The Long Term Operating Plan for Sydney (Kingsford Smith) Airport and Associated Airspace

Airservices Australia

Part One

Part Two

Appendices

Executive Summary and Recommendations

In March 1996, the newly elected Federal Coalition Government, in line with the stated policy '*Putting People First*', directed Airservices Australia to review current operating procedures and associated airspace and develop a Long Term Operating Plan for Sydney (Kingsford Smith) Airport.

Airservices Australia is a Government Business Enterprise and manages airspace and air traffic control requirements for 11 per cent of the world's airspace. Federal Transport and Regional Development Minister, John Sharp's direction gave Airservices Australia the ability to not only implement government policy but address a growing impasse which had been created from trying to balance continued high growth in air transport with the environmental impact caused by this growth on the Sydney community.

Under the *Air Services Act*, Minister Sharp issued the directive and then, in the letter of transmittal to the Airservices Board Chairman, provided Terms of Reference including consultation with the community, the aviation industry and interested parties.

A Policy Group, chaired by Airservices Australia, and including many interested parties, established the Sydney Air Traffic Management Task Force with representatives from the community, environmental groups, industry, military and government. This Task Force was further divided into four sub committees to examine specifically the areas of runway modes, environment, terminal control and en-route control.

Also in March, Mr Sharp announced the establishment of the Sydney Airport Community Forum. One of this group's principal tasks was to assist Airservices and the Task Force with community input into the review and planning process.

As a major component of public consultation more than 1500 submissions were received from individuals, industry, airlines, associations and others after an extensive advertising campaign.

Airservices determined that changes would need to be made to runway configurations and how and when these configurations are used to meet the terms of reference and provide the foundations of The Long Term Operating Plan.

In November, the Sydney Airport Community Forum and Airservices Australia presented 10 proposed runway configurations, associated flight paths and corresponding noise contours in a consultation process at six major public meetings throughout Sydney to obtain feedback from the community.

The processes employed by Airservices Australia in first reviewing and then developing a Long Term Operating Plan for Sydney Airport and associated airspace, including the consultation process and final recommended modes of operation are detailed in the following report.

It is important to note that Airservices Australia has developed this proposed plan within the Terms of Reference and within it's own responsibilities and area of expertise. During development of the plan and during the course of public consultation many issues including suggestions that the Airport be closed or building a new airport out in the Tasman Sea or issues concerning the site selection and construction of a second Sydney airport, were made which were either outside the Terms of Reference or not within Airservices Australia's areas of expertise or responsibility.

Adding to community awareness about aviation transport in general, were simultaneous investigations into a site for a second Sydney airport, plans and construction associated with Sydney's hosting of the 2000 Olympics and the sale of airports around Australia.

Throughout the process Airservices Australia has been clear on its role and responsibility in finding an equitable solution to the earlier mentioned impasse of balancing growth of air transportation with environmental considerations.

Following extensive investigations and assessment of a wide range of options by the Sydney Air Traffic Management Task Force, Airservices Australia has developed the following recommendations. These recommendations take into account suggestions in submissions from the public and those which arose during consultations with community representative groups, the aviation industry and other interested parties.

The following recommendations are provided by Airservices Australia following extensive consultation and active involvement of industry and the community in all aspects of the review and the development of the Long Term Operating Plan.

Airservices Australia believes that the acceptance and implementation of the following recommendations will, over time, satisfy the Government's and the majority of the public's requirements without compromising safety or adversely affecting operational efficiency.

Recommendations

Recommendation 1

Ten modes of operation, each defining relevant flight paths and runway configurations, should be available for use at Sydney Airport over the period of the Long Term Operating Plan.

The original modes under consideration were number 1 to 16. This numbering has been retained throughout the process, whether or not a particular mode was chosen for possible implementation. Runway Mode of Operation 14A, is a variation of Mode 14.

Proposed Runway Modes of Operation

Mode 1

The Curfew. Required by legislation. Uses only the main north-south runway (16R-34L). Departures and arrivals are over Botany Bay.

Mode 4

Departures to the south from Runway 16L.

(Heavy jet departures to the south from Runway 16R.)

Arrivals from the south on Runway 34L.

Mode 5

Departures to the south from Runways 16L and 16R.

Arrivals from the east on Runway 25.

(Heavy jet arrivals from the north on Runway 16R.)

Mode 7

Departures to the north-west, west and south-west from Runway 25.

(Heavy jet departures to the north and north-west from Runway 34L.)

Arrivals from the south on Runways 34L and 34R.

Mode 8

Departures to the west from Runway 25 and departures to the east and north-east from Runway 34R. (Heavy jet departures to the north from Runway 34L.)

Arrivals from the south on Runways 34L and 34R.

Mode 9

Departures to the north and north-west from Runways 34L and departures to the east and north-east from Runway 34R. Arrivals from the south on Runways 34L and 34R. Mode 10

Departures to the south from Runways 16L and 16R.

Arrivals from the north on Runways 16L and 16R.

Mode 12

Departures to the east and north-east from Runway 07.

Arrivals from the west on Runway 07.

(Heavy Jet departures to the north from runway 34L or to the South from runway 16R)

Mode 13

Departures to the north-west, west and south-west from Runway 25.

Arrivals from the east on Runway 25.

(Heavy Jet departures to the north from runway 34L or to the South from runway 16R)

Mode 14A

Departures to the south from Runways 16L and 16R.

Arrivals from the west on Runway 07.

(Heavy jet arrivals from the North on runway 16R)

Modes 9, 10, 12 and 13—should continue under the Long Term Operating Plan because of requirements dictated by weather conditions. Curfew legislation requires that Mode 1 will continue to be used during the hours of 2300 to 0600 daily.

Modes 4, 5, 7, 8 and 14A should be included in The Long Term Operating Plan to maximise flights over water and fairly share unavoidable aircraft noise over residential areas

Recommendation 2

The flight paths associated with the recommended modes of operation and shown in maps accompanying each mode, be adopted as the flight paths to be used in the Sydney Terminal Area (within 45 nautical miles of Sydney Airport) for the period of the long Term Operating Plan.

Recommendation 3

Discontinue those current noise abatement requirements which mandate changing to, or continuing the use of, runways 16L and 16R for arrivals and departures (in a southerly direction) when there is up to 5 knots of downwind.

Recommendation 4

Adopt new runway selection criteria to:

- Give preference to over-the-water operations (Mode 4) to minimise residential overflights.
- Restrict the dedicated use of the east-west runway (Modes 12 and 13) to circumstances when weather requires use of these modes.
- Interchange use of the other modes to ensure a fair sharing of unavoidable aircraft noise subject to weather and traffic demands.

Recommendation 5

The modes of operation should be changed throughout each day, when traffic and weather conditions permit, to provide respite from noise affecting residents in different areas.

Changes should not be more frequent than every four hours unless required for operational and or weather reasons. The preferred times for changing modes would be 1030, 1600, and 2000.

Other times when modes could or must change are:

- end of Curfew (Mode 1)
- around 0730 on weekdays to enable parallel operations to handle the peak traffic demands.
- when weather changes dictate.
- as traffic delays increase and a change of mode will better sustain the projected traffic levels.
- in preparation for Curfew (Mode 1).

Recommendation 6

Because of the complexity of the proposed changes and the time needed to optimise the capacity of the over-water mode and the modes using three runways, initially operations under the Long Term Operating Plan should not include Mode 8. Mode 8 should be included in the Long Term Operating Plan if experience indicated that it would contribute to the plan's objectives. While it is desirable that Mode 8 should not be used in the initial stages, documentation covering its operational requirements and flight paths would be included in the implementation plan. This would allow its use later if monitoring and operational experience indicated that adjustments were required to modes and such adjustments could not be achieved satisfactorily with only the other nine modes.

Recommendation 7

A runway selection procedure should be introduced to facilitate the fair sharing of the impact of aircraft noise.

The procedures for runway use to achieve this objective are detailed in Chapter 6.

Recommendation 8

Improvements to air traffic control equipment as identified in this report or during implementation should be carried out as a matter of priority so that the projected short-term capacities of each mode can be realised.

Additional taxiways (as proposed in Chapter 4) should be built to accommodate projected air traffic growth and maintain the noise-sharing benefits gained from the new operations under the Long Term Operating Plan.

Recommendation 9

An Implementation and Monitoring Committee should be established to oversight implementation of the Long Term Operating Plan and report on its effectiveness. Membership should include two community representatives nominated by SACF, the aviation industry, the Federal Airports Corporation, the Civil Aviation Safety Authority, and the Department of Transport and Regional Development. The committee should be chaired by the Manager Operations, Sydney District, Airservices Australia, and report through Airservices' Chief Executive to the Minister.

Recommendation 10

Flight corridors to the south should be repealed to allow alternative departure tracks from Runway 16R which would enhance the capacity of simultaneous opposite direction parallel operations over Botany Bay by allowing left turns through Botany Bay Heads after departure from Runway 16R to achieve separation with traffic approaching to land on Runway 34L. The current Air Navigation (Aerodrome Flight Corridor) regulations require jet aircraft to fly within, and not deviate from, the appropriate designated flight corridor for a specified runway. This means jet aircraft departing from runway 16R with a left turn through Botany Bay heads would breach the current regulations.

Recommendation 11

It is recommended that on-shift management of procedures and staff resources be enhanced to satisfy the objectives of the Long Term Operating Plan, focusing authority and accountability of Air Traffic Services staff to a core position. It is intended that the new function will result in improved overall coordination and responsibility for interaction between the tower and terminal area workplaces.

Recommendation 12

Consideration be given to allowing aircraft departing 16R during the curfew to turn left after departure and track over water through Botany Bay heads to provide separation assurance with arriving traffic and enhance safety.

Recommendation 13

That a study be undertaken to assess when aircraft require to operate on the long runway to provide the Implementation and Monitoring Committee with accurate data to adjust the plan in the interests of maximising respite periods.

Recommendation 14

That the Department of Transport and Regional Development consider the impact of cluster scheduling of airline flights on the availability of the Long Term Operating Plan modes.

Recommendation 15

That, where traffic levels and disposition allow, Runway 34L be the preferred runway for arriving traffic when runways in that direction are in use.

Recommendation 16

Following concerns expressed during the public consultation process it is recommended that the West Pymble locator beacon be removed from service.

Recommendation 17

That arrival flight paths to the north of the airport (known as the 'trident' refer Chapter 4 and 5) be further refined during the implementation phase to reduce the concentration of air traffic on the Runway 16 localiser tracks.

Recommendation 18

That consideration be given to the provision of an Instrument Landing System on Runway 25 to enhance the availability of the preferred operating modes.

Recommendation 19

That noise abatement climb procedures be standardised for all runways at Sydney Airport and that an assessment be made to determine whether the International Civil Aviation Organization (ICAO) Procedure 'A' or Procedure 'B' be mandated for all jet operations.

Recommendation 20

That, as part of the implementation process, consideration be given to the proposal that propellor aircraft departures on runway 34L be commenced no further north than Taxiway B10.

Recommendation 21

That, following the implementation of new arrangements, ANEI contours be produced on a quarterly (and cumulative—up to 12 months) basis.

Recommendation 22

That, after 12 months, stable operation an ANEF be produced in order to provide business and the community with appropriate data for long term land use planning.

Recommendation 23

That the Implementation and Monitoring Committee further progress equitable noise sharing by refining:

- an agreed set of criteria and target values;
- developing a practical and publicly accountable monitoring process; and
- establishing an agreed mechanism for informing Air Traffic Services of current outcomes in relation to target values.

Recommendation 24

That there be an appropriate process established for keeping the community informed on the distribution of noise.

Recommendation 25

That the location of the 12 permanent noise monitoring terminals be reviewed for their appropriateness in light of the new long term operating arrangements.

Recommendation 26

That, as required, a program of short term deployment of portable noise monitors be developed to provide data to residents in areas where significant problems are identified.

Recommendation 27

That a formal safety analysis of the proposals for the Long Term Operating Plan be undertaken prior to implementation and that an independent review of safety issues by an independent third party with international expertise be undertaken.

Recommendation 28

That detailed simulation and evaluation of alternatives to the departure track to the south on the 163 VOR radial be undertaken to determine the benefits of a change to Cronulla residents.

This should include:

- Initial departure tracks between runway heading and the 163 VOR radial
- Departure on the 163 VOR radial with a left turn at 5 DME to intercept 150 VOR radial.
- Southern jets departing from Runway 16L and tracking on 126 VOR radial through Botany Bay heads.

Recommendation 29

That aircraft tracking from Sydney to Bankstown during the curfew period, 2300-0600, be tracked at 3000' via non populous areas of the Royal National Park and Holsworthy military areas to reduce noise nuisance to suburbs to the south west of the airport.

Recommendation 30

That further simulation and development of practical departure tracks to the east off Runway 07 and 34R be undertaken to establish a track that is not the reciprocal of the Runway 25 arrival track.

Recommendation 31

That Airservices Australia and the Australian Military Forces enable implementation of the in principle agreements for changes to military airspace surrounding Sydney through the Air Coordinating Committee.

Chapter 1—Background to the review

Sydney Airport at Mascot, has been used by aviation since 1919. It is the nation's international gateway for inbound and outbound tourism and is the aviation transport hub for domestic aviation services and for the airfreight of many goods and services including mail and perishable foods.

The growth of aviation transport worldwide is reflected in Australia. Significant changes have taken place at all Australia's major airports. At Sydney Airport a new runway, new terminal, aircraft maintenance and freight forwarding facilities, new air traffic control facilities and other airport improvements have been made to enable this growth to be met.

In 1995-96 there were 270,000 aircraft movements at Sydney Airport. About 15 per cent were international movements [more than half of all international flights into Australia], 40 per cent were scheduled domestic jet aircraft movements, 32 per cent were scheduled propeller aircraft movements, 11 per cent were general aviation movements and 2 per cent were helicopter movements.

Significant growth in aviation transport is projected to continue for the foreseeable future.

The Federal Department of Transport and Regional Development's forecasts of air traffic demand for the Sydney Basin indicate an average annual increase of 4.1 per cent in aircraft movements at Sydney Airport (including any other major airport if built) between 1996 and 2000. The forecasts, based on estimates of unconstrained demand, were prepared for the environmental impact study on a possible second major airport for Sydney.

According to the Department, the 270,000 movements in 1995-96 are expected to rise to 316,500 in 1999-2000. Of this figure 55,000 are expected international movements (an average annual growth of 6.9 per cent), 235,000 domestic movements (3.8 per cent) and 26,500 non-scheduled movements (1 per cent).

Between 1999-2000 and 2009-2010, the rate of growth of total aircraft movements in the Sydney Basin is expected to decrease to 3.0 per cent a year and 1.9 per cent a year between 2009-2010 and 2024-2025.

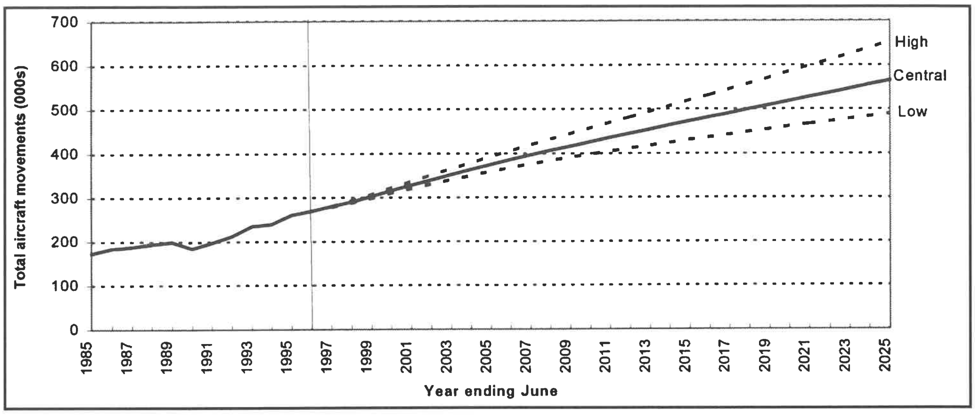


Figure 1: Aircraft movements using major gateway airports—Sydney Basin outlook to 2024-2025

The Department's statistics on hourly weekday movements at Sydney Airport between January and October 1996 show that there has been an average of about one hour a day when movements exceeded 60. The Department points out that estimated increases in total demand cannot be translated reliably into hourly movement rates because these will depend on factors such as slot control procedures, which might be implemented in coming years.

Sydney (Kingsford Smith) Airport
Number of hours by movement rate (excluding curfew period)

Month	Movement rate <30	30–39	40–49	50–59	60–69	70–79
Jan 96	107	151	189	78	2	0
Feb 96	82	130	144	124	13	0
Mar 96	97	129	133	146	21	1
Apr 96	86	145	131	114	30	4
May 96	87	142	155	112	25	6
Jun 96	102	128	146	109	24	1
Jul 96	72	151	144	125	33	2
Aug 96	65	164	148	118	31	1
Sep 96	69	137	152	117	30	5
Oct 96	62	146	153	128	35	3

Figure 2: Sydney Airport No of hours by movement rate (excluding curfew)

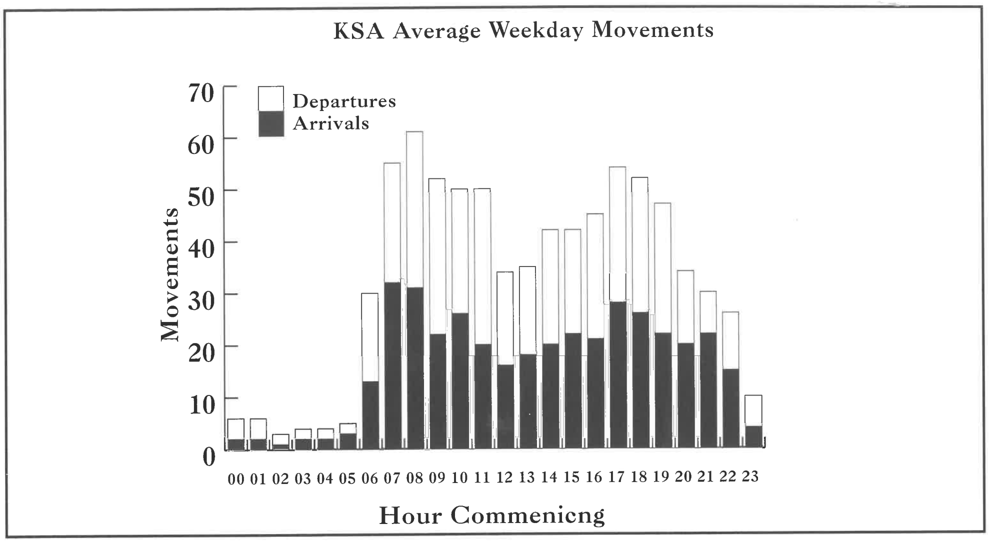


Figure 3: Kingsford Smith Airport average weekly movements January–October 1996

With growth there can also be problems and at Sydney Airport there has been a corresponding increase in concern by Sydney residents about environmental issues associated with the airport, the most immediate and significant being noise intrusion.

This community concern increased markedly when parallel runway operations began in November 1994 following commissioning of the airport's new third runway.

One effect of the introduction of parallel runway operations at Sydney was a concentration of aircraft noise in narrow corridors over residential areas directly to the north of the airport. This resulted in these areas experiencing nearly half of all aircraft movements.

The Federal Coalition's Policy on Sydney Airport and the proposed Sydney West Airport, '*Putting People First*', was released on 29 January 1996. In this policy document the Coalition stated that its policy was to reduce noise and pollution generated by Sydney Airport and to ensure that the noise burden was shared in a safe and equitable way.

'*Putting People First*' also stated that Sydney Airport's east-west runway would be reopened to distribute noise more equitably and that the full length of the east-west runway would be used by jet and propeller aircraft.

In March this year the Coalition was elected to Government and immediately took steps to implement the '*Putting People First*' policy.

Chapter 2—The Review & Planning Process

On 20 March 1996, the first step towards implementation of the Government's policy was taken by newly appointed Minister for Transport and Regional Development, the Hon. John Sharp, MP. In accordance with the Air Services Act 1995, he directed Airservices Australia to undertake a review of Sydney airspace and report to him by 16 December 1996 with recommendations for a Long Term Operating Plan for Sydney Airport and Associated Airspace.

The direction required that the review be based on the following Terms of Reference:

- All three runways at the airport, including the full length of the east-west runway, were to be available for use by jet and propeller aircraft.
- Maximum use was to be made of flight paths over water and non-residential areas.

  The capacity of the airport was to be maintained to the maximum practical extent but the programmed movement rate was not to exceed 80 movements per hour.
- The safety of aviation operations was not to be compromised.

The letter from the Minister to the Chairman of the Airservices Australia Board transmitting the direction indicated that it was open to Airservices to consider options, which could involve take-offs to the north on the new parallel runway.

In the transmittal letter the Minister also indicated there were additional matters which he expected Airservices to take into account in the conduct of the review and these included:

- The Review needed to be carried out in conjunction with the Department of Defence with a view to fully examining the scope for more effective use of airspace associated with Richmond and Williamtown air bases for both civil and military aircraft. The use of appropriate expertise available in Australia and other countries in developing flight path proposals for Sydney.
- That it would be appropriate and consistent with sound public policy for Airservices to undertake appropriate consultation with interested parties including the aviation industry and affected communities.
- That close consultation with the Civil Aviation Safety Authority (CASA) would be necessary to ensure that any new proposals for revised operating arrangements were fully consistent with safety requirements.

The Minister's direction and transmittal letter is Appendix 1.

In a media release [Appendix 2] issued on March 22, the Minister also stated that the review would not look at options 'that have the largest aircraft taking off to the north from the new runway, nor will it be looking at an option that has planes taking off from the new runway over the suburbs of Newtown, Annandale and Glebe'.

The direction required Airservices to take immediate steps to increase use of the east-west runway and thereby commence efforts to share the noise more fairly.

On April 3 Airservices Australia introduced the first of the short-term measures designed to increase the use of the east -west runway. Several other interim measures were also implemented during 1996.

On 23 May 1996, the Minister directed Airservices to examine the feasibility of introducing take-offs by jet and propeller aircraft to the north from the new parallel runway. Details of these measures and their relationship to the Long Term Operating Plan are covered in Chapter 3—'Past and Current Operating procedures'.

Organisational Arrangements for the Review

Following receipt of the direction from the Minister, Airservices Australia initiated the formation of a Senior Policy Group to oversight the development of the Long Term Operating Plan for Sydney Airport. The Chairperson of the Policy Group is the Chief Executive Officer of Airservices Australia, Mr Bill Pollard.

The initial membership of the Policy Group comprised principals (or their representatives) of the Departments of Transport and Regional Development, the Department of Environment Sport and Territories and Department of Defence. It also included representatives from the Civil Aviation Safety Authority (CASA), the Federal Airports Corporation (FAC), the Australian Aviation Industry Association (AAIA) now known as the Aviation Industry Council of Australia (AICA), the Australian Air Transport Association (AATA) and the Regional Airlines Association. The Coalition of Airport Action Groups (CAAG) was invited to join the Policy Group in June 1996 following consultations on appropriate representation from the Sydney Community.

The Policy Group first met on 15 April 1996, and agreed on the organisational arrangements and consultations process with interested parties were agreed. [Terms of Reference are at Appendix 3]. The Policy Group decided on the following organisational arrangements.

Given that the management of Australian airspace is a shared responsibility between Airservices Australia and the Department of Defence, airspace design work directly associated with the review and the development of the Long Term Operating Plan would be undertaken under the auspices of the Defence/Airservices Air Coordinating Committee (ACC). The ACC would serve as a Steering Committee for the technical aspects of the project, including flight track proposals and their impact on military airspace.

The ACC comprises the Deputy Chief of the Air Staff, Department of Defence and the General Manager, Air Traffic Services, Airservices Australia. The Chairman of the AICA was included in the Steering Committee for the duration of the review.

The Policy Group then decided on the establishment of a dedicated Task Force with responsibility for formulating proposals for the Long Term Operating Plan and Airspace for the Sydney Basin. It was agreed that the Task Force should be headed by a Senior Manager from Airservices, Air Traffic Services Division. It was also agreed that Task Force representation would involve those organisations included on the Policy Group. The Department of the Environment, Sport and Territories however, decided to keep its representation at the Policy Group level. The Task Force was named the Sydney Air Traffic Management Task Force.

It was also agreed that the principal body for Community consultation should be the body established by the Minister to replace the Sydney Airport Community Consultative Committee (SACCC). The Minister for Transport and Regional Development, The Hon. John Sharp MP, announced on 23 March 1996, the establishment of a consultative body called the Sydney Airport Community Forum (SACF) for Sydney Airport to represent the communities interests. The Terms of Reference of SACF indicated it would, in particular, be the main body for consultation on the Long Term Operating Plan for Sydney Airport and associated airspace. [The Terms of Reference of SACF are at Appendix 4].

Additionally, community involvement in the development of the Long Term Operating Plan was facilitated through CAAG membership and participation in the work of the Task Force and its working groups.

Operation of the Task Force

The Task Force established a secretariat and office accommodation at Brighton-Le-Sands, near Sydney Airport.

A Permanent Working Group was then established to coordinate and oversight the detailed developmental work and analysis of runway modes and flight path options for operations at Sydney.

To assist in this task, four specialist sub-committees were established to examine environmental issues, Runway Modes of Operation (RMO) (runway configurations), Terminal Area Control, which includes flight paths within 45 nautical miles (nm) of the airport, and en-route control issues associated with airspace beyond 45 nm.

The Permanent Working Group and the Environmental Working Group each met eight times. It became apparent early in investigations that the work of the Terminal Area Control and the RMO Sub-Committee overlapped to a large extent and it was decided to have joint meetings of these two sub committees. The combined TMA / Runway Modes Working Groups met 10 times. This group also dealt with En-route issues to the extent that they impacted on airspace within the 45 nm radius of Sydney.

There were also four informal meetings of RMO / TMA to consider issues associated with optimisation of capacity for runway configurations involving crossing runways and parallel opposite direction operations over Botany Bay.

There was also an informal meeting to consider operational and infrastructure constraints with particular runway modes of operation and two other informal meetings to discuss northern arrival flight path options.

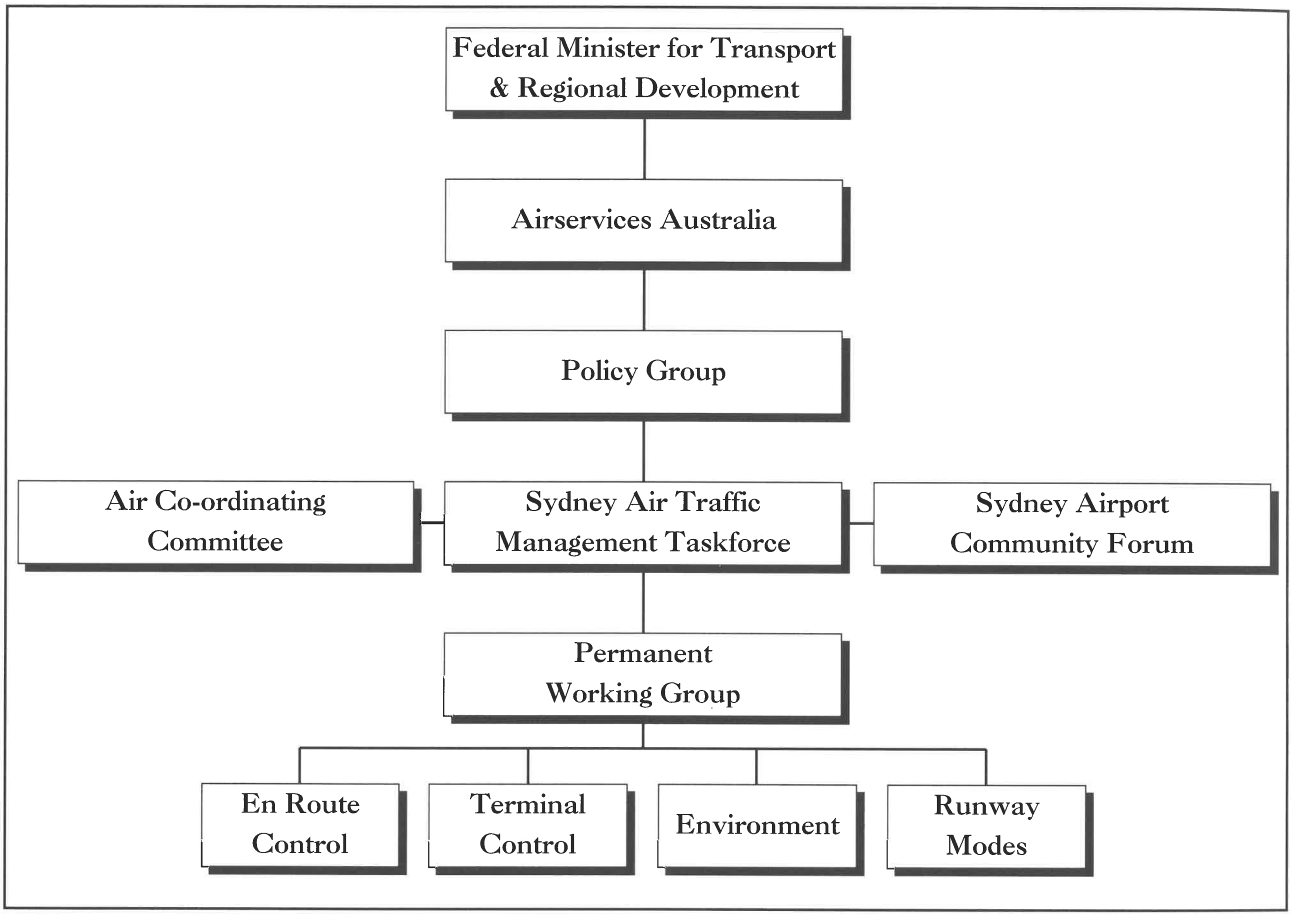


Figure 4: Organisational arrangements for the Review and development of the Long Term Operating Plan.

Public Consultation and Community Participation

The extent of concern within the Sydney community about aircraft noise resulting from the operation of Sydney Airport was recognised in the development of comprehensive arrangements for public consultation and community involvement in the review and development processes of the Task Force.

The public consultation and community participation process consisted of three distinct parts:

- an extensive campaign calling for public submissions.
- regular community briefings and meetings and community participation in all facets of the review and development process.

- a series of public meetings to advise affected communities of the options under consideration and gain feedback on the work of the Task Force and suggested approaches for the Long Term Operating Plan.

Major areas of community and community representative involvement have included:

- Call for public submissions on the Long Term Operating Plan through an extensive advertising and media campaign.
- Involvement and active participation of community representatives in the work of the Task Force.
- Regular briefings of the Sydney Airport Community Forum (SACF) on concepts and proposals during their development.
- Public meetings to explain operations at Sydney Airport and proposals for incorporation into the Long Term Operating Plan.
- Continuous responses to requests for attendance at local government and community meetings and meetings with industry associations and groups and other interested parties.
- Continuous responses to media inquiries regarding progress of Task Force and Task Force activities.
- Federal and State Parliamentarian briefings.

Public Submissions

On 10 May 1996, Airservices announced that submissions were being sought from the public on the Long Term Operating Plan and Associated Airspace for Sydney. Between 8 and 17 May 1996 the request for submissions was extensively advertised in the major Sydney metropolitan daily press, almost all of the major Sydney suburban newspapers and 14 of the major ethnic newspapers. The large display advertisements [a copy of the advertisement is at Appendix 5] were run twice in the major metropolitan papers during the period and indicated the closing date for submissions was 28 June 1996.

To supplement the advertisements, media were contacted and encouraged to write articles on the submission process and the activities of the Task Force and the Long Term objective of the process. The advertisements and media coverage generated considerable interest within the Sydney community.

After representations from several community groups and individuals Airservices decided it would facilitate the consultation process by extending the closing date to 10 July 1996.

Again the extension of the closing of the date was advertised extensively the major Sydney metropolitan newspapers on 22 and 23 June 1996. Again media were contacted with a 'fresh' angle on the submission process. On 10 July 1996 1545 submissions had been received.

The breakdown of the submissions by type is as follows:

Individuals and companies	591
Kurnell pro forma	473
Lane Cove pro forma	42
Earlwood pro forma	125
Aviation Industry	17
Community groups	39
State Government	2
Local Government	16
Federal Government	6
Noise complaints	57
Kurnell noise	35
Earlwood noise	142
TOTAL	1545

Subsequently a further 91 submissions were received, these were received and the views taken into account by the Task Force. The breakdown by type of these submissions is as follows:

Individuals and Companies	16
Kurnell pro forma	12
Earlwood pro forma	17
Community groups	1
Noise complaints	31
Kurnell noise	1
Earlwood noise	13
TOTAL	91

The main matters raised relevant to the Ministerial direction were:

- proposals for new runway configurations and changes to arrival and departure flight paths, including take-offs and landings over Botany Bay (commonly known as TALOW proposal);
- concerns of individuals and community groups about flight paths over specific areas, including flight corridors to the north and the use of non-reciprocal flight paths;
- suggestions for new flight paths including proposals for the minimisation of overflight of populous areas (commonly known as the Bonham proposals);

- the avoidance of aircraft tracking close to the airport in downwind legs when alternatives were available; and
- 'clean' approaches involving low power, low noise aircraft operations.

A number of submissions dealt with matters outside the scope of the Task Forces work. Principal issues outside the Terms of Reference were:

- acquisition of residences and insulation particularly in Kurnell
- location and role of a second Sydney Airport
- changes to the Curfew
- additional major infrastructure at Sydney Airport,e.g., additional runways; and
- minimisation of the use of the east-west runway

Chapter 8 addresses further the issues raised that are outside the Terms of Reference of the Task Force.

The Task Force then invited a representative sample of submittees to make a presentation to the Task Force on their concerns or proposals. A total of 40 individuals and organisations met with the Task Force and elaborated on their concerns and proposals. A list of those that met with the Task Force is at Appendix 5.

From these discussions and consultations the Task Force set about laying the foundations of the Long Term Operating Plan.

Community Representatives Participation in the Task Force

The 'umbrella' nature of the CAAG group was seen by the Task Force as representative of community interest and a group which could provide the level of feedback required throughout the project.

CAAG accepted an invitation to participate and CAAG members participated in all formal meetings held under the Task Force auspices and in a number of informal meetings. The CAAG Chairperson was the official CAAG representative on the Policy Group.

Due to the frequency of Task Force meetings CAAG representation varied according to the issues being considered and availability CAAG representatives.

Sydney Airport Community Forum

The Sydney Airport Community Forum (SACF) is the main body for consultation on the Long Term Operating Plan for Sydney Airport and Associated Airspace. Airservices Australia provided regular briefings to SACF and at SACF's request participated in discussions of matters relating to the Long Term Operating Plan.

The following briefings were provided by Airservices Australia to SACF members.

22 July 1996	Airservices representatives gave an initial presentation on progress with the airspace review and interim measures introduced at Sydney Airport over the previous three months.
9 August 1996	Detailed briefing on Sydney Airport Operations and inspection of Airservices facilities at Sydney.
16 August 1996	Detailed background briefing on progress with the Long Term Operating Plan and presentation of paper on Modes of Operation
26 August 1996	Airservices Australia presentation on development of Long Term Operating Plan for Sydney Airport which described indicative new flight paths for the Sydney Basin. Without coming to a firm view on acceptability or otherwise of individual options, SACF agreed that the range of indicative flight paths, covered all the main possibilities and should be further developed for more detailed consideration. Briefing on report to Minister on feasibility of Runway 34R departures.
23 September 1996	Airservices provided SACF with a progress report on the review of Airport operations and airspace and the Development of the Long Term Operating Plan. SACF decided to hold a series of public meetings at representative locations around Sydney Airport to explain possible options and to enable SACF to obtain community feedback. SACF requested Airservices Australia to participate in this process.
11 November 1996	Provided briefing of roadshow presentation and handout material.
29 November 1996	Airservices Australia received the interim report of public responses resulting from the roadshow from SACF. [Subsequently the SACF Chairman provided the final report of SACF].

The series of six joint SACF/Airservices public meetings which explained draft proposals for the Long Term Operating Plan were held between 11 November 1996 and 17 November 1996.

The following are the locations and approximate attendances at these meetings.

Willoughby Civic Centre	11 November 1996	350
Marrickville Town Hall	12 November 1996	350
Randwick Town Hall	13 November 1996	900
Drummoyne Civic Hall	14 November 1996	300
South Hurstville RSL Club	15 November 1996	250
Cronulla Leagues Club	17 November 1996	450

Airservices Australia provided a computer generated audio-visual program to detail the work of the Task Force and the suggested direction of the Long Term Operating Plan.

The program, and a supplementary information kit containing maps of the proposed modes of operation and suggested flight paths which were handed out to members of the public, ensured a consistent presentation of the proposals to all.

There was some confusion that the proposals presented were in draft form and that the point of the consultative meetings was to allow feedback on the presentation for consideration and ultimately inclusion in this report.

The following community concerns were expressed during the course of the public meetings.

- Defining 'equitably sharing of noise' whether based on aircraft movements, noise, hours of exposure or on a composite measure of noise.
- That maximising movements to the south did not constitute an equitable share for affected community of Kurnell.
- Apparent disparity in the number of flight paths that are possible to spread the noise in each direction.
- Take-offs were of greater concern to residents close to the airport, whereas landings were of greater concern to residents further from the airport.
- That some suburbs were potentially affected by flight paths associated with a significant number of the 10 presented modes.
- Concern that the effectiveness of any attempt to equitably share noise would diminish with continuing growth of air traffic.
- Advance notification of operational arrangements that would allow the community to know in advance the planned usage of modes (subject to weather). Easy access to daily information on weather and other operational conditions likely to affect use of modes.
- Safety standards.
- Adjustment of flight paths in various modes away from residential areas.

- Removal of West Pymble locator beacon.
- Usage of main north-south runway by only those aircraft which have a clear operational requirement to do so.
- Consideration of ICAO A take off procedures for departures to the west south and east.
- Encourage airlines to adopt 'cleaner ' landings.
- Relationship between proposed modes and Sydney second airport site and smaller aerodromes such as Bankstown.
- More extensive noise monitoring.
- Guarantees for ongoing community consultation and accountability post implementation.
- Continuing cooperation with Military over use of Military airspace.
- Trialling of suggested modes prior to implementation.
- Environmental impact assessment.

These issues are addressed in the relevant sections of the report.

There were also many issues and concerns raised which were outside the Terms of Reference and these included:

- Capping movements at 80 per hour through legislation.
- The Curfew to remain.
- Construct a second Sydney airport, but outside the Sydney Basin.
- Adequacy of regulatory controls over future private airport lessees. Eligibility for insulation program post implementation.
- Air pollution and other health impacts

Some of these issues are referred to further in Chapter 8.

Public Meetings and ongoing community consultation

In addition to the public meetings arranged in conjunction with SACF, Airservices attended other public meetings at the request of local councils, local communities and environmental groups to explain the interim changes at Sydney Airport and the development of the Long Term Operating Plan for Sydney Airport. This also included numerous telephone inquiries and written correspondence from the public.

Ongoing media inquiries

Throughout the year Airservices Australia continually liaised with the media about various aspects of the work and activities of the Task Force. Airservices as well as initiating stories also responded to issues arising from public meetings.

Chapter 3—Past and current operating procedures at Sydney Airport

There have been significant changes in the way Sydney Airport has operated in the past decade. In particular there have been changes associated with the introduction of parallel runway operations. There have been even further changes with several interim measures implemented since March 1996.

To understand past and current operating procedures, it is important to note how airspace is managed at Sydney Airport.

The flight path, or the track an aircraft takes departing from or arriving at Sydney Airport, is principally determined by the runways being used at the time.

The residential areas overflown by aircraft and subjected to noise can therefore also be identified by the choice of runways being used at the time.

The choice of runways and combinations of runways (or runway configuration) is determined by a number of complex factors, which are taken into account simultaneously. These factors include safety requirements, weather conditions, operational efficiency and noise abatement procedures (refer to Chapter 4 for further detail).

Noise abatement procedures are designed to reduce the impact of aircraft noise on residential areas. At Sydney Airport current noise abatement procedures are comprised of a combination of preferred runways and flight track procedures, climb procedures and curfew restrictions. There have also been regulations in place prescribing flight corridors for arrivals and departures on the parallel runways. On 28 March 1996, the northern flight corridors were repealed.

Each runway configuration has a range of Standard Terminal Arrival Routes (STARs), Standard Instrument Departures (SIDs), Standard Radar Departures (SRDs) and noise abatement air traffic control procedures. These different procedures cater for the wide variety of aircraft types, the operational capacity of the aircraft and take into account whether the aircraft is flying in visual conditions or by instruments only. All of these air traffic control procedures can specify a particular flight path for the aircraft to take on arrival or departure.

SIDs and SRDs take into account obstacle clearance requirements, airspace segregation requirements, and noise abatement requirements and help obtain optimum traffic flow.

STARs ensure aircraft are controlled through consistent arrival tracks. They satisfy airspace segregation requirements, reduce pilot and controller workloads, assist with noise abatement requirements and help attain maximum traffic handling capacity. As traffic levels increased, the standardisation of procedures such as these and the use of structured airspace has been progressively employed, to enhance safety and improve traffic handling efficiency. (Current SIDS and STARS are at Appendix 6)

Sydney Airport has three visible strips of pavement and each end of a strip of pavement can be used as a runway. So at Sydney there are six runway headings. The following diagram explains the name and location of each runway at Sydney Airport. The six runway headings are used in different combinations to provide runway modes of operation.

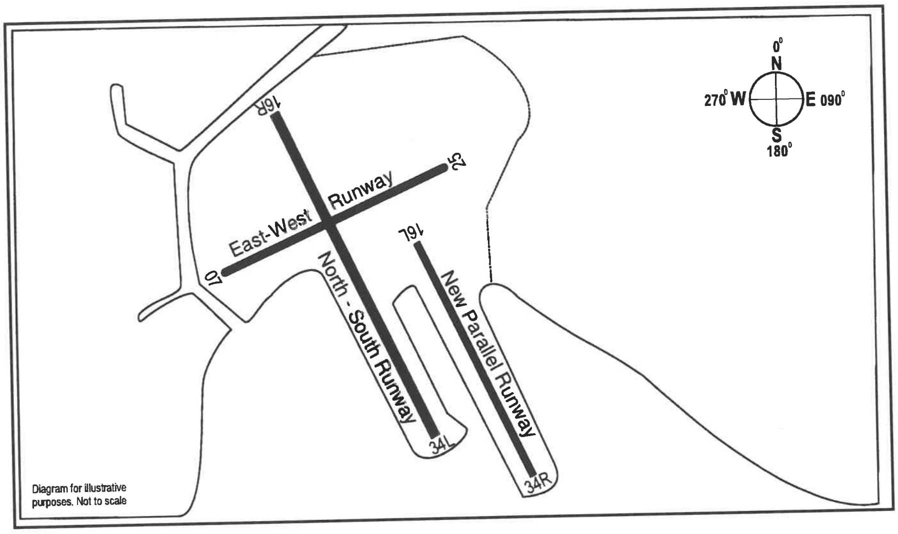


Figure 5: Runway identification at Sydney Airport

Figure 5 explanation.

Runway numbers refer to the magnetic direction of the runway rounded to the nearest 10 degrees.

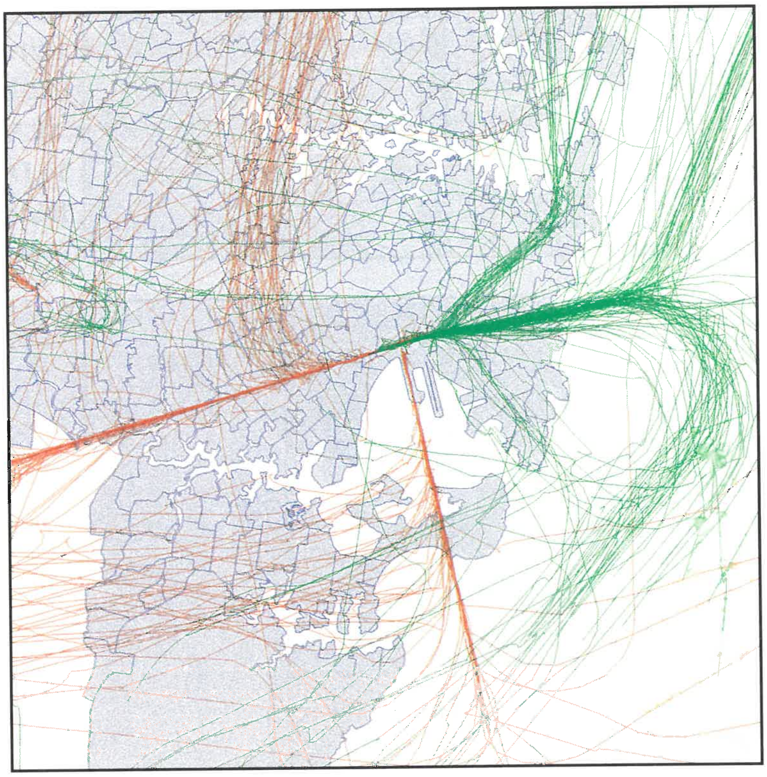
Runway 16R/34L	Main north-south runway.
Runway 16L/34R	New parallel north-south runway.
Runway 07/25	East-west runway.
Runways 16R & 16L	Used by aircraft landing or taking off towards the south. (16 = approx. 160 degrees compass bearing)
Runway 34R & 34L	Used by aircraft landing or taking off towards the north. (34 = approx. 340 degrees)
Runway 07	Used by aircraft landing or taking off towards the east. (07 = approx. 070 degrees)
Runway 25	Used by aircraft landing or taking off towards the west. (25 = approx. 250 degrees)

Pre Parallel Runway Operations at Sydney (Pre November 1994)

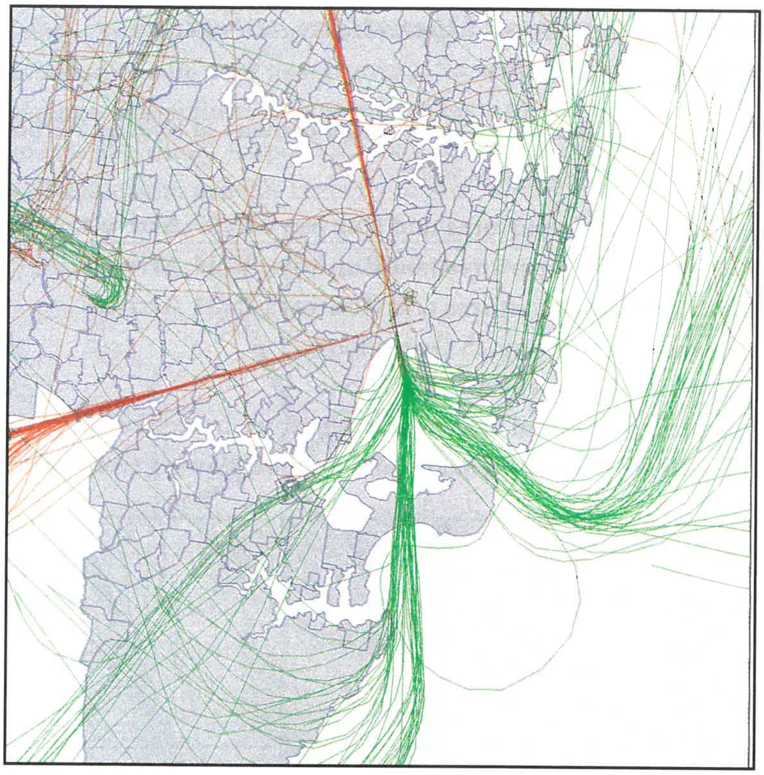
Prior to the commissioning of the parallel runway at Sydney Airport, the main runway combinations used at were:

- Runway 16 Departures and Runways 16/07 Arrivals
- Runway 07 Departures and Runways 07/34 Arrivals
- Runway 25 Departures and Runways 25/34 Arrivals
- Dedicated Runway 25 Operations
- Dedicated Runway 16 Operations

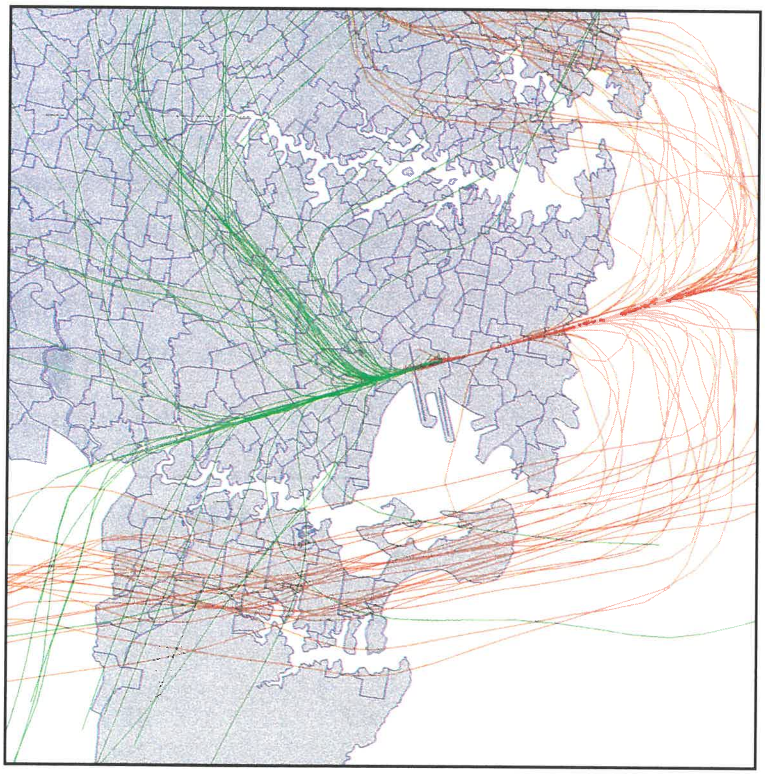
Maps depicting typical arrival and departure tracks for these runway combinations are shown below and on the following two pages.



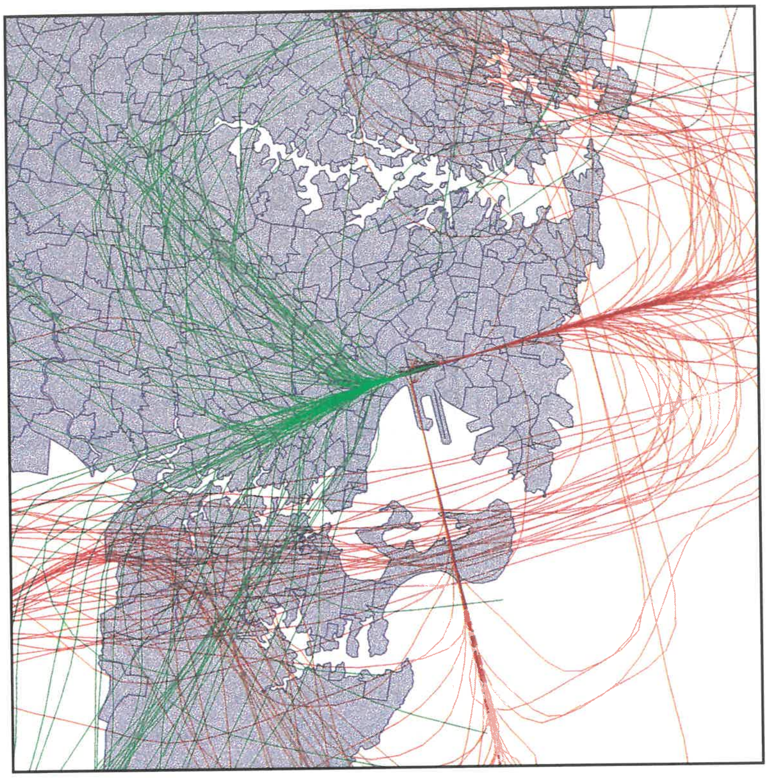
Sydney
Kingsford Smith
12/10/94
08:30 to 16:30L
All Movements
07 Dep 07/34 Arr
Red=Arrival
Green=Departure



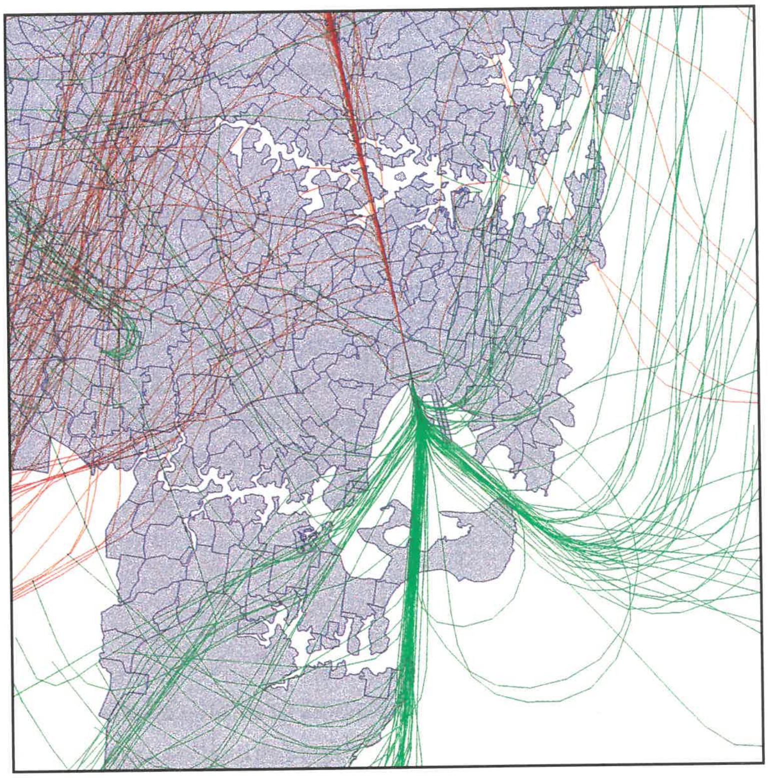
Sydney
Kingsford Smith
12/10/94
08:30 to 16:00L
All Movements
16 Dep 16/07 Arr
Red=Arrival
Green=Departure



Sydney
Kingsford Smith
8/10/94
12:00 to 17:00L
All Movements
Runway 25
Red=Arrival
Green=Departure



Sydney
Kingsford Smith
7/10/94
08:00 to 14:00L
All Movements
25 Dep 25/34 Arr
Red=Arrival
Green=Departure



Sydney
Kingsford Smith
21/10/94
10:00 to 16:45L
All Movements
Runway 16
Red=Arrival
Green=Departure

These runway configurations were operated in accordance with a noise abatement preferred runway system. In other words a preferred runway combination which met the previously mentioned criteria of operational efficiency, safety, noise abatement and could be used during suitable weather conditions. These runway configurations evolved over the years before the start of parallel runway operations in November, 1994. This preferred runway system was dictated by the departure runway with arrivals fitting in with the departure runway. Set out below are the arrangements relating to this preference system.

Runway 16 was preferred for departures at all times with a maximum crosswind of 15 knots and downwind 5 knots. This noise abatement requirement was to maximise departures over Botany Bay. The maximum crosswind allowance increased in 1989 to 25 knots. When Runway 16 departures were in operation, if runway 07 was suitable for arrivals, then Runways 16 and 07 were nominated for arrivals. Due to route structure half the arrivals used each runway.

From 1900 hours the runway preference changed to Runway 16 for departures and Runway 25 for arrivals. This gave the eastern suburbs arriving traffic from 1900-2300. As traffic levels increased during the 1980's the utilisation of this mode decreased.

Until 1989, the preferred runway configuration during the curfew period from 2300 to 0600, was Runway 16 departures, Runway 34 arrivals. When traffic and weather permitted, this runway configuration commenced earlier.

When the downwind was greater than 5 knots, departures and arrivals were on the runway operationally required. There was a special procedure with a displaced threshold Runway 16 for Electras.

From December 1989, the curfew mandated Runway 34 for landings and Runway 16 for departures. The decision to operate in crosswind or down-wind conditions rests with the pilot in command.

Outside the Curfew the noise abatement arrival runway preferences were:

1. Runway 34
2. Runway 25
3. Runway 16 or 07

However to accommodate traffic levels and to reduce conflict with departing traffic the runway providing the straight in approach was normally nominated. From 0600-1900 this was generally Runway 16 and 07. Runway 25 was used on occasions for aircraft arriving from the east.

In December 1982, Simultaneous Operations (SIMOPS) was introduced at Sydney Airport to maximise traffic. Under this technique, aircraft could land at the same time on the north-south and east-west runways, with one aircraft being instructed to stop before the intersection of the runways. An aircraft could depart while another was landing on an intersecting runway.

Following the introduction of parallel runway operations, SIMOPS was withdrawn on 23 December, 1994 due to the concentration on parallel operations and reduced controller familiarity with the SIMOPS procedure.

The average movement rates per hour at Sydney with the pre-parallel runway configurations were:

- Single runway, instrument conditions—up to 36.
- Single runway, visual conditions—up to 40.
- Two runways, instrument conditions—up to 44.
- Two runways, visual conditions without SIMOPS—up to 48.
- Two runways, visual conditions with SIMOPS—up to 65.

Parallel Runway Operations at Sydney (November 1994—March 1996)

The parallel runway operations, which commenced in November 1994, were determined by the Environmental Impact Statement (EIS) on the new third runway at Sydney Airport and the Noise Management Plan.

The EIS was based on the then Government Policy Guidelines on the operation of parallel runways at Sydney.

These guidelines required that:

- there would be no departures from the new runway to the North
- the existing north south runway would continue to handle all classes of traffic
- the use of the east-west runway would be restricted to circumstances in which adverse weather conditions precluded the use of the other runways for safety reasons

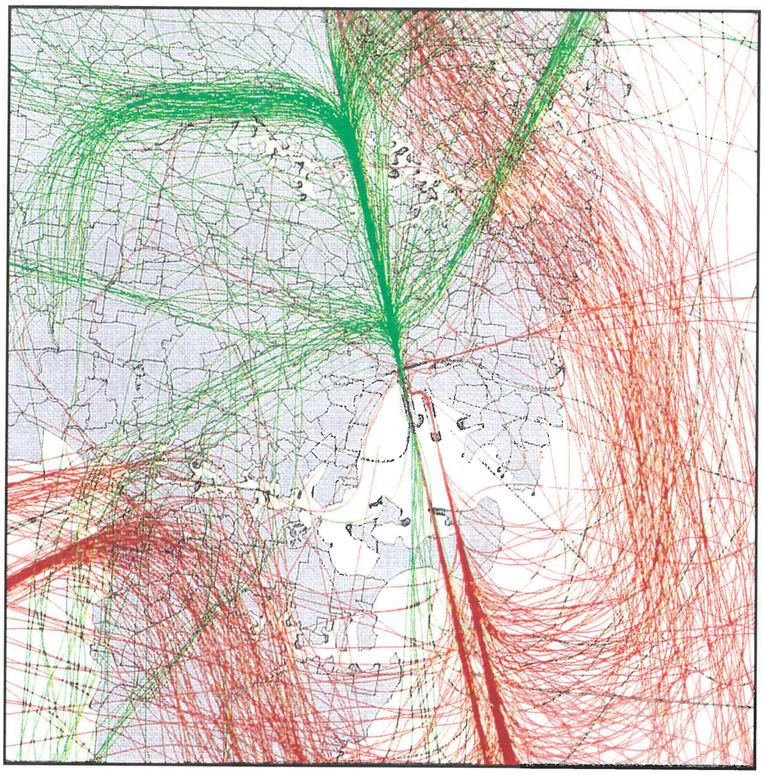
The introduction of parallel runway operations brought significant changes to the management of Sydney airspace, associated flight paths and air traffic control procedures. In planning the changes, a key aim was to make processing aircraft more routine, reducing the need for coordination between individual controllers and thus enhancing safety.

Aircraft had to fly different flight paths to those operating in the previous intersecting runway configurations. This generally involved flying greater distances around the city. For example, aircraft were more often required to fly a full circuit around the airport than have the opportunity to make a 'straight-in' approach.

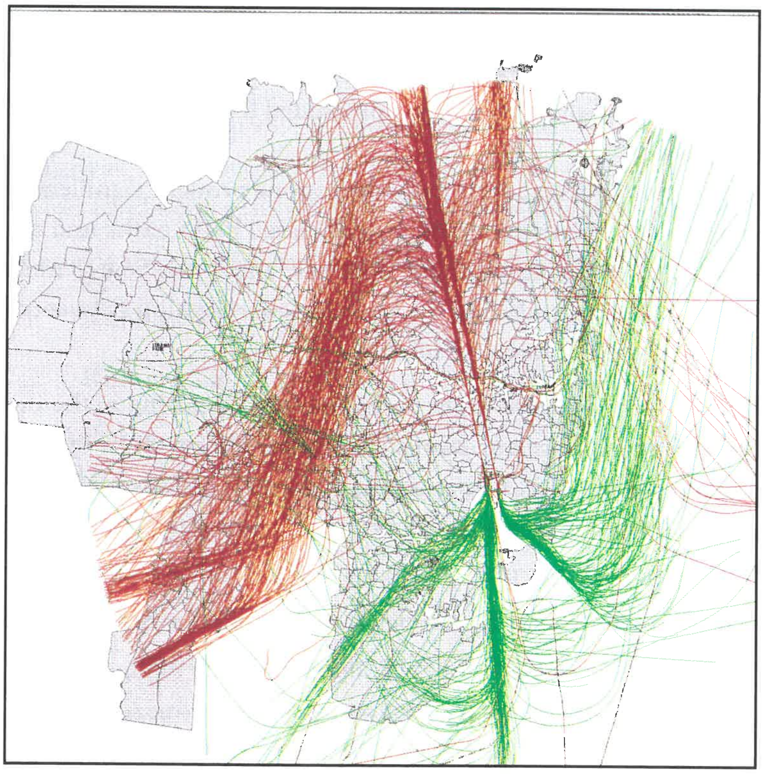
Climb and descent profiles had to be changed and, because of the planned increase in traffic, aircraft speeds had to be standardised.

In preparation for the use of parallel runways, a new system called Structured Airspace was introduced on 7 July 1994 which was consistent with international practice and met ICAO standards for parallel runway operations. The arrangements further segregated arriving and departing aircraft, enhancing safety and efficiency.

Maps depicting typical arrival and departure tracks for parallel operations at Sydney during 1995 are shown below.



Sydney
Kingsford Smith
All KSA Tracks
25 May 1995
Red=Arrival
Green=Departure



Sydney
Kingsford Smith
Friday 16/6/95
All Tracks
Red=Arrival
Green=Departure

When operations on the parallel runway commenced, revised noise abatement provisions relating to runway nomination were also introduced. The preferred runways for take-off and landing between 0600 and 2300 were the parallel runways with landings from the north (over the city) and take offs to the south (over Botany Bay).

The second preference for use of the parallel runways was to have landings from the south and take offs to the north. Take offs to the north on the new runway were precluded. The east-west runway was only used on a dedicated basis when either of the parallel runway operations were precluded because of weather conditions or the parallel runway was not operationally acceptable to the pilot in command.

A major component of parallel operations were Designated Flight Corridors. The Air Navigation (Aerodrome Flight Corridors) Regulations were introduced following the commencement of parallel runway operations at Sydney Airport.

These regulations defined corridors for both arriving and departing jet aircraft on the parallel runways and required that aircraft fly within, and not deviate from, the designated corridor, except when instructed or otherwise approved by Air Traffic Control for safety reasons. The corridors extended in the direction of the runway centreline for approximately six nautical miles from the aerodrome. The regulations provide for penalties where corridor regulations were breached. However, section 23 of the Air Navigation Act 1920 provides for certain defences in proceedings for offences against regulations made under the Act. (On March 28th 1996 the northern flight corridors were repealed, but corridors still apply to aircraft departing and arriving over Botany Bay).

Current Operations at Sydney (Post March 1996)

The direction issued to Airservices on 20 March 1996 required Airservices to take immediate steps, consistent with the requirements of the Act, to increase the usage of runway 07 / 25 (known as the east-west runway) at Sydney (Kingsford Smith) airport in order to distribute the noise generated at the Airport more fairly.

Consistent with this, the east-west runway is to operate in accordance with the following principles:

- the full length of the runway is to be available for use by both jet and propeller aircraft
- procedures involving independent use of the intersecting runways (such as the procedures known as SIMOPS) are not to be adopted
- usage of the runway should be directed, consistent with safety and efficiency of airport operations, towards achieving the earliest and maximum practicable reduction in the number of aircraft taking-off and landing over areas to the north of the Airport

Increased use of the East West Runway

From 3 April 1996 Airservices introduced arrangements to increase the dedicated use of the east-west runway during quite periods and suitable weather conditions.

The basis of this use was that the east-west runway would be nominated when the following criteria are met.

- 1200–1500 and 2000–2200 daily
- traffic demand (when forecast hourly arrival rate does not exceed 17)
- cloud base and visibility are suitable, maximum crosswind of 25 knots and no down wind
- the availability of the east-west runway for all aircraft types except those requiring the main north south runway for operational reasons

On 7 May 1996 further measures were introduced to increase the use of the east-west runway. The availability was increased from a maximum of five hours a day to six hours a day on weekdays (1100–1500 and 2000–2200) and up to 11 hours a day on weekends (1100–2200).

Use at such times depends on forecast hourly arrival rates not exceeding 18 an hour for a two hour period, favourable cloud and visibility conditions and crosswinds not exceeding 25 knots.

The east-west runway continues to be available for all aircraft types except those which require the main north south runway for operational reasons.

Runway 25 Departures and Runways 34L and R for Arrivals

New arrangements were introduced on 15 June, 1996 to allow take-offs to the west from the east-west runway and landings from the south over Botany Bay on the parallel runways. The new procedures are available between 1100—1500 and from 2000—2245 weekdays and between 1100—2200 on weekends subject to suitable weather conditions. On introduction, the scheduled arrival rate was not to exceed 22 an hour for a two hour period.

From 29 August 1996, the procedures for this mode of operation were extended to provide for the processing of up to 26 arrivals per hour for a maximum for two consecutive hours.

Runway 34R Departures and Parallel Opposite Direction Operations (Runway 16L Departures and 34L Arrivals)

From 19 October 1996, Airservices Australia introduced new procedures to further reduce the number of overflights of the areas currently exposed to the greatest levels of aircraft noise.

The first procedure involves take offs to the north from the new parallel runway (runway 34R) and turning east as soon as safely practicable, following existing flightpaths out to sea.

This procedure was introduced following a report provided to the Minister on 23 August 1996 confirming feasibility of aircraft taking off to the north from runway 34R.

The second procedure involves take offs and landings over Botany Bay during the sensitive early morning period and involves aircraft departing on runway 16L and arriving runway 34L.

This operation is currently available between 0600 and 0700 on Monday to Saturday and between 0600 and 0800 on Sundays. With this runway configuration or mode, the main north south runway continues to be available for those aircraft operationally requiring that runway.

Sydney Airport Curfew

The Sydney Airport Curfew Act 1995 regulates movement of aircraft at Sydney Airport between 2300 and 0600 local time. The Act prescribes certain types of aircraft that may operate, such as small jets satisfying 'ICAO Chapter 3' requirements, and 'low noise jet' requirements.

The permitted movements are:

- limited quota of BAe146 freight aircraft
- noise certificated propellor aircraft under 34,000 kg
- jet aircraft under 34,000 kg complying with specified noise standards
- limited international passenger jets in shoulder period 0500–0600
- emergency operations

Other requirements are:

- in curfew hours, all movements must be over Botany Bay
- runway 16L/34R is not available
- at weekends, between 0600 and 0700 and 2200 and 2245, movements must be over Botany Bay unless directed by Air Traffic Control from 2245 every day of the week departures must be over Botany Bay

The Act provides for the Minister or his/her delegate to issue dispensations in exceptional circumstances defined in guidelines issued by the Minister. The Act also limits the use of reverse thrust to the extent necessary for the safe operation of the aircraft during curfew hours and provides for appropriate penalties.

Chapter 4—Development of the Long Term Operating Plan

In his Direction to Airservices Australia, the Minister for Transport and Regional Development, the Hon. John Sharp MP, provided the following Terms of Reference:

- The safety of aviation operations is not to be compromised.
- All three runways at the airport, including the full length of the east-west runway (07-25), are to be available for use by jet and propeller aircraft.
- Maximum use is to be made of flight paths over water and non-residential areas.
- Where it is not possible for flight paths to be over water, the objective is to operate the airport to ensure that the overflight of residential areas is minimised and that noise arising from such flight paths is fairly shared.
- The capacity of the airport is to be maintained to the maximum practicable extent consistent with noise-sharing objectives, but the programmed movement rate is not to exceed 80 movements per hour.

The Task Force further developed the following principles as part of the process of review and development of the Long Term Operating Plan:

- The concept of respite is an integral component of fairly sharing aircraft noise, particularly for residents close to the airport. This means seeking to maximise the number of hours each day either totally free of aircraft movements or ensuring an absolute minimum of unavoidable overflights.
- To the extent practicable, residential areas overflown by aircraft arriving on a particular runway should not also be overflown by aircraft departing from the same runway.
- Flight paths for arriving aircraft should be developed to ensure as far as practicable that descent profiles of arriving aircraft are commensurate with low-power, low-noise operations.

Despite many public submissions to the contrary, the review did not consider that there would be any additional runway facilities, at Sydney Airport. However, the Task Force did consider other infrastructure developments such taxiway enhancements and changes to operational facilities, that would assist in optimising runway and airspace utilisation.

Airservices Australia then conducted an assessment on how runways are currently used and the impact of this usage on the Sydney community. This assessment also addressed how runways may be better used to ensure maximum aircraft movements over water and non-residential areas.

Based on this assessment and initial analysis of the objectives and requirements, the following foundations for the development of the long term operating plan were established:

- that new runway configurations or modes of operation be determined,
- that substantial changes to runway selection processes would be required,

- resulting from the determination of new runway configurations or modes and the identification of runway selection processes, fundamental changes in the patterns of runway use and in the operations of the Sydney Terminal control area would result, and
- consequential changes to enroute operations including an examination of military airspace would occur.

As detailed in Chapter 2, the Task Force then established a Permanent Working Group and four sub committees to deal with the specific areas of Runway Modes of Operation, Sydney Terminal Area control issues, En Route and military airspace issues and Environment issues.

In preparing the plan, Airservices has drawn extensively on the work of the Task Force, including community and industry representation, the large pool of operational experience and expertise of its employees, and independent traffic capacity studies by international experts.

The plan has two major components:

1. A set of 10 proposed modes of operation (runway configurations) that would allow for more or less regular changes of mode, providing periods of respite from noise to residential areas.

2. New flight paths and changes to controlled airspace in the Sydney Terminal Area (within 45 nautical miles of the airport) by taking flight paths beyond the more densely populated areas.

The proposed modes of operation have been designed to meet the Government's objective of maximising flight paths over water and non-residential areas and achieve fairer sharing of remaining aircraft noise. The plan will not compromise aviation safety standards and would maintain the efficiency of the airport.

Development and Selection of Modes of Operation

Of more than 4000 theoretical runway configurations, the Task Force began by eliminating all those which were impractical or that could not meet the Government's requirements. They included modes involving movements in opposite directions on the east-west runway, opposite-direction operations on runways 16 and 34, to the north, modes involving arrivals on Runway 16 and departures from Runway 25, modes that would involve too many flight paths over residential areas and too few over water or non-residential areas.

Other key considerations taken into account were:

- Effects of weather on availability of various runway configurations.
- Capacity of each configuration.
- Operational complexity of each configuration and associated airspace.
- Likely noise effects resulting from use of those configurations and associated airspace. Views expressed in public submissions.

- Limitations imposed by military airspace surrounding Sydney.
- Effects on flight paths which would arise from creation of a major airport at Badgerys Creek or Holsworthy.

By applying this process, the Runway Modes of Operation Working Group arrived at 16 modes of operation requiring detailed analysis.

To proceed to the next stage, the Runway Modes of Operation Working Group developed assessment criteria and listed runway configurations that would meet safety, environmental and operational standards. This included modes and runway operations suggested in public submissions that were within the terms of the Minister's direction.

The assessment criteria:

1. Air safety risk. Any risk to air safety inherent in the mode. Most risks are amenable to mitigation strategies.
2. Capacity. Some modes may only be operationally feasible at low traffic levels. The environmental acceptability of others may depend on limiting traffic.
3. Operations over water and non residential areas. A major objective.
4. Noise sharing. An important consideration for the flight paths that are not over water.
5. Population affected. Relates to the type of areas overflown.
6. New flight paths. The extent to which the mode would require overflight of areas not previously affected.
7. Total noise exposure. An assessment of the types and degrees of noise exposure caused by a mode.
8. Weather effect. Some modes would not be available because of wind conditions. The capacity of some modes would be significantly affected by low cloud or poor visibility.
9. Sector capacity. Some modes are more complex than others for air traffic controllers. A single controller can safely process more traffic in the less complex modes.
10. Tower traffic management. The feasibility of the mode from the tower operations (Ground Control and Aerodrome Control) perspective.
11. Terminal area traffic management. Feasibility from the terminal area controller's point of view with particular regard for airspace complexity.
12. En-route traffic management. Degree of interaction with route structure beyond the terminal area and the extent to which that structure may need to be modified.

13. Implementation risk. The feasibility of some modes may depend on such things as emerging technology or significant changes in airport structure that would effect the timing of implementation.

Using the above criteria, the number of possible Runway Modes of Operation was reduced from the initial 16 to 10, seven of which are currently in use. Subsequently, Mode 14A, a variation to Mode 14 was added, making a total of 17 modes.

Sabre Decision Technologies Runway Capacity Study

A fundamental consideration in selecting modes for use in the long term operating plan was the anticipated capacity that a particular mode would provide. Airservices Air Traffic Control staff were in a position to make professional estimate of the likely capacity of the 17 modes identified for further analysis.

However it was considered desirable to obtain independent advice on the potential capacity of these modes. Accordingly, after consultations involving the Sydney Airport Community Forum, Airservices engaged Sabre Decision Technologies (Sabre) to model the potential capacity of these modes. Sabre, a United States aviation consultancy company, was selected from two other international consultancies judged capable of carrying out the study.

In the study, Sabre included consideration of the existing airport layout, including runways, taxiways and terminals, and the effects of current operational procedures.

Sabre undertook its assessment using the United States Federal Aviation Administration's (FAA) Airport and Airspace simulation model (SIMMOD). The assessment involved quantifying the hourly capacity of each of the runway modes of operation identified by the Task Force assuming existing airfield layout (runways, taxiways and terminal layout) and current operational procedures.

Other key assumptions for the modelling included:

- The numbers of arrivals and the number of departures are equal for each individual mode.
- The traffic mix comprised 20 per cent light aircraft, 50 per cent medium aircraft and 30 per cent heavy aircraft (B767 and larger).
- Long haul operations which require runway 16R/34L are 16 per cent of jet arrivals and 19 per cent of jet departures.
- The airspace was modelled to an approximate 15 nautical miles radius to encompass final approach and initial departure flight paths.
- Winds of 10 knots or less, visual conditions and peak controller efficiency were assumed for maximum hourly capacity.

- Four hours of time was arbitrarily designated from 7 am to 10 am for the purpose of showing the rolling hour runway capacity for each mode.

The study required Sabre to recommend improvements and quantify benefits of changes to operational procedures and airfield layout (e.g. new runway exits, taxiways).

Mode	Arrivals	Sabre	Departures	Sabre	Sabre Total
1	34L	13	Current Curfew 16R	10	23
2	34R–16R (heavy)	27	16R	29	56
3	34L	21	16L–34L (heavy)	28	49
4	34L	15	16L–16R (heavy)	28	43
5	25–16R (heavy)	25	16L–16R	28	53
6	34L–34R	37	07–34L (heavy)	30	67
7	34L–34R	38	25–34L (heavy)	35	73
8	34L–34R		25–34R/34L (heavy)		78-80
9	34L–34R	44	34L–34R	38	82
10	16L–16R	49	16L–16R	38	87
11	16L–16R/07		16L–16R		56
12	07	23	07	10	33
13	25	22	25	11	33
14A	16R–07	26	16L–16R	49	75
15	34L	20	34R–34L (heavy)	35	55
16	34R–34L (heavy)		34L		62

Figure 6: Capacity for suggested modes of operation

Details of the Sabre results for the individual modes are outlined later in this chapter and a copy of the Sabre report is contained at Appendix 7.

Bureau of Meteorology Weather Study

The availability of individual runway configurations at Sydney is to a large extent influenced by the prevailing weather conditions. Average monthly availability of runways and runway configurations at Sydney Airport from January 1940 to December 1995, are given in Appendix 8.

The figures were prepared by the Bureau of Meteorology from adjusted synoptic wind observation data and are expressed as a percentage of the time in which aircraft could land or take off on a given runway or combination of runways within the limitations specified for the downwind and crosswind components.

The analysis assumed the maximum crosswind component of 25 knots, a maximum downwind component of 5 knots and a 'wet runway' frequency of 5 per cent which assumed a maximum crosswind of 15 knots and zero downwind. While these are more conservative than the operational requirements for wet runways, calculated runway availability's showed little sensitivity to the difference. An operational day of 0600-2300 was also assumed, to prevent any distortion which may have been occasioned by the generally lighter nocturnal wind strengths.

The figures indicate a broad balance between the single runway availability (about 70 per cent) and the availability of multiple runway combinations (about 50 per cent).

Seasonal conditions account for variations in average availability from a minimum of 57 per cent to a maximum of 95 per cent for single runways. Average availability of the runway combinations which were modelled ranged from a minimum of 28 per cent to a maximum of 78 per cent.

The detailed impact of wind conditions at Sydney on the individual 16 modes is discussed later in this chapter.

Factors affecting runway selection include how runways are selected, balancing the use of runway configurations and maximising the use of runway support facilities like taxiways.

In selecting a runway or combination of runways, air traffic controllers must consider:

- The type of aircraft.
- The effective length of the runway.
- Wind direction and speed.
- Weather, including wind gradient, wind shear, wake turbulence effects and position of the sun.
- The availability of landing aids when conditions require them.
- Disposition of other traffic.
- Taxiing distances.

- Implementation of 'preferred runway' systems, if workload or traffic conditions permit, in certain wind conditions, to provide the optimum traffic management configuration and comply with noise abatement procedures.

Without diminishing the importance of any of these considerations, wind velocity and 'preferred runway' systems are among the main determinants of runway availability.

Wind speed and direction, in relation to orientation of runways, will determine the availability of a runway or combination of runways.

In determining this availability, controllers take into account operational limitations, such as maximum crosswind and downwind components. When these components are exceeded, another runway or runway combination must be selected.

Generally, for completely dry runways the components are:

- Maximum crosswind 25 knots.
- Maximum downwind 5 knots.

For runways not completely dry:

- Maximum crosswind 25 knots.
- Zero downwind.

Variations to these components are part of the noise abatement procedures for Sydney Airport. The variations permit runways that are not completely dry to be used with a maximum crosswind of 15 knots and a maximum downwind of 5 knots, except that, under these downwind conditions, jet aircraft arrivals are restricted to Runways 16R and 34L.

Nevertheless, it is the responsibility of the pilot to ensure that the crosswind or downwind component is not greater than the maximum allowable for the aircraft in the prevailing conditions. This may result in a pilot requiring a different runway. Such requests are granted without loss of traffic priority.

At any airport actual runway use, as distinct from runway availability, is affected by air traffic management practices and may mean that runway use is considerably less than the availability, particularly if there are multiple runways with different orientations.

Historically, Sydney Airport has operated with a bias to a southerly flow of traffic by a 'preferred runway' system requiring that Runway 16 should be used unless the crosswind or downwind criteria were exceeded. The use of Runway 16 is well correlated to its calculated availability, whereas the use of Runway 34 is significantly lower than its availability. Continuing the 'preferred runway' system would maintain these correlation's and, consequently, the imbalance in usability across the different runways. This would impede attempts to make better use of all three runways to distribute airport noise more fairly.

To achieve a balance in runway usability it is necessary to consider the impact of the downwind component as it is one of the main determinants of actual use and needs to be uniform for all runways. This raises the question of whether it should be zero or 5 knots.

One of the major Air Traffic Control operational complexities which stems directly from the use of a downwind component is its impact in requiring an immediate change to the runway in use whenever the wind speed exceeds 5 knots.

For example, current practice requires that Runway 16 L & R is nominated as the runway in use with a downwind up to 5 knots, but 6 knots or more requires consideration of an immediate change of runway direction. This same immediacy however would also be required for a specified downwind criteria of zero if zero was absolute.

It is proposed, therefore, that the downwind component for runway nomination be specified as zero, but qualified so as to permit the runway or combination of runways to remain in use with downwind up to a maximum of 5 knots to enable a well planned and managed runway change.

This new criteria would provide additional time and therefore necessary flexibility in assessing and enabling a runway change to be undertaken with timely consideration of the disposition of traffic. This would provide a much needed improvement in the level of safety during a critical Air Traffic Services operation.

This greater flexibility would allow a desirable mode to continue to operate for longer than would otherwise be the case if the absolute was prescribed.

Having standardised the criteria for runway selection, Airservices also recommends the removal of the 'preferred runway' system and implement an alternating runway system with use based on time sharing and respite. The application of this system is discussed in Chapter 6.

The proposed alternating runway system is based on a selection of several runway modes of operation which, through the ability to change modes more or less regularly, would provide the means for a fairer distribution of noise and, where practicable, periods of respite.

A detailed analysis of each of the 16 modes of operation including capacity, environmental considerations and proposed usage appears later in this chapter.

Infrastructure Enhancements

Current operational facilities within Air Traffic Services and on the aerodrome reflect the needs identified when planning for airport operations as they can be anticipated.

Changes to operating practices can make previous assumptions invalid. The changes proposed in this plan reduce the concentration of dedicated parallel operations and will require some facility changes to be undertaken to ensure that the noise sharing benefits gained from the new operations can be maintained with traffic growth.

Operations involving crossing runways introduces a complexities for Tower control staff which create coordination requirements with other controllers.

The additional workload created by this coordination impacts on the traffic handling abilities of the controllers. To ensure that efficiency is maintained, it is recognised that Tower facility changes will be required to provide, for some operating configurations, an Aerodrome Control Coordinator position. This may also impact on staff requirements.

In proposing the Modes, the Task Force has also identified a number of additional taxiway enhancements which will be required, in order for the airport to function efficiently under the new arrangements, and maintain high hourly movement rates within the proposed movement cap. The Runway Capacity Study undertaken as part of the Task Force review, found that the taxiway enhancements (particularly of rapid exit taxiways) would increase runway capacity by two to four movements per hour, depending on the mode in use.

In their review Sabre used early taxiway proposals that were provided to the Task Force by the Federal Airports Corporation (FAC) representative. Subsequent work by the FAC, in consultation with Airservices has refined those proposals to enhance the efficiency of the aerodrome.

The provision of these taxiways would be the responsibility of the FAC. At this stage the FAC is preparing cost estimates and concept designs, prior to seeking its Board approval for the expenditure of funds. A final taxiway package and detailed works program has yet to be developed by the FAC in consultation with stakeholders. A key feature of the works program, will be to ensure that the airport is able to function normally during the construction period, with minimal disruption to day-to-day operations. However there may be some impact on the availability of particular modes during the construction phase.

It is expected that the capital cost of the taxiway works will exceed $6 million. Successful completion of infrastructure enhancements is essential to enable the plan to remain effective as traffic levels increase.

Second Sydney Airport

In May 1996, the Government reaffirmed its commitment to build a second major airport for Sydney, subject to the results of an Environmental Impact Statement (EIS). The Government decided to broaden the EIS to include Holsworthy as well as Badgerys Creek. While Badgerys Creek remains the

Government's preferred site it was considered prudent to include Holsworthy in case Badgerys Creek proves to be environmentally unacceptable.

In November 1996 it was announced that five design options are being considered in the EIS for the second airport, namely three for Badgerys Creek and two for Holsworthy.

The proposed operational modes for Sydney Airport will at least be valid until the second airport is ready, which will not be before the early years of the next century. When the second airport is ready it will be necessary to review the airspace management arrangements for the Sydney region and this may lead to changes to the flight paths for Sydney airport.

Preliminary work on the airspace management arrangements for the second airport is being undertaken for the EIS by the Department of Transport and Regional Development, in conjunction with Airservices Australia.

Terminal Area Procedures

In developing new airspace procedures for the Terminal Area the associated flight paths were determined taking into account many factors. These included:

- Compliance with established air traffic separation standards.
- Performance characteristics of aircraft.
- Destination or point of origin of the flight.
- Location of ground navigation aids for non-area navigation equipped aircraft.
- Established en route structure beyond the terminal area.
- As well as these operational standards, two other factors used in determining flight paths are:
  Minimising flights over populated areas.
  Maximising flights over water.

In order to minimise unnecessary flight over populous areas, flight paths for aircraft inbound to Sydney should be moved beyond the major population area and as a consequence maintain as high a level as practicable, commensurate with a low power/low noise flight.

Implementation of new airspace structures requires considerable development including extensive modelling and simulation in Air Traffic Services simulators as well as the use of aircraft systems. The current airspace was developed over a period of two to three years preceding the introduction of parallel runway operations. Any change proposed in this report will require similar effort, all of which could not be finally achieved during the course of the Task Force study.

Availability of operational staff and access to simulator facilities had to be balanced with the operational demands of the ongoing Air Traffic Services system, as well as preparation for the introduction of interim measures, such as Runway 34R departures and independent opposite direction operations. Further development must continue with a pre-implementation stage, subject to acceptance of Task Force recommendations.

