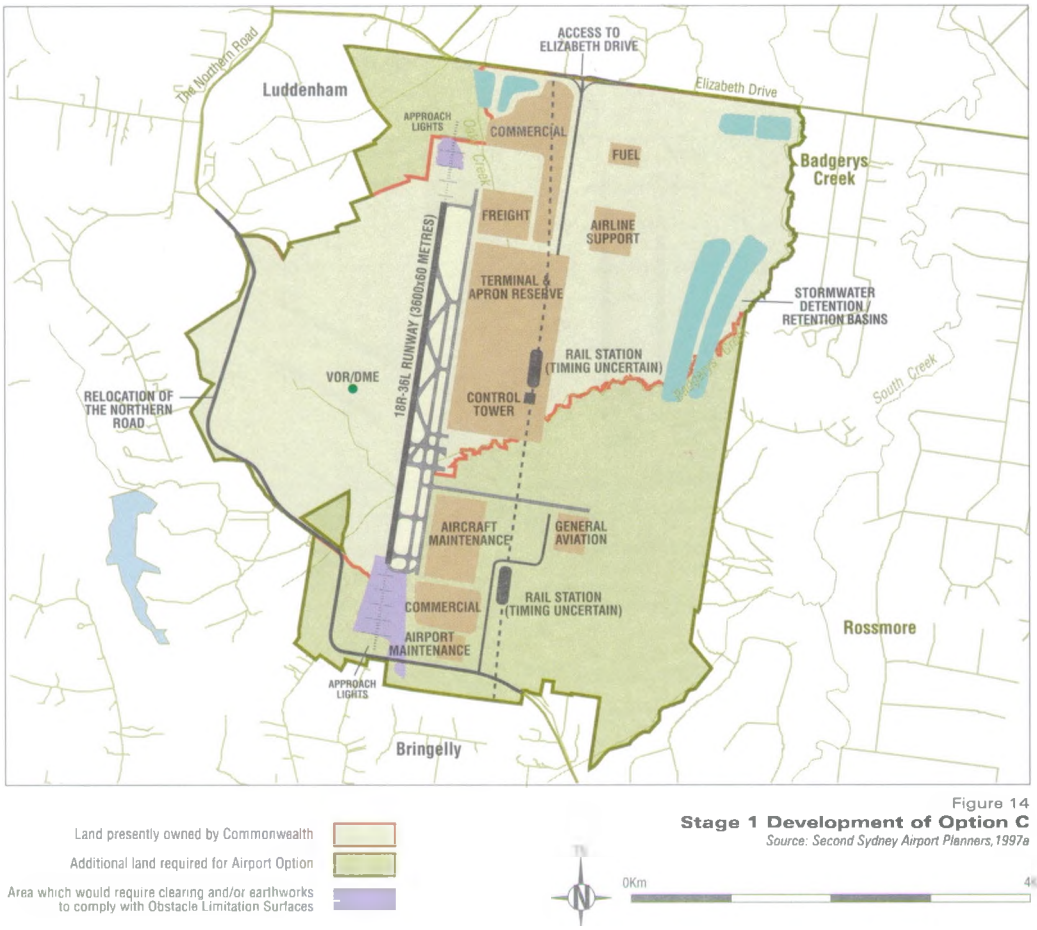


Figure 14
Stage 1 Development of Option C
Source: Second Sydney Airport Planners, 1997a

The airport options are:

- *Option A*, which has been developed to be generally consistent with the planning for this site undertaken since 1986. The airport would be developed within land presently owned by the Commonwealth (1,700 hectares) with two parallel runways constructed on an approximate north-east to south-west alignment;
- *Option B* would adopt an identical runway alignment to Option A, but provides greater distance between the parallel runways, an expanded land area (additional 1,200 hectares), and also a cross wind runway; and
- *Option C* would provide two main parallel runways on an approximate north to south alignment in addition to a cross wind runway. Once again the land area required would be significantly expanded (additional 1,150 hectares) above that presently owned by the Commonwealth.

The locations of the three airport options within Sydney are shown in Figure 15 which is located inside the back cover of this summary.

Operation of the Airport Options

To ensure that the likely range of possible impacts of the airport options are identified in the Draft EIS, a number of different assumptions about how the airport options would be developed and operate have been adopted. These different assumptions relate to the number and types of aircraft that may operate from the airport, the flight paths used and the direction of take offs and landings.

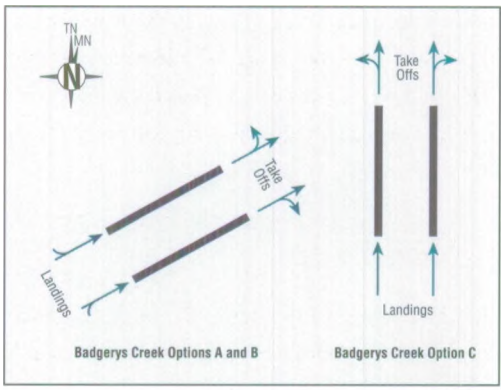


Figure 16
Predominant Directions of Movement of Aircraft for Airport Operation 1
Note: Cross wind runway used only when required because of meteorological conditions

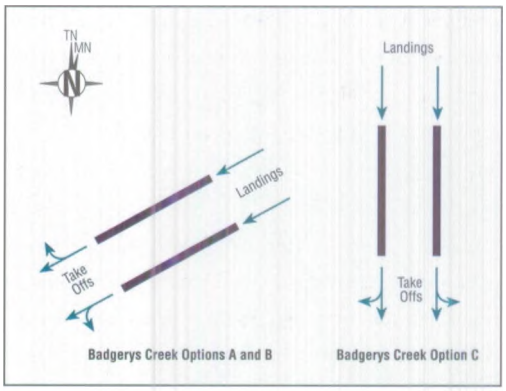


Figure 17
Predominant Directions of Movement of Aircraft for Airport Operation 2
Note: Cross wind runway used only when required because of meteorological conditions

Three airport operation scenarios were adopted for the environmental assessment to describe the potential ways the airport may operate. These were:

- *Airport Operation 1* (Figure 16). Aircraft movements would occur on the parallel runways in one specified direction (arbitrarily chosen to be the direction closest to the north), unless this is not possible due to meteorological conditions. That is, take offs would occur to the north from the parallel runways and aircraft landing would approach from the south, travelling in a northerly direction. Second priority is given to operations in the other direction on the parallel runways, with operations on the cross wind runway occurring only when required because of meteorological conditions;
- *Airport Operation 2* (Figure 17). Aircraft movements would adopt a similar pattern to Operation 1, but with the preferred direction of movements on the parallel runways reversed, that is to the south; and
- *Airport Operation 3*. Deliberate implementation of a noise sharing policy under which seven percent of movements are directed to occur on the cross wind runway (equal numbers in each direction) with the remainder distributed equally between the two parallel runway directions.

As a cross wind runway is not proposed for Option A, only Operations 1 and 2 were considered for that option.

Preliminary Flight Paths and Flight Zones

Flight paths define the anticipated routes of aircraft arriving or departing from an airport. To ensure efficient and economic operations, aircraft would ideally fly direct routes at optimum altitudes. However, it is not always possible for aircraft to fly preferred routes because of noise and safety considerations and the competing demands of other airspace users.

At this early stage in the airport planning process it is not practicable to develop a final set of flight paths for each airport option. When a decision is made on the actual configuration of the Second Sydney Airport, it would be necessary to review flight paths in the context of the noise and other environmental assessments. Between now and the opening of the airport, it may also be necessary to adjust the flight paths for operational and other reasons which cannot be foreseen. Detailed planning of flight paths cannot begin until decisions on the site and runway orientation are made. Such planning is likely to involve a separate process which would involve consultation with the community.

Preliminary flight paths were developed to allow an environmental assessment to be undertaken of each of the airport options. The flight paths represent the range that may be used if any of the airport options are developed, taking into account existing management of Sydney's airspace and the need to ensure safe and efficient aircraft operations. Use of these preliminary flight paths in the environmental assessment process has allowed the potential range of impacts to be identified, from relatively low to relatively high impacts.

Whereas flight paths show where aircraft fly most of the time, the Draft EIS also shows flight zones to describe in more general terms the airspace that may be used by aircraft operating to and from the airport. The flight zones include all the flight paths and adjacent airspace that may be used by aircraft for safety and other operational reasons. At some time, aircraft would potentially be seen and heard anywhere in the flight zones around the airport.

Costs

The construction, operation and environmental management of the Second Sydney Airport would incur a range of costs. Not all these costs can be quantified at this stage. The construction of the airport would, however, be the most substantial cost. Table 1 provides the estimated costs of constructing the airport options to the master plan stage and also the costs of constructing the infrastructure and services (such as roads and a rail line) that would be required to support them.

Future Expansion of the Second Sydney Airport

The Department of Transport and Regional Development estimate that there will be a demand for over 63 million passengers to fly into and out of Sydney by 2025. Current planning for Sydney Airport assumes it will ultimately handle about 30 million passengers a year. Consequently, if the Second Sydney Airport proceeds, there may be a demand to expand its capacity, possibly in about 30 years' time.

It is not feasible for an EIS to accurately predict the potential impacts of a major airport within Sydney over a timeframe of more than 30 years into the future. Nevertheless, some details about how the airport options may be expanded in the future are provided in the Draft EIS. The potential environmental implications of such an expansion are also discussed. The expansion could not proceed, however, unless a further detailed environmental assessment and decision making process were undertaken by the Government.

Table 1 Construction and Infrastructure Costs

Costs	Option A	Option B	Option C
Construction Costs (1997$)[1]	$3 to $4.1billion	$3.5 to $4.8billion	$3.4 to $4.7billion
Infrastructure Costs (1997$)[2]	$961 to $1,016million	$961 to $1,016million	$961 to $1,016million

Note: 1. Range of costs due to assumed level of accuracy.
2. Infrastructure costs are estimated costs of infrastructure required to service the airport. They include roads, a rail line, water supply, fuel pipeline, gas supply, electricity supply, telecommunications and sewage disposal services.

The most economical way to handle the future traffic increase would be to add one or more parallel runways outside the initial wide spaced parallel runways. Conceptual plans developed for this type of expansion would allow for a double wide spaced parallel runway system which could substantially increase aircraft handling capacity.

General airport layouts were developed to illustrate the typical land area required for a double wide spaced parallel runway configuration and additional airport facilities. These indicate that the potential for increased capacity beyond the master plan airport design is possible with only small additional land requirements. The general features of the layouts for the ultimate airport development are shown in Figure 18.

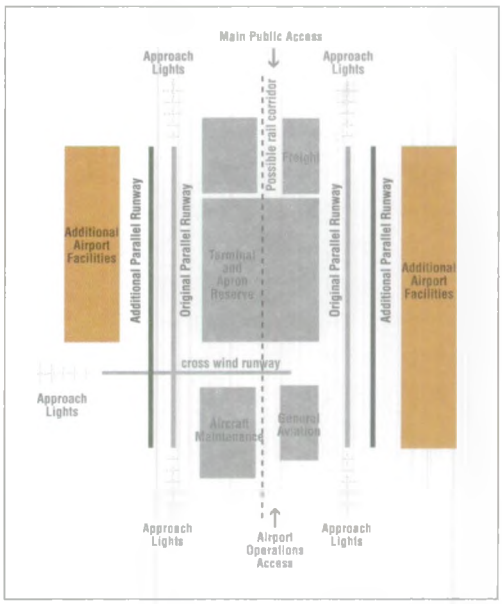


Figure 18
General Features of Potential Ultimate Airport Development

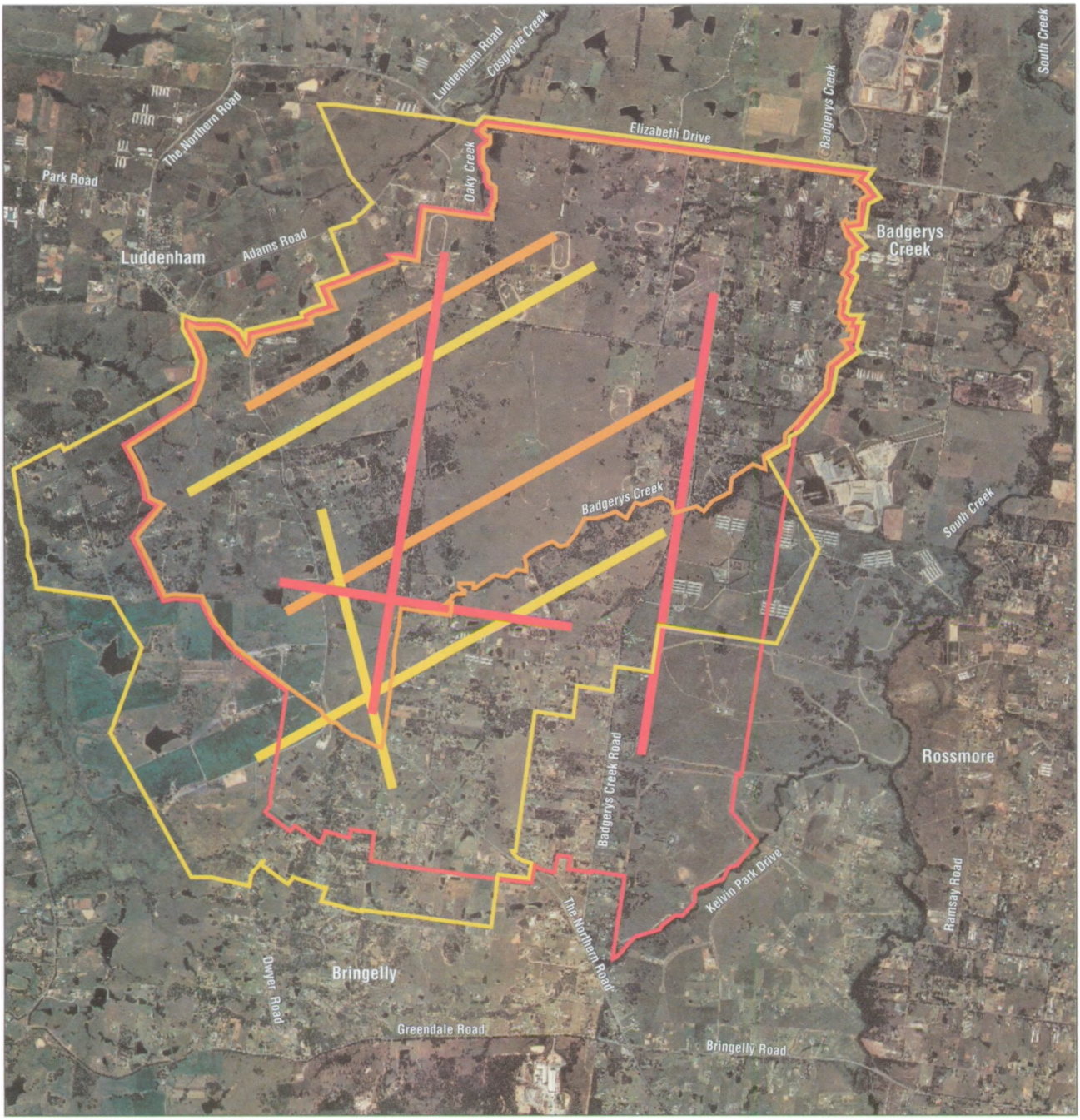
7. Characteristics of the Airport Sites

The sites of Badgerys Creek airport options are located about 15 kilometres west of Liverpool town centre, 12 kilometres south of Penrith town centre and 46 kilometres west of the Sydney central business district. The sites have an average elevation of approximately 80 metres above sea level, ranging from approximately 45 metres in the north-east to 120 metres in the north-west. The region is undulating with rolling hills and some extensive areas of relatively flat land. An aerial photograph of the airport sites is shown in Figure 19.

The Badgerys Creek airport sites are crossed by Badgerys (Photograph 3), Oaky (Photograph 4) and Cosgrove Creeks. These creeks flow into South Creek which ultimately drains to the Hawkesbury River. The streams are generally nutrient enriched and various indicators suggest poor ecological water quality.

The sites are used for agricultural purposes and low density rural residential development. They have been mostly cleared of native vegetation. Although scattered native vegetation remains, it is generally in poor condition. Fauna habitats have been significantly altered and the effects of introduced plants and animals are apparent. Nevertheless, the airport sites are considered to have regional significance for nature conservation.

Badgerys Creek village is located within the airport sites. Luddenham village is located immediately to the north-west and Bringelly village is located to the south. Other surrounding villages and communities include Kemps Creek, Wallacia, Mulgoa, Sovereign, Warragamba, Silverdale, Greendale, Rossmore, Austral, West Hoxton, Leppington, Catherine Field, Oran Park, Cobbitty, Theresa Park and Werombi (refer Figure 15). The nearby rural residential communities such as



Boundary and Runways of Option A
Boundary and Runways of Option B
Boundary and Runways of Option C

Figure 19
Aerial Photograph of Sites of Badgerys Creek Airport Options

TN
0Km 2.5Km

Photograph 3
Badgerys Creek within Airport Sites

Photograph 4
Oaky Creek within Airport Sites

Bringelly, Mount Vernon, and Hoxton Park have expanded over recent years through the construction of a substantial number of new dwellings. The closest suburban areas to the sites are between eight and 13 kilometres away.

8. Planning and Land Use Impacts

The Second Sydney Airport would influence urban planning decisions and resultant land uses in the regions surrounding the airport options. Major implications for urban planning would arise from the commercial and employment attractions of the airport, the infrastructure developed to support the airport such as roads and a rail line; and potential impacts on residential amenity, especially noise.

Metropolitan, regional and local planning initiatives were examined during the preparation of the Draft EIS. This was undertaken not only to assess the impacts on the future planning of Sydney, but also to develop estimates of the sizes and locations of future residential populations in the regions surrounding the airport options.

As the airport would take some time to construct and develop to its proposed operational limit, it is important that potential impacts are examined in the context of both existing and future land uses. The assessment of environmental impacts in the Draft EIS examined two future years of airport operation. The first year was 2006, which is

assumed to reflect the early stages of airport operation, and the second year was 2016 when about 30 million passengers could be using the airport each year.

A range of urban land use assumptions was developed taking into account the influences of each airport option. These influences were considered to be similar for Options A and B, but different for Option C. These assumptions are shown in Figures 20 and 21 and were used to develop forecasts about future populations.

The airport options would not necessarily greatly alter the type and scale of urban development planned for the western, south-western and southern regions of Sydney up to 2016. A potential difference between the proposed airport options is the extent to which each option presents advantages for future metropolitan planning and urban development. Options A and B would allow the opportunity to create urban villages that would be well serviced by public transport and close to the employment opportunities offered by the airport. This is consistent with the objectives of the State Government's metropolitan planning strategies. Option C may have similar potential, however, the extent to which the north-south runway alignment would compromise the ability to provide new urban villages along the rail corridor to the airport would require further investigation.

Employment centres surrounding Badgerys Creek could take advantage of the economic activity generated by the airport. Provided that planned upgrading of local and regional transport systems was carried out, the airport options would have reasonably good access to these centres.

Land use impacts from the development of each airport option would be varied. Commercial rural activities and rural residential development would be displaced and need to relocate to other areas; where Options B and C would have greater impact than Option A. There would also be potential impacts on Defence activities within the Orchard Hills Defence facility.

9. Noise Impacts

Methods Used to Assess Noise Impacts

The methods used to assess the noise impacts of each airport option allows the options to be compared as well as permitting the impacts on specific areas to be identified.

The assessment process was complex due to uncertainty as to how the airport may develop and operate. For example, the types of aircraft using the airport, the flight paths, and the direction of take offs and landings may change.

To ensure that the likely range of possible impacts was identified in the Draft EIS, a number of different assumptions were tested in the noise assessment. These assumptions related to air traffic forecasts, the staging of the development of the airport and the way the airport would operate (refer Section 6). In addition, the noise assessment looked at two future years of operation of the airport. The first year was 2006, which is assumed to reflect the early stages of the operation, and 2016 when about 30 million passengers could be using the airport each year.