The significant areas of change in this initiative will be the tracking of aircraft on paths that are further displaced from the immediate vicinity of the airport and the spreading of departure tracks after takeoff which will share the impact of aircraft operations.

Nominal track distances to be flown by arriving aircraft using this procedure were assessed and compared with current practice. Traffic to Runway 16 would fly 79 nm compared with 73 nm to a 10 nm final or 84 nm for a 15 nm final using current routes. Traffic to Runway 34 would fly 73 nm compared with 63 nm to a 10 nm final, 73 nm to a 15 nm final or 85 nm to a 25 nm final.

This additional track distance is a cost which has to be borne by the aviation industry. Higher, and therefore more economical descent profiles will contribute to offset this cost impost.

Arrival paths to Runways 16L and 16R

For aircraft landing on Runway 16, towards the south, the new track from the south and western points of origin will take them from the Camden area at an increased altitude via Richmond to a 'gate' approximately 20 nm to touchdown. Whilst this, thus far, has avoided areas of major population and in particular a downwind leg over such suburbs as Bankstown, Auburn and Parramatta, the options for avoiding concentrated flight paths to the airport are limited.

A consequence of this initiative is the loss of flexibility for fine tuning the arrival sequence, a feature of the current airspace arrangements. This will have an impact on the capacity of the airport when arrivals are from the north.

In addition to these aircraft, traffic from northern port of origin track to join the extended centrelines of the runways and further add to the concentration of traffic. Aircraft arriving from the east will cross the coast around Newport at 6000-8000 ft. As most of these aircraft are large passenger types, Runway 16L is not suitable for their operation as the landing distance available is too short. Consequently they will be tracked to land on Runway 16R. Currently there are only about 30 aircraft per day operating on this route and then only when Runway 16 is the nominated arrival runway.

Aircraft need to be aligned with the runway in stable flight for at least the last 1000 ft of their descent. This equates to the last three miles to touchdown.

The operational standard for independent parallel approaches includes requirements that;

- the aircraft is established on centreline by 4nm from the runway threshold
- a minimum of 1000ft or 3nm is maintained between conflicting aircraft until;
    - one aircraft is established within the final approach fix (IAF) when both aircraft are established on the localiser in visual conditions.
    - one aircraft is established on the localiser in visual conditions and the other is on a heading to intercept final inside the furthest IAF with the runway reported in sight

- both aircraft are established on a heading to intercept final inside the furthest IAF with the runway reported in sight

- Radar vectors must be such to enable the aircraft to intercept final course at an angle of not greater than 30 degrees.

In essence, in constructing the minimum flight path in visual conditions, it requires a line from the runway threshold along the extended centreline of the runway to a point 4nm along the track then at 30 degrees to the track until displaced at least 3nm from the adjacent parallel flight path. From this minimum point the track can vary so long as it maintains that 3 nm displacement. Some allowance must be made for the turning radius of the aircraft and that aircraft must be established on final by 4nm.

It is considered necessary, in an effort to share the noise burden, to diversify the arrival paths of aircraft in the latter stages of their descent, to the extent practicable and to this end the requirements of the Independent Visual Approach standard can be used to advantage. It is proposed that, in order to avoid the concentration of traffic on the localiser tracks to Runways 16L and 16R, three separate indicative inbound paths be established and that traffic be equitably distributed across these paths.

Many submissions to the Task Force stated that aircraft tracking on either localiser track created a noise nuisance to the same group of residents such that the effect of operations on the 16 parallel runways created continuous disruption as the noise from one aircraft receded as the noise from the next aircraft, albeit on the other flight path, began to build.

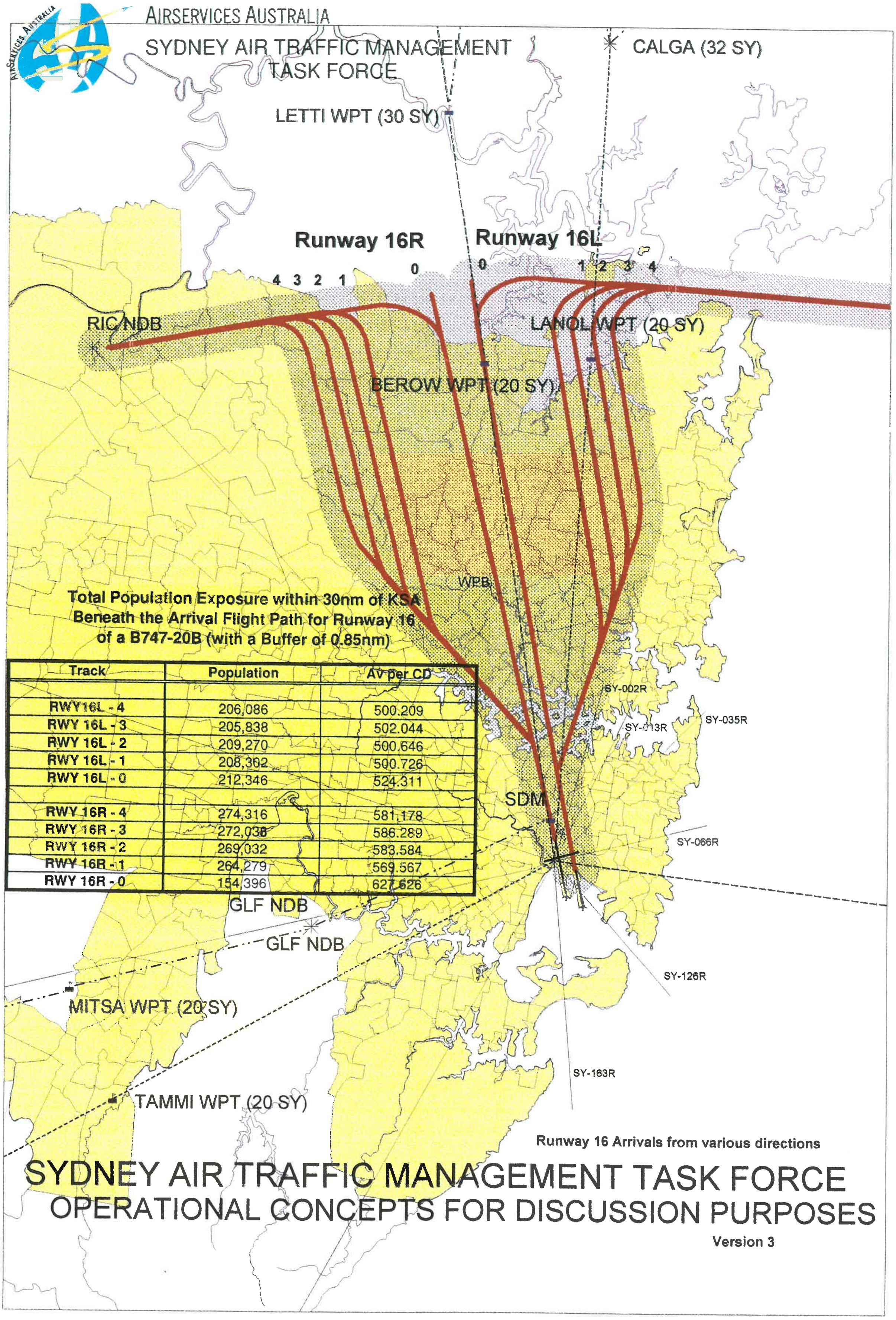
If one were to take the typical noise footprint of a Boeing 747-200 at 60 dB(A), which is approximately 3.2 km wide, and place this on both runway localiser tracks, it can be seen that as there is only approximately 1 km between the tracks, there is significant overlap of the noise.

In recognition of this fact, these two tracks should be treated as one for the purpose of assessing noise exposure. Two alternate nominal tracks can be established, one on either side of the localiser tracks but displaced sufficiently to ensure to the extent practicable there is no overlap between the noise footprints of the flight paths.

If aircraft were to be distributed across the three nominal tracks, the burden of aircraft overflight can be further spread to share the noise. As the outer flight paths converge on the centrelines to enable the aircraft to align with final approach to the runways there must be a convergence of the noise events until the point four miles from touchdown when aircraft are tracking directly to the runway to land.

There are few obvious tracks to the north of the airport which do not involve considerable overflight of populous areas with the exception of Ku-ring-gai Chase and Garigal National Parks. Figure 7 shows a selection of possible nominal tracks that have adequate displacement from the centrelines to minimise noise overlap, together with the population overflown.

Figure 7: Possible alternative tracks to north of Airport.



Track	Population	Av per CD
RWY16L - 4	206,086	500.209
RWY 16L - 3	205,838	502.044
RWY 16L - 2	209,270	500.646
RWY 16L - 1	208,302	500.726
RWY 16L - 0	212,346	524.311
RWY 16R - 4	274,316	581,178
RWY 16R - 3	272,038	586.289
RWY 16R - 2	269,032	583.584
RWY 16R - 1	264,279	569.567
RWY 16R - 0	154,396	627.626

Indicatively, were these three nominal tracks used, the sharing of traffic movements could be shown as follows:

The current traffic mix over 24 hours at Sydney is estimated as:

Operation Type		Port of Origin			
• International Aircraft	15%	South	7%	North	8%
• Scheduled Domestic Jets	40%	South	20%	North	20%
• Scheduled Props	32%	South	17%	North	15%
• General aviation	7%	South	3%	North	4%
• Curfew operations	4%				
• Helicopters	2%				

A majority of International aircraft require the straight in flight path. One in four domestic jets will require Runway 16R.

The proposed distribution of traffic on the three flight paths, west (A) centre (B) east (C), assuming 40 arrivals per hour would be:

		%	Average No. of Aircraft per hour
A	All southern domestic jets	20.0%	9
	Half southern props	8.5%	3
	Half general aviation	4.0%	2
	Total	32.5%	14
B	All International Jets	15.0%	7
	Half northern props	7.5%	3
	Northern jets for 16R	5.0%	2
	Total	27.5%	12
C	Northern jets for 16L	15.0%	7
	Half northern props	7.5%	3
	Half southern props	8.5%	3
	Half general aviation	3.0%	1
	Total	34.0%	14

The slight inequity in distribution of jet traffic over the three flight paths is a product of the unequal landing distance available between 16L and 16R and the anticipated operational requirements of some jet operations.

Foreign international aircraft are not permitted to participate in independent parallel approach operations, except where they are established on the straight in approach path. This is a CASA requirement associated with familiarisation with the standard and training requirements. It is also a sound, long established practice which recognises operational difficulties associated with infrequent flight by these aircrews into Sydney and an adherence to published procedures to preempt any language difficulties.

The area covered by the flight track is depicted in the attached flight path map for mode 10 later in this chapter, as a broad area, known as the 'Trident', to indicate the extent of the total area likely to be affected by arriving aircraft.

There should be no concentration of traffic on any particular path as this would amount to the reintroduction of flight corridors, albeit over different people. Subject to weather conditions prevailing and the need for instrument approaches, aircraft tracks will be varied within this area to achieve noise sharing to the greatest extent possible.

Early simulation of this proposal has shown that there is a potential loss of capacity using this airspace arrangement when compared with current arrangements as previously stated. This is due to difficulties associated with processing aircraft from the south to Runway 16L, necessary to balance arrivals across the two runways, and a higher level of flow control input to compensate for the lack of flexibility in close downwind tracking.

Should there be any change to fleet mix over time, additional measures may need to be taken to ensure an efficient throughput of traffic is maintained. This proposal will be subject to the monitoring processes recommended to ensure its continued effectiveness.

Departure Paths from Runways 34L and 34R

Where traffic departs from Runway 34L or Runway 34R there is more opportunity to use various headings after departure which will share the noise over a wider area and thus lessen the impact of concentrated traffic.

Aircraft using Runway 34L for departure will consist of jet traffic to the west and northwest, non-jet traffic to the west, northwest and south and other aircraft which may operationally require the use of the long runway. For traffic departing Runway 34L departure tracks will be varied, to the extent practicable, but will normally be a reflection of the ultimate destination of the aircraft. This is necessary to avoid complex cross-overs of traffic which will have safety implications. It is proposed that, over time, the distribution of traffic on the nominal tracks shown on the plan be equitable, monitoring over a short period, say one hour, may not show that equity if there is a concentration of departures to similar destinations.

The principle of avoiding areas that are subject to concentrated exposure to arriving air traffic will also be employed to the extent practicable. Consistent with this principle the flight path maps indicate that these aircraft turn to the west after takeoff and would eventually turn east and overfly additional suburbs further north of the airport. However, it is anticipated that there maybe some opportunity in light traffic periods for international aircraft bound for destinations to the east of Sydney to continue on runway heading as this will enable them to be turned to the east as early as possible, thus minimising flight over land. All other aircraft will be turned to the southwest, west or northwest after takeoff, depending on their ultimate destination.

Aircraft using Runway 34R for departure will consist of jet traffic to northern and southern destinations, and non-jet traffic to northern destinations.

The departure tracks currently in use for these aircraft take all jet aircraft over the golf course area to the east of the aerodrome and over the coast at Coogee, and non-jet aircraft over the Moore Park, Centennial Park areas towards South Head.

These tracks were designed to make use of the open golf course area, and the shortest route to the sea, to facilitate over water tracking, and to avoid the 'obstacle clearance area' posed by the city. Additionally, the design had to satisfy the requirement of the independent parallel runway separation standard, which dictates a turn of a minimum of 15 degrees to the east from runway heading.

Further limitations to aircraft departing on these tracks is occasioned by arriving aircraft operating on southbound flight paths to the east of the coast. This arriving traffic flow limits the climb of the departing traffic until separation between the flight paths is achieved. With the current aircraft fleet mix using Sydney Airport, this altitude limit is 5000 ft to accommodate non-pressurised aircraft which service destinations to the north.

As the Eastern Suburbs of Sydney are densely populated, there are few opportunities to identify alternative tracks that could be used over less populous areas than the two in current use. Also, the track to Coogee, whilst over significant open land in the vicinity of the airport and providing the shortest track to the coast, is almost the reciprocal of the arrival track from the east to Runway 25. The Task Force sought to avoid this where possible, and also to provide more than one departure track, where practicable, to share the noise. The Task Force was also mindful of the impact of any track over the Prince of Wales Hospital at Randwick.

To accommodate these aims, a track to the south of the existing Coogee track over the Maroubra/Matraville area was considered. It was foreseen that a major limitation for the use of this track would be the requirement for departing aircraft to be held to an even lower altitude (than on the Coogee track) until well east of the coast due to the conflicting paths of arriving aircraft. It was recognised, however, that should future changes to the aircraft fleet mix result in small aircraft being replaced by aircraft with better performance characteristics, then a higher altitude restriction could be used.

Following representations arising from public consultation, Airservices conducted preliminary simulation to determine the optimum easterly departure track to the extent that it is possible to minimise flight on the reciprocal of the arrival track from the east and still achieve a reasonable initial climb altitude for the departing aircraft. As a result of this simulation, it is proposed that jet aircraft departing for southern destinations be directed to use a track over the golf courses, but further to the south of the existing track, crossing the coast south of Coogee.

A third track that would take aircraft over Alexandria and Waterloo and then over the City was also considered feasible. This requires aircraft to climb at a steeper gradient than is required for other tracks due to the height of city buildings. The complexity of aircraft tracking requirements and conflict with departing jets crossing the outbound track of non-jet aircraft in the Manly area would mitigate against jets using this track.

It is proposed therefore that jet aircraft departing for northern destinations be directed to track over Moore Park/Centennial Park and that non-jet aircraft use the track over the city.

Arrival Paths to Runways 34L and 34R.

Aircraft arriving from southern and western ports of origin will track from the Camden area at higher altitudes than are presently the case and proceed clear of the major areas of population to cross the coast well to the south of Port Hacking. From there, tracking will be over water until crossing the Kurnell Peninsula on final approach to the runway.

Aircraft from the north will track towards the sea, leaving the inbound track 60 km north of the airport and cross the coast 40 km north. From there, tracking will be over water until crossing the Kurnell Peninsula on final approach to the runway.

Following simulation of a number of flight track proposals from the north, it was concluded that the path depicted on the maps, which has jet aircraft crossing the coast between Newport and Barrenjoey, is required to meet requirements. Availability of navigation aids for aircraft not equipped with area navigation systems, such as GPS, dictated that non jet aircraft turned to the east after reaching the navigation aid at Calga (Central Coast).

Segregation of jet and non-jet paths is required due to the significantly different performance characteristics of aircraft types. Were jet aircraft to be turned seawards earlier and cross the non-jet path, a separation complexity would have been introduced that would impact on efficiency in order to maintain safety.

Similarly, the angle at which the track intercepts the new southbound routes east of the coast needed to be at an appropriate angle that ensures aircraft do not overshoot the intercept and come into conflict with northbound departing traffic.

Altitudes of arriving aircraft will be commensurate with their planned track miles to touchdown but when over land will be significantly higher than current practice. Aircraft to the north will cross the coast, between Newport and Barrenjoey, at approximately 10,000 ft.

The practice of aircraft tracking over Menai-Grays Point and over the inner Northern and Eastern Suburbs will, in normal circumstances, be avoided.

Submissions to the Task Force from Kurnell residents proposed that aircraft track inbound via Botany Bay Heads for a landing. There is insufficient room to manouvre an aircraft for a stabilised approach from 500-700 feet and still remain clear of the Kurnell village.

Departure Paths from Runways 16L and 16R

Current departure tracks for jet aircraft through Botany Bay Heads and over the Kurnell sand hills will continue to be used whilst non-jet aircraft will continue to use existing tracks to the east and west of these jet tracks.

Consideration is being given to amending the flight path which is aligned, over water, just to the east of Cronulla. One option is for aircraft to turn left after crossing the Kurnell Peninsula to track further to sea. This proposal requires testing in aircraft simulators to assess the additional cockpit workload generated by requiring jet aircraft to execute a series of turns in quick succession, shortly after takeoff. There is also the possibility that there could be an increase in the noise experienced at Cronulla as aircraft turn, with jet efflux directed at the coast and an assessment of the relative noise exposure should be undertaken to assess the benefits.

Alternatively, aircraft could track on runway heading or further to the right, but not as far right as the current track, to position them further to the sea off Cronulla. This would have a greater impact on Kurnell residents but would not compromise the independent parallel separation standard nor add to cockpit workload.

Another option under consideration is for all jet aircraft bound for southern destinations to depart from Runway 16L and track to sea via Botany Bay Heads. These aircraft make up 18 per cent of all departing traffic and would reduce the amount of jet aircraft over water but in close proximity to Cronulla by over 40 per cent. The impact on Kurnell and Botany must be considered.

Further assessment of these options is required to confirm the noise benefits perceived.

Aircraft Both Arriving and Departing over Botany Bay

Runway Modes of Operation 1,2,3 and 4 involve aircraft departing in a southerly direction and arriving towards the north. Flight paths primarily have an effect on residents to the south of the airport.

Mode 1 is the current Curfew operating mode and only involves use of the main runway. All arrivals track over the western edge of the Kurnell village and departures track over the sand hills further to the west.

Whilst traffic levels are low during the curfew period, operational complexity is compounded by keeping outbound aircraft in potential conflict with arrivals for a considerable period.

It is proposed that those aircraft departing from Runway 16R, which are able to remain clear of the Kurnell village, be permitted to turn left after takeoff and track through Botany Bay Heads to minimise this conflict.

Aircraft types operating during the curfew do not include heavy jet departures and most are quite capable of containing their flight over water, within the bay. This procedure was permitted until January 1995.

Submissions to the Task Force from Kurnell residents proposed that aircraft track inbound via Botany Bay Heads for a landing. There is insufficient room to manouvre an aircraft for a stabilised approach from 500-700 feet and still remain clear of the Kurnell village.

Modes 3 and 4 involve aircraft departing from Runway 16L and tracking through Botany Bay Heads and arriving aircraft tracking over the western edge of the Kurnell village to land on Runway 34L. These Modes provide maximum over water tracking and should be used whenever weather conditions permit.

In Mode 2, all arriving aircraft track over the Kurnell village to land on 34R. All aircraft would depart from Runway 16R. This would place aircraft very close to or over Cronulla and would negate any initiatives discussed above to move aircraft further to sea off Cronulla.

To meet the required separation standard, the minimum divergence between the departure and arrival tracks is 15 degrees. This would place departing aircraft over, or in close proximity to, Cronulla. Any greater divergence between the departure and arrival paths increases the requirement for aircraft to track further over land with this mode, defeating the purpose of the opposite direction operation—to confine operations over water.

The standard established for Mode 3/4, where there is a divergence of 30 degrees, limits independent operations to the two runways when there is a cloud base of less than 2500 ft or visibility less than 8 km. Initial implementation of simultaneous opposite direction operations has specified a cloud base of 3000 ft and a visibility of 10 km to better provide for controller and pilot familiarisation. Unless independent operations are available, traffic movement rates can be little better than Mode 1 with the enhancement of a left turn after departure.

Any angular difference of less than 30 degrees will require further restriction to the weather minima applicable. The diagram for Mode 2 reflects this 30 degree divergence as the availability of the mode would be significantly limited by the higher weather minima requirement.

The flight path map for Mode 2 depicts arrival paths from the southwest which overfly populous areas to the north of the airport.

To enable this mode to achieve the traffic capacities modelled, arrivals and departures need to be segregated to minimise traffic confliction and therefore complexity. This precludes tracking this traffic to the south of the airport. Tracking further to the north. clear of populous areas would create a significant cost penalty to aircraft operators. Aircraft on the depicted track would be approximately 10,000-12000 ft over the Bankstown area and 8000 ft crossing the coast.

It is proposed that aircraft bound for western destinations that depart from Runway 16L under Mode 3 or Mode 4 climb east of the coast to reach an altitude of 10,000 ft before crossing the coast westbound around Sydney Harbour.

Flight paths showing aircraft turning to track back over the airport in Mode 15 would include altitude requirements to ensure aircraft reach an altitude of 10,000 ft before re-crossing the airport.

Arrival Paths to Runway 25

Aircraft arriving from southern and western ports of origin will track from the Camden area at higher altitudes than are presently the case and proceed clear of the major areas of population to cross the coast to the south of Port Hacking. From there, tracking will be over water until crossing the coast at Coogee on final approach.

Aircraft from the north will track towards the sea, leaving the inbound track 60 km north of the airport and cross the coast 40 km north as discussed above. From there, tracking will be over water until crossing the coast at Coogee on final approach to the runway.

The altitude that aircraft cross the coast on approach to Runway 25 is approximately 1200 ft AMSL which is an altitude commensurate with the distance to run to touch down.

Departure Paths from Runway 07

Departing traffic from Runway 07 will follow the paths discussed above under Runway 34R Departures. Currently the tracks used take all jet aircraft over the golf course area to the east of the airfield crossing the coast at Coogee. This is the shortest route to the sea to facilitate over water tracking. Non-jet aircraft track over the Moore Park, Centennial Park area towards South Head.

The track to Coogee, whilst over significant open land and providing the shortest track to the coast, is almost the reciprocal of the arrival track. The Task Force sought to avoid this where possible and also to provide more than one departure track, where possible, to share the noise. The Eastern Suburbs of Sydney are densely populated and there are few opportunities to identify alternative tracks that could be used over less populous areas than the two currently used. The Task Force was mindful of the impact of any track over the Prince of Wales Hospital at Randwick. This precluded the establishment of any additional track between the two established tracks.

A track to the south of the existing track, over the Maroubra/Matraville area would be available for non-jet aircraft or at times for jet aircraft to the south to provide the diversity of tracking and to avoid the use of the reciprocal arriving flight path. Unlike the flight paths associated with arriving traffic to Runway 34, there is no potential conflict between departures and arrivals when Runway 07 is used by itself.

A track that takes non-jet aircraft over the industrial areas of Alexandria and Waterloo and thus over the city would also be utilised to provide variation in tracking, thus sharing the noise. This track requires aircraft to climb at a steeper gradient than required for other tracks due to the height of the city buildings.

Departing jet aircraft will reach altitudes of approximately 4000 ft crossing the coast at Coogee or 5000 ft in the Dover Heights area. Climb performance will not be hindered by conflicting arriving traffic east of the coast where Runway 07 is in use and these altitudes may well be exceeded, depending on prevailing weather conditions and aircraft weight. However altitudes over a geographical point, particularly in the early stages of flight, are generally lower than those achieved by aircraft that depart Runway 34R because the distance travelled from the start of the take-off roll is less.

Once aircraft are established east of the coast over water tracking can be employed for most aircraft until beyond the areas of major population. Where jet aircraft are bound for western destinations it is proposed that an altitude requirement of 8000-10,000 ft be reached before re-crossing the coast to the north of the airport.

Arrival Paths to Runway 07

Arriving traffic to Runway 07 from northern departure points will be tracked further to the west than the current flight paths to be positioned for final approach in the Camden area at an altitude commensurate with a low power/low noise descent profile.

Whilst there will be some variation in the flight paths beyond 10 nm, closer to the aerodrome aircraft will be aligned with the runway.

Aircraft arriving from the east will be held above the departing traffic and cross the coast at Port Hacking at an altitude commensurate with the distance to run to touchdown. It is anticipated that this altitude will be approximately 10,000ft. Simulation during the implementation phase will be undertaken to optimise this track and altitude.

Departure Paths from Runway 25

Departures to the west will track on diverse paths which, to some extent will be determined by the ultimate destination of the aircraft. It is proposed that, over time, the distribution of traffic on the nominal tracks shown on the plan be equitable. Monitoring over a short period, say one hour, may not show that equity if there is a concentration of departures to similar destinations.

The track depicted on the flight path maps showing aircraft departing Runway 25 and tracking to the east over Sydney Harbour would not be a frequently used track as this runway is generally unsuitable for use by aircraft to oceanic destinations except in strong headwind conditions.

Avoidance of the reciprocal approach path will be employed to the extent practicable, in particular for western and northern jets. In order to utilise non-populous areas, particularly the area associated with the Holsworthy military establishment, it may be necessary to maintain southbound aircraft on runway heading for approximately 8 nm before turning to the south. The point at which the aircraft commence their turn and thus the altitude of the turn will vary with tracking requirements and provide some variation in flight paths to limit noise concentration.

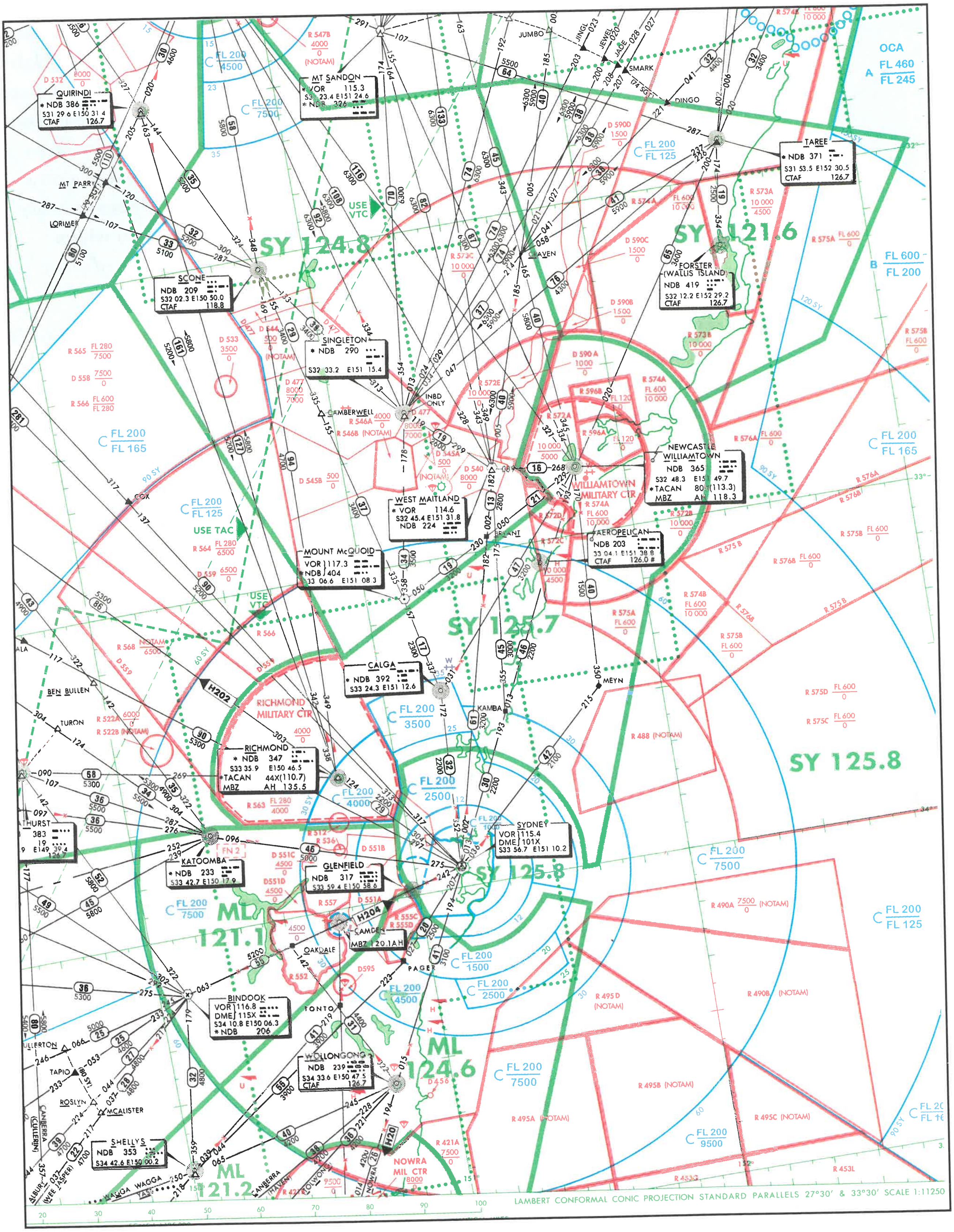
Military Airspace

Sydney Airport and the associated terminal area airspace has always been surrounded by designated military airspace. This has impacted on the movement of aircraft and the management of civil controlled airspace and has constrained civil flight paths.

The Royal Australian Air Force (RAAF) is responsible for airspace associated with air bases at Richmond to the northwest and Williamtown to the northeast of Sydney.

The Army has an artillery range at Holsworthy, 20 km to the southwest and the Navy has airspace for flying, gunnery and missile firing off the coast to the northeast, southeast and around the Royal Australian Naval Air Station at Nowra.

Figure 8: Military airspace map.



Richmond

Richmond airspace has constrained aircraft tracking on downwind legs, forcing them to overfly populous areas. Whilst there are large areas of airspace to the northwest of Richmond which are used for training and practice of high speed fighter aircraft, this is sufficient distance from Sydney so as not to impact adversely on Sydney operations. Generally access to the Richmond areas has been made available for aircraft on track to and from destinations in western New South Wales but this has been achieved by passing control of the aircraft to RAAF Air Traffic Controllers. However, transfer of control responsibility is not appropriate for aircraft manouvring within the terminal area where speed control, sequencing and tracking is critical to the movements of other aircraft in an arrival stream.

There is in principle agreement for Airservices Australia to provide Air Traffic Services over Richmond. Negotiations between the RAAF and Airservices are being conducted at a senior level to accommodate the transfer of airspace within the vicinity of the Richmond Air Base to civil Air Traffic Control. This will include airspace above 6000 ft which will still allow low level flying activity at Richmond controlled by the RAAF. The airspace associated with FA18 fighter operations is not required for civil operations and there is no proposal to affect this area.

Williamtown

Military Restricted Areas around the Williamtown Air Base north of Newcastle does not impact severely on Sydney Terminal Area traffic. Access for civil traffic through the provision of Civil Jet Corridors for northbound jets has been negotiated, but not yet implemented. [Currently requests for access to the airspace are usually accommodated by Williamtown RAAF ATC]. Although consideration was given to reversing the flow of traffic between Sydney and Brisbane, which would have impacted on the areas, there is no proposal to alter the current arrangements.

Holsworthy

Holsworthy Firing Areas, 20 km to the southwest of the airport is airspace administered by the Australian Army. The airspace is not permanently active and is divided into four areas. The northern portion is active from ground level to 1500 ft from 7 am until 9 pm and at other times when notified by NOTAM. This area is used for small arms firing. The area above that is only activated when required for a specific flying or firing activity to an altitude required to contain the projected activity.

The southern portion is normally active from ground level to 3000 ft from 7 am until 9 pm unless otherwise notified and above 3000 ft, for specific periods of artillery firing.

Military activity within the lower airspace is not a constraint to civil aviation. Activation of the airspace above 3000 ft is a constraint, however the airspace is relatively small and aircraft diversions are employed to avoid the area or coordination between Air Traffic Control and the Range Control Officer is accomplished to halt the firing permitting the safe passage of aircraft through the area.

Activation of the airspace at the higher levels is likely to have infrequent impact. Activation occurred on 75 days out of the 325 days until 20 November 1996 and then only for limited hours in the day. This firing activity is not normally above 6000 ft and most departing aircraft can reach an altitude that allows overflight of the area.

Diversion of aircraft around the area, when it is active, will necessitate the overflight of populous areas but is anticipated to be infrequent. The major impost will be on Runway 25 departures, turning to the south.

Naval areas

The Royal Australian Navy operates the Naval Air Station at Nowra, NSW. The airspace associated with flying activities based at Nowra and fleet support operations for ships from Sydney Harbour, in the waters to the east and southeast of Sydney has constrained civil aviation operations at Sydney.

Flight paths have been designed to accommodate the military requirements. The areas are not permanently active and access to civil air traffic has been available when there is no conflicting military activity or when necessitated by weather diversions although the coordination to achieve this through Fleet Headquarters is cumbersome and inefficient for short notice changes.

Activation of the areas normally only occurs Monday to Friday and airspace activation for 1996 up until 20 November have been 89 days for R495D, average activation 6.7 hours, 27 days R488, average activation 2.1 hours and 40 days R490A/B, average activation 5.3 hours.

The redesign of Sydney's airspace, moving flight paths further to the south and east, will move aircraft into airspace which is currently designated for Naval activity. The Royal Australian Navy has reviewed the civil requirements of the proposed new flight paths and has agreed in principle to amended airspace boundaries that will meet the needs of Airservices Australia and also accommodate naval activities without undue penalty.

In particular Restricted Area 495D and Restricted Area 490 will be reduced in altitude within 30 nm of Sydney and the boundaries of Restricted Area 488 will be moved further east but expanded to the north to compensate for the area lost.

Formalisation of the agreed amendments and publication of the revised areas will be undertaken as part of the implementation process.

En Route Airspace

Air routes outside the terminal area of Sydney have been designed, and revised over the years, to provide separation assurance through the segregation of inbound and outbound traffic as well as providing alternate routes for aircraft whose performance characteristics are not compatible. The main areas where this is achieved are to the north, south and west which account for the bulk of the traffic.

Outbound traffic from Sydney follows routes which are close to the coast when in a northerly or southerly direction or to the northwest via Richmond or west to Katoomba. This means that, initially, many aircraft can be tracked over water to the east of the coast, depending on the runway direction used for departure.

Inbound aircraft generally track via Bindook in the Blue Mountains to the southwest of Sydney or via Singleton to the north.

In the investigation, all phases of flight into and out of Sydney and the impact of the flight paths on the surrounding residential areas, consideration was given to changing or reversing the routes to and from the airport to see if there was any advantage to be gained. Any change in the air route structure would need to be accommodated by the Air Traffic Control Centres at Melbourne and Brisbane as the control of all traffic outside 45 nm Sydney will be done from those centres after March 1997.

An Upper Air Route Review (UAR) was conducted during 1995 to rationalise air routes within Australian airspace which allowed industry to realise the benefits of technology by flying more direct tracks and to enhance safety through separation assurance by traffic segregation and the elimination of opposite direction and crossing tracks where possible.

An option considered by Air Traffic Services Northern District to assist the Task Force was to reverse the air routes between Sydney and Brisbane. Aircraft Northbound would be routed via tracks in the Western side of the airspace with Southbound aircraft on the eastern side.

Restricted Airspace, controlled by RAAF Williamtown, abuts the eastern side of the airspace, extending from 50 nm North of Sydney to 40 nm south of Coffs Harbour. This majority of this airspace is normally active from 0800 to 2000 EST and affects civil air routes by restricting northbound civil air traffic to track via West Maitland and then to the West of the restricted areas.

Civil air traffic bound for the coastal ports of New South Wales are normally approved to track via the restricted airspace except during periods of intense flying activity or major exercises. Williamtown Air Traffic Control also accommodate where possible requests from Civil ATC to track individual turbo-jet aircraft through restricted airspace in order to solve particular traffic conflictions.

A transit corridor to allow the routing of civil turbo-jet aircraft northbound through this airspace has been negotiated, although it is not yet in use due to radar equipment limitations at Williamtown.

The use of this corridor requires aircraft to reach specified flight levels for separation with military traffic in the restricted areas. This corridor is designed to facilitate traffic departing Sydney and would need to be re-designed to accommodate the descent of aircraft for landing at Sydney should the air routes be reversed.

Many aircraft are not equipped with area navigation (RNAV) or global positioning (GPS) equipment and require to navigate with reference to ground based navigation aids. This is likely to be the case for the foreseeable future.

These aircraft, when required to hold enroute, need to hold at navigation aids if they are to fly accurate holding patterns. The navigation aids presently available on the Eastern side of the airspace are located at Williamtown and West Maitland.

Any holding pattern established at West Maitland would infringe the RAAF Williamtown Restricted Airspace and would also be in conflict with any outbound route via Singleton.

Radar vectoring to obtain the required longitudinal spacing for sequencing landing aircraft into Sydney Airport is used extensively, at times as an adjunct to on route holding if traffic demand is heavy. The current Restricted Airspace associated with RAAF Williamtown restricts the civil airspace available in the east for the conduct of this manoeuvring.

The Restricted Airspace associated with RAAF Williamtown would require significant re-design to accommodate the descent of Civil traffic inbound to Sydney and to accommodate holding and radar vectoring for sequencing.

A similar investigation of routes to the south was conducted. The major impact would be on the Restricted Areas associated with the Royal Australian Naval Air Station at Nowra where considerable access would be required to facilitate the tracks.

Whilst the change in route structure could be accommodated by the Southern Air Traffic Services Centre without major impact on the efficiency of aircraft operations in the Terminal Areas in Melbourne and Canberra, there would be a significant training load imposed, which would impact on the introduction of The Australian Advanced Air Traffic Services System (TAAATS) as data preparation and planning has been based on the current air route structures. Terminal route structures at Melbourne and Canberra would need to be modified and assessments of the environmental impact would be required.

It was concluded that, although a reversal of the route structure to the north and south was feasible, it would cause considerable disruption to established military activities and would be counter productive as far as recent changes to air routes to the north, undertaken to enhance safety and traffic management. There were no significant gains identified in terms of the objectives of the Long Term Operating Plan to be made that could not be achieved by widening the flight paths within 45 nm of Sydney which accomplishes tracking beyond the metropolitan area and at higher altitudes.

There may be benefits to be gained from reversing the air routes, should a second airport be established at Badgerys Creek or Holsworthy, which would need to be addressed once a decision is made on the location.

Risk assessment

With any introduction of a new procedure or a change to existing procedures there are safety risks. These risks must be analysed and managed to ensure that the level of risk is minimised, that safety margins are maintained and amelioration processes are implemented.

The increasing complexity involved in runway changes, the interruption of traffic flow and potential traffic conflict can introduce risk. These risks also need to be managed. Standard runway change procedures can minimise this risk.

The proposals of the Sydney Air Traffic Management Task Force have been the developed after extensive community consultation and with the benefit of significant operational expertise through the involvement of Air Traffic Services professionals, representatives of the Civil Aviation Safety Authority, military and industry representatives and community representatives with airline flight crew experience.

All procedures proposed are in accordance with standards published by CASA in their Manual of Operational Standards and are procedures which are currently in use at Sydney or are procedures of a similar type used prior to parallel operations.

Airspace and flight track proposals have been developed using local operational expertise and validation through simulation in radar and flight simulators.

Prior to training of local staff and implementation of the proposed changes, simulation will the carried out to further refine the concepts proposed.

Runway capacity analysis carried out by Sabre Decision Technologies did not include an assessment of the proposed terminal airspace.

In their report they recommended that:

> 'Risk analysis should be conducted before opposite direction Modes are used in high traffic hours' (Assessed as capable of 43-56 movements)
> 'Additional simulation analyses should be performed with a complete terminal airspace of the new Modes.'

A formal safety case will be prepared to establish where hazards exist and to define procedures to mitigate these hazards.

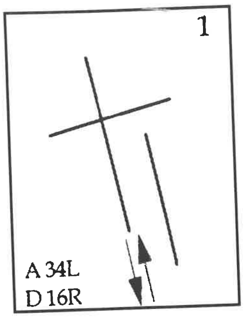
Mitigation strategies to address identified risk will be introduced prior to implementation. As is the case with any significant change to procedures or airspace a comprehensive program of controller briefings, simulation and training will be undertaken to implement the proposed changes.

This will follow the finalisation of the procedures and the preparation of pilot and controller documentation.

It is proposed that any additional risk imposed by runway changes be mitigated through the enhancement of on-shift management of procedures and staff resources, focusing authority and accountability of Air Traffic Services staff to a core position. Further mitigation of risk will be achieved through improved planning to runway changes where runway use is not retained to a critical downwind criteria, necessitating short notice changes. Further strategies will be identified and documented during the implementation process.

Modes of operation

Mode 1



Method of operation

All departures Runway 16R.

All arrivals Runway 34L.

(This is the mode under which the Sydney Airport Curfew operates.)

Requirements of Curfew legislation

The Curfew operates from 2300 to 0600 each day and uses only the main north-south runway.

Permitted movements during these hours are:

- Limited quota of BAe146 freight aircraft.
- Noise certificated propeller aircraft under 34,000 kilograms.
- Jet aircraft under 34,000kg which comply with applicable noise standards.
- Limited international passenger jet arrivals between 0500 and 0600.
- Emergencies.

During the Curfew, all movements must be over Botany Bay. Only the main north-south runway (16R-34L) is used. This means that departures are towards the south (16R) and landings are towards the north (34L). At weekends, between 0600 and 0700 and between 2200 and 2245, movements must be over Botany Bay unless otherwise directed by Air Traffic Control. From 2245 every day, departures must be over Botany Bay.

Availability of configuration

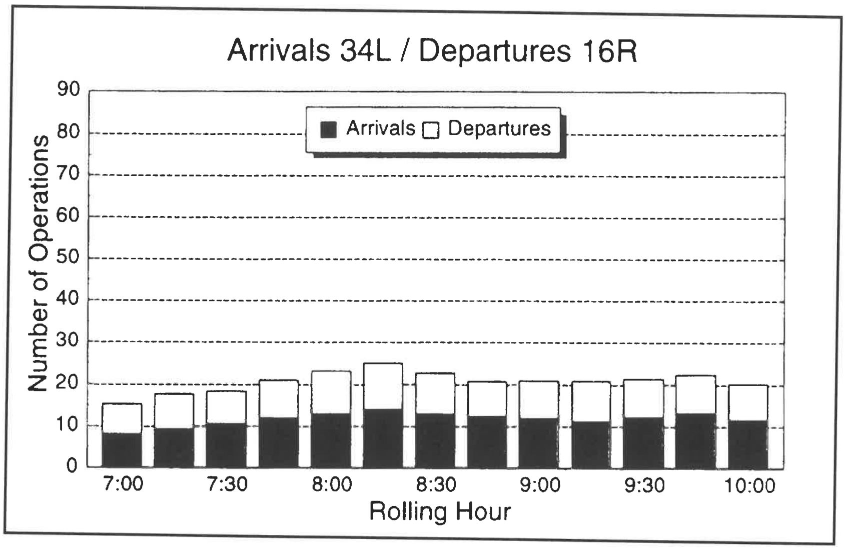
This runway configuration is used, by legislation, throughout the Curfew hours and cannot sustain reasonable traffic levels. It is not suitable for operations outside the Curfew.

Operational capacity

The Sabre SIMMOD modelling found a sustained capacity of 23 operations per hour consisting of 13 arrivals and 10 departures. Peak observe capacity was 25 operations.

Due to the interaction of arrivals and departures in opposite directions on Runway 16R/34L and the 20 mile buyout for 16R departures, significant aircraft spacing was required on the take off and final approach tracks, limiting the capacity of the runway.

In operational practice, up to 40 nautical miles spacing between arrivals may be required to accommodate slow departures. Sabre indicated that this mode will not reach 80 movements per hour using only one runway. However, if only arrivals or departures were operating for an extended period of time, the capacity for the active operation type could be increased. This would also decrease the capacity of the remaining operational type.



Graph Sabre simulation results for a rolling hour period

Operational complexity

Opposite direction operations to the same runway (16R/34L), with the requirement for departing aircraft to remain on the 163 radial of the Sydney VOR introduces a level of complexity which impacts on capacity. In addition, these operations do not provide for an operational environment of segregated airspace between arrivals and departures and safety must be maintained through additional restrictions to the aircraft.

Constraints to optimisation of capacity

The severe constraint is caused by nose to nose operations to the same runway and the need to maintain vertical separation until radar separation is achieved.

Movement rates will vary and the requirements of wake turbulence separation limit any increase in movement rates.

The availability of the mode, other than when it is mandated by legislation is limited to when the downwind does not exceed 5 knots.

Airspace arrangements are complex as both arrival and departures are over water in the same airspace. At times a high degree of traffic management is required to ensure aircraft conflictions remain at a level where controllers can safely ensure that undue noise is not created over populous areas due to separation or sequencing requirements.

Traffic management is complicated, with little ability to optimise operations. There is greater risk of controller error where a regime of separation assurance cannot be easily maintained.

Changes to airport operations to meet the requirements of the Curfew Act can have a significant effect on airport efficiency during the transition period into the curfew, particularly after 2230, when opposite direction traffic flow is commenced. The magnitude of this effect depends on the prevailing wind and weather conditions, and number and type of aircraft involved at the time.

Risk associated with this mode is provided for in the procedures employed and in the operating standard. The decision to operate aircraft during the curfew in conditions of significant downwind or crosswind is the responsibility of the pilot in command.

Environmental implications

Arrivals 34L

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 700.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	3,400ft	at	Over Water
B747-400	3,100ft	at	Over Water
B767	2,900ft	at	Over Water
Saab 340	850ft	at	Kurnell Peninsula

Departures 16R

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total 4,000.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	10,000ft	at	Over Water
B747-400	6,500ft	at	Over Water
B767	6,000ft	at	Over Water
Saab 340	3,000ft	at	Botany Bay

For further details refer to Appendix 9

Conclusions

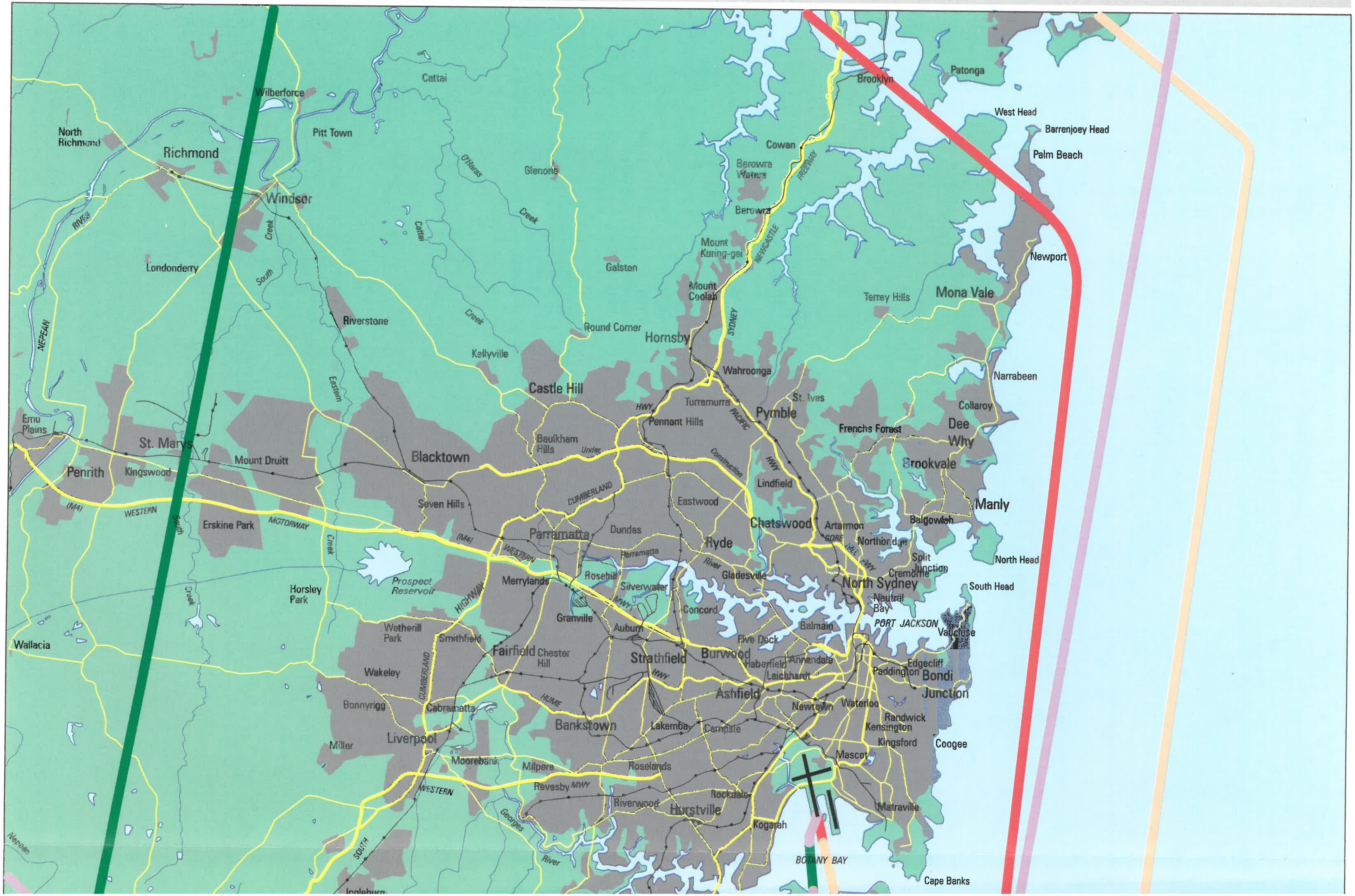
This mode is not practical except during the required Curfew period. Outside these hours alternate opposite direction modes can be employed.

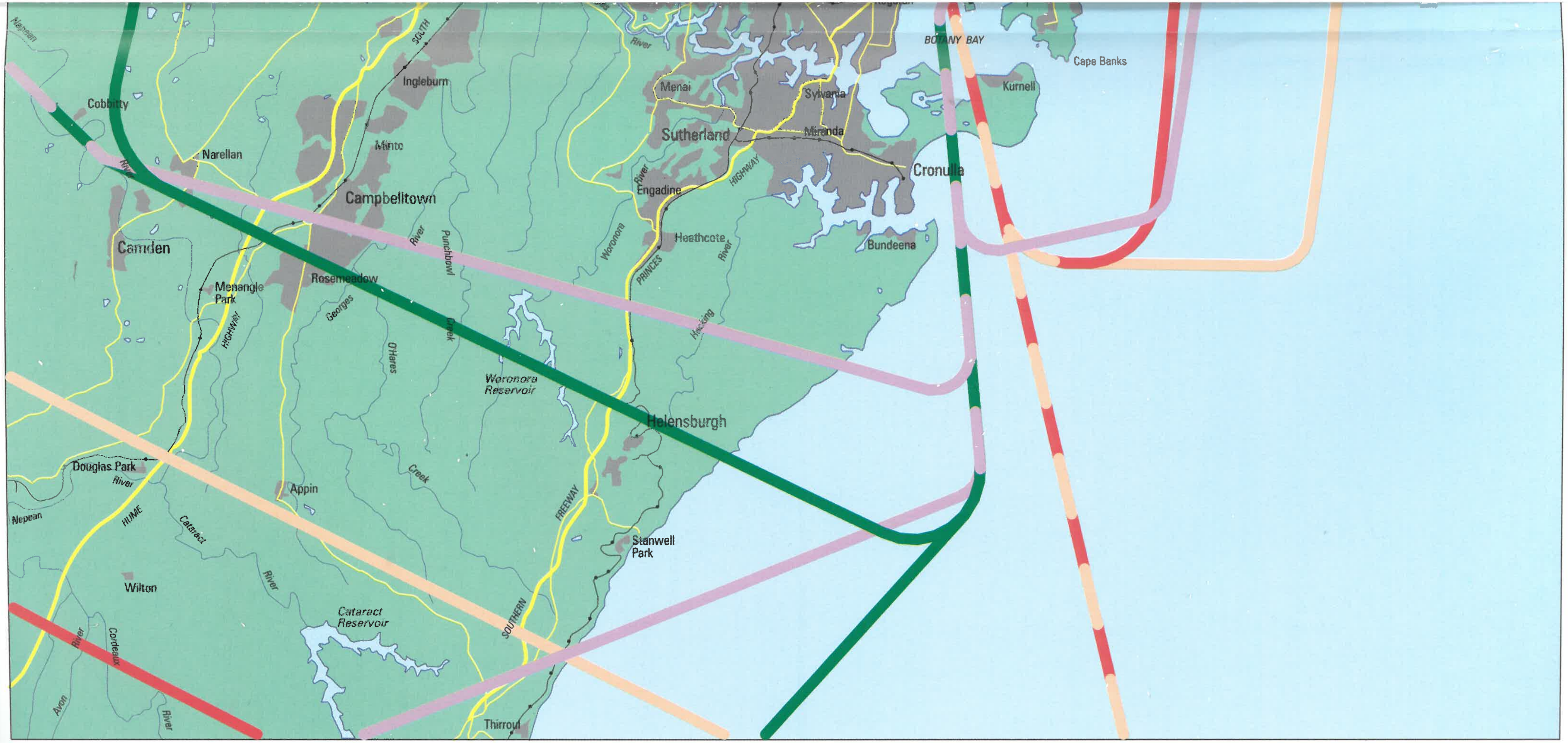
Consideration should be given to allowing aircraft to turn left after departure from Runway 16R and track over water through Botany Bay heads to provide separation assurance with arriving traffic and enhance safety.

Proposed use

Curfew hours only although enhancements noted above are proposed for consideration by Government

SYDNEY MODE 1 DEPARTURES 16R ARRIVALS 34L





MP 96/544.8.1
November 1996

Built-up-area (1993)

Note: Tracks shown are indicative

0 km 6
Scale approx

N

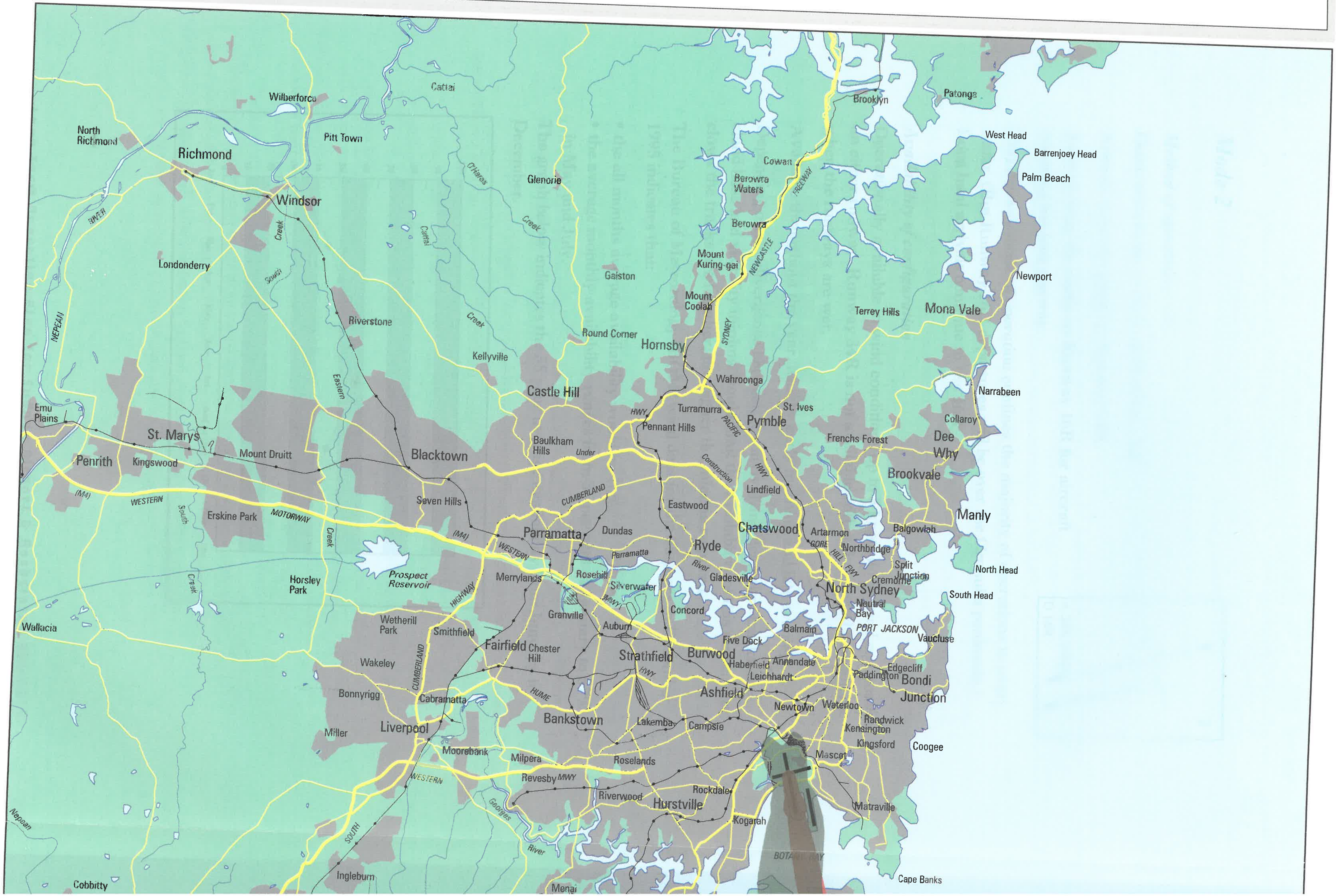
DEPARTURES

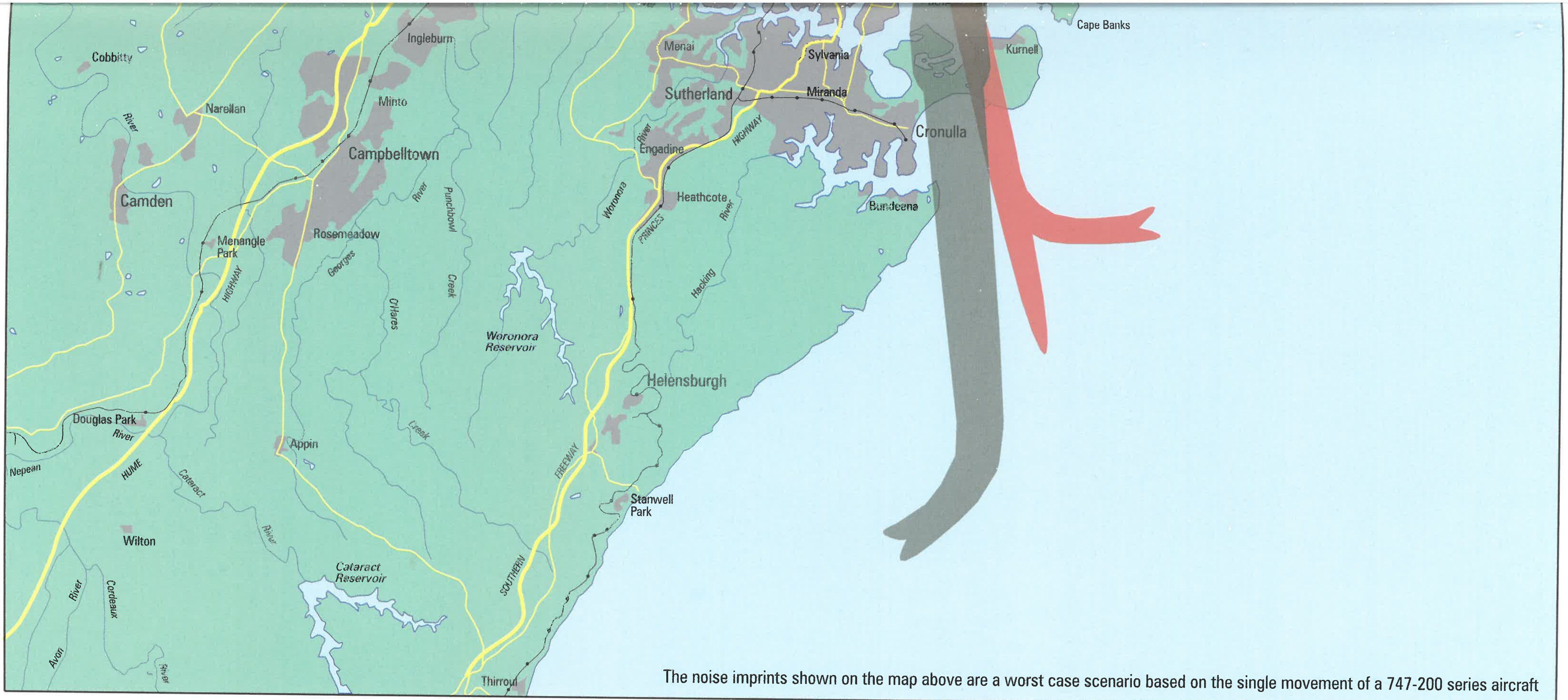
- Jet track
- Non-Jet track
- Dual track

ARRIVALS

- Jet track
- Non-Jet track
- Dual track

SYDNEY NOISE IMPRINT MODE 1 JET DEPARTURES 16R ARRIVALS 34L





The noise imprints shown on the map above are a worst case scenario based on the single movement of a 747-200 series aircraft

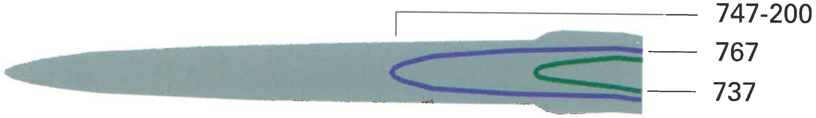
November 1996 MP 96/544.9.1

0 km 6

Scale approx

N

Note: The noise imprints shown are based on a single aircraft movement on the centreline of the indicative flight track



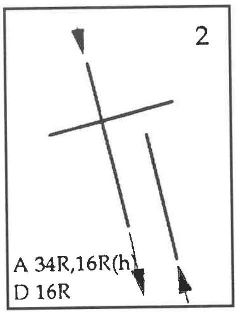
The diagram above indicates that a 767, 737 and similar aircraft leave a significantly smaller imprint than 747-200 series aircraft

Noise imprint Arrivals (70dBA or above based on a single movement of a 747-200 series aircraft)

Noise imprint Departures (70dBA or above based on a single movement of a 747-200 series aircraft)

Built-up-area (1993)

Mode 2



Method of operation

Departures to the south from Runway 16R.

Arrivals from the south on Runway 34R.

Arrivals from the north on Runway 16R for aircraft requiring the long runway.

This runway mode of operation confines the majority of operations to over-water. (But Runway 16R departures will be over the Cronulla peninsula.) Long haul arrivals continue to use 16R

Availability of configuration

Operationally available in wind conditions up to 5 knots downwind component on either runway. Runway 34R is not available with a downwind component when the runways are wet.

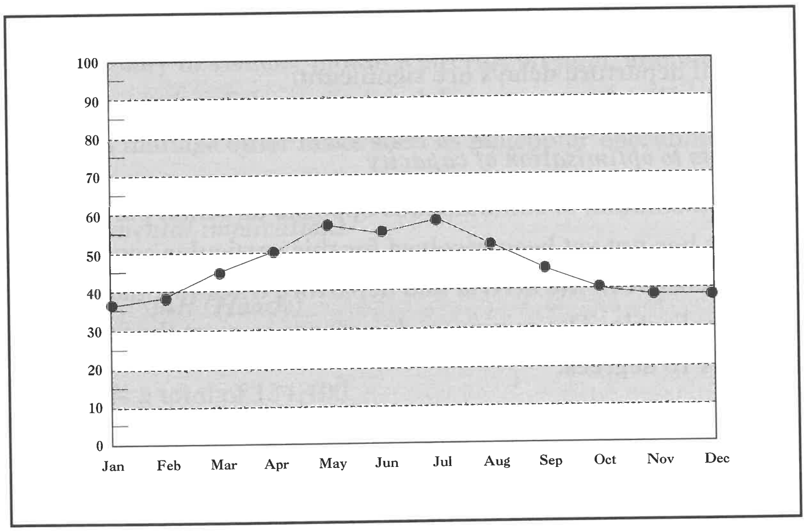
Available throughout the year, usually early morning and late evening.

Depending on the divergence between the arrival and departure tracks, the cloud base and visibility minima would limit the availability of this mode. The closer the tracks are together, the higher the minima required.

The Bureau of Meteorology (BOM) wind data for the 55 years to December 1995 indicates that:

- the all months average availability would be 46%.
- the average monthly availability ranges from 36 per cent in January to 57% in May and July.

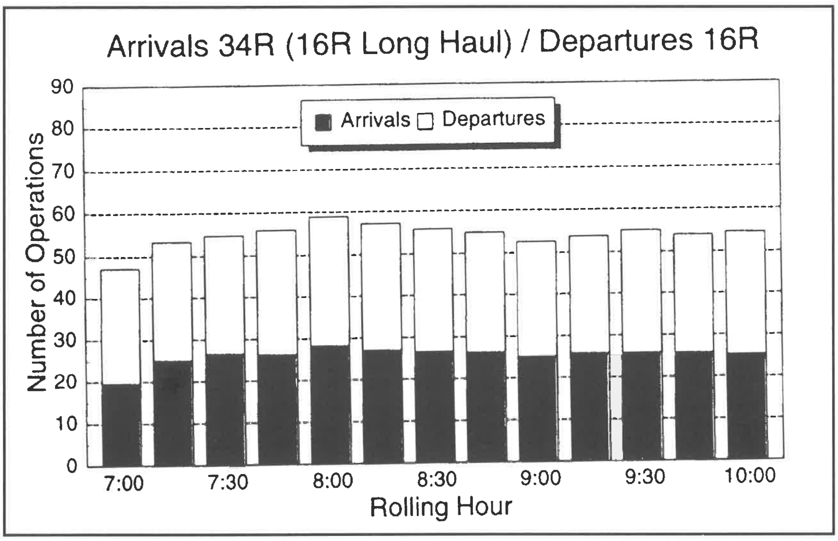
The graph below indicates the 55 year average availability from January to December.



Operational capacity

Sabre SIMMOD modelling found a sustained capacity of 56 operations per hour consisting of 26-27 arrivals and 29-30 departures. Peak observed capacity of 59 operations.

Due to single runway use for arrivals and departures the capacity for this mode is limited. The mixing of long-haul arrivals on the departure runway causes the departure capacity to be slightly below the arrivals capacity.



Graph Sabre simulation results for a rolling hour period

Operational complexity

Airspace complexity of this Mode increases with traffic levels.

All departures and arrivals must be segregated to opposite sides of the traffic circuit. This complexity is heightened when there is a mix of aircraft with different performance characteristics.

Taxiway congestion may impact on aircraft movement around the domestic terminals if departure delays are significant.

Constraints to optimisation of capacity

The implementation of simultaneous opposite direction parallel runway operations has not yet been resolved for this particular configuration. The divergence between the arrival and departure tracks would dictate the weather minima applicable. The minimum divergence to meet the required separation standard is 15 degrees.

This would place departing aircraft over, or in close proximity to, Cronulla. Any greater divergence between the departure and arrival paths increases the requirement for aircraft to track further over land with this mode, defeating the purpose of the opposite direction operation - to maximise operations over water.

The standard established for Mode 3 and 4, where there is a divergence of 30 degrees, limits independent operations to the two runways when there is a cloud base of less than 2500 ft or visibility less than 8 km. Initial implementation of simultaneous opposite direction operations has specified a cloud base of 3000 ft and a visibility of 10 km to better provide for controller and pilot familiarisation.

Unless independent operations are available, traffic movement rates can be little better than Mode 1 with the enhancement of a left turn after departure.

Any angular difference of less than 30 degrees will require further restriction to the weather minima applicable. The flight paths for Mode 2 reflects this 30 degree divergence as the availability of the mode would be significantly limited by the higher weather minima requirement.

The division of airspace responsibility between tower and radar controllers needs to be clear and distinct, appropriate to the level of traffic to be handled. Whilst low levels of traffic can be safely handled with a mix of arrivals and departures in the same piece of airspace, as traffic levels increase, it is inappropriate, on safety grounds, to continue to operate in this manner.

The differing runway lengths may mean that some aircraft will require to land on the longer runway. If this operation is in the same direction as the departure it will not cause significant delay. However, if there is a requirement to operate against the traffic flow, considerable delay can occur with resultant reduction in the handling rate.

Risk associated with this mode is provided for in the procedures employed and in the development of the operating standard.

Complexity of the mode will be a constraint to capacity if there are opposite direction operations to the same runway.

Controller workload is increased by extra coordination requirements between the aerodrome controllers. The controllers will also have an increased responsibility to visually monitor aircraft on final, and after departure, because of the proximity of the arrival and departure tracks. This may impact on their ability to manage other tasks such as helicopter operations.

Environmental implications

Arrivals   16R (Heavy)

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 134,400

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	3,400ft	at	Turramurra, Beecroft
B747-400	3,100ft	at	West Pymble, Epping

Arrivals 34R

The number of people exposed to noise of 70 dB(A) or more for B767 aircraft is a total of 700.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B767	2,900ft	at	Over Water
Saab 340	850ft	at	Kurnell Peninsula

Departures 16R

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 40,400.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

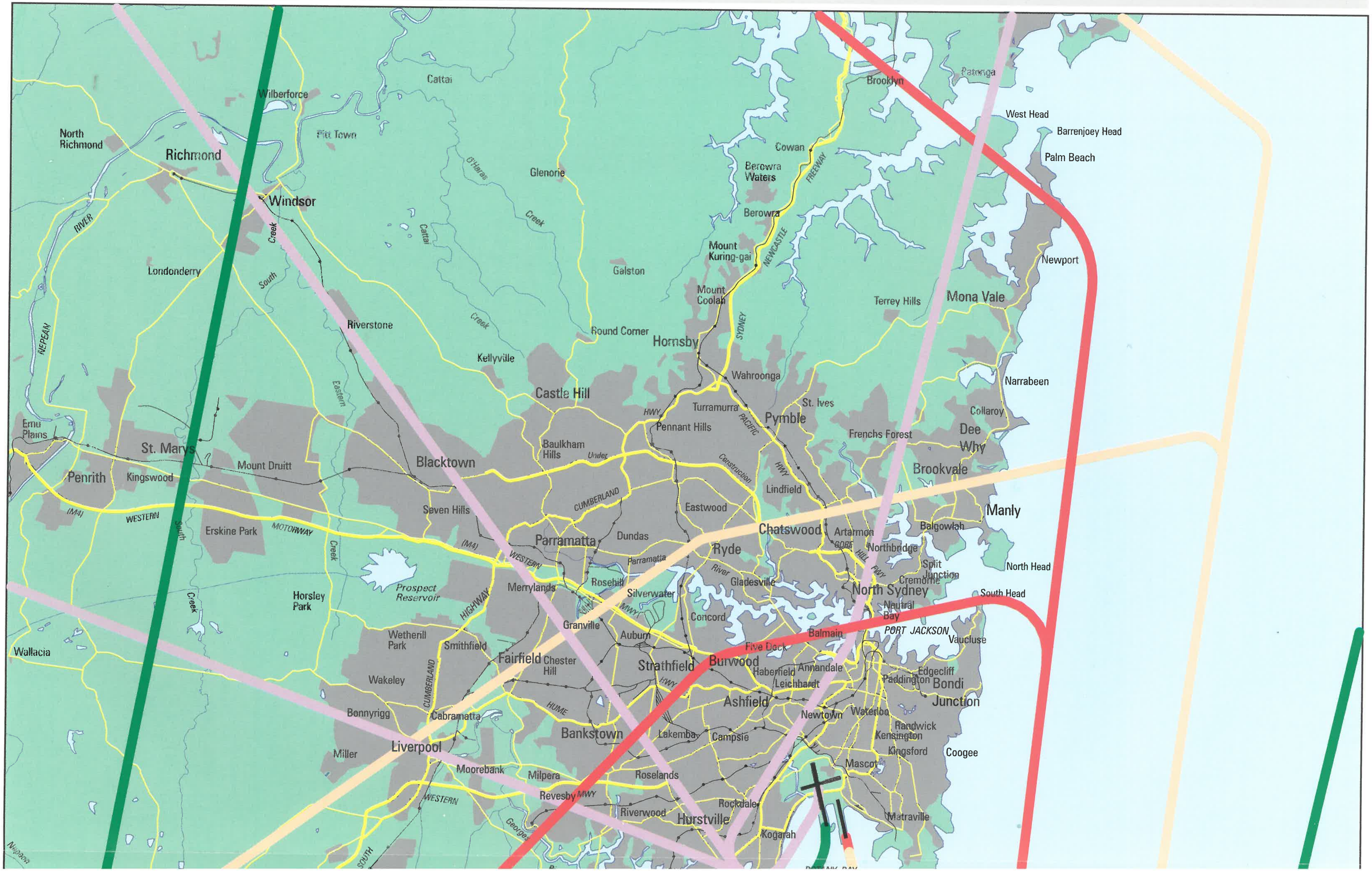
B747-200	10,000ft	at	Over Water (except for W and NW over Heathcote National Park)
B747-400	6,500ft	at	Over Water (except for the S, W and NW over the Royal National Park)
B767	6,000ft	at	Maianbar
Saab 340	3,000ft	at	Over Botany Bay

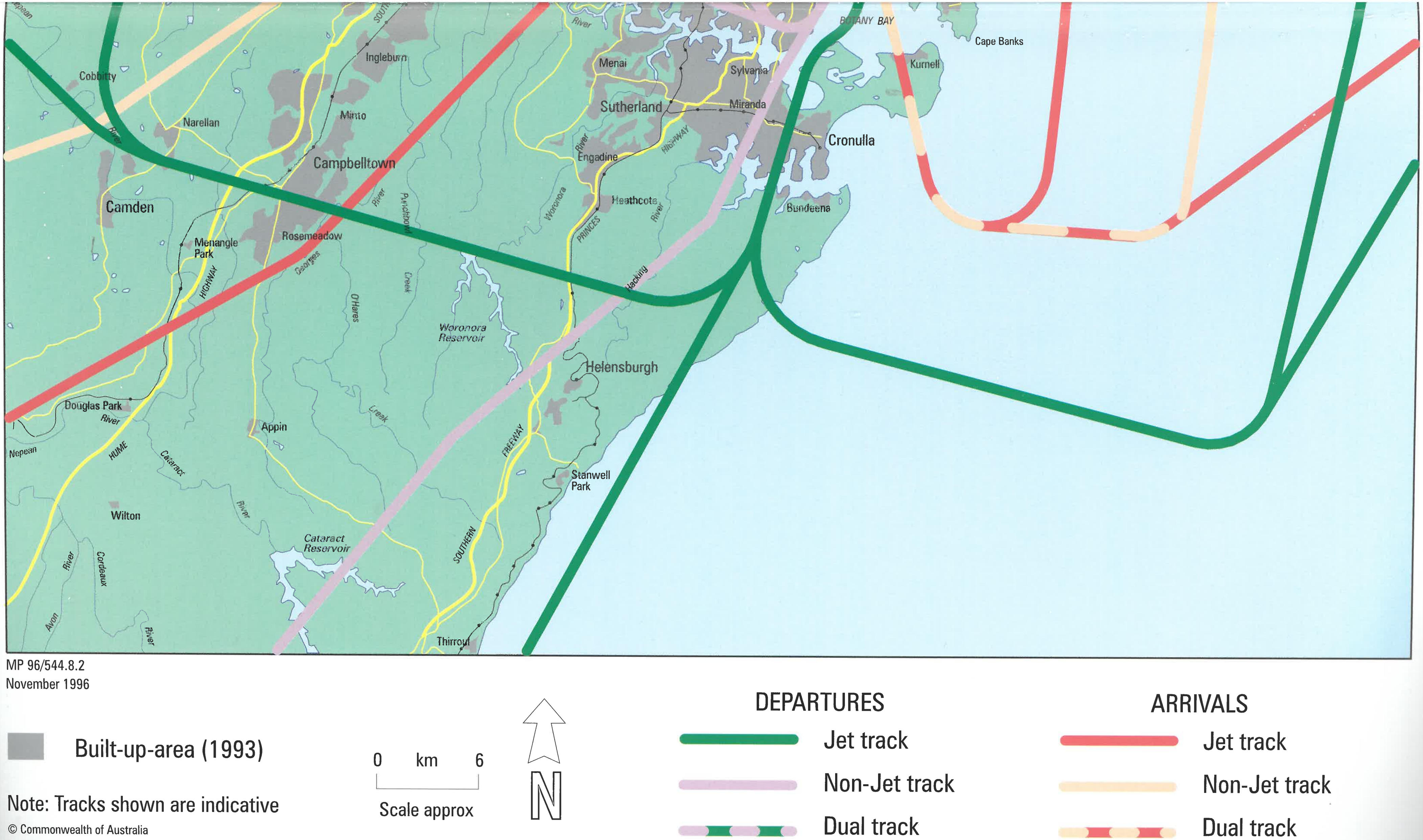
For further details refer to Appendix 9

Conclusions

This mode does not provide any respite to the residents of Kurnell and will require aircraft to fly closer to Cronulla than the present departure track which is over water to the east of Cronulla. It is best suited to late evening traffic patterns in light wind conditions, where a number of departures require the long runway. The alternative for these aircraft may be a departure to the north off Runway 34L, although this will be subject to the prevailing wind. Runway 34L departures has a far greater effect as far as the number of people overflown and in particular, close to the airport, in the early stages of flight.

SYDNEY MODE 2 DEPARTURES 16R ARRIVALS 34R (LONG HAUL JET ARRIVALS 16R)




Cobbitty
Narellan
Ingleburn
Minto
Campbelltown
Camden
Menangle Park
Rosemeadow
Douglas Park
Appin
Wilton
Woronora Reservoir
Cataract Reservoir
Menai
Sylvania
Sutherland
Miranda
Engadine
Heathcote
Cronulla
Bundeena
Kurnell
Cape Banks
BOTANY BAY
Helensburgh
Stanwell Park
Thirroul
HUME HIGHWAY
PRINCES HIGHWAY
SOUTHERN FREEWAY
Nepean River
Cataract River
Cordeaux River
Avon
Georges River
O'Hares Creek
Punchbowl Creek
Woronora River
Hacking River
MP 96/544.8.2
November 1996
Built-up-area (1993)
Note: Tracks shown are indicative
© Commonwealth of Australia
0 km 6
Scale approx
N
DEPARTURES
Jet track
Non-Jet track
Dual track
ARRIVALS
Jet track
Non-Jet track
Dual track

SYDNEY NOISE IMPRINT MODE 2 JET DEPARTURES 16R ARRIVALS 34R

The noise imprints shown on the map above are a worst case scenario based on the single movement of a 747-200 series aircraft

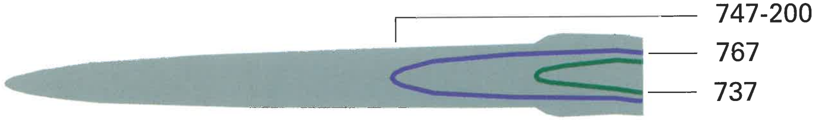
November 1996 MP 96/544.9.2

0 km 6

Scale approx

N

Note: The noise imprints shown are based on a single aircraft movement on the centreline of the indicative flight track



The diagram above indicates that a 767, 737 and similar aircraft leave a significantly smaller imprint than 747-200 series aircraft

Noise imprint Arrivals (70dBA or above based on a single movement of a 747-200 series aircraft)

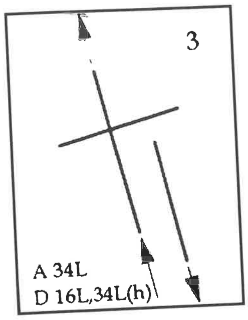
Noise imprint Departures (70dBA or above based on a single movement of a 747-200 series aircraft)

Built-up-area (1993)

Proposed use

It is not proposed that this mode be included in the plan due to the unique airspace arrangements that would need to be employed and to limit the number of runway modes to limit complexity of the airways system to maintain a safe operating regime. However, this Mode could be the subject of further consideration if the noise sharing objectives of the plan cannot be achieved with the proposed modes. The need for this mode would be obviated if Mode 4 can be optimised to achieve similar traffic capacity.

Mode 3



Method of operation

Departures to the south from Runways 16L. Departures to the north from Runway 34L for aircraft requiring the long runway.

Arrivals from the south on Runway 34L.

This runway mode of operation confines the majority of operations to over-water. Long haul departures continue to depart to the north (34L)

Availability of configuration

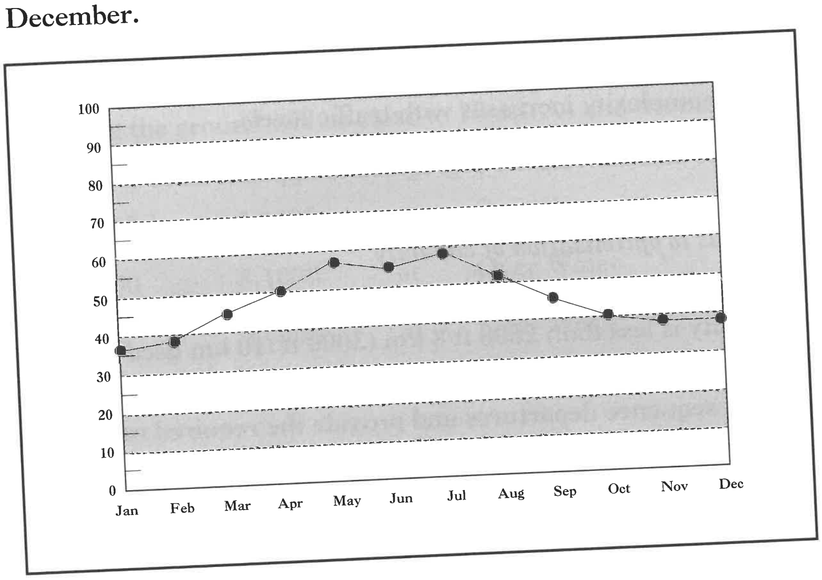
Operationally available in wind conditions up to 5 knots downwind component on either runway and where the cloudbase and visibility is not less than 2500 ft/8 km (3000 ft /10 km used for initial implementation).

Available throughout the year, usually early morning and late evening.

The Bureau of Meteorology (BOM) wind data for the 55 years to December 1995 indicates that:

- the all months average availability would be 46 per cent.
- the average monthly availability ranges from 36 per cent in January to 57 per cent in May and July.

The graph below indicates the 55 year average availability from January to December.



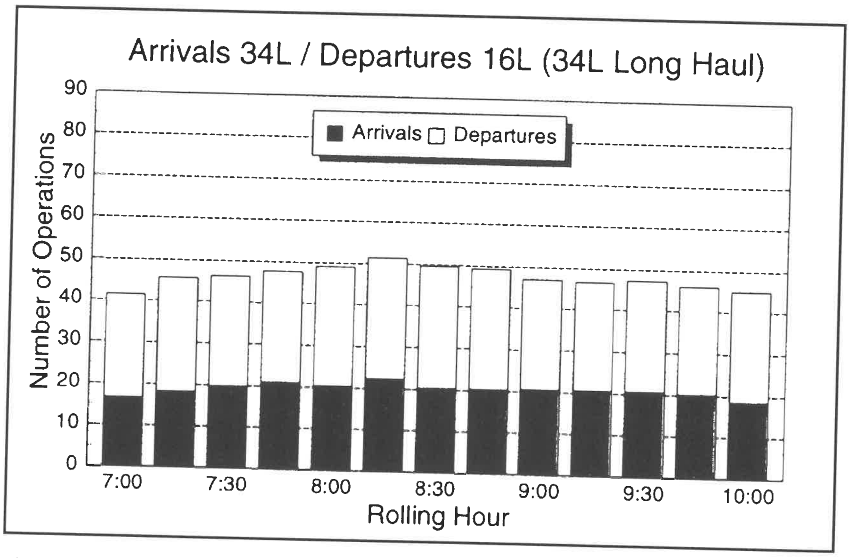
Operational capacity

Sabre SIMMOD modelling found a sustained capacity of 49 operations per hour consisting of 20-21 arrivals and 28-29 departures. Peak observed capacity of 51 operations

Due to single runway use for both departures and arrivals and the need to segregate arriving and departing traffic to opposite sides of the traffic circuit, capacity is limited in this mode.

This Mode provides better capacity than Mode 4 since the operations on 34L are in the same direction.

This Mode will not reach 80 operations per hour. However, if new high speed runway exits were provided for arrivals on Runway 34L, landing rolling times could be decreased allowing capacity to be enhanced.



Graph Sabre simulation results for a rolling hour period

Operational complexity

Airspace complexity increases with traffic levels.

Departures and arrivals are segregated to opposite sides of the traffic circuit.

Constraints to optimisation of capacity

Independent operation to the two runways is not permitted when the cloudbase and visibility is less than 2500 ft/8 km (3000 ft /10 km used for initial implementation). Dependent operations require additional spacing of arriving aircraft to sequence departures and provide the required radar separation and would severely limit capacity.