Because of the number of assumptions adopted, the results of the noise assessment presented in the Draft EIS show a range of noise impacts for individual communities, from relatively low to

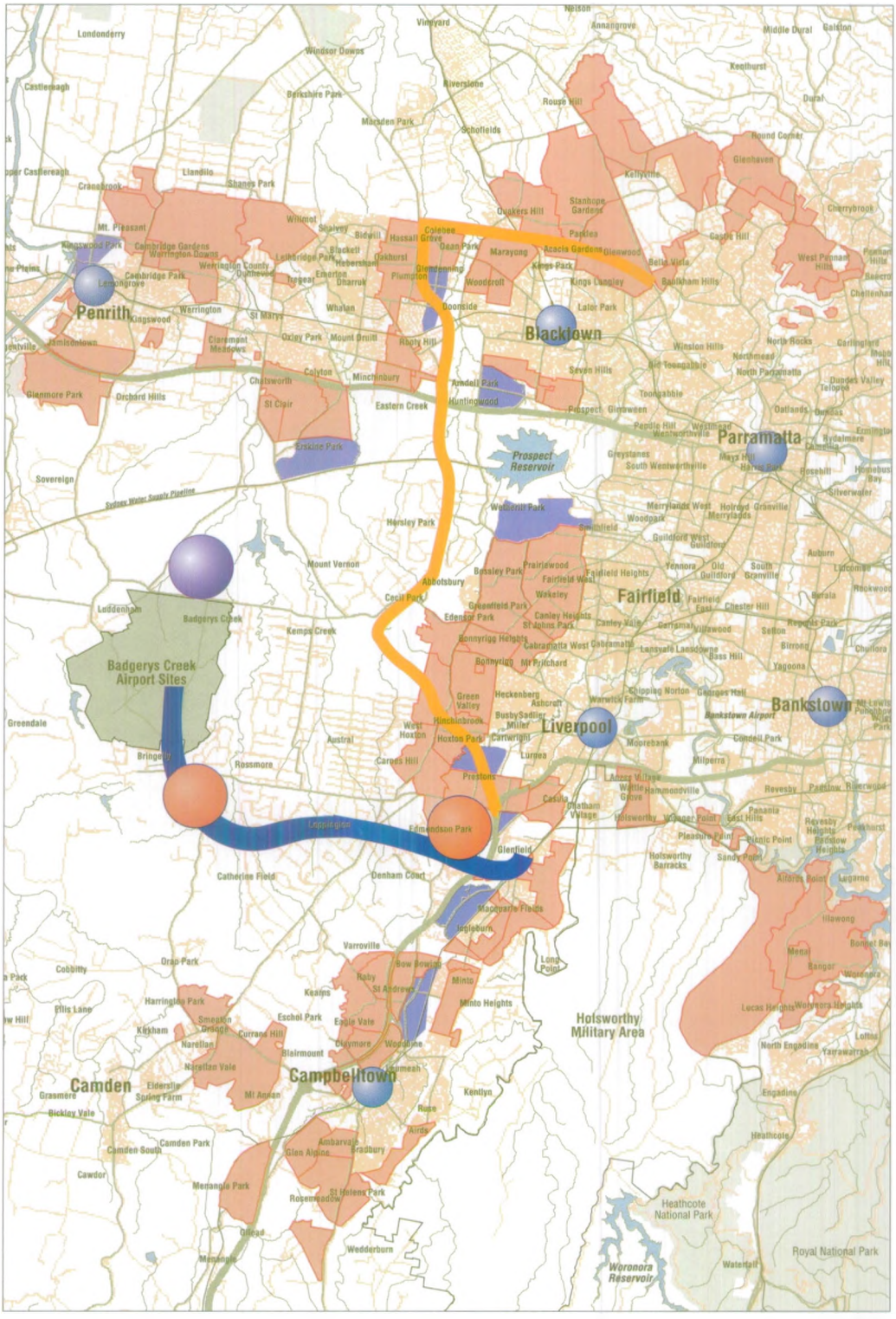


Figure 20
Future Urban Land Use Assumptions to 2016 for Options A and B

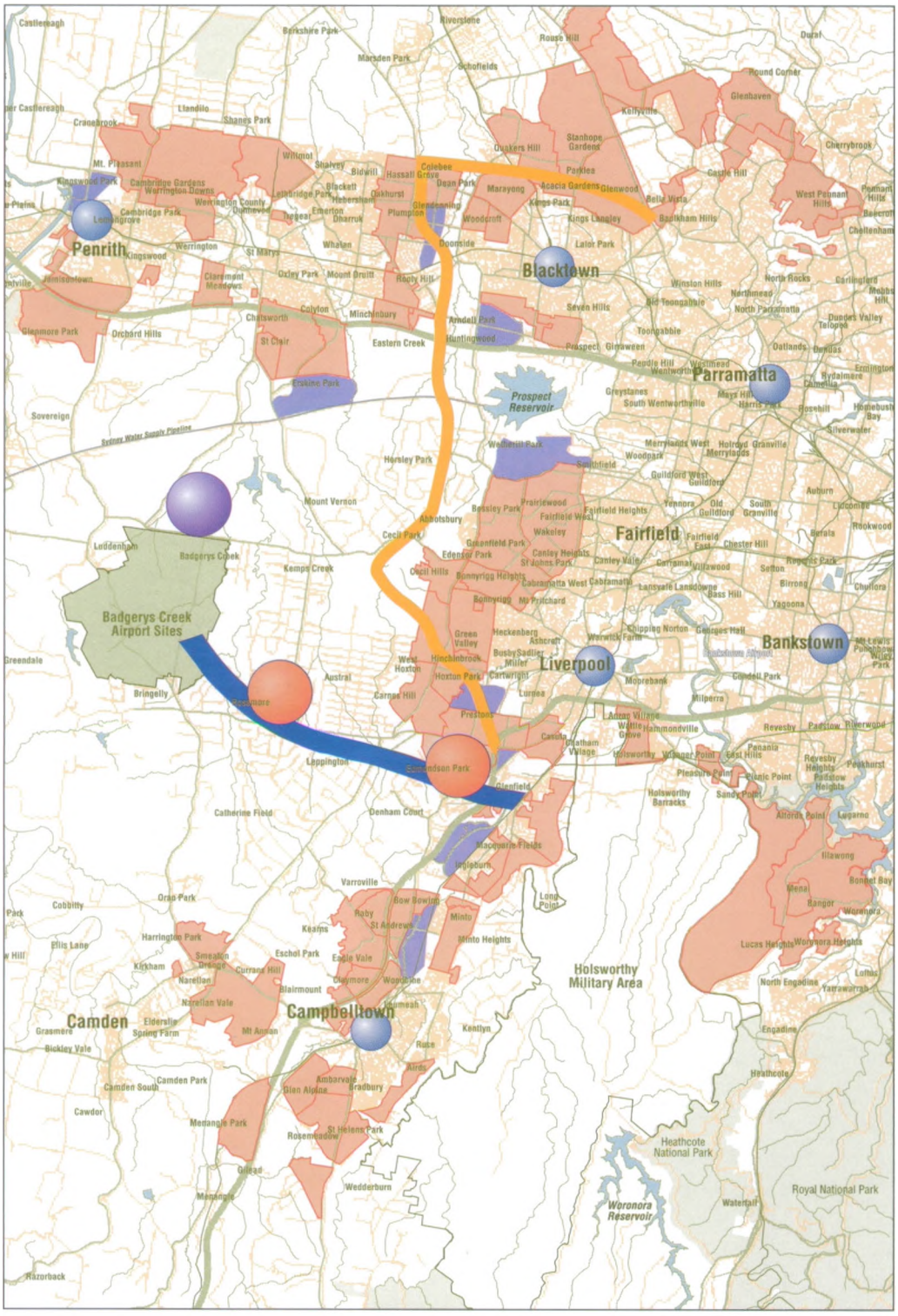


Figure 21

Future Urban Land Use Assumptions to 2016 for Option C

relatively high noise impacts. The actual noise impacts would likely be somewhere between these two levels.

Effects of Aircraft Overflight Noise

A literature search was carried out for the Draft EIS into the effects of noise from overflying aircraft. There are a number of potential impacts on people, property values and wildlife, but the research to date does not provide sufficient information to quantify accurately many of the suggested impacts on particular sensitive groups.

It does, however, show that there are some more general impacts which can reasonably be predicted. These are:

- sleep disturbance;
- disturbance to voice communication, which may be predicted by examining the number of aircraft overflights that would generate noise above certain levels;
- community annoyance when disturbed by aircraft noise; and
- devaluation of housing values.

How is Aircraft Noise Measured?

The loudness of noise is usually measured in decibels (dB). Because the ear responds to different types of noise in different ways, the A-weighted decibel (dBA) has been developed. The dBA measure most closely represents the way noise is heard by the human ear. Because of the way the dBA scale is calculated, a 10 dBA increase in noise is generally equivalent to doubling the loudness of the noise. Some typical noise levels are shown in Figure 22.

A useful way of describing aircraft noise is to use the maximum noise level of the particular aircraft. This is the highest level that occurs as the aircraft

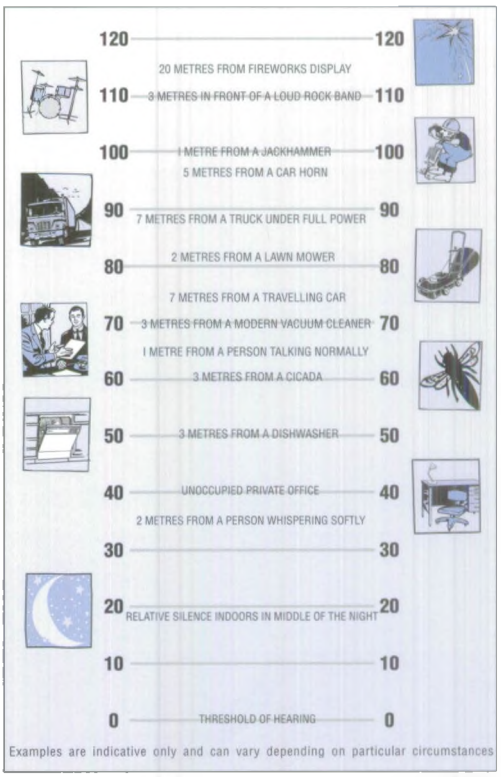


Figure 22
Typical Noise Levels [dBA]

flies overhead and is commonly measured in dBA. The maximum noise levels from aircraft that may occur in particular communities and the number of times these levels occur allow an estimate to be made of speech and sleep disturbance.

The noise impact assessment estimates the number of aircraft movements and the maximum noise levels of those movements over a large number of communities as shown in Figure 23. These estimates are set out in detail in Appendix D of the Draft EIS. Examination of this information can provide residents living in particular communities with an indication of potential impacts such as disruption to conversations and disturbance to sleep.

The most common measure of aircraft noise exposure in Australia is the Australian noise exposure forecast system. This system takes into account the noise level of each aircraft passing

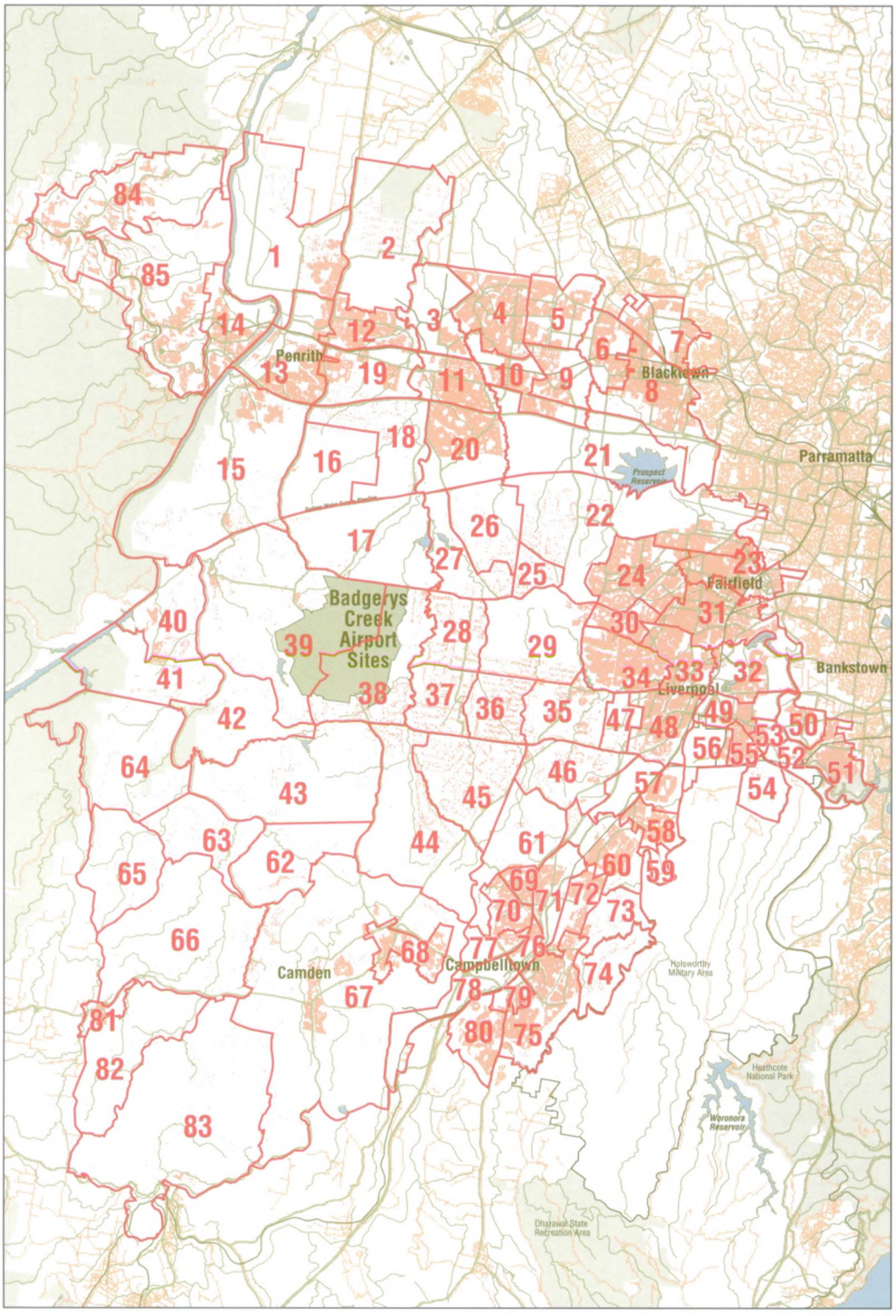


Figure 23
Community Assessment Areas

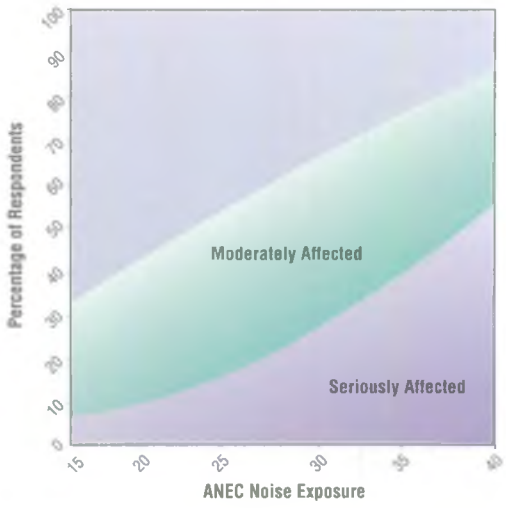
Urban Areas (indicated by local roads)
Indicates Density of Dwellings in 1996

TN
MN

0Km 10Km

overhead, the number of these movements and the time of the day or night. The system was originally designed for planning the use of land near airports, and so it is less than ideal for explaining potential noise impacts on residents in areas surrounding airports. The information it provides is commonly displayed in the form of contours on a map.

The Australian noise exposure forecast system yields a number of measures. The Draft EIS provides a range of contours including the Australian Noise Exposure Concept (ANEC) measure. This measure is based on indicative data on aircraft types, airport operations and flight zones. Figure 24 shows the relationship between the effect on residential communities and ANEC measured around existing Australian airports. Although 20 ANEC is generally the lowest level plotted on contour maps, noise levels below this may still have a significant effect on residential communities.



The above figure indicates the relationship between levels of community response to aircraft noise and the ANEC measure. People react differently to different levels of noise. In a study undertaken by the National Acoustic Laboratories approximately 10% of people regarded themselves as being seriously affected by noise and 45% regarded themselves as being moderately affected at a noise exposure of 20 ANEC. At 25 ANEC almost 20% of respondents were seriously affected and over 55% regarded themselves as moderately affected.

Figure 24
General Reactions to Aircraft Noise
Source: Australian Standard 2021

Figure 24 relates to residential communities already affected by aircraft noise. For those communities without prior exposure to aircraft noise, the effect of the noise is likely to be greater.

Noise Level Predictions

Consistent with the recommendations of the 1995 Senate Select Committee on Aircraft Noise in Sydney, a range of indicators have been used to describe the potential impacts of aircraft overflight noise. These impacts are described in detail in the Draft EIS, including noise level predictions for each Community Assessment Area. Reference may be made to these predictions, contained in Appendix D of the Draft EIS, to find out impacts on individual communities.

In a cumulative sense, it is useful to predict how often certain levels of noise would occur within the region surrounding Badgerys Creek. Figures 25 to 32 provide contours showing estimates of how many noise events exceeding 70 dBA would occur on an average day in 2016 for each type of airport operation assessed (refer Section 6). The number of noise events exceeding 70 dBA over a 24 hour period tends to indicate the degree of disruption to normal domestic communication such as conversation and listening to television. At noise levels below 70 dBA, communication is unlikely to be disrupted, while above 70 dBA some interruption is likely. The same comment applies in regard to schools, except that the critical noise level is 65 dBA.

The maximum extent of the ANEC contours modelled for 2016 is shown in Figures 33 to 35. These contours show the outside extent of a large range of ANEC levels which resulted from examining the combinations of assumptions about air traffic movements and the different ways the airport may be operated.

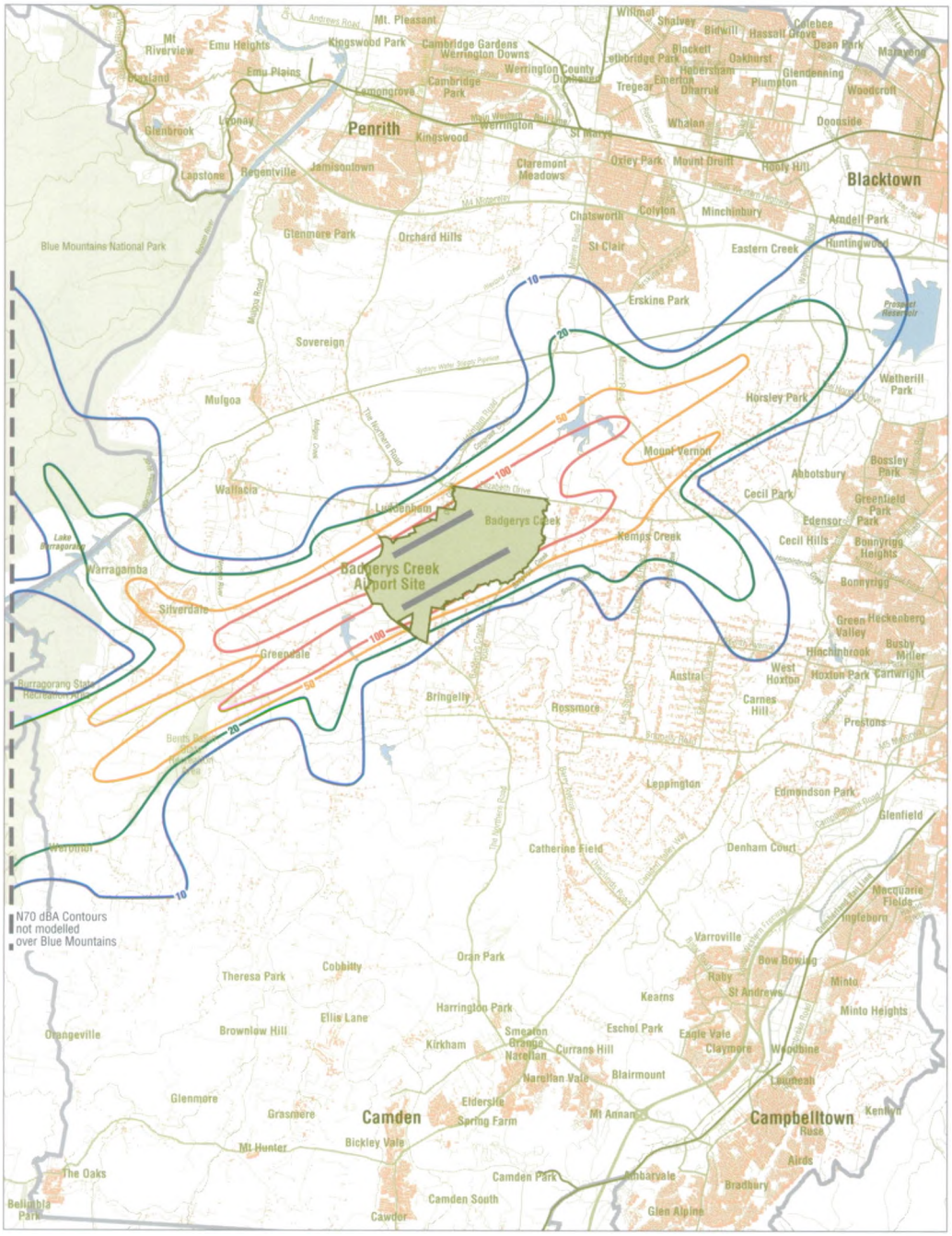


Figure 25

2016 N70 dBA Contours for Option A (Airport Operation 1)

Note: Refer to Section 6 for an explanation of what Airport Operation 1 means.