The division of airspace responsibility between tower and radar controllers needs to be clear and distinct, appropriate to the level of traffic to be handled. Whilst low levels of traffic can be safely handled with a mix of arrivals and departures in the same piece of airspace, as traffic levels increase, it is inappropriate, on safety grounds, to continue to operate in this manner.

Thus to enable much more than current curfew arrival and departure rates it is not practicable to confine all operations over water, east of the coast.

Flight paths on which arriving aircraft track over land at the highest practicable level and which avoid populous areas are to be employed with this mode.

Risk associated with this mode is provided for in the procedures employed and in the development of the operating standard.

As traffic levels increase departure delays on Runway 16L will occur due to the single runway in use for departure and the limited departure tracking available, necessary to contain flight over water.

Controller workload is increased by extra coordination requirements between the aerodrome controllers.

Mode changes must be planned judiciously in advance if the operational capacity is to be sustained. Some flexibility is required in the management of a change of mode and experience indicates that efficiency can be maintained where the time of the change of mode is coordinated with an appropriate time in the traffic sequence.

Complexity of the mode will be a constraint to capacity although there are no operations to opposite ends of the same runway.

Environmental implications

Arrivals 34L

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 700.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	3,400ft	at	Over Water
B747-400	3,100ft	at	Over Water
B767	2,900ft	at	Over Water
Saab 340	850ft	at	Kurnell Peninsula

Departures 16L

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 5,800.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	10,000ft	at	Over Water
B747-400	6,500ft	at	Over Water

B767	6,000ft	at	Over Water
Saab 340	3,000ft	at	Botany Bay

Departures *34L*

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 606,300.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	10,000ft	at	Kuring-gai Chase National Park (north), Cromer (east), Royal National Park (south), Horsley Park (west) and Kellyville (northwest)
B747-400	6,500ft	at	Davidson (north, east), Royal National Park (south), Wetherill Park (west), Baulkham Hills West (northwest)

For further details refer to Appendix 9

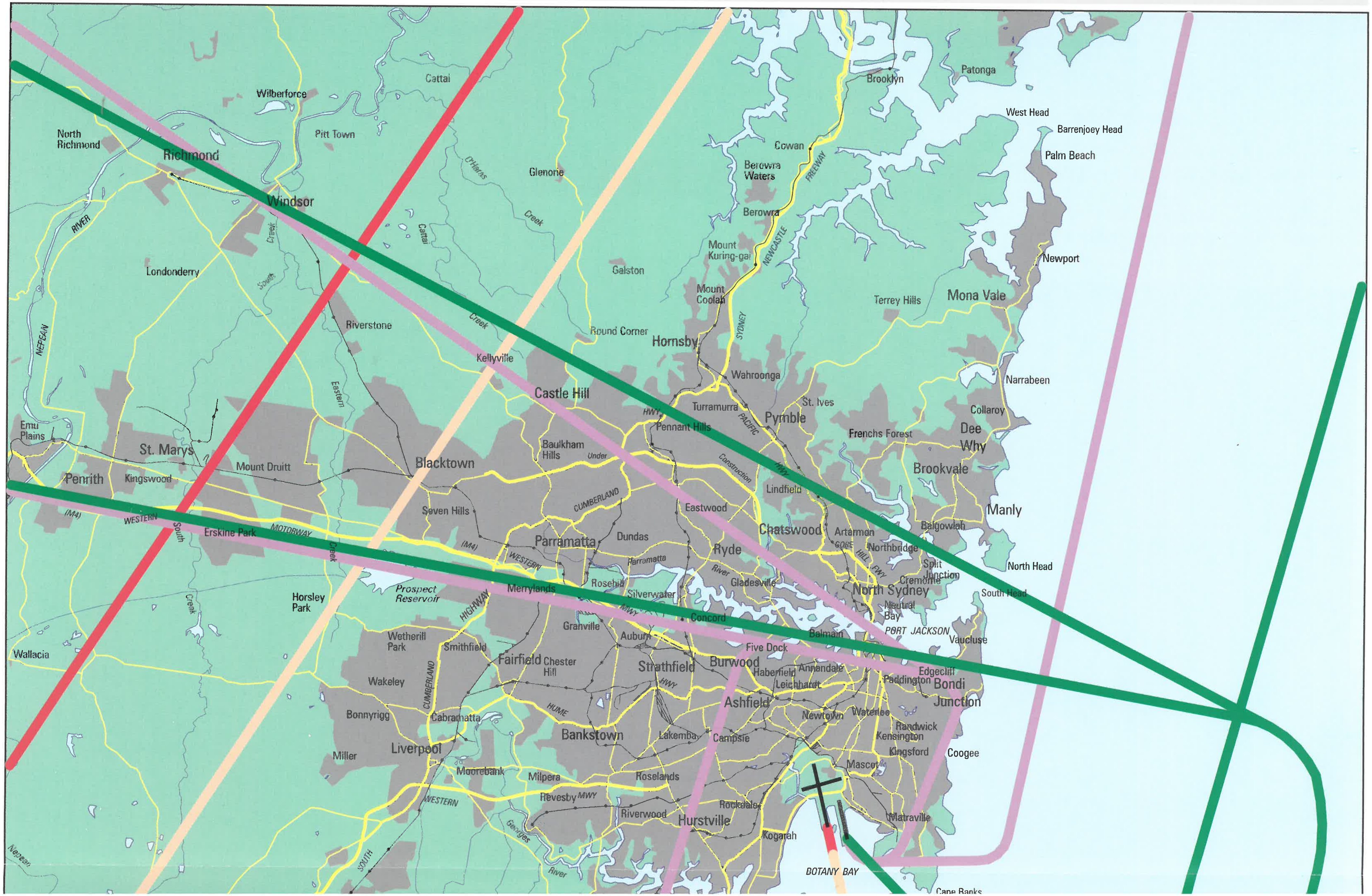
Conclusions

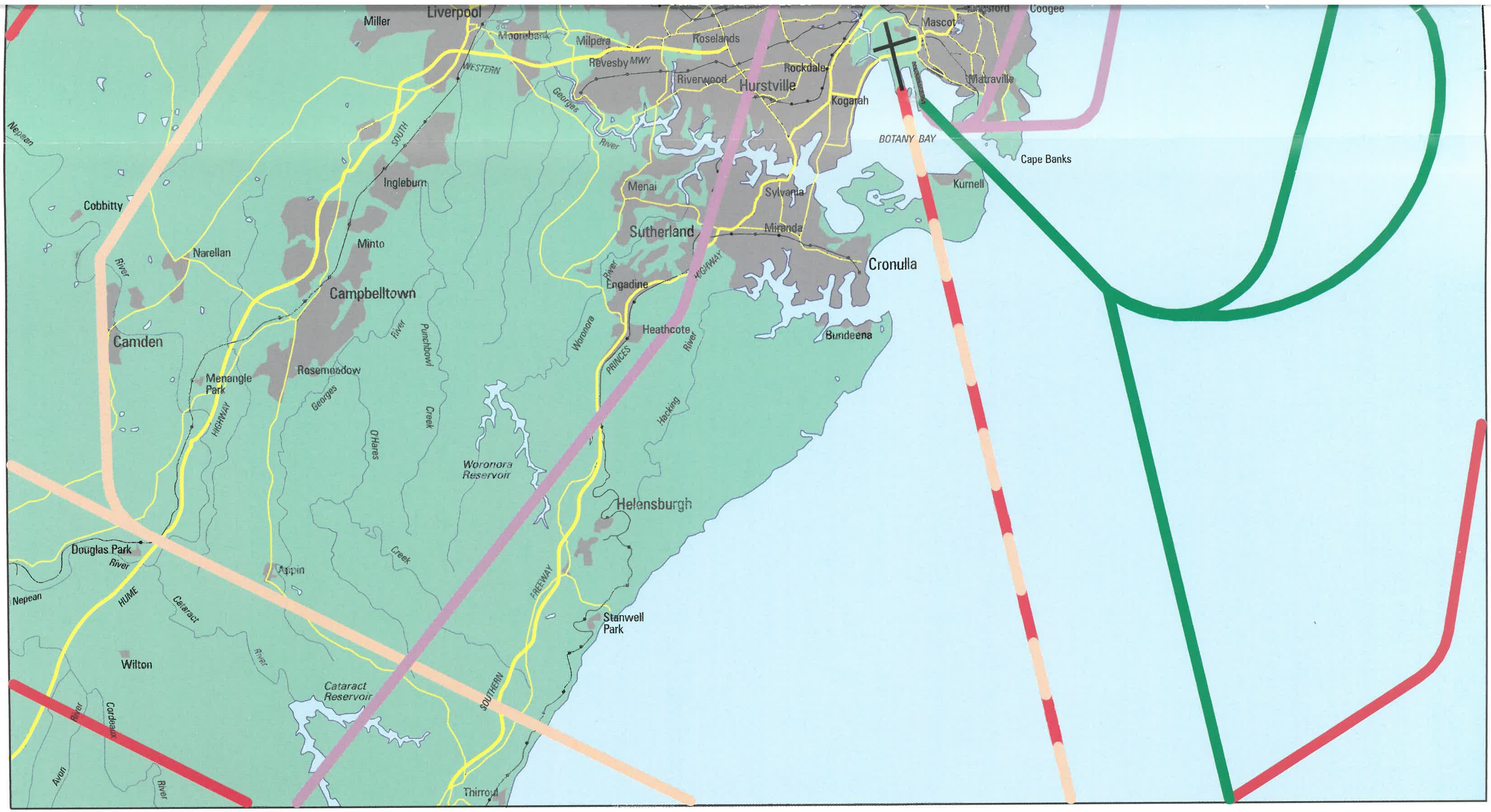
This is a suitable operating mode where weather conditions permit independent arrival and departure operations and traffic levels do not impact on complexity and thus compromise safety. All operations in the initial departure phase and the final approach phase of flight are over water with the minimum impact on Kurnell achievable.

Proposed use

As a variant of Mode 4, this mode would be used in a similar manner depending on the operational requirement of the aircraft using the long runway. Although the wind may only be a light drift, the operational requirement for those aircraft requiring the long runway may not be suited to this mode if the wind drift is southerly. Mode 4 covers this operation.

SYDNEY MODE 3 DEPARTURES 16L ARRIVALS 34L (LONG HAUL JET DEPARTURES 34L)





MP 96/544.8.3
November 1996

Built-up-area (1993)

Note: Tracks shown are indicative

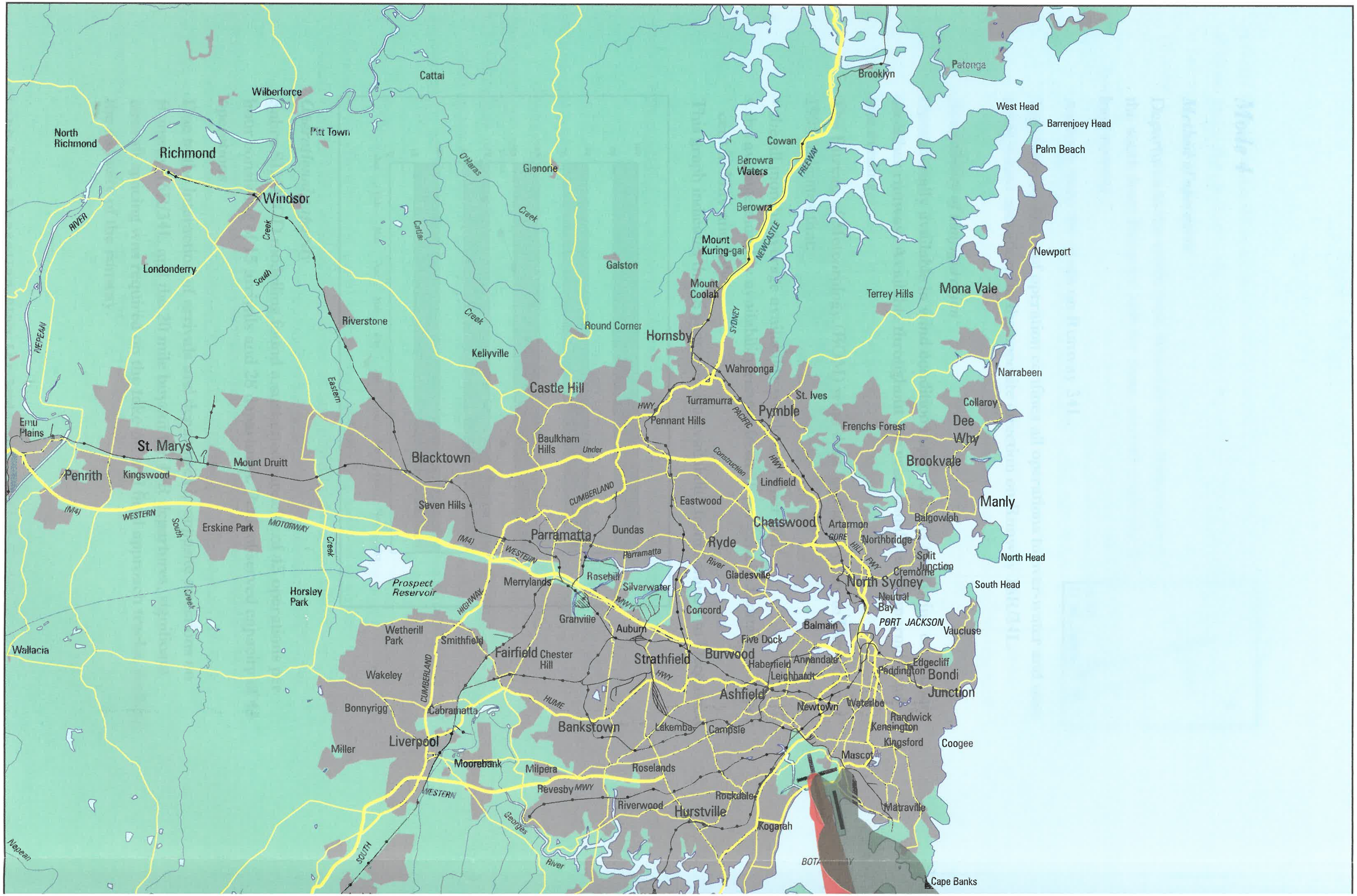
0 km 6
Scale approx

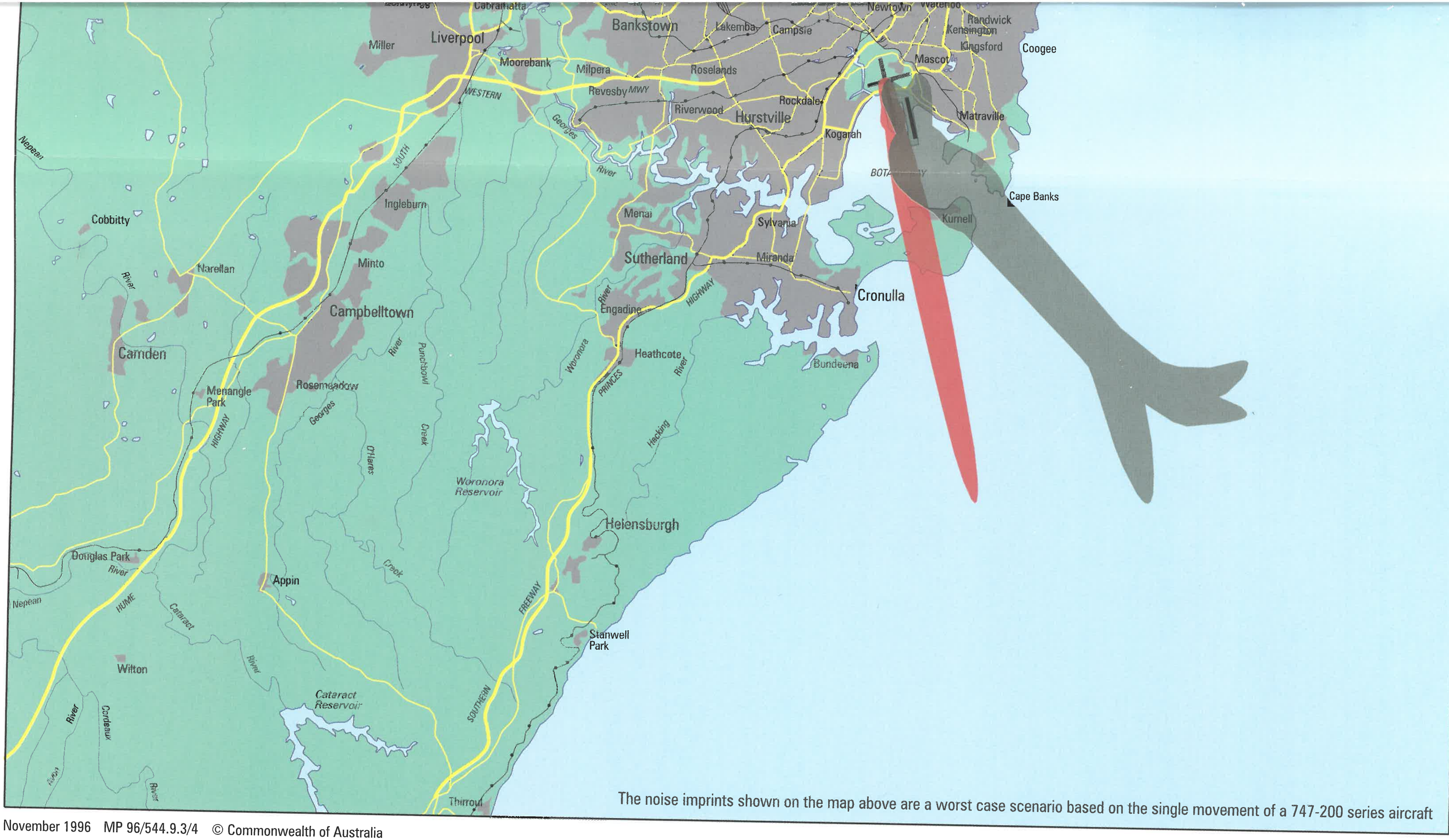
N

DEPARTURES
Jet track
Non-Jet track
Dual track

ARRIVALS
Jet track
Non-Jet track
Dual track

SYDNEY NOISE IMPRINT MODE 3 & 4 JET DEPARTURES 16L ARRIVALS 34L





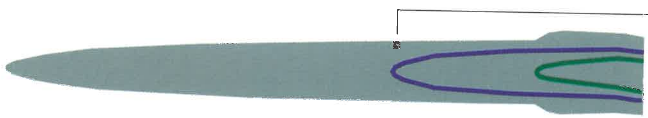
November 1996 MP 96/544.9.3/4

0 km 6

Scale approx

N

Note: The noise imprints shown are based on a single aircraft movement on the centreline of the indicative flight track



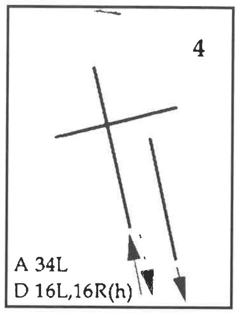
The diagram above indicates that a 767, 737 and similar aircraft leave a significantly smaller imprint than 747-200 series aircraft

Noise imprint Arrivals (70dBA or above based on a single movement of a 747-200 series aircraft)

Noise imprint Departures (70dBA or above based on a single movement of a 747-200 series aircraft)

Built-up-area (1993)

Mode 4



Method of operation

Departures to the south from Runway 16L. Departures to the south from Runway 16R for those aircraft requiring the long runway.

Arrivals from the south on Runway 34L.

This runway Mode of operation confines all operations to over-water and uses some mixed operations in the opposite direction on Runway 16R/34L.

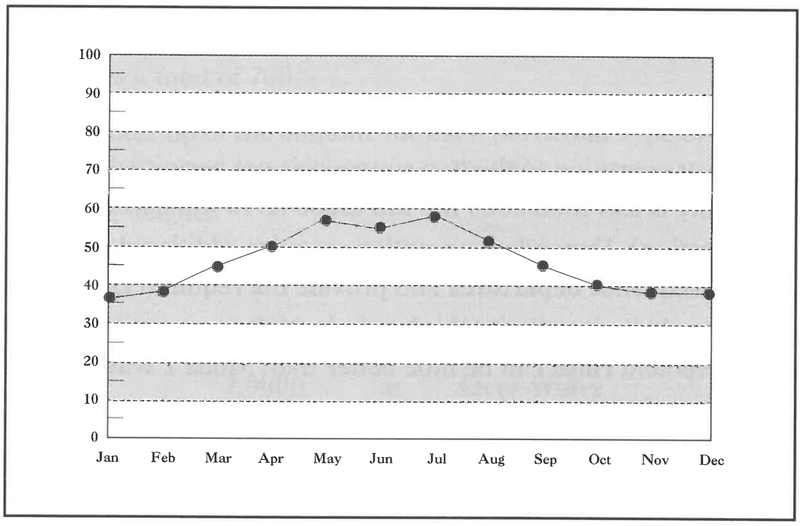
Availability of configuration

Operationally available in wind conditions up to 5 knots downwind component on either runway. Available throughout the year, usually early morning and late evening.

The Bureau of Meteorology (BOM) wind data for the 55 years to December 1995 indicates that:

- the all months average availability would be 46 per cent.
- the average monthly availability ranges from 36 per cent in January to 57 per cent in May and July.

This graph indicates the 55 year average availability from January to December.



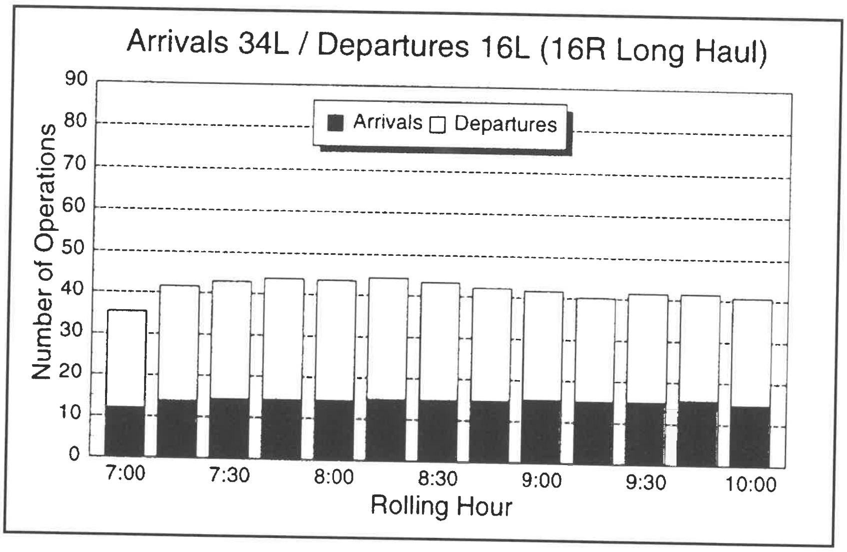
Operational capacity

Sabre SIMMOD modelling found a sustained capacity of 43 operations per hour consisting of 15 arrivals and 28 departures. Peak observed capacity of 44 operations

Due to the interaction of arrivals and departures in opposite directions on Runway 16R/34L and the 20 mile buyout for 16R departures, significant aircraft spacing was required on the take-off and final approach tracks, limiting the capacity of the runway.

This Mode will not reach 80 movements per hour. However, if new runway exits were provided on the arrivals runway 34L, landing role times could be decreased and capacity may be increased slightly. Additionally if a period of use of this Mode does not include long haul departures, the arrival capacity could be increased.

Graph below presents SDT simulation results for a rolling hour period.



Operational complexity

Airspace complexity increases with traffic levels.

Departures and arrivals are segregated to opposite sides of the traffic circuit.

Constraints to optimisation of capacity

Independent operation to the two runways is not permitted when the cloudbase and visibility is less than 2500 ft/8 km (3000 ft /10 km used for initial implementation). Dependent operations require additional spacing of arriving aircraft to sequence departures and provide the required radar separation and would severely limit capacity. Unless independent operations are available, traffic movement rates can be little better than Mode 1 with the enhancement of a left turn after departure

The division of airspace responsibility between tower and radar controllers needs to be clear and distinct, appropriate to the level of traffic to be handled. Whilst low levels of traffic can be safely handled with a mix of arrivals and departures in the same piece of airspace, as traffic levels increase, it is inappropriate, on safety grounds, to continue to operate in this manner.

Thus, to enable much more than current curfew arrival and departure rates it is not practicable to confine all operations over water, east of the coast. Flight paths on which arriving aircraft track over land at the highest practicable level and which avoid populous areas are to be employed with this mode.

Risk associated with this mode is provided for in the procedures employed and in the development of the operating standard.

As traffic levels increase, departure delays on Runway 16L will occur due to the single runway in use for departure and the limited departure tracking available, necessary to contain flight over water.

Controller workload is increased by extra coordination requirements between the aerodrome controllers.

Mode changes must be planned judiciously in advance if the operational capacity is to be sustained. Some flexibility is required in the management of a change of mode and experience indicates that efficiency can be maintained where the time of the change of mode is coordinated with an appropriate time in the traffic sequence.

Complexity of the mode will be a constraint to capacity and nose to nose operations on the same runway (34L arrivals and 16R departures) will require additional spacing to be provided between arrivals when aircraft taxi for departure from the long runway.

This may also require additional separation to provide for wake turbulence generated by either of the aircraft.

Environmental implications

Arrivals 34L

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 700.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	3,400ft	at	Over Water
B747-400	3,100ft	at	Over Water
B767	2,900ft	at	Over Water
Saab 340	850ft	at	Kurnell Peninsula

Departures 16L &R

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 9,800.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	10,000ft	at	Over Water
B747-400	6,500ft	at	Over Water

B767	6,000ft	at	Over Water
Saab 340	3,000ft	at	Botany Bay

For further details refer to Appendix 9

Conclusions

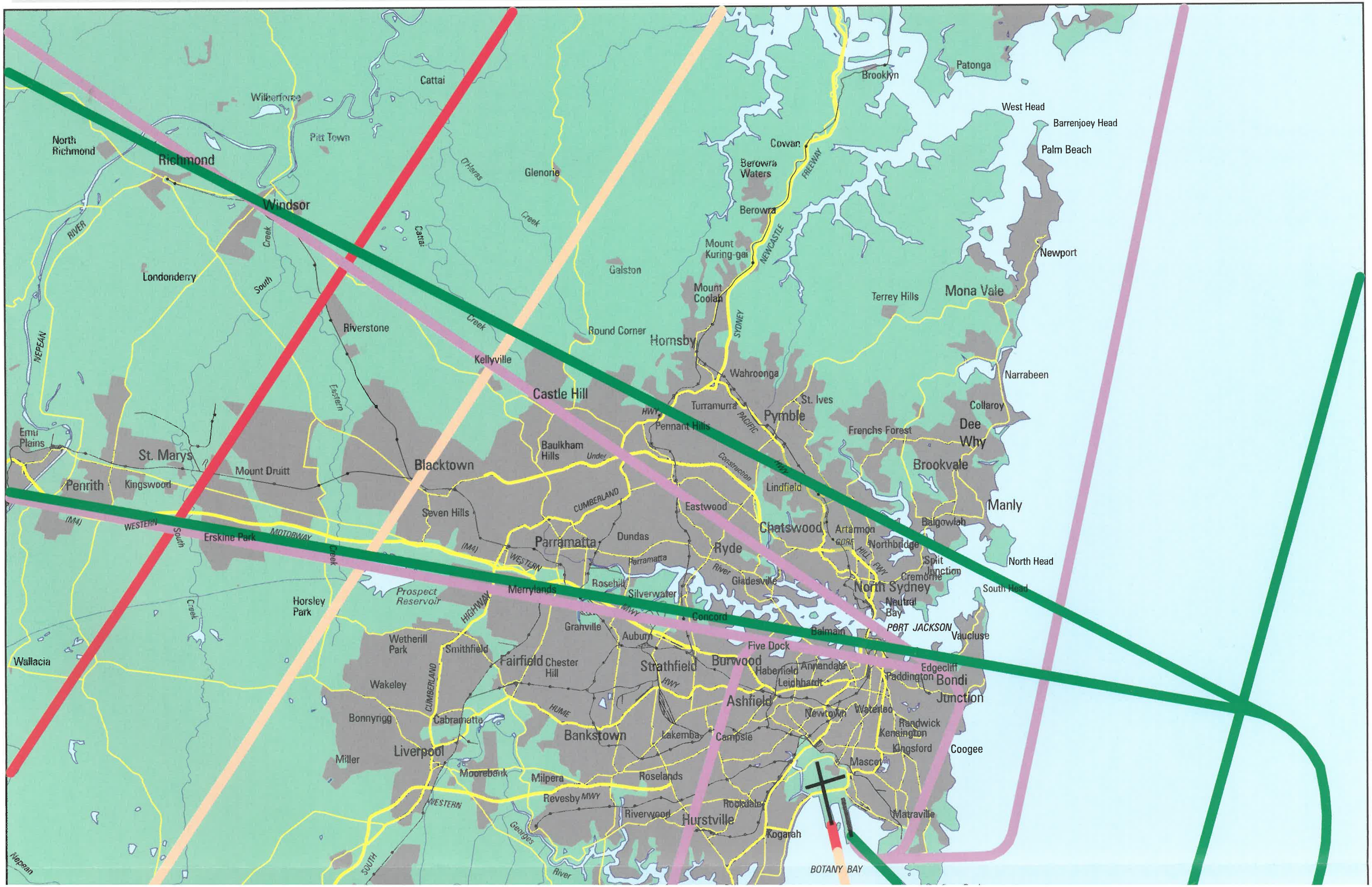
This is a suitable operating mode where weather conditions permit independent arrival and departure operations and traffic levels do not impact on complexity and thus compromise safety. All operations in the initial departure phase and the final approach phase of flight are over water with the minimum impact on Kurnell achievable.

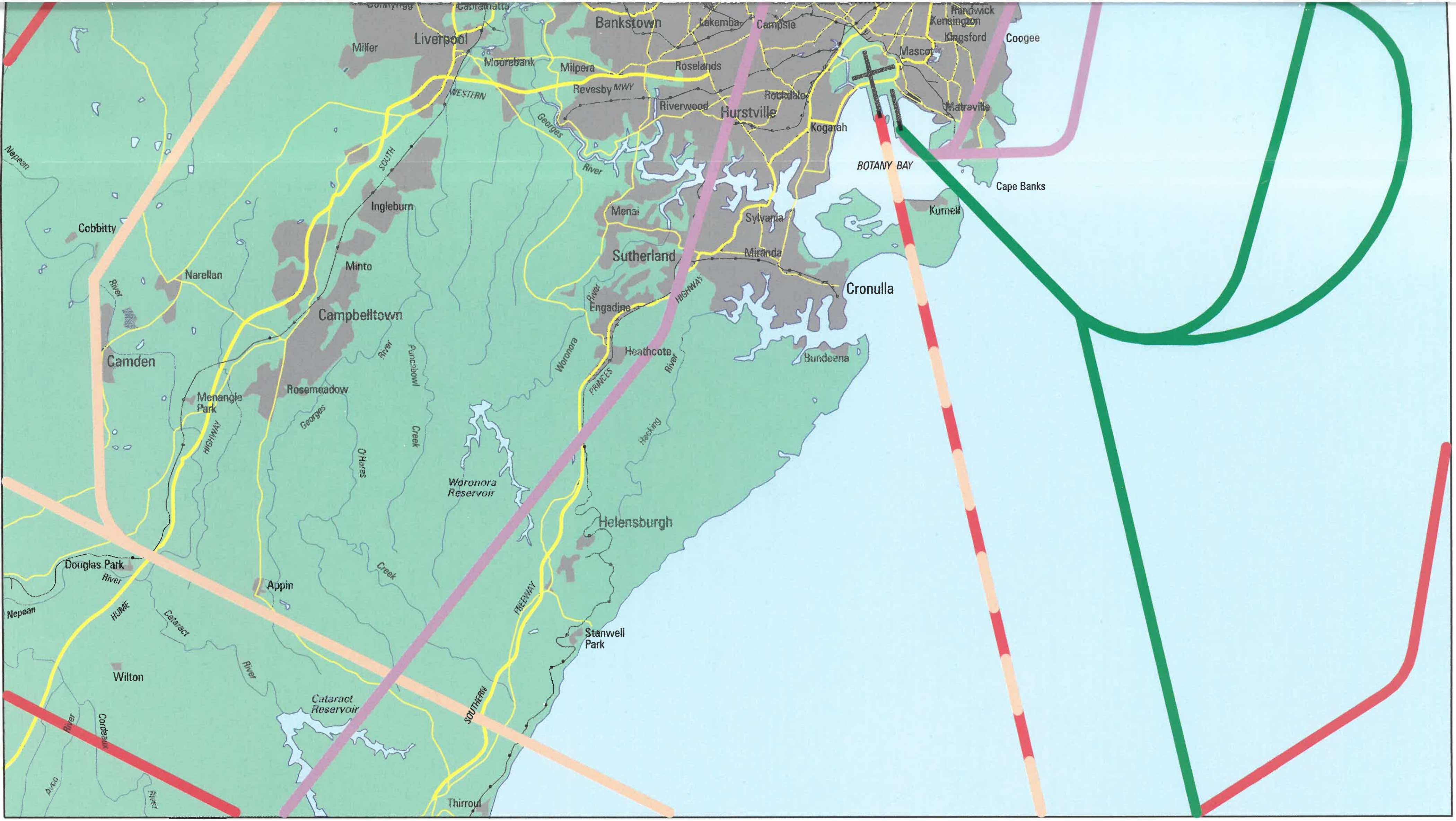
Proposed use

At all times when weather and traffic conditions allow. It is anticipated that this mode will, in the main, be available in the early morning, immediately following the curfew and during light traffic periods in the middle of the day or at weekends. The likelihood of suitable wind conditions at other than early morning or late evening is limited.

Although the wind may only be a light drift, the operational requirement for those aircraft requiring the long runway may not be suited to this mode if the wind drift is northerly. Mode 3 covers this operation.

SYDNEY MODE 4 DEPARTURES 16L ARRIVALS 34L
(LONG HAUL JET DEPARTURES 16R)





MP 96/544.8.4
November 1996

Built-up-area (1993)

Note: Tracks shown are indicative

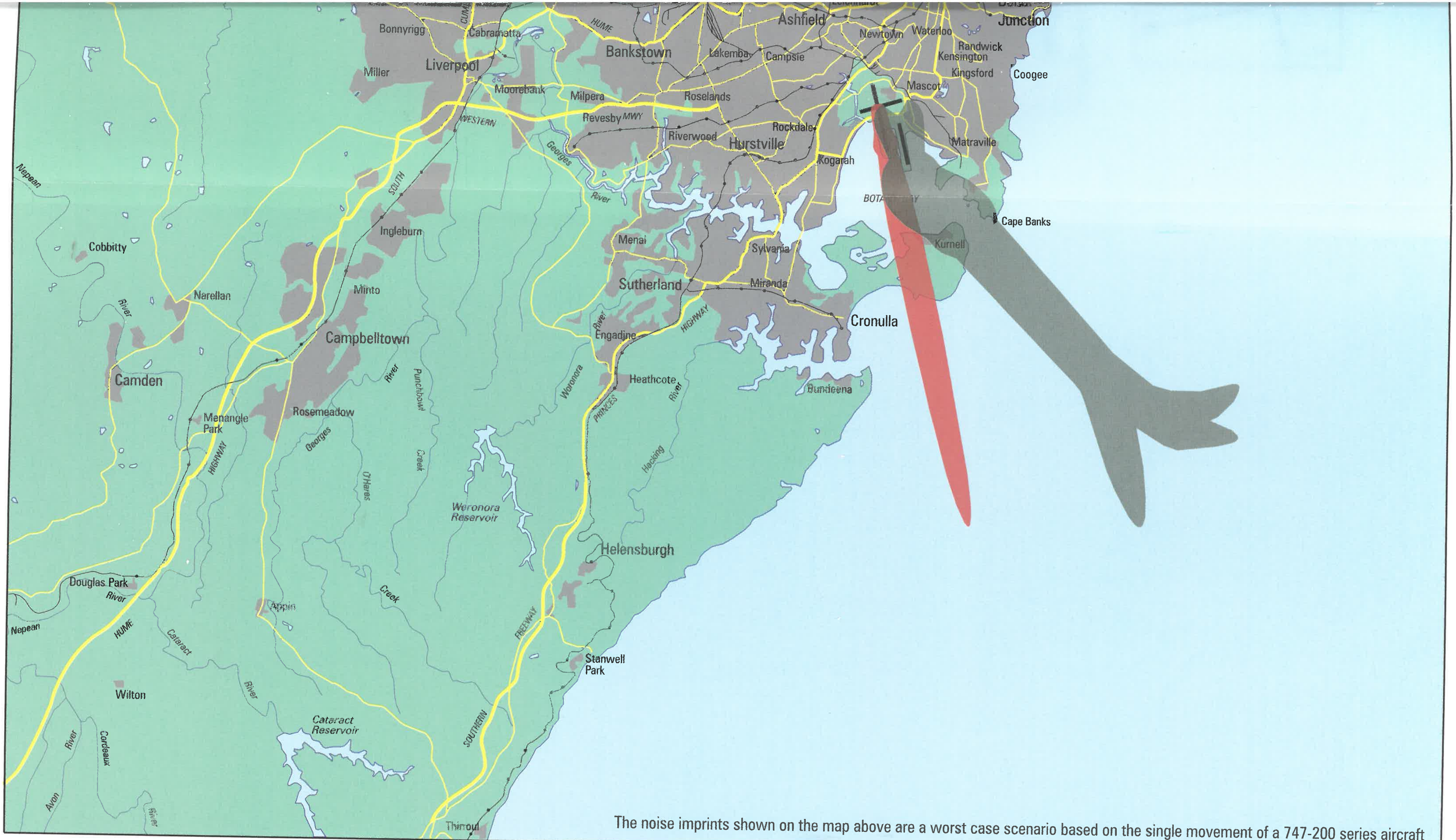
0 km 6
Scale approx

N

DEPARTURES
- Jet track
- Non-Jet track
- Dual track

ARRIVALS
- Jet track
- Non-Jet track
- Dual track

SYDNEY NOISE IMPRINT MODE 3 & 4 JET DEPARTURES 16L ARRIVALS 34L



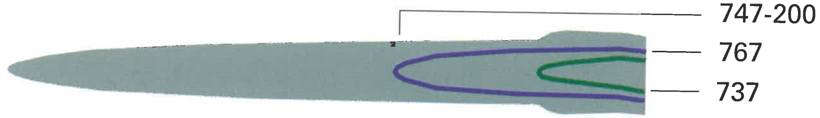
November 1996 MP 96/544.9.3/4

0 km 6

Scale approx

N

Note: The noise imprints shown are based on a single aircraft movement on the centreline of the indicative flight track



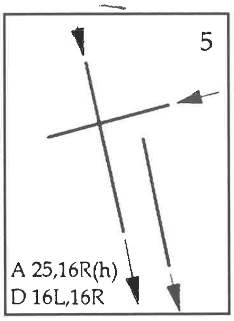
The diagram above indicates that a 767, 737 and similar aircraft leave a significantly smaller imprint than 747-200 series aircraft

Noise imprint Arrivals (70dBA or above based on a single movement of a 747-200 series aircraft)

Noise imprint Departures (70dBA or above based on a single movement of a 747-200 series aircraft)

Built-up-area (1993)

Mode 5



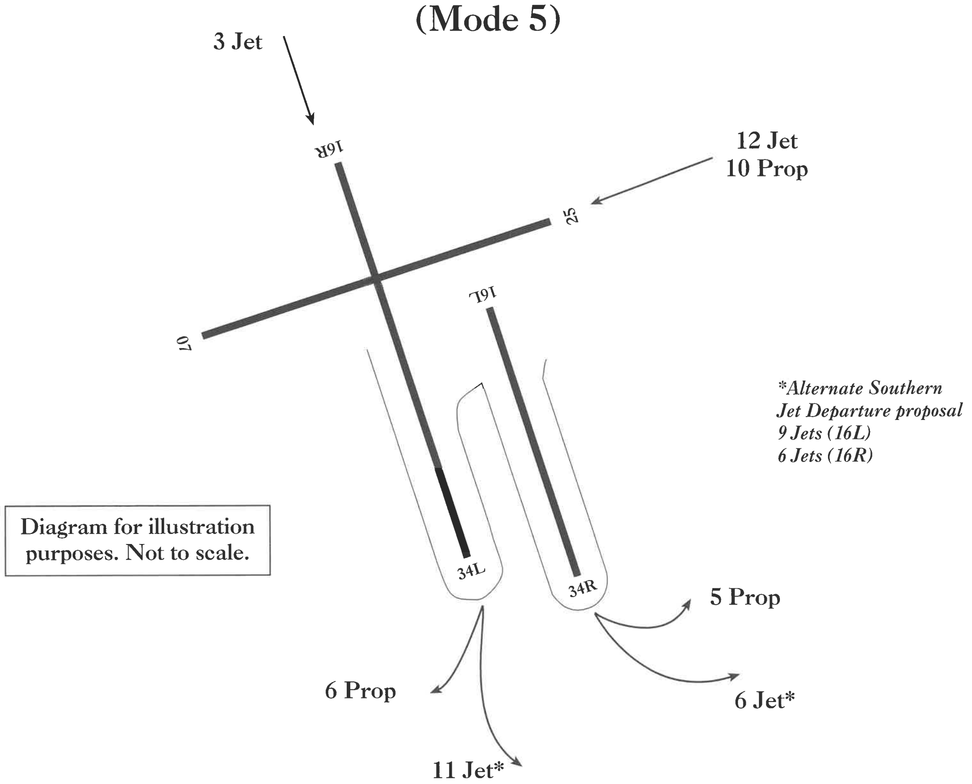
Method of operation

Departures to the south from Runways 16L and 16R.

Arrivals from the east on Runway 25. Arrivals from the north for those aircraft requiring to use the long runway.

This runway mode of operation confines departures to over-water and directs the majority of arrivals from the east.

Runway 16L/R Departures/25 Arrivals 16R (Long Haul) (Mode 5)



These traffic distribution figures represent estimated hourly movements for a Mode 5 operation based on a sustained capacity of 53 movements per hour consisting of 25 arrivals and 28 departures (refer Sydney Runway Capacity Study prepared by Sabre Decision Technologies).

Availability of configuration

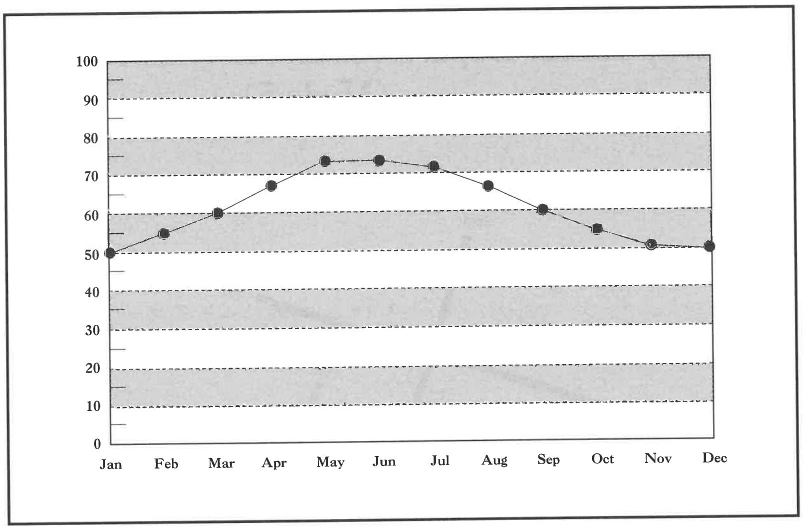
Operationally acceptable in wind conditions from south-south-east to west, depending on wind strength and in particular where traffic conditions are biased towards departures.

The Bureau of Meteorology wind data for the 55 years to December 1995 indicates that:

- the all months average availability would be 61 per cent.
- the average monthly availability ranges from 49 per cent in January and December to 74 per cent in May and June.

This graph indicates the 55 year average availability from January to December.

Where nil downwind criteria is specified the average of all months availability is 35 per cent

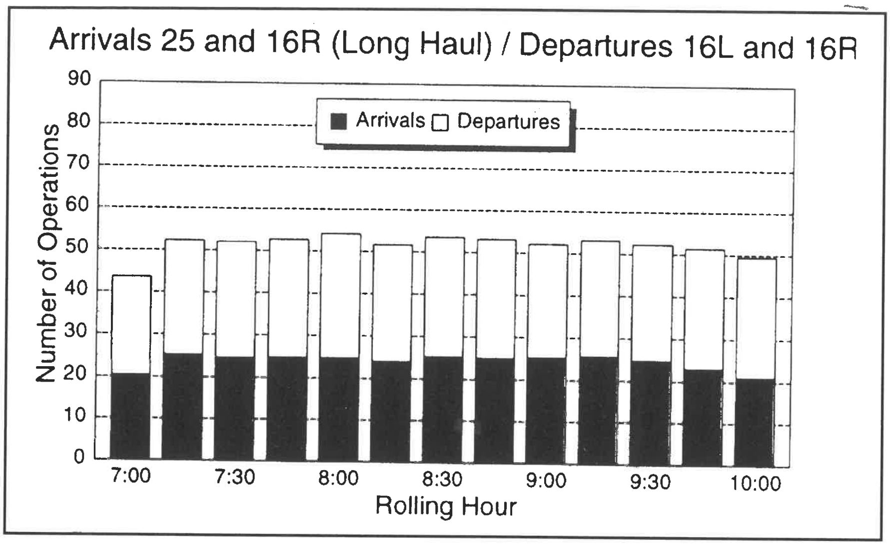


Operational capacity

Sabre SIMMOD modelling found a sustained capacity of 53 operations per hour consisting of 25 arrivals and 28 departures. Peak observed capacity of 54 operations

The capacity of this Mode does not quite reach the capacity of Mode 14 because of the use of a single arrival runway that intersects with a departure runway. Mode 14 allows more balanced arrivals on runways 07 and 16R.

This Mode will not reach 80 movements per hour. Sabre reported that the use of intersecting runways without LAHSO procedures will not allow 80 operations per hour due to the increase procedure time requirements.



Graph presents Sabre simulation results for a rolling hour period.

Operational complexity

Complexity increases as traffic levels increase where traffic from the south and west is tracked south of the airport over Kurnell. This creates a potential conflict with departing traffic which must cross over all these arrivals.

Departures are required to remain beneath the traffic arriving from the south and west which is routed 5 nautical miles south of the airport and out to sea to descend before turning back to the west to land.

Propeller aircraft to the north would be required to depart 16R. To offset this jet aircraft to the south would use 16L.

Controller workload is high during this mode of operation. Coordination between tower controllers is required to manage all runway crossings by aircraft, vehicles, and aircraft under tow. Additional coordination may be required for helicopter operations on, and in the vicinity of the airport. Controller workload may be reduced, and operating efficiency improved with the addition of an aerodrome control coordinator position (ADCC).

Constraints to optimisation of capacity

Capacity is constrained by the use of only a single arrival runway.

All departures need to cross the arrival runway, either during take-off roll on Runway 16R, where they must be sequenced by the aerodrome controller, or when taxiing for departure from Runway 16L.

Most arrivals will need to re-cross Runway 16R after landing, when proceeding to the domestic apron areas. This mode of operation may create problems with taxiway congestion around the International Terminal.

Use of Runway 25 is constrained in non VMC conditions due to the lack of a precision approach aid.

Helicopters may incur significant delays during this mode of operation due to the proximity of the heliport and the 25 threshold.

Risk associated with this mode is provided for in the procedures employed and in the development of the operating standard.

Environmental implications

Arrivals 16R (Heavy)

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 134,400.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	3,400ft	at	Turramurra, Beecroft.
B747-400	3,100ft	at	West Pymble, Epping.

Arrivals 25

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 44,200.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	3,400ft	at	Over Water
B747-400	3,100ft	at	Over Water
B767	2,900ft	at	Over Water
Saab 340	850ft	at	Coogee

Departures 16L &R

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 9,800.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	10,000ft	at	Over Water
B747-400	6,500ft	at	Over Water
B767	6,000ft	at	Over Water
Saab 340	3,000ft	at	Botany Bay

For further details refer to Appendix 9

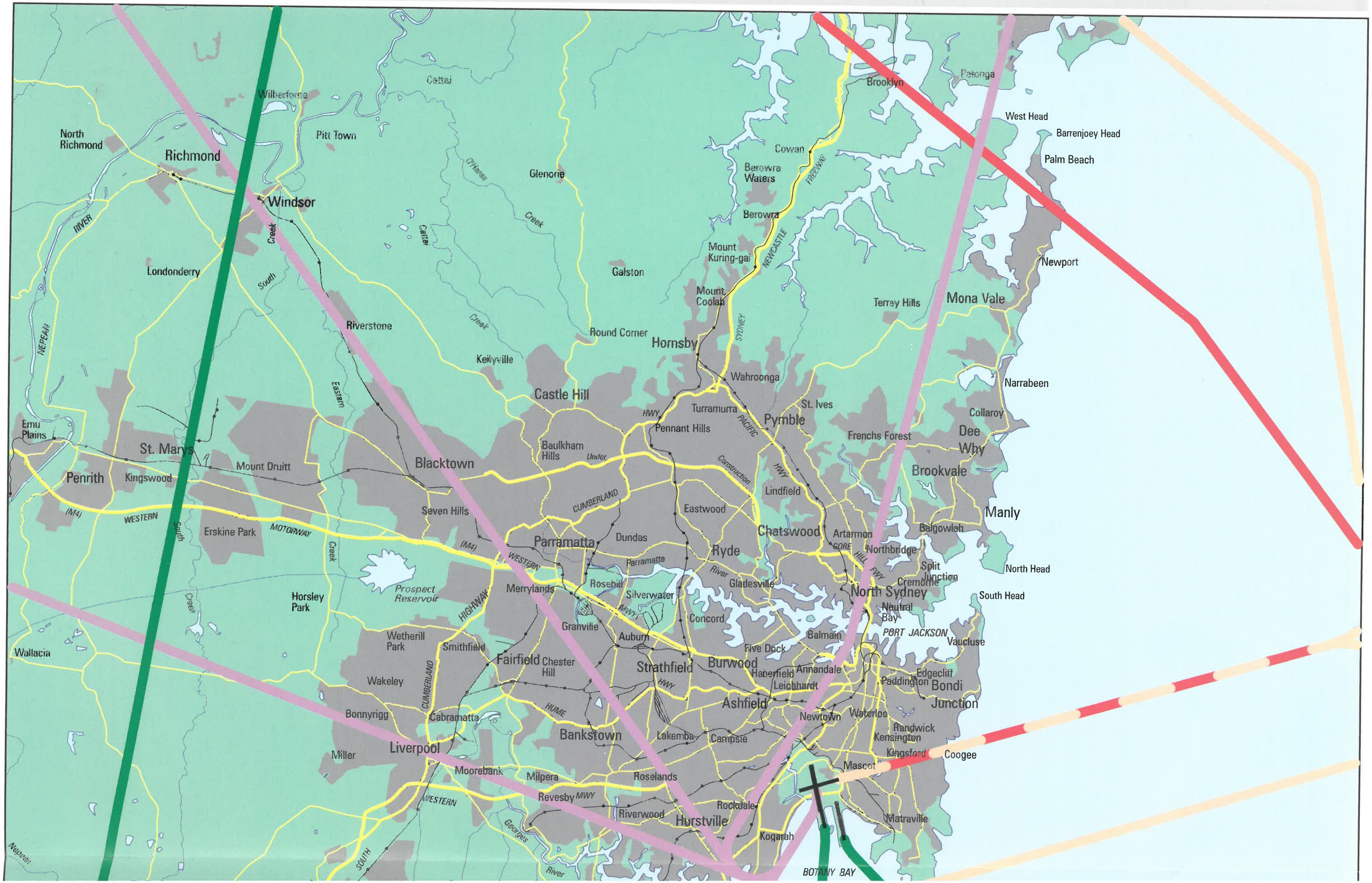
Conclusions

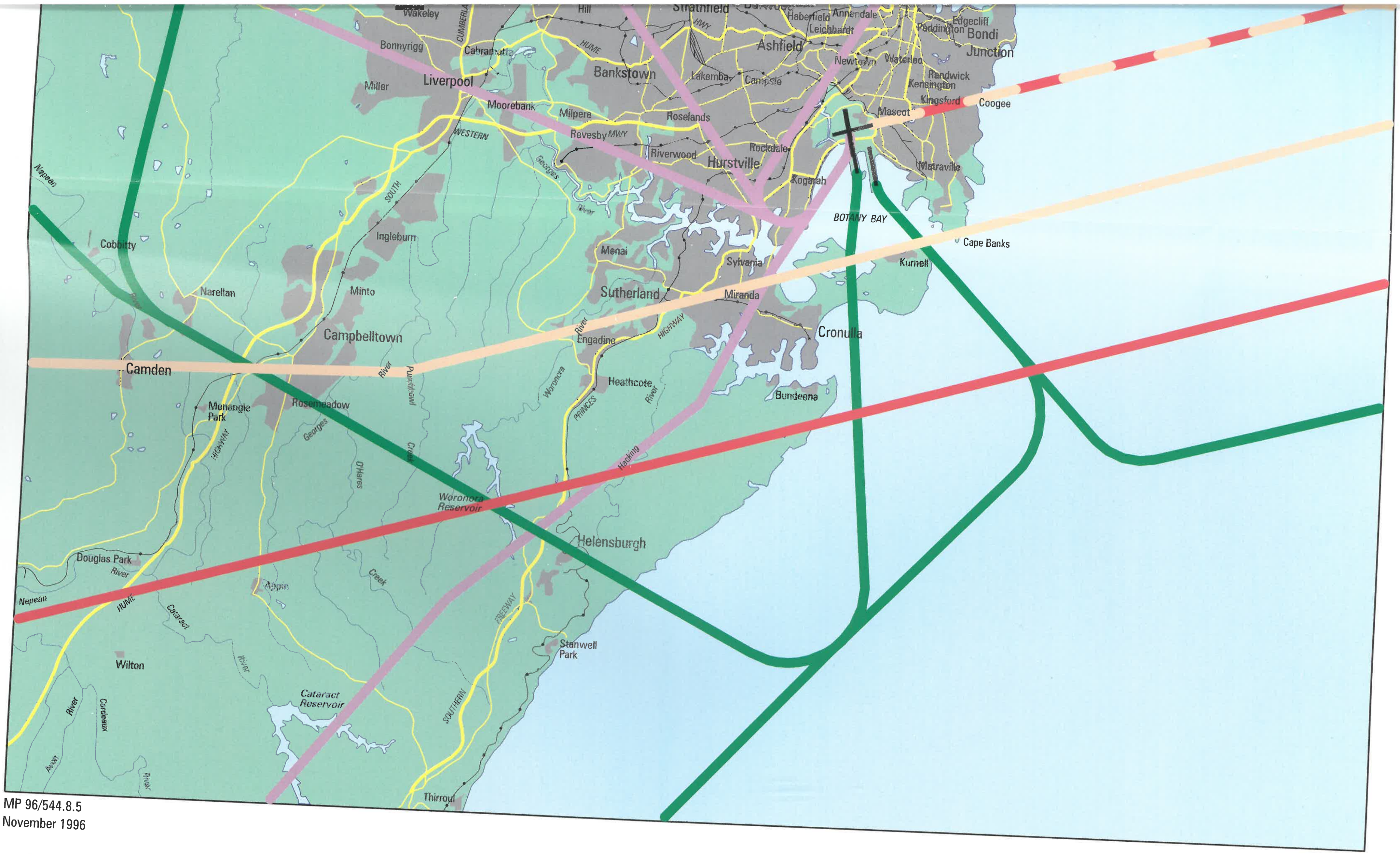
This is a suitable mode that can be employed to provide respite to residents to the north and northwest of the airport when the wind is in a southerly direction.

Proposed use

It is proposed that this mode be included in the plan and be available to provide respite and as an alternative to parallel operations when conditions are suitable.

SYDNEY MODE 5 DEPARTURES 16L, 16R ARRIVALS 25 (LONG HAUL JET ARRIVALS 16R)





MP 96/544.8.5
November 1996

Built-up-area (1993)

Note: Tracks shown are indicative

0 km 6

Scale approx

N

DEPARTURES

Jet track

Non-Jet track

Dual track

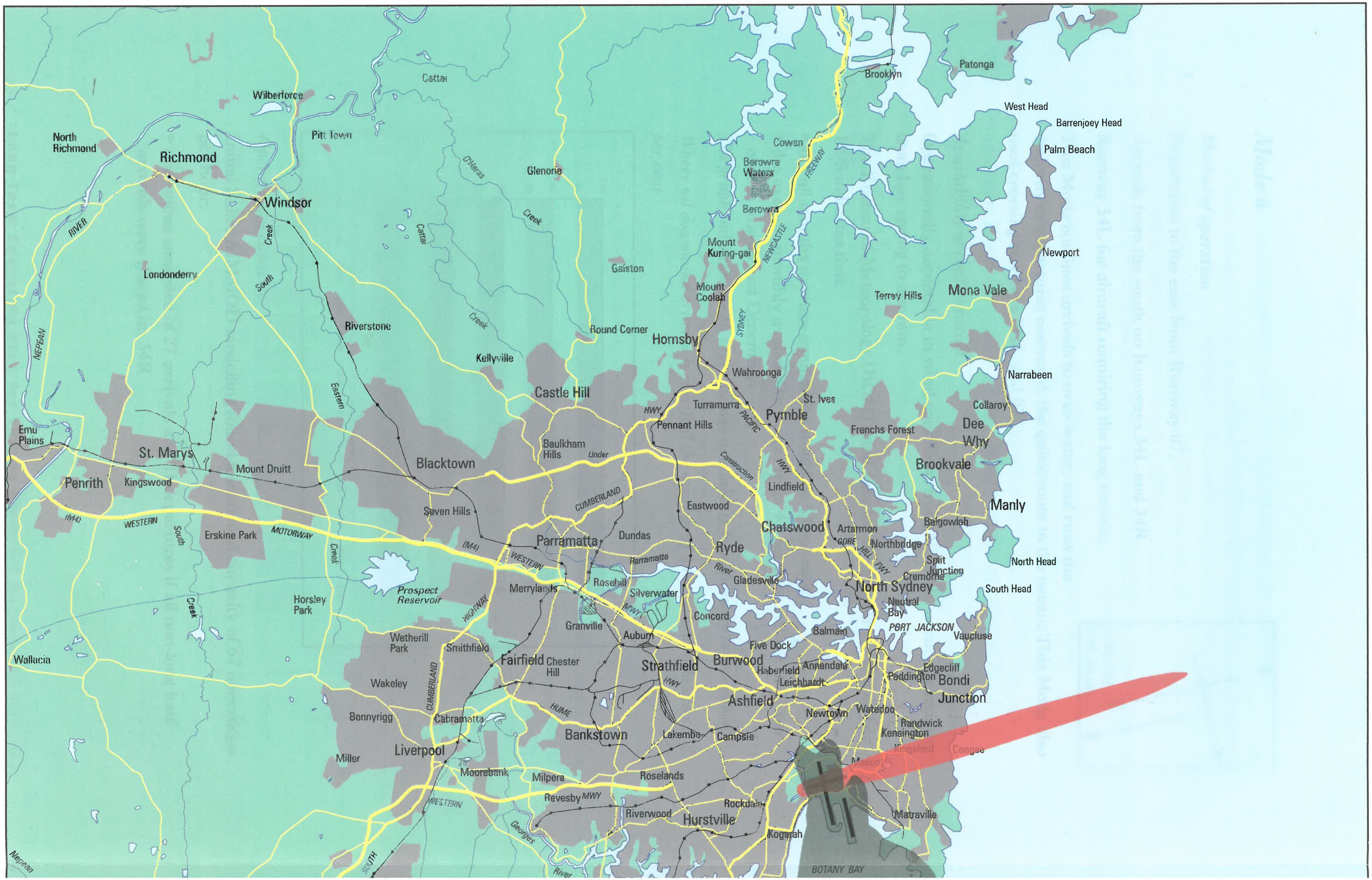
ARRIVALS

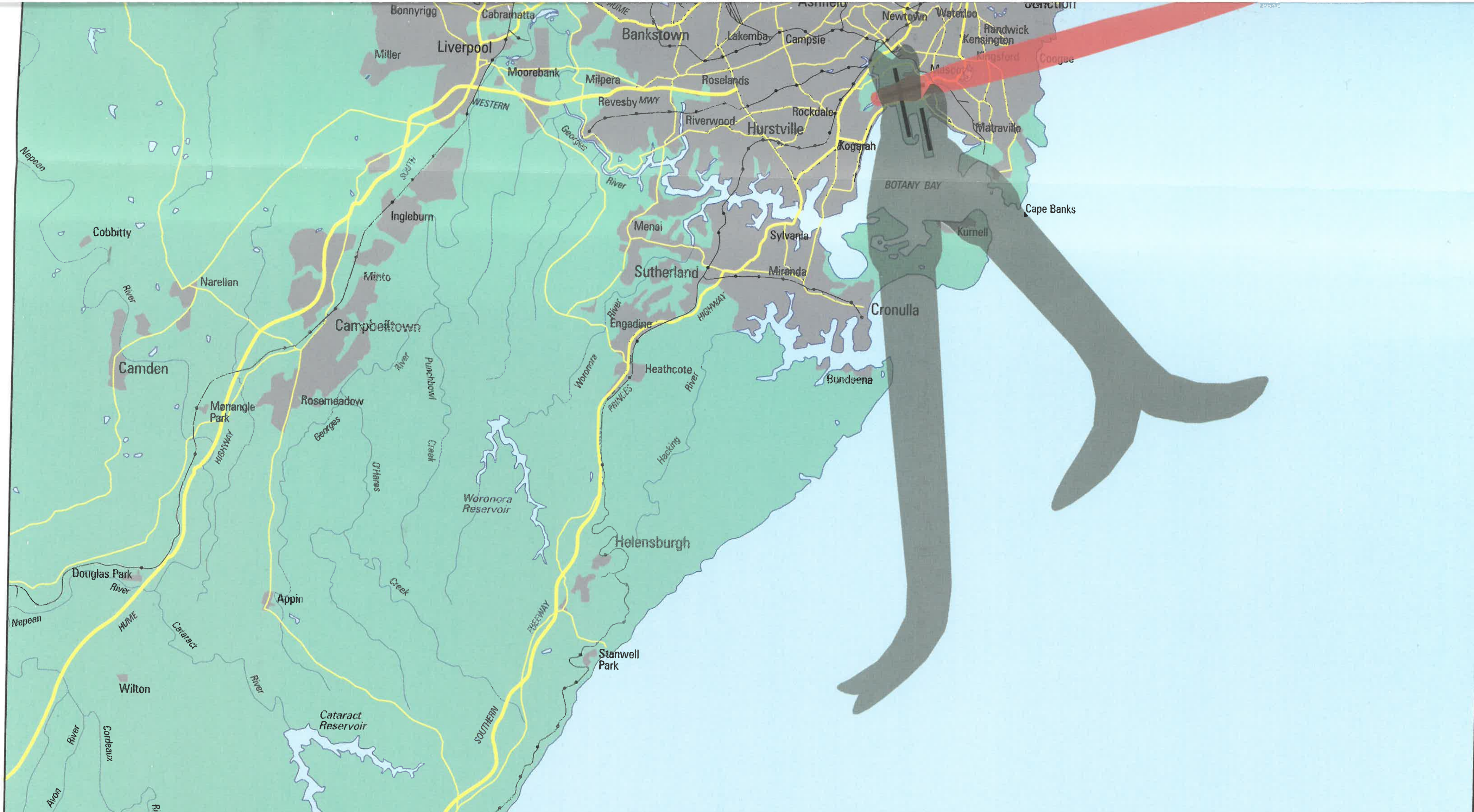
Jet track

Non-Jet track

Dual track

SYDNEY NOISE IMPRINT MODE 5 JET DEPARTURES 16L, 16R ARRIVALS 25





The noise imprints shown on the map above are a worst case scenario based on the single movement of a 747-200 series aircraft

November 1996 MP 96/544.9.5 © Commonwealth of Australia

0 km 6

Scale approx

N

Note: The noise imprints shown are based on a single aircraft movement on the centreline of the indicative flight track

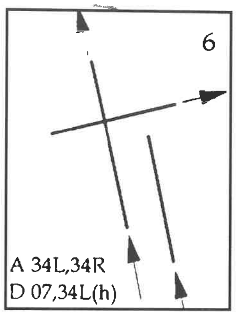
The diagram above indicates that a 767, 737 and similar aircraft leave a significantly smaller imprint than 747-200 series aircraft

Noise imprint Arrivals (70dBA or above based on a single movement of a 747-200 series aircraft)

Noise imprint Departures (70dBA or above based on a single movement of a 747-200 series aircraft)

Built-up-area (1993)

Mode 6



Method of operation

Departures to the east from Runway 07.

Arrivals from the south on Runways 34L and 34R.

Runway 34L for aircraft requiring the long runway.

This Mode confines arrivals to over-water, and runs the majority of departures eastward, the quick route to the ocean. This Mode also uses crossing runways (34L and 07).

Availability of configuration

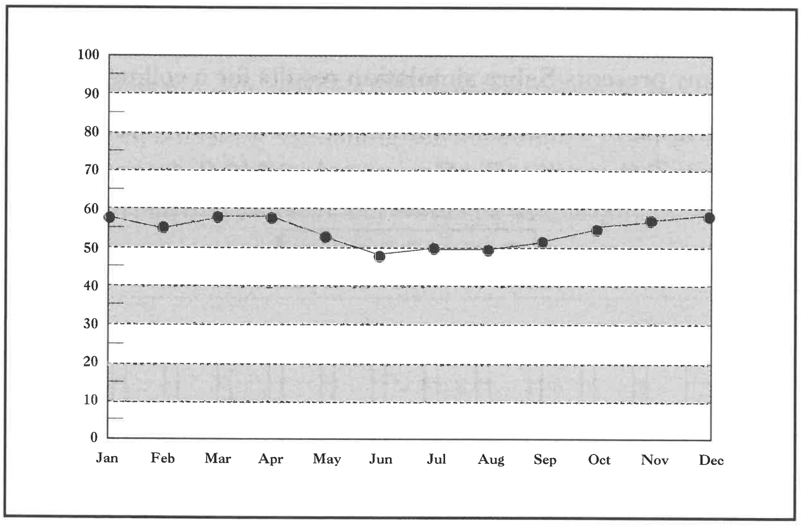
Operationally acceptable in wind conditions from NNW-E, occurring mainly from late spring to autumn.

The Bureau of Meteorology (BOM) wind data for the 55 years to December 1995 indicates that:

- the all months average availability would be 53 per cent.
- the average monthly availability ranges from 47 per cent in June to 57 per cent in March and December.

The graph indicates the 55 year average availability from January to December.

Where nil downwind criteria is specified the average of all months availability is 33 per cent



Operational capacity

Initial Sabre SIMMOD modelling found a sustained capacity of 67 operations per hour.

- operations consisted of 27 arrivals and 31 departures if all non-long haul arrivals were placed on 34R

- operations consisted of 38 arrivals and 20 departures if arrivals were balanced between 34L and 34R
- peak observed capacity of 59 operations

Arrival capacity is limited due to inefficient exit locations on both runways, crossing runway operations and the need for slightly increased spacing on the arrival track to 34L. Departure capacity is limited due to the crossing runway operations.

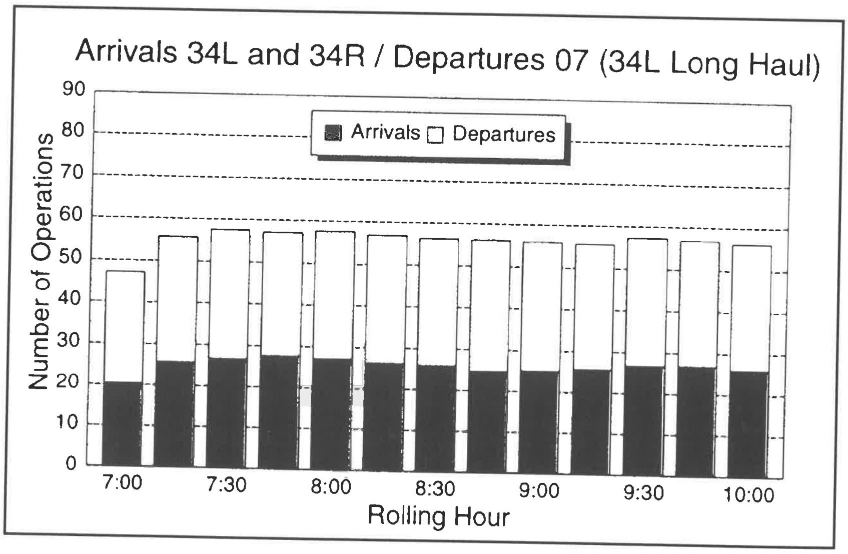
Sabre states that this Mode may be able to approach 80 movements per hour. However, new runway exits from 34L and 34R would be required and LAHSO would need to be applied to runway 34L arrivals whenever possible. The addition of new runway exits to runway 34L would probably remove the need for the increased spacing the arrival track. Additionally, the fanning of departures could improve the capacity of runway 07.

Further Sabre modelling which assumed the new runway exits and land and hold short operations found a sustained capacity of 67 movements per hour consisting of 37 arrivals and 30 departures. A peak observed capacity of 68 movements.

Sabre found that when the new runway exits were used without land and hold short operations a sustained capacity of 61 movements per hour could be achieved. (39 arrivals and 24 departures).

Additionally Sabre found that when the runway 34L buyout (the distance required between a runway 34L departure and the next runway 34L arrival) is reduced to 2 nautical miles, the sustained capacity increased to 68 movements (38 arrivals and 30 departures).

Graph below presents Sabre simulation results for a rolling hour period.



Operational complexity

This Mode involves complex operation that requires all departing traffic off Runway 07 to be sequenced with two streams of arrivals to the parallel runways. There is potential conflict at the runway intersection with the main runway and again between the airborne departure and any overshoot from Runway 34R. This impacts upon the operational capacity of the configuration.

Constraints to optimisation of capacity

Complexity for tower controllers, due to the interaction between arriving and departing aircraft, would introduce considerable risk which would impair operating efficiency. This would be managed at the expense of capacity.

The restriction caused by the area to the south which is used for the descent of arriving aircraft limits turns to the south and impact upon the departure rate achievable,

Helicopter operations to and from the heliport would be delayed during this Mode of operation.

Availability of PARM required to maintain arrival rates in non-visual conditions.

Requires a high skill level for all controllers involved.

Accuracy of sequencing to 'pair' arrivals to the parallel runways required to provide for departures.

There is a shortage of available taxiways around the International Terminal which consequently contributes to departure delays as well as restricting entry to and exit from the terminal aprons.

This effects not only arriving and departing aircraft, but the regular movement of aircraft under tow to and from the maintenance areas or repositioning of aircraft on the aprons. Additional taxiway facilities between Taxiway G and Runway 07 may alleviate this problem, but would be usable only in visual conditions.

All departing domestic traffic would require to cross an active arrival runway.

Environmental implications

Arrivals 34L&R

The number of people exposed to noise of 70 dB(A) or more for B747-200 (34L) and B767 (34R) aircraft is a total of 700.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	10,000ft	at	Over Water
B747-400	6,500ft	at	Over Water

B767	6,000ft	at	Over Water
Saab 340	3,000ft	at	Kurnell Peninsula

Departures 07

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 223,200.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	10,000ft	at	Over Water
B747-400	6,500ft	at	Over Water
B767	6,000ft	at	Over Water
Saab 340	3,000ft	at	Rosebery

Departures 34L

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 606,300.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	10,000ft	at	Kuring-gai Chase National Park (north), Cromer (east), Royal National Park (south), Horsley Park (west) and Kellyville (northwest)
B747-400	6,500ft	at	Davidson (north, east), RNP (south), Wetherill Park (west), Baulkham Hills West (northwest)

For further details refer to Appendix 9

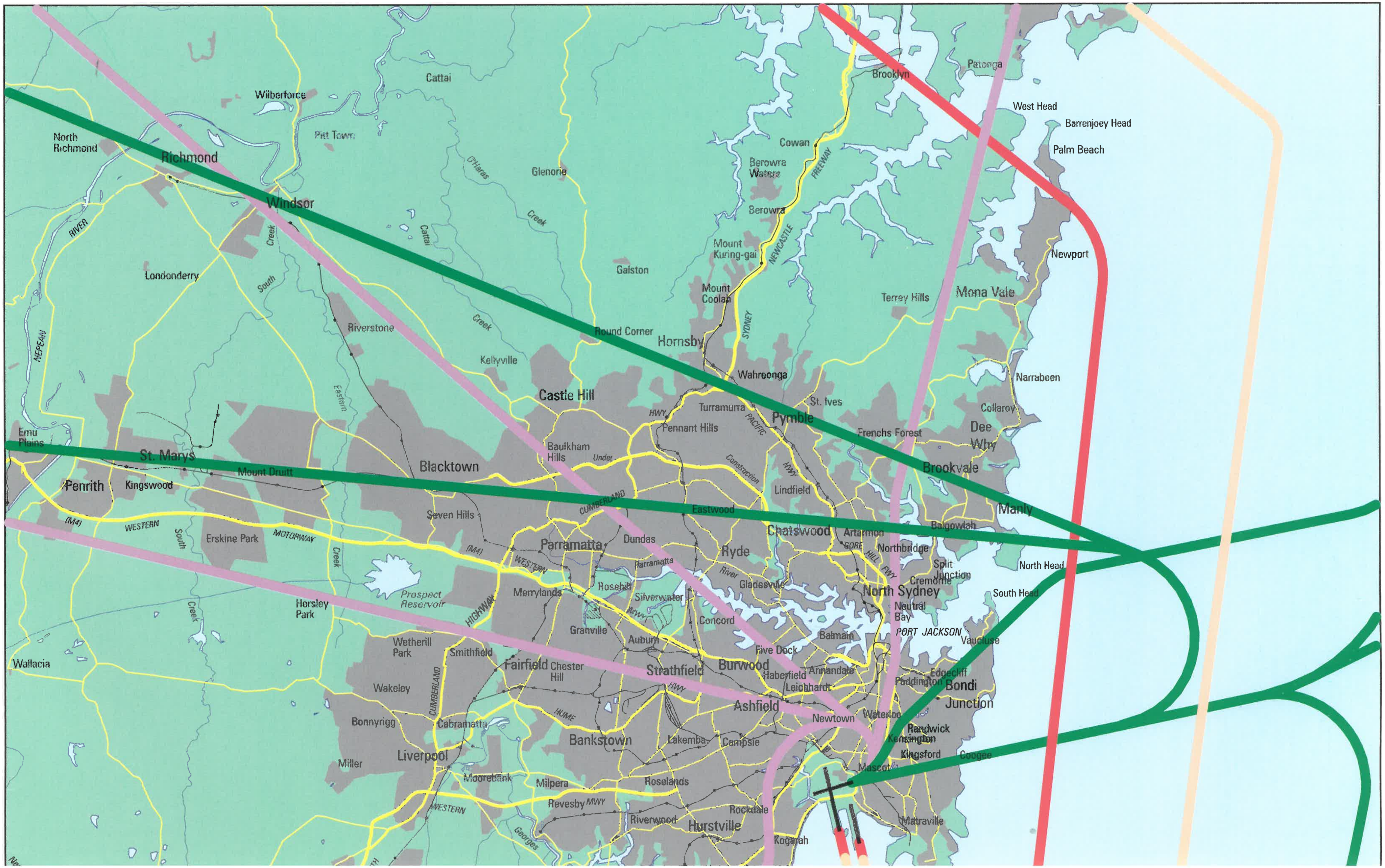
Conclusions

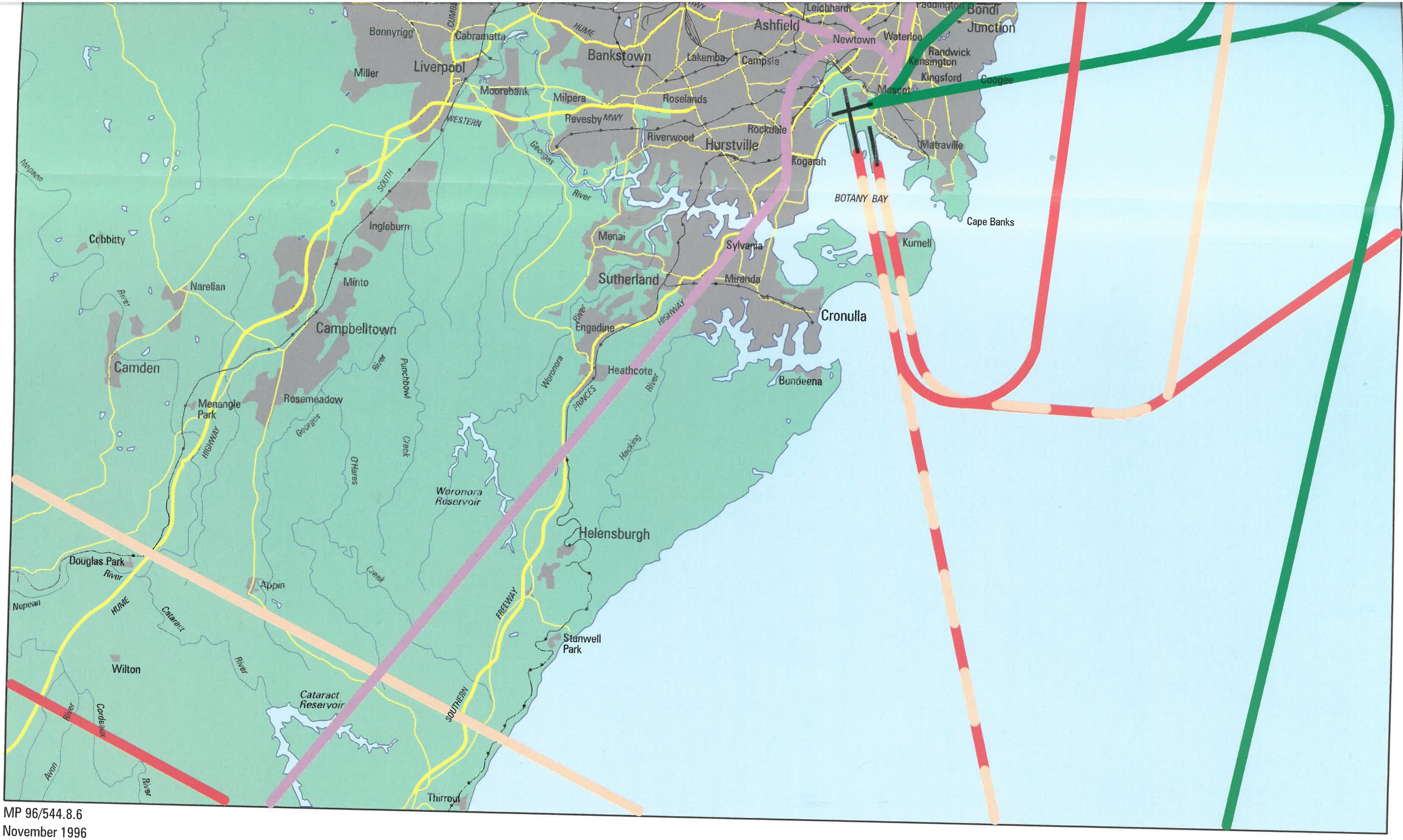
The complexity of this configuration, with the attendant impost on capacity, mitigates against this mode as a preferred option. It concentrates departing traffic over the Eastern Suburbs which will also experience traffic from other, more preferred modes. The benefits of respite for the north can be better achieved through other modes.

Proposed use

It is proposed that this Mode not be included in the plan.

SYDNEY MODE 6 DEPARTURES 07 ARRIVALS 34L, 34R (LONG HAUL JET DEPARTURES 34L)





MP 96/544.8.6
November 1996

Built-up-area (1993)

Note: Tracks shown are indicative

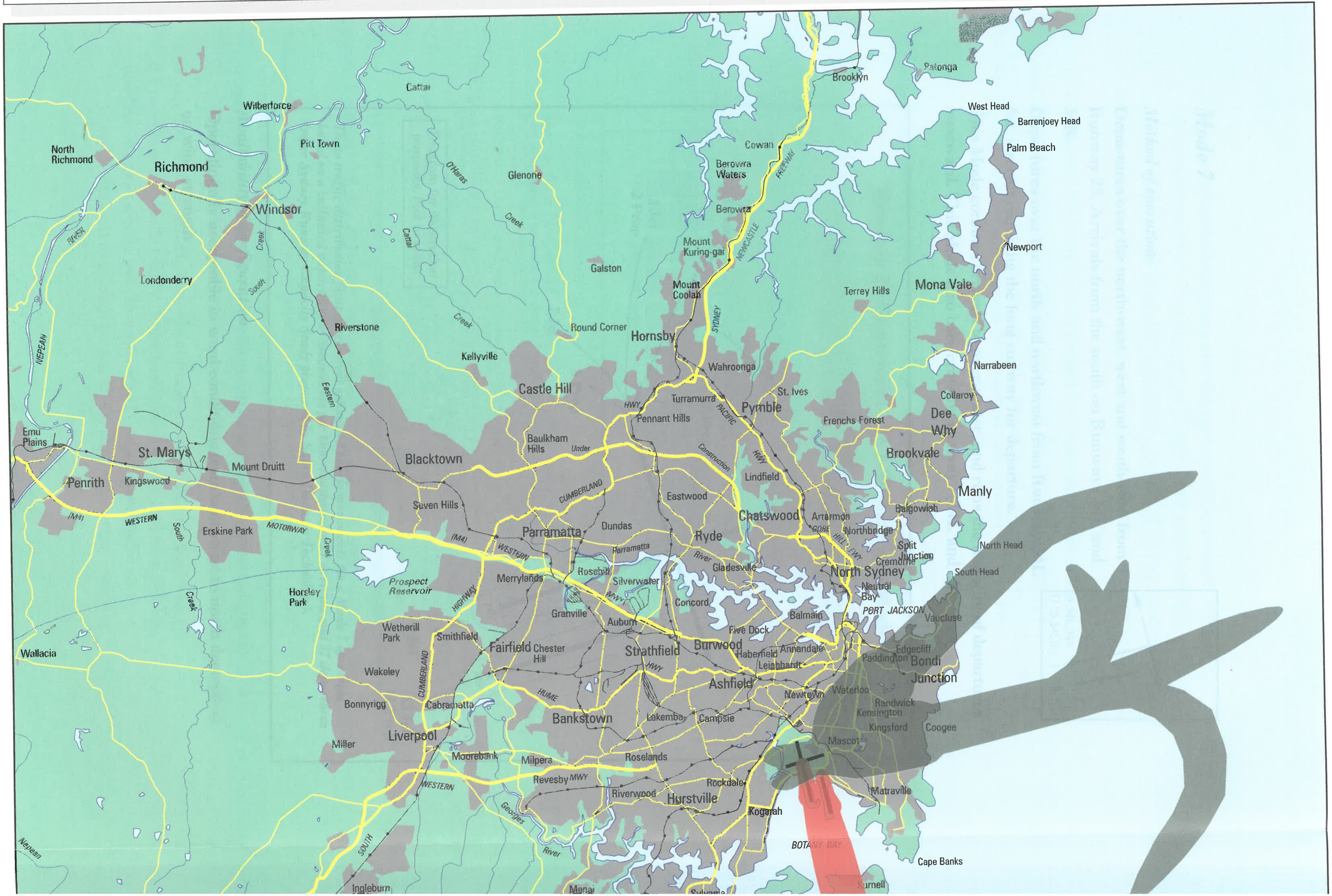
0 km 6
Scale approx

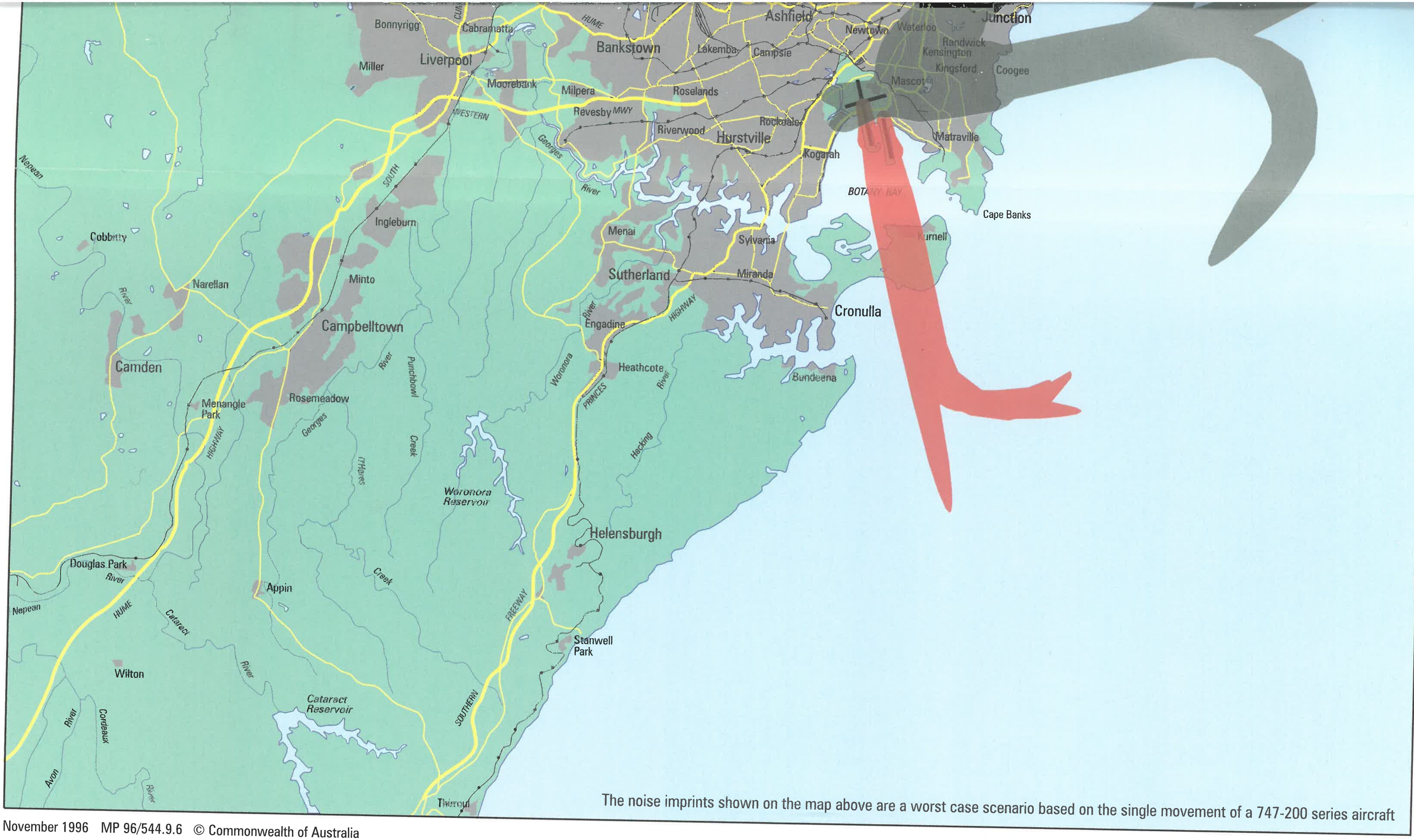
N

DEPARTURES
- Jet track
- Non-Jet track
- Dual track

ARRIVALS
- Jet track
- Non-Jet track
- Dual track

SYDNEY NOISE IMPRINT MODE 6 JET DEPARTURES 07 ARRIVALS 34L, 34R





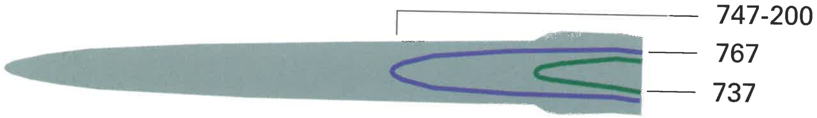
November 1996 MP 96/544.9.6

0 km 6

Scale approx

N

Note: The noise imprints shown are based on a single aircraft movement on the centreline of the indicative flight track



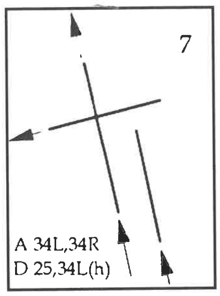
The diagram above indicates that a *767, 737* and similar aircraft leave a significantly smaller imprint than 747-200 series aircraft

Noise imprint Arrivals (70dBA or above based on a single movement of a 747-200 series aircraft)

Noise imprint Departures (70dBA or above based on a single movement of a 747-200 series aircraft)

Built-up-area (1993)

Mode 7



Method of operation

Departures over the north-west, west and south-west from Runway 25. Arrivals from the south on Runways 34L and 34R.

Departures over the north and northwest from Runway 34L for aircraft requiring the long runway for departure.

This Mode confines arrivals to over-water, and runs the majority of departures westward. This Mode also uses crossing runways (34L and 25).

Runway 25 Departures / 34 L/R Arrivals (Mode 7)

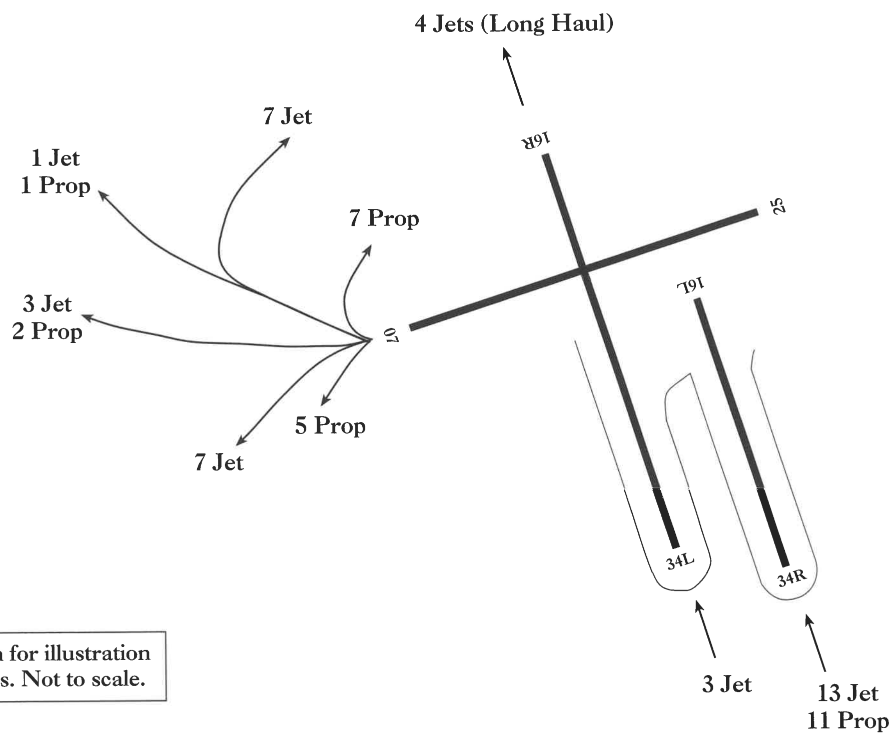


Diagram for illustration purposes. Not to scale.

These traffic distribution figures represent estimated hourly movements for a Mode 7 operation based on a sustained capacity of 64 movements per hour consisting of 27 arrivals and 37 departures (refer Sydney Runway Capacity Study prepared by Sabre Decision Technology).

Availability of configuration

Operationally acceptable in wind conditions from southwest to north depending on wind strength

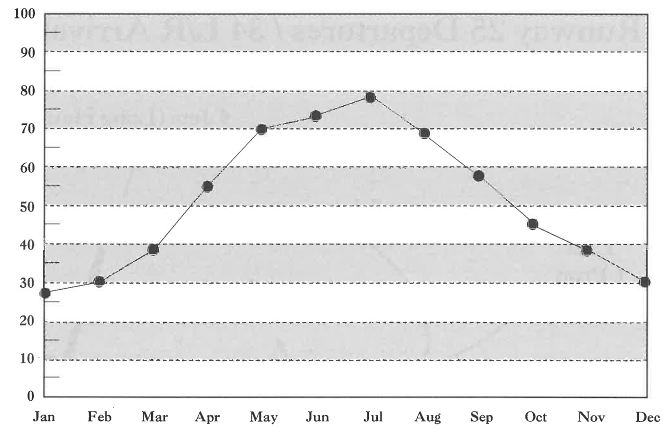
The Bureau of Meteorology (BOM) wind data for the 55 years to December 1995 indicates that:

- the all months average availability would be 50 per cent.
- the average monthly availability ranges from 28 per cent in January to 78 per cent in July.

Mainly available Autumn and Spring

The graph indicates the 55 year average availability from January to December.

Where nil downwind criteria is specified the average of all months availability is 38 per cent



Operational capacity

Initially Sabre SIMMOD modelling found a sustained capacity of 64 operations per hour

- operations consisted of 27 arrivals and 37 departures if all non-long haul arrivals were placed on 34R
- operations consisted of 37 arrivals and 27 departures if arrivals were balanced between 34L and 34R
- peak observed capacity of 65 operations

Mode 7 has more departure capacity than Mode 6 due to the fanning departure tracks which decreases the procedure times

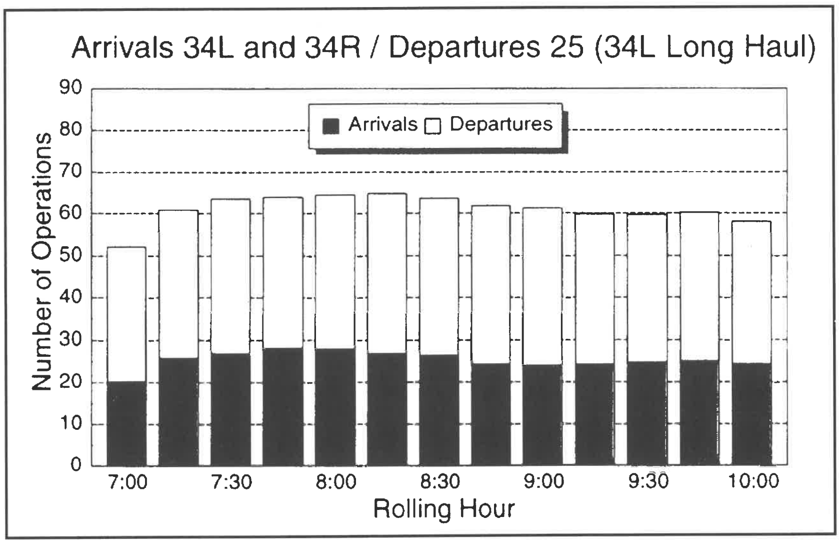
Sabre modelling indicates that arrival capacity is limited due to inefficient exit locations on both runways, crossing runway operations, and the need for slightly increased spacing on the arrival track to runway 34L. Departure capacity is limited due to the crossing runway operations.

This Mode may attain 80 movements per hour. However, new runway exits for 34L and 34R would be required and LAHSO should be applied to 34L arrivals whenever possible. The addition of new runway exits to 34L will probably remove the need for increased spacing in the arrival track.

Further Sabre modelling with the new runway exits and land and hold short operations found sustained capacity of 73 movements per hour consisting of 38 arrivals and 35 departures. Peak observed capacity of 75 movements.

Sabre found that when the new runway exits were used without land and hold short operations a sustained capacity of 69 movements per hour could be achieved (38 arrivals and 31 departures). Also Sabre found that when the 34L buyout is reduced to 2 nautical miles (the distance required between a 34L departure and the next 34L arrival) the sustained capacity increased to 75 movements (39 arrivals and 36 departures).

Graph below presents SDT results for a rolling hour period.



Operational complexity

This mode is best suited where the arrival demand exceeds the departure demand. Heavy departure demand results in taxiway congestion at the departure threshold which can impact on operations at domestic terminals.

Experience with this Mode of operation indicates significant departure delays in other than light to moderate traffic. Resulting taxiway congestion increases the complexity of managing ground traffic and increases controller workload.

The operating efficiency of controllers may be impaired by the high workload generated by this mode of operation. Efficiency may be improved with the provision of an aerodrome control coordinator to assist the aerodrome controller.

Some complexity for tower control exists with interaction between arrivals on the long runway with departing traffic. Landing operations on Runway 34R can proceed independently.

Constraints to optimisation of capacity

Single runway operations for departures.

Provision of PARM required to maintain arrival rates in non-visual conditions.

Interaction of arrivals on Runway 34L with departures on Runway 25.

All arriving aircraft must cross the active departure runway when taxiing after landing.

Risk associated with this mode is provided for in the procedures employed and in the development of the operating standard.

Environmental implications

Arrivals 34L&R

The number of people exposed to noise of 70 dB(A) or more for B747-200 (34L) and B767 (34R) aircraft is a total of 700.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	3,400ft	at	Over Water
B747-400	3,100ft	at	Over Water
B767	2,900ft	at	Over Water
Saab 340	850ft	at	Kurnell Peninsula

Departures 25

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 787,200.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	10,000ft	at	Belrose (north), Heathcote/Royal National Park (south), over water/Middle Harbour (east), Horsley Park (west), Toongabbie (northwest) & Parklea (northwest-early turn)
B747-400	6,500ft	at	Lindfield (north), Royal National Park (south), North Sydney (east), Cabramatta (west), Merrylands (northwest) & Northmead (northwest-early turn)

B767	6,000ft	at	Tennyson (north), Sutherland (south), Gladesville (north), Bankstown Aerodrome (west), Yagoona (northwest) & Silverwater (northwest-early turn)
Saab 340	3,000ft	at	Arncliffe (north), Brighton le Sands (south), Arncliffe (east), Arncliffe (west) & Arncliffe (northwest)

Departures 34L

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 606,300.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	10,000ft	at	Kuring-gai Chase National Park (north), Cromer (east), Royal National Park (south), Horsley Park (west) and Kellyville (northwest)
B747-400	6,500ft	at	Davidson (north, east), Royal National Park (south), Wetherill Park (west), Baulkham Hills West (northwest)

For further details refer to Appendix 9

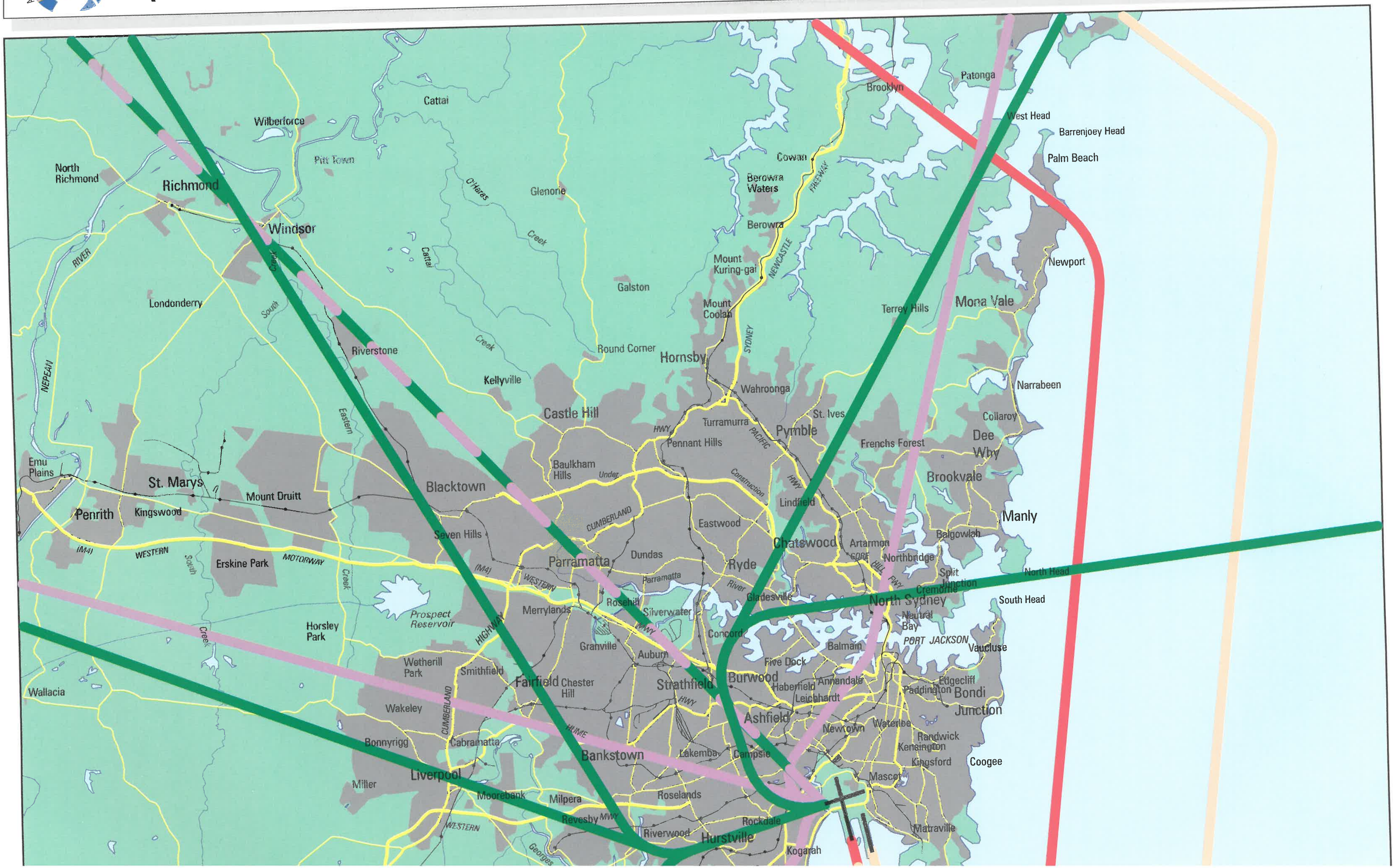
Conclusions

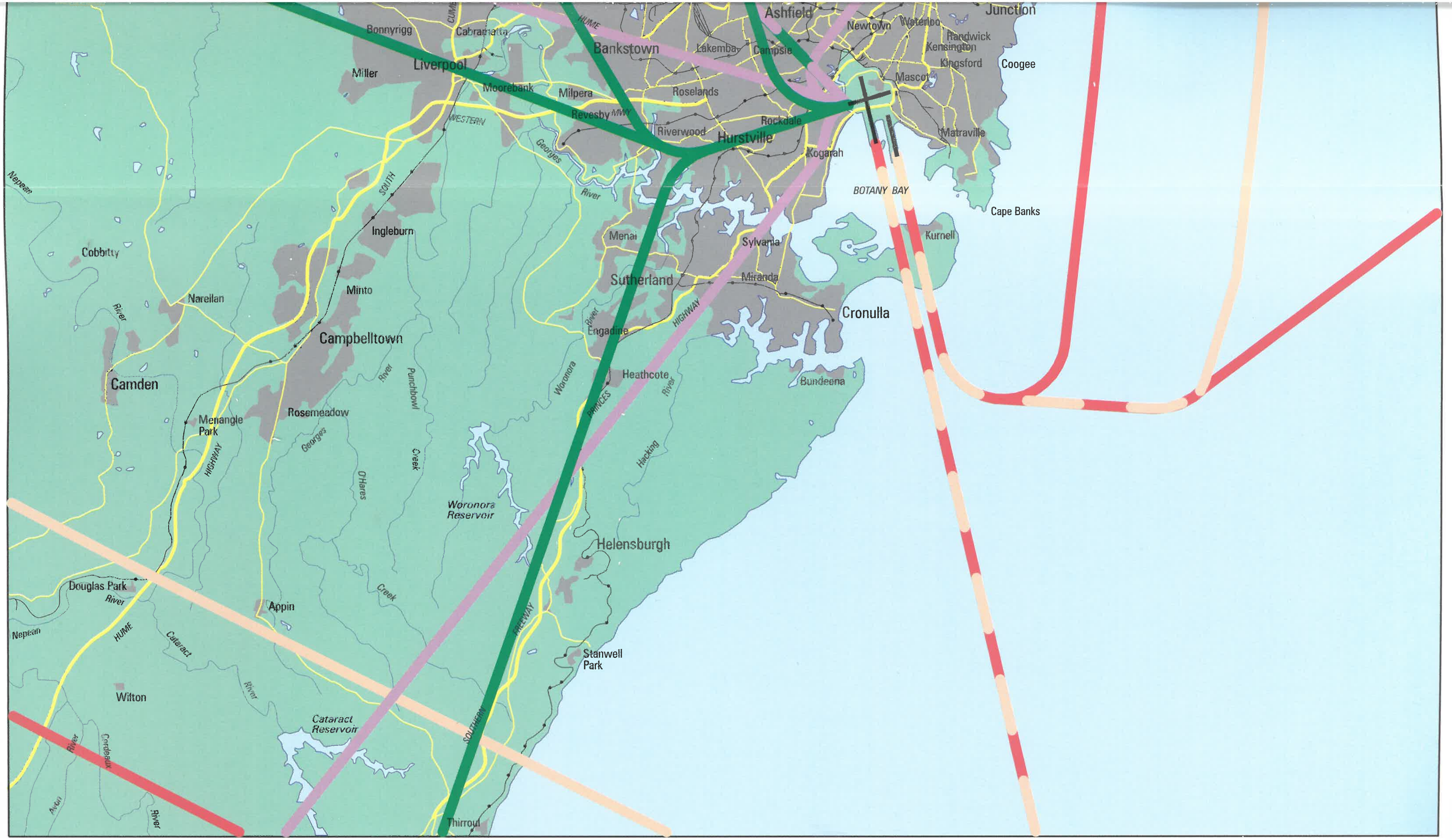
This Mode can be utilised when the wind is a north westerly. It will provide respite to the east and the northern suburbs from the operations of Mode 9 (34L and 34R parallel operations).

Proposed use

It is proposed that this Mode be included in the plan as part of the initial nine Modes selected for initial implementations.

SYDNEY MODE 7 DEPARTURES 25 ARRIVALS 34L, 34R (LONG HAUL JET DEPARTURES 34L)





MP 96/544.8.7
November 1996

Built-up-area (1993)

0 km 6

Scale approx

N

Note: Tracks shown are indicative

DEPARTURES

Jet track

Non-Jet track

Dual track

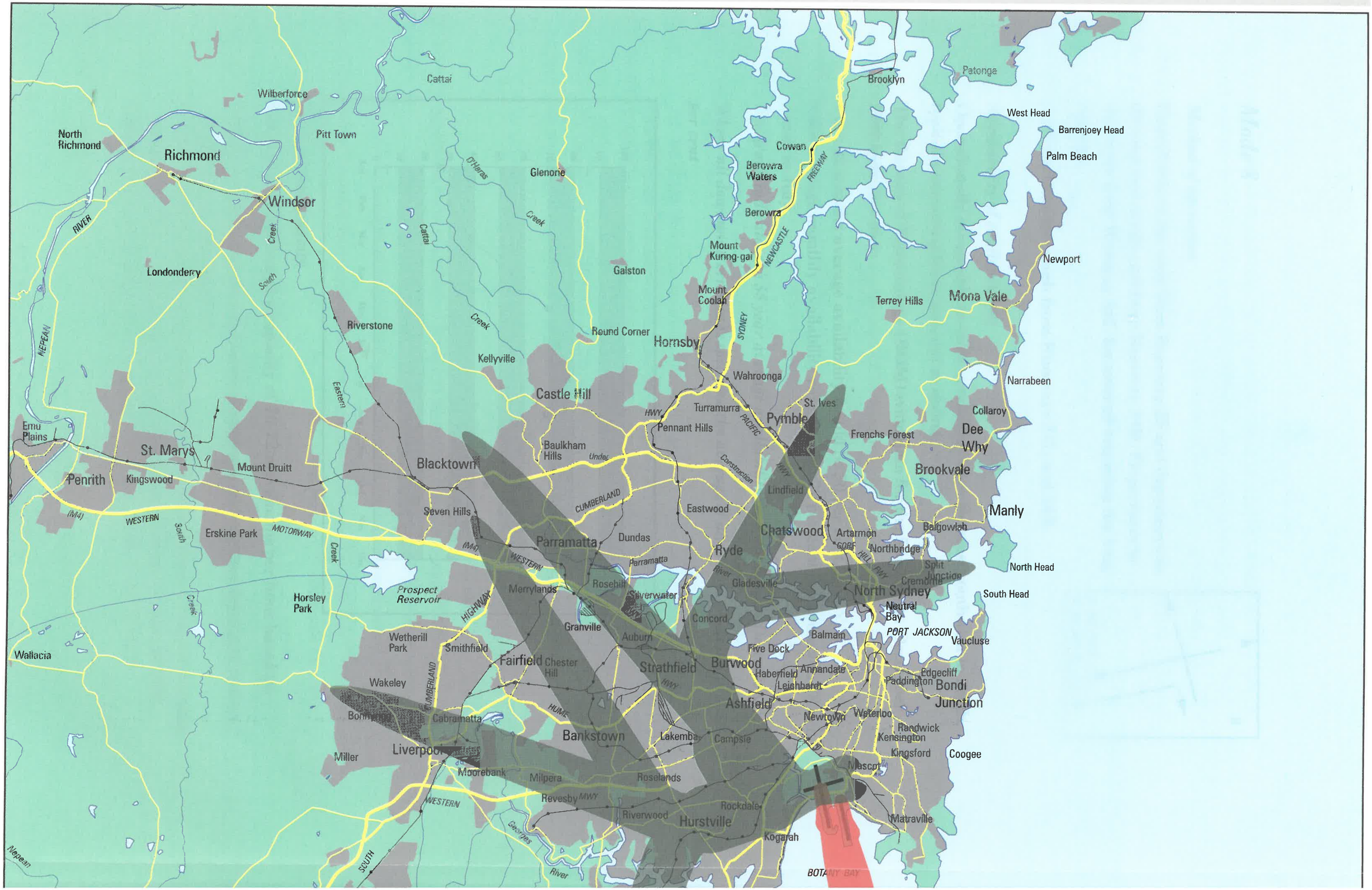
ARRIVALS

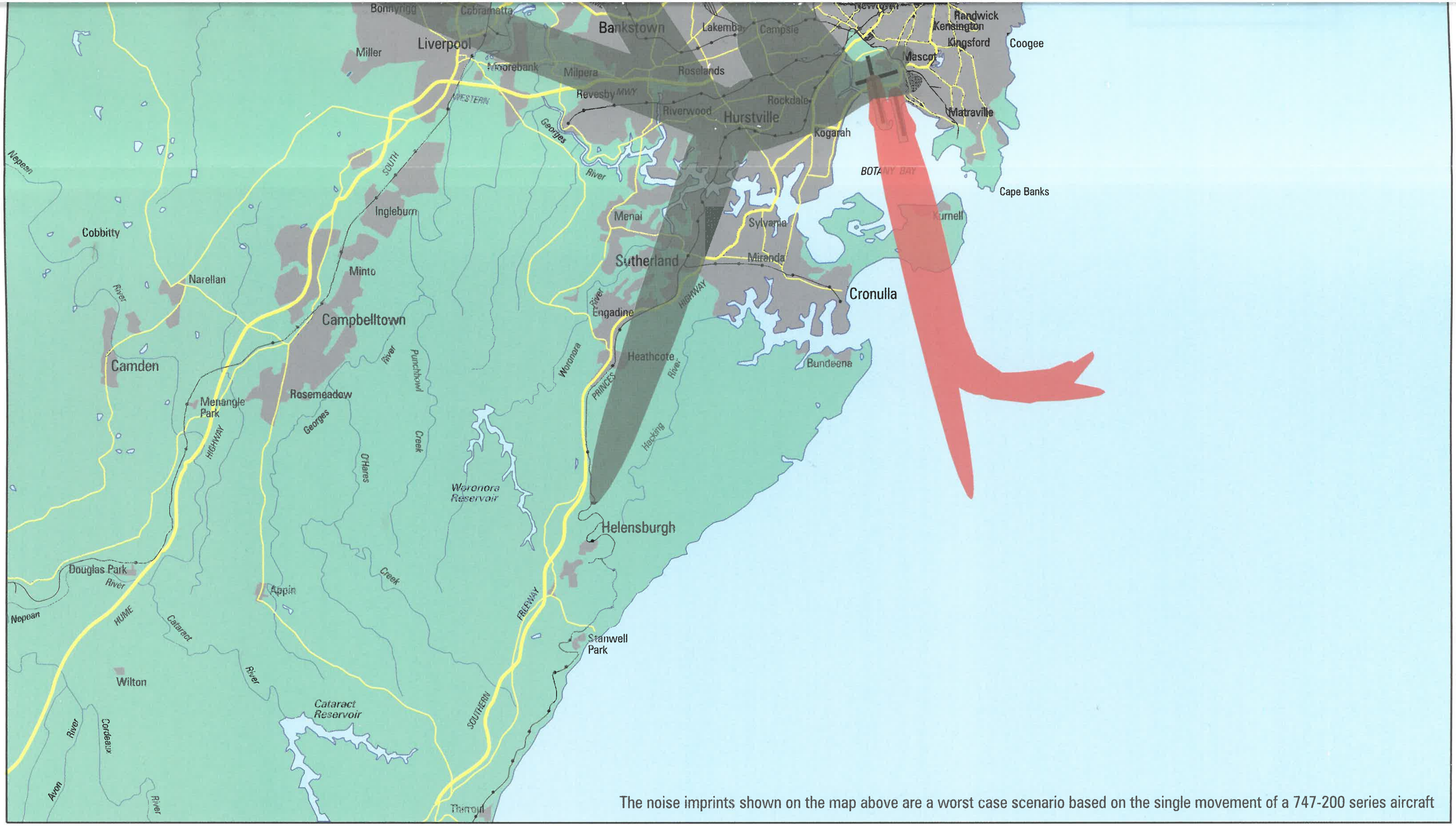
Jet track

Non-Jet track

Dual track

SYDNEY NOISE IMPRINT MODE 7 JET DEPARTURES 25 ARRIVALS 34L, 34R





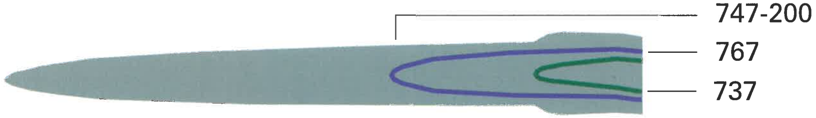
November 1996 MP 96/544.9.7 © Commonwealth of Australia

0 km 6

Scale approx

N

Note: The noise imprints shown are based on a single aircraft movement on the centreline of the indicative flight track



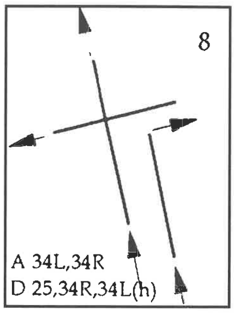
The diagram above indicates that a 767, 737 and similar aircraft leave a significantly smaller imprint than 747-200 series aircraft

Noise imprint Arrivals (70dBA or above based on a single movement of a 747-200 series aircraft)

Noise imprint Departures (70dBA or above based on a single movement of a 747-200 series aircraft)

Built-up-area (1993)

Mode 8



Method of operation

Departures to the west from Runway 25 and departures to the east and north-east from Runway 34R. Departures to the north from Runway 34L for aircraft requiring the long runway.

Arrivals from the south from Runways 34L and 34R.

Availability of configuration

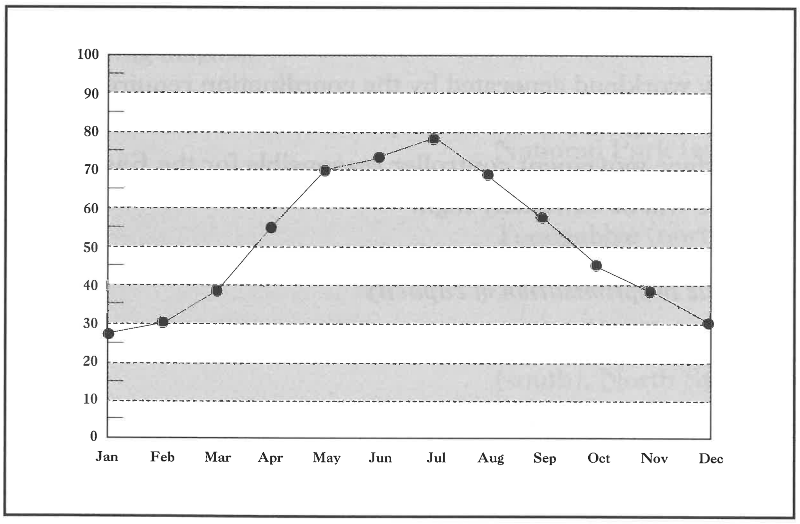
Operationally acceptable in wind conditions from the west southwest to north, typically occurring from autumn to spring.

The Bureau of Meteorology (BOM) wind data for the 55 years to December 1995 indicates that:

- the all months average availability would be 50 per cent.
- the average monthly availability ranges from 28 per cent in January to 78 per cent in July.

The graph indicates the 55 year average availability from January to December.

Where nil downwind criteria is specified the average of all months availability is 38 per cent



Operational capacity

Sabre initially estimated a capacity of 70-72 movements per hour based on

- Mode 7 which uses the same arrival runways and one less departure runway (34R), has a capacity of 64
- Mode 9 which uses the same arrival and departure runways without crossing operations (25), has a capacity of 74 with a peak of 15 departures off 34R
- Mode 8 should produce capacity results between Mode 7 and Mode 9.

This Mode confines arrivals to over-water, and distributes departures to the east, west and to the north (long hauls). In addition, this mode may be very complex for the air traffic controllers.

Sabre considered this Mode may obtain 80 movements per hour. However, new runway exits for 34L and 34R would be required and LAHSO should be applied to 34L arrivals whenever possible.

Following further modelling of Mode 7 and Mode 9, Sabre revised estimate for Mode 8 is a sustained capacity of 78-80 movements per hours when the new runway exits, land and hold short operations, and a reduced buyout of 2 nautical miles are used.

This Sabre estimate was based on

- Mode 7 achieving a capacity of 73 movements per hour when using land and hold short operations and the new runway exits
- Mode 9 achieving a capacity of 82 operations per hour when using the new runway exits and the reduced buyout.

Sabre considered that the increase of 9 movements per hour for both Mode 7 and Mode 9 suggested that the same operational and airfield improvements would increase the initial capacity of 70-72 movements per hour for Mode 8 by the same magnitude.

Operational complexity

This Mode has the potential to place a very high workload on tower controllers, with a consequent deterioration in operating efficiency. There will be a heavy workload generated by the coordination requirements to facilitate runway crossing clearances and departures off three runways. The workload on the surface movement controller responsible for the Eastern sector of the aerodrome will be extremely high.

Constraints to optimisation of capacity

Provision of PARM would be required to maintain arrival rates in non-visual conditions.

Interaction of arrivals on Runway 34L with departures.

All arriving aircraft must cross the active departure runway when taxiing after landing.

Risk associated with this mode is provided for in the procedures employed and in the development of the operating standard but increases with traffic levels and therefore complexity.

There may be taxiing conflictions in the southwest quadrant of the airport between arrivals and departures to Runway 34R. Operations could be enhanced by the provision of a taxiway between Runway 34R and Taxiway T to provide segregation between outbound and inbound traffic.

Helicopter operation to and from the heliport would be restricted and delays incurred during this operating mode.

Environmental implications

Arrivals 34L&R

The number of people exposed to noise of 70 dB(A) or more for B747-200 (34L) and B767 (34R) aircraft is a total of 700.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	3,400ft	at	Over Water
B747-400	3,100ft	at	Over Water
B767	2,900ft	at	Over Water
Saab 340	850ft	at	Kurnell Peninsula

Departures 25

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 787,200.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	10,000ft	at	Belrose (north), Heathcote/Royal National Park (south), over water/Middle Harbour (east), Horsley Park (west), Toongabbie (northwest) & Parklea (northwest-early turn)
B747-400	6,500ft	at	Lindfield (north), Royal National Park (south), North Sydney (east), Cabramatta (west), Merrylands (northwest) & Northmead (northwest-early turn)
B767	6,000ft	at	Tennyson (north), Sutherland (south), Gladesville (north), Bankstown Aerodrome (west), Yagoona (northwest) & Silverwater (northwest-early turn)
Saab 340	3,000ft	at	Arncliffe (north), Brighton le Sands (south), Arncliffe (east), Arncliffe (west) & Arncliffe (northwest)

Departures 34L

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 606,300.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	10,000ft	at	Kuring-gai Chase National Park (north), Cromer (east), Royal National Park (south), Horsley Park (west) and Kellyville (northwest)
B747-400	6,500ft	at	Davidson (north, east), Royal National Park (south), Wetherill Park (west), Baulkham Hills West (northwest)

Departures 34R

The number of people exposed to noise of 70 dB(A) or more for B767 aircraft is a total of 127,200.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B767	6,000ft	at	Over Water
Saab 340	3,000ft	at	Mascot

For further details refer to Appendix 9

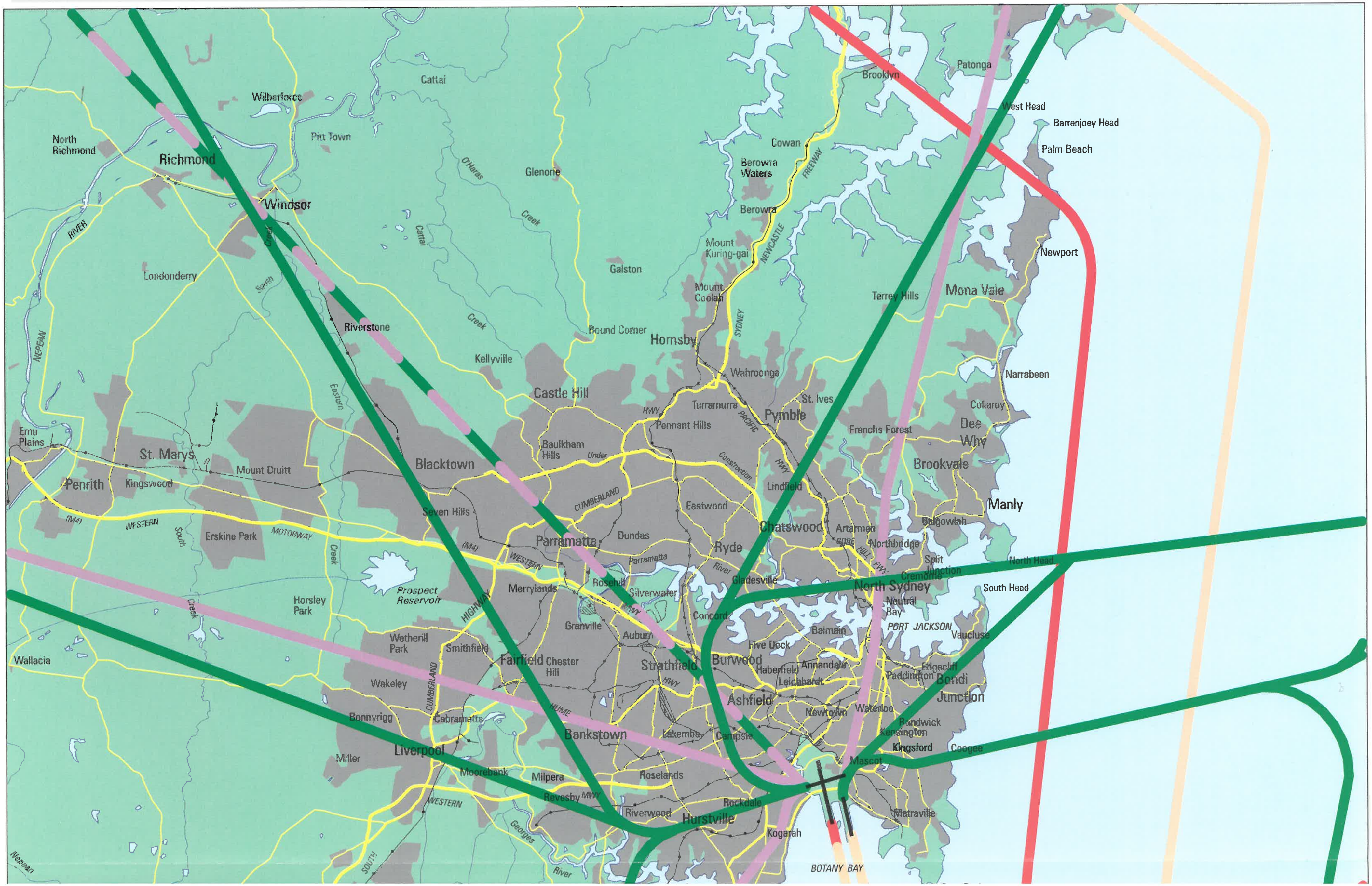
Conclusions

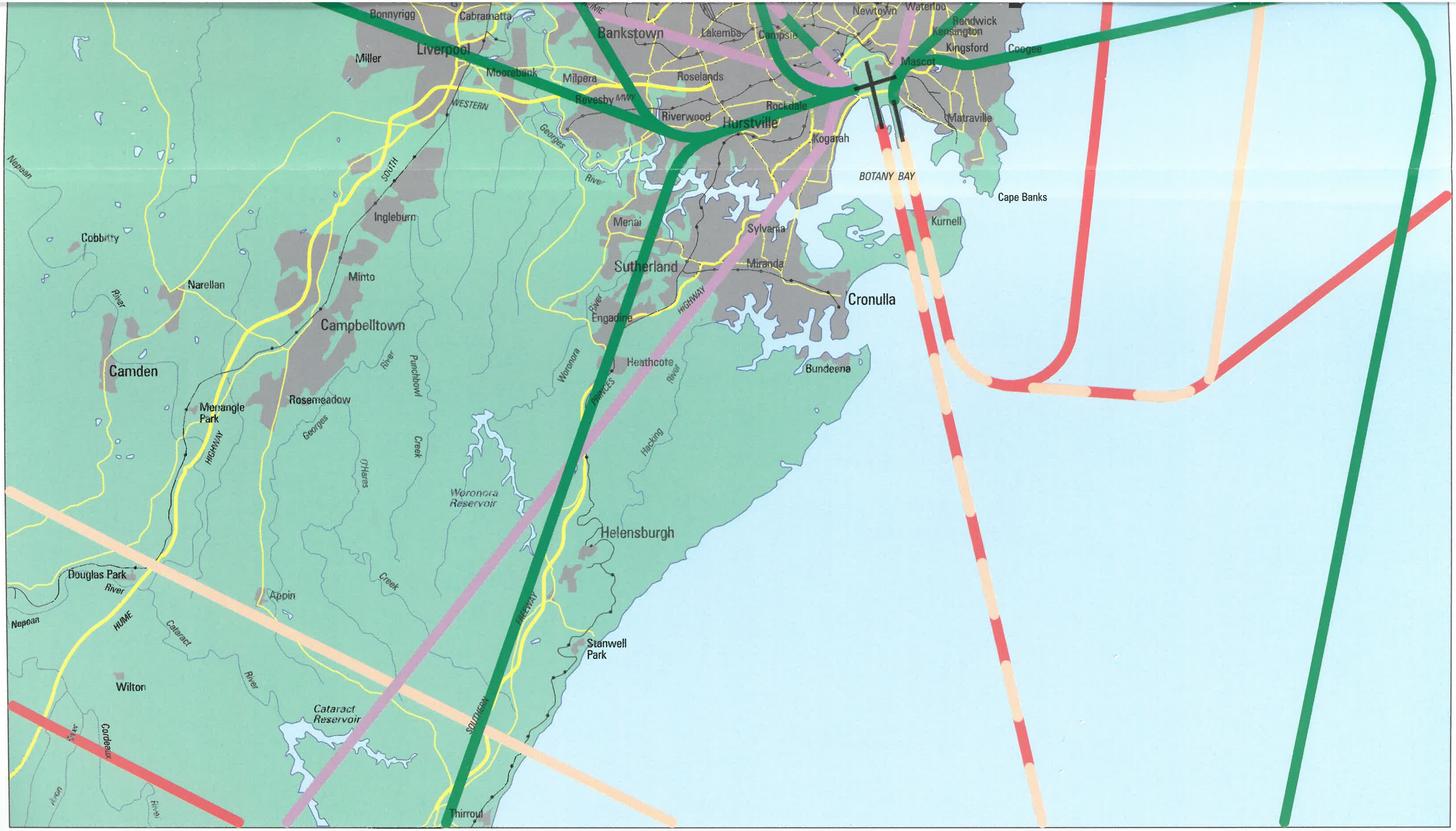
This Mode has the potential to handle high movement rates, but traffic complexities will place a higher workload on controllers.

Proposed use

It is proposed that this Mode not be introduced in the initial stages of the airspace plan, but be retained for further development if required to achieve the effectiveness of the noise sharing objectives of the plan.

SYDNEY MODE 8 DEPARTURES 25, 34R ARRIVALS 34L, 34R (LONG HAUL JET DEPARTURES 34L)





MP 96/544.8.8
November 1996

Built-up-area (1993)

Note: Tracks shown are indicative

0 km 6
Scale approx

N

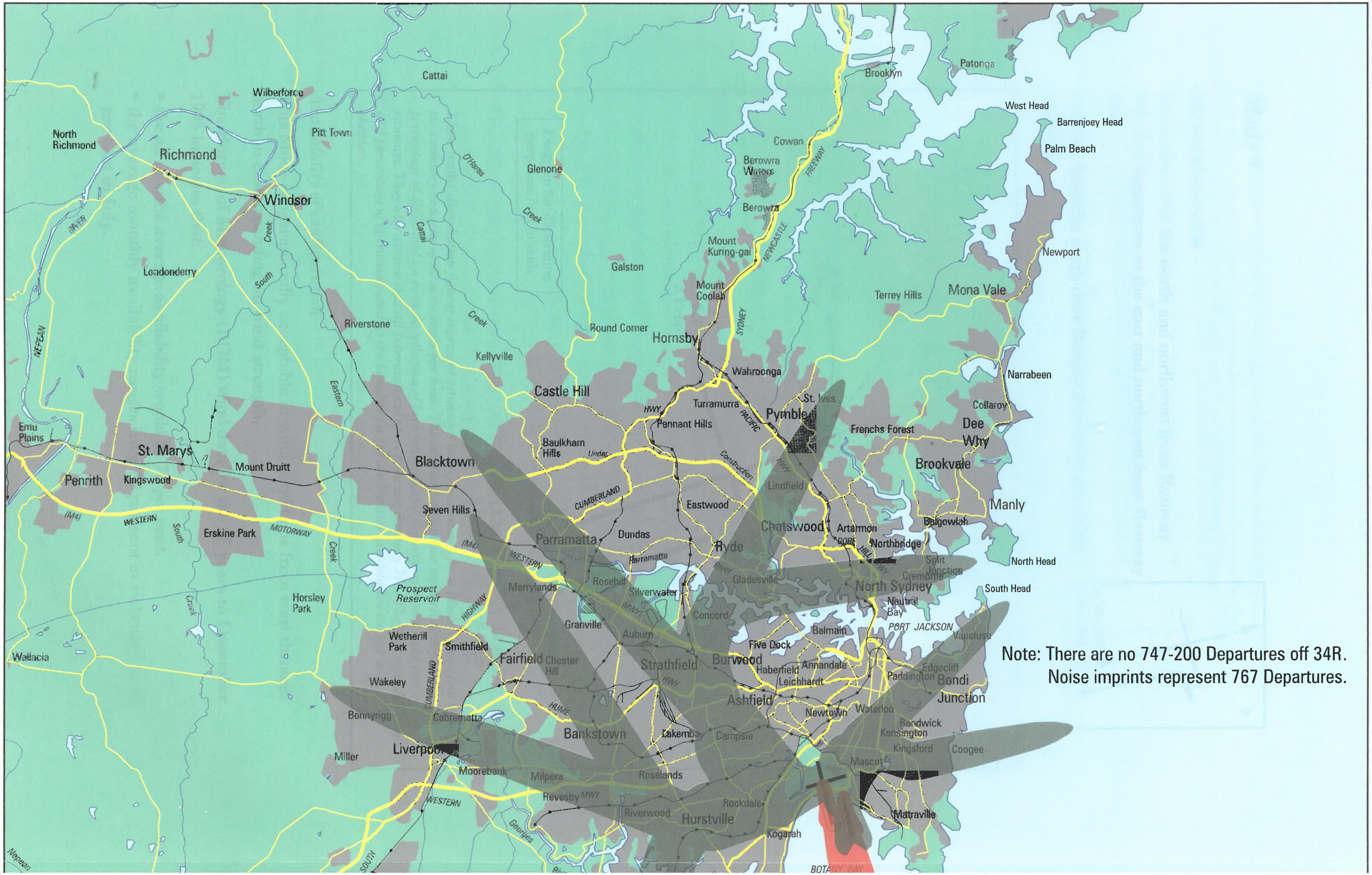
DEPARTURES

- Jet track
- Non-Jet track
- Dual track

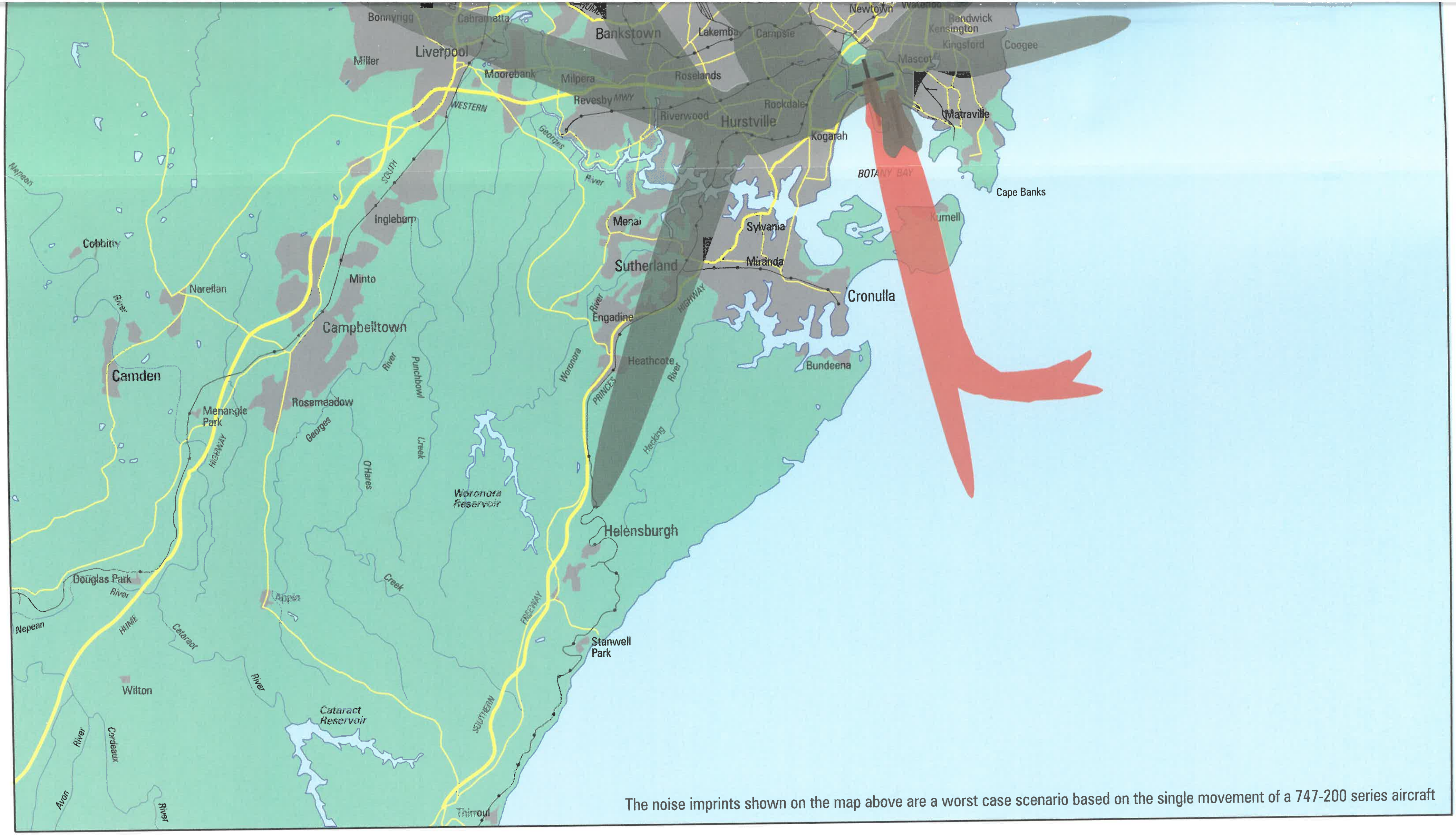
ARRIVALS

- Jet track
- Non-Jet track
- Dual track

SYDNEY NOISE IMPRINT MODE 8 JET DEPARTURES 25, 34R ARRIVALS 34L, 34R



Note: There are no 747-200 Departures off 34R.
Noise imprints represent 767 Departures.



The noise imprints shown on the map above are a worst case scenario based on the single movement of a 747-200 series aircraft

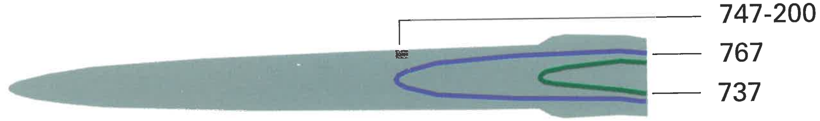
November 1996 MP 96/544.9.8

0 km 6

Scale approx

N

Note: The noise imprints shown are based on a single aircraft movement on the centreline of the indicative flight track



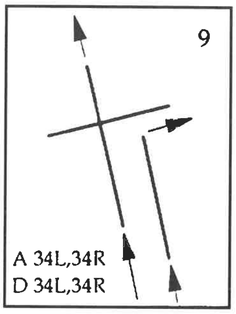
The diagram above indicates that a 767, 737 and similar aircraft leave a significantly smaller imprint than 747-200 series aircraft

Noise imprint Arrivals (70dBA or above based on a single movement of a 747-200 series aircraft)

Noise imprint Departures (70dBA or above based on a single movement of a 747-200 series aircraft)

Built-up-area (1993)

Mode 9



Method of operation

Departures over the north and northwest from Runway 34L and departures to the east and north-east from Runway 34R

Arrivals from the south over Botany Bay on Runway 34L and 34R.

Runway 34L/R (Mode 9)

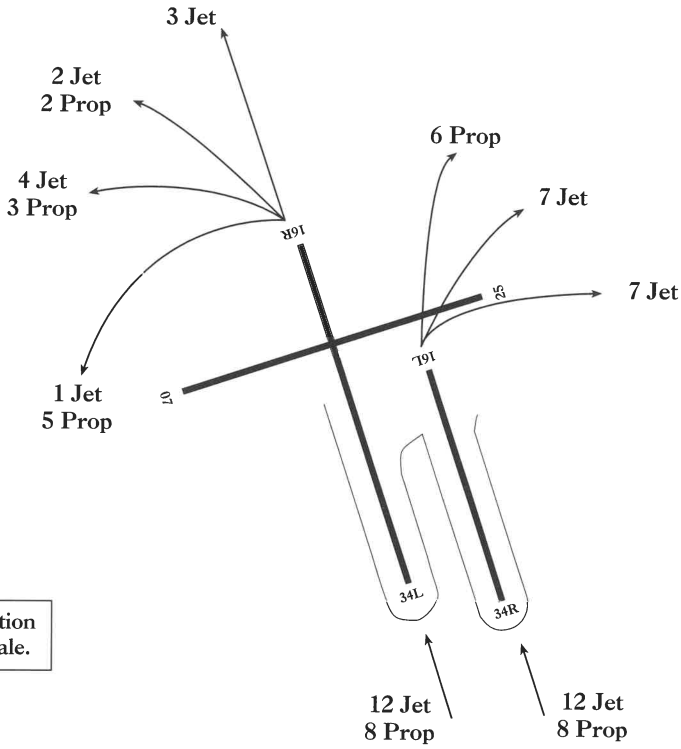


Diagram for illustration purposes. Not to scale.

These traffic distribution figures represent estimated hourly movements for a Mode 9 operation based on a runway capacity of 80 movements per hour. The calculations assume an arrival/departure percentage of 50/50 and an even distribution of both arrivals and departures between the two runways. They also assume that all International operations use Runway 34L. The fleet mix (Jet/Prop) and percentage of operations used as the baseline for these estimates are detailed earlier in this chapter.

Availability of configuration

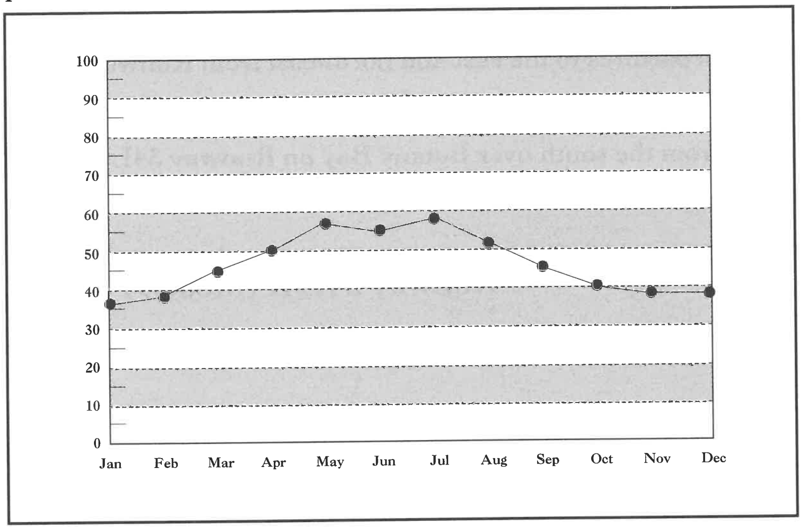
This Mode is operationally acceptable in wind conditions from west through north to east depending on wind strength.

The Bureau of Meteorology (BOM) wind data for the 55 years to December 1995 indicates that:

- the all months average availability would be 70 per cent.
- the average monthly availability ranges from 60 per cent in February to 82 per cent in July.

The graph indicates the 55 year average availability from January to December.

Where nil downwind criteria is specified the average of all months availability is 58 per cent



Operational capacity

Initially Sabre SIMMOD modelling found a sustained capacity of 74 operations per hour consisting of 39 arrivals and 35 departures. Peak observed capacity of 75 operations

This Mode confines arrivals to over-water and directs departures to the east (34R) and to the north.

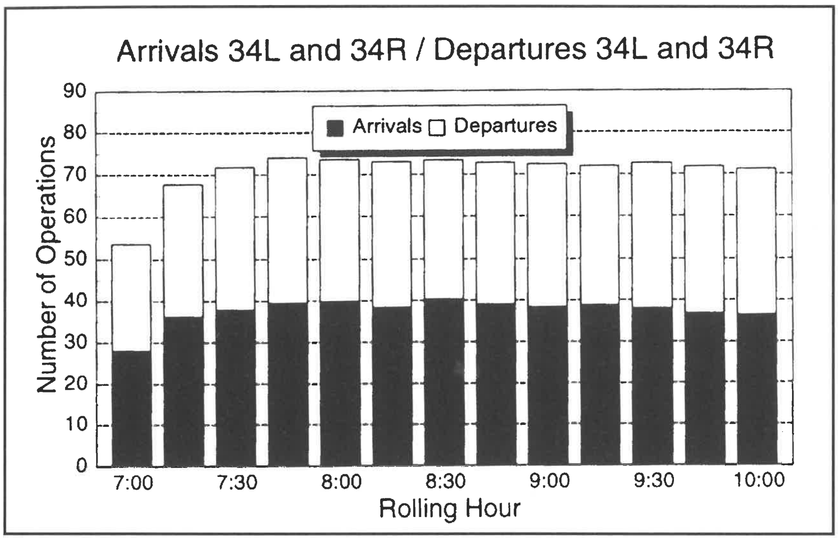
The Sabre modelling evaluation found that balancing the departures evenly between Runways 34L and 34R initially produced a capacity of 71 operations. When all propeller departures were moved to Runway 34L and all large departures to Runway 34R capacity increased to 74. Capacity may be limited by inefficient runway exits on both arrival runways.

This Mode will attain 80 movements per hour. However, new runway exits 34L and 34R that will shorten landing roles, maybe required.

Further Sabre modelling with both new runway exits and a reduced buyout of two nautical miles resulted in a sustained capacity of 82 movements per hour consisting of 43-44 arrivals and 38-39 departures. Peak observed capacity was 83 movements per hour.

The high speed exit locations used in the model for the arrival runways did not prove to be advantageous for high frequency use by small and medium commuter aircraft.

Graph below presents SDT simulation results for a rolling hour period.



Operational complexity

Current parallel operating mode allowing segregation of airspace and variation in departure tracks to achieve noise sharing.

Constraints to optimisation of capacity

Traffic levels up to the cap of 80 movements per hour would be achievable under this mode with some variation, dependent on traffic mix, wake turbulence separation requirements and whether instrument or visual approaches are being used.

Operation under this mode could be enhanced by the provision of high speed exits from Runway 34L to allow closer spacing between successive arrivals and a taxiway between Runway 34R and Taxiway T to provide segregation between outbound and inbound traffic.

The operating efficiency of the aerodrome controllers would be increased with the addition of aerodrome control coordinator positions to assist the aerodrome controllers. Experience with the Mode indicates the complexity of managing ground traffic may eventually require an additional ground controller positions. The enhancement provided by the extra positions, in conjunction with the provision of identified taxiway improvements, should enable controllers to sustain efficient operations at the nominated capacity.

Helicopter operations to and from the Heliport may be restricted and delayed during this mode of operation.

Environmental implications

Arrivals 34L&R

The number of people exposed to noise of 70 dB(A) or more for B747-200 (34L) and B767 (34R) aircraft is a total of 700.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	3,400ft	at	Over Water
B747-400	3,100ft	at	Over Water
B767	2,900ft	at	Over Water
Saab 340	850ft	at	Kurnell Peninsula

Departures 34L

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 606,300.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	10,000ft	at	Kuring-gai Chase National Park (north), Cromer (east), Royal National Park (south), Horsley Park (west) and Kellyville (northwest)
B747-400	6,500ft	at	Davidson (north, east), Royal National Park (south), Wetherill Park (west), Baulkham Hills West (northwest)
B767	6,000ft	at	Gladesville (north & east), Mortdale (south), Berala (west) & Homebush (northwest)
Saab 340	3,000ft	at	Marrickville South (south and west), Marrickville (northwest)

Departures 34R

The number of people exposed to noise of 70 dB(A) or more for B767 aircraft is a total of 127,200.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B767	6,000ft	at	Over Water
Saab 340	3,000ft	at	Mascot

For further details refer to Appendix 9

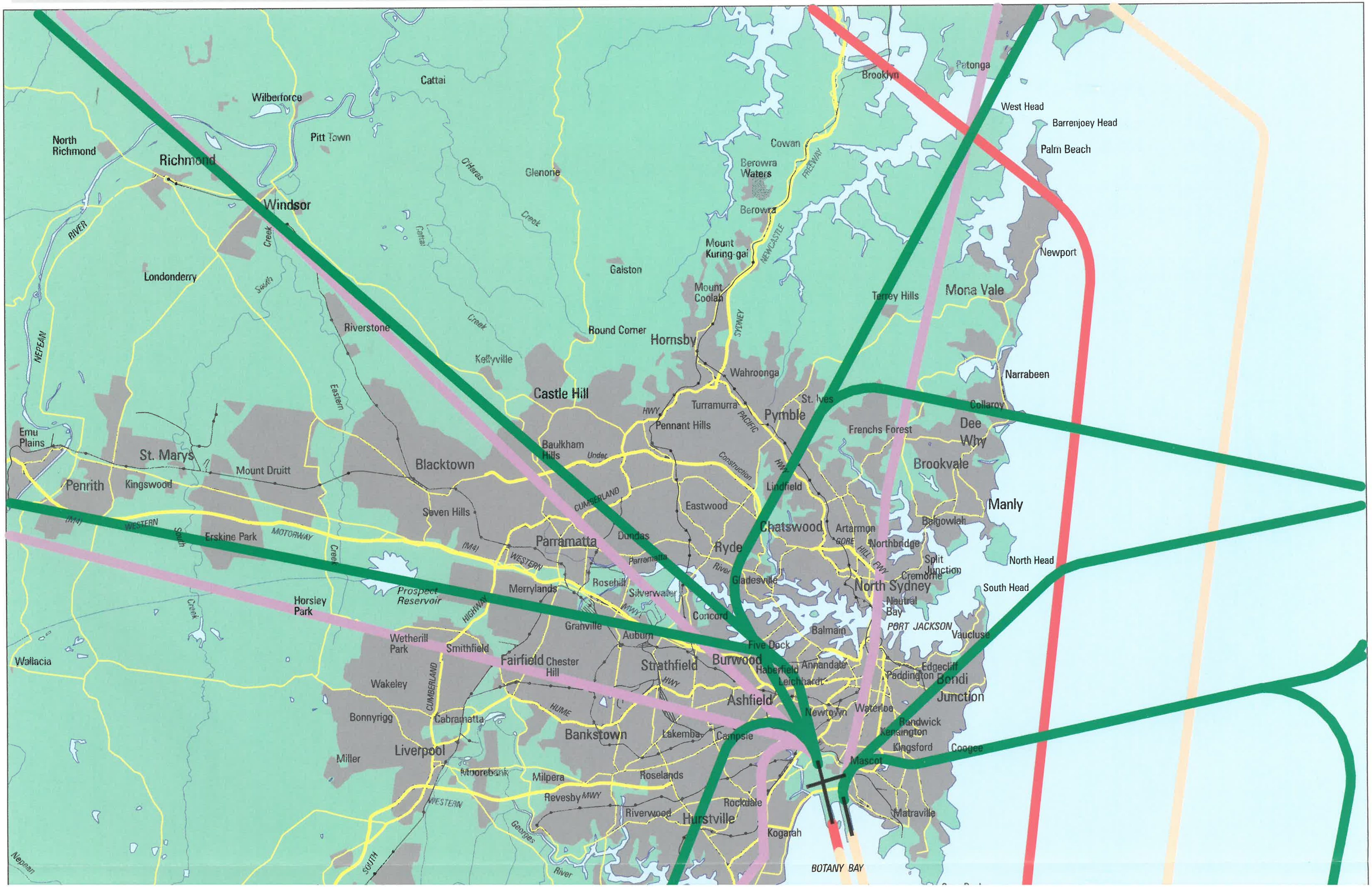
Conclusions

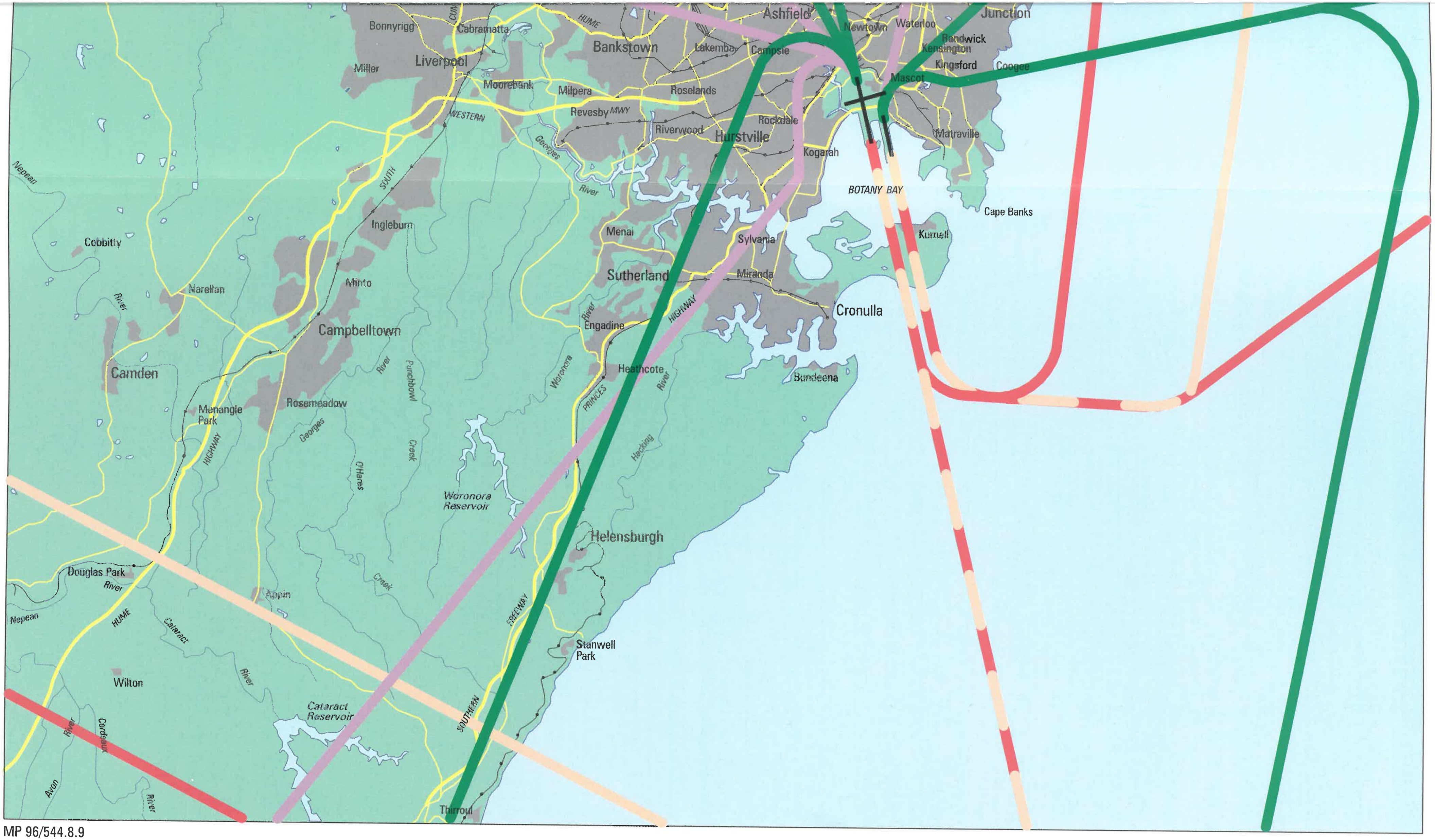
This is a prime mode of operation, providing air traffic capacities up to the cap of 80 movements per hour, flight over water for all arriving traffic and the capability to disperse departures.

Proposed use

It is proposed that this Mode be included in the plan for use during peak traffic periods, and when weather conditions require, in accordance with the runway selection plan, to assist in achieving equity of noise sharing.

SYDNEY MODE 9 DEPARTURES 34L, 34R ARRIVALS 34L, 34R





MP 96/544.8.9
November 1996

Built-up-area (1993)

Note: Tracks shown are indicative

0 km 6

Scale approx

N

DEPARTURES

Jet track

Non-Jet track

Dual track

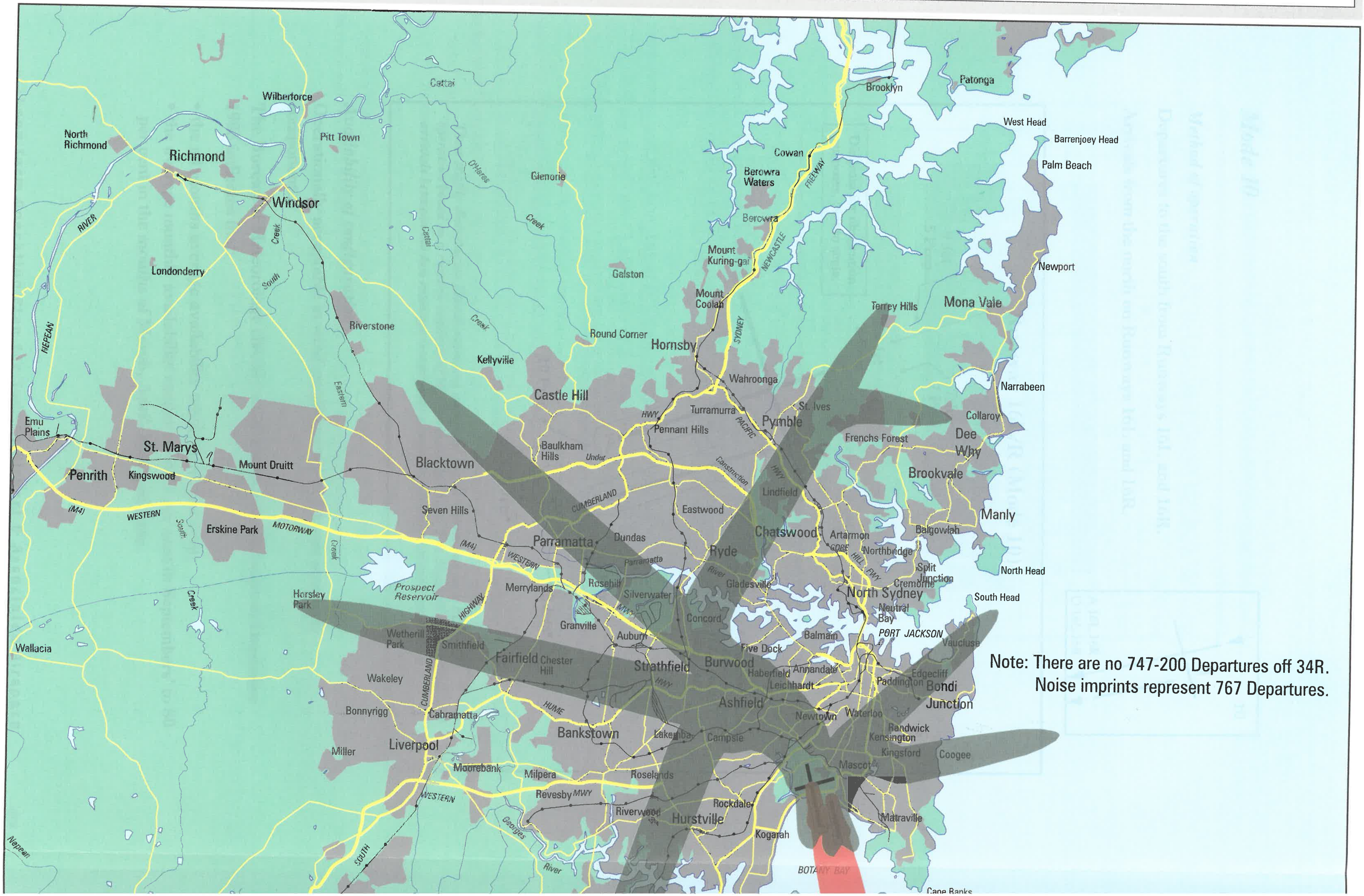
ARRIVALS

Jet track

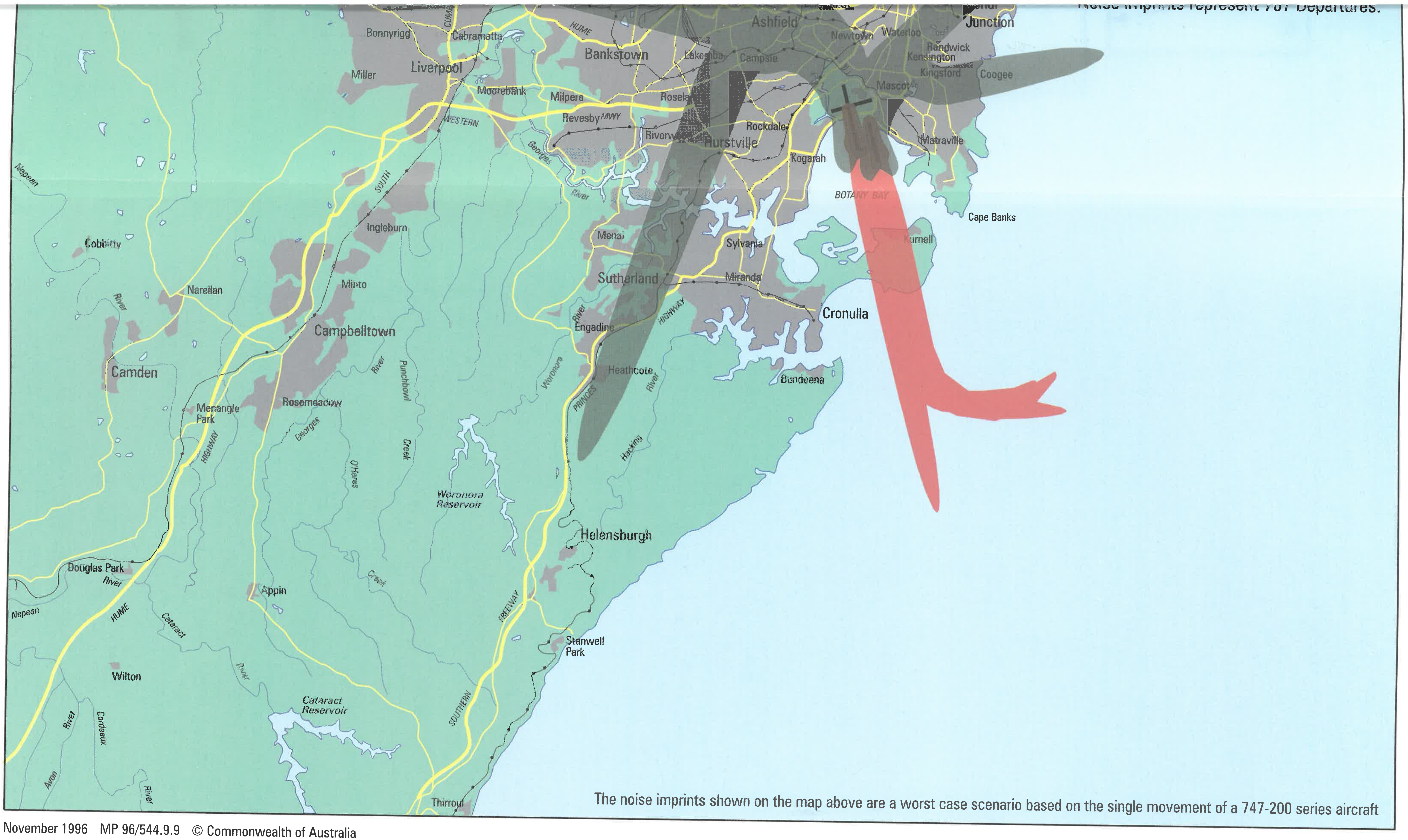
Non-Jet track

Dual track

SYDNEY NOISE IMPRINT MODE 9 JET DEPARTURES 34L, 34R ARRIVALS 34L, 34R



Note: There are no 747-200 Departures off 34R.
Noise imprints represent 767 Departures.



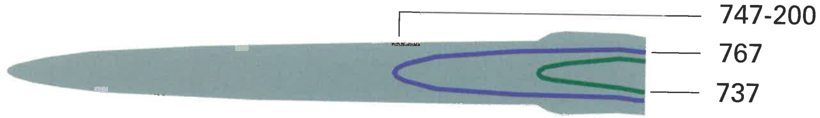
November 1996 MP 96/544.9.9 © Commonwealth of Australia

0 km 6

Scale approx

N

Note: The noise imprints shown are based on a single aircraft movement on the centreline of the indicative flight track



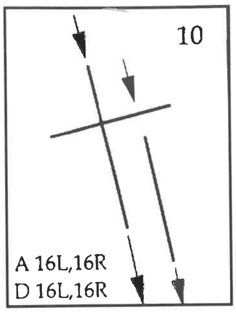
The diagram above indicates that a 767, 737 and similar aircraft leave a significantly smaller imprint than 747-200 series aircraft

Noise imprint Arrivals (70dBA or above based on a single movement of a 747-200 series aircraft)

Noise imprint Departures (70dBA or above based on a single movement of a 747-200 series aircraft)

Built-up-area (1993)

Mode 10

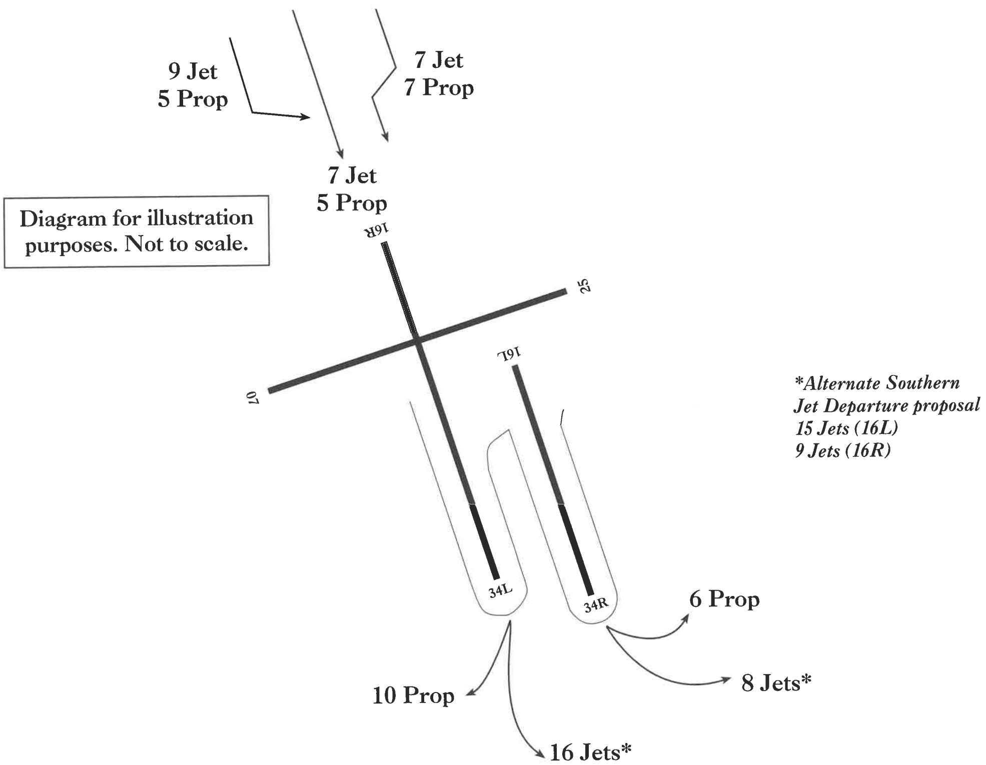


Method of operation

Departures to the south from Runways 16L and 16R.

Arrivals from the north on Runways 16L and 16R.

Runway 16L/R (Mode 10)



These traffic distribution figures represent estimated hourly movements for a Mode 10 operation based on a runway capacity of 80 movements per hour. The disparity in distribution of arrivals between the two runways is a product of unequal landing distances available.

Availability of configuration

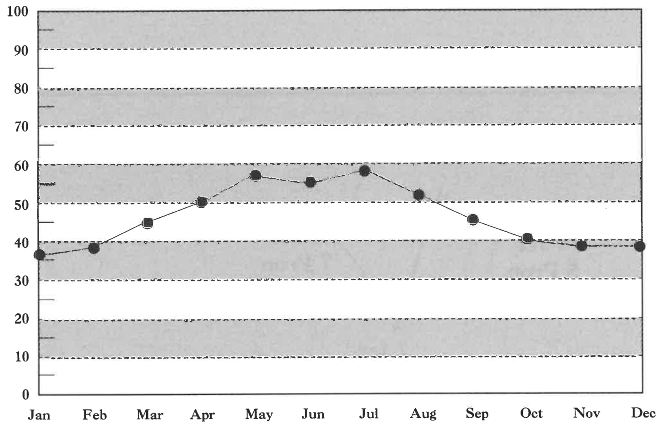
Operationally acceptable in wind conditions up to 5 knots southerly component..

The Bureau of Meteorology (BOM) wind data for the 55 years to December 1995 indicates that:

- the all months average availability would be 76 per cent.
- the average monthly availability ranges from 71 per cent in Septembers' to 80 per cent in the months of March, April, May and June.

The graph below indicates the 55 year average availability from January to December.

Where nil downwind criteria is specified the average of all months availability is 55 per cent



Operational capacity

Initial Sabre SIMMOD modelling found a sustained capacity of 73 operations per hour consisting of 40 arrivals and 33 departures. Peak observed capacity of 74 operations

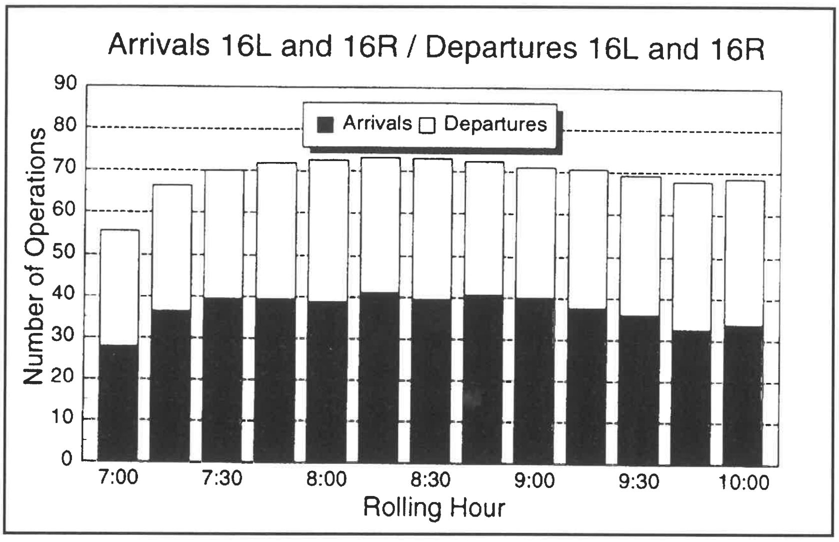
The Sabre modelling assigned arrivals 50/50 to 16L and 16R and departures were assigned 52/48 to 16L and 16R to attain the 73 operations per hour. Sabre found capacity may be limited by inefficient runway exits on both runways.

This Mode will attain 80 operations per hour. However, new runway exits for 16L and 16R that will shorten landing rolls, may be required.

Further Sabre modelling, with both new runway exits and a reduced buyout of 2 nautical miles, produced a sustainable capacity of 87 movements per hour consisting of 49 arrivals and 38 departures. Peak observed capacity of 88 operations

Sabre indicated that Mode 10 produced a significantly higher capacity than Mode 9 due to more optimal location of the new high speed exits on the arrival runways.

Graph below presents the simulation results for a rolling hour period.



Operational complexity

Current parallel operating mode allowing segregation of airspace. Complexity is increased as procedures providing flight paths that spread arriving aircraft over three separate arrival tracks north of Sydney Harbour are employed to lessen the impact of concentrated flight paths. A higher degree of skill and accuracy will be required in aircraft sequencing beyond 15 miles from the airport in order to achieve optimum spacing of aircraft on final approach.

Constraints to optimisation of capacity

Traffic levels up to the cap of 80 movements per hour would be achievable under this mode with some variation, dependent on traffic mix, wake turbulence separation requirements and whether instrument or visual approaches are being used.