Area within these two contours is estimated to receive between 10 and 20 aircraft overflights louder than 70dBA on an average day — 10 — 20

Area within these two contours is estimated to receive between 20 and 50 aircraft overflights louder than 70dBA on an average day — 20 — 50

Extent of Dwelling Data

Area within these two contours is estimated to receive between 50 and 100 aircraft overflights louder than 70dBA on an average day — 50 — 100

Area within this contour is estimated to receive more than 100 aircraft overflights louder than 70dBA on an average day — 100

Indicates Density of Dwellings in 1996

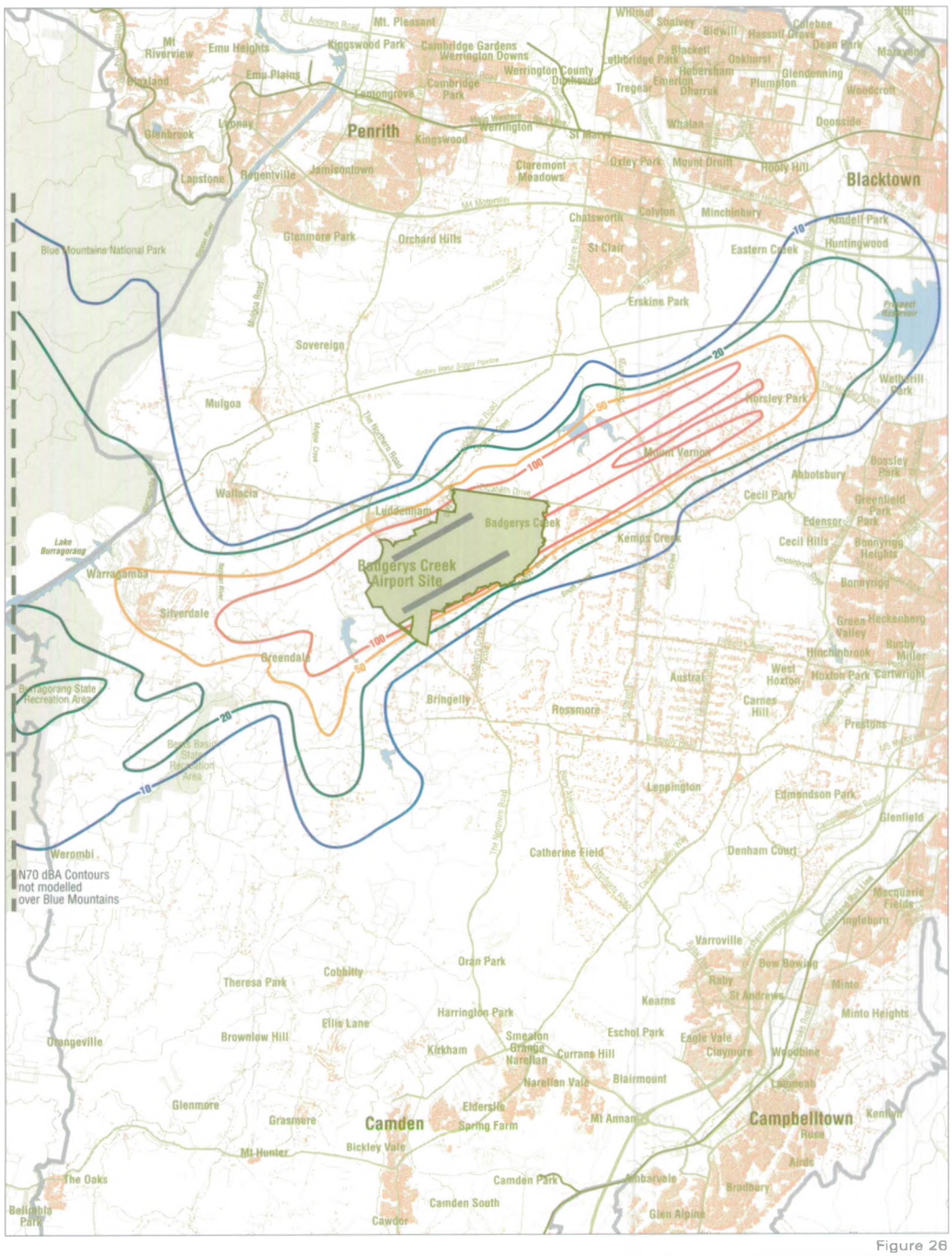


Figure 26

2016 N70 dBA Contours for Option A (Airport Operation 2)

Note: Refer to Section 6 for an explanation of what Airport Operation 2 means.

Area within these two contours is estimated to receive between 10 and 20 aircraft overflights louder than 70dBA on an average day — 10 — 20

Area within these two contours is estimated to receive between 20 and 50 aircraft overflights louder than 70dBA on an average day — 20 — 50

Extent of Dwelling Data

Area within these two contours is estimated to receive between 50 and 100 aircraft overflights louder than 70dBA on an average day — 50 — 100

Area within this contour is estimated to receive more than 100 aircraft overflights louder than 70dBA on an average day — 100

Indicates Density of Dwellings in 1996

TN MN

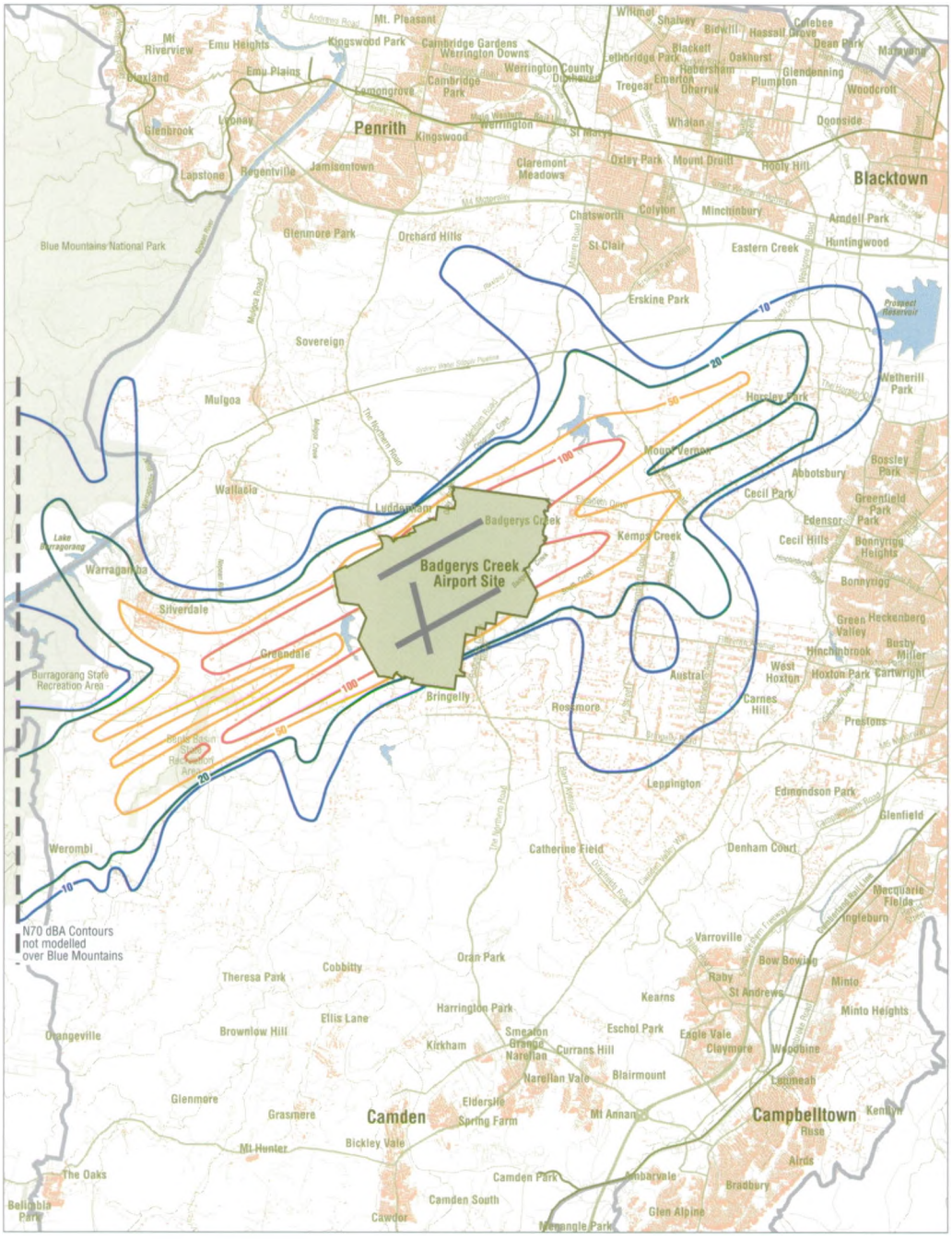


Figure 27

2016 N70 dBA Contours for Option B (Airport Operation 1)

Note: Refer to Section 6 for an explanation of what Airport Operation 1 means.

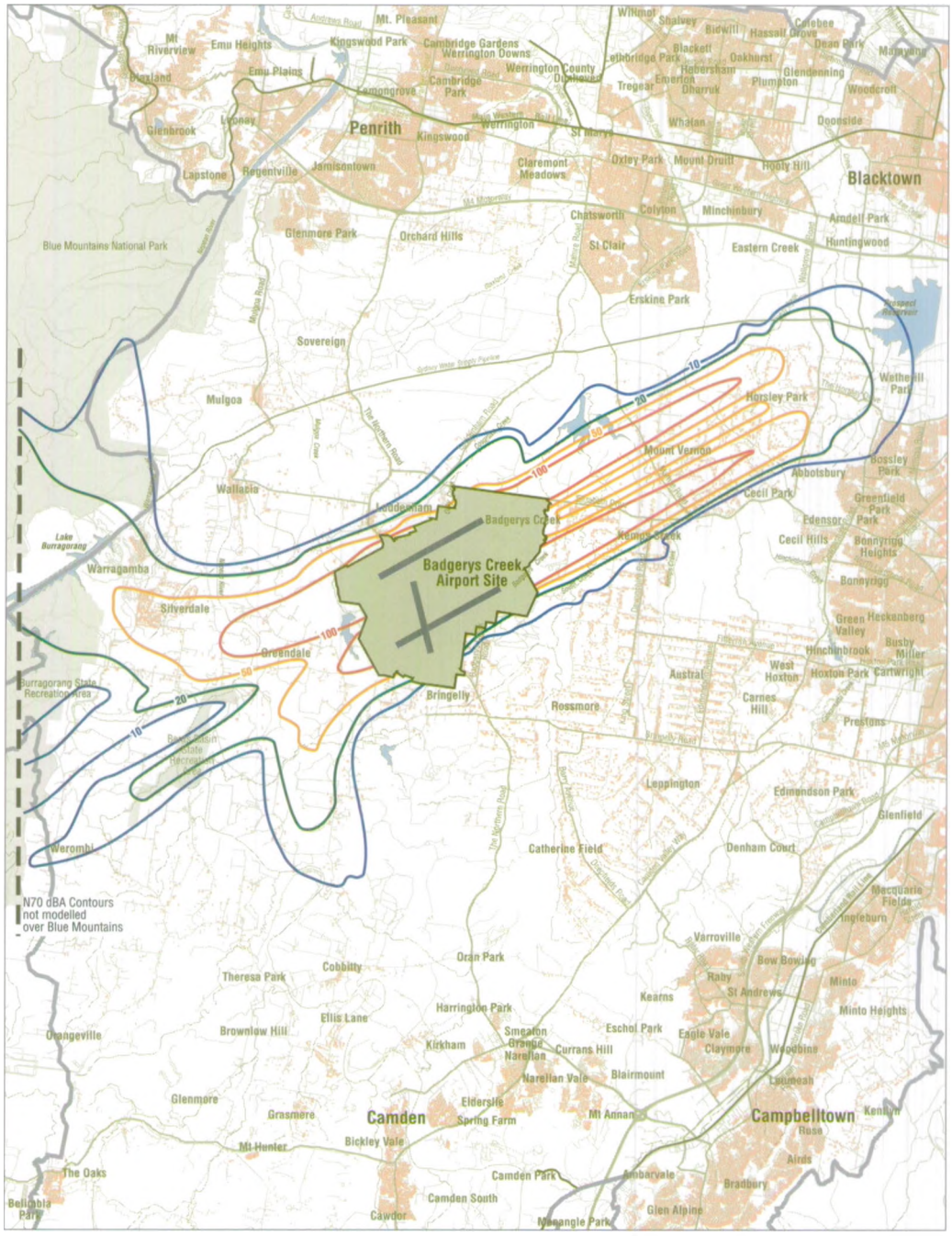


Figure 28

2016 N70 dBA Contours for Option B (Airport Operation 2)

Note: Refer to Section 6 for an explanation of what Airport Operation 2 means.

Area within these two contours is estimated to receive between 10 and 20 aircraft overflights louder than 70dBA on an average day — 10 — 20

Area within these two contours is estimated to receive between 50 and 100 aircraft overflights louder than 70dBA on an average day — 50 — 100

Area within these two contours is estimated to receive between 20 and 50 aircraft overflights louder than 70dBA on an average day — 20 — 50

Area within this contour is estimated to receive more than 100 aircraft overflights louder than 70dBA on an average day — 100

Extent of Dwelling Data

Indicates Density of Dwellings in 1996

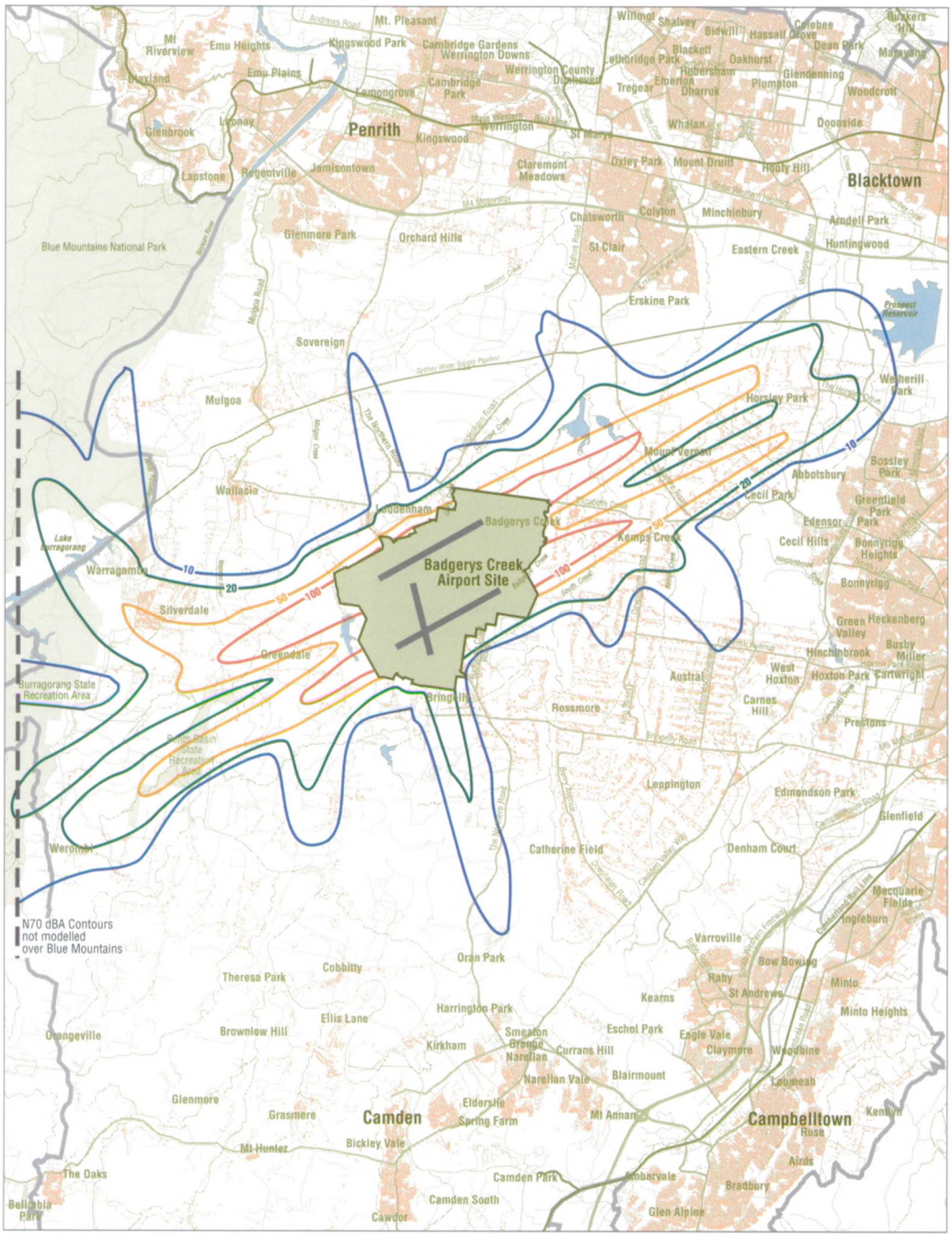


Figure 29

2016 N70 dBA Contours for Option B (Airport Operation 3)

Note: Refer to Section 6 for an explanation of what Airport Operation 3 means.

Area within these two contours is estimated to receive between 10 and 20 aircraft overflights louder than 70dBA on an average day — 10 — 20

Area within these two contours is estimated to receive between 20 and 50 aircraft overflights louder than 70dBA on an average day — 20 — 50

Extent of Dwelling Data

Area within these two contours is estimated to receive between 50 and 100 aircraft overflights louder than 70dBA on an average day — 50 — 100

Area within this contour is estimated to receive more than 100 aircraft overflights louder than 70dBA on an average day — 100

Indicates Density of Dwellings in 1996

TN MN

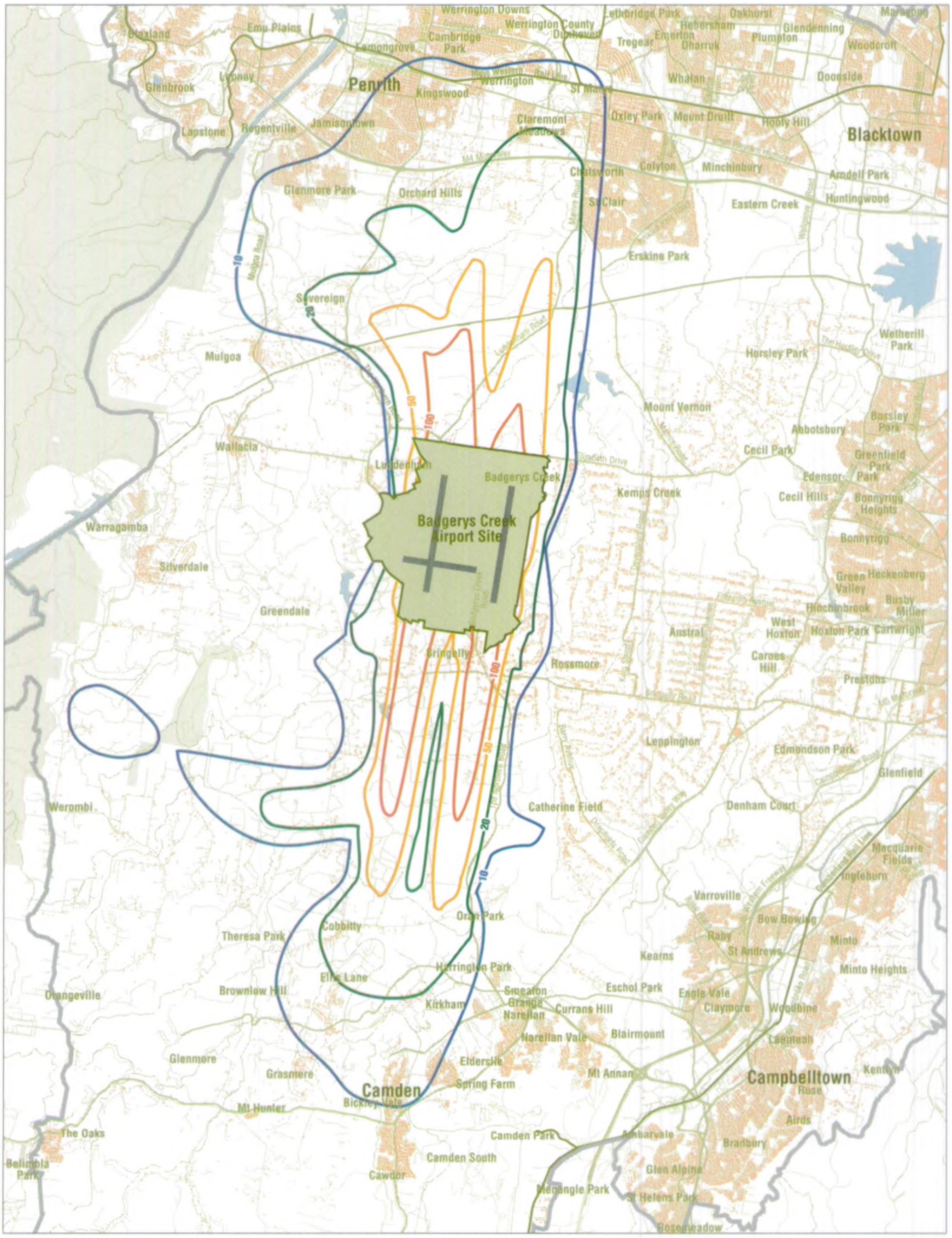


Figure 30
2016 N70 dBA Contours for Option C (Airport Operation 1)
Note: Refer to Section 6 for an explanation of what Airport Operation 1 means.

Legend			
Area within these two contours is estimated to receive between 10 and 20 aircraft overflights louder than 70dBA on an average day	—10— / —20—	Area within these two contours is estimated to receive between 50 and 100 aircraft overflights louder than 70dBA on an average day	—50— / —100—
Area within these two contours is estimated to receive between 20 and 50 aircraft overflights louder than 70dBA on an average day	—20— / —50—	Area within this contour is estimated to receive more than 100 aircraft overflights louder than 70dBA on an average day	—100—
Extent of Dwelling Data		Indicates Density of Dwellings in 1996	

TN MN N
0Km 5Km

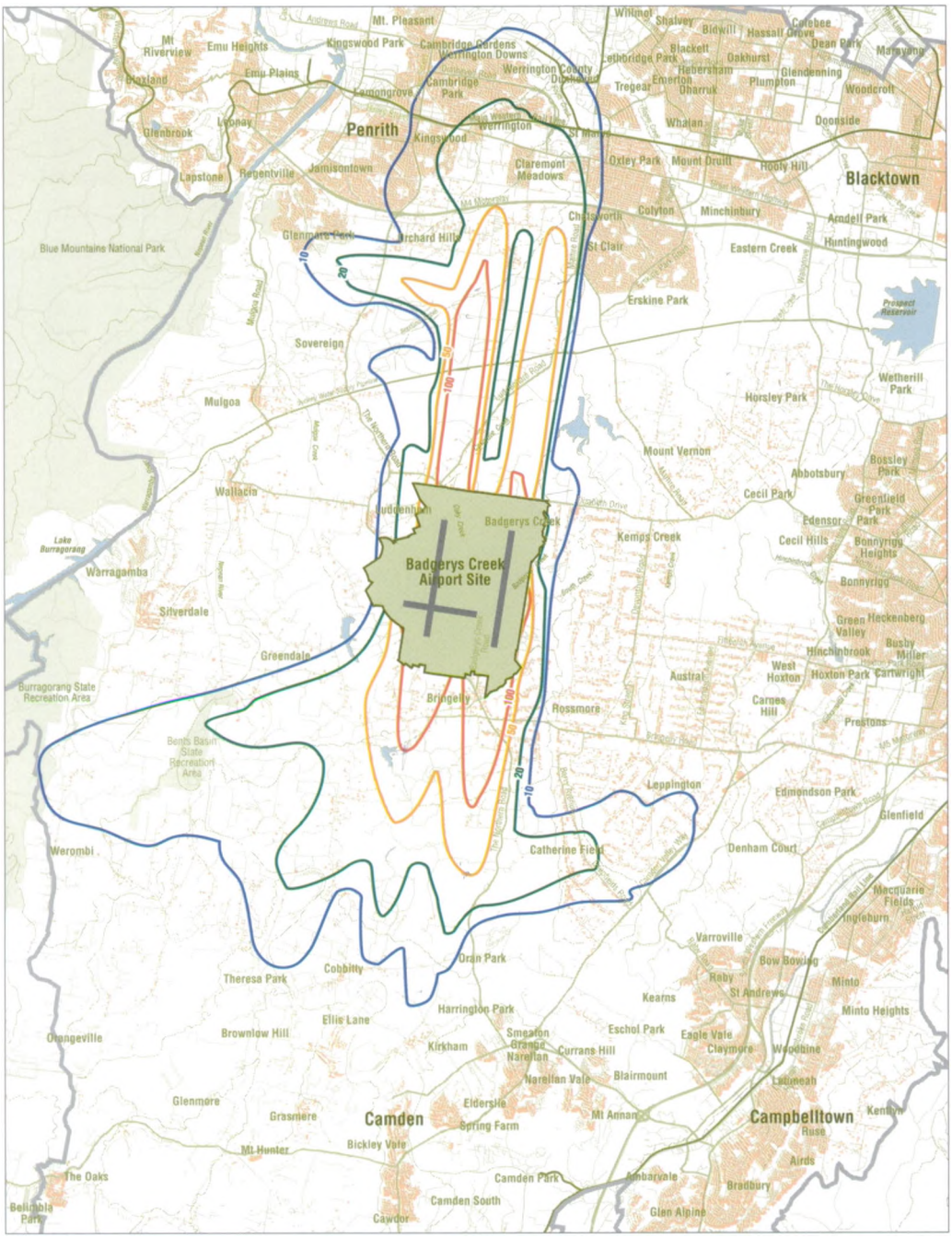


Figure 31

2016 N70 dBA Contours for Option C (Airport Operation 2)

Note: Refer to Section 6 for an explanation of what Airport Operation 2 means.

Area within these two contours is estimated to receive between 10 and 20 aircraft overflights louder than 70dBA on an average day — 10 — 20

Area within these two contours is estimated to receive between 20 and 50 aircraft overflights louder than 70dBA on an average day — 20 — 50

Extent of Dwelling Data

Area within these two contours is estimated to receive between 50 and 100 aircraft overflights louder than 70dBA on an average day — 50 — 100

Area within this contour is estimated to receive more than 100 aircraft overflights louder than 70dBA on an average day — 100

Indicates Density of Dwellings in 1996

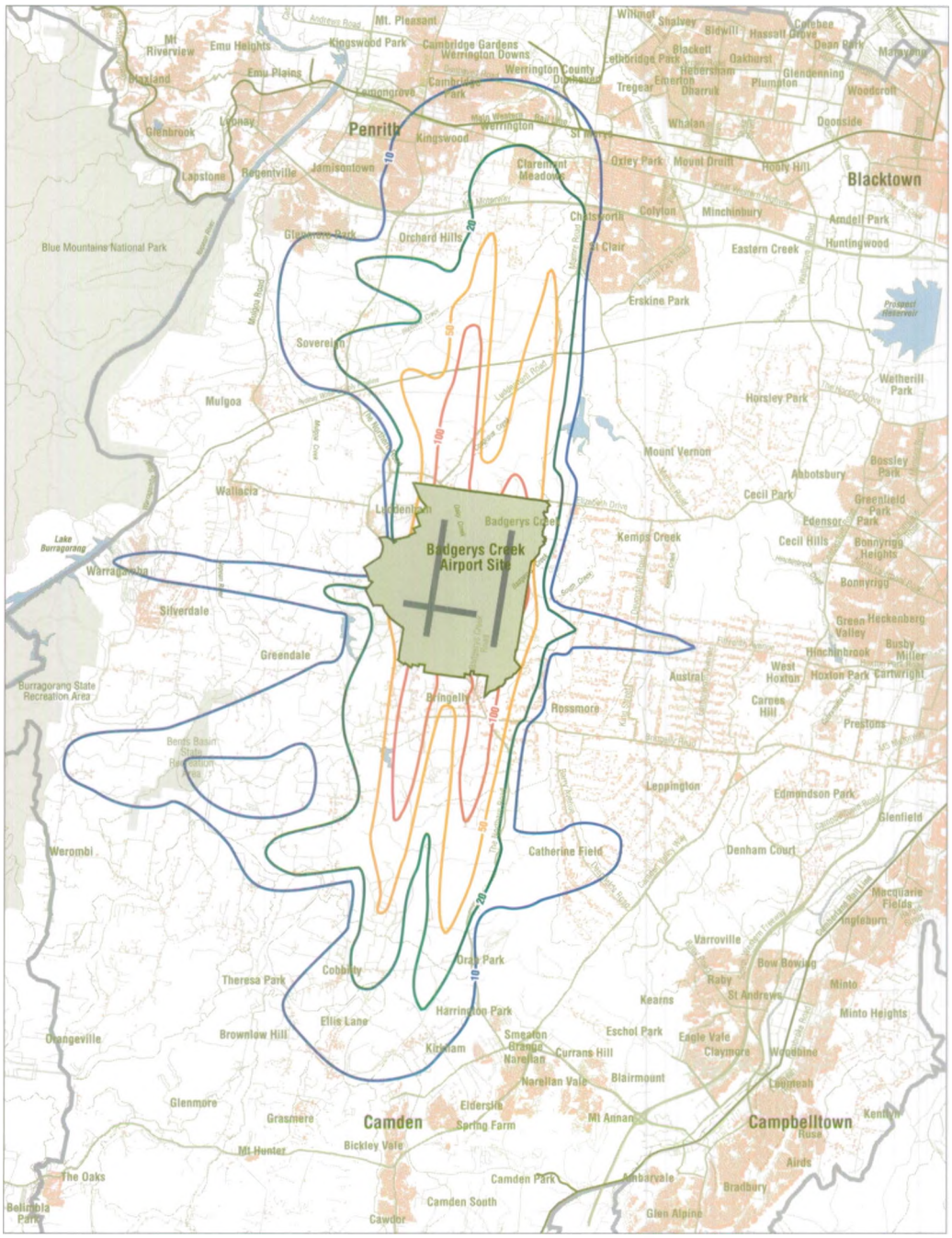


Figure 32

2016 N70 dBA Contours for Option C (Airport Operation 3)

Note: Refer to Section 6 for an explanation of what Airport Operation 3 means.

Area within these two contours is estimated to receive between 10 and 20 aircraft overflights louder than 70dBA on an average day — 10 — 20

Area within these two contours is estimated to receive between 20 and 50 aircraft overflights louder than 70dBA on an average day — 20 — 50

Extent of Dwelling Data

Area within these two contours is estimated to receive between 50 and 100 aircraft overflights louder than 70dBA on an average day — 50 — 100

Area within this contour is estimated to receive more than 100 aircraft overflights louder than 70dBA on an average day — 100

Indicates Density of Dwellings in 1996

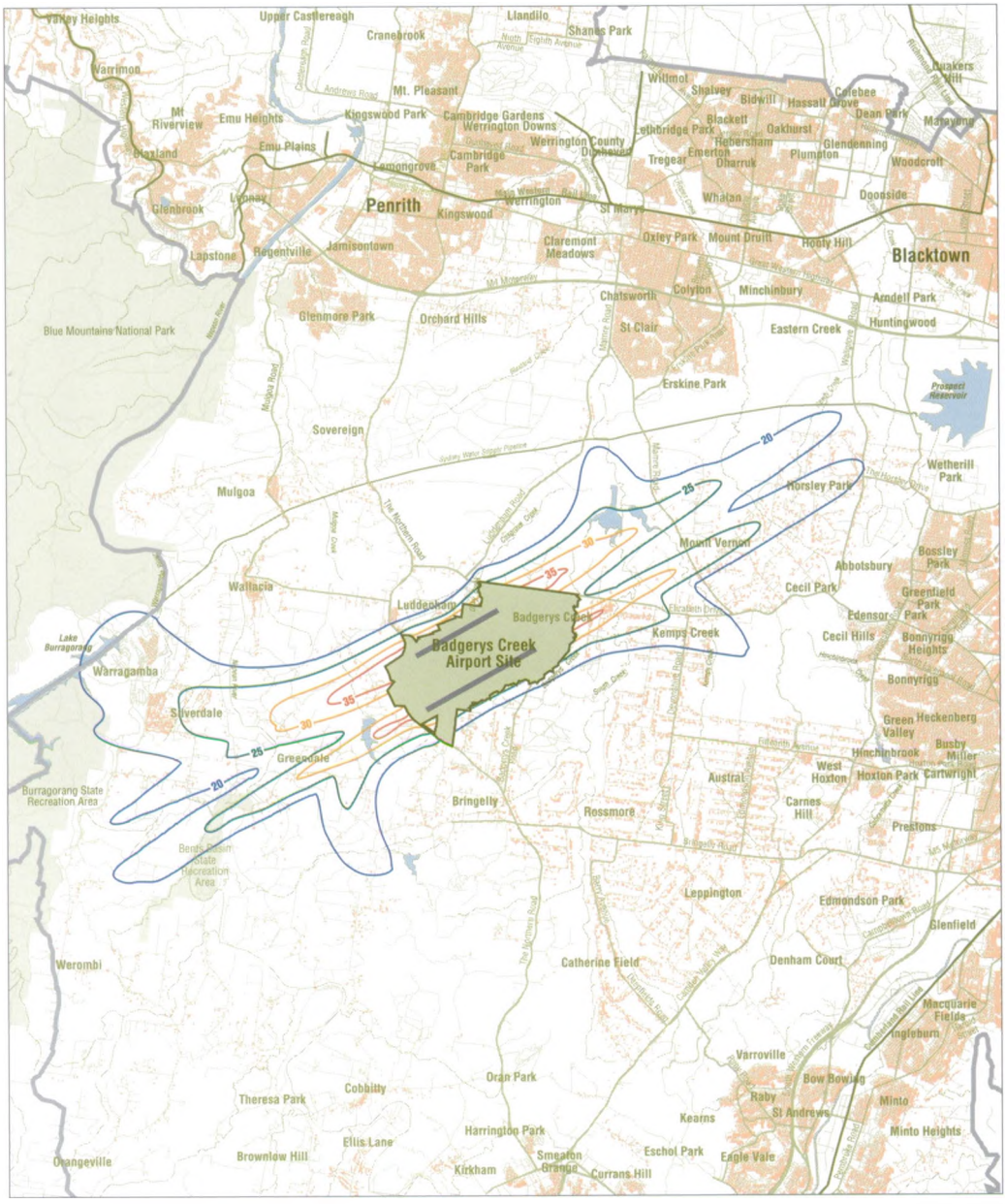


Figure 33
Modelled Maximum 2016 ANEC Contours for Option A

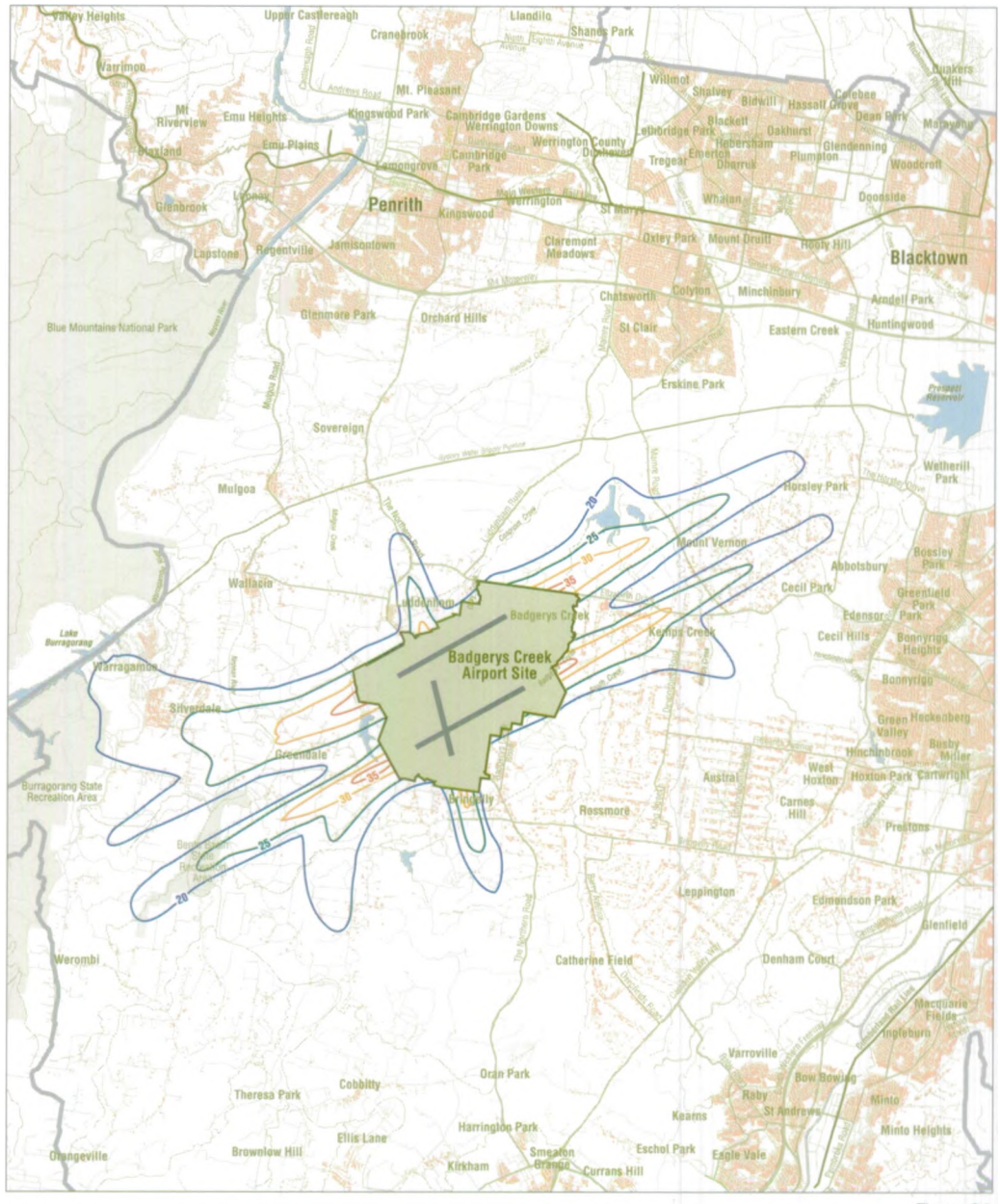


Figure 34
Modelled Maximum 2016 ANEC Contours for Option B

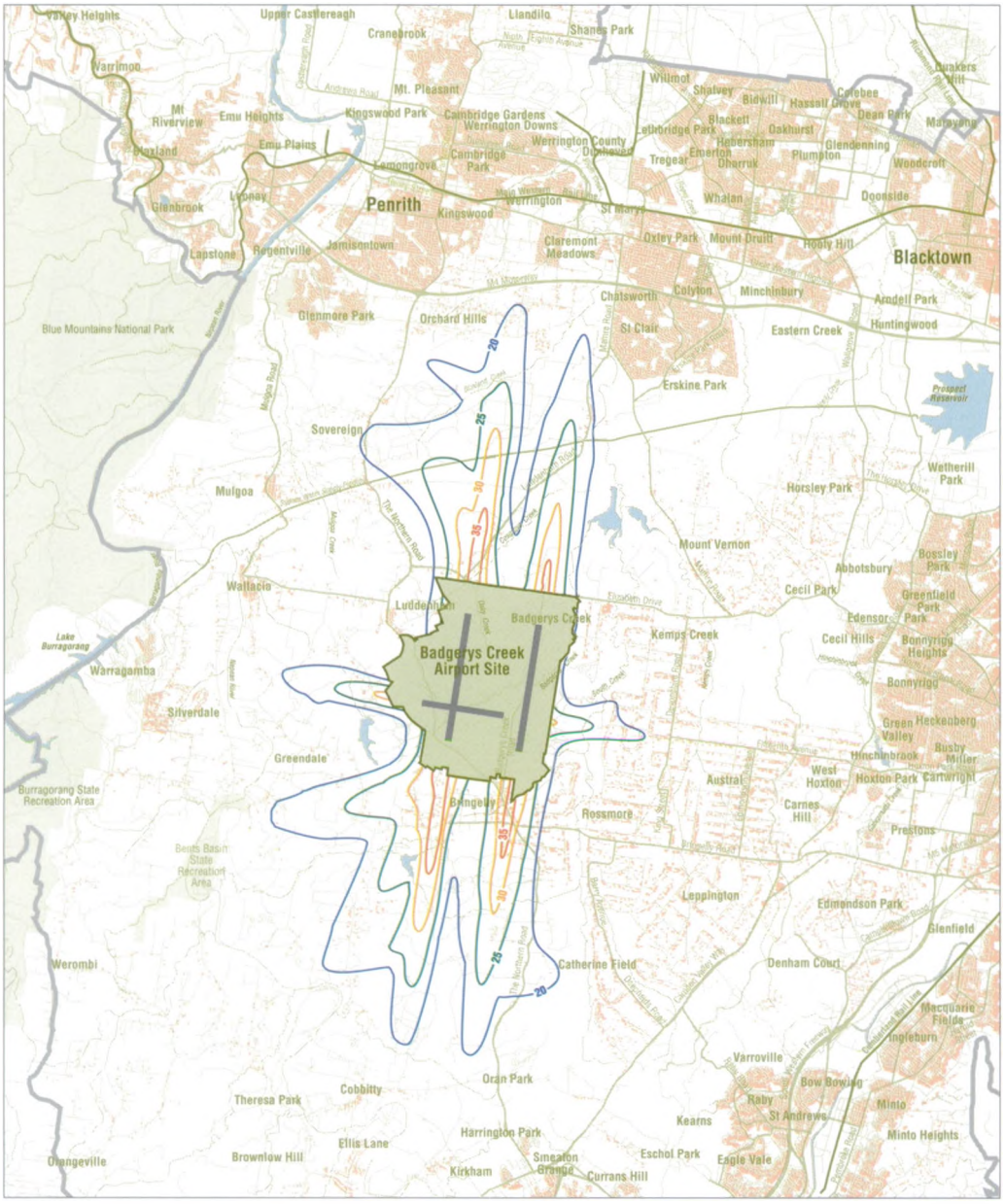


Figure 35
Modelled Maximum 2016 ANEC Contours for Option C

Overview of Impacts of Aircraft Overflight Noise on People

Table 2 summarises potential impacts on the predicted numbers of educational facilities in the years 2006 and 2016. Table 3 summarises the impacts of aircraft overflight noise from all airport options on populations in the years 2006 and 2016. These tables have been prepared on the basis of Air Traffic Forecast 3, which represents the highest level of aircraft movements. The results are provided in the form of a range because of the different ways the airport may operate.

The noise impacts that would be caused by all of the airport options would result in some people experiencing noise levels that would exceed Australian standards. Australian Standard 2021 suggests that some people may find land within the 20 to 25 ANEC is not compatible with residential or educational uses and land above 25 ANEC is not acceptable for these uses. Many people may also be disturbed by lower levels of noise outside these areas.

The impacts presented in these tables are the average annual impacts. On most days, the noise impacts would be greater or lower than this average.

The number of noise events exceeding 70 dBA over a 24 hour period tends to indicate the degree of disturbance to normal domestic communication. This level of impact would also occur at educational facilities for the number of events exceeding 65 dBA.