Cloud below 4000 ft or visibility below 20 km will limit or preclude operations employing independent visual approaches. Dependent instrument approaches will be required in where weather conditions are worse than 3000 ft cloud base and 5 km visibility and all aircraft will be required to join the runway centreline by 9 nm from touchdown

Environmental implications

Arrivals 16L & R

The number of people exposed to noise of 70 dB(A) or more for B747-200 (16R) and B767 (16L) aircraft is a total of 169,900.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	3,400ft	at	Beecroft, Turramurra (16R).
B747-400	3,100ft	at	Epping, West Pymble (16R).
B767	2,900ft	at	Ryde, Lane Cove (16R); Hunters Hill, Waverton (16L).
Saab 340	850ft	at	Leichhardt (16R); Newtown (16L).

Departures 16L &R

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 9,800.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	10,000ft	at	Over Water
B747-400	6,500ft	at	Over Water
B767	6,000ft	at	Over Water
Saab 340	3,000ft	at	Botany Bay

For further details refer to Appendix 9

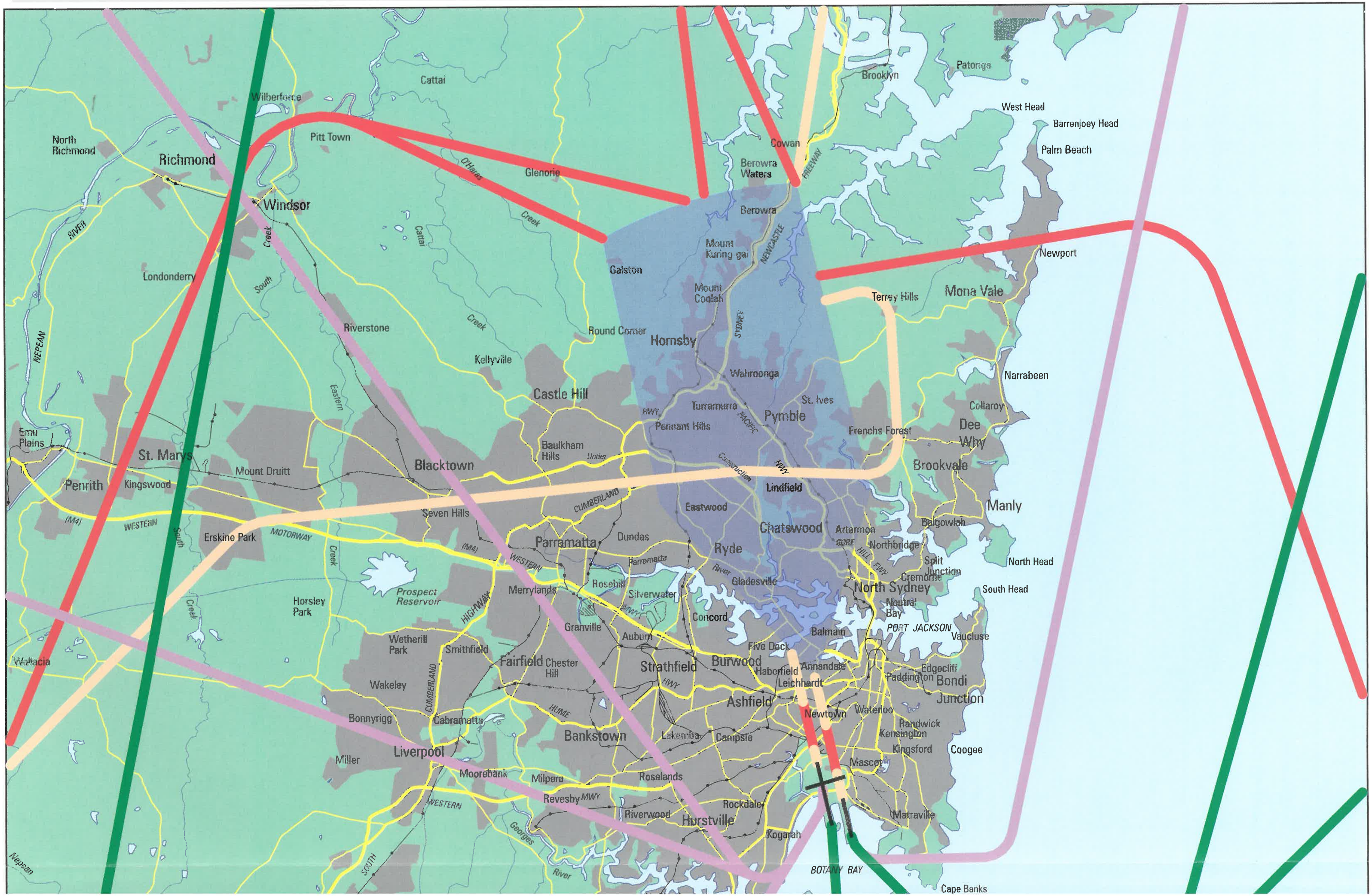
Conclusions

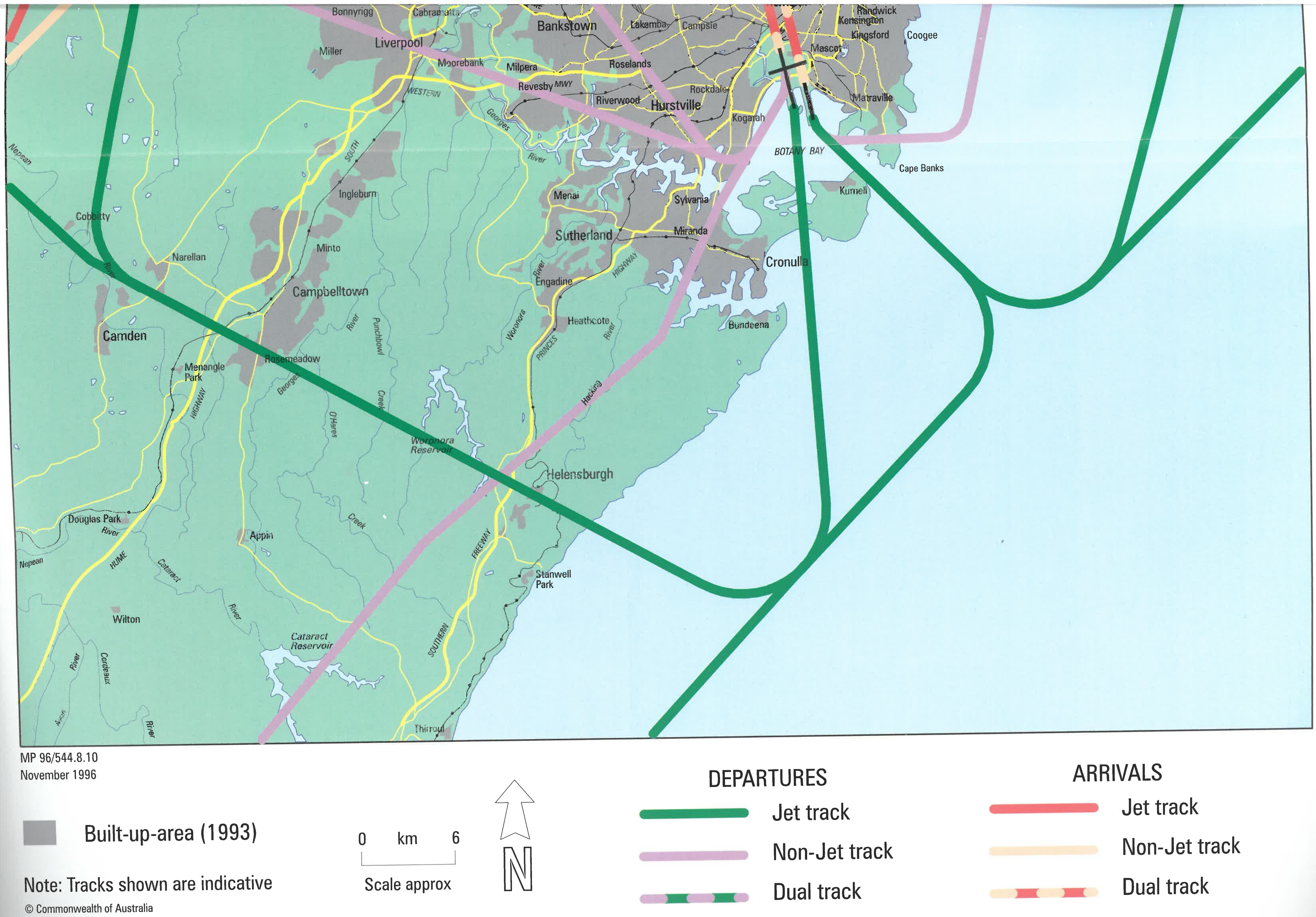
This Mode of operation has the capability to provide high movement rates. All departing traffic is over Botany Bay and turns, either left or right, to avoid the Kurnell township. There is some capability to provide alternate flight paths north of Sydney Harbour in visual conditions, but this leads to a concentration of all arriving aircraft along the extended centrelines of the runways when south of Sydney Harbour or within nine nm when instrument approaches are in use.

Proposed use

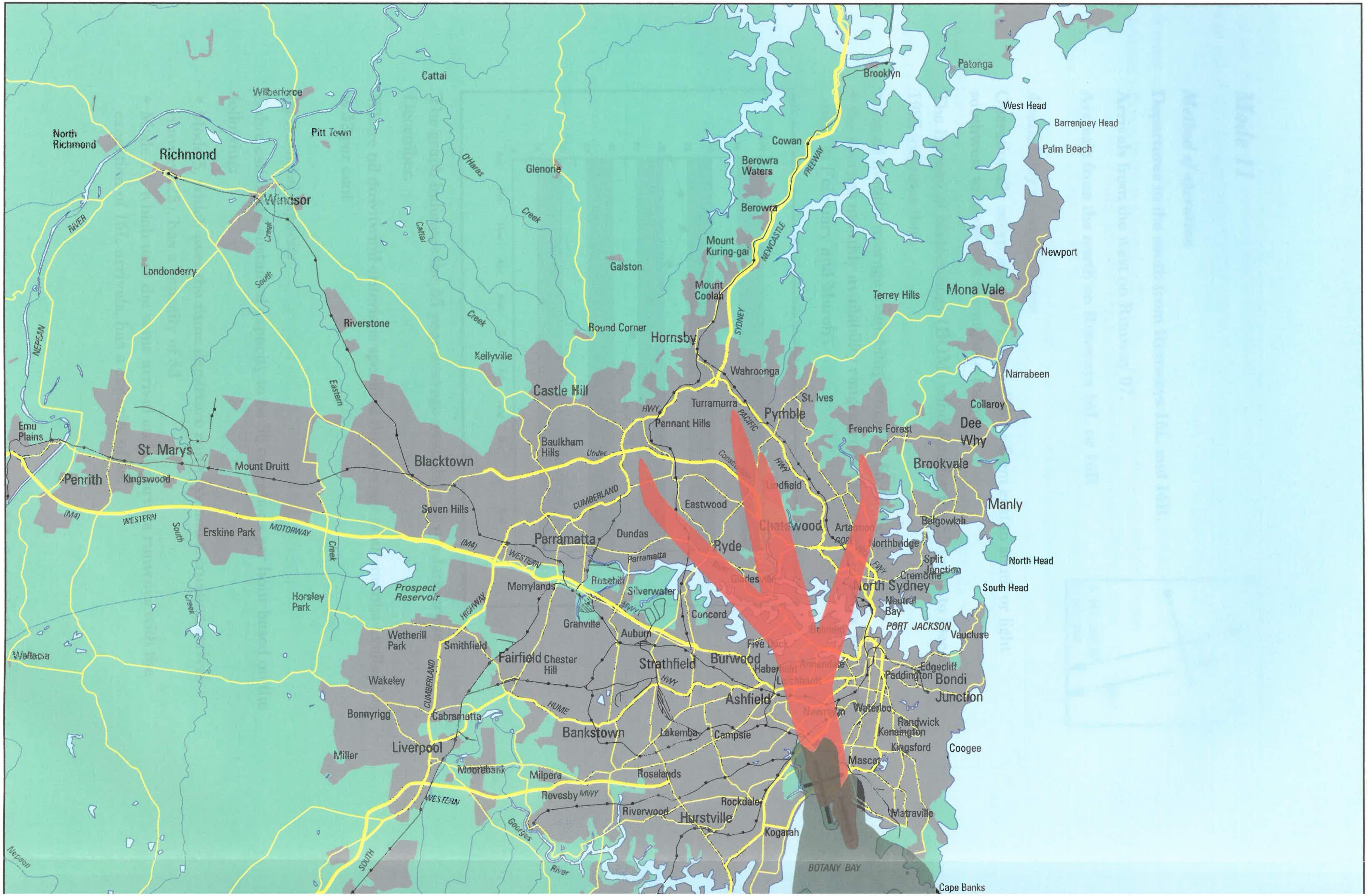
In accordance with the runway selection plan, to meet peak traffic demands and during peak periods when strong southerlies prevent use of other Modes.

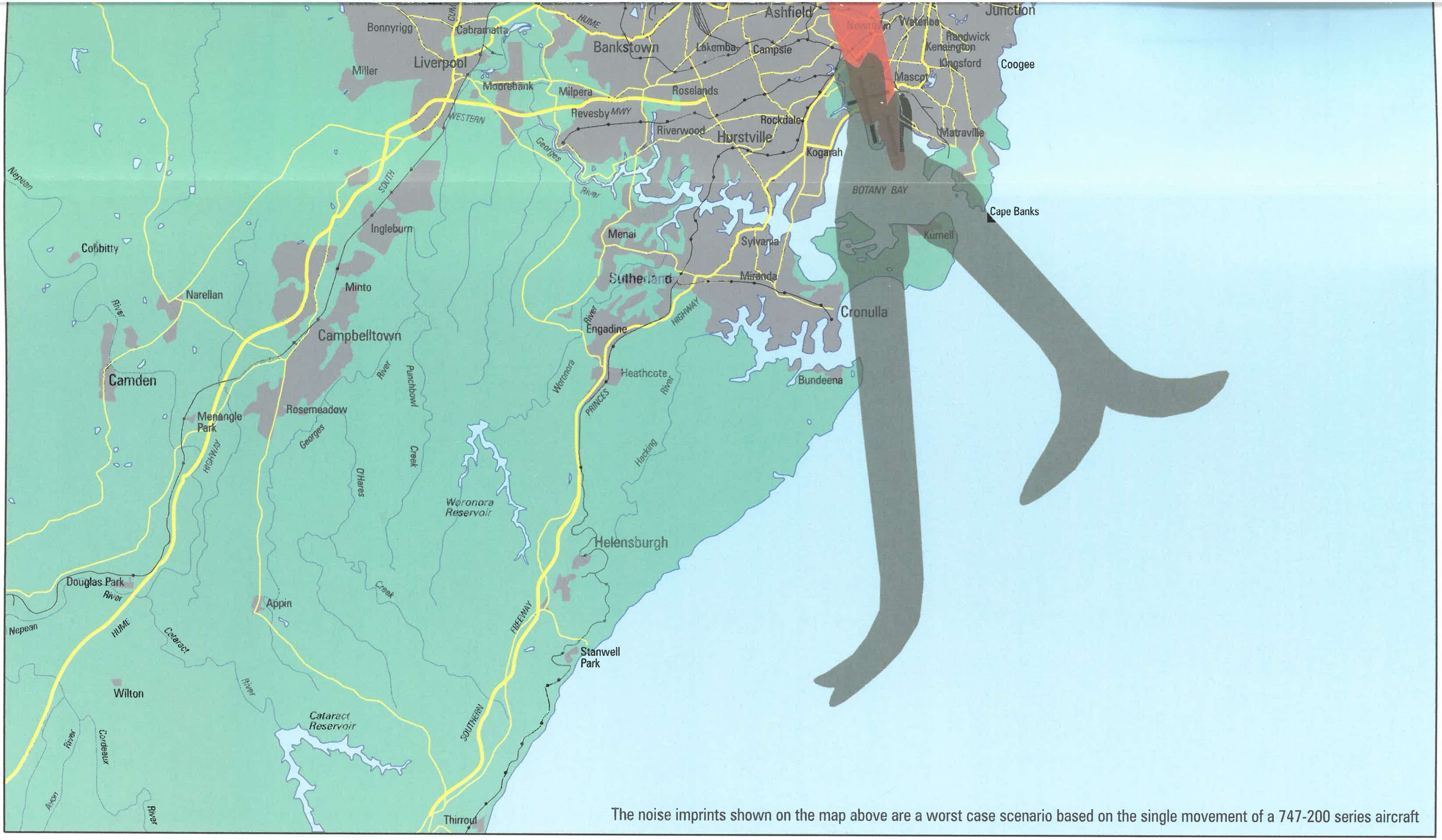
SYDNEY MODE 10 DEPARTURES 16L, 16R ARRIVALS 16L, 16R




Bonnyrigg
Cabramatta
Bankstown
Lakemba
Campsie
Randwick
Kensington
Kingsford
Coogee
Miller
Liverpool
Moorebank
Milpera
Revesby
Roselands
Mascot
Riverwood
Hurstville
Rockdale
Kogarah
Matraville
BOTANY BAY
Cape Banks
Kurnell
Ingleburn
Menai
Sylvania
Sutherland
Miranda
Cronulla
Cobbitty
Narellan
Minto
Campbelltown
Engadine
Heathcote
Bundeena
Camden
Menangle Park
Rosemeadow
Woronora Reservoir
Helensburgh
Douglas Park
Appin
Stanwell Park
Wilton
Cataract Reservoir
Thirroul
MP 96/544.8.10
November 1996
Built-up-area (1993)
Note: Tracks shown are indicative
© Commonwealth of Australia
0 km 6
Scale approx
N
DEPARTURES
Jet track
Non-Jet track
Dual track
ARRIVALS
Jet track
Non-Jet track
Dual track

SYDNEY NOISE IMPRINT MODE 10 JET DEPARTURES 16L,16R ARRIVALS 16L, 16R





The noise imprints shown on the map above are a worst case scenario based on the single movement of a 747-200 series aircraft

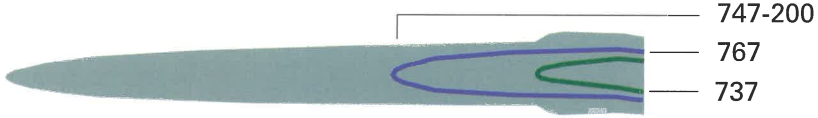
November 1996 MP 96/544.9.10

0 km 6

Scale approx

N

Note: The noise imprints shown are based on a single aircraft movement on the centreline of the indicative flight track



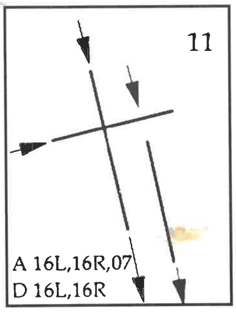
The diagram above indicates that a 767, 737 and similar aircraft leave a significantly smaller imprint than 747-200 series aircraft

Noise imprint Arrivals (70dBA or above based on a single movement of a 747-200 series aircraft)

Noise imprint Departures (70dBA or above based on a single movement of a 747-200 series aircraft)

Built-up-area (1993)

Mode 11



Method of operation

Departures to the south from Runways 16L and 16R.

Arrivals from the west on Runway 07.

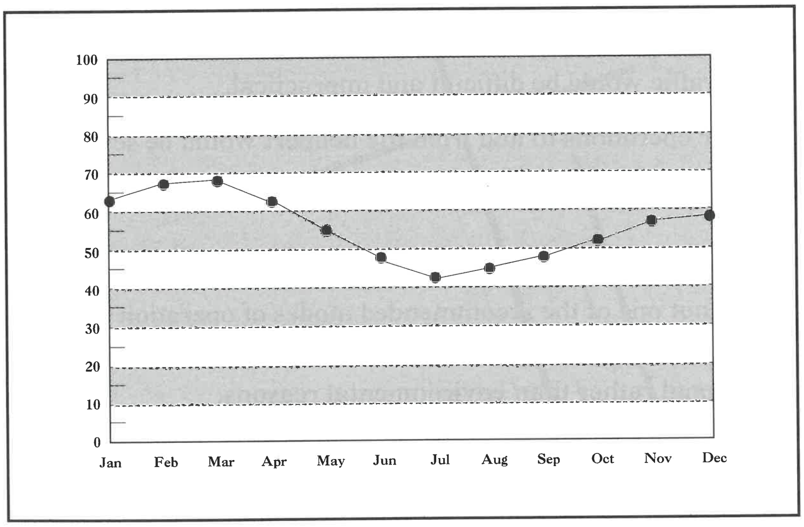
Arrivals from the north on Runways 16L or 16R

Availability of configuration

Operationally acceptable in wind conditions from east to south or light southwest to northwest throughout the year.

The Bureau of Meteorology (BOM) wind data for the 55 years to December 1995 indicates that:

- the all months average availability would be 55 per cent.
- the average monthly availability ranges from 43 per cent in Julys' to 67 per cent in February and March'.



The graph indicates the 55 year average availability from January to December.

Where nil downwind criteria is specified the average of all months availability is 32 per cent

Operational capacity

Sabre estimated sustained capacity to be 56 operations per hour based on the following:

- Mode 5, which uses the same departure runways and a crossing arrival runway (25), has a capacity of 53
- Mode 14, which uses the same arrival and departure runways with the exception of 16L arrivals, has a capacity of 59.

Mode 11 should produce capacity results slightly lower than Mode 14 due to the added crossing arrivals of 16L but should be higher than Mode 5 due to the additional arrival runways.

This Mode confines departures to over-water and distributes arrivals from the north and west. This mode is also very difficult in terms of air traffic control with the 16L and 16R arrivals crossing the 07 arrivals.

Sabre indicated that this Mode will not attain 80 operations per hour and no airfield changes will improve the capacity significantly.

Operational complexity

An extremely difficult and complex configuration involving arrivals to three different runways and departures from the two parallel runways. The complexity of this mode makes it inappropriate for continuing safe and efficient operations in other than fairly light traffic.

Constraints to optimisation of capacity

Controller ability and workload would be a severe constraint to the safe operation of this mode. Sequencing aircraft to three crossing streams of arriving traffic would be difficult and impractical.

Helicopter operations to and from the heliport would be severely restricted during this mode of operation.

Environmental implications

As this is not one of the recommended modes of operation no further environmental assessment was performed. This mode is not recommended due to operational rather than environmental reasons.

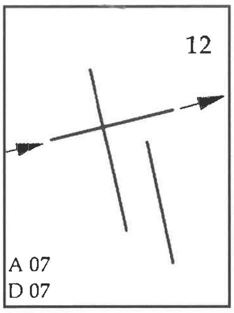
Conclusions

This Mode involves operations which are too complex. Airservices Australia believes there is no merit in this Mode being further considered. However, the concept of Runway 07 and Runway 16 arrivals is further developed and discussed in a modified form under Modes 14 and 14A.

Proposed use

Not proposed for inclusion in the plan or for further development.

Mode 12

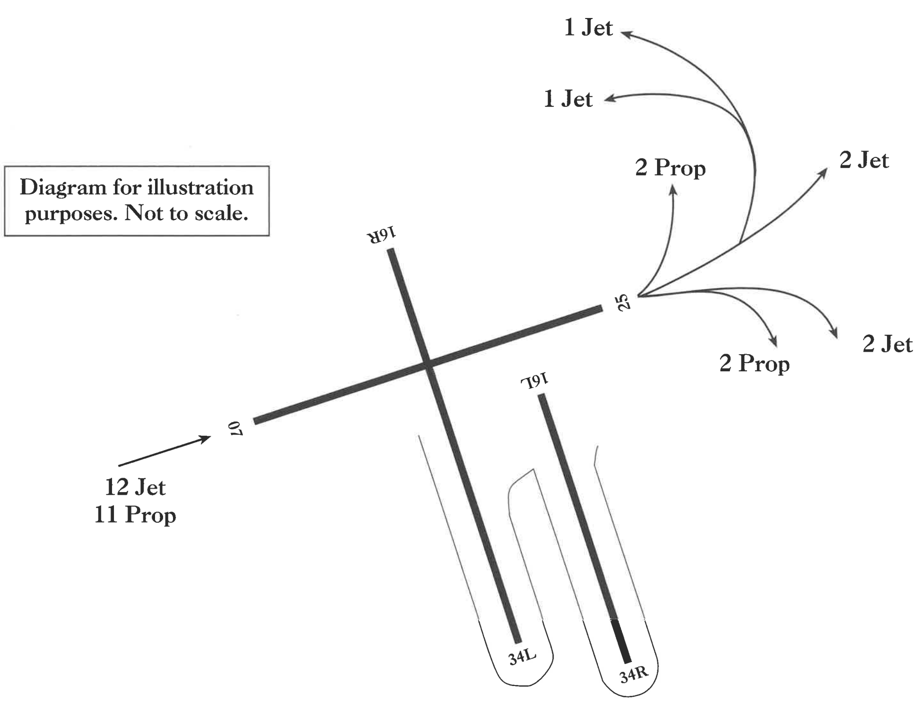


Method of operation

Departures over the east and north-east from Runway 07. Departures to the north from Runway 34L or to the south from Runway 16R for those aircraft requiring the use of the long runway.

Arrivals from the west on Runway 07

Runway 07 (Mode 12)



The traffic distribution figures represent estimated hourly movements for a Mode 12 operation based on a sustained capacity of 33 movements per hour consisting of 23 arrivals and 10 departures (refer Sydney Runway Capacity Study prepared by Sabre Decision Technology).

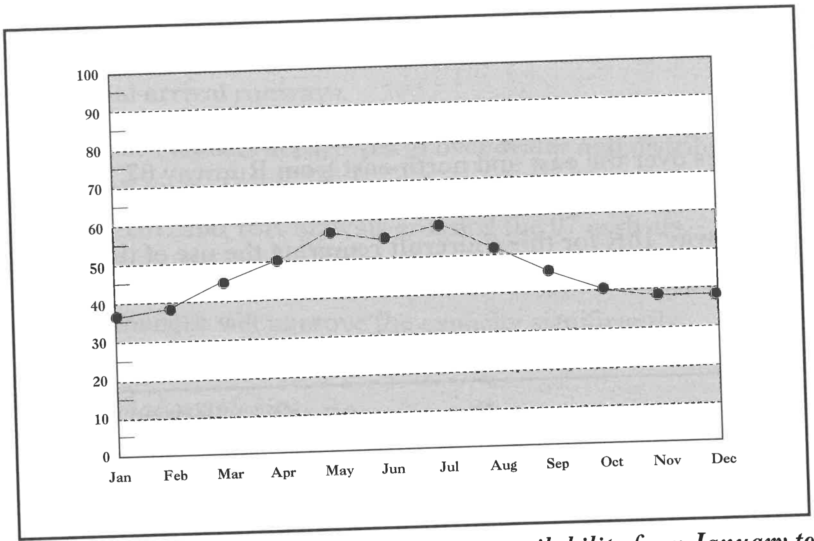
Note: an additional 6 aircraft per hour would require arrival/departure on Runway 16R/34L.

Availability of configuration

Operationally acceptable in wind with an easterly component.

The Bureau of Meteorology (BOM) wind data for the 55 years to December 1995 indicates that:

- the all months average availability would be 74 per cent.
- the average monthly availability ranges from 59 per cent in Julys' to 87 per cent in January and February.



The graph indicates the 55 year average availability from January to December.

Where nil downwind criteria is specified the average of all months availability is 53 per cent

Operational capacity

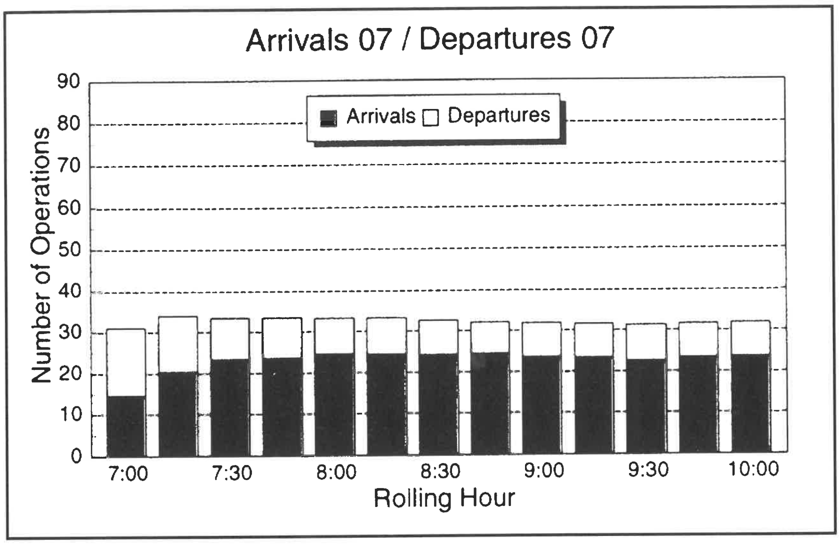
Sabre SIMMOD modelling found a sustained capacity of 33 operations per hour consisting of 23 arrivals and 10 departures. Peak observed capacity of 34 operations

Sabre indicated Mode 12 may achieve a sustainable capacity of 37 movements per hour if the landing rolls of the arriving aircraft were shortened to better match runway exit geometry. However, as no observations were made of Runway 07 operations it was determined that the observed Runway 25 landing rolls would be used.

Sabre indicated that additional separation could be required between consecutive arrivals to ensure that more departures will operate per hour. This would not necessarily increase the overall capacity, but rather balance the arrivals with the departures.

Sabre indicated this mode will not attain 80 operations per hour with only one runway in use.

Graph below presents SDT simulation results for a rolling hour period.



Operational complexity

This is a current operational mode which is not complex because of single runway operations.

Constraints to optimisation of capacity

There is a shortage of available taxiways around the International Terminal which consequently contributes to departure delays as well as restricting entry to and exit from the terminal aprons. This affects not only arriving and departing aircraft, but the regular movement of aircraft under tow to and from the maintenance areas or aircraft being repositioned on the aprons. Additional taxiway facilities between Taxiway G and Runway 07 may alleviate this problem, but would be usable only in visual conditions.

Single runway operation requires spacing of arriving traffic to allow for departures.

Environmental implications

Arrivals 07

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 72,600.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	3,400ft	at	Royal National Park
B747-400	3,100ft	at	Royal National Park
B767	2,900ft	at	Padstow Heights
Saab 340	850ft	at	Hurstville

Departures 07

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 223,200.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	10,000ft	at	Over Water
B747-400	6,500ft	at	Over Water
B767	6,000ft	at	Over Water
Saab 340	3,000ft	at	Rosebery

For further details refer to Appendix 9

Conclusions

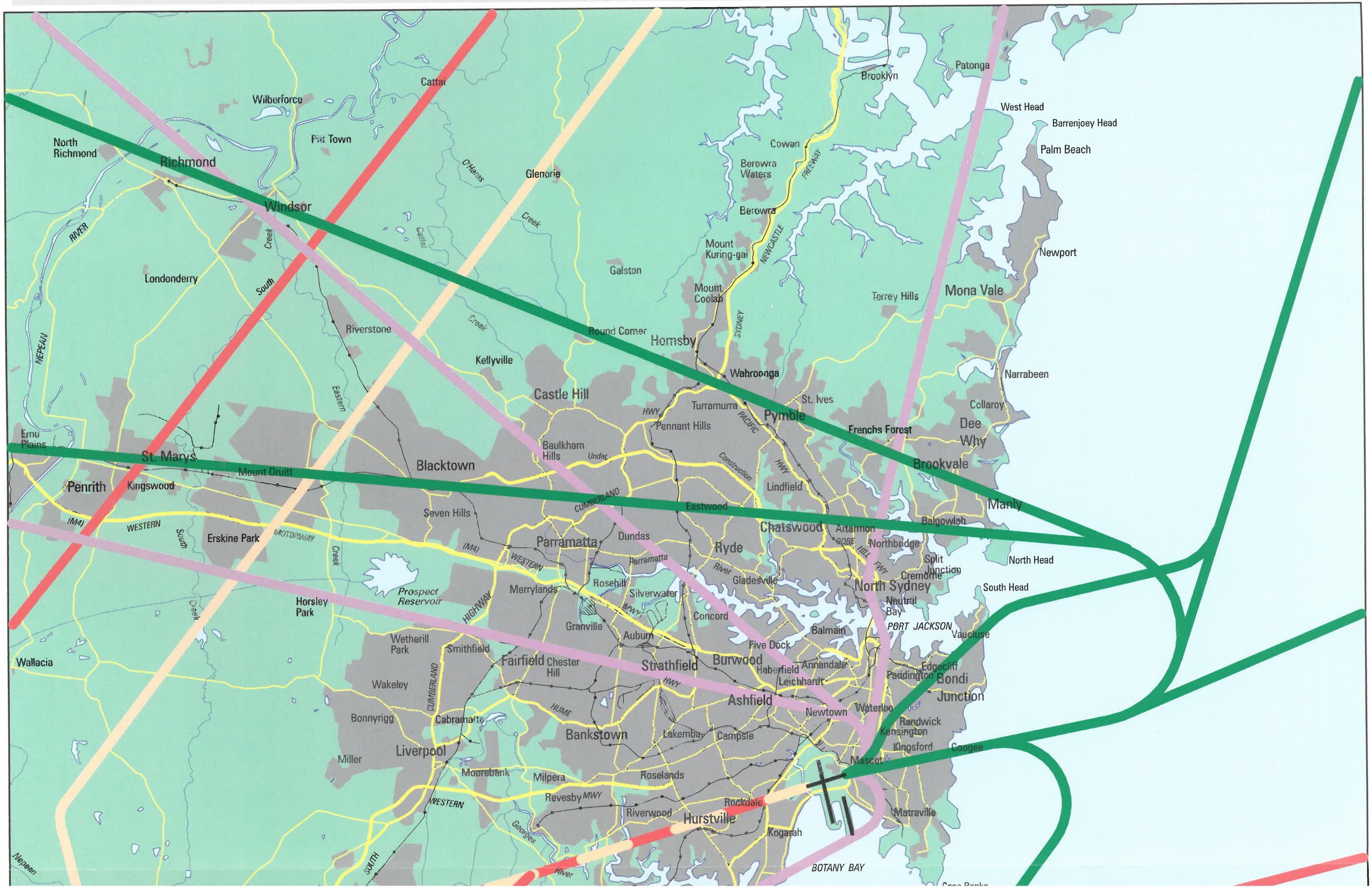
This mode results in aircraft noise to the east and west of the airport, but provides relief to the north. It does not meet the aims of maximising flight over water or non populous areas. The mode has limited potential because of the capacities of the single runway. There are other modes which achieve relief to the north with higher movement rates and less noise impacts.

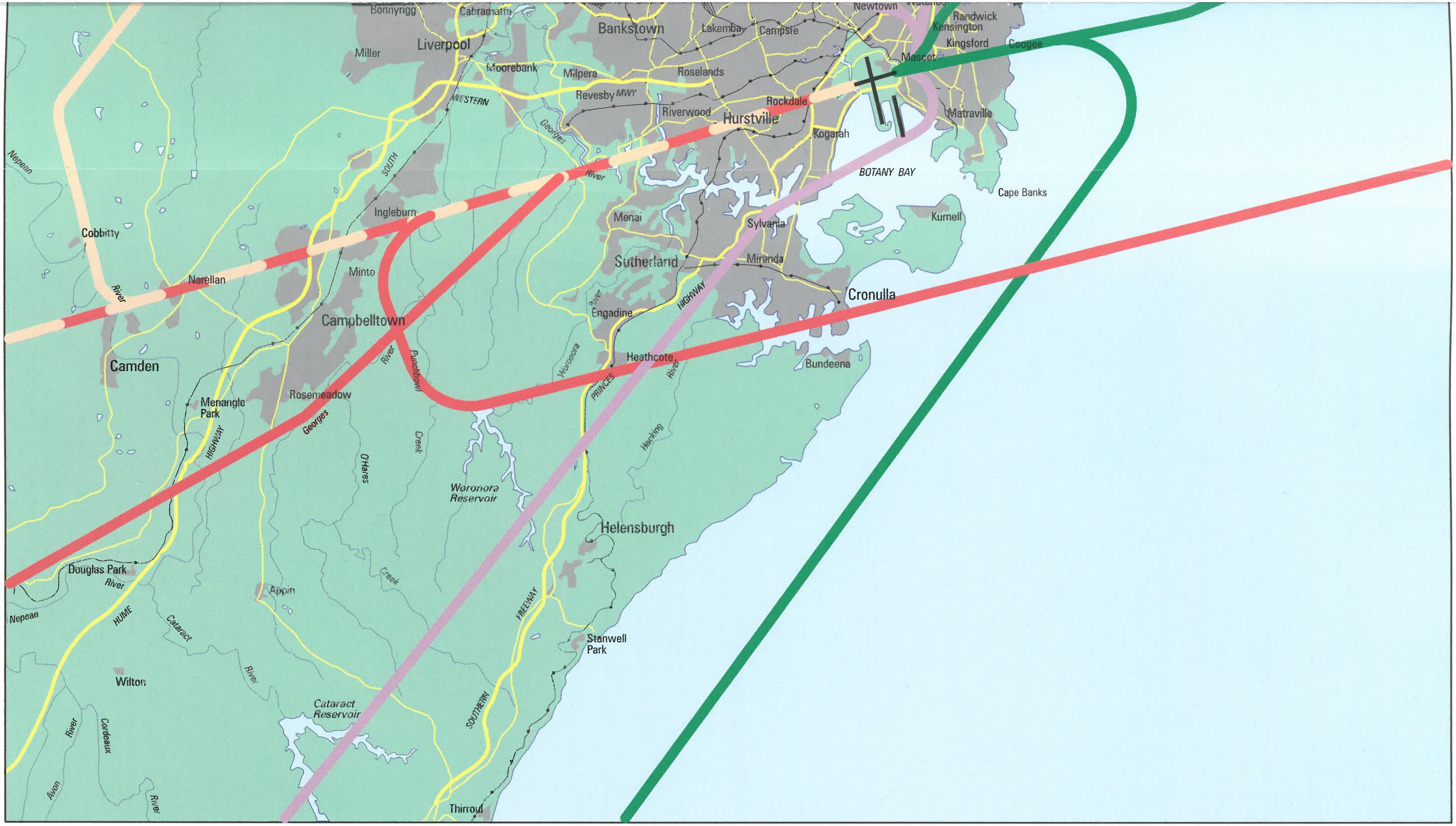
Proposed use

It is proposed that this Mode be included in the plan for use when wind conditions require, such as when a crosswind on the parallel runways is 25 knots or more.

When this Mode is in use, there will be the occasional use of Runways 16R or 34L for departing and arriving long haul jets.

SYDNEY MODE 12 DEPARTURES 07 ARRIVALS 07 (LONG HAUL JET DEPARTURES/ARRIVALS 16R OR 34L)





MP 96/544.8.12
November 1996

Built-up-area (1993)

Note: Tracks shown are indicative

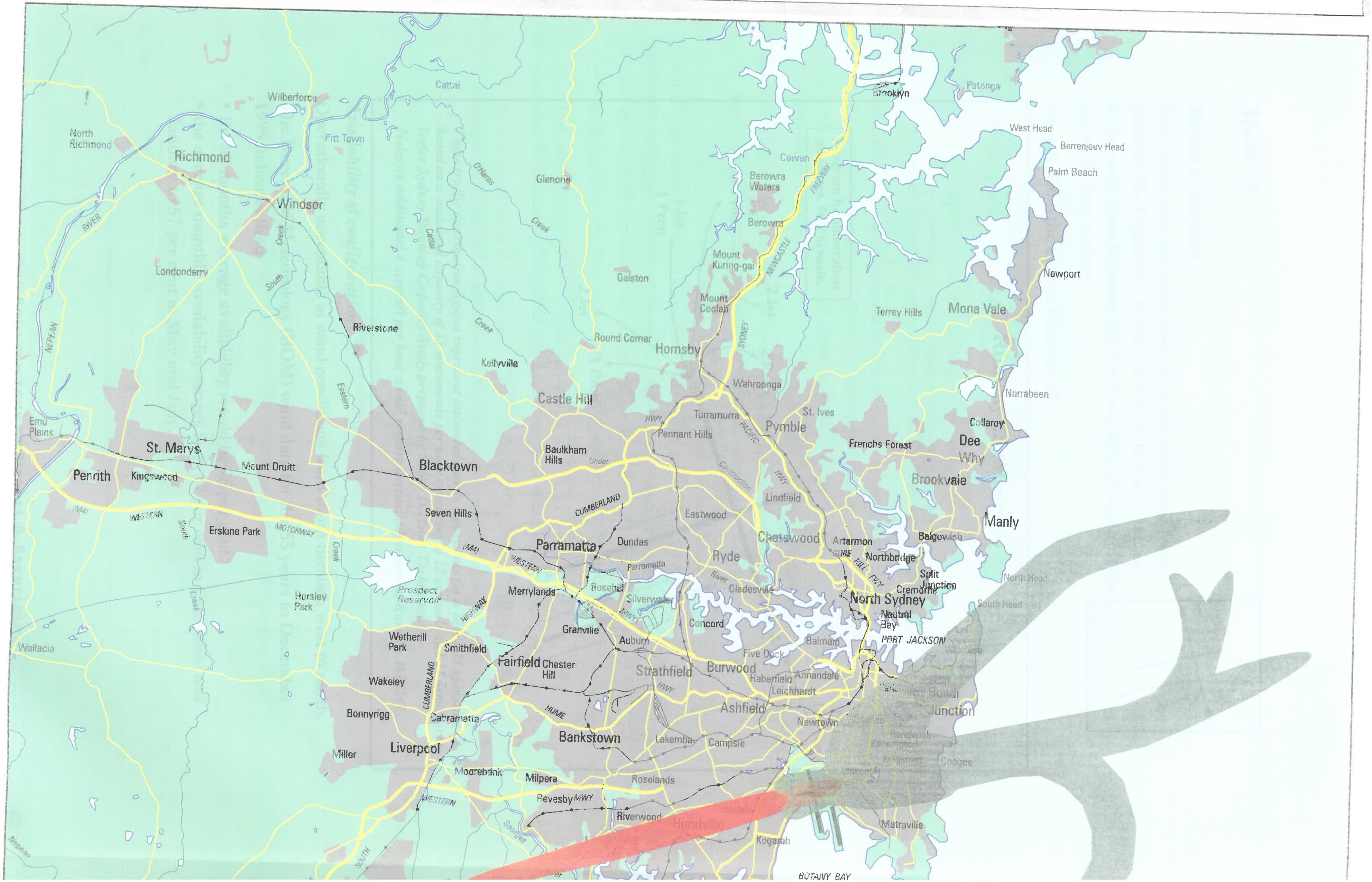
0 km 6
Scale approx

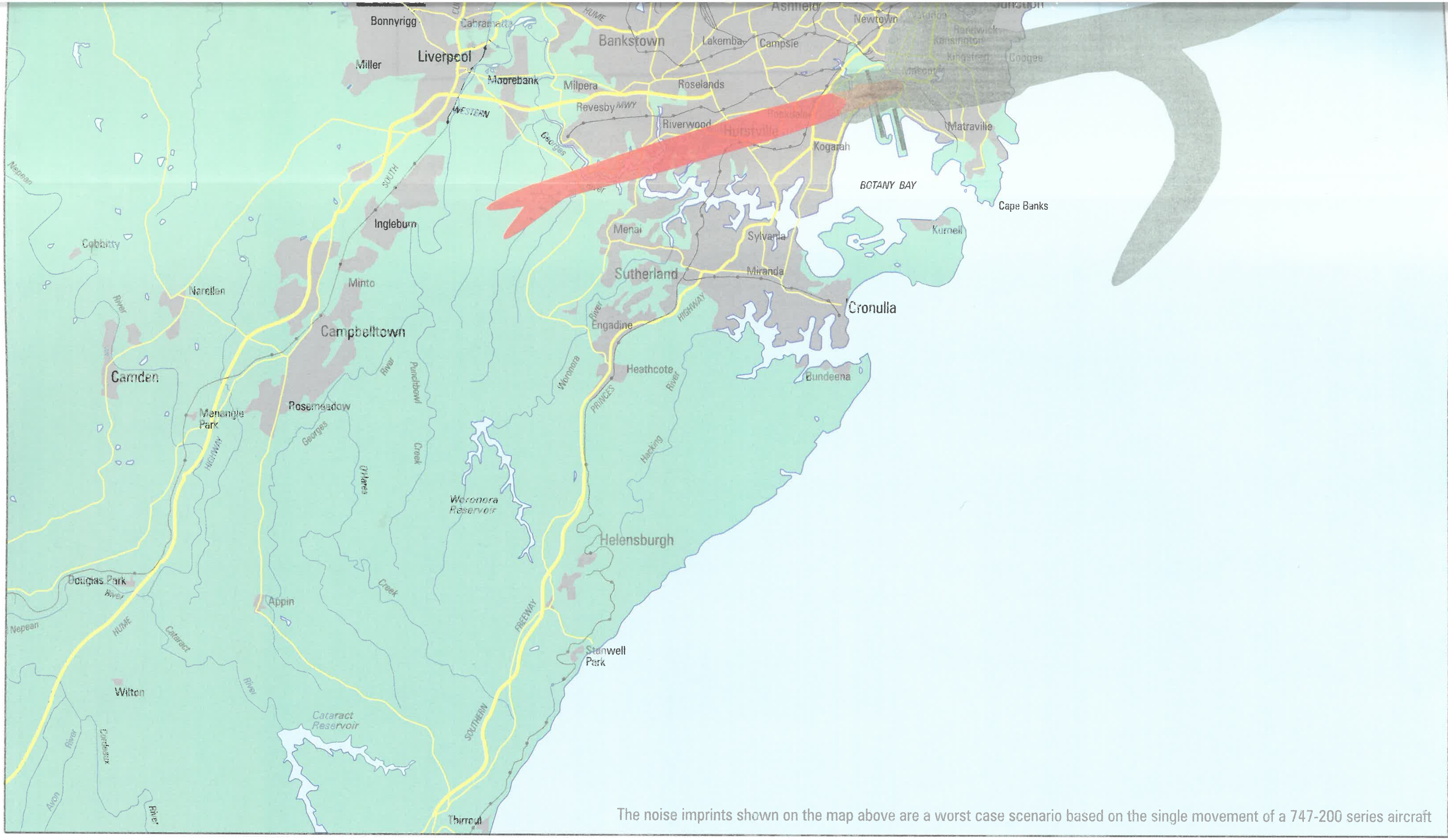
N

DEPARTURES
Jet track
Non-Jet track
Dual track

ARRIVALS
Jet track
Non-Jet track
Dual track

SYDNEY NOISE IMPRINT MODE 12 JET DEPARTURES 07 ARRIVALS 07





The noise imprints shown on the map above are a worst case scenario based on the single movement of a 747-200 series aircraft

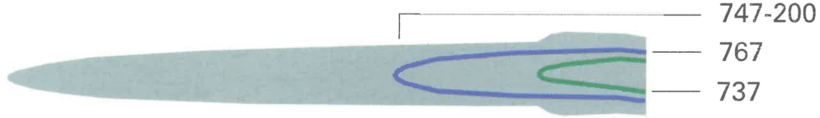
November 1996 MP 96/544.9.12 © Commonwealth of Australia

0 km 6

Scale approx

N

Note: The noise imprints shown are based on a single aircraft movement on the centreline of the indicative flight track



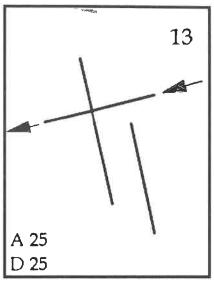
The diagram above indicates that a 767, 737 and similar aircraft leave a significantly smaller imprint than 747-200 series aircraft

Noise imprint Arrivals (70dBA or above based on a single movement of a 747-200 series aircraft)

Noise imprint Departures (70dBA or above based on a single movement of a 747-200 series aircraft)

Built-up-area (1993)

Mode 13

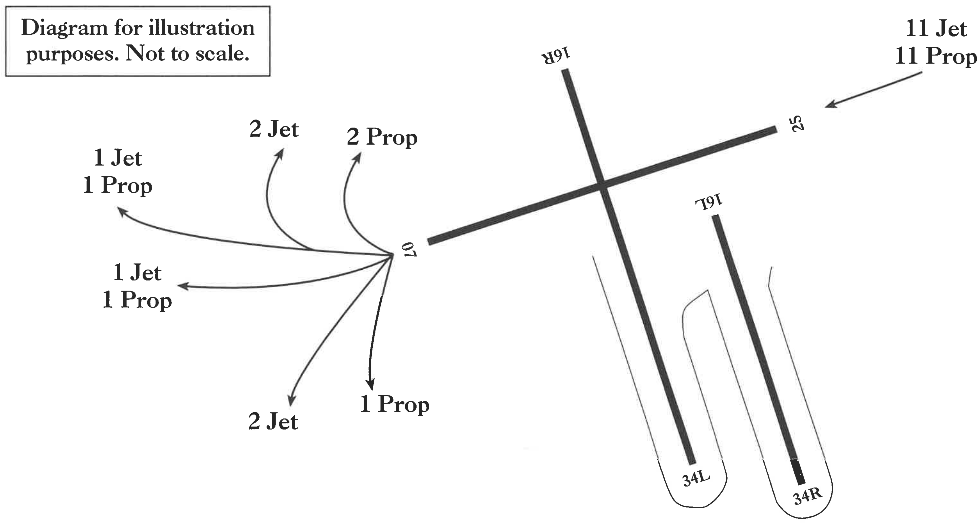


Method of operation

Departures over the north-west, west and south-west from Runway 25. Departures to the north from Runway 34L or to the south from Runway 16L for those aircraft requiring the use of the long runway.

Arrivals from the east on Runway 25.

Runway 25 (Mode 13)



These traffic distribution figures represent estimated hourly movements for a Mode 13 operation based on a sustained capacity of 33 movements per hour consisting of 22 arrivals and 11 departures (refer Sydney Runway Capacity Study prepared by Sabre Decision Technologies).

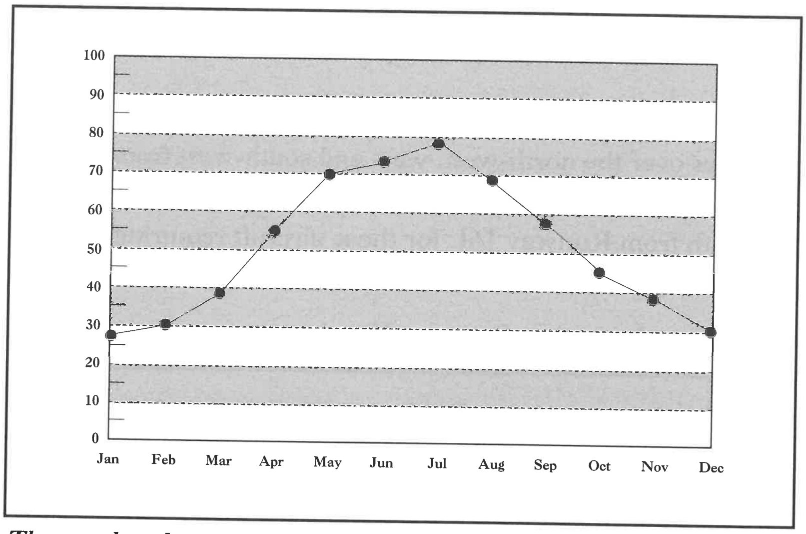
Note: an additional 6 aircraft per hour would require arrival/departure on Runway 16R/34L.

Availability of configuration

Operationally acceptable in wind conditions from south through west to north.

The Bureau of Meteorology (BOM) wind data for the 55 years to December 1995 indicates that:

- the all months average availability would be 75 per cent.
- the average monthly availability ranges from 57 per cent in December and January to 57 per cent in May and July.



The graph indicates the 55 year average availability from January to December.

Where nil downwind criteria is specified the average of all months availability is 59 per cent

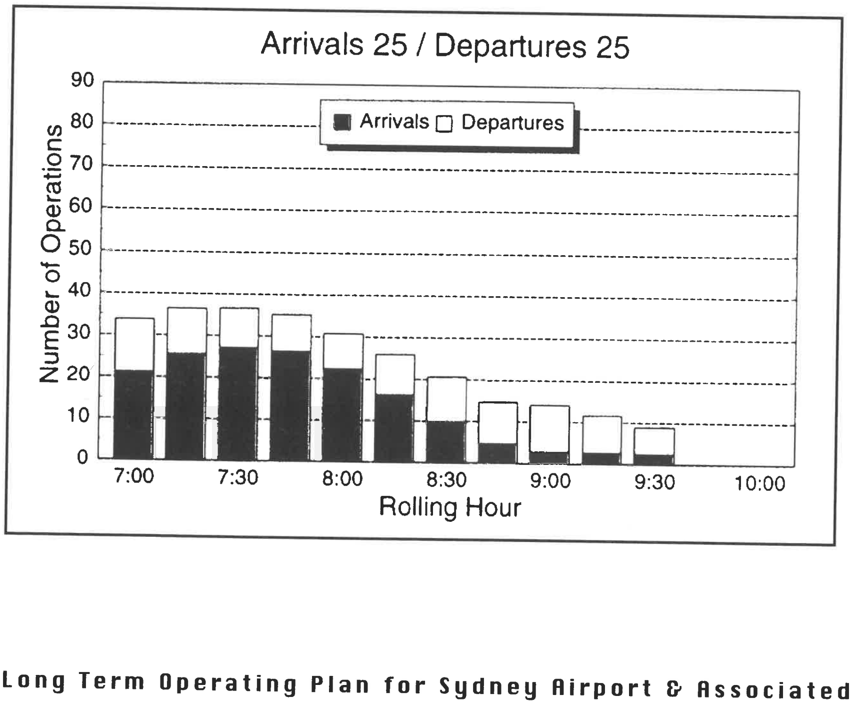
Operational capacity

Sabre observed a sustained capacity of 33 operations per hour consisting of 22 arrivals and 11 departures. Peak observed capacity of 37 operations

Sabre found that the smaller separation time for subsequent departures on 25 (than on 07) due to the availability of fanned departure headings did not improve the capacity over Mode 12 due to the infrequency of back-to-back departures. The arrivals and departures are balanced 50/50 in this case. If more departures and less arrivals were operated, the hourly sustainable capacity should improved beyond 33 operations.

Sabre modelling evaluation found this Mode will not attain 80 operations per hour with only one runway in use.

Graph below presents the simulation results for a rolling hour period.



Operational complexity

Current operational use not complex because of single runway in use.

Constraints to optimisation of capacity

Taxiway congestion at the departure end of the runway will result as traffic levels increase.

Single runway operation requires spacing of arriving traffic to allow for departures.

Environmental implications

Arrivals 25

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 44,200.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	3,400ft	at	Over Water
B747-400	3,100ft	at	Over Water
B767	2,900ft	at	Over Water
Saab 340	850ft	at	Coogee

Departures 25

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 787,200.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	10,000ft	at	Belrose (north), Heathcote/Royal National Park (south), over water/Middle Harbour (east), Horsley Park (west), Toongabbie (northwest) & Parklea (northwest-early turn)
B747-400	6,500ft	at	Lindfield (north), Royal National Park (south), North Sydney (east), Cabramatta (west), Merrylands (northwest) & Northmead (northwest-early turn)

B767	6,000ft	at	Tennyson (north), Sutherland (south), Gladesville (north), Bankstown Aerodrome (west), Yagoona (northwest) & Silverwater (northwest-early turn)
Saab 340	3,000ft	at	Arncliffe (north), Brighton le Sands (south), Arncliffe (east), Arncliffe (west) & Arncliffe (northwest)

For further details refer to Appendix 9

Conclusions

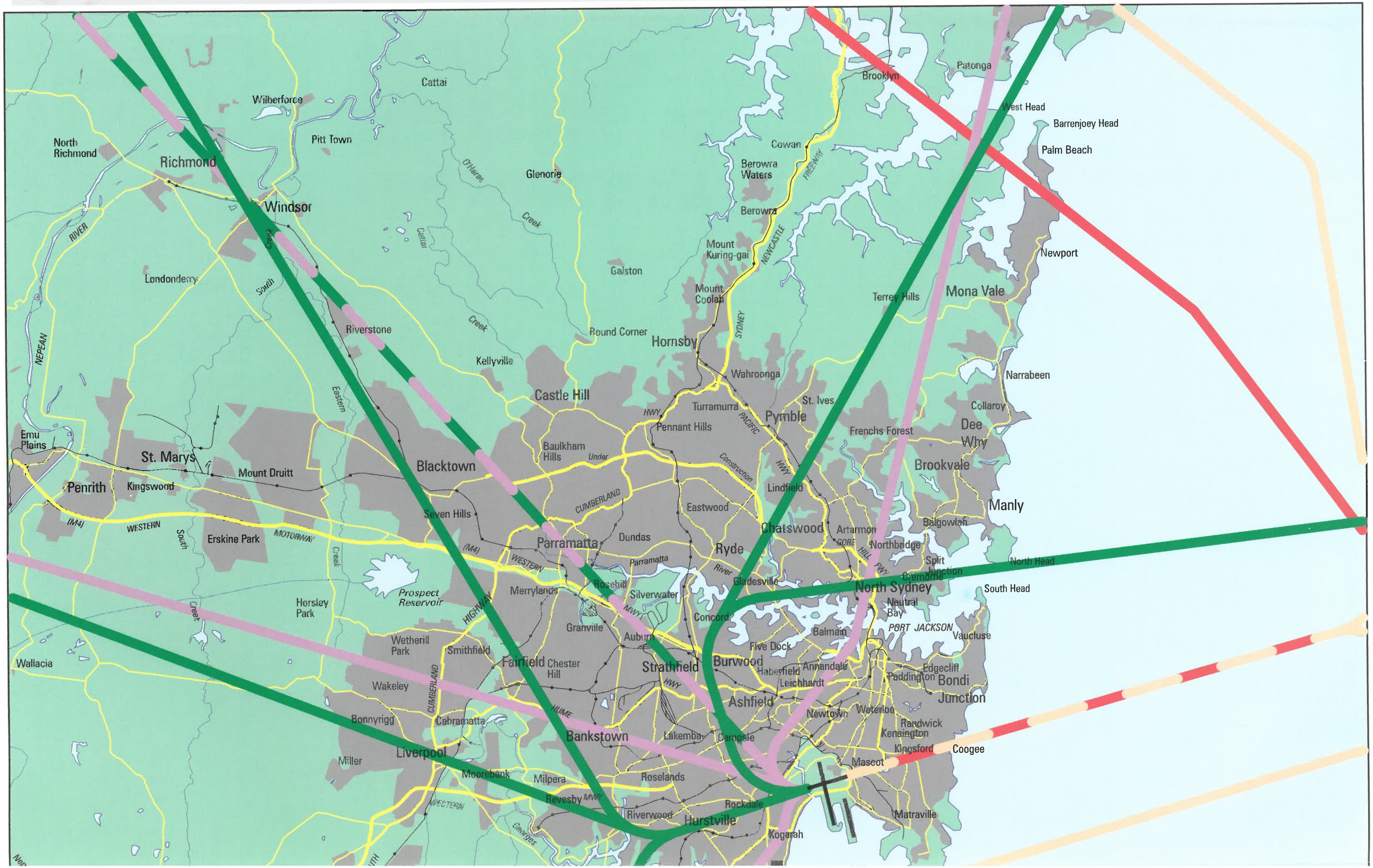
This mode results in aircraft noise to the east and west of the airport, but provides relief to the north. It does not meet the objective of maximising flight over water or non populous areas and has limited potential because of the capacities of the single runway. There are other modes providing relief to the north giving higher movement rates and which also involve overwater flight for some aircraft. These would be preferable if wind conditions allowed.

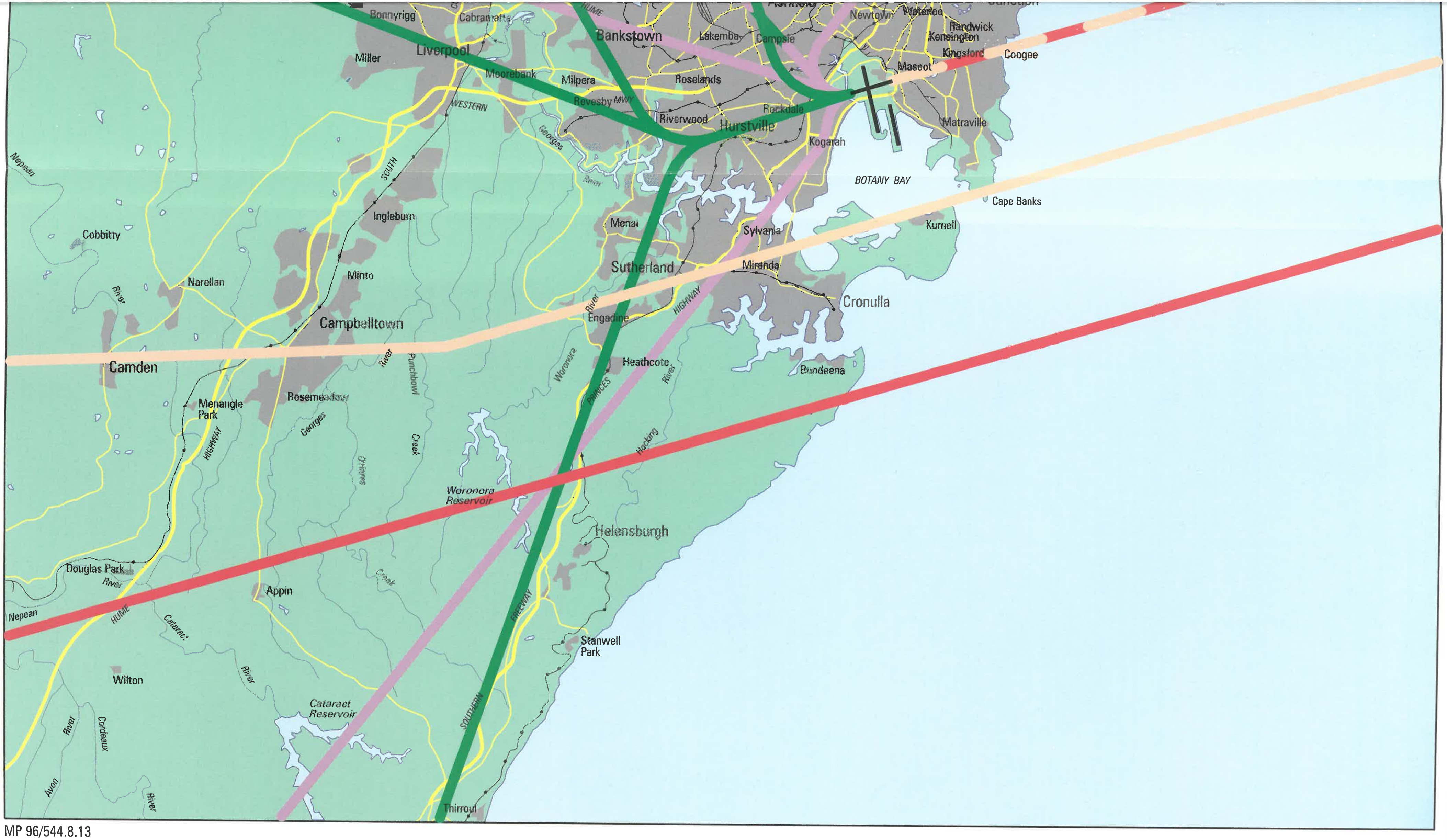
Proposed use

This Mode is proposed for including in the plan for use when wind conditions require, such as when a crosswind on the parallel runways is 25 knots or more.

Occasional use of Runways 16R or 34L when required for departing and arriving heavy jets.

SYDNEY MODE 13 DEPARTURES 25 ARRIVALS 25 (LONG HAUL JET DEPARTURES/ARRIVALS 16R OR 34L)





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Built-up-area (1993)

Note: Tracks shown are indicative

0 km 6
Scale approx

N

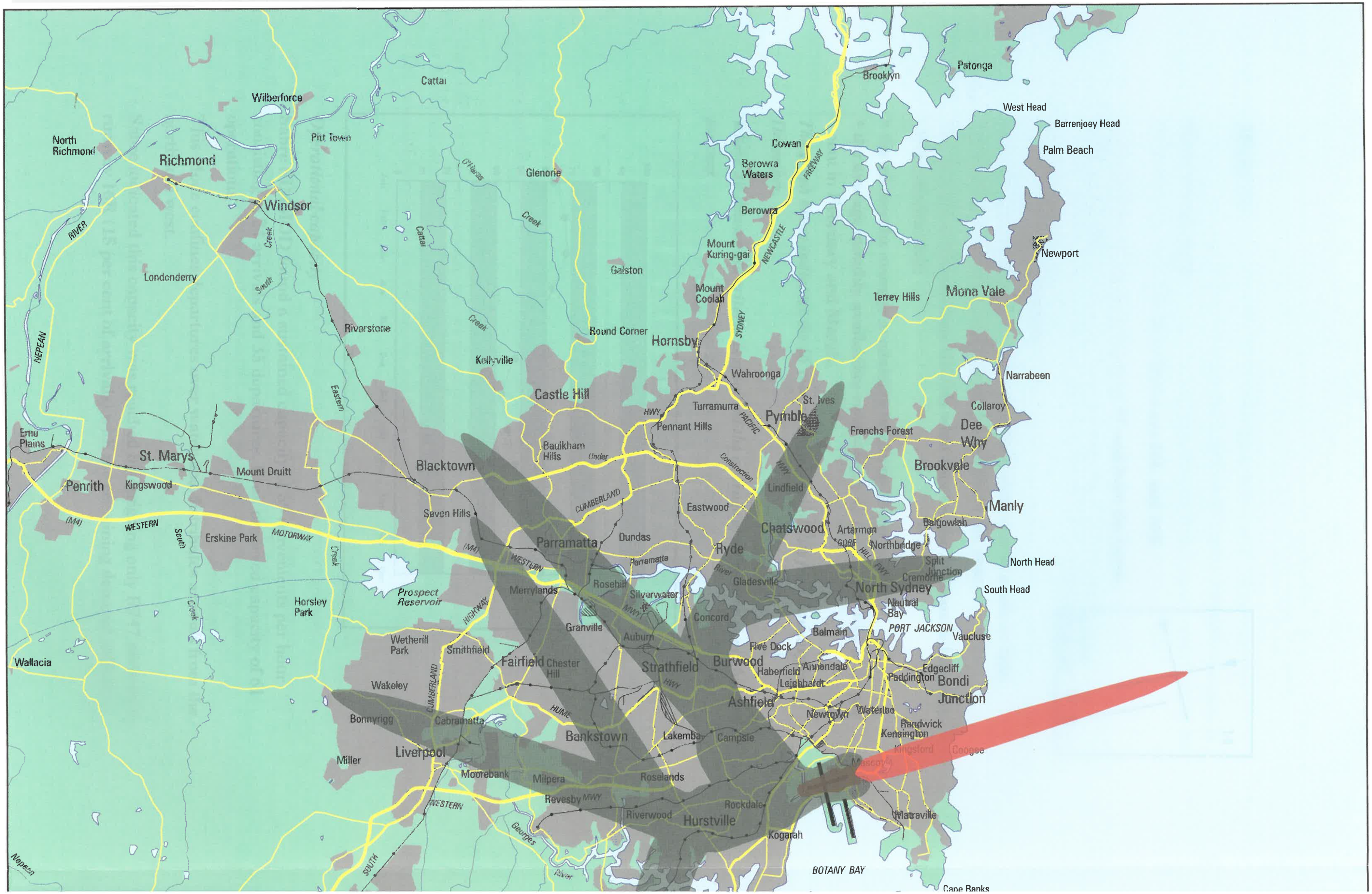
DEPARTURES

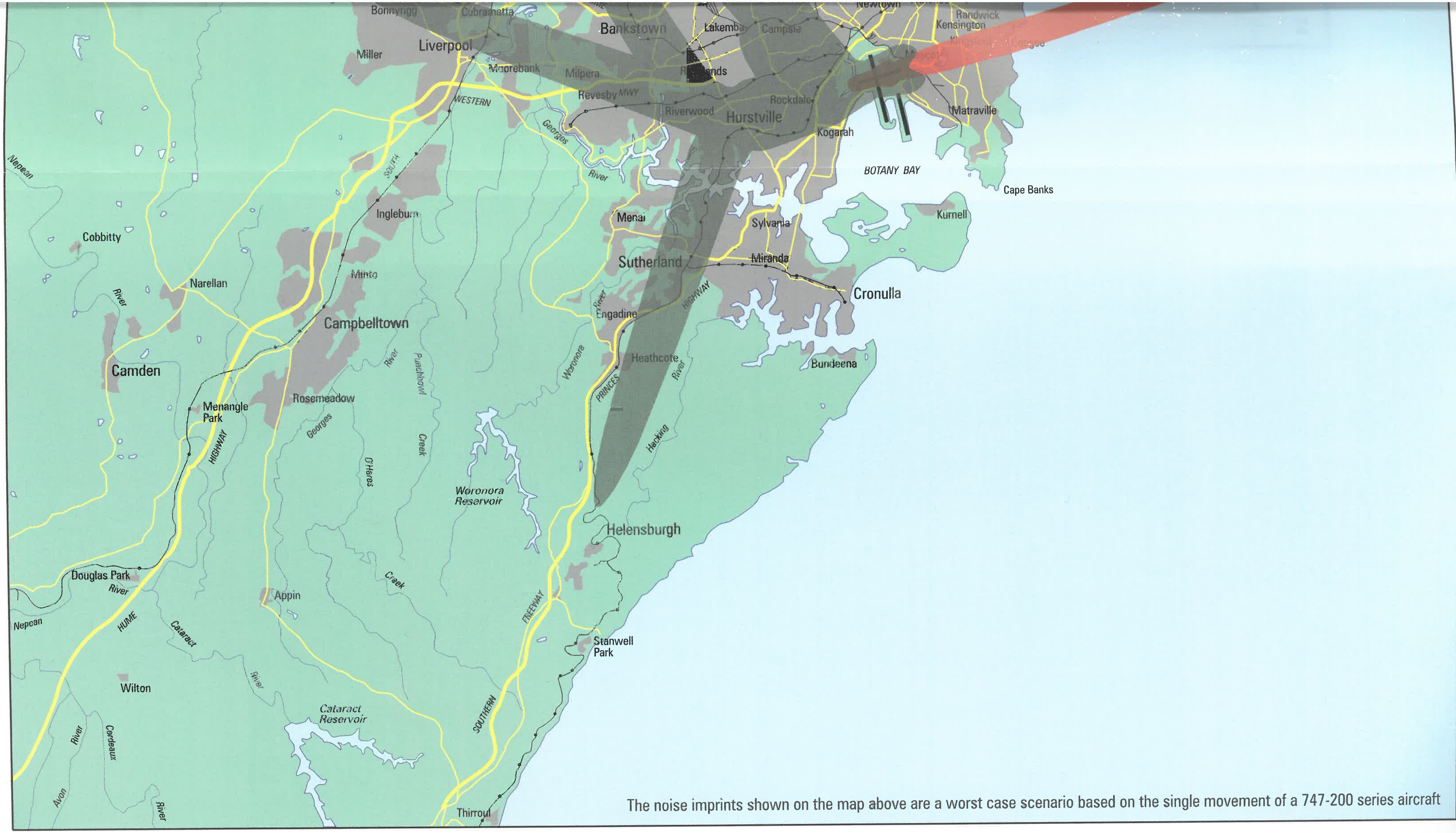
- Jet track
- Non-Jet track
- Dual track

ARRIVALS

- Jet track
- Non-Jet track
- Dual track

SYDNEY NOISE IMPRINT MODE 13 JET DEPARTURES 25 ARRIVALS 25





The noise imprints shown on the map above are a worst case scenario based on the single movement of a 747-200 series aircraft

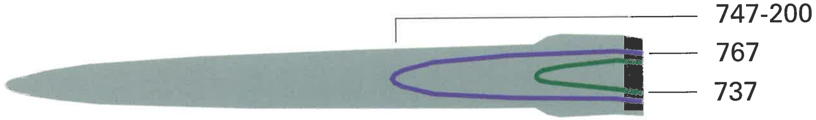
November 1996 MP 96/544.9.13 © Commonwealth of Australia

0 km 6

Scale approx

N

Note: The noise imprints shown are based on a single aircraft movement on the centreline of the indicative flight track



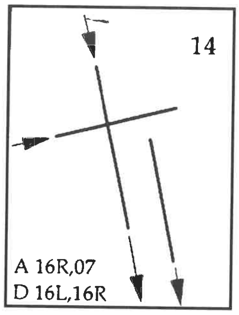
The diagram above indicates that a 767, 737 and similar aircraft leave a significantly smaller imprint than 747-200 series aircraft

Noise imprint Arrivals (70dBA or above based on a single movement of a 747-200 series aircraft)

Noise imprint Departures (70dBA or above based on a single movement of a 747-200 series aircraft)

Built-up-area (1993)

Mode 14



Method of operation

Departures to the south from Runways 16L and 16R.

Arrivals from the west on Runway 07 and from the north on Runway 16R.

Availability of configuration

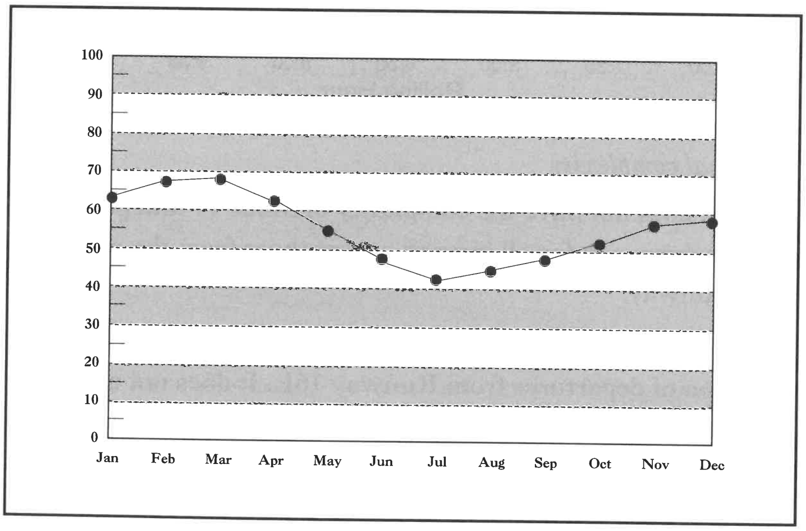
Operationally acceptable in wind conditions from east to south or light southwest to northwest which occurs throughout the year.

The Bureau of Meteorology (BOM) wind data for the 55 years to December 1995 indicates that:

- the all months average availability would be 55 per cent.
- the average monthly availability ranges from 43 per cent in July to 67 per cent in February and March.

The graph below indicates the 55 year average availability from January to December.

Where nil downwind criteria is specified the average of all months availability is 32 per cent



Operational capacity

Sabre SIMMOD found a sustained capacity of 59 movements per hour consisting of 24 arrivals and 35 departures. Peak observed capacity of 61 operations

This Mode confines departures over water and distributes arrivals from the north and west.

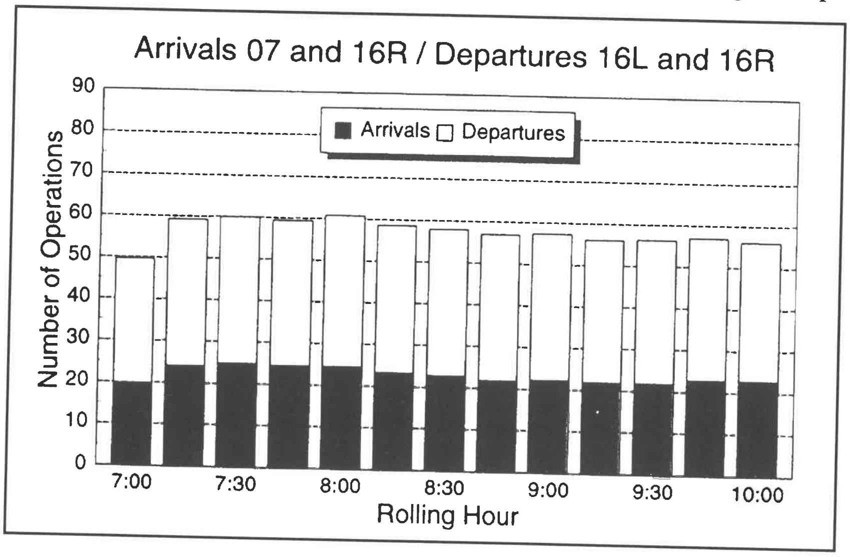
Sabre indicated this capacity was reached by assigning only B747 arrivals to runway 16R (15 per cent of arrivals) with the remaining demand shifted to runway 07. The initial assignment of 25 per cent of the arrivals to runway 16R produced a capacity of only 50 movements per hour.

Sabre indicated the introduction of crossing arrivals on runway 07 and runway 16R produces a smaller capacity for Mode 14 than that of Mode 14a.

Sabre reported that the proximity of the runway intersection to the thresholds of runway 07 (1273 metres) and runway 16R (998 metres) prohibits the use of LAHSO.

Sabre indicated that this Mode will not attain 80 operations per hour due to the active runways intersecting and the inability to use LAHSO.

Graph below presents Sabre simulation results for a rolling hour period.



Operational complexity

This mode does not have the complexity of Mode 11 and provides for a straight-in approach for all aircraft except those from the southwest requiring the long runway.

This was the preferred operating mode for day operations prior to 1994 with the addition of departures from Runway 16L. It does not easily lend itself to segregated airspace unless west bound non-jet aircraft depart Runway 16L.

Constraints to optimisation of capacity

Crossing runway operations introduce a degree of complexity requiring management of two arrival streams of traffic which interact at the runway intersection. There also is a requirement to sequence departures from Runway 16R with both arriving streams. Departures from Runway 16L can proceed unimpeded.

Environmental implications

As this is not one of the recommended modes of operation no further environmental assessment was performed.

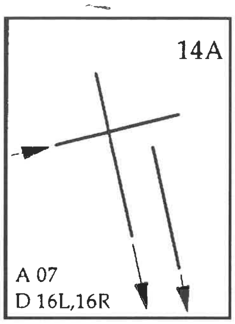
Conclusions

This mode provides for all departures over water and for respite to the east. It does not provide respite for the northern suburbs and does not contribute to the noise sharing objectives of the plan.

Proposed use

It is not proposed to use this configuration in this form. Mode 14A better meets the objectives of respite.

Mode 14A

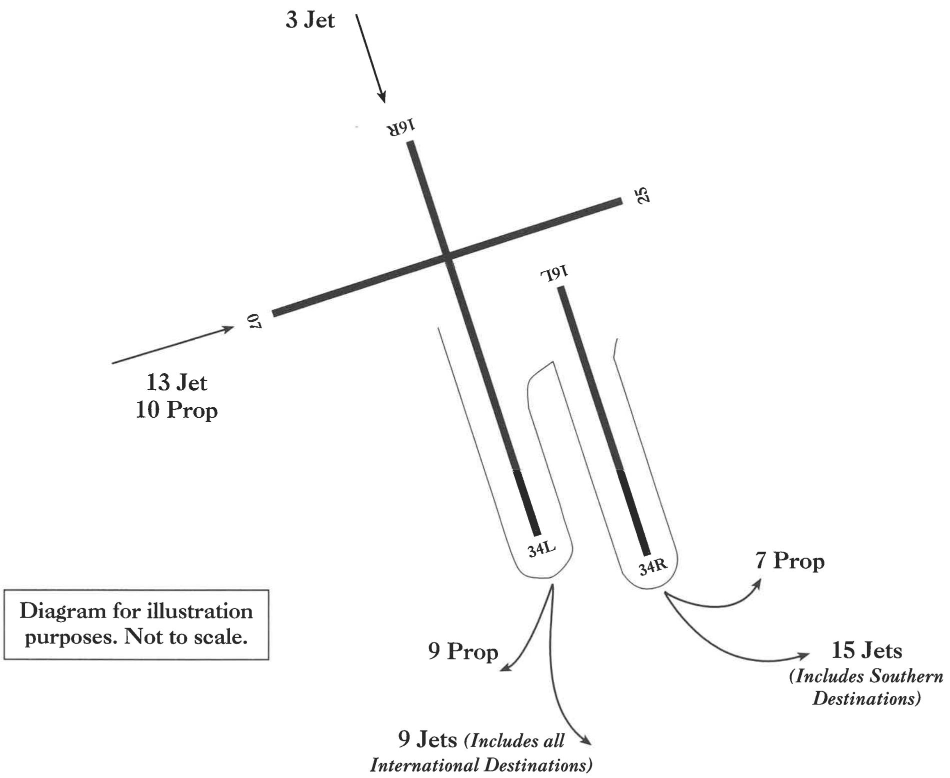


Method of operation

Departures to the south from Runways 16L and 16R.

Arrivals from the west on Runway 07. Arrivals from the north for those aircraft requiring the use of the long runway.

Runway 16L/R Departures/07 Arrivals 16R (Long Haul) (Mode 14A)



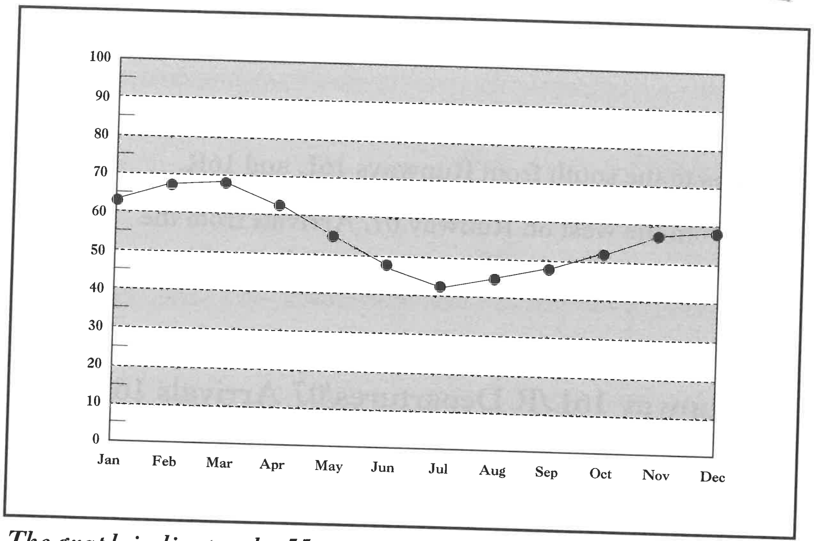
These traffic distribution figures represent estimated hourly movements for a Mode 14 operation based on a sustained capacity of 66 movements per hour consisting of 26 arrivals and 40 departures (refer Sydney Runway Capacity Study prepared by Sabre. Decision Technologies). These calculations assume an assignment of 55% of departures to Runway 16L and 45% to Runway 16R.

Availability of configuration

Operationally acceptable in wind conditions from east to south, or light south-west to north-west. These conditions occur throughout the year.

The Bureau of Meteorology wind data for the 55 years to December 1995 indicates that:

- average yearly availability over 55 years was 55 per cent.
- average monthly availability over 55 years ranged from 43 per cent in July to 67 per cent in February and March.



The graph indicates the 55-year average availability from January to December.

Where nil downwind criteria is specified the average of all months availability is 32 per cent

Operational capacity

Sabre SIMMOD modelling indicated a sustained capacity of 66 movements an hour consisting of 26 arrivals and 40 departures. Peak capacity was 67 movements.

Sabre indicated this capacity was reached by assigning 55 per cent of the departures to runway 16L and 45 per cent to runway 16R.

Sabre indicates this mode would not be likely to attain 80 movements an hour because the active runways intersect and inability to use LAHSO given current procedures.

However, Sabre indicates that if all runway 16R (non long haul) would begin take-off from taxiway H, the resultant capacity of the Mode would likely reach 80 movements per hour. This was based on

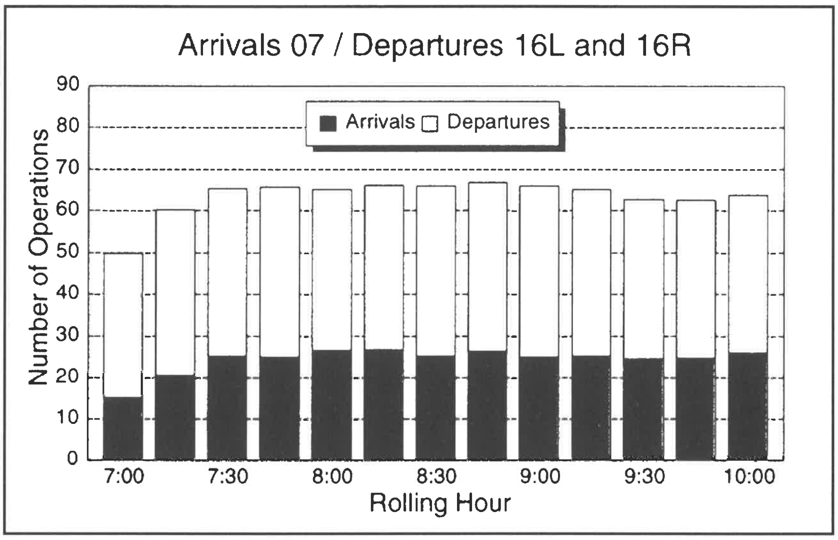
- the distance of runway 16R from taxiway H to the southern threshold being newly 2,200 metres, the same length as runway 16L
- the departures from runway 16R being independent from runway 07 arrivals as are the runway 16L departures

Further Sabre modelling found a sustained capacity of 75 movements per hour when non long haul departures on runway 16R were moved south of runway 07, consisting of 26 arrivals and 49 departures. Peak observed capacity was 77 movements

Sabre indicates this scenario assumes that ground controllers could officially manage the runway crossing of runway 07 at taxiways B and C (departures to the taxiway H intersection of runway 16R would taxi south on taxiway B and departures for runway 16L would taxi south on taxiway C). Sabre states that

- the model predicted 39 delayed crossings with an average delay of 24 seconds during a 4 hour period
- arriving light and medium commuter aircraft may either have to taxi longer to exit at taxiway G3 rather than taxiway B or C, or departures may have to be held north of taxiway G to allow those aircraft to use the taxiway B and C exits when required.

Graph below presents SDT simulation results for a rolling hour period.



Operational complexity

Less complex than Mode 14, requiring only sequencing of Runway 16R departures with arriving traffic. Some additional airspace complexity as northern and southern arrival streams are blended.

Management of aerodrome traffic would increase in complexity as traffic levels increased. Taxiway congestion can quickly become a problem in the north east sector of the aerodrome and a significant number of taxiing aircraft will be required to cross active runways.

Sabre suggested that some departures off runway 16R may commence from a taxiway, intersection south of runway 07/25 to enhance capacity. This would enable these aircraft to depart independently of arrivals on runway 07. Consideration of this proposal has identified the difficulties of managing the additional runway crossings required, the potential for taxiway congestion in critical areas, and the effect on other operations.

The additional wake turbulence separation required with aircraft departing from north of runway 07 also has to be considered where landing aircraft are still generating lift as they cross Runway 16L in their landing roll.

Constraints to optimisation of capacity

Not suited to high arrival rates.

The potential for ground conflict between aircraft taxiing after landing with those aircraft taxiing for departure from Runway 16L may impact on capacity. The non-availability of Taxiway C to vacate Runway 07, where it is occupied by aircraft waiting to cross the runway may increase the runway occupancy times for arrivals and require greater spacing between successive arrivals.

There may be some scope to counter this by the provision of some taxiway enhancements.

Environmental implications

Arrivals 07

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 72,600.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	3,400ft	at	Royal National Park
B747-400	3,100ft	at	Royal National Park
B767	2,900ft	at	Padstow Heights
Saab 340	850ft	at	Hurstville

Arrivals 16R (Heavy)

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 134,400.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	3,400ft	at	Turramurra, Beecroft.
B747-400	3,100ft	at	West Pymble, Epping.

Departures 16L &R

The number of people exposed to noise of 70 dB(A) or more for B747-200 aircraft is a total of 9,800.

At the outer tip of the contour for each particular type of aircraft the noise reaching the ground will be close to 70 dB(A) and the aircraft will be at the following heights.

B747-200	10,000ft	at	Over Water
B747-400	6,500ft	at	Over Water
B767	6,000ft	at	Over Water
Saab 340	3,000ft	at	Botany Bay

For further details refer to Appendix 9

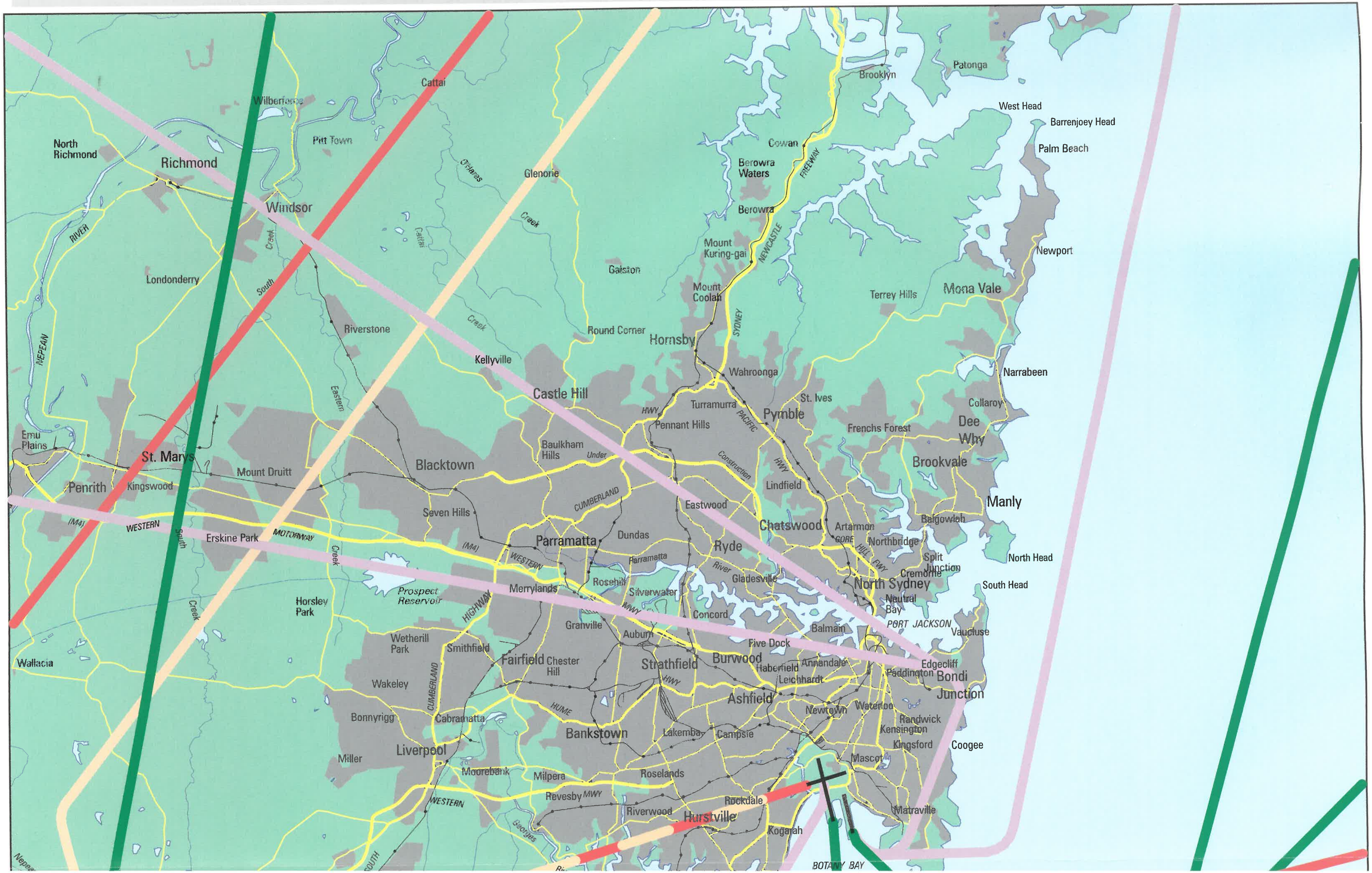
Conclusions

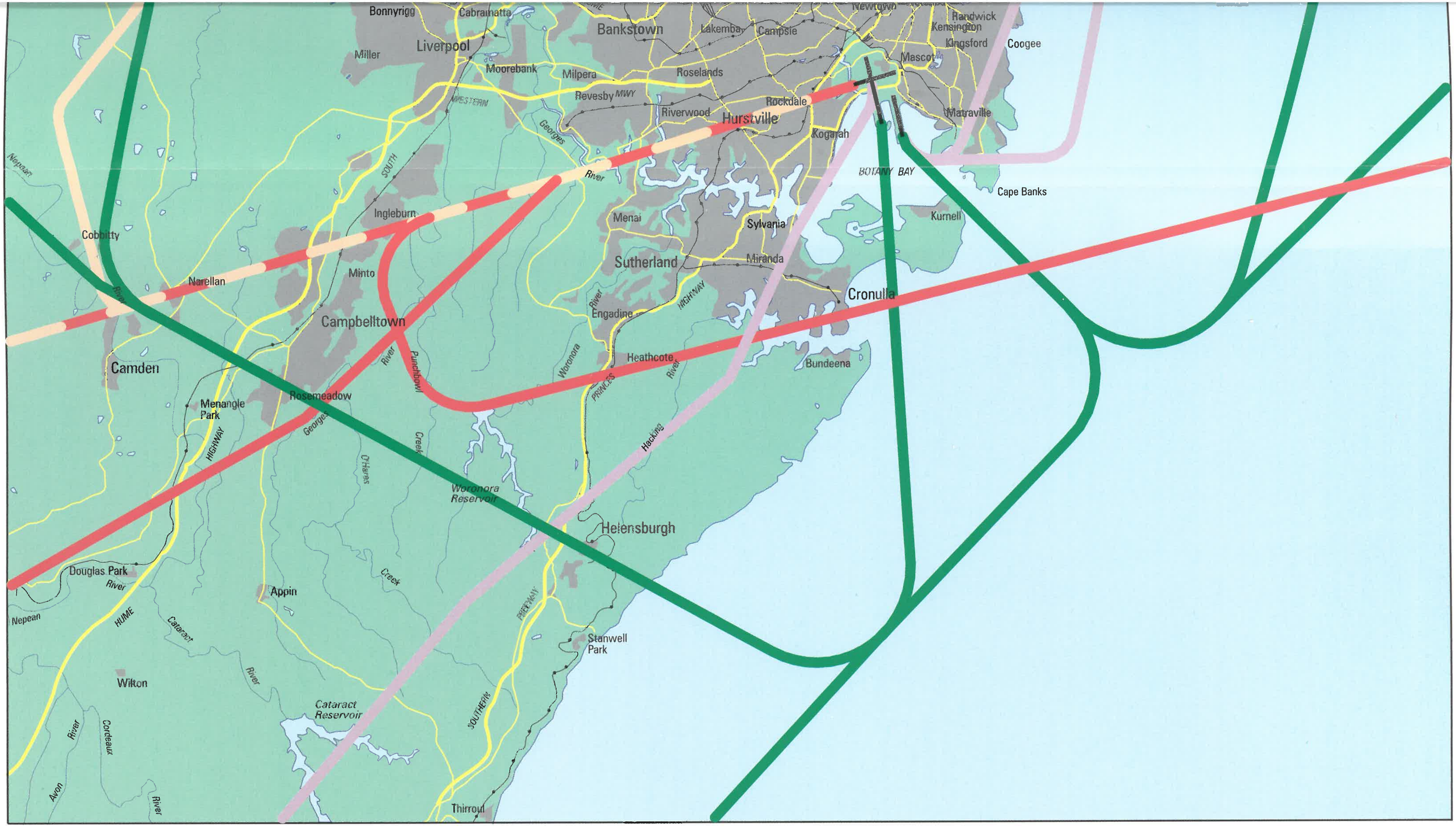
This Mode has the potential to provide high levels of throughput when there is a traffic bias in favour of departures. This is a suitable mode for operations for providing respite to the east and to the north, except where a landing aircraft requires the long runway for its operation. It provides for all departures to operate over Botany Bay.

Proposed use

During non peak periods, in accordance with the runway selection plan, to achieve equity of noise sharing

SYDNEY MODE 14A DEPARTURES 16L, 16R ARRIVALS 07





MP 96/544.8.14
November 1996

Built-up-area (1993)

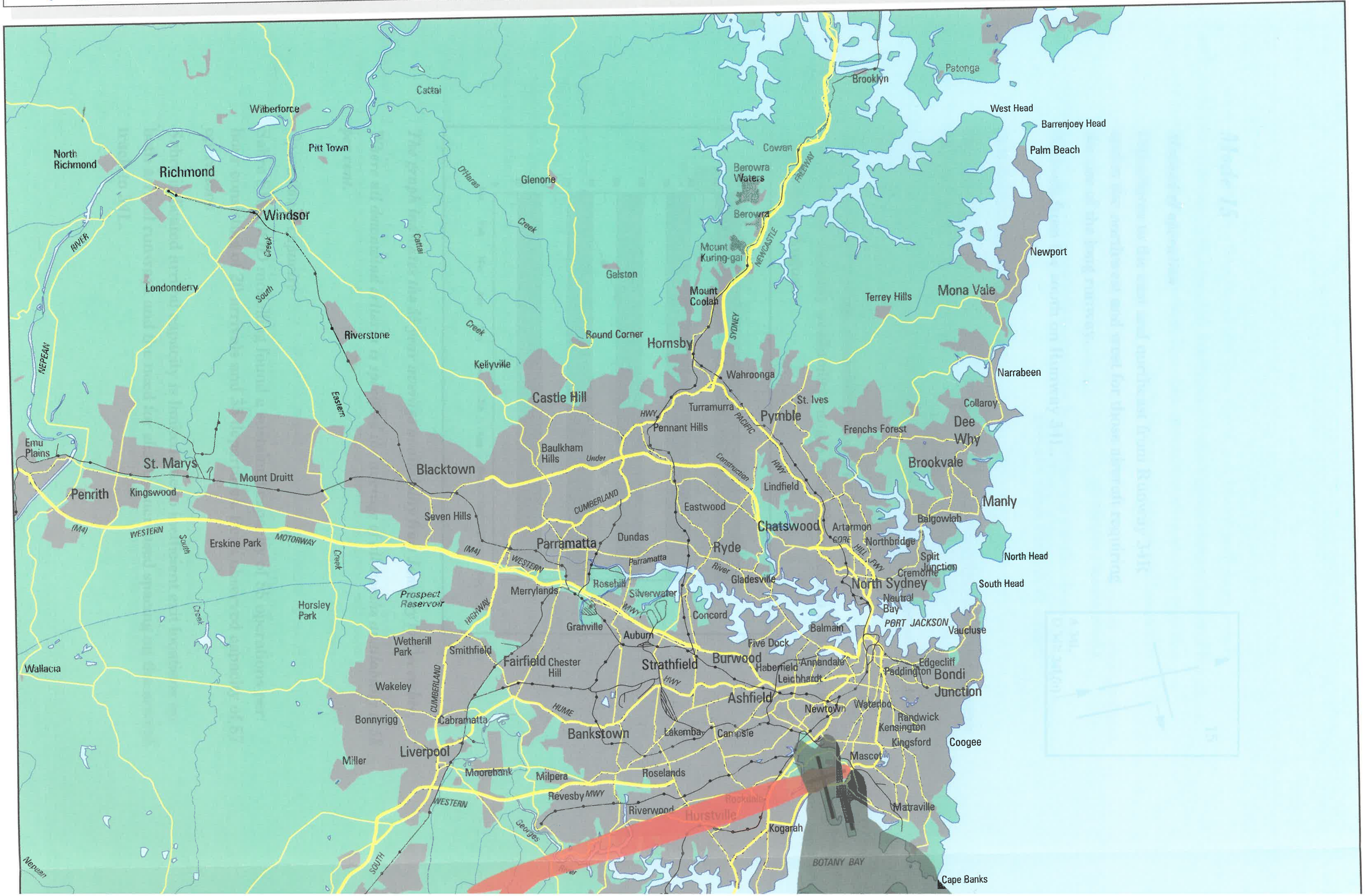
Note: Tracks shown are indicative

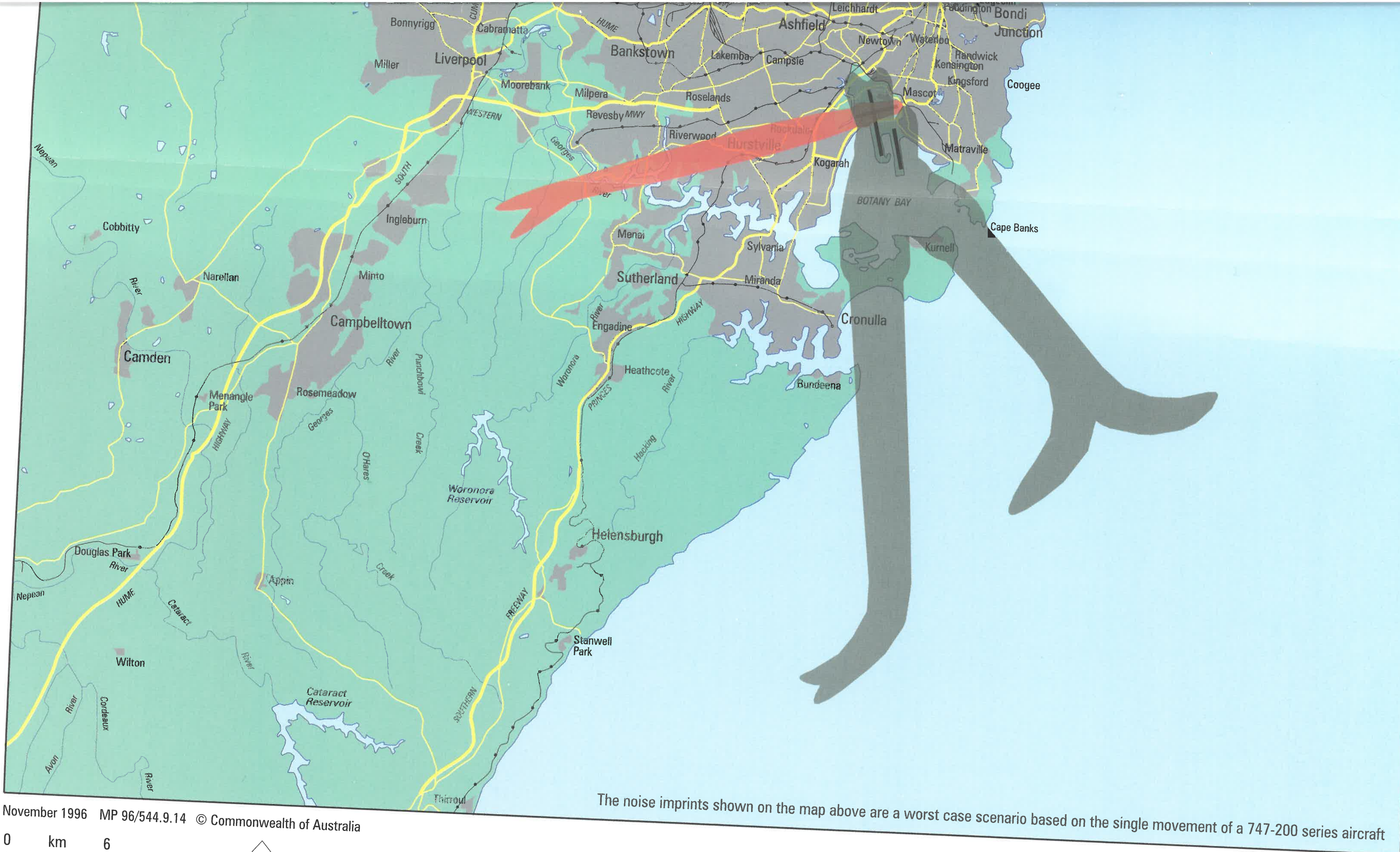
0 km 6
Scale approx

N

DEPARTURES	ARRIVALS
Jet track	Jet track
Non-Jet track	Non-Jet track
Dual track	Dual track

SYDNEY NOISE IMPRINT MODE 14A JET DEPARTURES 16L, 16R ARRIVALS 07





November 1996 MP 96/544.9.14 © Commonwealth of Australia

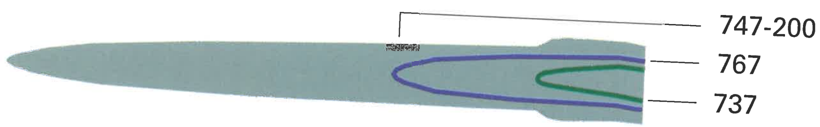
The noise imprints shown on the map above are a worst case scenario based on the single movement of a 747-200 series aircraft

0 km 6

Scale approx

N

Note: The noise imprints shown are based on a single aircraft movement on the centreline of the indicative flight track



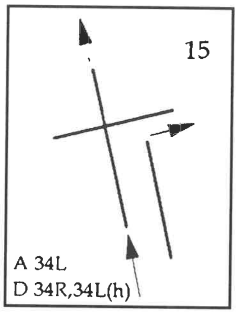
The diagram above indicates that a 767, 737 and similar aircraft leave a significantly smaller imprint than 747-200 series aircraft

Noise imprint Arrivals (70dBA or above based on a single movement of a 747-200 series aircraft)

Noise imprint Departures (70dBA or above based on a single movement of a 747-200 series aircraft)

Built-up-area (1993)

Mode 15



Method of operation

Departures to the east and northeast from Runway 34R and to the northwest and west for those aircraft requiring the use of the long runway.

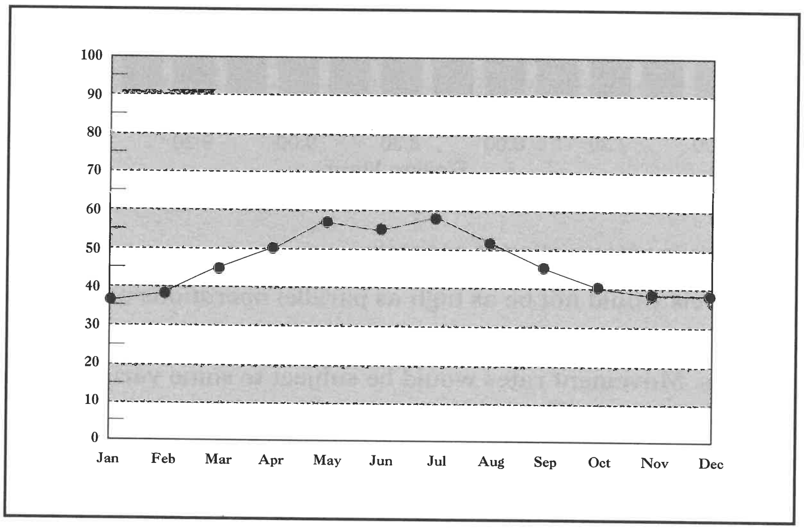
Arrivals from the south on Runway 34L.

Availability of configuration

Operationally acceptable in wind conditions from west through north to east depending on wind strength.

The Bureau of Meteorology (BOM) wind data for the 55 years to December 1995 indicates that:

- the all months average availability would be 70 per cent.
- the average monthly availability ranges from 60 per cent in February to 78 per cent in August.



The graph indicates the 55 year average availability from January to December.

Where nil downwind criteria is specified the average of all months availability is 58 per cent.

Operational capacity

Sabre SIMMOD modelling found a sustained capacity of 55 operations per hour consisting of 20 arrivals and 35 departures. Peak observed capacity of 57 operations

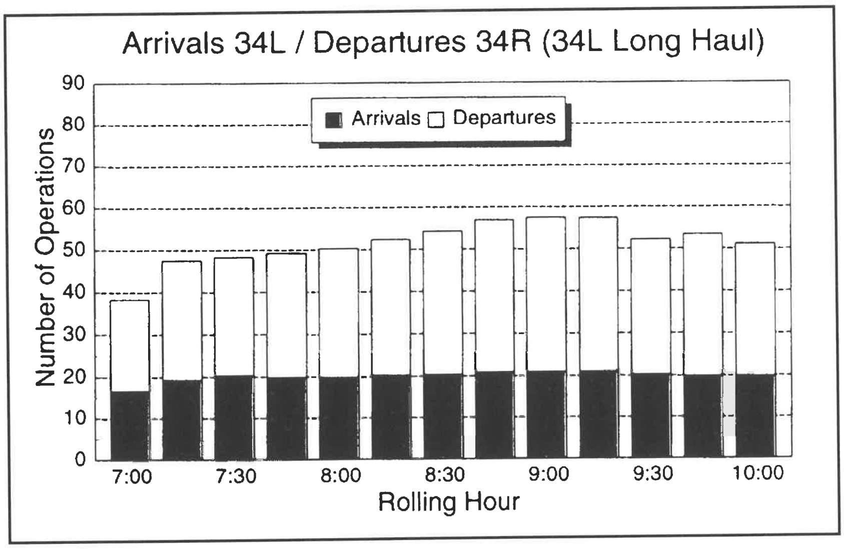
Sabre indicated arrival capacity is limited due to inefficient exit locations on both arrival runways and the need for slightly increased spacing on the arrival track to 34L.

Sabre modelling found this Mode may attain over 60 operations per hour. However, new runway exits for runways 34L and 34R would be required. The addition of new exits to runway 34L will probably remove the need for the increased spacing in the arrival track.

Operational complexity

This mode allows segregation of airspace and some variation in departure tracks to achieve noise sharing.

Graph below presents SDT simulation results for a rolling hour period.



Constraints to optimisation of capacity

Traffic levels would not be as high as parallel operations on both runways as the runways in this configuration would be dedicated to either arrivals or departures. Movement rates would be subject to some variation, dependent on traffic mix, wake turbulence separation requirements and whether instrument or visual approaches are being used.

Operation of this mode could be enhanced by the provision of high speed exits from Runway 34L to allow closer spacing between successive arrivals.

Departures would be concentrated over the eastern suburbs unless left turns over the north and west were also used. This would limit departures to some extent.

Risk is increased where there may be too many different operating configurations which may lead to misunderstanding by controllers or aircrew, particularly where variation between operating conditions is marginal.

Environmental implications

As this is not one of the recommended modes of operation, there was no further environmental assessment.

Conclusions

Whilst this mode provides some respite for Kurnell residents from the direct overflight of arriving traffic it concentrates departures over the eastern suburbs.

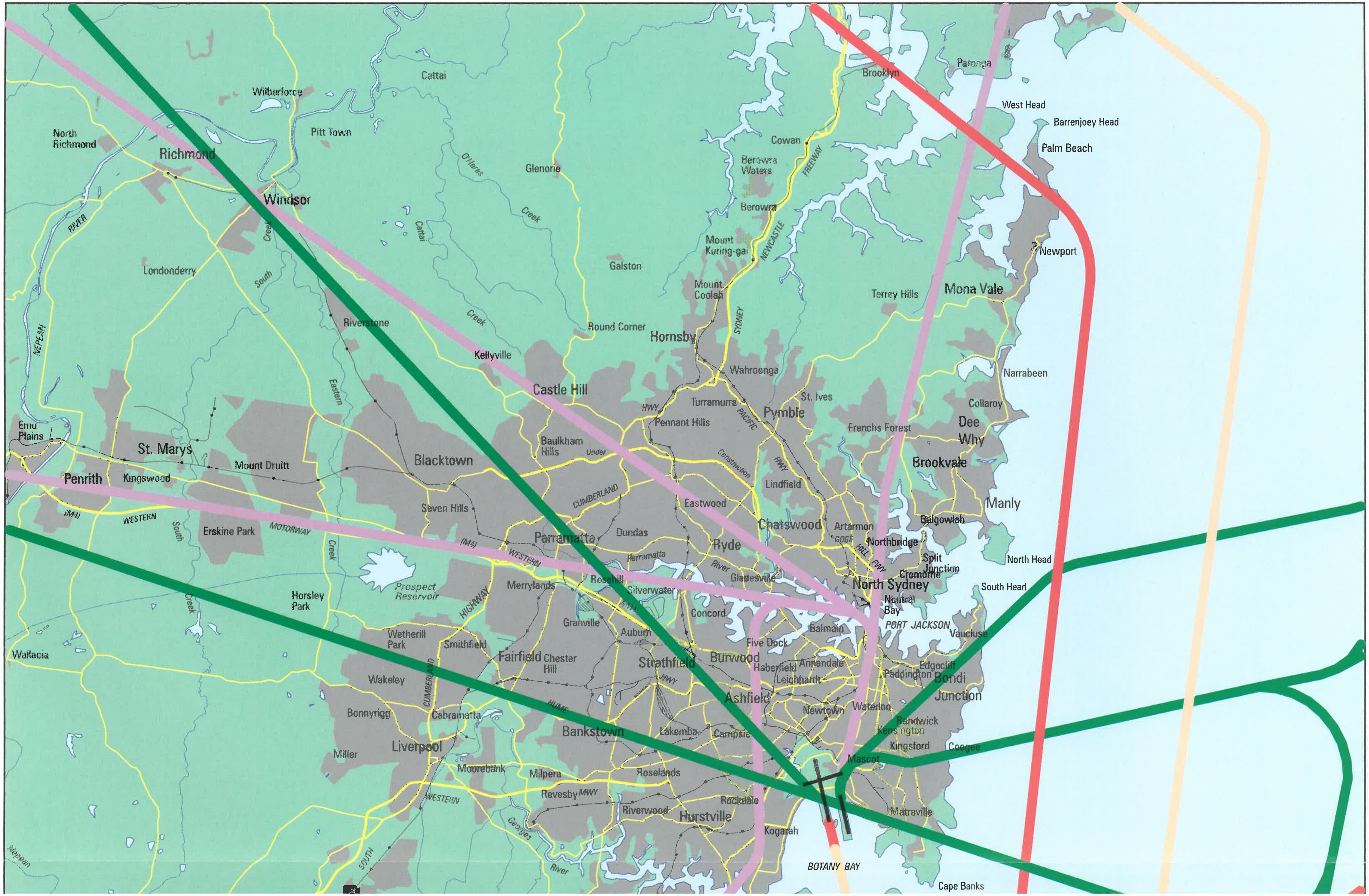
It also introduces an added degree of complexity as the airspace arrangements would be unique to this operation.

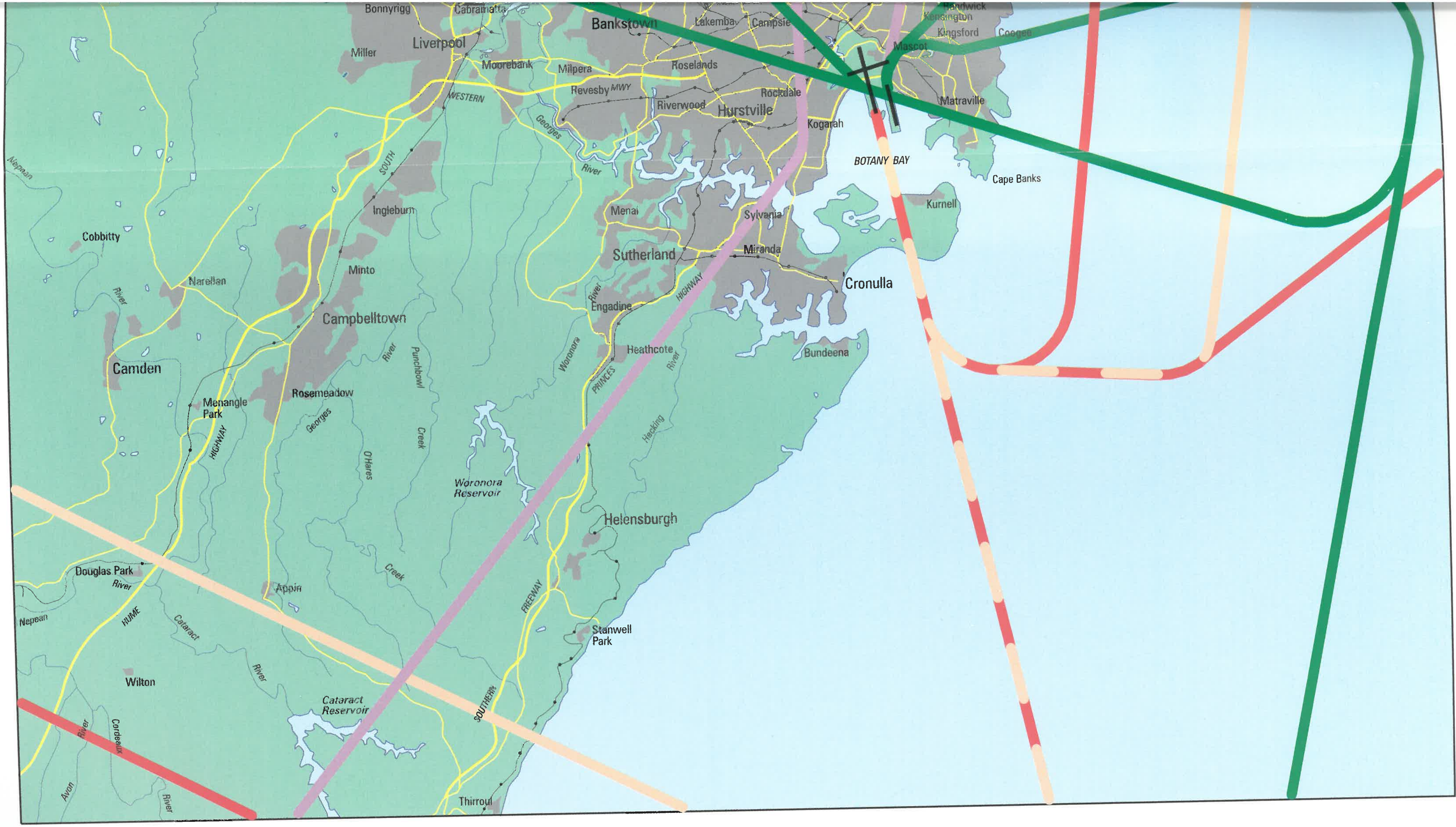
It is undesirable to have too many different operating configurations because of the risk of misunderstanding by controllers or aircrew, particularly where variation between operating conditions is marginal. The benefit of this mode can be realised by some flexibility in the use of standard parallel operations but by biasing landing to Runway 34L as traffic conditions allow.

Proposed use

Not proposed for inclusion in the operating plan.

SYDNEY MODE 15 DEPARTURES 34R ARRIVALS 34L (LONG HAUL JET DEPARTURES 34L)





MP 96/544.8.15
November 1996

Built-up-area (1993)

Note: Tracks shown are indicative

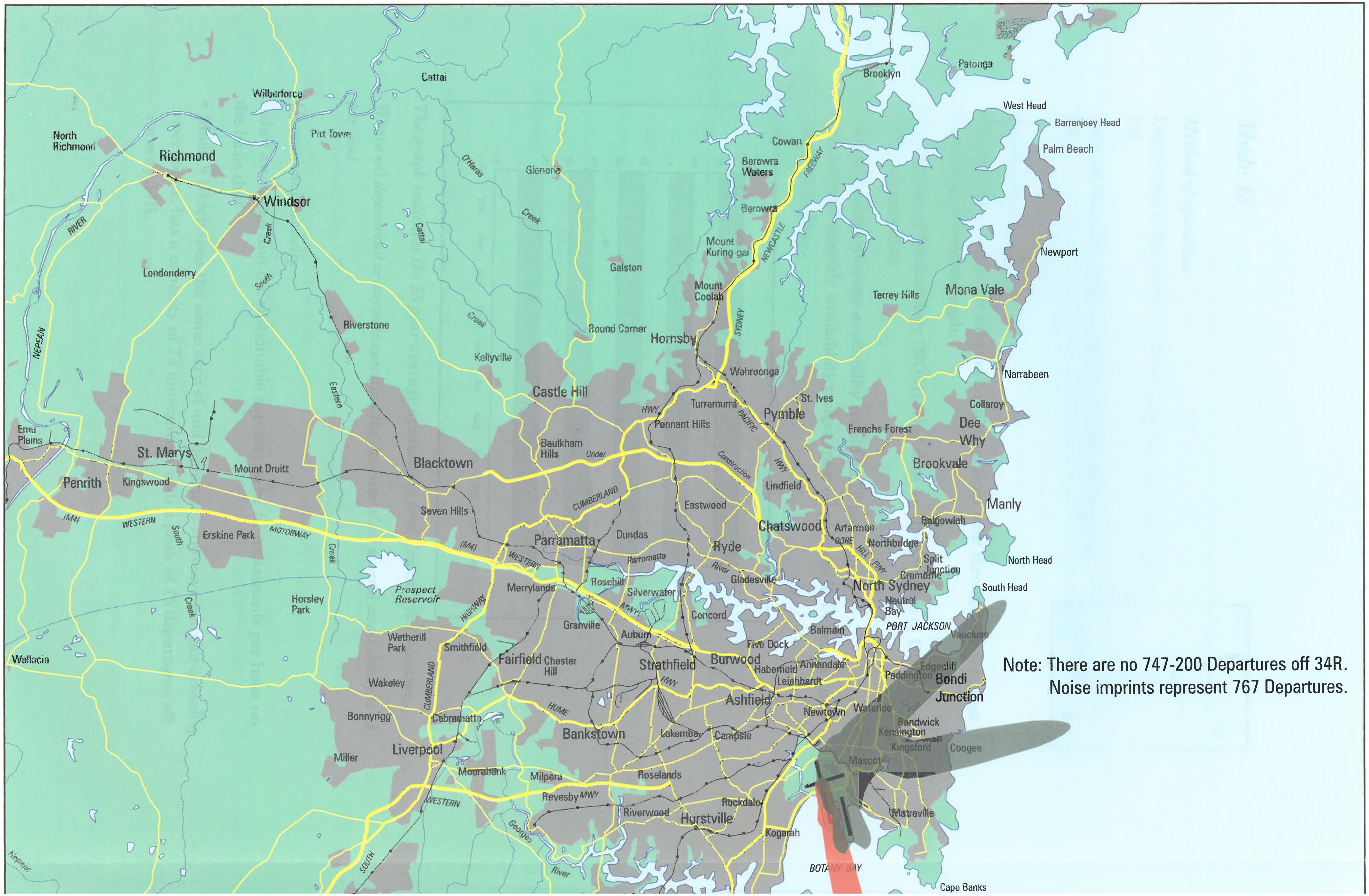
0 km 6
Scale approx

N

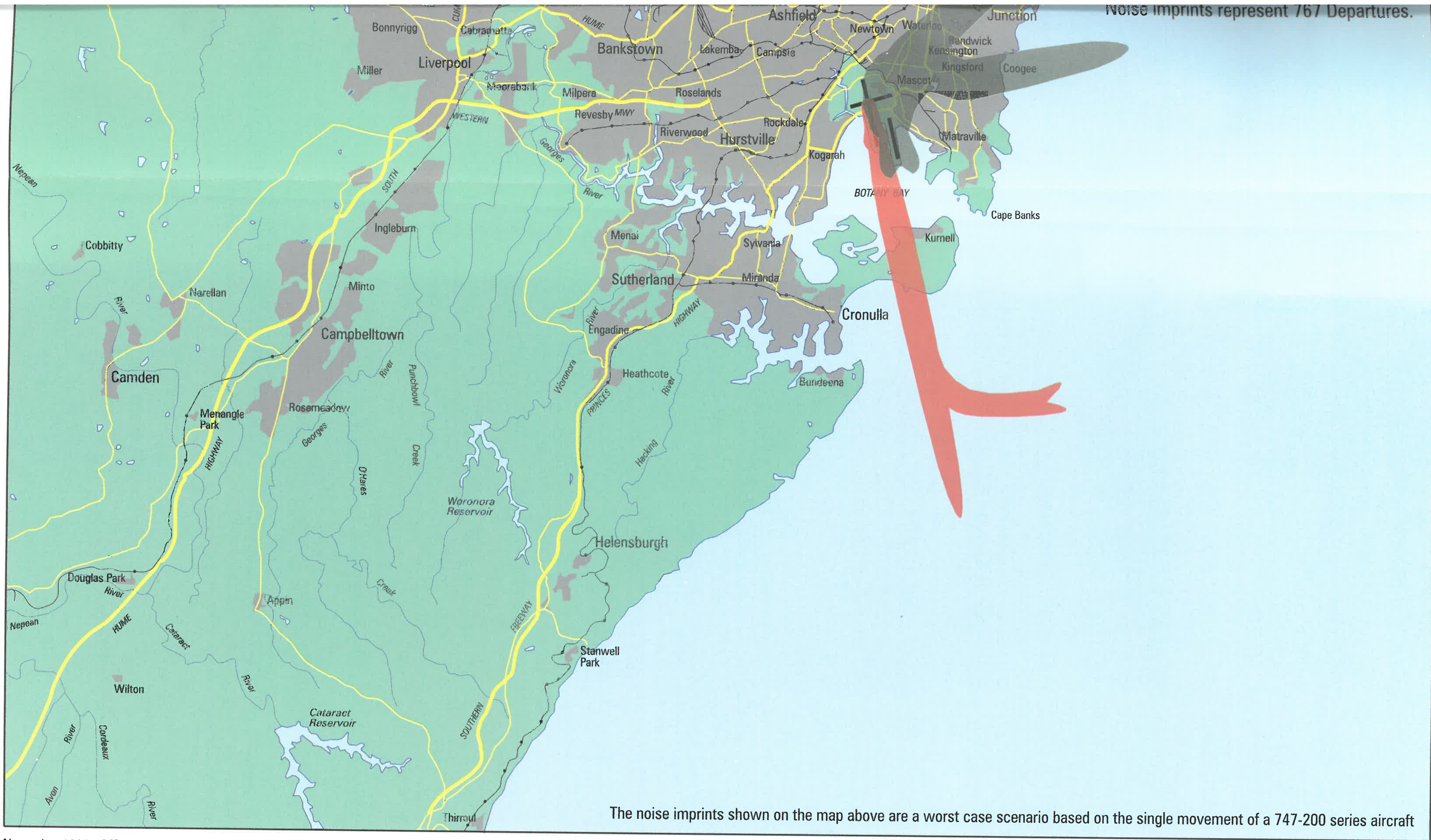
DEPARTURES
- Jet track
- Non-Jet track
- Dual track

ARRIVALS
- Jet track
- Non-Jet track
- Dual track

SYDNEY NOISE IMPRINT MODE 15 JET DEPARTURES 34R ARRIVALS 34L



Note: There are no 747-200 Departures off 34R.
Noise imprints represent 767 Departures.



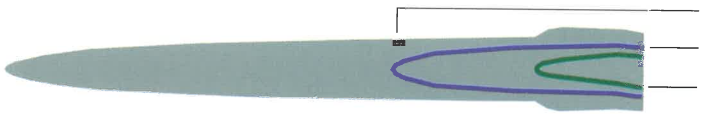
November 1996 MP 96/544.9.15 © Commonwealth of Australia

0 km 6

Scale approx

N

Note: The noise imprints shown are based on a single aircraft movement on the centreline of the indicative flight track



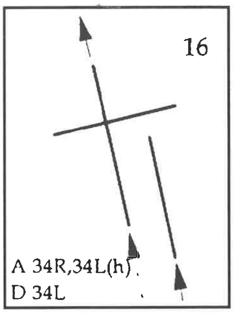
The diagram above indicates that a 767, 737 and similar aircraft leave a significantly smaller imprint than 747-200 series aircraft

Noise imprint Arrivals (70dBA or above based on a single movement of a 747-200 series aircraft)

Noise imprint Departures (70dBA or above based on a single movement of a 747-200 series aircraft)

Built-up-area (1993)

Mode 16



Method of operation

Departures to the north northwest and west from Runways 34L .

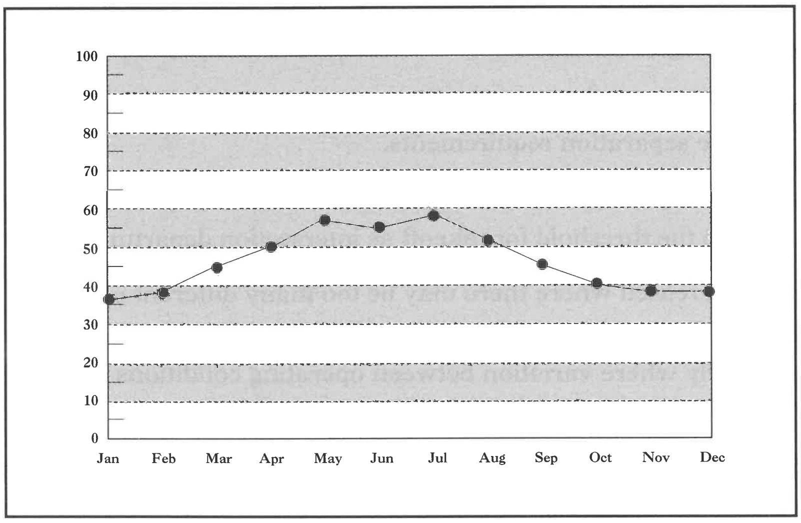
Arrivals from the south on Runways 34R and Runway 34L.

Availability of configuration

Operationally acceptable in wind conditions from west through north to east depending on wind strength.

The Bureau of Meteorology (BOM) wind data for the 55 years to December 1995 indicates that:

- the all months average availability would be 70 per cent
- the average monthly availability ranges from 60 per cent in February to 77 per cent in May.



The graph indicates the 55 year average availability from January to December.

Where nil downwind criteria is specified the average of all months availability is 58 per cent

Operational capacity

Sabre estimated that the sustainable capacity to be 62 movements per hour on the basis that

- Mode 9 which uses the same arrival and departure runways without crossing operations, has a capacity of 74 movements with a peak of 15 departures off runway 34R.

- without departures off runway 34R, the capacity of Mode 16 should be 10 - 15 movements less per hour.

This Mode confines arrivals to over-water and distributes to the north. This was the northerly mode used at Sydney until 19 October 1996, when runway 34R departures were introduced.

Sabre indicates that this Mode would only approach 80 movements per hour with one departure runway (mixed with long haul arrivals) if the number of arrivals were significantly higher than the number of departures e.g.: a mix of 70/30. However, new runway exits for both runway 34L and 34R would most likely be required and some long hauls would be required to use runway 34R.

Operational complexity

Single departure runway operations require a concentration of arriving traffic to Runway 34R to reduce delays for departures.

Constraints to optimisation of capacity

Dedicated use of 34L for departures together with the occasional use for arrivals for those aircraft requiring the long runway or when departure demand is light.

Little ability to vary the order of departures to minimise the impact of wake turbulence separation requirements.

All domestic jet departures need to cross the active departure runway to proceed to the threshold for takeoff as intersection departures are not available.

Risk is increased where there may be too many different operating configurations which may lead to misunderstanding by controllers or aircrew, particularly where variation between operating conditions is marginal

Environmental implications

As this is not one of the recommended modes of operation, there was no further environmental assessment.

Conclusions

This operating configuration was used in parallel operations prior to 19 October 1996 when it was enhance with departures from Runway 34R.

Operations result in a bias of arriving traffic to Runway 34R to accommodate departures from Runway 34L.

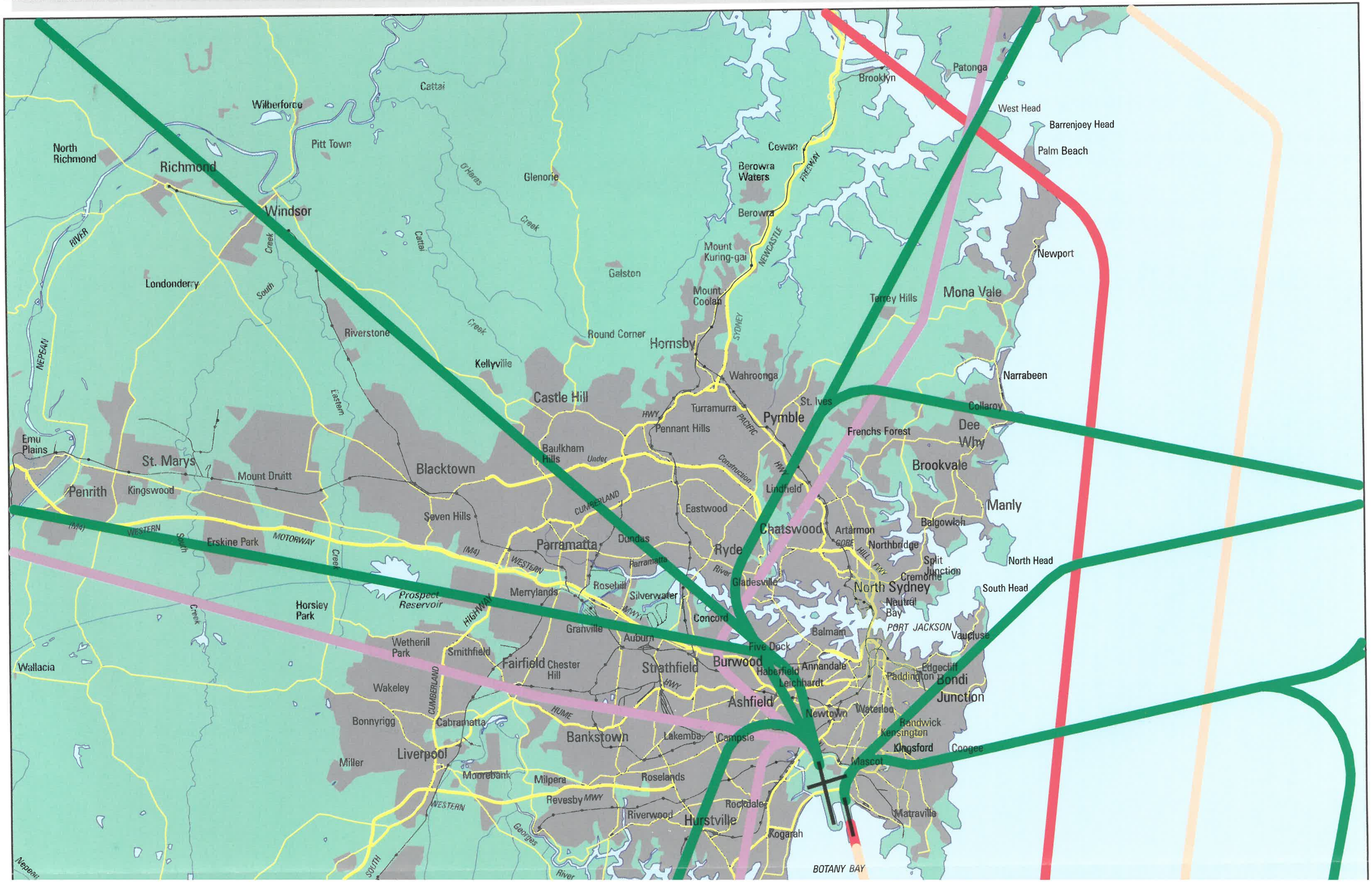
Departures are concentrated over the north northwest and west with little opportunity to further share the noise

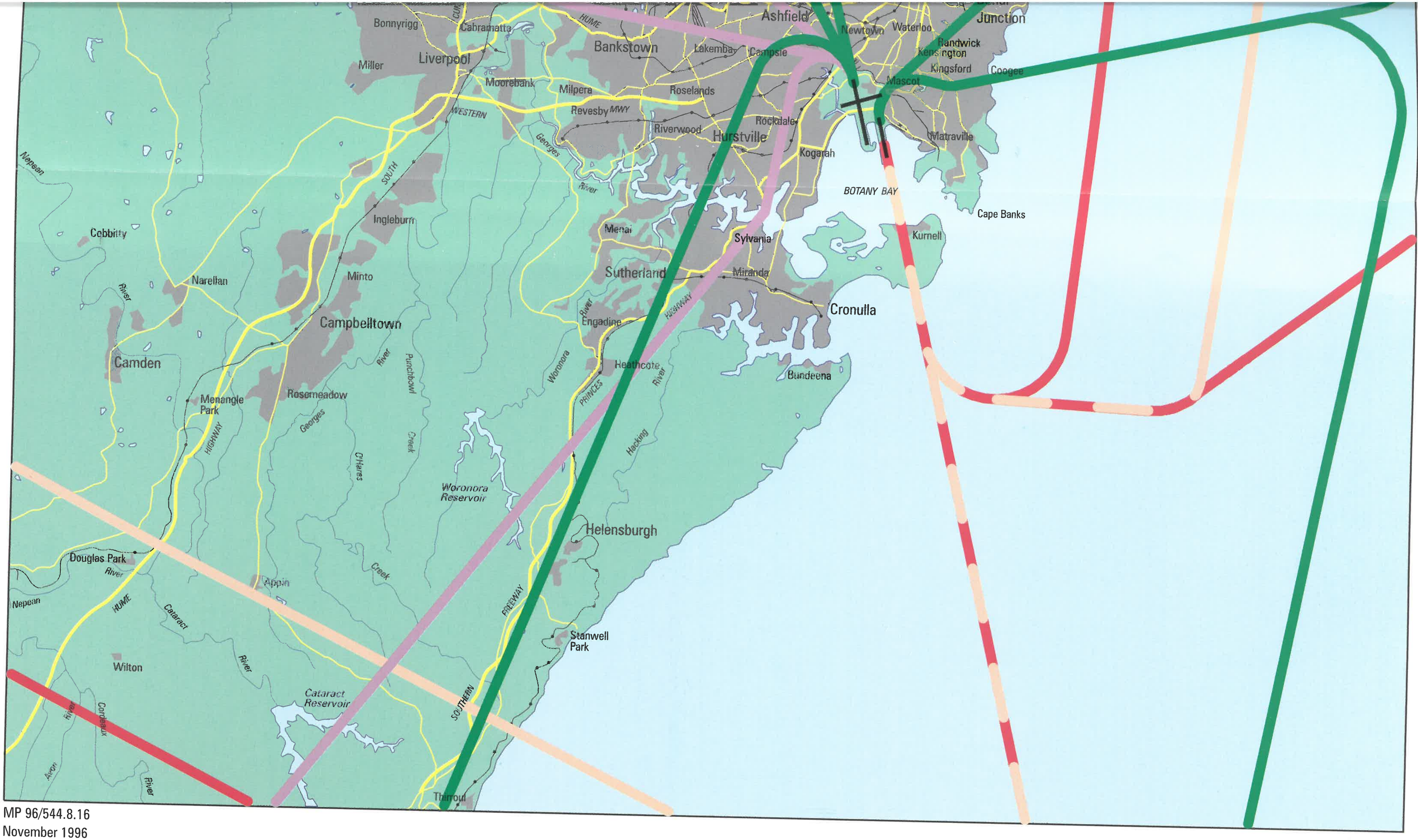
It is undesirable to have too many different operating configurations because of the risk of misunderstanding by controllers or aircrew, particularly where variation between operating conditions is marginal.

Proposed use

Not proposed for inclusion in the operating plan as it results in a concentration of aircraft over Kurnell and is not as effective in meeting the Task Force objectives as do evenly distributed parallel operations.

SYDNEY MODE 16 DEPARTURES 34L ARRIVALS 34R (LONG HAUL JET ARRIVALS 34L)





MP 96/544.8.16
November 1996

Built-up-area (1993)

Note: Tracks shown are indicative

0 km 6
Scale approx

N

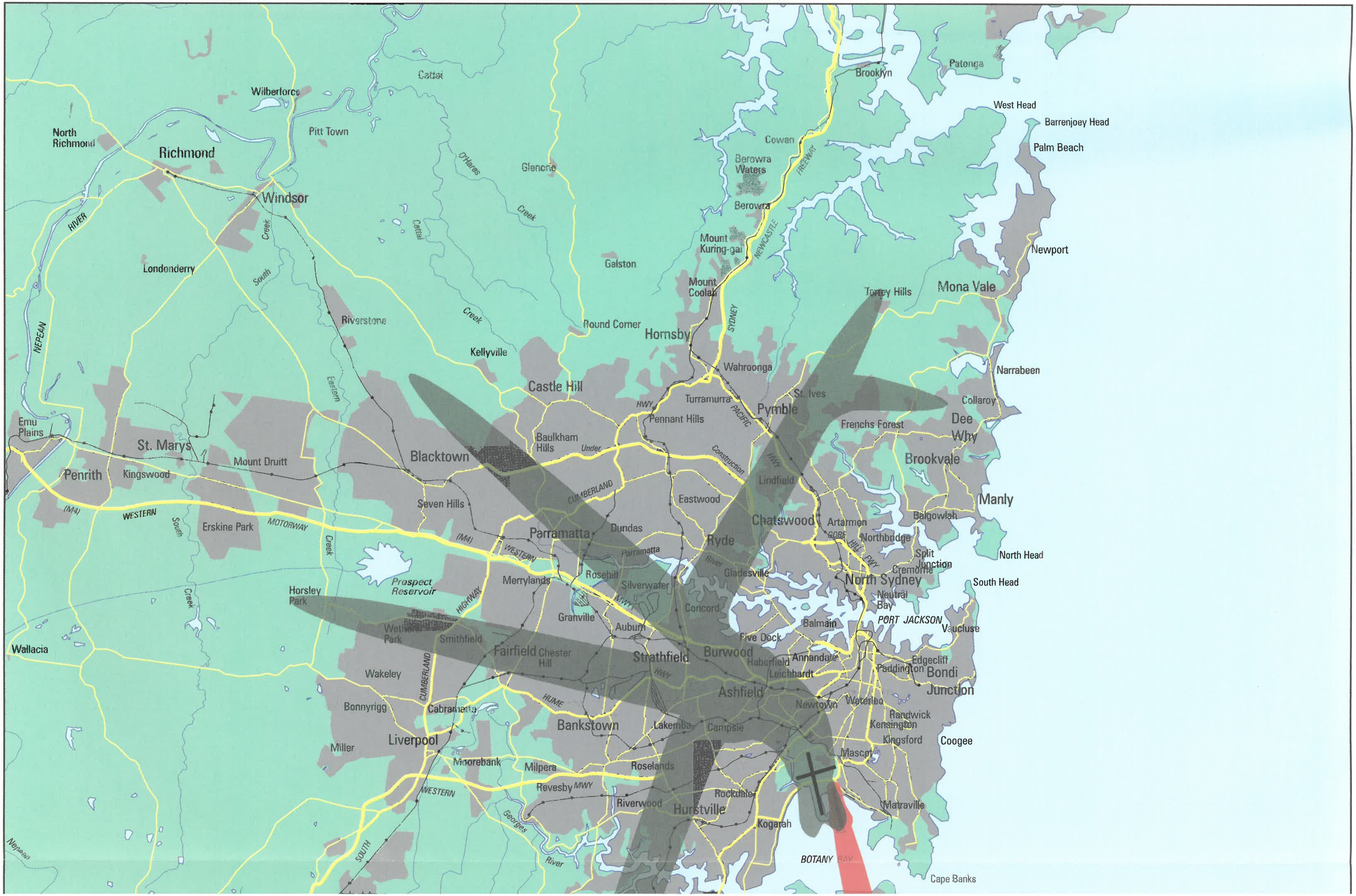
DEPARTURES

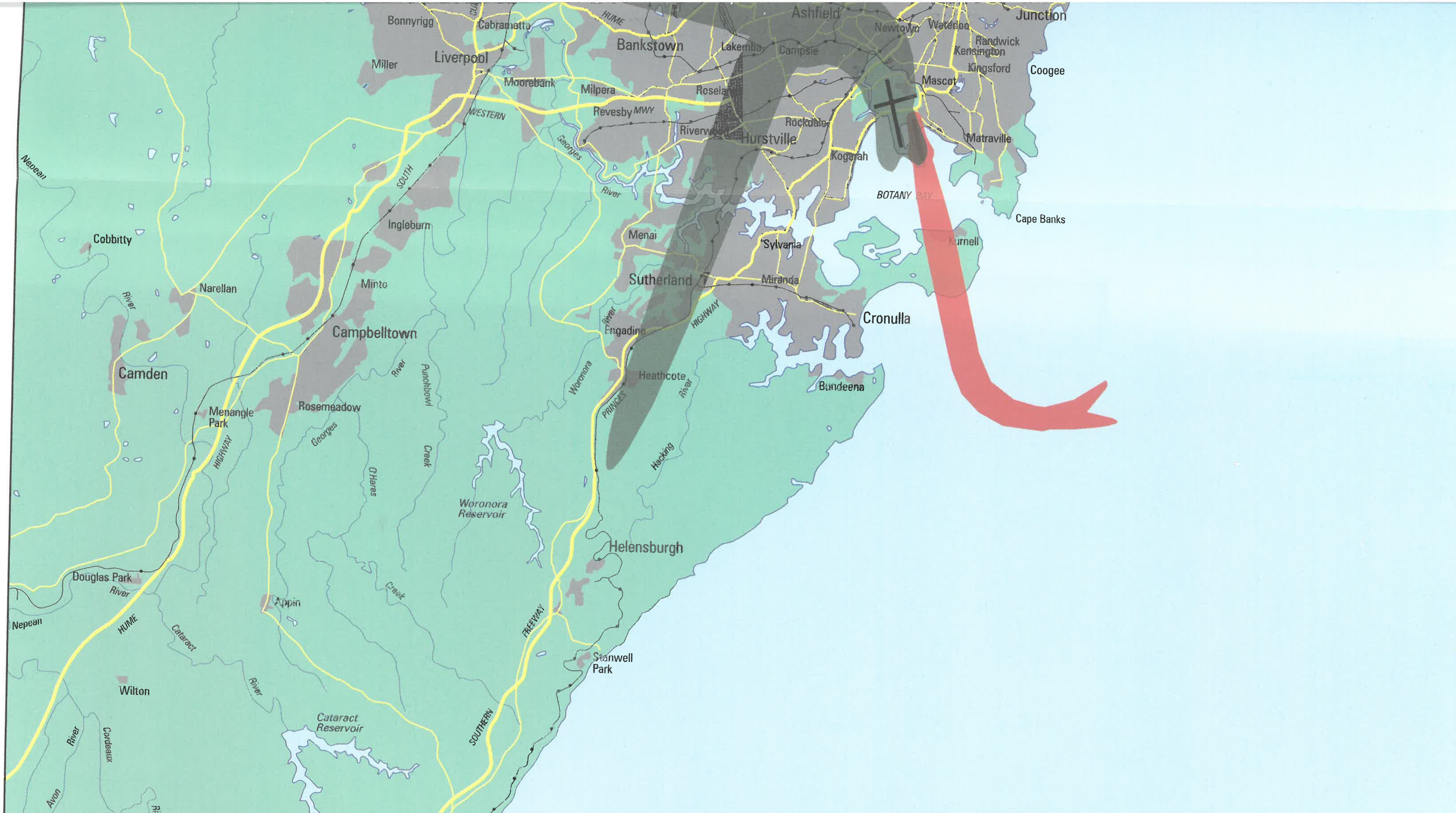
- Jet track
- Non-Jet track
- Dual track

ARRIVALS

- Jet track
- Non-Jet track
- Dual track

SYDNEY NOISE IMPRINT MODE 16 JET DEPARTURES 34L ARRIVALS 34R





The noise imprints shown on the map above are a worst case scenario based on the single movement of a 747-200 series aircraft

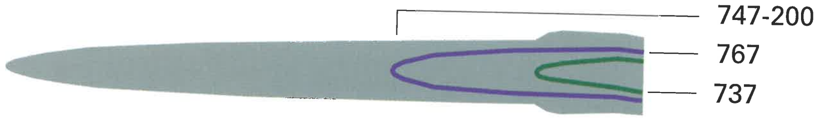
November 1996 MP 96/544.9.16

0 km 6

Scale approx

N

Note: The noise imprints shown are based on a single aircraft movement on the centreline of the indicative flight track



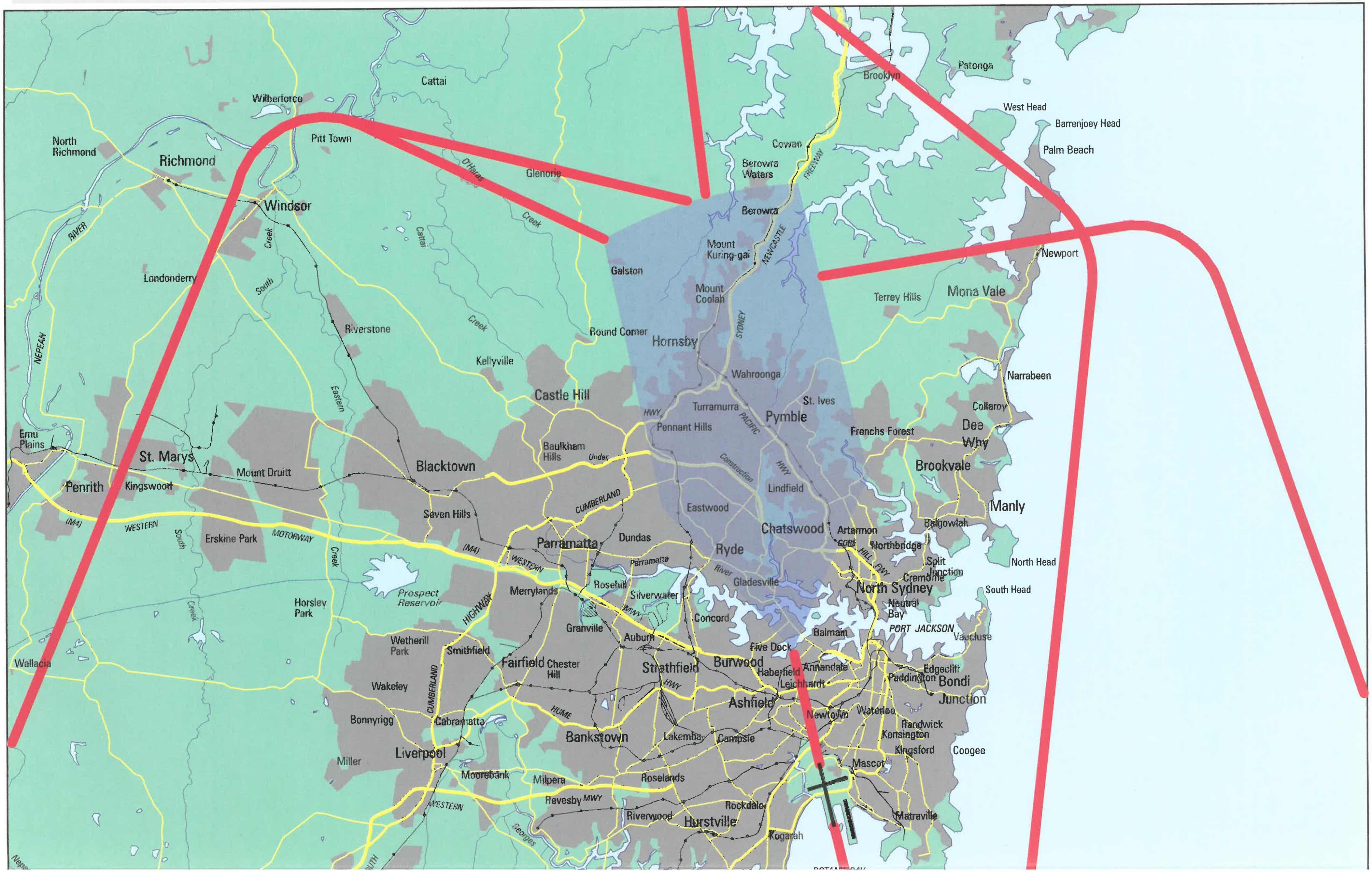
The diagram above indicates that a 767, 737 and similar aircraft leave a significantly smaller imprint than 747-200 series aircraft

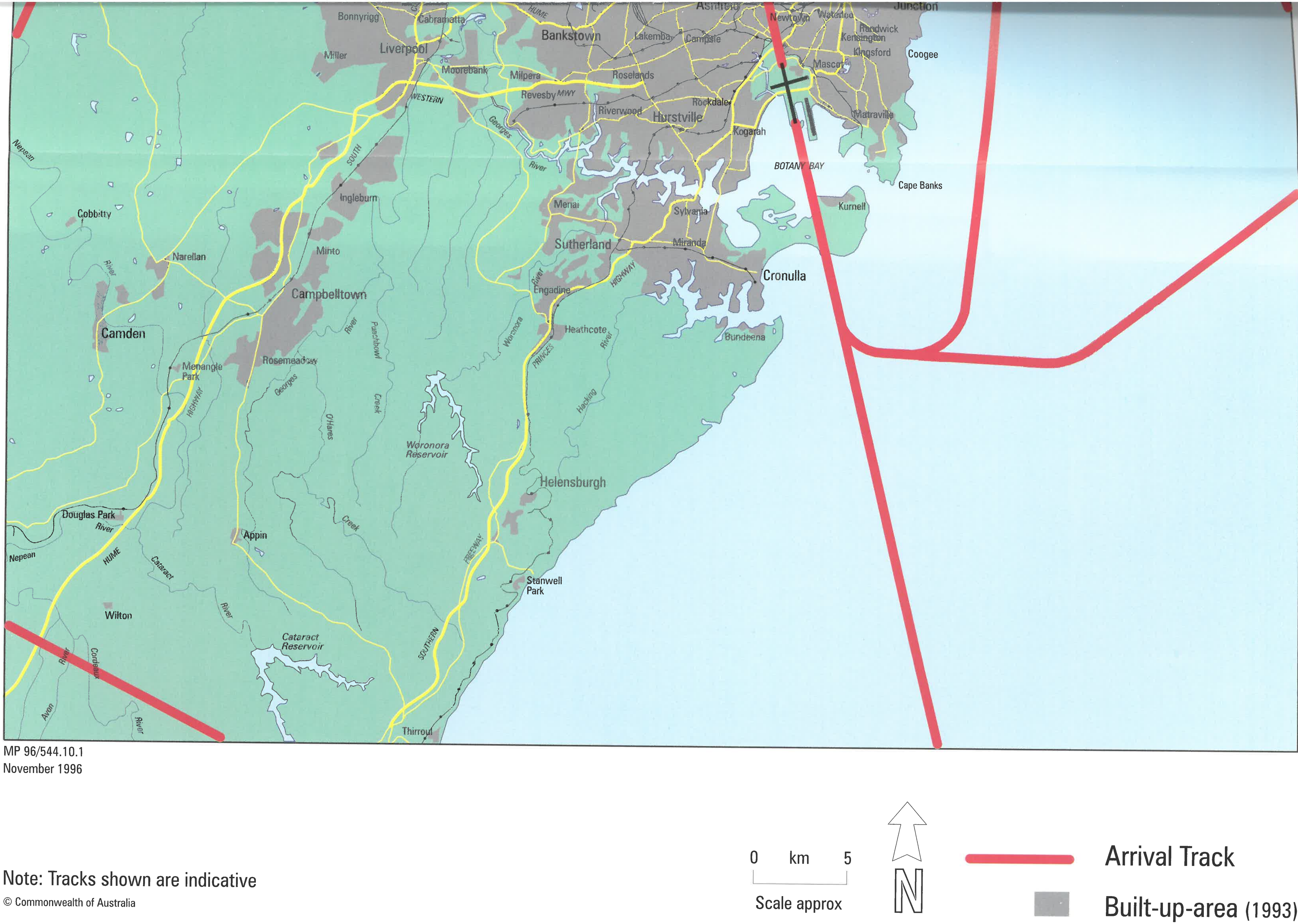
Noise imprint Arrivals (70dBA or above based on a single movement of a 747-200 series aircraft)

Noise imprint Departures (70dBA or above based on a single movement of a 747-200 series aircraft)

Built-up-area (1993)

SYDNEY LONG HAUL JET ARRIVALS

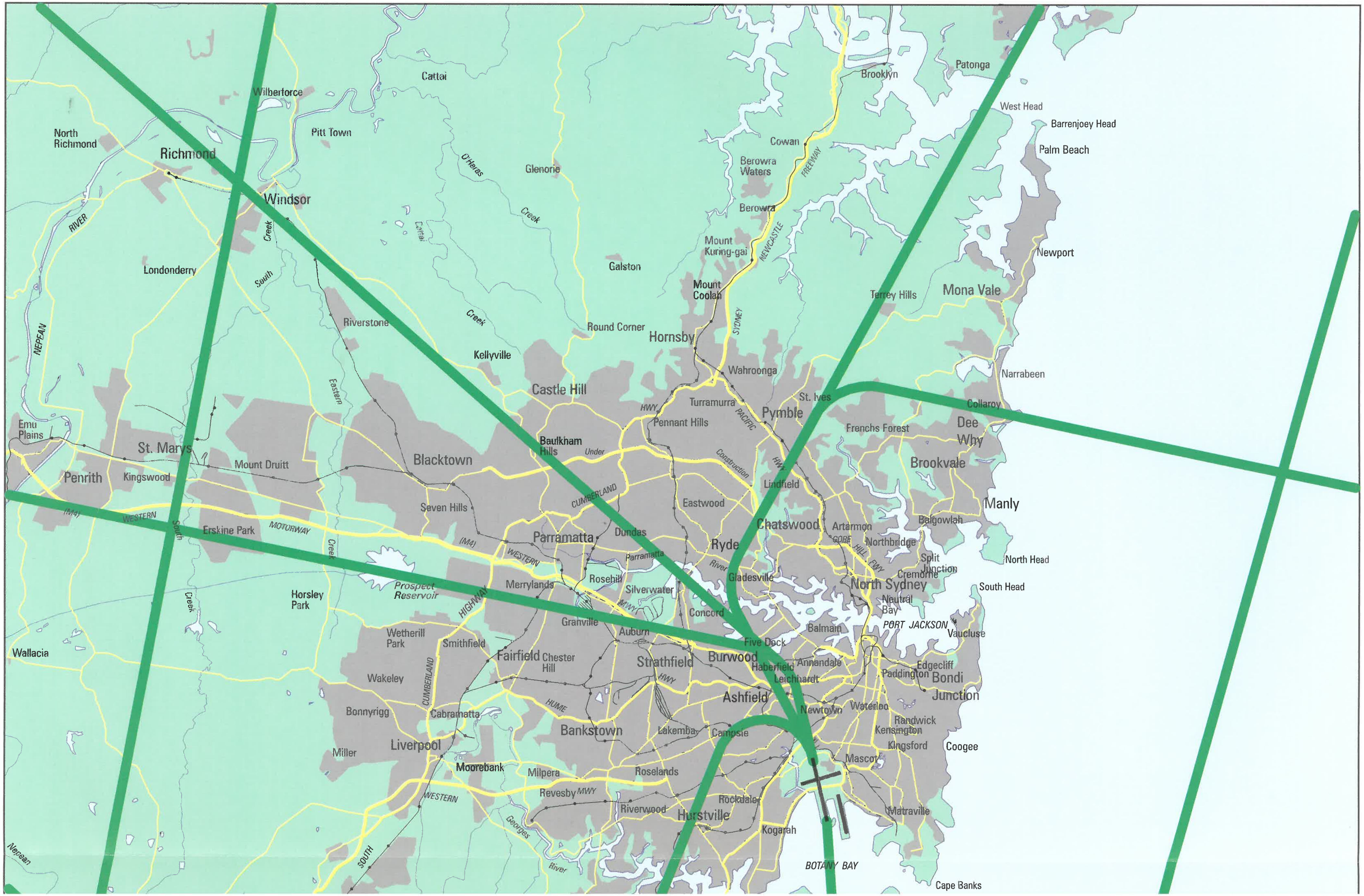


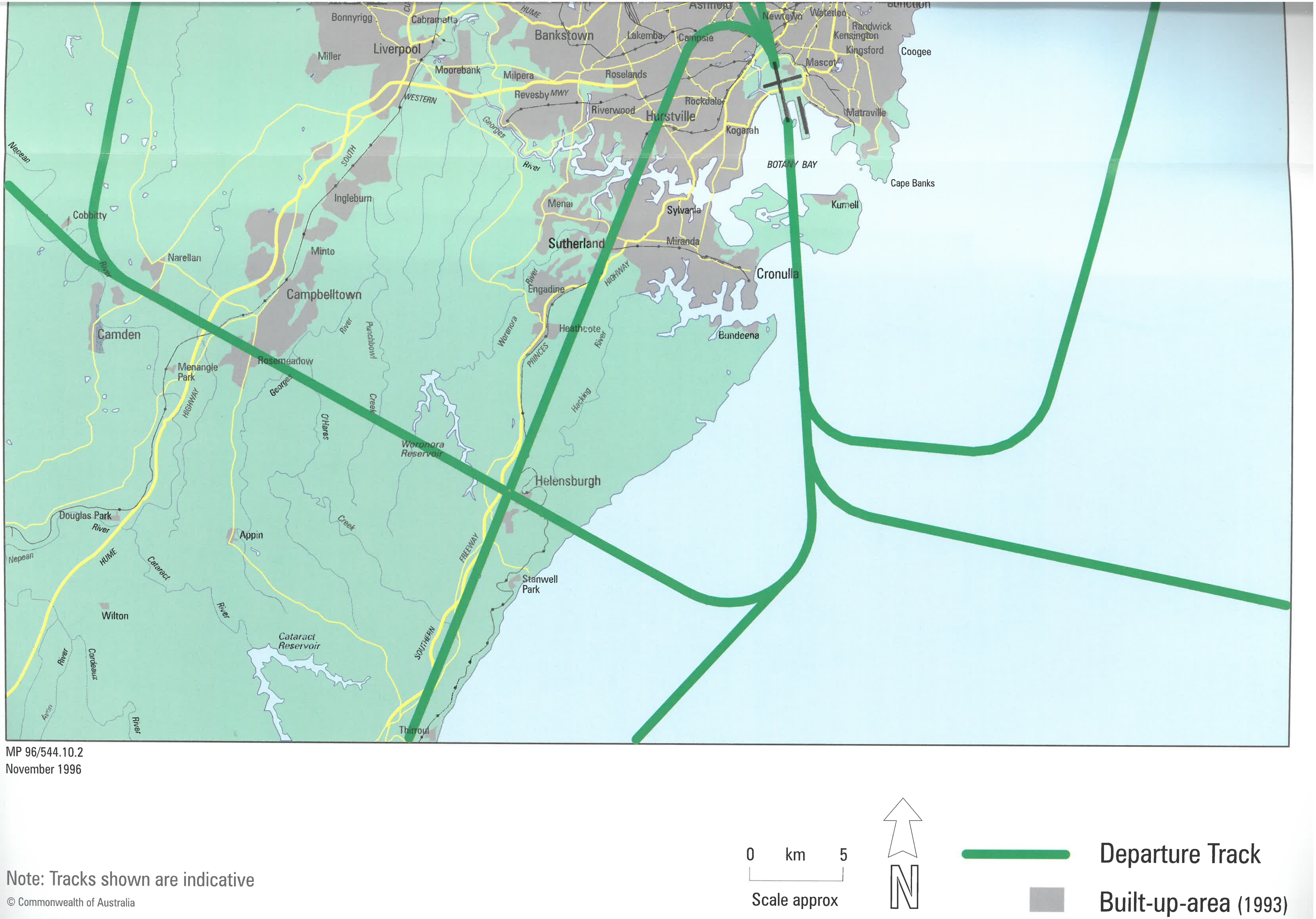


MP 96/544.10.1
November 1996

Note: Tracks shown are indicative

SYDNEY LONG HAUL JET DEPARTURES





MP 96/544.10.2
November 1996

Note: Tracks shown are indicative

Chapter 5—Noise considerations of the Long Term Operating Plan

The impact of noise on the Sydney community is the driving force behind the review and the need to develop a Long Term Operating Plan as a solution to the previously mentioned impasse between noise intrusion and air traffic growth.

Industry has attempted solutions to this problem including the construction of quieter aircraft, governments have responded with various community good policies and legislation such as curfews, agencies like Airservices Australia have changed operating procedures and airspace management techniques, and communities themselves have become much more environmentally aware and now push for new solutions to previously accepted conditions.

While it may be correct that noise inquiry figures and the total number of attendees at public forums and submissions to this review process represent a small percentage of the total Sydney basin population, it would be quite erroneous to suggest that the problem or community awareness of the problem is small.

Having developed the proposed plan, Airservices Australia examines in the following pages the noise related environmental issues associated with the long term proposal and also the concept of noise sharing which applies to the proposal.

Airservices Australia with the assistance of the Task Force, looked at the operating arrangements associated with the modes and in the previous chapter has provided an estimate of the number of people in the community exposed to higher noise levels. This chapter looks at the methodology used for that and also the steps taken to assess the overall impact of the most likely combination of modes compared with the impact under pre-parallel and parallel operations. Where possible, quantitative estimates of the effect of the changes are made.

On the question of noise sharing, Airservices Australia looked at the issues involved in understanding what fairness and equity mean in the context of noise sharing and has identified the parameters that might be used to measure noise sharing. This chapter goes on to suggest an approach that could produce a monitoring system acceptable to the community.

The work reported in this chapter was conducted under the auspices of the Environment Working Group of the Sydney Air Traffic Management Task Force. This included representatives from the major agencies, industry and community organisations (in particular the Coalition of Airport Action Groups—CAAG) and met regularly throughout the review period to consider and discuss flight path options developed by the Enroute,Terminal Area and Runway Modes of Operation Working Groups.

The Working Group considered proposals in the context of their environmental acceptability in relation to the Ministerial Direction, principles developed by the Working Group itself and general principles used by Airservices Australia nationally.

In summary, these required that:

- Noise should be concentrated wherever possible over water and non-residential areas.
- Where it is not possible for flight paths to be over water, the objective is to operate the airport to ensure that the overflight of residential areas is minimised and that noise arising from such flight paths is fairly shared.
- To the extent practicable, residential areas overflown by aircraft arriving on a particular runway should not also be overflown by aircraft departing from the same runway.
- The concept of respite is an integral component of fairly sharing aircraft noise, particularly for residents close to the airport. This means seeking to maximise the number of hours each day either totally free of aircraft movements or ensuring an absolute minimum of unavoidable overflights.
- Both short term and long term noise exposure should be taken into account in deciding between options and there should be a process for determining the relative exposure of community groups in relation to the equity requirements.

Assessment of the Proposals

All proposals for change in terminal area and air route arrangements in Australia are subject to environmental assessment in accordance with Airservices Australia's statutory obligations. These relate principally to two pieces of legislation; the *Environment Protection (Impact of Proposals) Act 1974* (the EP(IP) Act) and the *Air Services Act 1995.*

The EP (IP) Act requires any proposed action by a Commonwealth body which may have environmental implications to be assessed in terms of its environmental significance.

If the implications of the proposal are considered environmentally significant, then in accordance with the Administrative Procedures under the Act, a proponent for the proposal is formally designated and the Minister for the Environment is advised.

Such advice includes information which allows the Minister to determine whether a environmental impact statement (EIS), public environment report or other form of assessment is necessary.

Under the *Air Services Act*, Airservices Australia has two environmental functions. Under Section 8(1)(d) of the Act, it must carry out activities to protect the environment from the effects of, and the effects associated with, the operation of aircraft. Under Section 9(2) of the Act, it must endeavour to perform its functions in a manner that ensures, as far as is practicable, that the environment is protected from the effects of, and the effects associated with, the operation of aircraft.

In accordance with the provisions of these Acts, Airservices Australia, in consultation with the Environment Working Group of the Sydney Air Traffic Management Task Force, undertook an environmental evaluation of the proposed changes involved in the development of the long term operating plan for Sydney Airport. This assessment focused on the primary environmental impact, namely, aircraft noise.

Environmental assessments were made of each of the proposed flight tracks associated with each mode and also of the overall impact of the most likely combination of modes.

Single track analyses provided data on the number of people exposed to maximum noise levels greater than 70 dB(A) from departing and arriving aircraft of each of the main jet and non-jet types. Comparisons were then made of the impact of alternative flight tracks and the environmentally preferred tracks identified.

The likely impact of the overall preferred combination of modes was determined using the Australian Noise Exposure Forecast (ANEF) modelling system. The Integrated Noise Model (INM) was run for two scenarios involving the preferred modes and the results, average noise exposure levels, were compared with pre-parallel and parallel operations. Australian Noise Exposure Concept (ANEC) contour plots provided an indication of the number of people exposed to specific levels of aircraft noise under each scenario. In this case, the model served as a useful tool for selecting the environmentally preferred modes. It also provided data on the spread and balance of the impact between communities in different localities.

Single Track Analysis

Single event noise footprints (LAmax 70 decibel A-weighted dB(A) contours) for five common types of aircraft operating at Sydney Airport were produced. The noise modelling used the Integrated Noise Model (INM) version 5.01. The modelling provided data on the number of people who may be exposed to noise from aircraft operations from the proposed flight paths at levels greater than, 70 dB(A).

The LAmax noise metric is defined as the maximum instantaneous A-weighted sound level measured on a sound level meter using 'S' ('slow' averaging) response.

A-weighted means that the frequency response of the sound level meter is designed to mimic the frequency response of the human ear, and therefore is most sensitive at conversational frequencies. Within the INM, a single Metric (LAmax only) was used for calculating all single event contours.

70 dB(A)max

During the public consultative process, explanation for the use of the 70 dB(A) contour data was frequently requested. It is appropriate that this information be included in this report. The 70 dB(A) level contour was chosen because it represents an external sound level which should cause no difficulty with reliable communication from radio, TV, or conversational speech in a typical room with windows open (Sydney Draft Noise Management Plan, Volume 2, p. 6.13). It is also the level which equates with windows open to an indoor sound level of 60 dB(A), the indoor design sound level which when heard inside a normal domestic living room by the average listener will not be judged as intrusive or annoying (Australian Standard AS 2021—1994). It also equates, when the windows are closed, to an indoor level of about 45 to 50 dB(A) which does not exceed the indoor design sound level considered acceptable for relaxing or sleeping areas (Australian Standard AS 2021—1994).

Australian Standard AS 2021—1994 (Acoustics—Aircraft noise intrusion—Building siting and construction) is the relevant Standard in considering the impact of noise on residential areas. As implied in its title, the Standard also includes guidance material on the levels of aircraft noise that are tolerable inside a building and the methods of construction which can be used to achieve those levels.

Flight Paths

The flight paths used in the modelling were those developed as options by Air Traffic Services specialists from the Task Force. Air Traffic Services-supplied flight path information was converted into flight tracks suitable for use in the INM.

Departures

The flight tracks supplied by the Task Force show that most departures will generally proceed to turning points at Williamtown (North), Wollongong (South), Katoomba (West), or Richmond (North West). However, easterly tracks will generally proceed on a heading of 090(magnetic rather than to a defined waypoint. For propeller aircraft, an intersection departure from Taxiway Golf on Runway 34L was used as this represents the worst case for propeller aircraft operations from this runway.

Arrivals

The arrival tracks were initially modelled as straight in approaches from 20 DME (37 km). Following the changes made to flight tracks by the Task Force, the full arrival flight path was used for modelling jet arrivals on all runways except for Runway 25 and Runway 34L/R from the south.

In these cases the aircraft joined the final approach point over water and in excess of 30 km from the runway threshold. In these instances the flight track of the aircraft before the final approach point did not influence the 70 dB(A) contour.

Similarly propeller aircraft arrivals were modelled as a straight in approach from a point approximately 5.5 km from the threshold. Again this point was beyond the extent of the 70 dB(A) contour.