To determine the potential extent of sleep disturbance, forecasts were developed to estimate the number of flights that would occur in the critical time for potential sleep of 10.00 pm to 6.00 am. Experience at Brisbane and Melbourne airports and possible future demands for scheduling arrivals and departures at night were examined. The analysis showed that about seven percent of flights

Table 2 Cumulative Aircraft Overflight Noise Impacts on Estimated Educational Facilities in the Years 2006 and 2016[1]

Noise Indicator	Option A	Option B	Option C
	Educational[2] Facilities	Educational[2] Facilities	Educational[2] Facilities
Educational facilities that may experience, on average, the following number of noise events over 65 dBA[3] between 9am and 3pm in 2006:			
greater than 100 events	0	0	0
greater than 50 events	1	2	0
greater than 20 events	1 to 2	2 to 4	0 to 7
greater than 10 events	4	6 to 7	7 to 22
Educational facilities that may experience, on average, the following number of noise events over 65 dBA[3] between 9am and 3pm in 2016:			
greater than 100 events	0	0	0
greater than 50 events	2 to 3	1 to 2	1
greater than 20 events	6	4 to 7	3 to 22
greater than 10 events	6 to 13	10 to 16	28 to 40

Notes: 1. Based on Air Traffic Forecast 3.
2. Estimates of number of educational facilities in 2006 and 2016.
3. 65 dBA is the level at which communication within education buildings would be disturbed.

Table 3 Cumulative Aircraft Overflight Noise Impacts[1,2] on Estimated Populations in the Years 2006 and 2016

Noise Indicator	Option A	Option B	Option C
	Population Affected[3,4]	Population Affected[3,4]	Population Affected[3,4]
People that may experience the following ANEC levels in 2006[5]:			
greater than 30	100 to 200	less than 100	less than 100
greater than 25	500	100 to 200	100 to 300
greater than 20	1,500 to 2,000	600 to 3,000	300 to 600
greater than 15	4,000 to 5,000	4,000	1,500 to 24,000
People that may experience, on average, the following number of noise events over 70 dBA a day in 2006:			
greater than 100 events	400 to 1,000	less than 100 to 200	less than 100
greater than 50 events	1,500	400 to 800	200 to 300
greater than 20 events	3,000 to 3,500	2,500 to 4,000	400 to 23,000
greater than 10 events	5,500 to 6,500	5,000 to 5,500	24,000 to 38,000
People that may, on average, be awoken the following times in 2006[6]:			
once a night	less than 100	less than 100	less than 100
once every 2 nights	300 to 600	less than 100 to 100	less than 100 to 200
once every 5 nights	1,500	600 to 3,000	200 to 400
People that may experience the following ANEC levels in 2016[5]:			
greater than 30	200	less than 100 to 200	less than 100 to 300
greater than 25	700 to 1,000	500 to 800	200 to 700
greater than 20	4,500 to 7,000	3,500 to 5,000	200 to 1,500
greater than 15	11,000 to 15,000	13,000 to 15,000	9,000 to 11,000
People that may experience, on average, the following number of noise events over 70 dBA a day in 2016:			
greater than 100 events	500 to 1,000	200 to 700	300 to 400
greater than 50 events	2,500 to 5,000	2,000 to 4,500	800 to 1,000
greater than 20 events	8,000 to 9,500	6,000 to 7,000	3,000 to 17,000
greater than 10 events	14,000 to 25,000	12,000 to 14,000	46,000 to 49,000
People that may, on average, be awoken the following times in 2016[6]:			
once a night	less than 100	less than 100	less than 100 to 100
once every 2 nights	500 to 1,000	300 to 800	400 to 600
once every 5 nights	6,000 to 8,000	3,500 to 6,000	1,500 to 17,000

Notes:
1. *Based on Air Traffic Forecast 3.*
2. *The noise impacts provided in this table are for standard airport operational conditions which have not been optimised with the objective of reducing noise impacts. Optimising runway use and flight paths would likely significantly reduce the numbers of people affected.*
3. *Population estimates for 2006 and 2016. Estimates of population affected by noise vary because of the different assumptions made about how the airport may operate.*
4. *There are limitations in the accuracy of predicting future populations and predicting future aircraft noise levels. Estimates of population greater than 10,000 have been rounded to the nearest 1,000; estimates of population between 1,000 and 10,000 have been rounded to the nearest 500; and estimates of population less than 1,000 have been rounded to the nearest 100. Estimates of population less than 100 are expressed as less than 100.*
5. *Impacts of levels of ANEC assume all residential properties within the 35 ANEC contour would be acquired.*
6. *Worst case situation as it does not assume use of any of the noise management measures available to minimise noise at night,*

would occur during this period if a nighttime curfew was not operating.

The impacts of the three airport options vary depending on which noise indicator is examined. For many of the indicators only small differences between the potential impacts of the options would exist. For example, the impacts would be similar for the higher and mid range noise levels modelled (say above 15 ANEC or more than 20 noise events a day greater than 70 dBA). At the lower noise levels modelled (10 noise events a day greater than 70 dBA), however, it can be concluded that Option C is likely to impact more people than Options A and B. Nevertheless, when all levels of noise impacts are taken into consideration, it is not possible to provide a definitive ranking between the airport options.

It is also the case that methods available to quantify the degree of noise impact for each option are not precise enough to provide a definitive ranking. For example the reported extent of aircraft overflight noise impact around each airport option could be reduced by the adoption of appropriate noise management measures. It is not known at this stage the type and extent of measures that would be put in place. Also, knowledge of the relationships between the noise indicators and the response of affected communities is relatively limited.

The three airport options would result in different noise levels from aircraft overflights to individual communities. The relative impacts of these differences would depend on individual reactions. Reference should be made to the information contained in Appendix D of the Draft EIS for an indication of potential impacts such as communication and sleep disturbance on residents living in particular communities.

The extent of aircraft overflight noise from each airport option could be reduced by the adoption of noise management measures. The most effective measure would be noise abatement procedures, such as restricting some types and times of runway and flight path use to minimise overflying of residential areas, particularly at night.

Impacts of Aircraft Overflight Noise on Property Values

Research has shown that noise from overflying aircraft can reduce residential property values in areas affected by high levels of aircraft overflight noise. Analysis of previous research and additional surveys carried out for the Draft EIS allowed forecasts to be made of potential changes in property values that might result from the operation of the proposed Second Sydney Airport. These are shown in Table 4.

The effect of aircraft noise on residential property values provides a basis for comparing the airport options. It does not provide a precise measure of possible devaluation for individual properties. The analysis addresses only the direct impacts on

Table 4 Potential Devaluation of Residential Property Values

ANEC Band[1]	Devaluation Range[2]	Assumed Devaluation[2]
Under 15	Nil	Nil
15-20	0 to 6%	3%
20-25	5.9% to 13.6%	8%
25-30	8.6% to 19.6%	15%
30-35	10.9% to 24.3%	20%

Notes: 1. No devaluation estimates for ANEC >35 because dwellings located in this noise level are assumed to be acquired.
2. Compared to under 15 ANEC.

dwellings in areas potentially affected by noise of greater than 15 ANEC. There is also likely to be more indirect impacts on property values such as changes to the future development potential of land in the region surrounding the airport.

The estimated net direct residential property devaluation for each airport option is shown in Table 5.

Impacts of Aircraft Overflight Noise on Wildlife

Only a limited amount is known about the effects of noise on wildlife. This is because of the diverse reaction that could occur across different species, and the different levels and character of noise that might be experienced. It is therefore not possible to quantify the relationship between the levels of aircraft overflight noise and impacts on wildlife.

Noise associated with the airport options has the potential to affect wildlife in the Blue Mountains National Park and the natural areas south of Lake Burragorang. However, in these areas the noise levels would generally be relatively low, and overflights would be infrequent.

Options A and B may generate up to 25 aircraft overflights a day exceeding 70 dBA, and up to five exceeding 80 dBA in some areas of the Blue Mountains National Park. South of Lake Burragorang, fewer overflights would occur, with about 15 exceeding 70 dBA and one or two exceeding 80 dBA. At these levels, it is unlikely that there would be significant effects on wildlife in these areas.

Option C would have a lower effect than the first two options. Within the two natural areas it is expected that no overflights would exceed 80 dBA, while up to seven or eight overflights daily would exceed 70 dBA. This level of noise is unlikely to have an adverse effect upon wildlife.

Although the likely effect of aircraft noise on domestic animals and birds is not clearly understood, there is some evidence that some animals located under flight paths, such as horses and chickens, may be affected. This is particularly so in areas close to the airport boundaries.

Other Noise Impacts

Noise is also generated from within an airport site as a result of activities such as ground test running of aircraft engines, taxiing and the application of reverse thrust after landing. These activities would impact on people living near the airport site. The extent of adverse effects would depend on a number of factors including weather conditions. Ground operation noise tends to spread further under temperature inversion conditions.

Table 6 provides estimates of the number of people who might experience ground operation noise from the airport options above 50 dBA. These are conservatively high estimates of noise as no allowance has been made for various management measures that could be put in place to reduce the noise.

Table 5 Estimated Net Direct Residential Property Devaluation[1]

Airport Option	2016 Net Devaluation[2]
Option A	$49m to $67m
Option B	$52m to $60m
Option C	$25m to $31m

Notes: 1. All results are expressed in real 1996 dollars.
2. Figures rounded to nearest $ million.

Table 6 Ground Operation Noise Impacts in 2016

Noise Level	Option A	Option B	Option C
	Population[1] Affected	Population[1] Affected	Population[1] Affected
People who may experience the following noise levels during neutral weather conditions[2] in 2016:			
50-55 dBA	1,000	1,000	600
Over 55 dBA	1,500	700	700
People who may experience the following noise levels during temperature inversion conditions[3] in 2016:			
50-55 dBA	12,000	12,000	10,000
Over 55 dBA	9,000	8,500	5,500

Note: 1. Population projection for 2016. Estimates greater than 10,000 rounded to the nearest 1,000; estimates between 1,000 and 10,000 rounded to nearest 500; estimates below 1,000 rounded to nearest 100.
2. Isothermal atmospheric or neutral conditions occur when temperature is constant above ground level notwithstanding height.
3. Temperature inversion conditions occur when temperature increases uniformly with height above ground level, up to a height of 100 metres.

10. Physical and Biological Impacts

Air Quality

The NSW Environment Protection Authority regards carbon monoxide, sulphur dioxide, lead and air toxics as indicators of potential *local* air quality impacts from particular developments.

Carbon monoxide is produced in motor vehicle and aircraft exhaust. Sulphur dioxide is an acidic gas which, when mixed with water, forms acids that may cause irritation to breathing; it is produced by combustion of fuel containing sulphur. Lead is a poison that can accumulate in the body with continuing exposure. As a result of various initiatives to reduce concentrations of these three substances, recorded levels are generally within accepted goals.

Air toxic compounds have been linked with incidence of cancer and other serious health issues, but acceptable limits for these have not yet been established in NSW due to lack of scientific knowledge about their impacts.

Ozone, nitrogen dioxide and fine particulates are considered to be *regional* air pollutants and contribute to problems of photochemical smog and brown haze. Ozone levels in Sydney have occasionally exceeded air quality goals, while levels of nitrogen dioxide and fine particulates are more regularly within acceptable limits.

Air quality in the Sydney Region is regularly monitored by a network of stations operated by the NSW Environment Protection Authority; in addition, recent scientific study has given a better understanding of the characteristics of air quality problems and put forward some recommendations to address them. In the case of some pollutants, such as those from motor vehicles, this is already having beneficial effects.

The Sydney region's major air quality problems are photochemical smog and brown haze. Currently, the quality of Sydney's air complies with NSW Environment Protection Authority guidelines for the majority of the time. However, it is recognised

that the influence of local topography and air currents tends to carry pollutants towards western Sydney, where they can be slow to disperse under certain weather conditions.

Construction of the airport options would generate dust and fine airborne particulates; and modelling carried out for the Draft EIS indicates that the levels of these outside the airport boundaries could exceed appropriate goals. Extensive dust management measures would be required during the construction of the airport to reduce this impact to an acceptable level.

Air quality studies carried out for the Draft EIS predict increased concentrations of nitrogen dioxide, fine particulates, carbon monoxide and sulphur dioxide due to airport operations. Given existing background levels this would not, however, result in the concentrations of these pollutants exceeding the goals adopted by the NSW Environment Protection Authority.

The operation of each airport option would increase ozone concentrations in areas already experiencing occasional occurrences of high background ozone levels. Ozone can irritate eyes and air passages and might trigger asthma attacks. Health impacts are also predicted due to increased levels of air toxics and particulates associated with aircraft emissions.

Some residents living near the airport options would experience kerosene odours from the operation of the airport.

Table 7 summarises the predicted number of people in 2016 who would be affected by health impacts due to increased ozone, particulates and air toxics concentrations. Also shown is the predicted number of people who would be able to detect significant kerosene odours emitted from each of the airport options.

Table 7 Air Quality and Health Impacts in 2016[1, 2]

Predicted Impact	Option A	Option B	Option C
Number of people exposed to increased peak hourly ozone concentration by more than 1 part per 100 million during high ozone events	8,000[3]	8,000[3]	8,000[3]
Increase in hospitalisation of persons each 100 years due to ozone	2	2	3
Increase in deaths each 100 years due to ozone	1	1	1
Increase in hospitalisation of persons each 100 years due to particulates below 10 microns in size	4	3	4
Increase in deaths each 100 years due to particulates below 10 microns in size	less than 1	less than 1	less than 1
Increase in number of cancer cases each 100 years due to exposure to air toxics	3	3	3
Number of people who would be able to detect kerosene odours for more than 44 hours per year	1,500[3]	1,000[3]	1,500[3]

Notes: 1. Population estimate for 2016.
2. Effects of associated developments and motor vehicles are not included in figures in this table.
3. Rounded to nearest 500.

The Draft EIS predicts that all the airport options would increase peak ozone concentrations in areas where ozone levels occasionally currently exceed the NSW Environment Protection Authority goal of 10 parts per 100 million. There would be little difference in the air quality impacts of each option. Emissions from increases in road traffic resulting from the airport's operation would increase the level of ozone predicted for the airport by 20 to 30 percent. This would probably shift or extend the areas of ozone impacts. Increases in emissions from urban development associated with the airport would be less significant.

Overall, any increase in hospital admissions and deaths caused by air emissions from the operation of the airport would be relatively low. Increased concentrations of ozone are considered to be the most significant air quality impact. Ozone is a regional air quality issue, particularly for western Sydney. The Second Sydney Airport would add to ozone concentrations, increasing the need for the successful implementation of Sydney-wide strategies to manage emissions.

Fuel dumping by aircraft in emergency situations is not considered to be a major air quality issue. While no specific records on fuel dumping are kept, anecdotal evidence suggests it occurs infrequently (about twice a year) and in controlled situations over the ocean. Deliberate dumping has never been reported to occur over built up areas of Sydney, but there has been occasional accidental fuel venting caused by faulty equipment on aircraft.

Water

Streams flowing through and near the Badgerys Creek airport sites are generally nutrient enriched. Algal growth is excessive and macroinvertebrate levels suggest poor ecological water quality.

The Badgerys Creek airport options would result in a range of water quality impacts predicted to include low local impacts and moderate regional impacts from release of sediments during construction, discharge of treated stormwater, ecological changes from reduced stream variability and increased nutrient discharges from effluent. Analysis carried out for the Draft EIS does not indicate any significant contamination of Sydney's water supply or ecological impacts due to aerial pollutants.

Specifically, water related impacts of the airport options would potentially include:

- removal of approximately five kilometres, 10 kilometres and 10 kilometres of stream habitats for Options A, B and C respectively;
- minimal short term impacts of potential sediment releases during construction, but more significant longer term impacts due to nutrient loading of sediments;
- minor impact on Badgerys Creek from discharges of treated stormwater from the airport, due to existing elevated nutrient loadings;
- eutrophication and higher levels of in-stream algae in the South Creek system from discharge of treated sewage effluent into Badgerys Creek;
- minor impacts on groundwater;
- some potential regional impacts for recreation, fishing and agricultural uses;
- moderate local and regional impacts from effluent discharges, particularly from nutrient additions;
- potential human health impacts from contamination of rainwater tanks (the possible extent of such impacts could not be quantified); and
- very low concentrations of benzene in Lake Burragorang and Prospect Reservoirs associated with overflights from Options A and B, predicted as being more than ten thousand times lower than drinking water guidelines and 10 million times lower than ecosystem protection guidelines.

Any potential contamination of water supply reservoirs by fuel due to accidental venting or aircraft crashes could be overcome by drawing water from below the surface. Existing filtration and disinfection processes for drinking water would be likely to overcome any potential health risks associated with aircraft crashes.

Flora and Fauna

The sites of the airport options are considered to have regional significance for nature conservation. The airport options would result in the loss of terrestrial and stream habitats and create a barrier across a wildlife corridor of local significance. The area of Option A would be smaller than the other options, therefore fewer remnant terrestrial habitats and streams would be affected. Given the existing degraded stream conditions and the associated low conservation values of the streams, significant impacts on stream biota are considered unlikely. Native vegetation located on the sites of the airport options is shown in Figure 36.

The sites of the airport options are predicted to contain two fauna species of national, 12 of State and 38 of regional significance (Photographs 5 and 6). Five types of birds listed under international agreements could also be affected by the airport options.

The Badgerys Creek area, however, has not been identified as being a site of conservation significance for terrestrial fauna in the Urban Bushland Biodiversity Survey undertaken in western Sydney by the NSW National Parks and Wildlife Service. Although Badgerys Creek provides a corridor of some significance, habitat on the airport sites is not likely to wholly support any fauna species or populations, nor provide significant resources for nomadic species such as the Regent Honeyeater. Overall, the impact of the airport development on terrestrial fauna biodiversity is considered to be of local rather than regional, State or national significance.

Development of Option A would impact one flora species of national (Photograph 7) and 33 species of regional significance. Options B and C would have similar impacts, but with more flora species of regional significance potentially affected. The Badgerys Creek area has not been classified by the NSW National Parks and Wildlife Service as a core biodiversity area for terrestrial flora in western Sydney. The site supports some Cumberland Plain Woodland, a community which has been listed as an endangered community under the NSW Threatened Species Conservation Act, 1995. However, the woodland surveyed is not considered to be significant due to its small size and highly altered condition; this may need to be reviewed once significance criteria are clearly defined by the National Parks and Wildlife Service.

Photograph 5
Lace Monitor
(Taeniopygia bichenovii - reptile of regional significance recorded within the sites of the airport options)

Photograph 6
Common Bent-wing Bat
(Miniopterus schreibersii- mammal of State significance recorded within the sites of the airport options)

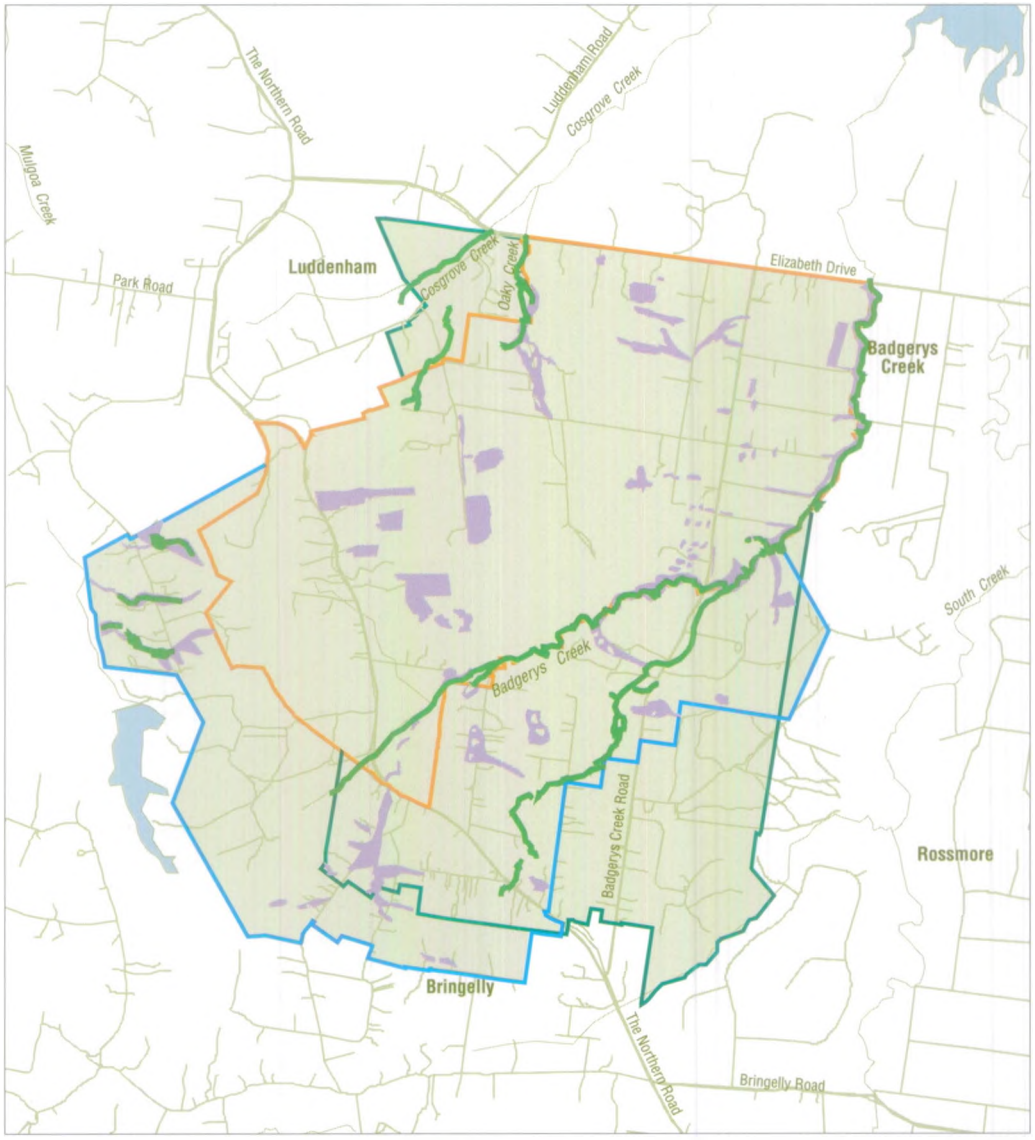


Figure 36
Native Vegetation

Although 48 plant species of regional significance were found on the sites of the airport options, the vast majority of these were considered to belong to plant groups that are common to widespread, and are unlikely to become regionally extinct in the near future. However, at least three species are described as belonging to vulnerable plant groups which, due to rarity, restricted distribution or range limits, may face extinction in western Sydney within the next 10 years. Because the airport development has the potential to alter the distribution of these species at a regional level, the overall impact on terrestrial flora biodiversity is considered to be at least regional.