Aircraft Modelled

The five INM aircraft types used in the model were representative of the most common types operating at Sydney Airport. The composition of the Ansett and Qantas fleets was considered indicative of the four most common jet aircraft operating at Sydney Airport. The B747-400 and B747-200 were chosen as representative of the heavy jets, the B767-300 for the medium jets, and the B737-300 for small jets. The most common propeller driven aircraft was the Saab 340 turboprop. This type was modelled as representative of twin-engined propeller aircraft.

In response to a community group suggestion, additional modelling of departures and arrivals on all relevant runways was conducted for the B747-200 aircraft. This variant of the B747 is the noisiest ICAO Chapter 3 aircraft currently operating at Sydney, but is less common than the B747-400. However, this information also allowed a direct comparison to be made between the number of people exposed to noise by the B747-400 and the B747-200.

Stage Length (Departing Aircraft)

The 'Stage Length' used in the INM modelling process refers to the distance between the originating and the destination airport, with 1 being the shortest and 7 the longest distance. Aircraft proceeding on long distance flights have additional fuel requirements and so are heavier and generally climb more slowly, thus generating noise over a wider residential area. To provide a 'worst case' scenario the maximum stage length possible for each aircraft type from each runway was used as this enabled the analysis to be gauged in terms of the largest number of people exposed to noise from that aircraft operation. The stage lengths used for each aircraft type were as follows:

B747-400 & 200	Stage 7 for Runways 16R/34L
	Stage 6 for Runways 07/25
	Stage 5 for Runway 16L
B767-300	Stage 7 for all runways
B737-300	Stage 4 for all runways
SF-340	Stage 2 for all runways

People Exposed To Aircraft Noise of 70 dB(A) or greater

For comparative purposes, the number of people exposed to aircraft noise of 70 dB(A) or greater was determined for each operation. The number of people exposed to this level of aircraft noise does not have the same meaning as the terms 'moderately affected' and 'seriously affected' as sometimes used in conjunction with Australian Noise Exposure Forecasts (ANEFs). In the ANEF-based approach to measuring the number of people affected, reference is made to a dose-response relationship between aircraft noise and population response developed from a community survey conducted in 1979-82 by the National Acoustic Laboratories. This enables the number of people 'moderately' and 'seriously' affected to be estimated. Airservices Australia is of the view that use of dose-response data may not be valid for situations with changing noise exposures and that it is more reliable and meaningful to the community to consider the total number of people within various noise contours.

In order to determine population levels the 70 dB(A) contours from the INM were exported to a table in Mapinfo Professional 4.0 software and overlaid on a population map of the Sydney metropolitan area. The population data used was the projected population data for Sydney as at June 1994, supplied by the Australian Bureau of Statistics.

ANEC Methodology and Assumptions

An Australian Noise Exposure Concept (ANEC) chart is a map showing hypothetical forecast contours of aircraft noise exposure around an airport. In contrast to single noise event contours, the ANEC noise exposure contours represent the average noise exposure from an average day's aircraft movements, the average being over a twelve-month period.

In calculating the noise exposure levels around Sydney Airport, the ANEC projections took into account the following factors:

- the sound level, frequency spectrum and duration of the noise produced by each aircraft type at each phase of the takeoff or landing procedure;
- the location of flight paths associated with each runway;
- the forecast number of movements by each aircraft type on each flight path, and the operating weight of the aircraft;
- the time of day or night at which the aircraft movement takes place; and,
- the use of standard arrival and departure procedures.

The result of the ANEC calculations is a set of contours joining points of equal aircraft noise exposure around the airport.

The noise modelling for the proposed changes was conducted with the Integrated Noise Model (INM) Version 5.01 and was based on the traffic data used in the Australian Noise Exposure Index (ANEI) completed for Sydney Airport for the period 4 November 1994 to 3 November 1995.

This provided a sound basis for comparison between parallel runway operations and the proposed operating procedures. Additional data from the 1993 ANEI was also used for comparison.

The 1995 ANEI traffic mix was remodelled at the request of community representatives on the working group to reflect the increase in INM aircraft types from 16 used in the 1995 ANEI to 23 types used in the ANECs. The runway usage was also modified to reflect the usage required by the proposed operations at Sydney Airport. The total number of movements used for the ANECs was approximately 260 000 per annum.

ANEC 1 used runway usage data developed by the Task Force and flight tracks developed by Air Traffic Services specialists from the Task Force. The runway usage data for ANEC 1 is shown in Figure 9. The traffic data used in this ANEC was slightly less than 260†000 per annum due to rounding associated with the increase in numbers of INM aircraft types and modification of runway usage to reflect the desired movements for each runway. In ANEC 2 daily movements were calculated to four decimal places in order to obtain a higher level of precision. The runway usage for ANEC 2 is shown in Figure 10.

Runway movements (percentage)
Input for ANEC 1

	Total	34L		34R		16L		16R		25		07	
	(%)	A	D	A	D	A	D	A	D	A	D	A	D
Curfew	3	1.50							1.50				
Dedicated 07/25	2									.50	.50	.50	.50
Opposire Dirn	2	1.00					1.00						
Heavies	12	2.50	2.50		.50			2.50	2.50	.50	.50	.50	
Mode16IIs	21					4.50	4.50	5.50	6.50				
Mode 34IIs	22	5.50	5.50	5.50	5.50								
Mode 16D/25A	11						3.00		2.50	5.50			
Mode 16D/07A	11						3.00		2.50			5.50	
Mode 25D/34A	16	3.50		5.00							7.50		
Total	100	14.00	8.00	10,5	6.00	4.50	11.50	8.00	15.50	6.50	8.50	6.50	0.50

A = Arrivals, D = Departures

Figure 9

Runway movements (percentage)
Input for ANEC 2

	Total	34L		34R		16L		16R		25		07	
	(%)	A	D	A	D	A	D	A	D	A	D	A	D
Curfew	4	2.00							2.00				
Dedicated 07/25	2									.50	.50	.50	.50
Opposire Dirn	8	4.00					4.00						
Mode16IIs	20					5.00	5.00	5.00	5.00				
Mode 34IIs	27	6.75	6.75	6.75	6.75								
Mode 16D/25A	11						3.00		2.50	5.50			
Mode 16D/07A	12						3.00		3.00			6.00	
Mode 25D/34A	16	3.00		5.00							8.00		
Total	100	14.00	8.00	10,5	6.00	4.50	11.50	8.00	15.50	6.50	8.50	6.50	0.50

A = Arrivals, D = Departures

Figure 10

Relationship Between ANEF and Other Noise Measures

Environmental noise levels are generally measured in A-weighted decibels dB(A). A commonly encountered form of measurement is the Equivalent Continuous Sound Level, abbreviated to LAeq, which is the average noise level in dB(A) over a stated period. This was used in the feasibility report on the use of Runway 34R for departures. Since ANEF and LAeq are each a measure of average noise levels, they can be compared. The addition of 35 to the ANEF value at a location gives an approximation of the LAeq (i.e. 25 ANEF is approximately equal to 60 LAeq), and so allows the aircraft noise to be compared to the noise of other sources. As a comparison with another urban nose source, the LAeq beside a busy urban freeway is typically of the order of 60 to 70 LAeq.

It should be noted that it is not possible to directly compare average noise levels (such as ANEF and LAeq) with sound level criteria set for instantaneous noise levels (such as the LAmax) which may be specified for a motor vehicle muffler test or which have been used in the Single Track Analysis in this assessment.

Results

Single Track Analysis

The 70 dB(A)max noise level contour for each of the five representative types of aircraft is illustrated for each track in the discussion of the alternative operating modes (refer Chapter 4).

It should be noted that the contour is a line joining points experiencing a maximum sound level of 70 dB(A) and represents the outer edge of the exposure area. Points within the contours will experience noise greater than 70 dB(A). Outside the 70 dB(A) contour noise will still be heard since 70 dB(A) is not the limit of audibility.

The numbers of people falling within the 70 dB(A)max contour for each track for the worst case (normally the B747-200 or B747-400, or, for runway 34R, B767) are given in Figure 11 and Figure 12, which appear on the following two pages.

Numbers of people within the 70dB(a) single event noise contour for 747–200 aircraft at Sydney Airport

Runway	Operation	Direction	Mode	People>=70dB(a)	End suburb
07	Dep	N		105800	Over water
		NE		158000	Over water
		E		105800	Over water
		S		105800	Over water
		W		105800	Over water
		NW		105800	Over water
	Arr	All		72600	Royal Nat Pk
25	Dep	N		234600	Belrose
		E		273500	Middle Harbour
		S		180200	Heathcote Nat Pk
		W		241300	Horsley Pk
		NW		282500	Toongabbie
		NW 1		234400	Parklea
	Arr	All		44200	Over water
16L	Dep	N		5800	Over water
		E		5800	Over water
		S		5800	Over water
		S	3	5800	Over water
		W	3	5800	Over water
		NW	3	5800	Over water
(B767)	Arr	ILS		32000	Hunters Hill
(B767)		Trident		35100	Waverton
16R	Dep	S		4000	Over water
		W		4000	Over water
		NW		4000	Over water
		N	2	40200	Over water
		E	2	40200	Over water
		S	2	40400	Over water
		W	2	40400	Heathcote Nat Pk
		NW	2	40400	Heathcote Nat Pk
		N	3	4000	Over water
		E	3	4000	Over water
		ILS		83300	Turramurra
		Trident		105900	Beecroft
34R (B767)	Dep	N		64600	Over water
		NE		86600	Over water
		E		64600	Over water
		S		64600	Over water
(B767)	Arr	All		700	Over water
34L	Dep	N		238000	Ku-Ring-Gai Chase Nat Pk
		E		244200	Cromer
		S		270200	Royal Nat Pk
		W		259200	Horsley Pk
		NW		252400	Kellyville
	Arr	All		700	Over water

Figure 11

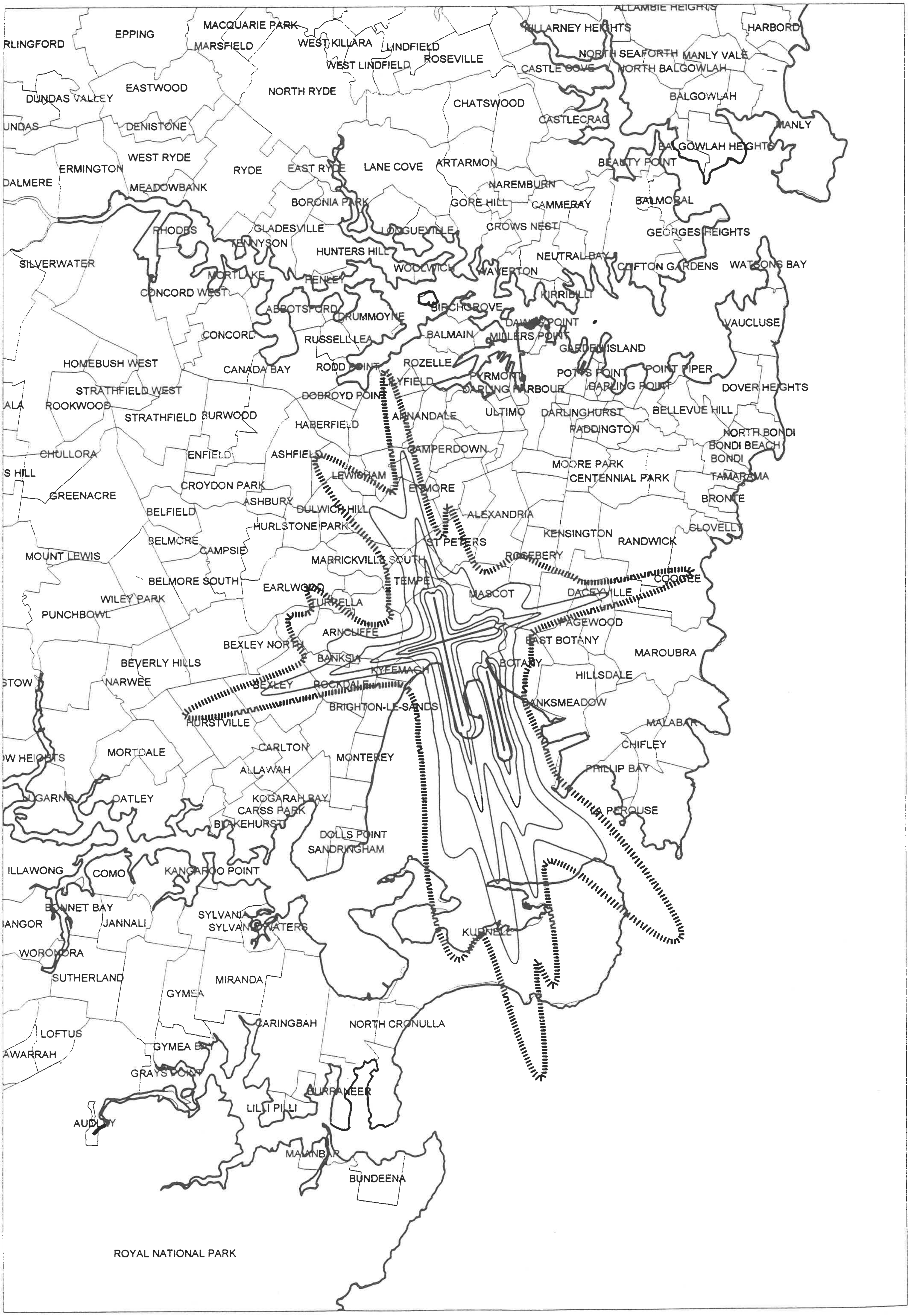
Combined total of people within the 70dB(A) contour for each runway.

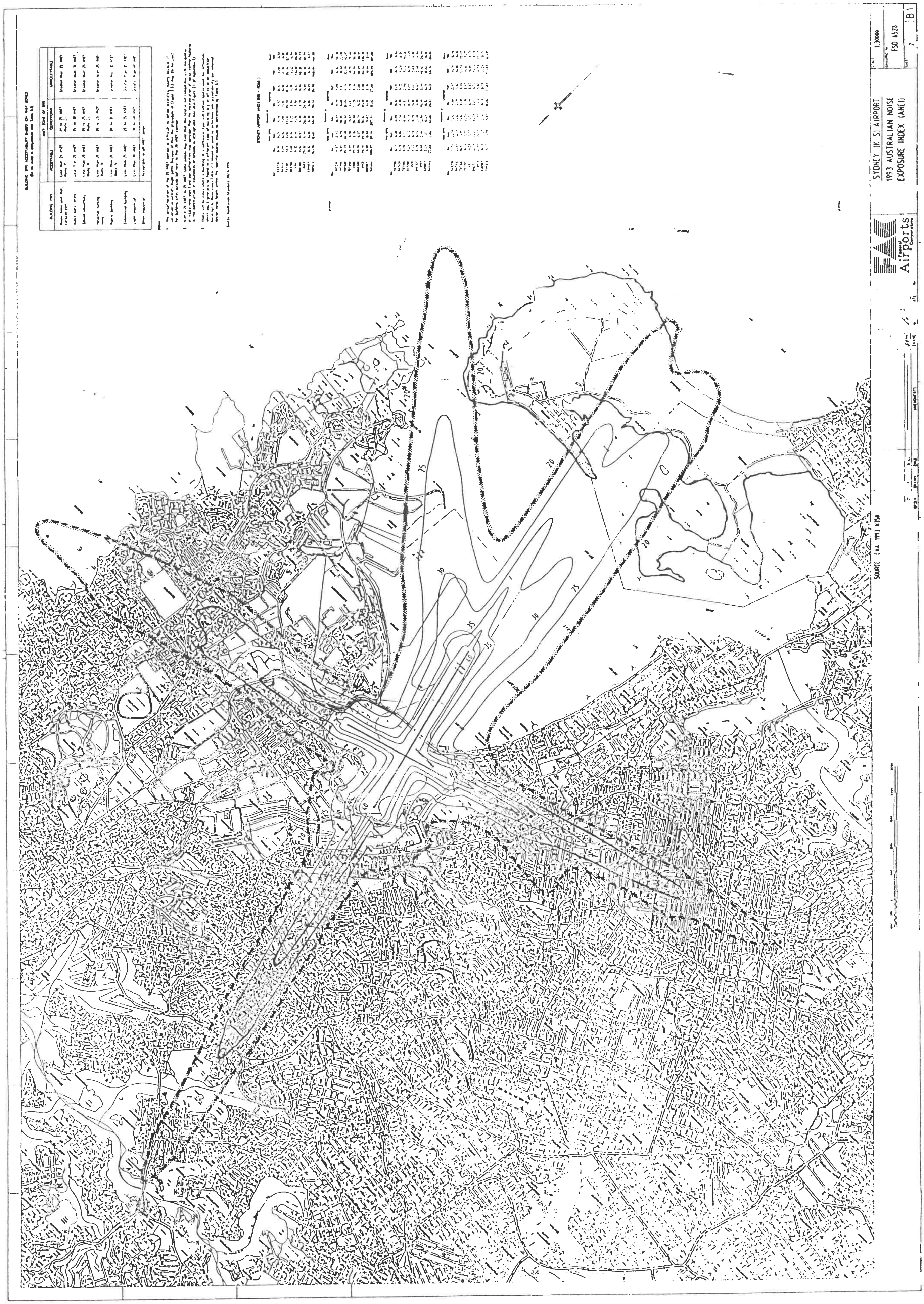
Runway	Operation	People >=70dB(a)
07	Dep	223200
	Arr	72600
25	Dep	787200
	Arr	44200
16L	Dep	5800
(B767)	Arr	46000
16R	Dep	4000
	Arr	134400
16R Mode 2	Dep	40400
34L	Dep	606300
	Arr	700
34R (B767)	Dep	127200
(B767)	Arr	700

Figure 12

Notes for Figures 11 and 12:

1. Mode is noted only where a track is for a specific mode.
2. B747 aircraft do not depart from Runway 34R, therefore the number of people within the 70dB(A) contour for B767 aircraft is shown.
3. For Arrivals, 'All' indicates arrivals from all directions are established on a straight approach before the beginning of the contour. 'ILS' and 'Trident' show whether the contour is straight down the ILS or down one arm of the Trident approach path.
4. Directions:
   N = North
   NE = North East, then North
   E = East
   W = West (Katoomba0
   NW = North West (Richmond)
   NW1 (for Runway 25 Departures) = Immediate turn and track direct to Richmond from the runway end.
5. All numbers of people within the 70dB(A) contour are to the nearest 100.
6. People within the 70dB(A) contour are exposed to noise of EQUAL TO OR GREATER THAN 70dB(A) max.


EPPING
MACQUARIE PARK
MARSFIELD
WEST KILLARA
LINDFIELD
WEST LINDFIELD
ROSEVILLE
KILLARNEY HEIGHTS
HARBORD
NORTH SEAFORTH
MANLY VALE
NORTH BALGOWLAH
CASTLE COVE
EASTWOOD
NORTH RYDE
CHATSWOOD
BALGOWLAH
DENISTONE
CASTLECRAG
MANLY
BALGOWLAH HEIGHTS
WEST RYDE
ERMINGTON
RYDE
EAST RYDE
LANE COVE
ARTARMON
BEAUTY POINT
MEADOWBANK
NAREMBURN
BORONIA PARK
GORE HILL
CAMMERAY
BALMORAL
RHODES
GLADESVILLE
LONGUEVILLE
CROWS NEST
GEORGES HEIGHTS
TENNYSON
HUNTERS HILL
NEUTRAL BAY
SILVERWATER
WOOLWICH
WAVERTON
CLIFTON GARDENS
WATSONS BAY
MORTLAKE
HENLEY
CONCORD WEST
KIRRIBILLI
ABBOTSFORD
BIRCHGROVE
DRUMMOYNE
DAWES POINT
VAUCLUSE
CONCORD
RUSSELL LEA
BALMAIN
MILLERS POINT
GARDEN ISLAND
HOMEBUSH WEST
RODD POINT
ROZELLE
CANADA BAY
POTTS POINT
POINT PIPER
LILYFIELD
PYRMONT
STRATHFIELD WEST
DOBROYD POINT
DARLING HARBOUR
DARLING POINT
DOVER HEIGHTS
ROOKWOOD
STRATHFIELD
BURWOOD
ANNANDALE
ULTIMO
DARLINGHURST
BELLEVUE HILL
HABERFIELD
PADDINGTON
NORTH BONDI
CHULLORA
ENFIELD
ASHFIELD
CAMPERDOWN
BONDI BEACH
BONDI
MOORE PARK
LEWISHAM
CENTENNIAL PARK
TAMARAMA
CROYDON PARK
ERSKINEVILLE
GREENACRE
ASHBURY
BRONTE
DULWICH HILL
ALEXANDRIA
BELFIELD
HURLSTONE PARK
CLOVELLY
KENSINGTON
RANDWICK
BELMORE
ST PETERS
CAMPSIE
MOUNT LEWIS
MARRICKVILLE SOUTH
ROSEBERY
TEMPE
BELMORE SOUTH
COOGEE
EARLWOOD
MASCOT
DACEYVILLE
WILEY PARK
TURRELLA
PUNCHBOWL
PAGEWOOD
ARNCLIFFE
BEXLEY NORTH
EAST BOTANY
MAROUBRA
BEVERLY HILLS
BANKSIA
BOTANY
KYEEMAGH
HILLSDALE
NARWEE
BEXLEY
ROCKDALE
BANKSMEADOW
BRIGHTON-LE-SANDS
HURSTVILLE
MALABAR
CHIFLEY
CARLTON
MORTDALE
MONTEREY
ALLAWAH
PHILLIP BAY
OATLEY
KOGARAH BAY
CARSS PARK
LA PEROUSE
BLAKEHURST
DOLLS POINT
SANDRINGHAM
ILLAWONG
COMO
KANGAROO POINT
BONNET BAY
SYLVANIA
JANNALI
SYLVANIA WATERS
KURNELL
WORONORA
SUTHERLAND
MIRANDA
GYMEA
CARINGBAH
NORTH CRONULLA
LOFTUS
GYMEA BAY
GRAYS POINT
BURRANEER
LILLI PILLI
AUDLEY
MAIANBAR
BUNDEENA
ROYAL NATIONAL PARK


SYDNEY (K S) AIRPORT
1993 AUSTRALIAN NOISE
EXPOSURE INDEX (ANEI)
1:30000
FSO 6528
B1
Federal Airports Corporation
20
25
30
35

ANEC

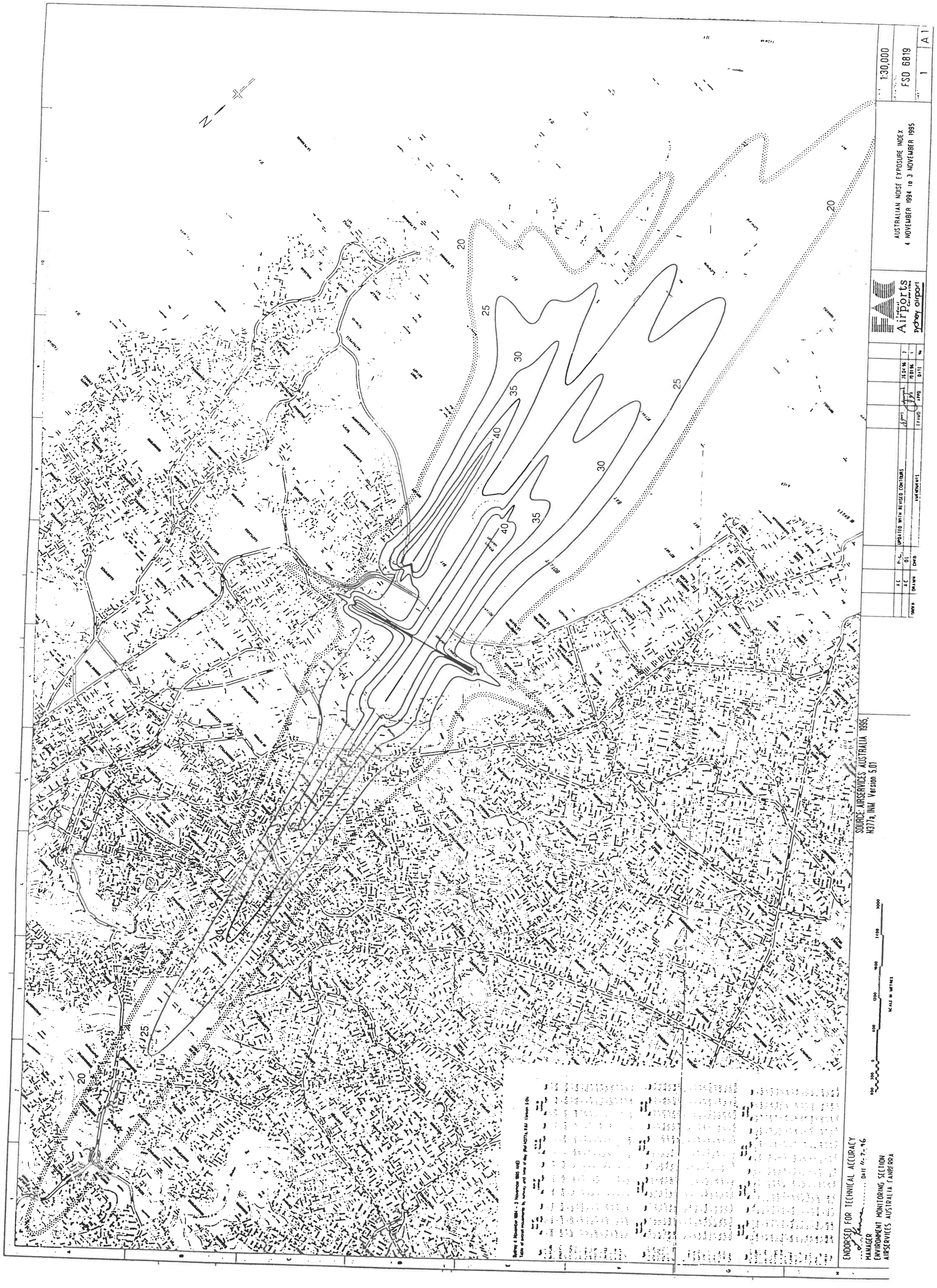
ANECs were produced for two scenarios using movement data from 1995. ANEC 1 was the first concept of the long term operating model for Sydney Airport and took into account a selection of modes in accordance with operational requirements and the need to achieve a balance in the distribution of noise between communities as well as a minimum environmental impact. ANEC 2 is a refinement of that model and represents an attempt by Airservices Australia to achieve a better balance in noise distribution. Further evaluation of the environmental impact of the operational arrangements assumed for ANEC 2 in terms of noise sharing is required.

ANEC 1, and 2 are shown in figures 13 and 14 and the ANEI contours for 1993 and 1995 are shown in figures 15 and 16 respectively.

However, in terms of the analysis of the ANEC itself, a comparison of the number of people within the 20, 25, and 30 ANEC contours with those in the same contours prior to the opening of the parallel runway (1993) and during full parallel runway operation (1995) shows that the very significant extension of the contour to the north and the corresponding contraction of the eastern and western arms as a consequence of the introduction of parallel runways (and supporting noise abatement procedures) in late 1994 would be largely reversed by the new operating arrangements. The numbers of people are broken down by Postcode (and representative suburb) and a comparison given in Figure 17. The population data is taken from the 1991 Census, the most current at the time. The estimated number of people within the respective contours for the 1993 Sydney ANEI is also shown for comparison.

Figures 13 to 17 appear on the following five pages.


ALLAMBIE HEIGHTS
HARBORD
MACQUARIE PARK
EPPING
KILLARNEY HEIGHTS
RLINGFORD
MARSFIELD
WEST KILLARA
LINDFIELD
NORTH SEAFORTH
MANLY VALE
WEST LINDFIELD
ROSEVILLE
CASTLE COVE
NORTH BALGOWLAH
EASTWOOD
NORTH RYDE
DUNDAS VALLEY
BALGOWLAH
CHATSWOOD
CASTLECRAG
UNDAS
DENISTONE
MANLY
BALGOWLAH HEIGHTS
WEST RYDE
ERMINGTON
RYDE
EAST RYDE
LANE COVE
ARTARMON
BEAUTY POINT
DALMERE
MEADOWBANK
NAREMBURN
BORONIA PARK
GORE HILL
CAMMERAY
BALMORAL
RHODES
GLADESVILLE
LONGUEVILLE
CROWS NEST
GEORGES HEIGHTS
TENNYSON
HUNTERS HILL
NEUTRAL BAY
SILVERWATER
WOOLWICH
WAVERTON
CLIFTON GARDENS
WATSONS BAY
MORTLAKE
HENLEY
CONCORD WEST
KIRRIBILLI
ABBOTSFORD
BIRCHGROVE
DRUMMOYNE
DAWES POINT
VAUCLUSE
CONCORD
BALMAIN
RUSSELL LEA
MILLERS POINT
GARDEN ISLAND
HOMEBUSH WEST
CANADA BAY
RODD POINT
ROZELLE
PYRMONT
POTTS POINT
POINT PIPER
STRATHFIELD WEST
LILYFIELD
DARLING HARBOUR
DARLING POINT
DOVER HEIGHTS
DOBROYD POINT
ALA
ROOKWOOD
STRATHFIELD
BURWOOD
ANNANDALE
ULTIMO
DARLINGHURST
BELLEVUE HILL
HABERFIELD
PADDINGTON
NORTH BONDI
CHULLORA
BONDI BEACH
ENFIELD
ASHFIELD
CAMPERDOWN
MOORE PARK
BONDI
S HILL
LEWISHAM
CENTENNIAL PARK
TAMARAMA
CROYDON PARK
ENMORE
GREENACRE
ASHBURY
BRONTE
DULWICH HILL
ALEXANDRIA
BELFIELD
HURLSTONE PARK
KENSINGTON
CLOVELLY
RANDWICK
BELMORE
ST PETERS
CAMPSIE
MOUNT LEWIS
MARRICKVILLE SOUTH
ROSEBERY
TEMPE
COOGEE
BELMORE SOUTH
EARLWOOD
WILEY PARK
MASCOT
DACEYVILLE
TURRELLA
PUNCHBOWL
PAGEWOOD
ARNCLIFFE
BEXLEY NORTH
EAST BOTANY
MAROUBRA
BANKSIA
BEVERLY HILLS
KYEEMAGH
BOTANY
STOW
NARWEE
HILLSDALE
BEXLEY
ROCKDALE
BANKSMEADOW
BRIGHTON-LE-SANDS
HURSTVILLE
MALABAR
CHIFLEY
CARLTON
W HEIGHTS
MORTDALE
MONTEREY
ALLAWAH
PHILLIP BAY
OATLEY
KOGARAH BAY
LA PEROUSE
CARSS PARK
BLAKEHURST
DOLLS POINT
SANDRINGHAM
ILLAWONG
COMO
KANGAROO POINT
BONNET BAY
JANNALI
SYLVANIA
ANGOR
SYLVANIA WATERS
KURNELL
WORONORA
SUTHERLAND
MIRANDA
GYMEA
CARINGBAH
NORTH CRONULLA
LOFTUS
GYMEA BAY
AWARRAH
GRAYS POINT
BURRANEER
LILLI PILLI
AUDLEY
MAIANBAR
BUNDEENA
ROYAL NATIONAL PARK


AUSTRALIAN NOISE EXPOSURE INDEX
4 NOVEMBER 1994 to 3 NOVEMBER 1995
1:30,000
FSD 6819
Airports
sydney airport
UPDATED WITH REVISED CONTOURS
SOURCE: AIRSERVICES AUSTRALIA 1995,
H377a, INM Version 5.01
ENDORSED FOR TECHNICAL ACCURACY
MANAGER
ENVIRONMENT MONITORING SECTION
AIRSERVICES AUSTRALIA CANBERRA
20
25
30
35
40

Number of People Within Area of Indicated ANEF Value (By Postcode Area)

Postcode	Suburb	1993 ANEI (N350) >=30	1993 ANEI (N350) >=25	1993 ANEI (N350) >=20	1995 ANEI (N377a) >=30	1995 ANEI (N377a) >=25	1995 ANEI (N377a) >=20	ANEC1 (N382) >=30	ANEC1 (N382) >=25	ANEC1 (N382) >=20	ANEC2 (N385) >=30	ANEC2 (N385) >=25	ANEC2 (N385) >=20
North of Airport													
2038	Annandale	0	370	1320	230	1420	3980	0	120	800	0	0	420
2015	Beaconsfield	0	0	0	0	0	80	0	0	40	0	0	40
2050	Camperdown	0	0	0	0	0	1180	0	0	0	0	0	0
2047	Drummoyne	0	0	4110	0	100	7860	0	0	490	0	0	0
2203	Dulwich Hill	0	0	0	0	0	0	0	0	6320	0	0	5670
2043	Erskineville	0	0	0	0	0	30	0	0	0	0	0	0
2110	Hunters Hill	0	0	0	0	0	1760	0	0	0	0	0	0
2066	Lane Cove	0	0	0	0	0	720	0	0	0	0	0	0
2040	Leichhardt	0	3790	9910	1400	8260	13650	0	1970	8520	0	0	4930
2204	Marrickville	590	3730	5730	2940	4880	7420	370	9670	18600	140	5810	16900
2042	Newtown	0	0	880	20	1240	8110	0	0	740	0	0	460
2049	Petersham, Lewisham	0	2140	3690	920	2350	4870	0	1930	11050	0	150	7480
2039	Rozelle	0	0	0	0	0	500	0	0	0	0	0	0
2048	Stanmore	0	2820	5150	2750	5430	5960	0	1870	4650	0	0	3460
2130	Summer Hill	0	0	0	0	0	0	0	0	3130	0	0	2640
2044	Sydenham	1360	2880	5570	2220	4450	7300	2460	4390	7440	1370	3820	7270
	North Total	1950	15730	36360	10480	28130	63420	2830	19950	61780	1510	9780	49270
East of Airport													
2019	Banksmeadow	210	590	1720	210	470	1400	390	720	3070	390	800	3380
2034	Coogee	0	0	7220	0	0	0	0	0	310	0	0	1450
2018	Eastlakes (Rosebery)	450	1380	2480	0	0	150	30	1920	11720	30	1590	11830
2033	Kensington	0	0	0	0	0	0	0	0	30	0	0	0
2032	Kingsford	0	1460	5670	0	0	0	0	0	4410	0	0	4190
2035	Maroubra	0	1100	5110	0	0	0	0	0	0	0	0	20
2020	Mascot	660	1990	4110	120	450	1320	310	5490	7240	270	5530	7580
2036	Matraville	0	0	50	0	0	0	0	0	0	0	0	0
2031	Randwick	0	0	2820	0	0	0	0	0	1980	0	0	2450
	East Total	1320	6520	29180	330	920	2870	730	8130	28760	690	7920	30900
South of Airport													
2231	Kurnell	0	0	110	0	0	870	0	0	900	0	70	930
	South Total	0	0	110	0	0	870	0	0	900	0	70	930
West of Airport													
2205	Arncliffe	670	1080	5050	150	230	790	710	1340	6680	780	3170	11760
2207	Bexley, Bardwell Park	80	4950	9740	0	0	0	0	2600	9880	0	2760	10290
2206	Earlwood	0	0	0	0	0	0	0	0	0	0	0	600
2220	Hurstville	0	0	5540	0	0	0	0	0	2130	0	0	3080
2223	Mortdale	0	0	130	0	0	0	0	0	0	0	0	0
2222	Penshurst	0	0	1670	0	0	0	0	0	0	0	0	20
2216	Rockdale, Banksia	2260	6280	9250	0	0	430	1070	6650	10600	960	6400	10010
	West Total	3010	12310	31380	150	230	1220	1780	10590	29290	1740	12330	35760
	TOTALS:	6280	34560	97030	10960	29280	68380	5340	38670	120730	3940	30100	116860

Note 1: Number of people within contours includes figures from higher level contours
Note 2: Numbers have been rounded to the nearest 10 (Data from the 1991 Census)
Note 3: All suburbs in the postcode area are included though only one or two are listed

Discussion

Single Track Analysis

Single track analysis data provided key input to the environmental assessment of the relative merit of alternative modes and flight tracks. Relevant data for the selected modes and flight tracks is summarised in the discussion on modes in Chapter 4.

By indicating the number of people expected to experience noise of 70 dB(A) or more from a single overflight, single track analysis provided a quantitative basis on which to select the best options. This was particularly helpful in the following cases:

Arrivals from the North—'Trident' Options

The principle of non-reciprocal flights was given high priority in working group discussions. In the case of Runway 25 arrivals, the short distance to the coast means that little can be done with arrivals.

In the south, arrivals and departures over Kurnell are well separated, while to the west there is wide scope to distribute departures so arrivals can be brought straight in without conflict with the principle.

However, to the north residents are subject to both arrivals and departures of heavy jet aircraft and while there is some scope to vary departures to the west, additional consideration needed to be given to developing arrival options beyond 3-4 nautical miles from the runway threshold.

The working group considered three main approaches and drew heavily on track analysis data in accepting or rejecting the alternatives: 'Herringbone', 'Chevron' or 'Trident'.

Under the 'Herringbone' scenario, aircraft approaching from the west or east would track via one of a series of paths set at 30 degrees or less to the final approach path to Runways 16L or 16R. They would join final approach at various points north of the airport but all would be on final approach by about 4 nautical miles. This proposal offered noticeable benefits to suburbs further than 8 nautical miles out but only minor relief for suburbs closer in. The proposal raised air traffic management problems because of the variability in track distances involved.

The 'Chevron' proposal addressed the problem of unequal approach distances in the 'Herringbone' by suggesting that there be a series of discrete parallelograms, each set at 30 degrees to the final approach path, the edges of which would define the approach tracks. However, this proposal was also discounted because it did not offer sufficient relief to those under the final approach path.

The 'Trident' approach was seen to offer the best prospect for relief directly to the north of the airport. With this proposal aircraft would approach the airport from the north via tracks parallel with the main approach path. They would then join a single angled approach to pick up the final approach as close as practicable (about 3.5 nautical miles) from the threshold. By setting the arms of the approach sufficiently apart from one another to minimise noise overlap (approximately 4 nautical miles) genuine relief could be provided to residents aligned with the main approach and noise could be distributed more evenly. The numbers of people under each leg of the 'Trident' approach experiencing noise exposure greater than 70 dB(A) from a single overflight were determined using 1994 projected population data supplied by the Australian Bureau of Statistics. Results in relation to B747-200 and B767 aircraft were as follows:

	B747-200	B767
Western Arm	106 000	42 100
16R	83 200	42 100
16L	not applicable	32 000
Eastern Arm	not applicable	35 100

The flight tracks associated with the 'Trident' model were taken into account in producing the ANEC2 forecast.

Cronulla—Mode 2

Under the Mode 2 proposal, aircraft would arrive on Runway 34R (heavy jets on 16R) and depart on Runway 16R. Because of the need to ensure safe separation of arriving and departing aircraft, with similar weather minima, departing aircraft would be required to adopt the 185 degree radial. This would take them closer to Cronulla than normal departures from Runway 16R. Modelling using single track analysis indicated that some 26 000 people would experience maximum noise levels of greater than 70 dB(A) from the overflight of a B747-400 and 40 400 by the overflight of a 747-200.

Mode 2 was therefore judged to be not an environmentally preferred mode of operation, provided Mode 4 and/or Mode 3 can achieve the capacity potential of Mode 2.

Runway 07 Departures—Avoiding South Head

From the track analysis it became clear that with the initial proposal noise from heavier jets departing Runway 07 for westerly and north-westerly destinations would impact on residents near South Head on re-crossing the coast if not taken sufficiently far east before executing their turn. The new flight tracks developed for this operation took this into account, as well as the need to avoid any conflict with arriving traffic off the eastern seaboard, but the situation will need to be monitored when operations begin.

Similar circumstances apply in relation to southerly departures off Runway 25 where steps will need to be taken to avoid residential areas near Menai. Also, departures from 16R to the west and north west are expected to proceed via Camden and largely avoid residential areas such as Campbelltown and Liverpool, but these too will need to be monitored to ensure minimum environmental impact.

Runway 34L Departures by Propeller Aircraft

Analysis of the Saab 340 departure track from Runway 34L showed that the 70 dB(A) noise contour is about 4 500 metres long. Currently, propeller aircraft can depart from Taxiway `G' which puts some noise over residents near to the airport. If the departure procedure is changed to require aircraft to depart no further north than Taxiway `B10' some relief will be provided to those residents.

Mode 4—Preferred

Mode 4 has general support as being the environmentally preferred option. With all arrivals and departures over water (arrivals: 34L; departures: 16L and 16R—heavy aircraft) the minimum number of people are affected. In the worst case scenario (747-200) the forecast numbers of people in the 70 dB(A) contour are as follows:

Arrivals	34L	700
Departures	16L	5 800
	16R	4 000

ANEC 1 and 2

In 1995 about 50 per cent of aircraft operations were over northern suburbs. Under the proposed operating arrangements, the initial goal is for movements off runways to the north, east and west to be about 15 ±2 percent. Consistent with this, both ANEC 1 and ANEC 2 show a contraction of the northern contours in relation to those for the 1995 ANEI and an approximate equal distribution of contour areas to the north, east and west.

The number of people within the 20, 25 and 30 ANEC contours is shown by Postcode Area in Table Figure 17. This table also shows that the number of people affected increases in the 20 ANEC contour but reduces significantly in the higher noise level contours. Thus, in 1995 there were some 10,960 people in the equal to or greater than 30 ANEI contour and 68,380 in the equal to or greater than 20 ANEI contour compared with 3940 and 116,860 respectively in ANEC2. This suggest there is clear evidence that the noise impact in high noise areas would be dissipated and that there would be a much greater sharing of the noise burden.

The ANEC analysis results also indicate that the total number of people exposed to noise greater than 20 ANEC under the ANEC 2 scenario, 116,860, is slightly less than under ANEC 1 scenario, 120,730. This is due mainly to slight increases in the percentage of movements for modes involving overwater operations factored into the model. However, both are significantly higher than the number of people exposed to this level of noise in 1995, some 68,380. This result is consistent with the sharing of noise impacts. However, it does show that the redirection to over water modes of even small percentages of movements produces worthwhile benefits.

As the noise generated by arriving aircraft is concentrated into a long thin corridor while that from departing aircraft is spread into shorter broader bands, the effective spreading of noise relies mostly on the spread of departing traffic. The use of multiple departure tracks is a feature of the new operating design. The ANECs reflect this with the main arms of the contours directly attributable to arrivals and the broader spurs between the axes due to departure tracks. Suburbs to the north now clear of the 20 ANEC contour include those in Postcodes 2050 (e.g. Camperdown), 2047 (e.g. Drummoyne), 2110 (e.g. Hunters Hill), 2066 (e.g. Lane Cove), 2043 (e.g. Erskinville) and 2039 (e.g. Rozelle). Suburbs now within the 20 ANEC contour in ANEC 2 but not within this contour in the 1995 ANEI include those in Postcode 2203 (e.g. Dulwich Hill) and 2130 (e.g. Summer Hill) to the north; 2034 (e.g. Coogee), 2032 (e.g. Kingsford), 2035 (e.g. Maroubra) and 2031 (e.g. Randwick) to the east; and 2207 (e.g. Bexley), 2206 (e.g. Earlwood), 2222 (e.g. Penshurst) and 2220 (e.g. Hurstville) to the west.

In moving from 1995 parallel operations to the new long term proposal, the suburbs that will show the biggest increase in the number of people exposed to aircraft noise greater than ANEC 20 will be those in the Postcodes mentioned above who were outside the 20 ANEI contour in 1995, as well as those in Postcodes 2204 (Marrickville) 16,900 (previously 7420); 2018 (Eastlakes) 11,830 (previously 150); 2020 (Mascot) 7580 (previously 1320); 2205 (Arncliffe) 11,760 (previously 790); 2019 (Banksmeadow) 3380 (previously 1400) and 2216 (Rockdale) 10,010 (previously 430).

The use of full length departures for jet aircraft on runway 34L which enables many aircraft to gain substantial height and to be able to turn while still close to the airport. This also produces some reduction in the noise at ground level and also facilitates the spreading of noise.

However, to achieve maximum benefits in this area, specific noise abatement departure procedures are necessary. In such procedures, rather than conduct a continuous climb from the airport with the engines at full power and flaps at takeoff settings, the aircraft's engine power settings and flap angles are manipulated to produce a trade-off of speed for height, increasing the distance between the aircraft and the observer and thus reducing the noise levels at the ground.

Two alternative departure procedures have been standardised by ICAO. These are referred to as ICAO 'A' and ICAO 'B'. In both procedures, the departing aircraft is configured for a normal take-off pursuant to the aircraft weight and weather conditions. However, at an appropriate altitude, depending upon the procedure (1500 test for 'A'; 1000 feet for 'B') the configuration of the aircraft is adjusted. This combines both power and flap changes which in turn affect the flight characteristics of the aircraft.

The climb resulting from procedure 'A' is steeper and slower than that from procedure 'B', and this would tend to complicate air traffic control if both procedures were used by different operators on the same routes.

Procedure 'A' provides a noise reduction benefit to communities further out from the airport, while procedure 'B' is most beneficial to communities immediately adjoining the airport.

However, it is not possible to be completely specific and prescriptive about the magnitude of the benefits and where they will occur, since the aircraft climb performance depends on factors such as the make and model of aircraft, the loading of the aircraft, and the wind, temperature and pressure conditions at the time of the takeoff. The magnitude of the benefits is greater for the older aircraft types than it is for the modern twin-jet types with very steep climb-out rates.

With these factors to be taken into account, together with consideration of the effects on air traffic separation, determination of the optimum procedure for a given departure direction requires a detailed technical analysis by the operators in conjunction with the air traffic control authorities. Given that this issue was raised during the public consultative process it would be appropriate to refer it to the Implementation and Monitoring Committee managing community consultation during the implementation process.

Conclusion

Single track analyses indicate that under the new operating arrangements the amount of traffic over most highly exposed residential areas would be much reduced, particularly in the parallel runway operations. However, a substantial number of people will experience aircraft noise greater than 70 dB(A)max.

There is not much scope to spread arriving aircraft flight tracks, particularly close to the airport, but in sensitive areas some distribution of approach paths further out is possible. On the other hand, in relation to departures, a large number of alternative tracks have been developed and these are instrumental in achieving successful noise distribution.

ANEC analysis results indicate that the new flight path arrangements produce a contour pattern which is not dissimilar from that which applied in pre-parallel runway conditions but with some additional coverage of areas between the axes. They do so without losing the advantage of the extra capacity provided by the third runway.

As well as being a powerful prediction tool, the ANEF system can also be used for monitoring. In this case, Australian Noise Exposure Index (ANEI) contours can be produced from historical data. It is intended to prepare ANEI on a quarterly (and cumulative—up to 12 months) basis following implementation of the long term operating plan and for the results to be used to guide subsequent operational practices.

When operational arrangements at Sydney Airport have moved into an established pattern and reliable forecasts of traffic patterns can be made an ANEF will be prepared. This will facilitate long term land use planning in the vicinity of the airport and also provide the government with essential data for its house acquisition and insulation program.

Noise Distribution and Monitoring

The accepted primary environmental objective in the review was to ensure that the number of flights over water and non-residential areas was maximised and that as little disturbance as possible is caused to residents during curfew hours. With this objective in mind the next consideration was the minimisation of impact on residents when overflights are unavoidable and the distribution of such impact between communities on an equitable basis. Concern has been expressed that maximising movements over water (to the south), which may be possible for up to about 55 per cent of movements, may not constitute an equitable share for affected communities in Kurnell and Cronulla. However, wherever possible, steps have been taken to have aircraft avoid Kurnell Village.

Direct overflights, mainly due to Runway 34R arrivals, are expected to be no more than about 12 per cent of all movements. In overall average noise terms, Kurnell will remain in the 20 to 25 ANEF contour.

The Minister sought from Airservices Australia a long term operating plan which will ensure a fair distribution of aircraft noise among Sydney residents and also provide a process able to demonstrate that this is indeed the case on an ongoing basis.

To achieve this there has to be an agreed understanding of what is meant by fair and equitable. The task force environment working group was not able to identify a single criterion to demonstrate equity but it was able to identify a number of considerations which together, and in balance, could be considered to constitute the basis for a fair and reasonable distribution of noise.

These were:

Average Noise Exposure
The average noise exposure levels for different community groups provide a basis for comparing their exposure levels. In this regard, the ANEF System is regarded as the best available and is directly referred to in the Australian Standard AS 2021.

Noise Level and Duration of Exposure
The type of aircraft, type of operation (arrival or departure) and height of overflight are all reflected in noise level. These may be considered collectively and put into a time of duration context as a 'Time Above' noise metric such as T70, i.e. Time Above 70 dB(A)max.

Respite
The concept of respite arises from a recognition of the need to provide 'quiet' periods for those affected by noise and to balance these between communities, preferably with periods having no aircraft at all.

Number of Overflights
The number of each type of aircraft, both jets and propeller aircraft, is an important factor in considering disturbance levels. When associated with noise levels a noise metric such as N70 i.e. number of noise events above 70 dB(A)max may be used.

Time of the Day/Night
Disturbance during or near sleeping hours outside curfew hours is a source of particular annoyance and should be minimised by use of over water operations and otherwise distributed.

Non-reciprocal Flights
A single population should not generally be subject to both arriving and departing traffic.

Assessment of Noise Sharing Indices

As indicated above, the Environment Working Group identified a number of ways in which noise sharing may be defined and assessed. It is clear that each of the assessment indices identified has strengths and weaknesses and that it very unlikely that it will be possible to satisfactorily demonstrate 'sharing' by using a single criterion.

Feedback from the community consultation process indicates that there is broad support for the concept of sharing the noise where it cannot otherwise be directed over water or non-residential areas. However, this support is almost always conditional on it being demonstrated that the sharing will be fair.

Therefore it would appear that community confidence in the plan will be enhanced if the noise sharing indices are understandable to the layperson and are able to be easily monitored so that the sharing can, at least to some extent, be independently verified.

The following is a brief summary of the strengths and weaknesses of the noise sharing assessment measures selected by the Task Force.

ANEI

This measure enables an accurate determination to be made of the total amount of noise that has been received at any particular location over a period of time. It is the accepted basis for long term land use planning in Australia and is an important element in the Australian Standard AS 2021—1994.

The ANEI is complex and is not able to be readily measured. This means that it is extremely difficult for a private individual to verify the accuracy of information produced by the authorities. Even if there is public confidence in the announced ANEI values it is difficult for a lay person to understand the differences in noise impact between two locations where one has say 21 ANEI and the other has say 24 ANEI.

Number Above (N70)

This is a relatively simple measure to understand although not easy to determine on an ongoing basis by Airservices Australia except at a few selected points where it has noise monitoring terminals. It can be independently verified to a reasonable degree of accuracy at selected locations by short term monitoring.

This measure is simply a count of the number of 'significant' noise events, i.e. events above a predetermined noise level of 70 dB(A). It therefore suffers from the fact that a noise event at 71 dB(A) is considered to have the same impact as one which is much louder, e.g. say of 90 dB(A).

Number of Overflights

This is probably at first sight the easiest measure for a member of the public to relate to and monitoring methodology is already available in the form of track density plots from Airservices Australia's Noise and Flight Path Monitoring System (NFPMS).

However, it is difficult for a person on the ground to gauge with any accuracy the points over which an aircraft is flying. Radar tracking is required to monitor where an aircraft actually flies and hence it is difficult for this index to be independently monitored except by involvement in Airservices Australia processes.

In a similar way to the N70, this measure suffers from the fact that an overflight say of a B747 at an altitude of 300 ft is considered the same as say an overflight by a quiet jet such as a BAe 146 at 6 000 ft.

Time Above (T70)

This measure is a simple concept for the public to understand and monitoring data can be readily produced from existing processes within Airservices Australia.

This measure overcomes the main shortcoming of N70 in that it takes into account noise events greater than the threshold noise level, e.g. a noise event of 90 dB(A) will generally exceed a level of 70 dB(A) for longer than an event of 75 dB(A). But it needs to be used in combination with a measure such as N70 to indicate how many noise events are involved.

While the concept is simple it may be difficult for a member of the public to gauge the noise impact when results are expressed in this measure. For example, how bad is it when there are 2.5 minutes in the average day above 70 dB(A)?

Respite

The concept of respite is an integral component of fairly sharing aircraft noise, particularly for residents close to the airport. If respite is clearly defined it is a parameter that is easily understood and lends itself to independent verification. A view that had widespread support in the Task Force was that respite means seeking to maximise the number of hours each day either totally free of aircraft movements or ensuring an absolute minimum of overflights, but it is an issue that requires more detailed study by the Implementation and Monitoring Committee particularly in relation to setting targets, monitoring performance and reporting to the public.

Limitation to Noise Sharing

It is important to recognise that it will not be possible for all areas to receive the same amount of noise. It is inevitable that some areas will receive more noise than others. As a generalisation, exposed areas close to the Airport (particularly those in line with the runways) will receive more noise than areas further away. This is because aircraft are:

- generally lower;
- on, or are being fed into or out of, concentrated flightpaths aligned with the runways; and,
- using more power than when overflying other areas (especially during take-offs).

In seeking to achieve an equitable share of residual noise (i.e. noise not directed to the south) between areas to the north, east and west, it is recognised that there are differences between localities that may make noise amelioration and absolute equal sharing difficult. For example, there is a disparity in the availability of runways as a result of their length and disposition in relation to prevailing winds. It should also be noted that seasonal weather factors may produce short term distortions of noise in some areas.

In the proposal which goes forward in this report, every effort has been made to achieve the desired balance and, in relation to the first criterion, average noise as measured by the ANEF System, progress has been made towards achieving a reasonable balance. In terms of total movements, it is expected that, with the judicial use of the various modes proposed, over the longer term a balanced distribution will be achieved between the areas east, north and west of the airport. These then are judged to be the best operational arrangements. However, it still remains for the equity of these arrangements to be demonstrated to the public through some monitoring process.

Geographic Sharing

To date the extent to which noise is being shared with the re-opening of the east-west runway has largely been assessed by examining the number of aircraft movements on each of the runways. Under the proposed arrangements, when there are multiple flightpaths off each runway, it will not be accurate to state that departures to the north are imposing noise on the north since many of the departing aircraft will turn to the west or north west soon after leaving the Airport.

Similarly, while the amount of noise over general geographic areas may be broadly similar, the amount of noise that individual suburbs will receive will be determined to a large extent by the number of available flightpaths. If there are more flightpaths off a particular runway there are more opportunities to spread the noise and reduce the impost on any particular location.

Sharing over Time

Due to variations in wind patterns there will inevitably be wide fluctuations in the amount of noise that any area receives over any particular short term time period. At certain times some areas will receive noise over the whole of a day (or for several days) due to persistent strong winds. Similarly, there are seasons when particular wind patterns predominate (e.g. the westerlies in late winter and early spring) and hence certain areas may receive a large amount of noise over a period of some weeks. This means that noise sharing needs to be considered in a longer term context.

This will have impacts on the way in which respite can be provided. While it may be possible to provide blocks of assured periods of respite on 'normal' days (by using some form of system for rotating the preferred runways at different times of the day) the periods of respite cannot be guaranteed.

Questions have been raised about the equivalence of overflights on say a Sunday afternoon compared to overflights on say a Wednesday. These, and other similar questions of detail are matters for further discussion in a consultative process.

Monitoring Noise Distribution

The Task Force considered a wide range of inputs and parameters that might be used to monitor the equidistribution of noise. The consensus view was that the system had to be simple, easily understood and accessible by the community. While at the same time there is a need to provide sufficient information for there to be community confidence in the monitoring process.

Once the new airport operating and flightpath arrangements are in place it will be necessary to apply the above discussed noise sharing indices to assess the extent to which the noise is being shared. On the face of it this will not be straightforward.

When applying the noise sharing assessment indices there will be apparent inconsistencies and it is very likely that what may appear to represent fair sharing using one of the indices may present a different picture when one of the other indices is applied.

Monitoring Plan

At the time of preparing this report there was no consensus within the Permanent Working Group on the most practical way of demonstrating equity in noise distribution to the community. Further work is clearly required. However, at this point there is agreement that there be a system of determining noise levels at various locations throughout the metropolitan area to supplement operational data on runway use and modes and time of operation. Actual flight track data will be available from the NFPMS and it is intended that the INM be used on a periodic basis to calculate representative noise metrics (selected from the criteria mentioned above) at two circular arrays of points centred on the airport. The points would be at, for example, 45†degree increments around the circle, and the radius of the two arrays could be 4†and 8 kilometres (or as otherwise decided). The period for calculation would be set at say quarterly or annual intervals.

It is also proposed that this data be supplemented with appropriate graphical presentations, including track density plots which will show the level of air traffic activity over the inner areas of Sydney.

A network of 12 permanent noise monitoring terminals is located around Sydney Airport. It is intended these be used to validate noise exposure data produced by other means. The location of these terminals will be reviewed to ensure they are appropriately placed. Portable monitors will also be employed on a short term basis at other locations where direct noise level data is required.

Imbalances in noise distribution detected through the monitoring process are expected to be redressed in the subsequent quarter, subject only to prevailing weather conditions. In this regard, it is expected that the monitoring function will include and a review of runway usage in relation to runway availability.

Reporting to the community on noise issues will occur through the general processes established for monitoring the overall plan.

Chapter 6—Runway selection procedures for noise sharing

Set out below are the procedures for Runway selection Airservices Australia propose be introduced to maximise movements over water and distribute the remaining noise as equitably as possible between suburbs to the East, North East, North, North West, West and Southwest. These procedures will facilitate the optimum initialisation of the runway Modes to achieve the above objectives.

The flight paths relating to individual modes are those described in Chapter 4. These seek to spread departure and share arrivals through selection of alternate runway options.

Runway Modes of Operation

Chapter 4 described 9 runway Modes, selected to maximise flight over water or minimise and diversify flight over populous areas. These Modes were selected after exhaustive analysis of their practicability and effectiveness in achieving the aims specified in the Terms of Reference. Additionally, Mode 8, (Runways 25 & 34R for departures and Runway 34L and R for arrivals), has been identified for inclusion in the plan and for utilisation should equity of noise sharing not be demonstrated by the other Modes after implementation.

The factors affecting Runway selection are discussed in detail in Chapter 4. The prime considerations are legislative, weather and the ability of the nominated Runway to handle the traffic offering.

Equity is a multi-faceted concept and cannot be effectively measured using any one parameter. In the light of the Task Force discussions, Airservices Australia consider that equity must be determined having regard to:

- The noise level experienced by residents
- The number of aircraft movements over particular residential areas
- The number of hours of exposure to aircraft noise (conversely the amount of respite available)

The objectives of the plan outlined below seeks to achieve equity measure against the factors above or the basis that there would be approximate equal distribution of impact to the eastern, northern and western area with the maximisation of flights over water.

Legislation determines the runway requirement during the curfew period 2300 - 0600. There is no scope to vary current arrangements regarding runway selection during this period.

The two fundamental factors which will influence the selection of runway for use outside the curfew period are forecast or prevailing weather and traffic levels including the balance between arrivals and departures. Following Task Force deliberations, Airservices Australia sought to provide a range of runway options which provided alternatives to achieve noise sharing and respite, suitable for use in varying weather and traffic conditions.

The proposed utilisation of the 9 initial runway Modes is depicted in the pie chart at Figure 18 which gives the expected range of use of each Mode in the operating plan. The ANEC 2 contour in Chapter 5 is based on traffic levels falling within the range for the individual Modes depicted in the pie chart. For comparison purposes, Figure 19 depicts the actual utilisation of runway Modes during parallel runway operations in 1995.

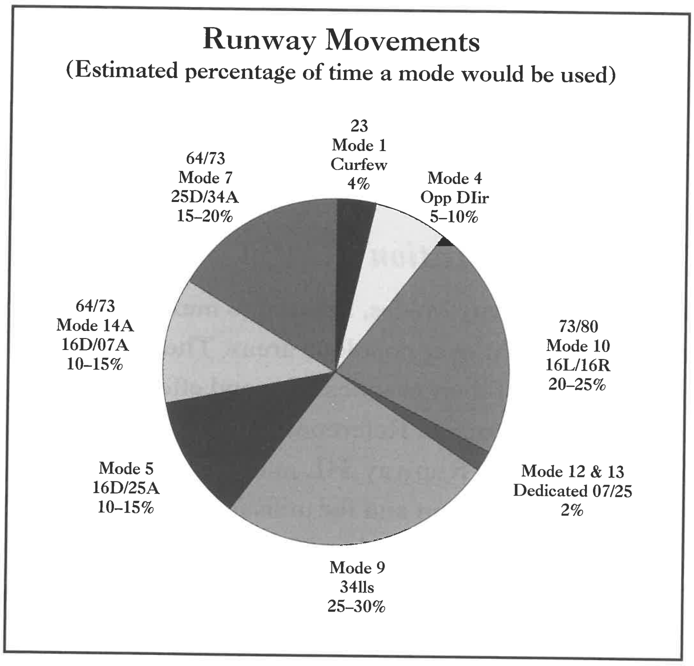


Figure 18

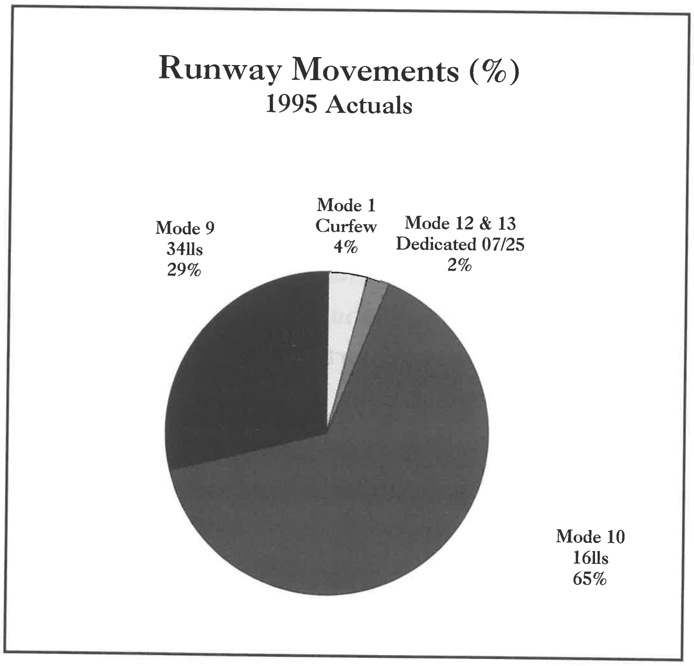


Figure 19

To achieve the runway utilisation distribution depicted in the pie chart, it is proposed that a hierarchy of available runway combinations be used throughout each day. Diurnal variation and annual cyclical weather patterns will give some variation to the runway in use. At any time that weather conditions permit and traffic levels can be sustained Mode 4, or Runway 16L Departures/Runway 34 L Arrivals, will be the nominated runway.

For any period, be it a day or part thereof, either a northerly or a southerly weather pattern will be evident. The runway options available in a southerly direction are Runway 16L&R for departures with arrivals on either Runways 07, 25 or 16L&16R. Options available in a northerly direction are Runways 34L&R or Runway 25 for departures with arrivals on Runways 34L&R

However, traffic patterns, particularly in the current situation of unrestricted domestic scheduling, have a significant bearing on the delays experienced when movement rates are restricted by severe weather or runway capacity. Scheduled hourly movements indicate traffic levels that can be accommodated by a number of runway combinations. Aircraft delays are exacerbated by cluster scheduling and there are times when a runway configuration, which optimises the traffic flow in either an arrival or departure direction, cannot be maintained and the alternative, of parallel operations must be employed. To maintain the efficiency of the airport and to maximise the noise sharing capability, there is a need to address the issue of cluster scheduling. Airservices Australia notes that it is the Government's intention to bring in legislation capping movements at the airport to 80 per hour and considers this will provide an opportunity to address this matter.

It is proposed that the current bias towards operations in a southerly direction be removed and that runways be selected on the basis of a prevailing headwind component except where the runway for use is Mode 4, Runway 16L departures and Runway 34L for arrivals. Whilst this is proposed as the criterion for runway selection, the 5 knot tailwind tolerance should be retained to enable a smooth, well managed transition from a runway combination already in use.

The anticipation and planning of a runway change is critical for the maintenance of a safe and efficient airways system. As the tailwind component on a runway increases, the suitability of that runway may become marginal, leading to aircraft crews specifying the need for a more in-to-wind runway, This is particularly the case for Runways 07/25 and 16L/34R, because of the length available, and this need will vary with aircraft weight and ambient temperature.

Runway Selection Proposal

It is proposed the Mode 4 be the preferred Mode during all non-curfew hours subject to weather and traffic. A change of runway will be triggered by one of or a combination of three factors. These are weather, anticipated traffic demand or delay and provision of respite. Changes due to weather cannot be influenced but they can be effectively managed to ensure a smooth transition from one runway mode to another. On occasions the effect of weather will dictate a single option. Analysis of weather data by the Bureau of Meteorology from 1940 to 1995 shows that Runway 07 is required an average of less than 0.1 per cent over all months, with a maximum of 1.7 per cent in any month. Runway 16 is required an average of 0.9 per cent over all months, with a maximum of 10.7 per cent in any month. Runway 25 is required an average of 0.4 per cent over all months with a maximum of 5.4 per cent in any month and Runway 34, is required an average of 0.1 per cent over all months with a maximum of. 3.2 per cent in any month.

At other times a combination of runways can be used. A weather dictated runway change is, to the extent possible, anticipated by weather forecasts and actual weather reports and a suitable gap in the traffic sequence is chosen or created to accommodate the runway change.

Traffic capacities established through Sabre modelling and operational experience will determine whether a runway configuration can handle the traffic offering. Programmed traffic, through airline schedules and aircraft flight plans, allows an assessment of anticipated aircraft delays. to be made in sufficient time to allow a managed runway change to take place.

In line with recent practice, respite triggers should also occur during the day which provide a decision point for a change to an available runway combination, subject to weather and traffic capacities, which, where possible, provides relief to areas which have been bearing the noise burden over the previous period.

On weekdays in the period 0600 to 0730 when Mode 4 cannot be used, a cross-runway Mode should be used (Modes 5, 7 or 14A). The chosen Mode should be the Mode that facilitates the change to parallel operations at a capacity trigger point occurring around 0700 and 0730.

Analysis of busy hour statistics indicates that on a majority of weekdays between 0730 and 0900 there is at least one half hour period when the number of arrivals exceed 20. This means a single arrival runway would not be able to maintain the efficiency of operation and according parallel runway would be required (noting, however that there may be occasions when in the Runway 34 direction that the shift from 25/34 operation could be delayed because of the greater arrival capacity with this Mode).

Accordingly, it is proposed that on weekdays during the period from around 0730 to 1030 (or later if traffic requires) Modes 9 or 10 be the preferred Modes.

Following this period an assessment will be made on the availability of an alternate runway configuration. This will occur around 1030, with some flexibility either side to meet a suitable point in the traffic sequence. The configuration chosen should, where possible, be an alternate to the configuration in use during the previous period. A further respite trigger will occur at around 1600 and again at 2000 and an alternate to the runway combination in use will be sought where weather and traffic conditions permit.

The afternoon weekday peak periods are not as pronounced or as regular as the morning peaks and accordingly it is not proposed to give Mode 9 and 10 preference during these periods. However, there will frequently be a requirement to use these Modes during the afternoon peaks and it is anticipated that a weather or traffic trigger will be used to bring these Modes into operation.

Runway changes for traffic reasons will be predicated on an anticipated arrival delay which exceeds 10 minutes and which is expected to remain at that level or increase during the period. This trigger is only likely to activate where the mode of operation only gives a single arrival runway (Modes 4, 5, 14A).

Runway changes brought about by departure delays will not occur until departure delays, not including normal pushback and taxiing times, will exceed 10 minutes and are expected to remain at or above that level for 30 minutes. This trigger is only likely to activate where a single departure runway is nominated (Mode 4, 7).

The following matrix shows runway options and an hierarchy for selection throughout the day. Where there is equal preference for a number of runway configurations, the selection, where possible will be an alternate to the configuration in use during the previous period. Parallel runway options, although further down the order of preference, will receive exposure through weather or capacity driven imperatives.

	FIRST	SECOND	THIRD	FOURTH
2300 to 0600 (Curfew)	Departures 16R Arrivals 34L	N/A	N/A	N/A
600 - 0730	Departures 16L Arrivals 34L	1. Departures 16L&R Arrivals 25 2. Departures 16L&R Arrivals 07 3. Departures 25 Arrivals 34L&R	34 Parallels 16 Parallels	07 only 25 only
0730 - 1030	Departures 16L Arrivals 34L	34 Parallels 16 Parallels	07 only 25 only	N/A N/A
1100 - 1500	Departures 16L Arrivals 34L	1. Departures 16L&R Arrivals 07 2. Departures 25 Arrivals 34L&R 3. Departures 16L&R Arrivals 25	34 Parallels 16 Parallels	07 only 25 only
1500 - 2000	Departures 16L Arrivals 34L	1. Departures 25 Arrivals 34L&R 2. Departures 16L&R Arrivals 25 3. Departures 16L&R Arrivals 07	34 Parallels 16 Parallels	07 only 25 only
2000 - 2300*	Departures 16L Arrivals 34L	1. Departures 16L&R Arrivals 25 2. Departures 16L&R Arrivals 07 3. Departures 25 Arrivals 34 L&R	34 Parallels 16 Parallels	07 only 25 only

Note: Preference depends on wind, weather and traffic demands.

** Curfew legislation requires departures after 2245 to use Runway 16L or 16R.*

The matrix applicable on weekends deletes the period 0730 to 1030 where parallel operations are specified during the week. However, similar to afternoon peak periods mid-week, there will be times when parallel operations will need to be employed, brought on by weather or traffic triggers, particularly Sunday afternoons and/or evenings.

	FIRST	SECOND	THIRD	FOURTH
2300 to 0600 (Curfew)	Departures 16R Arrivals 34L	N/A	N/A	N/A
600 - 1030	Departures 16L Arrivals 34L	1. Departures 16L & R Arrivals 25 2. Departures 16L & R Arrivals 07 3. Departures 25 Arrivals 34L & R	34 Parallels 16 Parallels	07 only 25 only
1030 - 1600	Departures 16L Arrivals 34L	1. Departures 16L & R Arrivals 07 2. Departures 25 Arrivals 34L & R 3. Departures 16L & R Arrivals 25	34 Parallels 16 Parallels	07 only 25 only
1600 - 2000	Departures 16L Arrivals 34L	1. Departures 16L & R Arrivals 34L & R 2. Departures 16L & R Arrivals 25 3. Departures 16L & R Arrivals 07	34 Parallels 16 Parallels	07 only 25 only
2000 - 2300*	Departures 16L Arrivals 34L	1. Departures 16L & R Arrivals 25 2. Departures 16L & R Arrivals 07 3. Departures 25 Arrivals 34 L & R	34 Parallels 16 Parallels	07 only 25 only

Note: Preference depends onwind, weather and traffic demands

* *Curfew legislation requires departures after 2245 to use Runway 16L or 16R.*

The monitoring arrangements proposed in Chapter 7 are designed to achieve an equitable distribution of impacts as between eastern, northern and western residential areas affected by aircraft noise. The ANEC 2 contour described in Chapter 5 is one measure of equity based on noise distribution.

Other factors that need to be taken into account are the number of flights over particular areas and the hours that individual areas will be subjected to aircraft overflights.

Figures 20 and 21 provide an indication of the potential hours that suburbs to the east, north and west will experience aircraft noise with the same level of traffic assumed in the ANEC 2 contour. Also figure 21 indicates that using Sabre capacity figures the cross runway modes have the potential to be available for substantial periods of time to permit equitable sharing of noise, even if Sydney Airport reaches 360,000 movements per annum.

Sydney Airport – 270,000 Movements a Year
(Based on a 17-hour day which excludes the curfew period)

Mode	Percentage of movements	Total yearly movement	Avg mov rate per hr	Hrs per year	Hours 17 hr. day	North hours	East hours	West hours	%17hrs	***Runway availability
Mode 1	0.04	10800								
Modes 12–13	0.02	5400	29	186	0.5		0.5	0.5	3.0	74
Mode 4	0.08	21600	31	697	1.9				11.2	46
Mode 10	0.2	54000	58	931	2.6	2.6			15.0	76
Mode 9	0.27	72900	50	1473	4.0	4.0	4.0		23.7	70
*Mode 5	0.11	29700	36	837	2.3		2.3		13.5	61
*Mode 14A	0.12	32400	35	914	2.5			2.5	14.7	55
*Mode 7	0.16	43200	37	1168	3.2			3.2	18.8	50
Total	100	270000	**42	6205	17.0	6.6	6.8	6.2	100.0	

* There will be some movements of long haul aircraft over the north during operation of these modes.

** Average hourly movement rate for a 17-hour day

*** Percentage availability of mode based on Bureau of Meteorology wind study covering 55 years (1940 to 1995), with maximum downwind component of 5 knots and maximum crosswind of 25 knots.

Figure 20

Sydney Airport – 360,000 Movements a Year

(Based on a 17-hour day which excludes the curfew period)

Mode	Percentage of movements	Total yearly movement	Avg mov rate per hr	Hrs per year	Hours 17 hr. day	North hours	East hours	West hours	%17hrs	***Runway availability
Mode 1	0.04	14400								
Modes 12–13	0.02	7200	33	218	0.60		0.6	0.6	3.5	74
Mode 4	0.08	28800	42	686	1.9				11.1	46
Mode 10	0.2	72000	75	960	2.6	2.6			15.5	76
Mode 9	0.27	97200	65	1489	4.1	4.1	4.1		24.0	70
*Mode 5	0.11	39600	45	880	2.4		2.4		14.2	61
*Mode 14A	0.12	43200	50	864	2.4			2.4	13.9	55
*Mode 7	0.16	57600	52	1108	3.0			3.0	17.9	50
Total	100	360000	**55.5	6205	17.0	6.7	7.1	6.0	100.0	

* There will be some movements of long haul aircraft over the north during operation of these modes.

** Average hourly movement rate for a 17-hour day

*** Percentage availability of mode based on Bureau of Meteorology wind study covering 55 years (1940 to 1995), with maximum downwind component of 5 knots and maximum crosswind of 25 knots.

Figure 21

Chapter 7—Implementation processes & timetable for the Long Term Operating Plan

Implementation is dependent on the government's acceptance of the proposed long term operating plan and the completion of any environmental assessment processes that are determined to be necessary. It is proposed that initial planning, analysis and design proceed in parallel with any further environmental consideration deemed necessary by government, without prejudice to any government decision.

Operational Implementation

The implementation of the Operating Plan will be a critical phase in the eventual success of the Plan, requiring careful planning in terms of safety assessment, timing and delivery of the essential project elements. These elements include initial planning and assessment, further computer modelling, Air Traffic Services simulation, document preparation and printing, and controller training. A change to air routes and procedures will require formal promulgation and advice to pilots in accordance with international standards.

It is intended that a dedicated Project Team will operate under the direction of ATS Management, Sydney and be comprised of Air Traffic Services specialists and support staff from Airservices Australia Sydney District. Other specialist expertise and policy advice will be provided by Airservices Australia Head Office.

This team structure will ensure that the continued development and consequent ownership of the Operating Plan will be undertaken by those ultimately responsible for its practical application.

Further, through ATS chairmanship of the Implementation and Monitoring Committee, this structure will also provide a continuity of the consultative arrangements already established during the development of the Operating Plan, and an appropriate avenue for advice of the promulgation of the Plan.

To ensure that the benefits of the Operating Plan, in terms of both noise sharing and noise relief for the Sydney community, are delivered as early as practicable, Airservices Australia is proposing a project strategy for the operational implementation of its recommendations.

This strategy is based on a staged implementation program, as opposed to a total package program, to ensure that the benefits to be gained from the Operating Plan begin to be delivered at the earliest opportunity.

Stage 1 of the program consists of the introduction of Mode 5 -'Runways 16L and 16R for Departures, and Runway 25 for Arrivals - and, Mode 14A - Runways 16L and 16R for Departures, and Runway 07 for Arrivals. A management process will be implemented to ensure the selection of runways for noise sharing is optimised.

Stage 2 of the program covers the development and introduction of the other elements of the Plan. This incorporates the major Terminal Area flight path restructure for all of the designated Runway Modes of operation.

The phase will consist of the formal design of the various airspace configurations and their associated management procedures. This undertaking includes the final design and approval of the relevant Standard Instrument Departure (SID) and Standard Arrival Route (STAR) procedures. Draft SIDS and STARS are detailed in Appendix 6.

A production phase for each stage of development will be required. The major tasks in this phase include liaison with Airservices Australia's, Aeronautical Information Services Section and CASA for the finalisation of documentation for production and promulgation. This documentation is for both pilot and controller use and as such must meet the requirements of the international publications cycle (AIRAC) which provides 28 days notice of implementation. These phases will need to be timed carefully in order to produce external documentation in time to meet the relevant publication cut off dates.

Additional controller documentation includes Local Instructions, Airspace maps, and supplementary training and briefing notes.

This phase also includes the development of specific simulation lesson software, its validation, and preparation of classroom lessons. It also includes preparation of an education program for pilots.

The review phase provides for the conduct of a complete and comprehensive post implementation review of the operational aspects of each stage of implementation of the Long Term Operating Plan.

The purpose of the post implementation review is to assess the safety and efficiency of the plan in terms of its operational effect, and its effectiveness in terms of its impact on the Sydney community.

The scope of the post implementation review will ensure that any safety aspects identified as requiring attention can be addressed immediately and that operational advice ;and modifications to the initial operations of the plan can be directed to the Implementation and Monitoring committee.

Project Timetable

The schedule for implementation of the Operating Plan is based on a two Stage approach to ensure that the benefits of the Plan can be delivered in the shortest practical time.

Stage 1 will deliver considerable benefits by noise sharing through runway mode selection within 18 weeks of commencement. This stage will result in alternatives to the 16 parallel operations. The introduction of Modes 5 and 14A will increase respite periods for the north, further enhancing fairer sharing of noise across Sydney. It also includes some initial adjustments to airspace to provide reductions in overflight of populous areas and expanded over water operations.

Preliminary planning for Stage 2 has been undertaken and a timetable for this stage is currently being finalised.

Minimisation of the leadtime of the stages can be achieved through early preparation pending acceptance of the plan. Work can proceed in parallel with consideration of the plan by Government without prejudice to any further environmental and consultative processes that the Government may deem necessary.

The implementation plan has been developed to ensure, as far as possible, that Task Force initiatives, the extensive training associated with TAAATS commissioning and other management efficiencies can be accommodated in sufficient time to stabilise and consolidate operations prior to the Olympic Games in Sydney in September 2000.

The Sydney District will be responsible for resource development and allocation to ensure that both the implementation of the long term operating plan and the transition to TAAATS can be accommodated while maintaining ongoing operations.

Oversighting of the Implementation of the Long Term Operating Plan and Monitoring Progress Against the Objectives of the Plan

As stressed in various sections of this report the success of the long term operating plan will depend significantly on effective arrangements for managing the implementation and for monitoring progress against the objectives of the plan. Accordingly Airservices Australia is proposing that an Implementation and Monitoring Committee be established to oversight these tasks.

The membership of the committee should include two community representatives nominated by SACF, the aviation industry, the Federal Airports Corporation, the Civil Aviation Safety Authority, and the Department of Transport and Regional Development. The committee should be chaired by the Manager Operations, Sydney District, Airservices Australia, and report through Airservices Australia's Chief Executive to the Minister.

It's proposed the committees' tasks would be:

- oversighting the introduction of the new modes and the changes to airspace and flight tracks in accordance with the recommendations contained in this report.

- recommend priorities and timing for the introduction of infrastructure changes (e.g. taxiway enhancements).
- preparing an ongoing noise management plan to progress equitable noise sharing by developing
  - an agreed set of criteria and target values
  - a practical and publicly accountable monitoring process
  - an agreed mechanism for informing Air Traffic Services of current outcomes in relation to target values.
- oversight the preparation of relevant ANEI, and other noise measurement measures.
- conduct appropriate public consultations and community awareness programs
- making recommendations on modifications to proposed operations under the plan in the light of monitoring outcomes.
- to assess the operational and safety implications of any proposed changes.
- to assess the efficiency impacts of any changes.
- provide regular reports on progress with implementation of the Plan and the monitoring of the Plan against its objectives.

In undertaking these tasks the Implementation Monitoring Committee should be guided by the principles contained in Chapter 4.

Chapter 8—Issues Arising Outside Terms of Reference

The call for submissions for the operating plan attracted many comments on issues outside the Review's Terms of Reference.

These issues were raised as parts of submissions, in meetings with organisations and individuals about their submissions and during the public meetings held in Sydney between 11 and 17 November 1996.

While outside the terms of reference, the frequency with which some of the issues were raised prompted the task force to recognise the need for them to be given due recognition in the report.

The most significant of these issues were:

- Downgrading and/or closure of Sydney Airport
- Building a second airport outside the Sydney basin.
- Building a second airport out to sea
- Construction of additional runway/s in Botany Bay
- Views on the location of a second Sydney airport at Holsworthy or Badgerys Creek
- Eligibility for insulation of properties affected by aircraft noise
- Acquisition of noise-affected properties
- Support for continuation of the curfew
- Relaxation of the curfew
- Cap on capacity.
- Minimisation of the use of the east-west runway
- Re-introduction of the SIMOPS system at Sydney Airport, involving the simultaneous use of the intersecting runways (16R/34L and 07/25)
- Bankstown Airport operations

In addition to these matters there were a large number of noise complaints lodged with the Task Force following the introduction of measures to increase the use of the East West Runway. These were noted by the Task Force and referred to the Airservices Australia Noise Inquiry Unit.

The issues which did not fall within the terms of reference of the review are summarised in this Chapter to record community concerns and to provide a basis for future consideration by the organisation responsible.

It is important to note that Airservices Australia has core responsibilities of Airspace management and Air Traffic Control. All of these issues are well outside Airservices Australia's jurisdiction. They are brought to the attention of government as an assistance in future planning and development and to provide important information on other areas of public concern in the area of aviation transport.

Downgrading and/or closure of Sydney Airport

There were repeated calls for this action from many individuals and organisations both in submissions and at the public meetings.

The No Aircraft Noise Party sought the replacement and closure of the present Sydney Airport, stating: 'Factors which make the present site unsuitable include its incompatibility with surrounding land uses, especially housing and hazardous industry, and the noise, air pollution and crash risk imposed on these land users.'

The Party said that in the short term, the airport operations on the existing site must be limited to minimise the nuisance caused. 'In the long term, the demands of the airline and tourist industries should not take precedence over proper urban planning.'

A submission from the Glebe Society suggested Sydney Airport should be downgraded to handle only domestic aircraft with a limit of 50 movements per hour, and that Badgerys Creek should be the site of a 24 hour international airport.

Calling for the eventual closure of Sydney Airport, the Society said it was no longer appropriate to have an airport in the inner city, surround by densely populated areas and with a major petrochemical installation close to its southern end. Among other purposes for the site, Runway 16L/34R should be converted to a wharf for Port Botany, the Society said.

Building a second airport outside the Sydney basin

There were frequent comments that neither Badgerys Creek nor Holsworthy was a re suitable site for a second Sydney airport.

In its submission, the Leichhardt Council Airport Working Group stated: '.......It is patently obvious that the only real solution to the noise problem is to build a real, major gateway, airport outside the Sydney Basin airshed as soon as possible. Changing Sydney airport flightpaths in the vain hope of establishing a long-term solution to noise and congestion problems (i.e. establishing 'permanent maximum capacity' airport operations at Sydney Airport) is like trying to cure a terminal cancer with bandaids.'

Building a second airport out to sea

The author of one submission called for the construction of an offshore airport as an option for future airspace management plans.

In a major proposal which included details of possible construction methods, this submission suggested an airport be built 5-10 km east of Bondi.

It would incorporate two parallel rotating runways 'to provide an optimum head to wind bearing for the prevailing wind conditions'. Its construction would mean that no new areas would be subjected to high level aircraft noise and significant areas of Sydney would have flight path noise removed permanently. This proposal received support in a number of other submissions.

Construction of additional runway/s in Botany Bay

There were a number of suggestions for building additional runways at Sydney Airport.

One submission called for a fourth runway, reclaimed from Botany Bay, parallel to the existing East/West Runway.

'Sydney's weather conditions and wind velocities, a major consideration in runway selection, indicate that an airport with four runways would operate for approximately equal time on its North/South and East/West configurations, thereby increasing traffic movements by 33per cent and at the same time contribute to more equitable aircraft noise distribution.....' said the author of this submission. Another view was that an additional runway be built parallel to the third runway 'and have all planes land or take off over Botany Bay'.

Views on the location of a second Sydney airport at Holsworthy or Badgerys Creek

Comments were received on the possible choice of Badgerys Creek or Holsworthy as the site for a second Sydney airport. Strong opposition/support applied in regard to each location.

However, there were calls to reconsider Towra Point and Wilton, while another submission suggested that Richmond was the solution.

'It is grossly overlooked, the single 2100 metre runway can support regional and domestic aircraft in the interim, and fewer people would lose out by choosing Richmond,' was the comment.

Eligibility for insulation of properties affected by aircraft noise

There were many calls for insulation of properties and compensation for residents affected by use of the East/West Runway, and claims that the Aircraft Noise Insulation Project was only marginally effective.

In their submission, two Lewisham residents said: 'With the new spaghetti flight paths, the integrity of the insulation project must be questioned and the issue of insulation reopened and offered to a wider class of people affected by the aircraft noise'.