Given the existing degraded stream conditions and the associated low conservation value of streams, the predicted major stream impacts from the

Photograph 7
Pultanaea Parviflora
(plant of national significance recorded within the sites of the airport options)

airport options are unlikely, in an absolute sense, to result in profound deleterious changes to the stream biota. It is likely that the fish fauna would become even more dominated by pollution tolerant species and therefore be subject to an even greater decrease in the biodiversity of native fish species. The scale of impacts expected from each airport option is considered to be local; however, Option A would result in fewer impacts to fewer streams than Option B and C.

Hazards and Risks

An operating airport has the potential to create hazards and risks both to people and to the environment they live in. The Draft EIS assessed the hazards and risks associated with aircraft crashes, adverse meteorological and seismic activity, the interaction of birds and bats with aircraft movements, fuel supply and storage, the potential for contaminated sites to be located in the area of construction of the airport and bushfire hazards. It also assessed risks to individual facilities such as Defence Establishment Orchard Hills and Sydney's water supply infrastructure.

The most common risk associated with airports is of aircraft crashing. This risk can be expressed in a number of ways including individual fatality risk and overall societal risks. Individual fatality risk is the risk of death to a person located within a particular area on the ground because of an aircraft crash; this risk is expressed as a series of contours. The Draft EIS estimated the number of people who would be living within each contour in 2016.

The risk of an individual dying in everyday life can be expressed as a probability or chance of dying over a certain time period such as a year. For example, individuals in Sydney, on average, have a 10 in one million chance of dying in a fire each year or a three in one million chance of dying from electrocution each year. The chance of dying as a result of being struck by lightning is one chance in 10 million each year.

The NSW Department of Urban Affairs and Planning suggests that the individual fatality risk experienced in residential areas from the operation of a hazardous facility should be no greater than a one in one million chance of a fatality a year. The estimated number of people living near the airport options in 2016 who would be exposed to a risk greater than this because of the operation of the airport would be 2,500 for Options A and B and 9,000 for Option C. Another way of expressing this risk is the number of fatalities that may be caused by the operation of each airport option every 100 years. This would range from 2.2 fatalities every 100 years for Option B to 5 fatalities every 100 years for Option C.

Societal risk is the probability over a one year period of a certain number of people being killed as a result of an aircraft accident. Societal risk calculations take into account the density of

population in the study area. Generally, the societal risks that would occur from the operation of any of the three airport options would be lower than the societal risks for Sydney Airport.

Other conclusions of the hazards and risks study include:

- adverse meteorological conditions such as high intensity rainfall, thunderstorms, low cloud and fog would be unlikely to act as a significant constraint to large commercial aircraft because of modern navigation aids. Other aircraft may be at risk from adverse meteorological conditions; however, more data is required to fully quantify this risk;
- birds would present a moderate, but manageable risk to the operations of aircraft; and
- the operation of any of the airport options under consideration would result in a low level of risk to critical elements of water supply infrastructure. The highest level of risk would be from Option C to the water supply pipeline connecting Warragamba Dam and Prospect Reservoir. Modifying flight paths, where possible, to minimise this risk would need to be considered.

11. Social and Economic Impacts

Cultural Heritage

Development of the Second Sydney Airport would have an adverse impact on cultural heritage.

Figure 37 indicates the zones and sites of moderate to high Aboriginal archaeological potential within the sites for the airport options. Option A would impact on 60 known (119 predicted) Aboriginal sites or isolated finds; Option B would impact on 85 known (196 predicted) sites or isolated finds, and Option C on 94 known (205 predicted) sites or isolated finds. All of these sites are of local significance because of the extensive level of disturbance and low artefact densities found. They also have low collective values. Many of the sites could reasonably be salvaged.

The airport options would impact on between 14 and 18 non-Aboriginal heritage items of local and regional significance. Alternatives for mitigating impacts on non-Aboriginal heritage items are available for all airport options including, in some cases, the possibility of retention, archaeological excavation and archival recording.

Aviation

Options A and B would lead to significant interactions between aircraft using the second airport and aircraft using Sydney Airport. The anticipated level of interaction may adversely affect the capacity of the two airports. Both these options would also adversely impact on the operations of Bankstown and Camden airports. Hoxton Park Airport would have to be closed and parachute activities at Menangle and Wilton would also be severely affected.

Option C is compatible with operations at Sydney Airport, but would be unable to operate effectively if the Defence Establishment Orchard Hills continues to impose restrictions on airspace use. It would also significantly reduce the capacity of Camden Airport and there would be some impacts on operations at RAAF Base Richmond. It would have the same impacts as Options A and B on Bankstown, Hoxton Park and parachute activities at Menangle.

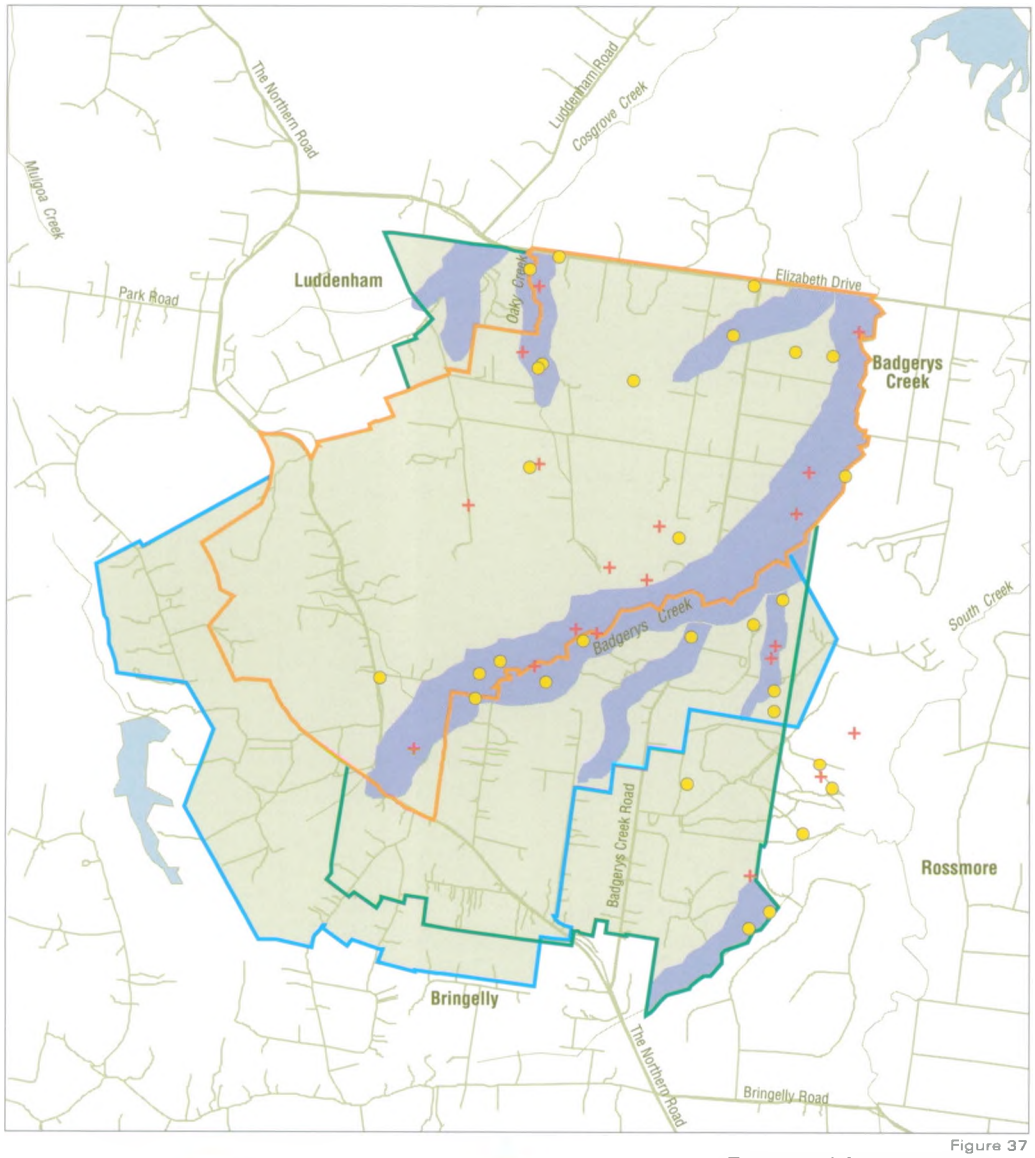


Figure 37
Zones and Sites of Moderate or High Archaeological Potential

The integration and coordination of airspace management in the Sydney basin would be the subject of further detailed review following the Government's decision on a preferred option for the Second Sydney Airport. Such a review would take into account both environmental and operational factors, including impacts on the long term operation of Sydney Airport.

Land Transport

The Second Sydney Airport would affect Sydney's public transport systems and the road network during both construction and operation. In the peak construction period, there would be about 900 trucks a day travelling to and from the airport site and up to 3,800 vehicle trips a day by

construction workers. A number of roads around each of the airport options would require upgrading to handle this traffic.

It is estimated that in 2016 up to 139,000 people would travel to and from the airport by car, truck, taxi, bus or train each day. This would result in between 66,000 and 77,000 road vehicle trips to and from the airport each day. The lower figure assumes that a rail line would be built, while the higher figure has been calculated to assess transport impacts if no rail line is provided.

Road access to all three airport options would be similar to that shown in Figure 38. It is anticipated the main road access would be via Elizabeth Drive, Bringelly Road and The Northern Road. Other major road improvements would need to occur on Luddenham Road.

Alternatives for providing rail access to an airport at Badgerys Creek have been the subject of investigation by the State and Commonwealth Governments over recent years. A rail connection is proposed from the Cumberland and East Hills rail lines at Glenfield to the airport site as shown in Figure 38.

The main corridor being considered passes through Edmondson Park and Bringelly. An alternative rail corridor direct from Rossmore to the airport site might be considered to service Option C, since in this case the alignment of the runways might affect the possibilities for residential development around the proposed stations of the new rail line. In the long term, this rail line could carry about 36,000 passengers a day, about 60 percent of whom would be travelling to and from the airport.

Social and Economic Impacts

A range of social impacts on communities located in the region surrounding the airport sites would result from the individual environmental impacts previously described. Changes in existing social structures would occur as well as modifications to future urban development proposals. These changes, in addition to potential impacts on residential amenity, would result in a sense of dislocation and alienation for some members of some communities.

Conversely, the airport would have the capacity to support some urban and social structures, either through direct generation of employment or through benefits that might accrue from the investment in urban infrastructure that would be required to support the airport.

About 8,400 person years of labour could be directly generated by the construction of the airport options. In addition indirect employment of about 17,000 person years would be generated over the period of construction.

If compared to the case in which Sydney Airport is allowed to go on expanding and no second airport is constructed, the overall impact of the Second Sydney Airport on employment would be, at the least, to redistribute employment throughout Sydney. If compared to the case in which Sydney Airport is restricted to about 30 million passengers a year and no second airport is constructed, the proposal would generate between 52,000 and 63,000 jobs in Sydney by 2016, depending on the assumptions made about improvements to productivity.

The Second Sydney Airport would influence the structure of local industry as it responds to the needs and opportunities the proximity of the airport provides, by moving towards greater value added services and manufactures. Other economic effects of the airport would include impacts on property values, transitional losses in agricultural production and sterilisation of mineral resources.

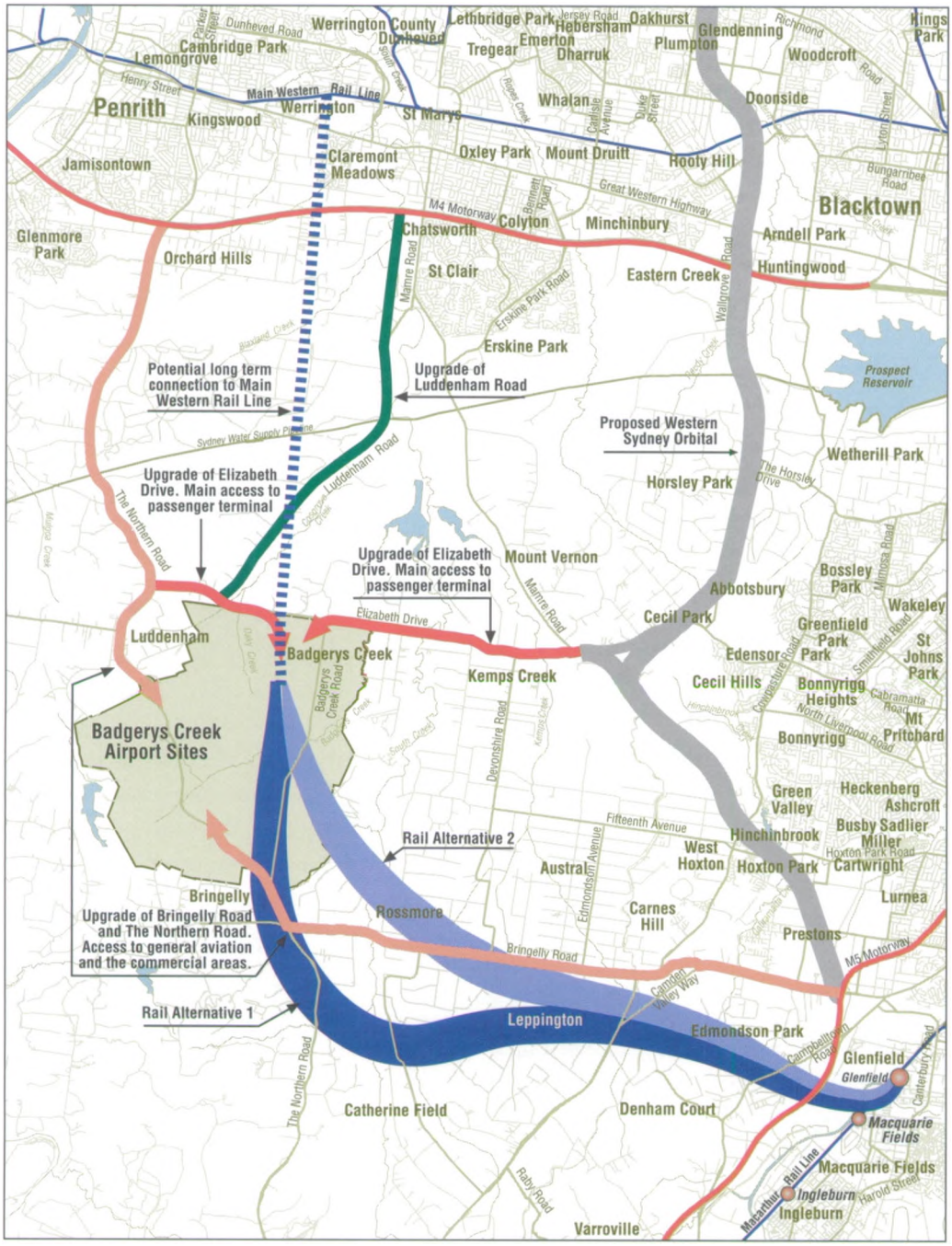


Figure 38

Potential Road and Rail Access to Badgerys Creek Airport Sites

Note: Access corridors are indicative only and not drawn to scale. Actual road and the rail lines would be narrower.

12. Environmental Management

The overarching principles that would govern the future environmental management of the Second Sydney Airport would be consistent with those contained in the Commonwealth Government's National Strategy for Ecologically Sustainable Development. Standards Australia has also adopted the international standard on environmental management systems ISO 14001. The general approach to environmental management based on ISO 14001 is shown in Figure 39.

In line with these obligations, a comprehensive environmental management system would be implemented for construction and operation of the airport. It would be designed to ensure effective ongoing management commitment and action, and would include the development of issue-specific environmental management plans.

While the environmental management system would be developed and implemented by the organisation(s) responsible for the construction and operation of the Second Sydney Airport, there would be opportunity for input from the community. The environmental management system would include features such as:

- environmental policy and environmental commitments of the organisation;
- issue-specific environmental management plans applying to aspects such as noise, air and water quality;
- responsibilities and reporting structure;
- ongoing communications and community consultation;
- emergency preparedness and response; and
- environmental monitoring, compliance and review audits.

A number of environmental management measures are available to minimise potential impacts during construction and operation of the airport. Table 8 presents details of measures which could be implemented.

During construction, steps would be taken to control dust, noise, ground vibration, visual impacts, and effects on water quality as well as impacts on other areas of the environment at risk.

When the airport becomes operational a reduction in potential impacts could be achieved by adopting a number of measures, including measures relating to noise. These might include controls on the way the airport operates, management of the flight paths that are used, the acquisition of some properties, and the acoustical treatment of houses.

There would be a need for effective, ongoing monitoring of the environmental performance of the airport during construction and in its operation.

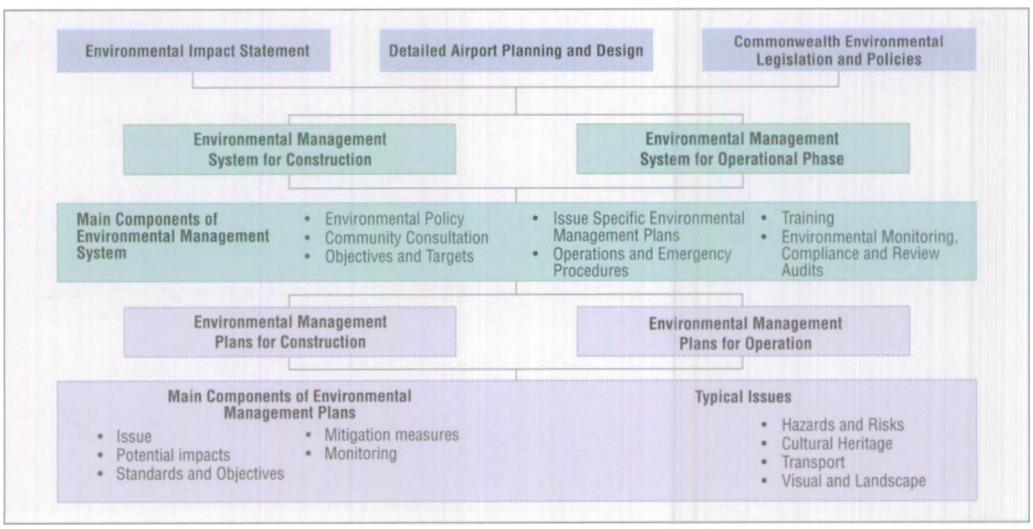


Figure 39
Approach to Environmental Management (Based on ISO 14001)

Table 8 Potential Environmental Management Measures

Environmental Issue	Management Measures for Construction Phase	Management Measures for Airport Operation
Planning and Land Use Impacts		
Future Urban Development	Not applicable	Options A and B, in particular, present opportunities to create urban villages which should be provided with effective public transport.
Development of Commercial Areas around and adjoining the Airport Site	Not applicable	Prepare planning controls with community input to ensure that future development respects landscape character.
Noise Impacts		
Aircraft Overflight Noise	Not applicable	Implement management measures such as:: • possible night-time curfews to minimise sleep disturbance; • selection of optimum airport operating modes and flight paths; • voluntary acquisition of highly affected properties; • acoustical treatment of affected properties; and • land use planning for future developments.
Ground Operation Noise	Not applicable	Implement management measures such as: • aircraft orientation to the east during testing; • night-time curfew on non emergency testing; and • noise shielding
Property Values	Not applicable	Selection of airport operating modes which affect the least number of properties, consistent with complying with Civil Aviation Safety Authority standards. Consideration of financial compensation measures.
Construction Noise	Management measures to be incorporated into construction plans at detailed design phase.	Not applicable
Physical and Biological Impacts		
Meteorology	Not applicable	Install site specific meteorological instruments to gather information for predicting air quality impacts and adverse meteorological conditions.
Air Quality	Require construction equipment to meet exhaust emission standards. Plan earthworks activities to minimise simultaneous active work areas, and use water sprays for dust control. Prompt vegetation of exposed areas.	Consistent with meeting Civil Aviation Safety Authority standards, implement as far as possible the following management measures: • reduce number of engines in use during taxi and idle; • take off under reduced power; • reduce use of reverse thrust; • turn off auxiliary power when aircraft docked; • use low emission ground support fleet; vehicles; • employ air traffic control procedures to reduce queuing and taxi time; • impose high quality aircraft maintenance standards; and • manage passenger fleet to avoid congestion.

Table 8 (Cont.) Potential Environmental Management Measures

Environmental Issue	Management Measures for Construction Phase	Management Measures for Airport Operation
Water	Soil and sediment control, through careful construction planning and use of detention basins. Use flocculants and desludging of sediment basins. Store fuels and materials appropriately.	Clean traps regularly, desilt sediment basins, maintain reed beds. Manage sewage treatment plants effectively and adopt best available commercially viable technology.
Flora and Fauna	Prepare emergency rescue procedures for injured and displaced fauna. Create river and stream crossings and wetland habitats. Use non-invasive species for landscaping. Implement weed and dieback control strategies.	Measures to reduce bird strike and maintain water quality.
Mineral Resources	Consider mining any surface minerals before construction begins, or separate them during construction.	Not applicable
Agricultural Resources	Assist enterprises needing to relocate. Control dust emissions which could impact on nearby facilities.	Consider agricultural impacts during development of noise and air quality management measures.
Energy	Use opportunities available to reduce energy consumption during earthworks phase of construction.	Adopt energy efficient design for buildings. Introduce energy conservation programs.
Waste Management	Reduce waste by good design and accurate ordering of materials. Recycle demolition wastes (50% target) and vegetation for mulch or chips. Balance cut and fill to earthworks design. Segregate hazardous and general waste.	Sterilise quarantine wastes. Implement waste minimisation plan. Maximise separation and recycling of wastes.
Hazards and Risks	Implement management measures for construction of fuel pipeline such as: • make a quantitative risk assessment and construction safety study a requirement of the EIS for fuel pipeline; and • undertake a Hazard Operability Study, Update Hazard Analysis, and Fire Safety Studies during planning and design phase. Undertake land contamination testing, and plan earthworks activities to ensure that any contaminated soils that are discovered do not cause adverse health/environmental impacts.	Implement management measures such as: • detailed attention to airport and near-airport design and planning; • site-specific bird hazard management plan; • select options and operating modes with lowest fatality risk levels; • prepare detailed flight planning measures aimed at reducing fatality risk levels; • future land use planning to prevent sensitive uses where risks exceed current NSW guidelines; • comprehensive emergency response plan and safety management system for fuel pipeline; • land use controls in vicinity of fuel pipeline; and • evaluate need to upgrade facilities at Orchard Hills Defence establishment or introduce procedures to reduce noise effects and shield explosives from electromagnetic radiation.
Social and Economic Impacts		
Aboriginal Cultural Heritage	Management options are limited because the preferred management measure of *in situ* conservation is mostly unavailable. However, the following should be implemented: • surface survey and salvage of remaining unsurveyed areas;	Not applicable

Table 8 (Cont.) Potential Environmental Management Measures

Environmental Issue	Management Measures for Construction Phase	Management Measures for Airport Operation
	• selected subsurface testing and salvage; • tree scar salvage; and • salvage plan for sites identified during construction.	
Non-Aboriginal Cultural Heritage	Implement management measures such as: • conserve items *in situ* where possible; • undertake archaeological; assessment of potential sites before or during construction; • make archival record for sites to be lost; and • protect retained items during construction.	Not applicable
Transport	Implement temporary and permanent diversions of The Northern Road and Badgerys Creek Road. Make improvements to Adams Road. Construct vehicle wash facilities.	Act on increased viability for a rail line and improved public bus services to the area. Make significant improvements possible to local and regional road networks.
Visual and Landscape	Implement management measures such as: • plan and design construction operations to minimise visual impacts; • setback development from boundaries and road margins by at least 200 metres; • landscape perimeter zones; • construct cut and fill embankments to avoid abrupt changes in grade; • fence vegetation to be protected during construction phase; • plan site development to maximise retention of native vegetation; • revegetate with native woodland plant communities where appropriate; • wherever possible, new drainage patterns should reflect scale and character of existing drainage; and • set back security fencing substantially from road boundaries so it is not visible from any point along road edge.	Adequate maintenance of landscaping.
Social/Economic	Consult with affected communities. Appoint community reference groups to advise on better avoidance of construction impacts and provision of alternative facilities. Undertake community audit detailing facilities, services, access patterns, and condition of communities. Nominate indicators for ongoing monitoring. Implement mitigation measures discussed in other parts of this table.	Restrict development of sensitive land uses. Assist community groups, for instance, to relocate facilities, and adapt to changes. Undertake community audit detailing facilities, services, access patterns, and condition of communities. Nominate indicators for ongoing monitoring. Implement mitigation measures discussed in other parts of this table.

13. Comparison and Conclusion

Comparison

The method used to compare the three airport options involved identifying significant issues, reviewing environmental studies to select appropriate assessment criteria, and comparing the performance of each option against the selected criteria.

Submissions made by the community during the preparation of the Draft EIS assisted in determining the issues most appropriate for the comparison of the airport options. Against this background, and on the basis of the studies undertaken, assessment criteria were developed for examining the performance of each option.

Table 9 presents, in summary form, the comparison of the airport options. The option which is considered to perform best against each criterion is coloured blue. Where two options are coloured blue, this indicates that there is no significant difference in their performance. Where there is no significant difference between all three options no ranking is shown.

It is not appropriate for the number of 'best performances' to be added together to make up a single 'best performance overall' as some issues and criteria may be more or less important than others. For example, some people may value potential hazards and risks as being more important than noise impacts. Others will have a different opinion.

In brief, comparison of the airport options revealed a similar range of potential impacts across a large number of the environmental issues examined; there were, however, a small number of significant differences. Those environmental issues that do not allow a clear distinction to be made between the options include the requirements for off airport site infrastructure; the overall impacts of high and mid range levels of aircraft overflight noise; air quality impacts; effects on land transport systems and employment benefits. Those environmental issues that demonstrate a significant difference between the options include the following:

- Options B and C would allow greater flexibility and efficiency in design and operation than Option A, and are more capable of future expansion;
- Options A and B are more consistent with the metropolitan and regional planning carried out to date; however, further strategic planning investigation may show that Option C would have similar metropolitan and regional planning benefits;
- the three options would produce different aircraft overflight noise levels in the various communities surrounding the airport. The relative impacts of these differences would depend on individual reaction;
- because of the smaller site area, the impacts of Option A on stream and terrestrial habitats and items of Aboriginal heritage would be less significant than those of Options B and C;
- Option C would potentially create a higher risk of fatality from aircraft crashes than Options A or B;
- Option C would be more compatible with the operation of Sydney Airport than Options A or B, although the extent of this constraint in the case of A and B has not been fully quantified; and
- Option A could be between $400 million and $700 million cheaper to build than Options B or C because of the smaller scale of infrastructure proposed.

Conclusion

Each of the airport options would result in a range of adverse and beneficial environmental and economic impacts. Any assessment of these should be considered in the context of the implications of not proceeding with the Second Sydney Airport proposal, commonly referred to as the 'do nothing option'. Adopting the do nothing option would likewise result in environmental and economic impacts.

The main environmental issues of concern raised by the community during the environmental assessment process were:

- potential aircraft noise impacts;
- air quality impacts, especially in regard to community health;
- water quality;
- loss of lifestyle and amenity; and
- hazards and risks.

Many members of the community are also seeking a firm and final decision on the proposal to enable them to plan their future. Key matters for consideration include the consistency of the options with metropolitan planning strategies, noise impacts, regional air and water quality issues, land transport, and airspace interactions of the proposed airport with the operation of Sydney Airport. Key differences between the options would be the level of aircraft overflight noise impacts on individual communities, the extent of biological and physical impacts, and airspace management issues.

The relative importance that should be placed on the potential adverse and beneficial impacts of the proposal and on the differences between the options is a matter for community comment during the exhibition of the Draft EIS, and ultimately a matter for judgement by the Commonwealth Government, when it is considering its decision on the Second Sydney Airport proposal.

Table 9 Comparative Assessment of Airport Options[1] (Approximately 30 Million Passengers a Year in 2016)

Assessment Criterion Performance Measure	Comparative Assessment Option A
Airport Planning and Development (Chapters 8 and 9 of Draft EIS)	
Airfield Efficiency and Layout	
Efficiency and flexibility in design and operation	Inflexible for alternative terminal configurations; location of airport support facilities split; limited land for commercial development
Construction	
Ease of construction	27 million cubic metres of earthworks; 6 year construction program; transmission line to be relocated; flexibility for staging
Air Traffic Demands	
Capacity to satisfy long term demand for air travel	Planned to satisfy operational objective of 30 million passengers a year; potential limitations because of airspace management issues
Expandability	
Ease of future expansion	Not applicable
Planning and Land Use (Chapter 10 of Draft EIS)	
Metropolitan and Regional Planning	
Compliance with current metropolitan and regional planning	Complies with metropolitan planning objectives and creates opportunity for self contained new urban communities, close to employment opportunities and serviced by public transport; site accessible to existing employment centres; no significant changes to Urban Development Program
Support of employment centres	Airport site would be accessible to existing employment centres, and land surrounding site could be available for employment uses
Off Airport Site Infrastructure	
Benefit of off airport site infrastructure to regional planning	Road, rail and other services required for airport would also benefit existing and planned communities
Acquisition of Properties	
Numbers of properties to be acquired to allow airport development	1 (part of public road)
Defence Activities	
Impact on armaments logistic support	Low[2]
Relocation costs	No costs
Aircraft Overflight Noise (Chapters 11 and 12 of Draft EIS)	
Land Use Planning[3,4, 5, 6 & 7]	
People (2016 estimate) who may experience the following ANEC levels in 2016:	
- greater than 30 ANEC	200
- greater than 25 ANEC	700-1,000
- greater than 20 ANEC	4,500-7,000
- greater than 15 ANEC	11,000-15,000
Communication Disturbance[3, 5, 6 & 7]	
People (2016 estimate) who may experience, on average, the following number of noise events over 70 dBA a day in 2016:	
- greater than 100 events	500-1,000
- greater than 50 events	2,500-5,000
- greater than 20 events	8,000-9,500
- greater than 10 events	14,000-25,000
Sleep Disturbance[3,5, 6 & 7]	
People (2016 estimate) who may, on average, be awoken at night the following number of times in 2016:	
- once a night	<100
- once every 2 nights	500-1,000
- once every 5 nights	6,000-8,000
Disturbance to Learning[3,5, 6 & 7]	
Educational facilities (2016 estimate) which may experience, on average, the following number of noise events over 65 dBA between 9am and 3pm in 2016:	
- more than 100 events	0
- more than 50 events	2-3
- more than 20 events	6
- more than 10 events	6-13

Comparative Assessment

Option B	Option C
Flexibility for alternative terminal configurations; efficient layout of airport support facilities; sufficient land for commercial development	Flexibility for alternative terminal configurations; efficient layout of airport support facilities; sufficient land for commercial development
36 million cubic metres of earthworks; 6.5 year construction program; transmission line to be relocated; earthworks required to clear airspace obstacles at Bringelly; flexibility for staging	29 million cubic metres of earthworks; 6 year construction program; transmission line to be relocated; earthworks required to clear airspace obstacles at Bringelly; flexibility for staging
Planned to satisfy operational objective of 30 million passengers a year; potential limitations because of airspace management issues	Satisfies operational objective of 30 million passengers a year
Good capability for expansion	Good capability for expansion
Complies with metropolitan planning objectives and creates opportunity for self contained new urban communities, close to employment opportunities and serviced by public transport; site accessible to existing employment centres; no significant changes to Urban Development Program	Complies with metropolitan planning objectives and may create the potential for self contained new urban communities, close to employment opportunities and serviced by public transport: (this potential may be more limited than for Options A or B); site accessible to existing employment centres; no significant changes to Urban Development Program
Airport site would be accessible to existing employment centres, and land surrounding site could be available for employment uses	Airport site would be accessible to existing employment centres, and land surrounding site could be available for employment uses
Road, rail and other services required for airport would also benefit existing and planned communities	Road, rail and other services required for airport would also benefit existing and planned communities
194	206
Low[2]	Moderate to High
No costs	Not available[2]
<100-200 500-800 3,500-5,000 13,000-15,000	<100-300 200-700 200-1,500 9,000-11,000
200-700 2000-4,500 6,000-7,000 12,000-14,000	300-400 800-1,000 3,000-17,000 46,000-49,000
<100 300-800 3,500-6,000	<100-100 400-600 1,500-17,000
0 1-2 4-7 10-16	0 1 3-22 28-40

Table 9 (Cont.) Comparative Assessment of Airport Options[1] (Approximately 30 Million Passengers a Year in 2016)

Assessment Criterion Performance Measure	Comparative Assessment Option A
Noise Induced Vibration People (2016 estimate) who may experience one noise event per 30 days capable of causing vibration to buildings (that is over 90 dBA)	700–1,000
Direct Property Devaluation Cost of direct property devaluation from noise impacts (1996$)	$49–67 million
Noise Management Cost of voluntary acquisition for dwellings affected by more than 35 ANEC (1997$)	$6–11 million
Cost of acoustical treatment for dwellings affected between 25 and 35 ANEC (1997$)	$12–19 million
Cost of acoustical treatment for dwellings affected between 30 and 35 ANEC (1997$)	$3 million
Ground Operation Noise (Chapter 13 of Draft EIS)	
During Neutral Conditions[6 & 8] People (2016 estimate) affected by noise levels over 50 dBA	2,500
During Temperature Inversion Conditions[6 & 9] People (2016 estimate) affected by noise levels over 50 dBA	21,000
Meteorology (Chapter 14 of Draft EIS)	
Runway Use Usability of runways due to wind conditions	94.15% for aircraft with 10 knot cross wind capability; 97.25% for 13 knot cross wind capability; 99.84% for 20 knot cross wind capability
Air Quality (Chapter 15 of Draft EIS)	
Ozone People (2016 estimate)[6] exposed to 1 part per 100 million increase in peak hourly ozone concentrations during high background ozone events	8,000
Increase in hospitalisation of persons each 100 years due to ozone	2
Increase in deaths each 100 years due to ozone	1
Air Toxics Increase in number of cancer cases per 100 years caused by air toxics	3
Particulates Increase in hospitalisation of persons each 100 years due to particulates	4
Increase in deaths each 100 years due to particulates	Less than 1
Odours People (2016 estimate)[6] affected by kerosene odours for more than 44 hours per year	1,500
Water (Chapter 16 of Draft EIS)	
Stream Habitat and Biota Length of stream habitat to be removed	5 kilometres
Natural Water Quality Impact on nutrient concentrations in receiving waters	Moderate
Drinking Water Quality Potential to exceed ANZECC guidelines for benzene levels in drinking water	Low
Flooding Capability of managing flooding impacts	High

Comparative Assessment	
Option B	Option C
500–2,500	6,000–8,000
$52–60 million	$25–31 million
$0	$12–27 million
$7–9 million	$6–12 million
$1–3 million	$2–5 million
1,500	1,500
21,000	16,000
97.75% for aircraft with 10 knot cross wind capability; 99.30% for 13 knot cross wind capability; 99.96% for 20 knot cross wind capability	99.23% for aircraft with 10 knot cross wind capability; 99.91% for 13 knot cross wind capability; 99.99% for 20 knot cross wind capability
8,000	8,000
2	3
1	1
3	3
3	4
Less than 1	Less than 1
1,000	1,500
10 kilometres	10 kilometres
Moderate	Moderate
Low	Low
High	High

Table 9 (Cont.) Comparative Assessment of Airport Options[1] (Approximately 30 Million Passengers a Year in 2016)

Assessment Criterion Performance Measure	Comparative Assessment Option A
Flora and Fauna (Chapter 17 of Draft EIS)	
Fauna	
Area of terrestrial habitat of local and regional significance affected by airport site and access corridors	120 hectares
Extent of fragmentation and barriers to fauna corridors	Impact on corridor of high local significance.
Disturbance to adjacent terrestrial habitat	None
Significant terrestrial fauna species potentially affected by airport site	2 species national significance, 12 species State significance; 38 species regional significance; 5 species listed under international agreements
Potential impacts of feral animals	Low
Flora	
Significant vegetation communities affected by airport site and access corridors	None
Significant flora species affected by airport site	1 species of national significance; 33 species of regional significance
Potential impacts of weeds	Low
Resources, Energy and Waste (Chapter 18 of Draft EIS)	
Mineral Resources Sterilisation of mineral resources	57–63 million tonnes of medium ash thermal coking coal
Agriculture Direct loss of agricultural productivity due to land acquisition	$0.6 million per year
Energy Fuel consumption during construction	90 million litres
Hazards and Risks (Chapter 19 of Draft EIS)	
Aircraft Crashing Maximum predicted fatality rate (persons per 100 years)	2.5
People (2016 estimate) on the ground exposed to a risk of fatality from aircraft crashes greater than one chance in 1 million	2,500
Exposure of Sensitive Land Uses Sensitive land uses exposed to predicted maximum frequency of aircraft crashes per square kilometre of: - 1 crash per 1,000 years	None
- 1 crash per 10,000 years	Prospect Reservoir; Warragamba Dam; Sydney Water Supply Pipeline
- 1 crash per 100,000 years	As above; Defence Establishment Orchard Hills
Bushfire Risk of bushfire to airport operations	Low
Bird and Bat Strike Risk of bird strike to aircraft operations	Manageable risk
Risk of bat strike to aircraft operations	Manageable risk
Land Contamination Environmental and health risks of existing land contamination	Low

Comparative Assessment

Option B	Option C
210 hectares	180 hectares
Impact on corridor of high local significance.	Impact on corridor of high local significance
None	None
2 species national significance, 12 species State significance; 38 species regional significance; 5 species listed under international agreements	2 species national significance, 12 species State significance; 38 species regional significance; 5 species listed under international agreement
Low	Low
None	None
1 species of national significance; 34 species of regional significance	1 species of national significance; 37 species of regional significance
Low	Low
64–84 million tonnes of medium ash thermal coking coal	63–84 million tonnes of medium ash thermal coking coal
$2.3 million per year	$1.7 million per year
90 million litres	90 million litres
2.2	5
2,500	9,000
None	Sydney Water Supply Pipeline; Defence Establishment Orchard Hills
Prospect Reservoir; Warragamba Dam; Sydney Water Supply Pipeline	As above
As above; Defence Establishment Orchard Hills	As above
Low	Low
Manageable risk	Manageable risk
Manageable risk	Manageable risk
Low	Low

Table 9 (Cont.) Comparative Assessment of Airport Options[1] (Approximately 30 Million Passengers a Year in 2016)

Assessment Criterion Performance Measure	Comparative Assessment Option A
Cultural Heritage (Chapters 20 and 21 of Draft EIS)	
Aboriginal Heritage Items	
Number of known sites and isolated finds of local and regional significance affected	60
Number of predicted sites and isolated finds of local and regional significance affected	119
Aboriginal Cultural Heritage	
Collective value of resource	Low
Expressed Aboriginal values	Site is subject to Native Title claim; Aboriginal sites, locations and natural environment are culturally important to Aboriginal people; Local Aboriginal Land Council opposes development of second airport in Sydney basin
Environmental Management	
Ability to manage adverse impacts on Aboriginal cultural heritage	Limited scope for in situ conservation; salvage may be possible
Non-Aboriginal Heritage Items	
Number of identified sites of local, regional or State significance affected	8 local; 5 regional; 1 partial loss (regional); 7 of these items listed by Liverpool Council
Environmental Management	
Ability to manage adverse impacts on non-Aboriginal cultural heritage	Potential to retain one item; able to relocate headstones/ burial remains, etc, removed from two churches
Transport (Chapter 22 of Draft EIS)	
Construction Traffic	
Impact of construction traffic on road network	Upgrading of Bringelly Road and The Northern Road required
Rail Transport During Operation	
Travel times between airport options and Sydney CBD	48 minutes
Travel times between airport options and Parramatta CBD	33 minutes
Compatibility with existing and future network	Opportunity for new transit oriented residential development; provides opportunity for creation of loop line to Main Western rail line; links to high frequency services at Glenfield station and East Hills rail line (allowing direct line to Sydney Airport); long term patronage of up to 36,000 passengers a day
Road Traffic During Operation	
Travel times between airport options and Sydney CBD (am peak)	74 minutes from airport; 60 minutes to airport
Travel times between airport options and Parramatta CBD (am peak)	42 minutes from airport; 38 minutes to airport
Compatibility with existing and future network	Accessible to Western Sydney Orbital which, if constructed, would provide a high level of service to many parts of Sydney; upgrading of Elizabeth Drive already approved; further improvements required on Luddenham Road, The Northern Road and Bringelly Road; compatible with the draft State Road Network Strategy; environmental constraints to the upgrade of Bringelly Road and The Northern Road; a key road network constraint would be the capacity of the M4 Motorway
Aviation	
Interaction with Sydney Airport	Significant impact, potentially reducing capacity of both airports
Impacts on secondary airports	Hoxton Park would close, moderate impacts on Camden and Bankstown
Impacts of restricted airspace	Defence Establishment Orchard Hills would have minor impacts on airport operations
Impacts on other aviation activities	High impacts on parachuting at Menangle and Wilton

Comparative Assessment

Option B	Option C
85	94
196	205
Low	Low
Site is subject to Native Title claim; Aboriginal sites, locations and natural environment are culturally important to Aboriginal people; Local Aboriginal Land Council opposes development of second airport in Sydney basin	Site is subject to Native Title claim; Aboriginal sites, locations and natural environment are culturally important to Aboriginal people; Local Aboriginal Land Council opposes development of second airport in Sydney basin
Limited scope for in situ conservation; salvage may be possible	Limited scope for in situ conservation; salvage may be possible
10 local; 5 regional; 1 partial loss (regional); 8 of these items listed by Liverpool Council	11 local; 6 regional; 1 partial loss (regional); visual impact on 1 item (State); 10 of these items are listed by Liverpool Council
Potential to retain four items; able to relocate headstones/ burial remains, etc, removed from two churches	Potential to retain two items; able to relocate headstones/burial remains, etc, removed from two churches; can reduce visual impact on Kelvin Park (State significance)
Upgrading of Bringelly Road and The Northern Road required	Upgrading of Bringelly Road and The Northern Road required
48 minutes	45 minutes
33 minutes	30 minutes
Opportunity for new transit oriented residential development; provides opportunity for creation of loop line to Main Western rail line; links to high frequency services at Glenfield station and East Hills rail line (allowing direct line to Sydney Airport); long term patronage of up to 36,000 passengers a day	Opportunity for new transit oriented residential development; provides opportunity for creation of loop line to Main Western rail line; links to high frequency services at Glenfield station and East Hills rail line (allowing direct line to Sydney Airport); long term patronage of up to 36,000 passengers a day
74 minutes from airport; 60 minutes to airport	74 minutes from airport; 60 minutes to airport
42 minutes from airport; 38 minutes to airport	42 minutes from airport; 38 minutes to airport
Accessible to Western Sydney Orbital which, if constructed, would provide a high level of service to many parts of Sydney; upgrading of Elizabeth Drive already approved; further improvements required on Luddenham Road, The Northern Road and Bringelly Road; compatible with the draft State Road Network Strategy; environmental constraints to the upgrade of Bringelly Road and The Northern Road; a key road network constraint would be the capacity of the M4 Motorway	Accessible to Western Sydney Orbital which, if constructed, would provide a high level of service to many parts of Sydney; upgrading of Elizabeth Drive already approved; further improvements required on Luddenham Road, The Northern Road and Bringelly Road; compatible with the draft State Road Network Strategy; environmental constraints to the upgrade of Bringelly Road and The Northern Road; a key road network constraint would be the capacity of the M4 Motorway
Significant impact, potentially reducing capacity of both airports	Operation of airports would be compatible
Hoxton Park would close, moderate impacts on Camden and Bankstown	Hoxton Park would close; moderate impacts on Bankstown; low impacts on RAAF Base Richmond; high impacts on Camden
Defence Establishment Orchard Hills would have minor impacts on airport operations	Conflicts with restricted airspace over Defence Establishment Orchard Hills would require relocation of Defence activities
High impacts on parachuting at Menangle and Wilton	High impacts on parachuting at Menangle and Wilton

Table 9 (Cont.) Comparative Assessment of Airport Options[1] (Approximately 30 Million Passengers a Year in 2016)

Assessment Criterion Performance Measure	Comparative Assessment Option A
Visual and Landscape (Chapter 23 of Draft EIS)	
Terrain Modification	
Area of impact	1,700 hectares
Scale of earthworks	Up to 16 metres cut and 13 metres fill
Visibility	
Viewing opportunities	Views from The Northern Road, otherwise limited
Costs (Chapter 24 of Draft EIS)	
Costs	
Construction costs (1997$)[10]	$3–4.1 billion
Costs of infrastructure (1997$)[11]	$961–1,016 million
Social and Economic Impacts (Chapter 25 of Draft EIS)	
Employment and Economic Activity	
Generation of construction jobs	Up to 8,400 person years of labour
Generation of jobs during airport operation	Between 52,000 and 63,000 jobs in Sydney by 2016 when compared to a case of Sydney Airport being restricted to about 30 million passengers a year and no new airport being developed
Potential to support regional economic benefits	Region has relatively mature industry structure to take advantage of increased economic activity
Community Character and Lifestyles	
Potential to cause severance or alienation of communities	Community alienation would be experienced due to displacement of residents and facilities from within existing airport sites; and due also to the corridors accessing the airport (Kemps Creek, Badgerys Creek, Bringelly and Luddenham)
Potential to significantly change community character and individual lifestyles	Community character likely to change dramatically from rural to urban; overall amenity of nearby communities likely to decline, especially Badgerys Creek, Luddenham, Greendale, Bringelly, Rossmore, Kemps Creek, Mount Vernon, Warragamba, Wallacia, Silverdale and Horsley Park
Community Facilities and Services	
Change to provision of community facilities and support structures	Loss of community facilities (school, store, post office) at Badgerys Creek; breakdown of family and business support structures probable, given the historical development and agricultural industry; long term replacement with new commercial and social structures
Displacement of individuals or communities	Displacement of community at Badgerys Creek (approximately 500 people); displacement of residents due to acquisition of properties in 35 ANEC and individual reaction to noise

Notes:
1. The airport option considered to perform best against each criterion is shaded blue. Where two options are shaded blue, this indicates that there is no significant difference in performance. Where there is no significant difference between any of the options, no ranking is shown.
2. Based on the conclusion that Options A and B could co-exist with defence activities at Orchard Hills. It is uncertain whether Defence facilities at Orchard Hills would have to be relocated if Option C were developed.
3. Estimates of people impacted by noise vary because of the different assumptions made about how the airport may operate.
4. Impacts of levels of ANEC assume all residential properties within the 35 ANEC contour would be acquired.
5. There are limitations in the accuracy of predicting future aircraft noise levels and future population.
6. Estimates of population greater than 10,000 have been rounded to the nearest 1000; estimates of population between 1,000 and 10,000 have been rounded to the nearest 500; and estimates of population less than 1,000 have been rounded to the nearest 100. Estimates of population less than 100 are shown as <100, meaning less than 100.

Comparative Assessment

Option B	Option C
2,900 hectares	2,850 hectares
Up to 13 metres cut and 10 metres fill	Up to 9 metres cut and 13 metres fill
Views from The Northern Road, otherwise limited	Views from The Northern Road, otherwise limited
$3.5–4.8 billion	$3.4–4.7 billion
$961–1,016 million	$961–1,016 million
Up to 8,400 person years of labour	Up to 8,400 person years of labour
Between 52,000 and 63,000 jobs in Sydney by 2016 when compared to a case of Sydney Airport being restricted to about 30 million passengers a year and no new airport being developed	Between 52,000 and 63,000 jobs in Sydney by 2016 when compared to a case of Sydney Airport being restricted to about 30 million passengers a year and no new airport being developed
Region has relatively mature industry structure to take advantage of increased economic activity	Region has relatively mature industry structure to take advantage of increased economic activity
Community severance and alienation would be experienced due to acquisition of the airport site and displacement of residents and facilities within existing site; and due also to the corridors accessing the airport (Kemps Creek, Badgerys Creek, Bringelly and Luddenham)	Community severance and alienation would be experienced due to acquisition of the airport site and displacement of residents and facilities within existing site; and due also to the corridors accessing the airport (Kemps Creek, Badgerys Creek, Bringelly, Luddenham and Rossmore)
Community character likely to change dramatically from rural to urban; overall amenity of nearby communities likely to decline, especially Badgerys Creek, Luddenham, Greendale, Bringelly, Rossmore, Kemps Creek, Mount Vernon, Warragamba, Wallacia, Silverdale and Horsley Park	Community character likely to change dramatically from rural to urban; overall amenity of nearby communities likely to decline, especially Badgerys Creek, Luddenham, Greendale, Bringelly, Rossmore, Kemps Creek, Erskine Park, Orchard Hills, Sovereign and Catherine Field
Loss of community facilities (school, store, post office) at Badgerys Creek; breakdown of family and business support structures probable, given the historical development and agricultural industry; long term replacement with new commercial and social structures	Loss of community facilities (school, store, post office) at Badgerys Creek; breakdown of family and business support structures probable, given the historical development and agricultural industry; long term replacement with new commercial and social structures
Displacement of community at Badgerys Creek (approximately 1,000 people); displacement of residents due to acquisition of properties in 35 ANEC and individual reaction to noise	Displacement of community at Badgerys Creek (approximately 1,200 people); displacement of residents due to acquisition of properties in 35 ANEC and individual reaction to noise

Notes:
7. The noise impacts shown in this table are for standard airport operational conditions which have not been optimised to reduce noise impacts. Optimising runway use and flight paths would likely significantly reduce the numbers of people affected.
8. Isothermal (neutral) atmospheric conditions occur when temperature is constant above ground level notwithstanding height.
9. Temperature inversions occur when temperature increases uniformly with height above ground level, up to 100 metres.
10. Range of costs provided because of assumed level of accuracy.
11. Estimated costs of infrastructure required to service the airport including roads, a rail line, water supply, fuel pipeline, gas supply, electricity supply, telecommunications and sewage disposal services. They do not include costs of consequential upgradings of other parts of the rail network. A range of costs is shown because of rail alternatives available.

14. How to Make a Submission

An important objective of the EIS process is to ensure that all relevant information has been collected and assessed so that the Commonwealth Government can make an informed decision on the proposal. Making a submission is a way for the community to provide information to the proponent and the decision makers about the proposal. Interested persons, groups and authorities are encouraged to make a submission on the Draft EIS.

What Can be Included in a Submission?

A submission can comment on any aspect of the proposal. It may provide information, options or suggestions on the material contained in the Draft EIS or may also identify errors or omissions. Comments may be made on general issues or specific items, they may cover related facts or topics that should be considered and may include suggestions on how to improve the proposal.

How to Make a Submission

It is helpful if you can:

- provide your comments in point form so that the issues raised are clear to the reader;
- refer each point to the appropriate sections of the Draft EIS;
- include your name, address and date; and
- ensure that the submission is as clear as possible if hand written.

All submissions will be treated as public documents unless confidentiality is requested.

The Draft EIS will be available for public review from the date the notice appears in the Australian Government Gazette. The closing date for submissions will be notified in press advertisements.

Submissions can be made by letter or facsimile and should be sent to:

Second Sydney Airport EIS
Environment Assessment Branch
Environment Australia
Locked Bag 42
Kingston ACT 2604

or

Facsimile: (02) 6274 1914

What Happens Next?

Copies of all submissions will be made available to the Department of Transport and Regional Development, PPK and SMEC Australia. A Supplement to the Draft EIS will then be prepared taking into account the content of the public submissions received. The Supplement will also be a public document. The Supplement and the Draft EIS together form the final EIS.

SMEC Australia will continue its audit throughout the public review period and the preparation of the Supplement. SMEC will provide its second report to the Minister for the Environment following the issue of the Supplement by the Department of Transport and Regional Development.

After receiving the Supplement, Environment Australia will prepare its advice to the Minister for the Environment taking into account the contents of the final EIS, public submissions received and the two reports of the auditor. The Minister will then provide his advice on the proposal to the Minister for Transport and Regional Development including any suggestions and recommendations for the protection of the environment.

The decision on whether to proceed or not to proceed with the proposal may then be made by the Commonwealth Government.

This document provides a summary of the Draft EIS. Accordingly, the results of the studies have been simplified. For a more complete understanding of the potential impacts of the Second Sydney Airport proposal, reference should be made to the Draft EIS and, if required, the technical papers prepared in conjunction with the Draft EIS.

Data used to develop the figures contained in this document have been obtained and reproduced by permission of the Australian Bureau of Statistics, NSW Department of Land and Water Conservation, NSW National Parks and Wildlife Service (issued 14 January 1997), NSW Department of Urban Affairs and Planning and Sydney Water. Predominantly based on 1996 and 1997 data. To ensure clarity, names of suburbs have been deleted from inner western, eastern, south-eastern and north-eastern areas of Sydney. On other maps only "Primary" and "Secondary" centres identified by the Department of Urban Affairs and Planning's Metropolitan Strategy in addition to Camden, Fairfield and Sutherland have been shown.

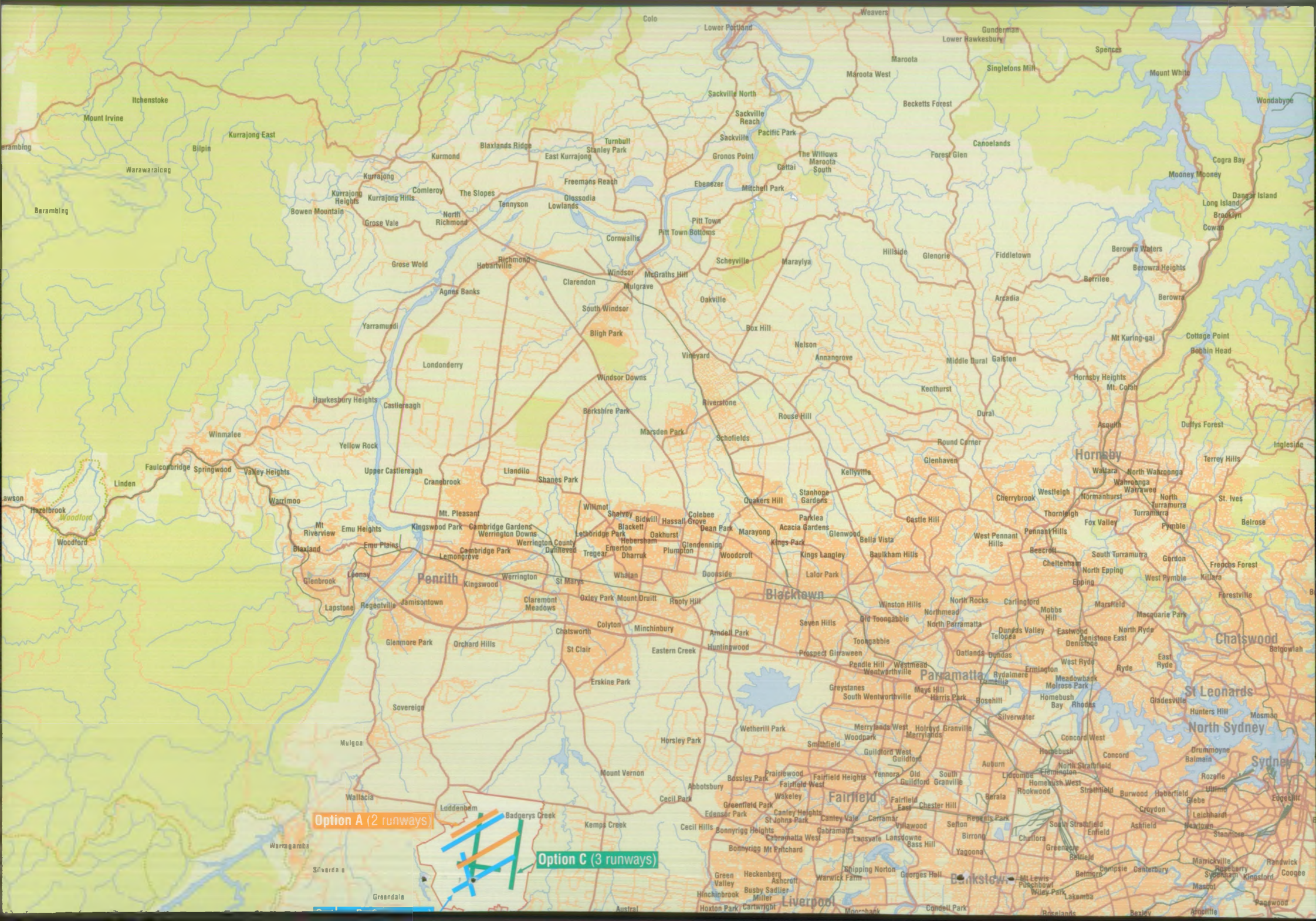

Option A (2 runways)
Option C (3 runways)
Penrith
Blacktown
Parramatta
Fairfield
Liverpool
Bankstown
Hornsby
Chatswood
St Leonards
North Sydney
Sydney
Colo
Lower Portland
Weavers
Gunderman
Lower Hawkesbury
Spencer
Maroota
Maroota West
Singletons Mill
Mount White
Wondabyne
Itchenstoke
Mount Irvine
Kurrajong East
Bilpin
Warawarang
Berambing
Sackville North
Sackville Reach
Sackville
Pacific Park
Becketts Forest
Canoelands
Forest Glen
Cogra Bay
Mooney Mooney
Dangar Island
Long Island
Brooklyn
Cowan
Kurmond
Blaxlands Ridge
East Kurrajong
Turnbull Stanley Park
Gronos Point
Cattai
The Willows
Maroota South
Kurrajong
Kurrajong Heights
Kurrajong Hills
Comleroy
The Slopes
Tennyson
Freemans Reach
Glossodia
Lowlands
Ebenezer
Mitchell Park
Bowen Mountain
Grose Vale
North Richmond
Pitt Town
Pitt Town Bottoms
Cornwallis
Grose Wold
Richmond
Hobartville
Windsor
McGraths Hill
Clarendon
Mulgrave
Scheyville
Maraylya
Hillside
Glenorie
Fiddletown
Berowra Waters
Berowra Heights
Berrilee
Berowra
Agnes Banks
Oakville
Arcadia
South Windsor
Yarramundi
Bligh Park
Box Hill
Nelson
Vineyard
Annangrove
Middle Dural
Galston
Mt Kuring-gai
Cottage Point
Bobbin Head
Londonderry
Windsor Downs
Kenthurst
Hornsby Heights
Mt. Colah
Hawkesbury Heights
Castlereagh
Riverstone
Berkshire Park
Rouse Hill
Dural
Acquith
Duffys Forest
Marsden Park
Schofields
Round Corner
Glenhaven
Ingleside
Winmalee
Yellow Rock
Kellyville
Terrey Hills
Faulconbridge
Springwood
Valley Heights
Upper Castlereagh
Llandilo
Shanes Park
Cranebrook
Linden
Warrimoo
Wilmot
Shalvey
Bidwill
Hassall Grove
Colebee
Quakers Hill
Stanhope Gardens
Parklea
Castle Hill
Cherrybrook
Westleigh
Normanhurst
Wallara
North Wahroonga
Wahroonga
Warrawee
North Turramurra
Turramurra
St. Ives
Thornleigh
Fox Valley
Pymble
Belrose
Mt. Pleasant
Mt Riverview
Emu Heights
Kingswood Park
Cambridge Gardens
Werrington Downs
Blackett
Lethbridge Park
Oakhurst
Dean Park
Marayong
Acacia Gardens
Glenwood
Bella Vista
West Pennant Hills
Pennant Hills
Beecroft
Cheltenham
South Turramurra
Gordon
Frenchs Forest
Hazelbrook
Woodford
Blaxland
Emu Plains
Cambridge Park
Lemongrove
Werrington County
Dunheved
Tregear
Emerton
Hebersham
Dharruk
Plumpton
Glendenning
Woodcroft
Kings Park
Kings Langley
Baulkham Hills
North Epping
Epping
West Pymble
Killara
Forestville
Glenbrook
Loonsy
Kingswood
Werrington
St Marys
Whalan
Doonside
Lalor Park
Lapstone
Regentville
Jamisontown
Claremont Meadows
Oxley Park
Mount Druitt
Rooty Hill
Winston Hills
North Rocks
Carlingford
Marsfield
Mobbs Hill
Macquarie Park
Northmead
North Parramatta
Old Toongabbie
Seven Hills
Colyton
Minchinbury
Chatsworth
Arndell Park
Toongabbie
Dundas Valley
Telopea
Eastwood
Denistone East
Denistone
North Ryde
Glenmore Park
Orchard Hills
St Clair
Eastern Creek
Huntingwood
Prospect
Girraween
Oatlands
Dundas
Pendle Hill
Westmead
Wentworthville
West Ryde
Ermington
Rydalmere
Ryde
East Ryde
Meadowbank
Melrose Park
Camellia
Erskine Park
Greystanes
South Wentworthville
Mays Hill
Harris Park
Rosehill
Homebush Bay
Rhodes
Gladesville
Hunters Hill
Mosman
Silverwater
Sovereign
Wetherill Park
Merrylands West
Holroyd
Granville
Merrylands
Woodpark
Concord West
Concord
Drummoyne
Balmain
Horsley Park
Smithfield
Guildford West
Guildford
Homebush
North Strathfield
Auburn
Lidcombe
Flemington
Homebush West
Rookwood
Strathfield
Burwood
Haberfield
Glebe
Ultimo
Rozelle
Mulgoa
Mount Vernon
Prairiewood
Bossley Park
Fairfield Heights
Yennora
Old Guildford
South Granville
Fairfield West
Abbotsbury
Wakeley
Greenfield Park
Fairfield East
Chester Hill
Berala
Croydon
Leichhardt
Petersham
Stanmore
Wallacia
Luddenham
Badgerys Creek
Cecil Park
Edensor Park
Canley Heights
St Johns Park
Canley Vale
Carramar
Regents Park
Sefton
Villawood
Cabramatta
Cabramatta West
Lansvale
Lansdowne
Bass Hill
Yagoona
Birrong
Chullora
South Strathfield
Enfield
Ashfield
Kemps Creek
Cecil Hills
Bonnyrigg Heights
Bonnyrigg
Mt Pritchard
Greenacre
Bellfield
Warragamba
Silverdale
Greendale
Austral
Green Valley
Heckenberg
Ashcroft
Warwick Farm
Shipping Norton
Georges Hall
Hinchinbrook
Busby
Sadlier
Miller
Hoxton Park
Cartwright
Moorebank
Condell Park
Mt Lewis
Punchbowl
Wiley Park
Lakemba
Belmore
Campsie
Canterbury
Marrickville
Dulwich Hill
Sydenham
Kingsford
Randwick
Coogee
Mascot
Pagewood
Bexley
Arncliffe
Roselands

Figure 15
Regional Context of Airport Options Being Considered

Urban areas (indicated by local roads)
Major Roads
National Parks and State Recreation Areas
Protected Water Catchment Areas