And, from the Principal of Kyeemagh Public School: 'The previous Federal Government had begun soundproofing buildings, including schools, which were seriously affected by the North/South Runway. I have requested that this school be treated in a similar way as planes using the East West Runway make it almost impossible to teach'.

In its submission, Sutherland Shire Council said the Kurnell Peninsula had been particularly heavily impacted by the Third Runway, which placed a centreline directly over the village.

'Residents who live west of Dampier Street, Kurnell have borne the brunt of night time aircraft noise for many years (particularly from small aircraft). Provision of insulation should be considered for their sleeping areas in alleviating the disturbance created,' the Council said.

Acquisition of noise-affected properties

Some submissions touched on the possibility of the Government acquiring those properties most seriously affected by aircraft noise.

One Kurnell resident wrote: 'It has been suggested an option for the expansion of Sydney Airport would be to buy out the entire Kurnell village or to voluntarily acquire premises. If the decision was for expansion of Sydney Airport and to allow for the capacity to grow to 80 flights per hour from 6 am to 11 pm the impact on the Kurnell community would be unbearable and maybe a buy out would have to be an option. I feel that this would not only affect the Kurnell community, but would firstly leave the potential for a change of Government to reverse the operations of the airport and direct flights to the North ass it was prior to the change of Government. Secondly it would devastate the birthplace of our nation.'

Support for the continuation of the curfew

There were repeated calls from many parts of Sydney for the curfew to be retained, but there was an indication of some misunderstanding of the curfew provisions.

More than 80 submissions from Kurnell residents said: 'Enforce the curfew between 11 pm and 6 am. Eradicate all aircraft noise between these curfew hours for all residents of Sydney.'

Others called for the elimination of the 'shoulder' periods of the curfew, during which limited operations are permitted.

Relaxation of the curfew

At the same time there were suggestions that the present curfew limitations at Sydney Airport impeded the growth and commercial viability of the airport.

The Tourism Task Force said that, by pushing additional aircraft into the 6 am - 7 am period new curfew regulations had also affected residents.

It suggested this initiative: 'Relax curfew restrictions to allow international flights to operate in accordance with their scheduling 'windows' and demand patterns. There should be a minimum number of 50 scheduled flights per week in the 5 am - 6 am period.'

Cap on capacity

The Regional Airlines Association of Australia was strongly opposed to the imposition of 'an artificial cap of 80 movements per hour', stating that the airport's natural capacity was well in excess of 80 movements per hour and that the figure of 80 could not be logically supported from an environmental or operating perspective.

However, the RAAA went on to say: '.....the chances of having these limitations changed in the short term are nil and the RAAA will endeavour to fully cooperate with the Task Force to achieve the best result for the industry and the community within the current limitations.'

At the same time there was overwhelming support from the Sydney community for aircraft movements to be capped at 80 or less per hour.

Minimisation of the use of the East West Runway

There were calls for the downgrading and/or closure of the East West Runway, and suggestions that it be used only in the most adverse weather conditions.

One Mascot resident said: 'The East West Runway should be downgraded to the point of closure', stating noise, environment and health and safety considerations.

Another submission, from Bexley, stated: 'There was never any suggestion of sharing the noise more fairly when the East West flightpath residents had the unequal share of the noise before the opening of the third runway'.

Reintroduction of the SIMOPS system

While the terms of reference for the review stated that procedures involving independent use of the intersecting runways (such as the procedures known as SIMOPS), were not to be adopted, some submissions made specific references to this procedure.

One submission, in favour of SIMOPS, stated: '....the specific instruction not to consider SIMOPS is premature and limits the flexibility and possibility of efficient and environmentally friendly operation of the airport.'

Others, expressing concerns on safety grounds, quoted incidents allegedly related to SIMOPS at Sydney Airport.

Bankstown Airport operations

Concerns were expressed about the noise effects of operations at Bankstown Airport and the noise impact of aircraft operations from Sydney Airport to Bankstown Airport during the curfew period.

At the public meetings in November, it was explained that local aerodrome operations at Bankstown were outside the Terms of Reference for this Review. However, a recommendation regarding Sydney - Bankstown curfew operations has been included in this report.

Other issues

There were numerous other issues raised in the submissions, related to airport operations but again, not within the terms of reference.

They included health factors, concerns about the structure of the Sydney Airport Community Forum with claims that all Local Government areas should be represented, air pollution and traffic congestion associated with the airport, the types of aircraft using the airport, including the comment that all jets using Sydney Airport should be mandatorily hush kitted, and concerns about the adequacy of the regulatory controls over future private airport lessees to ensure that noise issues would be adequately addressed.

Appendix 1

Ministerial Direction, Ministerial media statement 20 March 1996

MEDIA STATEMENT

Hon. John Sharp MP Minister for Transport and Regional Development

20 March 1996, TR2/96

COALITION GOVERNMENT TAKES IMMEDIATE STEPS TO REOPEN THE EAST WEST RUNWAY AT SYDNEY AIRPORT

The Federal Government has delivered in eight working days its pledge to reopen the east-west runway at Sydney (Kingsford-Smith) Airport within ten working days of taking office.

The commitment was made by the then Opposition Leader Mr John Howard and the Shadow Minister for Aviation, Senator Warwick Parer.

Mr John Sharp, the Minister for Transport and Regional Development, today issued a direction to Airservices Australia to take immediate steps to reopen the east west runway at Sydney Airport to redistribute aircraft noise more equitably.

"The direction I have issued today requires Airservices Australia to take immediate steps to increase the runway usage to distribute the noise generated by the airport more equitably." Mr Sharp said.

"They can start to increase use of the runway within a few weeks and build up the usage over time to provide greater relief to communities under the northern flight paths", Mr Sharp said. Mr Sharp acknowledged that it would take some time for Airservices Australia to put in place operating procedures which maximised the use of the runway.

"Airservices must regard the safety of air navigation as the most important consideration when carrying out any of its responsibilities including complying with this direction."

Under the direction, Airservices must make arrangements for the full length of the east west runway to be available for both jet and propeller aircraft. It must also work toward achieving the earliest and maximum practicable reduction in aircraft taking off and landing over areas to the north of the airport.

"The direction I have issued today also requires Airservices Australia to report to me by 16 December 1996 with proposals for longer term operating arrangements and airspace management options for the airport" Mr Sharp said.

"That review will consider all options in consultation with industry and affected communities."

As promised prior to the election, the Government will continue the existing acquisition and insulation program, and will extend it to cover the noise affected areas in the flight paths for the east-west runway.

The direction was issued after the Minister for the Environment granted an exemption from compliance with the requirements of the Administrative Procedures made under the Environment Protection (Impact of Proposals) Act.

The exemption granted by Senator Hill also extends to action taken to repeal the mandatory flight corridors to the north of the Airport. Mr Sharp said he would be recommending to the Governor-General amendments to the regulations to give effect to this without delay.

Attachments:

1. Letter from the Minister for Transport and Regional Development to the Minister for the Environment
2. Letter from the Minister for the Environment to the Minister for Transport and Regional Development
3. The exemption granted by the Minister for the Environment
4. Direction issued on 20 March 1996 to Airservices Australia

Contact: Mr John Wallis 277 7680

MINISTER FOR TRANSPORT AND REGIONAL DEVELOPMENT

PARLIAMENT HOUSE
CANBERRA, A.C.T. 2600

TELEPHONE: (06) 277 7680
FACSIMILE: (06) 273 6426

Senator the Hon Robert Hill
Minister for the Environment
Parliament House
CANBERRA ACT 2600

Dear Minister

I am proposing to give a direction to Airservices Australia under section 16 of the *Air Services Act 1995* to redistribute the noise generated by the Sydney (Kingsford-Smith) Airport more fairly by increasing the usage of Runway 07/25 (the east-west runway). I may need to give other directions for the same purpose in the coming months.

To the same end, I am also proposing to amend the *Air Navigation (Aerodrome Flight Corridors) Regulations* to remove the requirement for jet aircraft to use the presently prescribed corridors to the north of the airport. In due course I may need to take other action in relation to those Regulations and the Determination made on 16 March 1995 to effect my objective.

These actions will, of course, lead to action by Airservices Australia.

As you are no doubt aware, there is a question as to whether these actions are caught by the Environment Protection (Impact of Proposals) Act 1974 and the Administrative Procedures made thereunder. Against the possibility that they might, pursuant to paragraph 11.1 of the Administrative Procedures, I request an appropriate exemption to cover all relevant Commonwealth action, including my proposals and the steps to be taken by Airservices Australia to give effect to them from all the requirements of those Procedures. I forward herewith a draft form of exemption for your consideration.

In my opinion, it would be contrary to the public interest for the requirements of the Administrative Procedures to apply to the actions to which I have referred.

There should be no inhibition upon action being taken immediately and as may be necessary in the future to achieve a fairer distribution of the noise generated by aircraft movements at the airport - the level of hardship in the worst affected communities requires it. The issue has been the subject of intense public scrutiny as well as political controversy and debate for many months including the most recent New South Wales and Federal election campaigns. There is ample experience as to how the present regime is working and what it means to the communities affected.

My opinion, shared as you know by the Government, is that it is working unfairly, and this must be corrected as soon as possible. There have been years of experience as to the operation of the east west runway, the use of which has never ceased. As the action Minister, in my view I am in possession of all the material which I need to make a decision which is essentially political in character, involving a balancing of the interests of communities in differing parts of Sydney, and in my view I have the means of obtaining any material which I deem necessary on this topic in the future. Application of the Administrative Procedures would involve not only delay, which is not in the public interest, but also the quite unnecessary use of public resources, direct and indirect, which is also not in the public interest.

Airservices Australia will of course continue to be bound by its statutory obligation to make safety its prime consideration. There is also a public commitment to continue the noise acquisition and insulation program using the same criteria as have applied to date for access to that program.

You and your Department will no doubt continue to monitor developments. I will certainly ensure that you are kept informed of all relevant circumstances. You are of course able to revoke or vary any exemption granted at any time if circumstances so require.

Yours sincerely

John Sharp

JOHN SHARP

19/3/96

DRAFT EXEMPTION

I, ROBERT HILL, Minister for the Environment, grant an exemption pursuant to paragraph 11 of the Administrative Procedures made under the *Environment Protection (Impact of Proposals) Act 1974* in respect of all Commonwealth action (including, without limiting the generality thereof, action by the Airservices Australia) in relation to or connected in any way with:

(a) the proposed direction by the Minister for Transport and Regional Development under section 16 of the *Air Services Act 1995* to Airservices Australia to take immediate steps to increase the usage of runway 07/25 (known as the east-west runway) at Sydney (Kingsford Smith) Airport in order to distribute the noise generated at the airport more equitably;

(b) the proposed amendment to the Air Navigation (Aerodrome Flight Corridors) Regulations so as to remove the requirement for aircraft to use the presently prescribed corridors to the north of the airport; and

(c) any Commonwealth action (including but without limiting the generality thereof, action by Airservices Australia) in consequence of (a) and (b) above.

Dated this day of March 1996.

Minister for the Environment

Senator the Hon Robert Hill

Leader of the Government in the Senate
Minister for the Environment

Mr John Sharp MP
Minister for Transport and Regional Development
Parliament House
Canberra ACT 2600

Dear Minister

I refer to your letter to me of 19 March 1996 seeking an exemption for certain Commonwealth actions proposed in relation to management of air traffic at Sydney (Kingsford Smith) Airport from the requirements of the Administrative Procedures under the *Environment Protection (Impact of Proposals) Act*. You attached to your letter a draft form of exemption indicating the particular Commonwealth actions for which you seek an exemption. I refer also to your letter dated 20 March 1996 enclosing a copy of the direction which you propose to give to Airservices Australia.

You seek an exemption of these actions under paragraph 11.4 of the Procedures because you consider that it would be contrary to the public interest to apply all or any of the requirements of the Procedures to such actions. In particular, you consider an exemption is necessary to ensure immediate relief to those affected by the impact of noise resulting from the current arrangements.

I have carefully considered your request for an exemption. I have specifically taken into account the views expressed by you in this regard as I am required to do by paragraph 11.3.1.(b) of the Procedures.

I have decided to grant an exemption in relation to the actions referred to in your draft exemption (in slightly different form). This is an exemption from compliance with all or any of the Procedures, granted under paragraph 11.4 of the Procedures on the ground of public interest as provided for in paragraph 11.3.1(a)(iv). I attach a copy of my formal grant of an exemption.

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I emphasize that I have not made this decision lightly. However, in all the circumstances, I consider that it would be contrary to the public interest for the requirements of the Procedures to apply to the Commonwealth actions in question and have issued the exemption accordingly. I will provide a detailed statement of my reasons as soon as possible. These will be made available to the public.

While not directly relevant to my decision, I note from your letter that the actions granted an exemption will be implemented in a manner consistent with safety requirements, in accordance with the obligations imposed on the relevant agencies concerned.

I also note in this regard your reference to our public commitment to continue the noise acquisition and insulation program using the same criteria as have applied to date for access to that program.

Yours sincerely

Robert Hill

Robert Hill

EXEMPTION

I, ROBERT HILL, Minister for the Environment, hereby exempt, pursuant to paragraph 11 of the Administrative Procedures made under the *Environment Protection (Impact of Proposals) Act 1974*, the Commonwealth actions listed below from all of the requirements of the Administrative Procedures.

(a) the proposed direction by the Minister for Transport and Regional Development under section 16 of the *Air Services Act 1995* to Airservices Australia (a copy of which is attached).

(b) any proposed amendment to the Air Navigation (Aerodrome Flight Corridors) Regulations so as to remove the requirement for aircraft to use the presently prescribed corridors to the north of the airport;

(c) any Commonwealth action in relation to or connected in any way with actions (a) or (b) (including, without limiting the generality thereof, action by Airservices Australia).

(d) any Commonwealth action (including but without limiting the generality thereof, action by Airservices Australia) in consequence of (a), (b) and (c) above.

Dated this 20th day of March 1996.

Robert Hill.

Minister for the Environment

MINISTER FOR TRANSPORT
AND REGIONAL DEVELOPMENT

PARLIAMENT HOUSE
CANBERRA, A.C.T. 2600

TELEPHONE: (06) 277 7680
FACSIMILE: (06) 273 6426

Mr John Pascoe AM
Chairperson
Airservices Australia
GPO Box 367
CANBERRA ACT 2601

Dear Mr Pascoe

As you know the Government gave an election commitment to issue a direction to Airservices Australia to begin work on reopening the east-west runway at Sydney Airport so as to equitably distribute the noise generated by the Airport.

The Government also gave two related commitments. The first was to repeal the flight corridors to the north of the Airport. The other was to re-work the flightpaths for take-offs and landings at the Airport to minimise the impact on surrounding communities.

Attached is a direction I have issued today to Airservices Australia under section 16 of the *Air Services Act 1995* which requires Airservices Australia to take immediate steps to increase the use of the east-west runway and to prepare a long term operating plan for the Airport and associated airspace.

The direction, in so far as it relates to immediate action to increase the usage of the east-west runway, is self explanatory. It is the Government's objective that use of the runway should be progressively increased towards a level which, as far as practicable, approximates that which preceded the opening of the parallel runway in 1994.

The direction also sets out the policy principles which are to govern the development of longer term operational arrangements for Sydney Airport. I should make it clear that it is open to Airservices Australia to consider possible options which involve take-offs to the north on the new parallel runway. There are a number of additional matters which I would expect Airservices Australia to take into account in the conduct of the review.

(a) First, the review work needs to be done in conjunction with the Department of Defence with a view to fully examining the scope for more effective use of airspace associated with Richmond and Williamtown airbases for both civil and military aircraft.

(b) Secondly, Airservices Australia will I am sure want to make full use of appropriate expertise available both in Australia and in other countries in developing flightpath proposals for Sydney.

(c) Thirdly, it would be appropriate, and consistent with sound public policy for Airservices Australia to undertake appropriate consultation with interested parties including the aviation industry and affected communities.

(d) Finally, close consultation with the Civil Aviation Safety Authority will be necessary to ensure that the development of any new proposals for revised operating arrangements are fully consistent with safety requirements.

I am also proposing to amend the Air Navigation (Aerodrome Flight Corridors) Regulations to remove the requirement for jet aircraft to use the presently prescribed corridors to the north of the airport. In the light of this proposal I do not believe it is necessary for Airservices Australia to continue its investigations into possible prosecutions into breaches of flight corridors to the north as to do so would not be in the public interest.

I would expect that Airservices Australia, in developing appropriate procedures, will take account of the undertaking given by the Prime Minister prior to the election that there should be no new flightpaths over Ashfield, Burwood, Concord, Concord West, Homebush, Mortlake, North Strathfield, Rhodes, Strathfield, Strathfield South or Strathfield West.

The Minister for the Environment, Senator the Hon Robert Hill, has granted an exemption from the requirements of the Administrative Procedures of the Environment Protection (Impact of Proposals) Act 1974 for action connected with the attached direction to Airservices Australia and the repeal of the mandatory flight corridors to the north of the airport. This exemption covers relevant action by Airservices Australia. A copy of Senator Hill's exemption is attached.

I would appreciate it if you would keep me closely informed of the progress Airservices Australia is making in giving effect to the matters covered by the direction.

Yours sincerely

John Sharp

JOHN SHARP

20/3/96

COMMONWEALTH OF AUSTRALIA

AIR SERVICES ACT 1995

DIRECTION

I, JOHN RANDALL SHARP, Minister for Transport and Regional Development, acting under section 16 of the *Air Services Act 1995* (the Act), hereby direct Airservices Australia to:

1. take immediate steps, consistent with the requirements of the Act, to increase the usage of Runway 07/25 (known as the east-west runway) at Sydney (Kingsford Smith) Airport in order to distribute the noise generated at the Airport more fairly. Consistent with this, the east-west runway is to operate in accordance with the following principles:

   - the full length of the runway is to be available for use by both jet and propeller aircraft

   - procedures involving independent use of the intersecting runways (such as the procedures known as SIMOPS) are not to be adopted

   - usage of the runway should be directed, consistent with safety and efficiency of airport operations, towards achieving the earliest and maximum practicable reduction in the number of aircraft taking-off and landing over areas to the north of the Airport

2. report to me by 16 December 1996 on a proposed long term operating plan for the Airport and associated airspace based on the following principles:

   - all three runways at the Airport, including the full length of the east-west runway, are to be available for use by jet and propeller aircraft

   - maximum use is to be made of flightpaths over water and non-residential areas

   - the capacity of the Airport is to be maintained to the maximum practicable extent but the programmed movement rate is not to exceed 80 movements per hour

   - the safety of aviation operations is not to be compromised.

Dated this TWENTIETH day of March 1996.

John Sharp

Appendix A
Landing Roll Distributions

APPENDIX A - LANDING ROLL DISTRIBUTIONS

Cumulative Distributions from Data Collection

RWY 16L	Roll (ft)	Light	Med. Com.	Med. Jet	Heavy
J	223	-	-	-	-
T1	1987	0.00	0.00	-	-
T2	3174	0.06	0.19	0.00	-
T3	5230	0.94	.094	0.12	0.00
T4	6261	1.00	1.00	0.88	1.00
T5	7191	-	-	1.00	-

RWY 16R	Roll (ft)	Light	Med. Com.	Med. Jet	Heavy
F	1728	-	-	-	-
B3	2002	0.00	0.00	-	-
B4	2499	0.07	0.20	-	-
B6	3275	0.36	0.48	-	-
G	3533	0.36	0.48	-	0.00
25	4177	.072	0.86	0.00	0.01
H	5157	1.00	1.00	0.28	0.17
B8	2768	-	-	0.91	0.54
A2	6406	-	-	0.97	0.66
A3	6813	-	-	0.97	0.78
B10	7704	-	-	1.00	0.83
J	7936	-	-	-	0.99
A5	10524	-	-	-	1.00
A6	12294	-	-	-	-

Cumulative Distributions with New High-Speed Exits

RWY 16L	Roll (ft)	Light	Med. Com.	Med. Jet	Heavy
J	223	-	-	-	-
T1	1987	0.00	0.00	-	-
T2	3174	0.07	0.19	0.00	0.00
T2B	4135	0.74	0.80	0.09	0.01
T3	5230	1.00	0.94	0.12	0.01
T4	6261	-	1.00	0.88	1.00
T5	7191	-	-	1.00	-

RWY 16R	Roll (ft)	Light	Med. Com.	Med. Jet	Heavy
F	1728	-	-	-	-
B3	2002	0.00	0.00	-	-
B4	2499	0.07	0.20	-	-
B6	3275	0.36	0.48	-	-
G	3533	0.36	0.48	-	0.00
25	4177	0.74	0.86	0.00	0.01
B7	5157	1.00	1.00	0.28	0.17
B7A	5157	-	-	0.28	0.17
B8	5768	-	-	0.91	0.54
A2	6406	-	-	0.97	0.66
B9A	6406	-	-	0.97	0.66
A3	6813	-	-	0.97	0.78
B10	7704	-	-	1.00	0.83
J	7936	-	-	-	0.99
A5	10524	-	-	-	1.00
A6	12294	-	-	-	-

APPENDIX A - LANDING ROLL DISTRIBUTIONS

Cumulative Distributions from Data Collection

RWY 34R	Roll (ft)	Light	Med. Com.	Med. Jet	Heavy
T4	930	-	-	-	-
T3	1961	0.00	0.00	0.00	-
T2	4017	0.73	0.76	0.09	0.00
T1	5204	0.98	1.00	0.98	0.90
J	6968	1.00	-	1.00	1.00
B10	7191	-	-	-	-

RWY 34L	Roll (ft)	Light	Med. Com.	Med. Jet	Heavy
J	4358	-	0.25	0.00	0.02
A2	5888	0.00	0.25	0.07	0.35
B8	6526	1.00	0.75	0.49	0.43
25	8117	-	0.75	0.66	0.66
G	8761	-	1.00	0.83	0.97
B3	10292	-	-	1.00	0.98
F	10566	-	-	-	1.00

Cumulative Distributions with New High-Speed Exits

RWY 34R	Roll (ft)	Light	Med. Com.	Med. Jet	Heavy
T4	930	-	-	-	-
T3	1961	0.00	0.00	0.00	-
T2A	3050	0.06	0.20	0.01	-
T2	4017	0.73	0.80	0.09	0.00
T1	5204	1.00	1.00	0.98	0.90
J	6968	-	-	1.00	1.00
B10	7191	-	-	-	-

RWY 34L	Roll (ft)	Light	Med. Com.	Med. Jet	Heavy
J	4358	0.00	0.86	0.00	0.02
B9	4590	0.81	1.00	0.10	0.10
A2	5888	0.81	-	0.90	0.54
B8A	6526	0.81	-	0.97	0.66
B8	6526	1.00	-	0.97	0.66
25	8117	-	-	1.00	1.00
G	8761	-	-	-	-
B3	10292	-	-	-	-
F	10566	-	-	-	-

Appendix B
Runway Usage

APPENDIX B - RUNWAY USAGE

- The three aircraft classes, Light, Medium, and Heavy were described in the Assumptions Document. The Medium class was separated into Medium Commuter (turboprops) and Medium (jets) due to differences in landing and take-off roll and approach speed characteristics. The Heavy class was separated into Heavy (all non B747 Heavy aircraft) and Jumbo (all B747) aircraft due to differences in approach speed characteristics. Representative aircraft in each class include:

  - Light: Beech Baron
  - Medium Commuter: Saab 340, Swearingen Metroliner, Dash 8
  - Medium: B737, B727, BAE 146, Airbus 320
  - Heavy: B767, Airbus 340
  - Jumbo: B747

- The tables in this appendix show the allocation of aircraft types to the arrival and departure runways used for each simulated RMO (RMO's 8, 11, and 16 were estimated and therefore allocations for these three cases are not shown)

	RMO 1		RMO 2			RMO 3		
AC Type	ARR-34L	DEP-16R	ARR-16R	ARR-34R	DEP 16R	ARR-34L	DEP 16L	DEP 34L
Light	23%	10%	0%	14%	17%	20%	18%	0%
Med Comm	8%	20%	0%	21%	17%	22%	20%	0%
Medium	38%	30%	4%	28%	36%	36%	30%	4%
Heavy	23%	30%	4%	18%	20%	17%	14%	1%
Jumbo	8%	10%	7%	4%	10%	6%	6%	7%

	RMO 4			RMO 5			
AC Type	ARR-34L	DEP 16L	DEP-16R	ARR-16R	ARR-25	DEP 16R	DEP 16L
Light	27%	14%	0%	0%	21%	0%	14%
Med Comm	7%	21%	0%	0%	15%	0%	21%
Medium	32%	36%	4%	2%	29%	3%	33%
Heavy	27%	14%	4%	4%	19%	3%	16%
Jumbo	7%	3%	4%	8%	2%	6%	4%

APPENDIX B - RUNWAY USAGE

RMO 6

AC Type	ARR-34L	ARR-34R	DEP 07	DEP-34L
Light	5%	13%	18%	0%
Med Comm	8%	11%	18%	0%
Medium	21%	11%	27%	5%
Heavy	2%	16%	18%	5%
Jumbo	11%	2%	5%	4%

RMO 7

AC Type	ARR-34L	ARR-34R	DEP 25	DEP 34L
Light	0%	18%	19%	0%
Med Comm	0%	22%	16%	0%
Medium	0%	30%	30%	3%
Heavy	4%	15%	19%	3%
Jumbo	11%	0%	5%	5%

RMO 9

AC Type	ARR-34L	ARR-34R	DEP 34L	DEP-34R
Light	6%	16%	15%	0%
Med Comm	11%	10%	23%	0%
Medium	19%	10%	0%	35%
Heavy	3%	16%	11%	8%
Jumbo	12%	6%	7%	2%

RMO 10

AC Type	ARR-16R	ARR-16L	DEP 16R	DEP 16L
Light	8%	11%	12%	5%
Med Comm	11%	8%	9%	11%
Medium	21%	8%	12%	23%
Heavy	2%	18%	4%	14%
Jumbo	9%	3%	8%	2%

RMO 12

AC Type	ARR-07	DEP-07
Light	20%	19%
Med Comm	18%	23%
Medium	32%	21%
Heavy	24%	28%
Jumbo	7%	9%

RMO 13

AC Type	ARR-25	DEP 25
Light	20%	20%
Med Comm	22%	15%
Medium	26%	30%
Heavy	18%	20%
Jumbo	14%	15%

RMO 14

AC Type	ARR-16R	ARR-07	DEP 16R	DEP 16L
Light	9%	7%	6%	9%
Med Comm	0%	24%	8%	14%
Medium	2%	28%	2%	32%
Heavy	3%	18%	2%	16%
Jumbo	9%	1%	8%	3%

RMO 14A

AC Type	ARR-07	DEP 16L	DEP-16R
Light	20%	7%	12%
Med Comm	17%	12%	9%
Medium	32%	21%	10%
Heavy	22%	17%	4%
Jumbo	10%	2%	6%

RMO 15

AC Type	ARR-34L	DEP 34R	DEP 34L
Light	15%	6%	0%
Med Comm	20%	25%	0%
Medium	30%	31%	3%
Heavy	20%	20%	3%
Jumbo	15%	6%	6%

Appendix 8

Bureau of Meteorology runway availability statistics

dry 25/5 (95%)
rwy34
wet 15/0 (5%)

Percentage availability - Rwy34 (SYDNEY5A.DAT)																
Thresholds: dry (95%) xwind 25kt, hwind -5 kt; wet (5%) xwind 15kt, twind 0kt. Hours of operation 0600-2300LT.																
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	Stddev	Min	Max
1940	53	59	76	63	63	76	82	64	71	64	60	72	67	8	53	82
1941	65	57	77	66	80	83	75	72	75	58	68	66	70	8	57	83
1942	70	77	49	71	83	80	75	86	89	58	67	63	72	12	49	89
1943	76	61	56	71	59	85	94	63	64	58	58	55	67	12	55	94
1944	79	60	71	76	72	72	76	58	74	72	62	64	70	7	58	79
1945	66	53	56	58	73	59	70	84	80	75	71	66	67	10	53	84
1946	77	58	69	54	81	79	94	82	63	67	61	72	71	12	54	94
1947	58	60	70	57	76	84	89	76	72	77	51	67	70	12	51	89
1948	44	72	62	64	86	76	78	90	71	83	71	73	72	12	44	90
1949	52	66	55	60	80	63	82	71	59	88	72	66	68	11	52	88
1950	67	57	67	53	63	44	72	67	87	68	58	62	64	11	44	87
1951	50	55	63	80	89	64	87	81	80	75	67	73	72	12	50	89
1952	65	47	73	72	80	93	69	57	79	75	67	61	70	12	47	93
1953	54	52	61	73	75	76	75	76	76	64	73	75	69	9	52	76
1954	59	62	65	68	72	86	70	77	55	72	71	60	68	9	55	86
1955	67	53	57	63	87	83	83	93	79	81	77	57	73	13	53	93
1956	61	46	70	86	83	86	90	81	76	82	64	65	74	13	46	90
1957	57	56	62	76	86	87	74	62	73	72	73	69	71	10	56	87
1958	63	58	69	67	96	64	84	81	66	74	73	59	71	11	58	96
1959	57	76	70	72	61	78	76	75	69	59	69	63	69	7	57	78
1960	75	55	57	83	86	66	89	84	81	61	66	62	72	12	55	89
1961	58	58	68	76	71	76	82	68	62	67	63	51	67	9	51	82
1962	70	50	57	53	76	93	80	81	72	69	62	76	70	13	50	93
1963	67	61	57	67	78	71	87	80	76	67	60	67	70	9	57	87
1964	77	69	61	79	81	76	93	84	89	73	69	62	76	10	61	93
1965	47	64	69	63	91	78	70	87	78	67	68	55	70	12	47	91
1966	60	46	63	63	81	83	79	70	71	61	66	64	67	10	46	83
1967	59	52	54	53	69	47	75	70	64	56	62	53	59	9	47	75
1968	52	78	71	87	86	84	79	83	80	79	76	54	76	12	52	87
1969	66	58	63	76	70	61	82	68	69	61	55	67	66	8	55	82
1970	54	61	65	81	75	83	91	81	68	63	58	66	70	11	54	91
1971	51	54	60	65	77	72	78	84	75	75	67	68	69	10	51	84
1972	53	62	49	70	66	63	88	76	71	61	44	67	64	12	44	88
1973	71	63	66	81	75	73	66	86	82	63	74	75	73	7	63	86
1974	66	52	68	82	62	66	90	81	82	61	50	64	69	13	50	90
1975	67	63	70	68	88	71	91	79	72	74	73	50	72	11	50	91
1976	55	57	58	63	82	68	84	76	66	62	69	80	68	10	55	84
1977	68	69	72	76	71	79	70	82	68	73	75	68	73	5	68	82
1978	64	67	76	69	86	74	94	82	74	73	63	66	74	9	63	94
1979	59	66	66	77	55	84	86	84	82	76	70	74	73	10	55	86
1980	55	66	67	68	88	74	85	87	87	73	59	68	73	11	55	88
1981	63	41	76	76	82	86	90	81	79	58	57	66	71	14	41	90
1982	63	57	61	69	89	62	64	80	64	69	67	61	67	9	57	89
1983	60	58	70	58	79	74	84	78	79	64	77	59	70	10	58	84
1984	66	65	58	61	71	77	78	92	79	61	62	58	69	11	58	92
1985	67	54	74	65	76	78	67	83	63	61	57	81	69	9	54	83
1986	65	64	72	78	72	78	87	74	71	83	57	73	73	8	57	87
1987	62	70	53	72	82	87	83	67	83	58	78	54	71	12	53	87
1988	68	44	67	59	74	79	93	79	77	80	70	68	71	12	44	93
1989	46	62	64	68	80	67	87	77	68	72	67	66	69	10	46	87
1990	44	59	58	80	70	76	90	82	70	63	66	68	69	13	44	90
1991	68	65	71	67	58	83	87	91	79	63	65	67	72	10	58	91
1992	63	44	59	66	73	81	87	80	76	66	67	56	68	12	44	87
1993	67	71	54	72	77	83	82	79	70	72	65	75	72	8	54	83
1994	72	71	54	75	80	69	80	74	76	69	73	50	70	9	50	80
1995	66	61	46	74	67	73	94	82	59	63	77	59	68	12	46	94
Ave	62	60	64	69	77	75	82	78	74	68	66	65	Average all months			70
stdev	8	8	8	9	9	10	8	8	8	8	7	7	Std dev all months			11
min	44	41	46	53	55	44	64	57	55	56	44	50	Min all months			41
max	79	78	77	87	96	93	94	93	89	88	78	81	Max all months			96

Percentage availability - Rwy16 (SYDNEY5A.DAT)																
(Thresholds: xwind 24.5kt, hwind -4.75kt. min hr 0500, max hr 2300)																
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	Stddev	Min	Max
1940	78	80	74	82	88	90	85	87	76	74	88	70	81	7	70	90
1941	79	76	69	85	85	85	73	75	70	72	77	80	77	6	69	85
1942	70	75	87	90	75	80	79	65	58	86	79	83	77	9	58	90
1943	69	72	85	74	90	88	69	82	84	82	75	86	80	7	69	90
1944	70	79	69	71	84	88	82	85	58	64	67	77	75	9	58	88
1945	78	76	69	83	79	85	91	78	79	76	63	69	77	8	63	91
1946	52	74	75	94	78	73	48	70	75	75	75	72	72	12	48	94
1947	79	75	80	97	89	63	54	64	68	65	79	70	74	12	54	97
1948	82	70	80	79	70	87	74	65	77	68	68	60	73	8	60	87
1949	78	76	87	85	83	83	58	63	75	50	65	74	73	12	50	87
1950	67	74	80	89	89	92	84	77	61	67	68	70	76	10	61	92
1951	88	81	77	68	77	86	66	79	71	70	67	68	75	8	66	88
1952	77	91	73	72	71	62	84	80	61	70	76	70	74	9	61	91
1953	79	82	70	76	81	83	77	80	68	75	63	62	75	7	62	83
1954	74	86	80	82	94	82	91	85	82	68	69	71	80	8	68	94
1955	70	82	89	88	91	91	80	61	73	64	69	89	79	11	61	91
1956	68	91	77	73	88	73	82	74	82	75	79	72	78	7	68	91
1957	84	78	81	81	93	88	94	87	82	76	76	73	83	7	73	94
1958	81	84	79	81	76	95	89	87	83	77	66	84	82	7	66	95
1959	83	72	93	92	94	92	95	88	80	85	71	77	85	8	71	95
1960	59	87	92	81	69	93	73	87	78	81	69	78	79	10	59	93
1961	72	85	81	71	90	78	74	84	78	80	70	83	79	6	70	90
1962	83	83	80	93	81	78	82	73	76	72	81	73	80	6	72	93
1963	72	80	88	92	89	91	82	76	73	69	75	80	81	8	69	92
1964	71	85	81	89	71	63	52	74	59	62	61	77	70	11	52	89
1965	81	80	76	74	69	71	70	71	71	75	66	82	74	5	66	82
1966	75	91	84	78	87	74	62	70	69	79	76	70	76	8	62	91
1967	75	71	84	75	77	93	75	75	72	74	72	74	77	6	71	93
1968	81	68	83	62	61	82	74	53	62	66	62	80	69	10	53	83
1969	72	75	72	72	57	67	56	67	72	71	83	68	69	7	56	83
1970	77	76	83	71	77	76	66	59	69	72	72	70	72	6	59	83
1971	83	90	76	67	60	69	68	52	46	58	62	68	67	13	46	90
1972	74	70	86	72	84	69	62	59	55	66	73	67	70	9	55	86
1973	64	68	66	68	70	69	83	85	69	77	79	71	72	7	64	85
1974	69	91	81	81	90	81	57	66	64	70	85	73	76	11	57	91
1975	66	76	77	77	63	77	60	73	61	66	66	71	69	7	60	77
1976	78	82	93	87	76	82	80	67	76	76	88	62	79	9	62	93
1977	74	67	75	78	73	80	70	71	86	73	67	72	74	5	67	86
1978	77	77	83	88	86	85	78	85	76	71	76	77	80	5	71	88
1979	73	74	86	80	94	86	75	76	56	78	74	68	77	9	56	94
1980	79	84	87	81	79	74	77	65	60	70	71	72	75	8	60	87
1981	78	92	85	91	86	69	73	67	76	76	82	77	79	8	67	92
1982	76	76	86	84	72	91	87	67	76	76	76	81	79	7	67	91
1983	79	83	73	78	71	73	70	69	61	77	72	81	74	6	61	83
1984	74	79	80	78	75	71	65	58	80	75	83	83	75	8	58	83
1985	77	73	81	94	88	94	89	73	91	76	81	65	82	10	65	94
1986	67	81	68	72	86	87	71	79	78	73	79	63	75	7	63	87
1987	72	62	88	84	90	93	89	85	69	75	54	72	78	12	54	93
1988	55	83	85	92	91	86	82	77	68	66	68	66	77	12	55	92
1989	90	81	80	72	79	86	73	76	73	68	73	72	77	6	68	90
1990	77	91	80	79	79	75	63	73	76	70	66	67	75	8	63	91
1991	68	72	70	79	89	73	84	62	67	63	70	71	72	8	62	89
1992	71	85	78	79	87	77	60	67	65	67	70	81	74	8	60	87
1993	67	67	90	74	77	70	81	73	69	67	68	68	73	7	67	90
1994	72	63	90	73	69	74	73	70	66	65	58	73	70	8	58	90
1995	66	76	81	74	74	66	66	62	76	73	67	65	71	6	62	81
Ave	74	78	80	80	80	80	74	73	71	72	72	73	Average all months			76
stdev	7	7	7	8	9	9	11	9	9	7	7	7	Std dev all months			9
min	52	62	66	62	57	62	48	52	46	50	54	60	Min all months			46
max	90	92	93	97	94	95	95	88	91	86	88	89	Max all months			97

Percentage availability - Rwy25 (based on SYDNEY5A.DAT)																
(Thresholds: xwind 24.5kt, hwind -4.75kt. min hr 0500, max hr 2300)																
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	Stddev	Min	Max
1940	66	59	71	80	99	93	98	87	82	68	82	55	78	15	55	99
1941	72	66	67	75	89	98	100	90	81	71	64	67	78	13	64	100
1942	56	51	67	80	93	93	100	93	80	58	71	68	76	16	51	100
1943	60	67	68	87	76	100	96	88	79	73	57	65	76	14	57	100
1944	53	72	57	84	95	97	89	89	73	75	70	63	76	15	53	97
1945	59	61	62	80	92	74	99	97	86	69	57	51	74	17	51	99
1946	42	54	75	81	91	96	98	92	80	69	65	56	75	18	42	98
1947	54	50	69	88	92	96	93	90	75	70	66	50	74	17	50	96
1948	65	50	76	83	92	88	95	84	76	81	59	46	75	16	46	95
1949	56	64	65	84	84	85	83	82	77	64	56	66	72	12	56	85
1950	60	60	67	87	97	73	85	91	71	69	51	44	71	17	44	97
1951	46	58	63	95	90	82	97	92	72	72	58	51	73	18	46	97
1952	58	74	65	79	94	91	84	81	81	70	71	59	76	12	58	94
1953	46	59	59	81	87	100	97	91	78	65	74	53	74	18	46	100
1954	49	64	62	80	93	99	87	94	83	63	67	51	74	17	49	99
1955	58	71	72	71	94	98	98	91	70	74	74	70	78	13	58	98
1956	55	63	52	94	95	94	97	94	87	80	66	56	78	18	52	97
1957	58	54	63	82	96	97	96	82	82	70	67	57	75	16	54	97
1958	66	64	66	64	93	88	99	94	83	82	56	64	77	15	56	99
1959	55	60	77	89	90	93	97	91	77	62	52	58	75	17	52	97
1960	63	66	63	82	95	97	96	91	89	76	62	58	78	15	58	97
1961	53	65	72	66	96	96	96	89	74	69	53	63	74	16	53	96
1962	58	60	63	82	93	97	90	84	81	80	59	39	74	17	39	97
1963	54	57	69	77	88	93	100	86	78	62	66	61	74	15	54	100
1964	57	55	75	81	95	88	97	91	75	79	53	59	75	16	53	97
1965	51	53	74	72	89	91	89	83	74	61	60	60	71	14	51	91
1966	51	72	77	78	94	94	93	84	76	75	67	54	76	14	51	94
1967	53	52	59	72	87	73	95	91	83	60	61	67	71	15	52	95
1968	73	47	72	78	87	98	92	85	72	65	61	59	74	15	47	98
1969	46	52	69	82	89	93	90	75	86	57	63	61	72	16	46	93
1970	59	60	67	74	92	97	95	89	77	71	58	51	74	16	51	97
1971	66	51	52	81	93	98	96	90	78	69	64	48	74	18	48	98
1972	50	56	63	81	88	95	95	78	67	60	70	57	72	16	50	95
1973	38	62	65	76	91	91	83	94	76	75	76	56	74	16	38	94
1974	44	77	68	76	88	92	98	88	79	70	82	58	77	15	44	98
1975	58	63	67	73	93	91	86	91	76	69	51	59	73	14	51	93
1976	52	66	74	85	94	88	98	92	87	81	67	65	79	14	52	98
1977	63	54	66	83	79	98	97	81	87	69	54	60	74	16	54	98
1978	68	75	61	94	92	95	97	93	88	70	58	59	79	15	58	97
1979	57	57	76	88	93	97	99	91	74	65	57	48	75	18	48	99
1980	71	66	73	74	87	93	95	89	78	63	68	55	76	13	55	95
1981	59	76	60	80	90	99	95	94	82	72	69	68	79	14	59	99
1982	52	58	69	83	96	98	98	81	74	73	54	63	75	17	52	98
1983	62	58	63	85	85	88	93	82	83	69	52	60	73	14	52	93
1984	55	59	76	88	91	95	95	92	89	75	64	68	79	15	55	95
1985	66	66	65	86	82	98	94	86	81	56	72	63	76	13	56	98
1986	59	51	61	74	96	96	93	77	72	75	59	54	72	16	51	96
1987	68	54	74	81	93	99	100	73	79	66	54	54	75	16	54	100
1988	57	69	72	75	97	98	94	95	75	78	56	55	77	16	55	98
1989	54	57	68	63	86	87	93	89	83	74	47	56	71	16	47	93
1990	64	64	68	82	93	91	95	89	69	68	59	53	75	14	53	95
1991	60	49	60	74	92	83	98	97	81	61	56	47	71	18	47	98
1992	53	64	65	73	96	99	100	92	87	57	65	58	76	18	53	100
1993	54	66	75	78	90	99	90	84	72	66	65	55	75	14	54	99
1994	50	49	63	69	96	97	97	88	86	66	64	56	73	18	49	97
1995	45	52	67	75	79	93	97	83	79	70	54	66	72	16	45	97
Ave	57	60	67	80	91	93	95	88	79	69	62	57	Average all months			75
stdev	8	8	6	7	5	6	4	5	5	7	8	7	Std dev all months			15
min	38	47	52	63	76	73	83	73	67	56	47	39	Min all months			38
max	73	77	77	95	99	100	100	97	89	82	82	70	Max all months			100

Percentage availability - Rwy07 (based on SYDNEY5A.DAT)																
(Thresholds: xwind 24.5kt, hwind -4.75kt. min hr 0500, max hr 2300)																
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	Stddev	Min	Max
1940	81	90	94	75	57	70	64	73	69	89	72	96	77	13	57	96
1941	92	79	78	72	76	55	51	50	64	80	87	85	73	14	50	92
1942	90	89	72	82	63	62	53	58	62	79	71	81	72	12	53	90
1943	82	83	78	61	67	42	50	54	64	80	87	83	69	15	42	87
1944	95	87	82	63	53	60	67	60	67	70	71	76	71	12	53	95
1945	94	83	69	63	55	67	58	58	71	78	79	88	72	13	55	94
1946	91	76	72	60	62	35	43	49	62	65	84	83	65	17	35	91
1947	86	93	93	68	79	45	44	57	67	69	75	84	72	17	44	93
1948	65	90	80	64	60	64	62	68	65	60	87	85	71	11	60	90
1949	72	85	83	81	66	53	51	72	69	73	77	85	72	11	51	85
1950	89	93	91	74	58	55	75	60	74	71	82	77	75	13	55	93
1951	95	84	89	54	64	59	41	41	68	69	69	82	68	17	41	95
1952	85	92	86	63	58	43	55	55	63	70	70	75	68	15	43	92
1953	90	86	75	74	51	39	49	54	65	80	64	87	68	17	39	90
1954	87	83	86	84	74	73	76	77	76	81	83	94	81	6	73	94
1955	93	88	97	87	71	56	56	62	83	79	72	86	77	14	56	97
1956	88	89	88	70	61	60	70	59	82	68	64	88	74	12	59	89
1957	85	85	90	82	72	83	68	81	72	82	80	84	80	6	68	90
1958	96	85	86	89	63	78	63	68	79	63	91	89	79	12	63	96
1959	94	96	97	89	67	80	69	63	76	82	97	91	84	13	63	97
1960	89	95	96	79	55	65	71	73	76	67	74	84	77	12	55	96
1961	88	91	88	84	70	59	51	70	73	86	88	83	78	13	51	91
1962	94	82	95	71	69	77	76	63	67	68	88	90	78	11	63	95
1963	91	92	87	87	84	76	44	69	67	90	91	93	81	15	44	93
1964	91	93	90	86	64	54	44	59	76	61	85	82	74	17	44	93
1965	89	89	90	77	73	63	55	73	79	86	75	90	78	11	55	90
1966	91	77	81	78	70	63	47	66	67	79	68	87	73	12	47	91
1967	80	86	80	78	69	79	62	54	60	83	75	82	74	10	54	86
1968	88	94	82	77	52	51	63	53	74	69	74	86	72	15	51	94
1969	93	95	86	77	53	54	70	76	44	87	76	79	74	16	44	95
1970	77	85	72	78	60	63	61	55	59	73	80	84	71	10	55	85
1971	67	87	89	74	52	48	58	50	62	67	68	81	67	14	48	89
1972	86	90	83	80	68	56	46	65	76	76	63	77	72	13	46	90
1973	94	87	83	82	60	57	74	65	66	85	78	87	76	12	57	94
1974	96	82	86	86	62	53	34	50	62	77	71	79	70	18	34	96
1975	82	89	84	78	65	51	61	60	71	72	82	90	74	13	51	90
1976	86	86	82	78	77	61	64	49	57	63	78	76	71	12	49	86
1977	89	89	93	81	74	46	59	81	69	86	90	83	78	14	46	93
1978	85	88	86	73	75	63	70	69	77	84	88	79	78	8	63	88
1979	84	92	76	86	68	78	74	66	82	81	92	87	80	8	66	92
1980	82	92	86	87	80	53	55	65	65	81	80	86	76	13	53	92
1981	93	92	91	88	81	58	56	51	79	84	82	81	78	15	51	93
1982	95	88	87	85	65	46	45	86	68	72	89	86	76	17	45	95
1983	86	88	85	55	63	66	66	65	68	73	78	82	73	11	55	88
1984	89	85	69	71	72	67	50	55	52	82	86	77	71	13	50	89
1985	88	91	89	80	81	54	60	72	78	85	90	83	79	12	54	91
1986	84	90	90	81	81	64	60	67	76	67	82	87	77	10	60	90
1987	96	96	83	89	83	81	81	83	64	71	79	82	82	9	64	96
1988	87	81	87	90	79	64	73	63	66	63	87	95	78	12	63	95
1989	88	83	88	78	72	60	50	52	51	60	93	84	72	16	50	93
1990	92	85	87	76	77	63	61	41	81	62	80	84	74	14	41	92
1991	81	89	83	79	79	72	51	51	54	85	80	82	74	14	51	89
1992	81	79	94	85	67	58	56	62	54	80	69	86	73	13	54	94
1993	91	81	76	87	73	58	83	69	72	75	82	80	77	9	58	91
1994	88	90	87	82	64	49	49	69	57	77	74	82	72	15	49	90
1995	91	80	83	67	70	52	54	64	71	81	82	80	73	12	52	91
Ave	87	87	85	77	68	60	59	62	68	75	80	84	Average all months			74
stdev	7	5	7	9	9	11	11	10	9	8	8	5	Std dev all months			13
min	65	76	69	54	51	35	34	41	44	60	63	75	Min all months			34
max	96	96	97	90	84	83	83	86	83	90	97	96	Max all months			97

Percentage availability - Rwy34_16 (based on SYDNEY5A.DAT)																
(Thresholds: xwind 24.5kt, hwind -4.75kt. min hr 0500, max hr 2300)																
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	Stddev	Min	Max
1940	31	39	50	45	52	68	67	51	47	39	48	42	48	11	31	68
1941	44	34	46	51	65	68	48	50	47	34	44	46	48	10	34	68
1942	41	52	36	61	58	59	55	53	49	45	46	47	50	8	36	61
1943	45	33	41	47	49	73	63	48	49	40	33	41	47	12	33	73
1944	49	39	43	50	57	61	58	44	32	38	30	40	45	10	30	61
1945	43	29	25	41	54	45	61	63	59	51	35	35	45	13	25	63
1946	29	32	45	48	59	54	45	53	39	43	37	45	44	9	29	59
1947	37	35	50	54	65	49	44	41	41	42	31	39	44	9	31	65
1948	26	41	42	44	57	63	52	57	49	52	39	33	46	11	26	63
1949	31	43	43	45	63	49	41	35	34	38	40	41	42	8	31	63
1950	33	32	47	42	52	36	56	44	49	35	27	34	40	9	27	56
1951	37	36	40	51	67	52	56	63	51	47	38	42	48	10	36	67
1952	41	39	46	46	52	57	54	38	40	45	45	33	45	7	33	57
1953	33	34	31	49	56	58	54	56	43	40	37	38	44	10	31	58
1954	33	47	44	51	66	69	61	63	37	39	41	31	49	13	31	69
1955	36	35	46	51	79	73	63	54	53	44	47	46	52	13	35	79
1956	31	37	47	59	71	61	73	55	58	57	43	36	52	14	31	73
1957	41	34	44	57	79	75	68	50	55	49	49	42	53	14	34	79
1958	44	42	48	48	72	59	73	67	48	51	39	44	53	12	39	73
1959	40	48	63	63	55	70	71	63	49	44	40	40	54	12	40	71
1960	34	42	49	64	55	59	63	72	58	43	35	40	51	12	34	72
1961	30	42	49	47	61	53	57	52	41	47	35	34	46	9	30	61
1962	54	34	37	47	57	72	61	54	47	41	42	48	50	11	34	72
1963	39	41	45	59	67	62	69	57	49	36	35	47	50	12	35	69
1964	48	54	41	68	52	39	47	60	49	37	30	39	47	11	30	68
1965	29	44	46	37	61	49	41	58	49	43	37	37	44	9	29	61
1966	34	37	48	42	68	59	43	40	41	40	42	34	44	10	34	68
1967	34	23	38	28	47	40	51	48	36	30	34	27	36	9	23	51
1968	32	46	54	49	49	67	54	39	43	46	41	34	46	9	32	67
1969	38	33	35	48	28	29	39	36	42	31	38	35	36	6	28	48
1970	31	37	49	52	54	58	58	40	36	35	31	37	43	10	31	58
1971	33	44	37	32	38	41	46	37	22	37	29	37	36	6	22	46
1972	27	32	35	42	50	33	51	38	28	27	18	36	35	10	18	51
1973	36	31	32	48	45	42	50	70	52	40	53	46	45	11	31	70
1974	35	43	49	63	52	47	47	50	47	31	36	37	45	9	31	63
1975	32	39	47	45	52	48	52	53	34	40	39	21	42	9	21	53
1976	33	39	51	50	58	51	64	44	44	38	57	41	47	9	33	64
1977	41	36	47	54	45	59	45	53	54	46	43	40	47	7	36	59
1978	41	44	59	58	71	59	73	67	51	44	39	43	54	12	39	73
1979	32	41	52	57	48	69	61	61	38	54	44	43	50	11	32	69
1980	34	49	54	49	68	48	63	53	51	44	31	40	49	11	31	68
1981	41	33	61	66	68	55	63	54	57	34	39	44	51	12	33	68
1982	39	32	46	54	61	53	51	47	41	46	43	43	46	8	32	61
1983	39	41	44	37	50	48	54	47	40	41	49	39	44	5	37	54
1984	39	44	39	39	46	48	44	50	59	37	44	40	44	6	37	59
1985	44	27	55	60	63	73	56	57	54	37	38	46	51	13	27	73
1986	32	45	40	51	58	66	58	52	49	56	36	37	48	10	32	66
1987	34	32	41	57	72	80	73	54	53	34	32	26	49	19	26	80
1988	22	26	52	52	65	66	75	58	46	46	38	34	48	16	22	75
1989	36	44	44	40	59	52	61	54	41	42	41	38	46	8	36	61
1990	21	50	38	59	48	52	53	55	47	33	31	35	44	12	21	59
1991	36	37	41	46	47	57	71	55	49	27	35	38	45	12	27	71
1992	34	28	37	45	60	58	48	47	43	34	37	37	42	10	28	60
1993	34	38	44	46	54	55	63	53	39	40	33	43	45	9	33	63
1994	44	34	45	48	50	43	54	45	43	34	33	23	41	9	23	54
1995	32	37	27	48	41	39	61	45	36	36	44	25	39	10	25	61
Ave	36	38	44	50	57	56	57	52	45	41	38	38	Average all months			46
stdev	6	7	8	8	10	11	9	9	8	7	7	6	Std dev all months			11
min	21	23	25	28	28	29	39	35	22	27	18	21	Min all months			18
max	54	54	63	68	79	80	75	72	59	57	57	48	Max all months			80

Percentage availability - Rwy34-2~~6~~5 (based on SYDNEY5A.DAT)															
(Thresholds: xwind 24.5kt, hwind -4.75kt. min hr 0500, max hr 2300)															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	Stddev	Min	Max
1940	32	30	50	49	63	70	80	53	57	39	44	30	50	16	30	80
1941	40	39	50	49	70	83	75	63	58	37	41	37	53	16	37	83
1942	33	30	30	54	75	75	75	79	69	35	42	35	53	20	30	79
1943	39	32	32	62	52	85	89	58	48	37	28	30	49	21	28	89
1944	37	39	38	64	68	70	70	50	48	52	37	32	50	14	32	70
1945	32	30	29	46	70	56	69	82	67	50	35	27	50	19	27	82
1946	30	25	50	43	73	76	92	75	47	45	35	37	52	21	25	92
1947	24	24	40	48	68	81	81	66	54	50	25	32	49	21	24	81
1948	21	29	44	50	82	67	73	74	50	65	35	23	51	21	21	82
1949	22	34	33	48	68	59	70	58	41	53	34	41	47	15	22	70
1950	32	29	41	44	61	42	64	60	60	46	28	20	44	15	20	64
1951	18	24	36	75	80	60	83	74	56	52	38	34	52	23	18	83
1952	29	26	40	56	74	84	62	52	63	48	44	27	51	19	26	84
1953	19	26	26	57	70	76	73	69	60	37	53	35	50	20	19	76
1954	16	38	40	53	67	85	65	71	41	43	45	24	49	20	16	85
1955	34	32	40	42	81	81	81	84	54	57	54	34	56	21	32	84
1956	27	24	30	80	79	81	88	76	63	63	44	35	58	24	24	88
1957	23	24	41	62	83	86	73	55	59	48	50	36	53	21	23	86
1958	38	35	47	44	89	62	83	76	53	61	35	36	55	19	35	89
1959	26	41	54	63	57	76	75	69	54	37	37	31	52	17	26	76
1960	54	37	43	68	81	65	87	76	69	44	38	28	57	19	28	87
1961	25	32	43	48	67	72	78	59	47	41	28	23	47	19	23	78
1962	37	24	34	46	72	91	75	68	58	52	32	26	51	22	24	91
1963	27	27	36	50	72	69	86	68	61	32	32	34	50	21	27	86
1964	43	31	42	61	77	73	90	77	67	53	29	35	56	20	29	90
1965	13	27	47	48	80	73	68	72	57	39	36	26	49	21	13	80
1966	24	31	46	48	74	78	72	56	50	40	41	28	49	18	24	78
1967	26	14	30	38	59	34	73	66	53	31	36	29	41	18	14	73
1968	29	28	45	67	75	83	70	73	58	51	45	23	54	20	23	83
1969	23	16	34	61	60	58	73	51	58	30	28	34	44	18	16	73
1970	30	25	41	59	68	80	87	71	51	40	29	30	51	22	25	87
1971	25	23	25	53	72	71	75	74	54	49	38	25	49	21	23	75
1972	16	31	27	53	58	62	86	58	49	30	25	32	44	20	16	86
1973	23	32	37	63	69	66	59	80	62	42	54	36	52	17	23	80
1974	20	34	40	61	57	65	88	71	65	37	36	33	51	20	20	88
1975	30	33	46	48	82	67	77	72	52	46	36	20	51	20	20	82
1976	19	29	39	52	76	64	83	68	54	50	43	47	52	19	19	83
1977	37	26	46	61	65	79	68	64	58	43	34	34	51	17	26	79
1978	37	42	43	63	79	72	91	74	62	44	29	27	55	21	27	91
1979	20	30	46	66	52	82	85	75	57	43	28	29	51	22	20	85
1980	29	35	41	43	77	68	81	75	66	39	32	31	51	20	29	81
1981	26	26	42	58	75	85	86	75	62	36	33	36	53	23	26	86
1982	26	26	38	56	86	61	63	62	45	45	28	28	47	19	26	86
1983	29	23	38	46	65	66	77	61	62	37	35	24	47	19	23	77
1984	25	30	40	53	65	72	74	84	69	37	34	35	51	20	25	84
1985	39	24	39	54	65	78	66	70	49	36	33	48	50	17	24	78
1986	28	31	36	58	70	77	80	60	51	60	27	35	51	19	27	80
1987	37	29	37	58	79	87	83	52	65	32	39	23	52	22	23	87
1988	29	22	47	42	73	77	88	74	61	61	33	33	53	22	22	88
1989	22	28	40	38	73	61	83	69	56	52	24	31	48	21	22	83
1990	18	30	35	67	67	71	86	77	43	40	31	29	49	23	18	86
1991	34	26	35	50	51	70	85	88	65	34	32	26	50	22	26	88
1992	28	22	30	46	69	81	86	71	64	33	37	27	50	23	22	86
1993	33	44	36	53	68	82	73	65	51	41	36	35	51	17	33	82
1994	29	23	33	47	76	67	77	64	65	43	44	16	49	21	16	77
1995	21	20	30	53	51	67	90	66	43	37	38	29	45	21	20	90
Ave	28	29	39	54	70	72	78	68	56	44	36	31	Average all months			50
stdev	8	6	7	9	9	11	8	9	8	9	7	6	Std dev all months			19
min	13	14	25	38	51	34	59	50	41	30	24	16	Min all months			13
max	54	44	54	80	89	91	92	88	69	65	54	48	Max all months			92

Percentage availability - Rwy34-07 (based on SYDNEY5A.DAT)																
(Thresholds: xwind 24.5kt, hwind -4.75kt. min hr 0500, max hr 2300)																
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	Stddev	Min	Max
1940	40	54	73	49	33	51	53	46	51	60	46	70	52	11	33	73
1941	62	50	59	56	66	47	39	40	49	51	58	56	53	8	39	66
1942	66	74	43	60	49	57	45	53	55	51	53	57	55	9	43	74
1943	62	55	54	42	41	36	47	38	37	49	50	52	47	8	36	62
1944	76	53	61	50	41	42	55	39	53	55	48	54	52	10	39	76
1945	62	44	42	37	41	37	40	50	58	57	58	64	49	10	37	64
1946	70	51	49	37	53	31	41	40	43	44	55	60	48	11	31	70
1947	55	58	69	47	66	38	39	44	48	53	39	58	51	10	38	69
1948	38	67	51	48	50	48	53	64	53	50	63	70	55	9	38	70
1949	45	61	51	51	58	33	47	49	48	65	59	56	52	8	33	65
1950	63	57	64	42	39	20	58	38	65	52	53	58	51	14	20	65
1951	50	51	61	41	56	47	38	33	60	51	53	63	50	9	33	63
1952	63	47	65	45	47	41	39	32	51	54	46	50	48	9	32	65
1953	53	49	57	54	38	28	34	39	44	51	46	66	47	11	28	66
1954	58	52	54	58	55	64	51	63	50	61	61	57	57	5	50	64
1955	63	52	57	58	61	53	48	55	67	62	55	51	57	6	48	67
1956	55	46	70	62	55	53	67	47	63	57	41	57	56	9	41	70
1957	56	55	55	66	63	73	55	50	52	60	59	60	59	7	50	73
1958	61	53	61	63	60	52	54	54	53	48	64	52	56	5	48	64
1959	56	75	69	65	39	61	50	51	52	52	67	59	58	10	39	75
1960	65	53	54	64	47	46	68	64	65	47	54	60	57	8	46	68
1961	56	57	63	68	54	44	43	48	44	58	59	48	53	8	43	68
1962	68	48	53	45	51	72	62	49	47	49	54	69	56	10	45	72
1963	63	58	53	61	67	52	39	60	51	63	56	63	57	8	39	67
1964	70	66	58	67	55	45	40	47	66	45	58	51	56	10	40	70
1965	45	60	62	45	65	52	36	61	63	58	55	51	54	9	36	65
1966	58	38	57	51	60	55	40	48	46	48	46	60	51	8	38	60
1967	53	49	45	42	50	37	46	36	41	51	47	47	45	5	36	53
1968	51	77	63	67	50	46	54	44	58	53	56	49	56	9	44	77
1969	63	57	60	59	40	37	60	55	29	56	46	55	51	11	29	63
1970	43	58	50	62	47	51	54	45	40	50	50	58	51	6	40	62
1971	45	52	59	46	41	41	48	44	48	50	46	63	48	7	41	63
1972	51	56	45	59	53	47	40	48	51	48	35	54	49	7	35	59
1973	70	60	58	66	44	43	47	58	57	55	62	69	58	9	43	70
1974	65	51	66	71	50	40	31	40	53	49	37	59	51	13	31	71
1975	55	60	58	52	56	40	55	45	53	54	57	46	53	6	40	60
1976	52	53	51	51	63	42	56	39	41	38	54	60	50	8	38	63
1977	63	65	69	63	51	41	40	69	43	64	70	59	58	11	40	70
1978	61	60	68	53	68	54	66	58	56	67	58	57	60	6	53	68
1979	59	63	59	66	37	72	62	57	66	63	66	66	61	9	37	72
1980	46	62	59	63	70	43	48	57	57	62	48	59	56	8	43	70
1981	62	39	71	67	67	51	48	41	62	50	47	58	55	11	39	71
1982	62	53	52	57	57	31	27	68	46	55	63	55	52	12	27	68
1983	52	55	63	39	53	45	60	52	54	53	59	52	53	6	39	63
1984	62	60	44	42	55	54	41	48	40	50	54	47	50	7	40	62
1985	59	54	71	52	65	43	41	58	52	51	54	67	56	9	41	71
1986	57	58	68	63	54	48	51	47	52	55	49	63	55	7	47	68
1987	59	69	41	68	67	71	68	57	51	45	64	47	59	11	41	71
1988	61	37	57	53	60	49	68	55	50	50	63	66	56	9	37	68
1989	41	59	61	59	58	41	45	37	36	40	64	57	50	11	36	64
1990	43	57	56	59	51	51	54	32	59	48	58	61	52	8	32	61
1991	58	63	63	54	50	61	44	44	41	56	55	58	54	8	41	63
1992	54	41	57	61	51	48	50	50	44	57	53	50	51	6	41	61
1993	66	64	45	65	60	52	70	56	48	54	55	62	58	8	45	70
1994	64	70	48	67	50	35	44	47	42	55	56	48	52	11	35	70
1995	64	57	42	50	52	42	50	53	44	55	66	50	52	8	42	66
Ave	57	56	57	55	53	47	49	49	51	53	54	57	Average all months			53
stdev	8	9	8	9	9	11	10	9	8	6	8	6	Std dev all months			9
min	38	37	41	37	33	20	27	32	29	38	35	46	Min all months			20
max	76	77	73	71	70	73	70	69	67	67	70	70	Max all months			77

Percentage availability - Rwy16_25 (based on SYDNEY5A.DAT)																
(Thresholds: xwind 24.5kt, hwind -4.75kt. min hr 0500, max hr 2300)																
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	Stddev	Min	Max
1940	55	57	66	71	87	83	84	81	68	62	75	45	69	13	45	87
1941	64	57	58	69	79	83	73	70	64	54	58	57	66	9	54	83
1942	49	47	62	75	73	77	79	62	53	53	62	61	63	11	47	79
1943	46	58	63	67	67	88	69	72	69	66	50	62	65	11	46	88
1944	47	63	47	64	81	86	72	75	46	52	50	56	62	14	46	86
1945	52	51	53	67	73	59	91	76	71	59	47	48	62	14	47	91
1946	31	48	59	77	73	70	48	66	64	55	53	44	57	13	31	77
1947	50	48	67	84	84	61	54	61	56	51	56	40	59	14	40	84
1948	61	44	64	69	64	78	72	56	63	56	46	39	59	12	39	78
1949	46	57	61	76	72	69	49	55	63	40	43	53	57	11	40	76
1950	51	56	63	80	88	65	74	70	47	52	39	38	60	16	38	88
1951	45	52	57	66	71	69	65	74	58	53	42	40	58	11	40	74
1952	54	73	54	59	68	59	73	64	55	59	60	49	61	8	49	73
1953	43	55	51	64	68	83	77	75	54	54	48	43	60	14	43	83
1954	47	59	58	71	88	82	79	83	77	53	54	47	66	15	47	88
1955	50	67	69	65	87	89	79	60	55	56	59	65	67	13	50	89
1956	51	63	50	70	83	69	81	70	78	61	55	46	65	13	46	83
1957	53	51	58	72	89	85	90	73	73	61	57	51	68	15	51	90
1958	61	62	58	59	70	84	89	83	71	68	50	62	68	12	50	89
1959	54	56	74	86	86	86	92	81	64	56	43	54	69	17	43	92
1960	37	62	60	69	66	91	70	82	74	68	48	54	65	15	37	91
1961	47	63	65	54	88	75	73	79	63	62	49	59	65	12	47	88
1962	54	57	57	78	75	77	75	63	64	63	53	37	63	12	37	78
1963	50	54	64	73	77	84	82	67	60	56	61	54	65	12	50	84
1964	48	52	69	76	66	53	51	67	50	54	42	50	56	10	42	76
1965	48	45	61	53	60	66	60	62	58	51	48	56	56	7	45	66
1966	47	70	72	69	84	71	61	66	60	66	51	48	64	11	47	84
1967	47	48	51	54	69	67	71	69	62	47	47	58	58	10	47	71
1968	68	43	64	52	57	80	72	45	48	43	39	52	55	13	39	80
1969	35	49	61	59	52	63	52	50	62	45	59	45	53	8	35	63
1970	48	57	59	56	73	73	62	56	54	53	47	41	57	10	41	73
1971	61	48	44	54	53	67	65	44	39	44	43	39	50	10	39	67
1972	45	46	60	60	75	65	59	46	38	43	57	43	53	11	38	75
1973	28	48	54	57	64	63	68	81	59	63	64	48	58	13	28	81
1974	40	76	62	64	80	72	55	59	56	58	74	50	62	12	40	80
1975	46	55	53	61	59	70	54	68	53	55	38	53	55	9	38	70
1976	49	60	69	77	73	71	78	64	69	63	65	48	65	10	48	78
1977	54	48	55	71	55	78	68	60	77	56	44	50	60	11	44	78
1978	58	64	57	84	80	82	76	81	72	58	51	52	68	13	51	84
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1980	62	60	66	71	69	71	75	60	49	53	58	47	62	9	47	75
1981	55	75	58	73	77	69	71	65	67	60	64	62	66	7	55	77
1982	46	54	66	72	71	89	85	58	59	58	42	54	63	14	42	89
1983	53	53	51	71	60	61	65	60	51	57	37	53	56	9	37	71
1984	48	51	63	68	67	67	62	55	73	65	57	65	62	8	48	73
1985	57	61	59	81	74	93	83	70	77	45	67	47	68	15	45	93
1986	46	44	52	61	83	84	69	64	61	58	54	44	60	14	44	84
1987	57	43	68	71	84	92	89	67	58	52	38	44	63	18	38	92
1988	44	63	66	71	88	86	77	74	54	55	45	43	64	16	43	88
1989	52	55	60	56	67	74	68	69	67	57	42	46	59	10	42	74
1990	59	63	61	67	73	67	61	65	58	57	47	41	60	9	41	73
1991	50	41	54	61	84	59	83	60	57	48	47	39	57	14	39	84
1992	46	59	59	62	85	76	60	64	60	44	54	52	60	12	44	85
1993	46	49	71	62	73	70	75	66	56	51	54	41	60	11	41	75
1994	40	40	59	62	67	73	73	65	58	46	42	53	56	12	40	73
1995	39	45	55	59	62	62	65	58	65	60	40	53	55	9	39	65
Ave	49	55	60	67	74	74	71	66	60	55	51	49	Average all months			61
stdev	8	8	7	8	10	10	11	10	9	7	9	7	Std dev all months			12
min	28	40	44	52	52	53	48	44	38	40	37	37	Min all months			28
max	68	76	74	86	89	93	92	83	78	68	75	65	Max all months			93

Percentage availability - Rwy16-07 (based on SYDNEY5A.DAT)																
(Thresholds: xwind 24.5kt, hwind -4.75kt. min hr 0500, max hr 2300)																
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	Stddev	Min	Max
1940	64	71	70	58	50	66	52	61	53	66	64	65	62	7	50	71
1941	72	59	50	59	64	49	34	34	42	61	66	69	55	13	34	72
1942	61	65	61	75	46	46	44	37	37	67	55	67	55	13	37	75
1943	56	57	64	44	60	37	31	48	54	63	65	70	54	12	31	70
1944	65	67	54	41	46	52	51	49	34	47	48	58	51	9	34	67
1945	73	60	39	53	42	56	50	44	55	59	45	56	53	9	39	73
1946	45	52	59	55	50	22	22	37	46	49	65	62	47	14	22	65
1947	66	68	73	65	70	31	21	29	45	45	61	60	53	18	21	73
1948	49	60	66	51	48	58	45	45	50	47	59	46	52	7	45	66
1949	55	62	73	68	51	44	29	46	49	34	49	66	52	14	29	73
1950	57	67	71	65	50	53	61	45	43	44	54	50	55	9	43	71
1951	82	68	67	41	50	51	25	32	45	49	43	55	51	16	25	82
1952	62	83	60	45	39	21	44	45	35	46	52	51	48	15	21	83
1953	69	68	45	54	38	32	36	43	46	58	42	54	49	12	32	69
1954	61	71	67	69	69	61	70	66	60	51	57	66	64	6	51	71
1955	64	69	85	76	65	49	45	37	61	48	46	78	60	15	37	85
1956	58	80	65	53	52	45	57	47	67	53	48	62	57	10	45	80
1957	69	64	71	64	67	76	64	72	59	61	61	59	65	5	59	76
1958	79	69	67	71	53	75	57	60	67	50	58	75	65	9	50	79
1959	77	70	91	81	62	73	68	57	59	68	69	69	70	9	57	91
1960	55	83	88	68	41	59	53	63	59	52	48	62	61	14	41	88
1961	60	76	70	59	62	47	39	56	58	69	59	67	60	10	39	76
1962	77	66	76	64	58	61	63	47	52	47	70	62	62	10	47	77
1963	65	72	75	81	76	68	36	52	51	61	67	75	65	13	36	81
1964	63	79	72	76	42	26	23	43	45	34	48	60	51	19	23	79
1965	70	69	71	56	47	41	35	51	57	63	48	72	57	13	35	72
1966	66	68	67	60	59	47	24	43	47	61	54	59	54	13	24	68
1967	59	57	66	59	51	73	46	37	39	60	54	59	55	11	37	73
1968	69	62	67	48	27	39	45	29	47	46	45	67	49	14	27	69
1969	68	70	58	53	28	34	38	48	32	60	61	53	50	14	28	70
1970	60	61	61	54	43	49	42	29	39	52	56	58	50	10	29	61
1971	52	78	67	51	28	29	40	26	24	35	41	51	44	17	24	78
1972	60	60	69	55	56	36	27	41	43	51	41	49	49	12	27	69
1973	58	56	51	53	38	31	60	52	46	65	62	59	53	10	31	65
1974	65	73	67	73	54	39	17	33	36	51	58	54	51	17	17	73
1975	54	66	66	60	45	38	39	44	42	44	55	61	51	10	38	66
1976	65	68	76	66	59	49	46	31	41	45	66	44	55	14	31	76
1977	63	58	69	62	55	32	40	54	59	63	59	59	56	10	32	69
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1979	57	66	63	69	62	65	53	47	44	62	67	58	60	8	44	69
1980	65	78	74	68	65	36	39	41	42	55	56	62	57	14	36	78
1981	70	84	76	80	72	37	41	35	62	65	66	60	62	17	35	84
1982	70	65	72	71	43	40	34	57	51	53	67	69	58	13	34	72
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1984	63	67	54	54	50	41	30	30	38	61	71	61	52	14	30	71
1985	68	64	72	78	69	51	53	50	70	63	71	53	63	9	50	78
1986	53	73	59	57	69	56	39	51	58	46	63	52	56	9	39	73
1987	68	60	72	75	74	77	74	70	42	53	37	57	63	14	37	77
1988	44	66	74	82	73	54	60	46	43	39	58	62	58	14	39	82
1989	77	65	68	52	57	51	37	38	32	38	67	59	53	15	32	77
1990	69	76	68	59	61	46	38	26	61	37	49	55	54	15	26	76
1991	54	61	54	62	70	50	38	38	36	52	51	55	52	10	36	70
1992	54	64	73	64	57	41	31	41	34	51	44	68	52	14	31	73
1993	59	52	67	63	55	41	65	51	48	47	53	53	54	8	41	67
1994	64	52	79	55	48	37	37	47	34	48	44	55	50	12	34	79
1995	57	58	65	46	46	29	32	36	51	56	53	47	48	11	29	65
Ave	63	67	67	61	54	47	43	45	48	53	56	60	Average all months			55
stdev	8	8	9	11	12	14	14	11	10	9	9	7	Std dev all months			13
min	44	52	39	38	27	21	17	26	24	34	37	44	Min all months			17
max	82	84	91	82	76	77	74	72	70	69	71	78	Max all months			91

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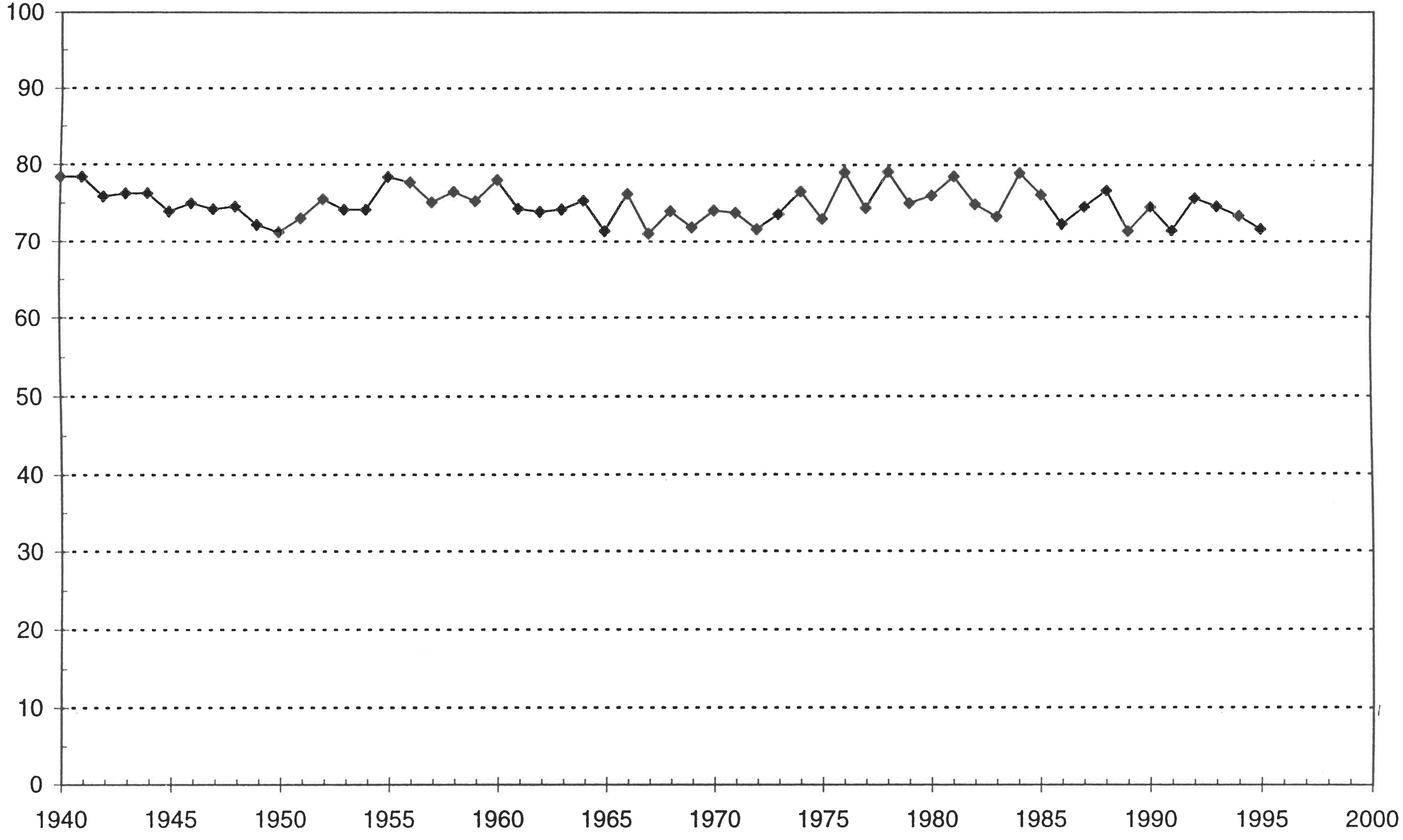

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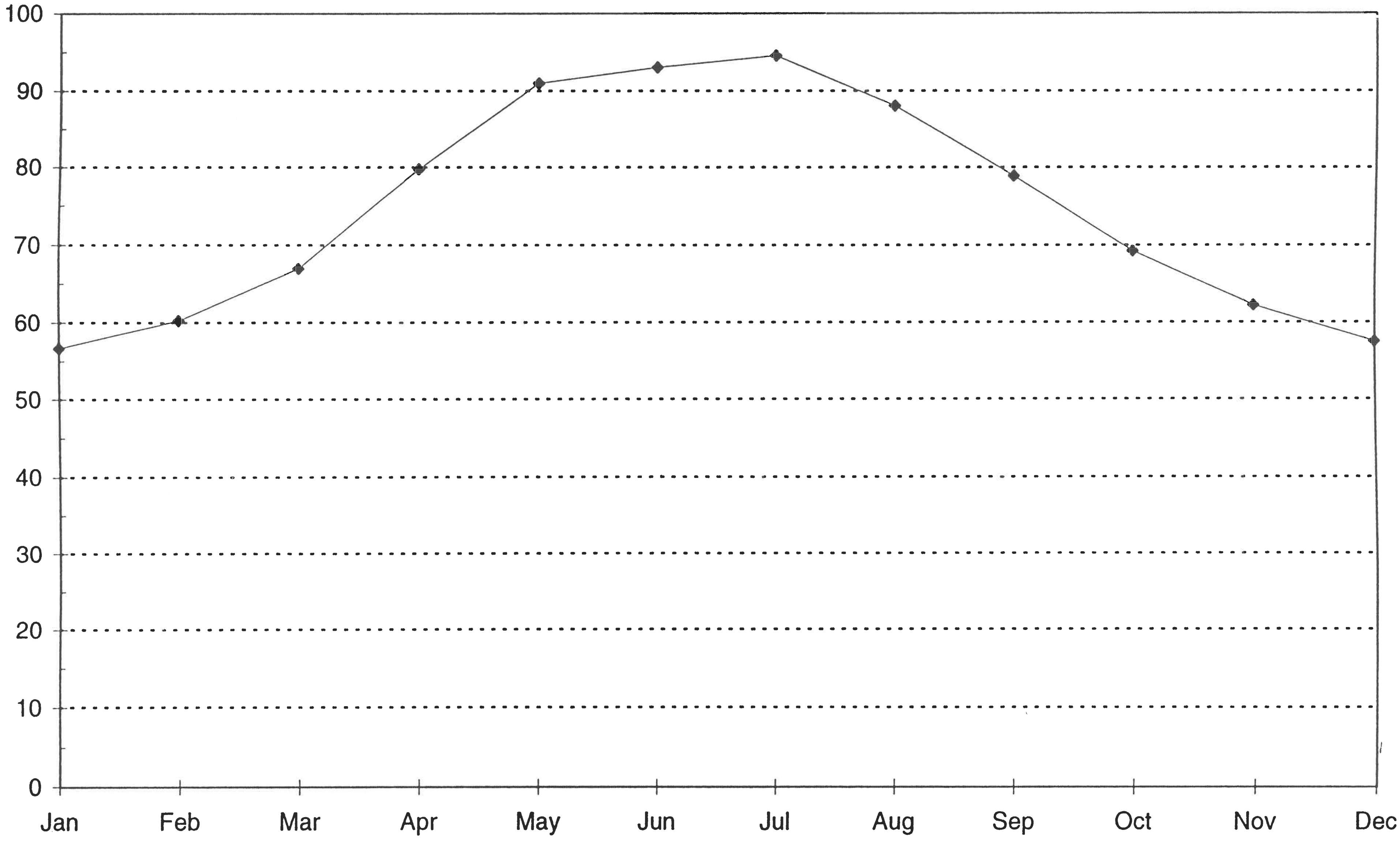
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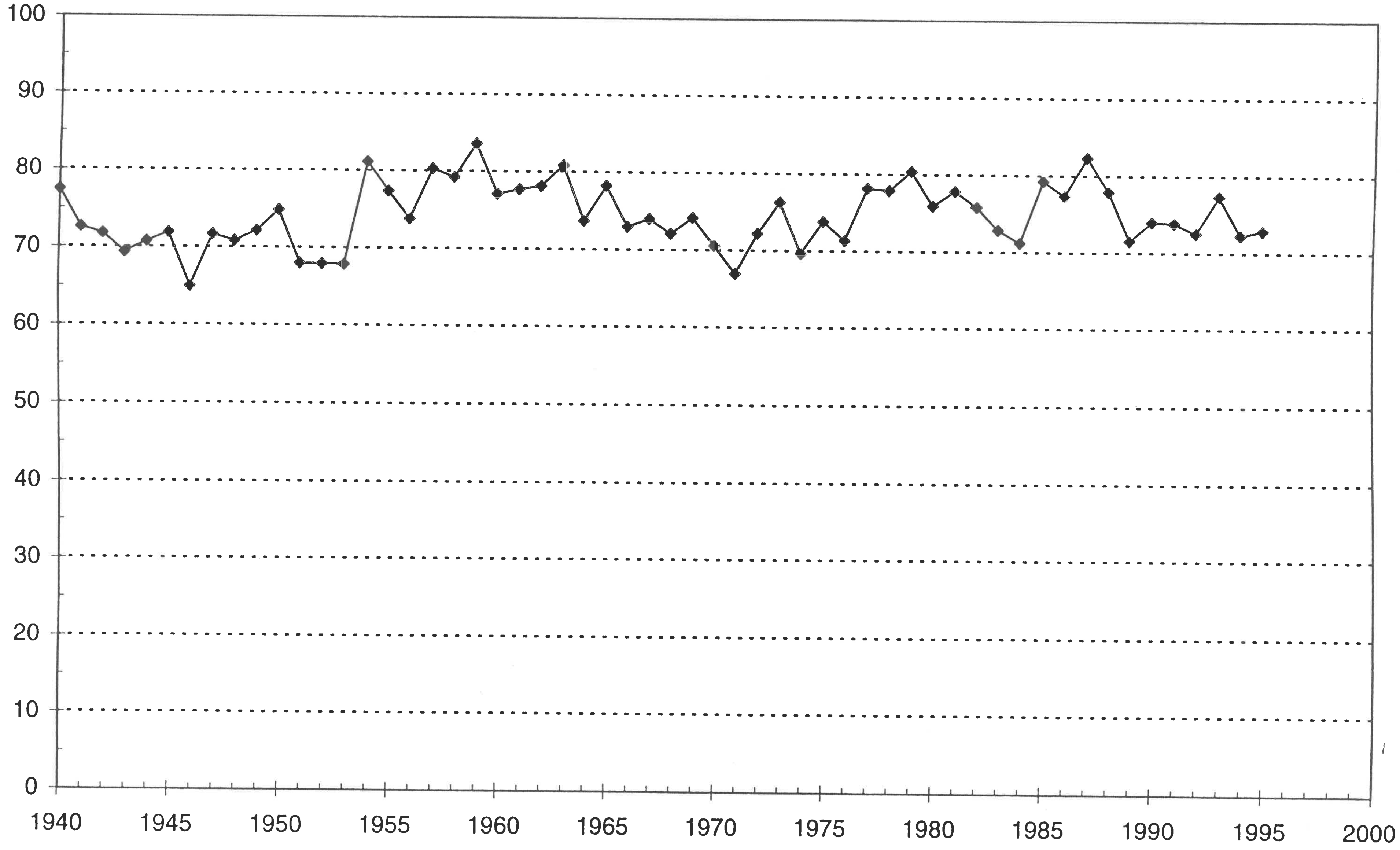
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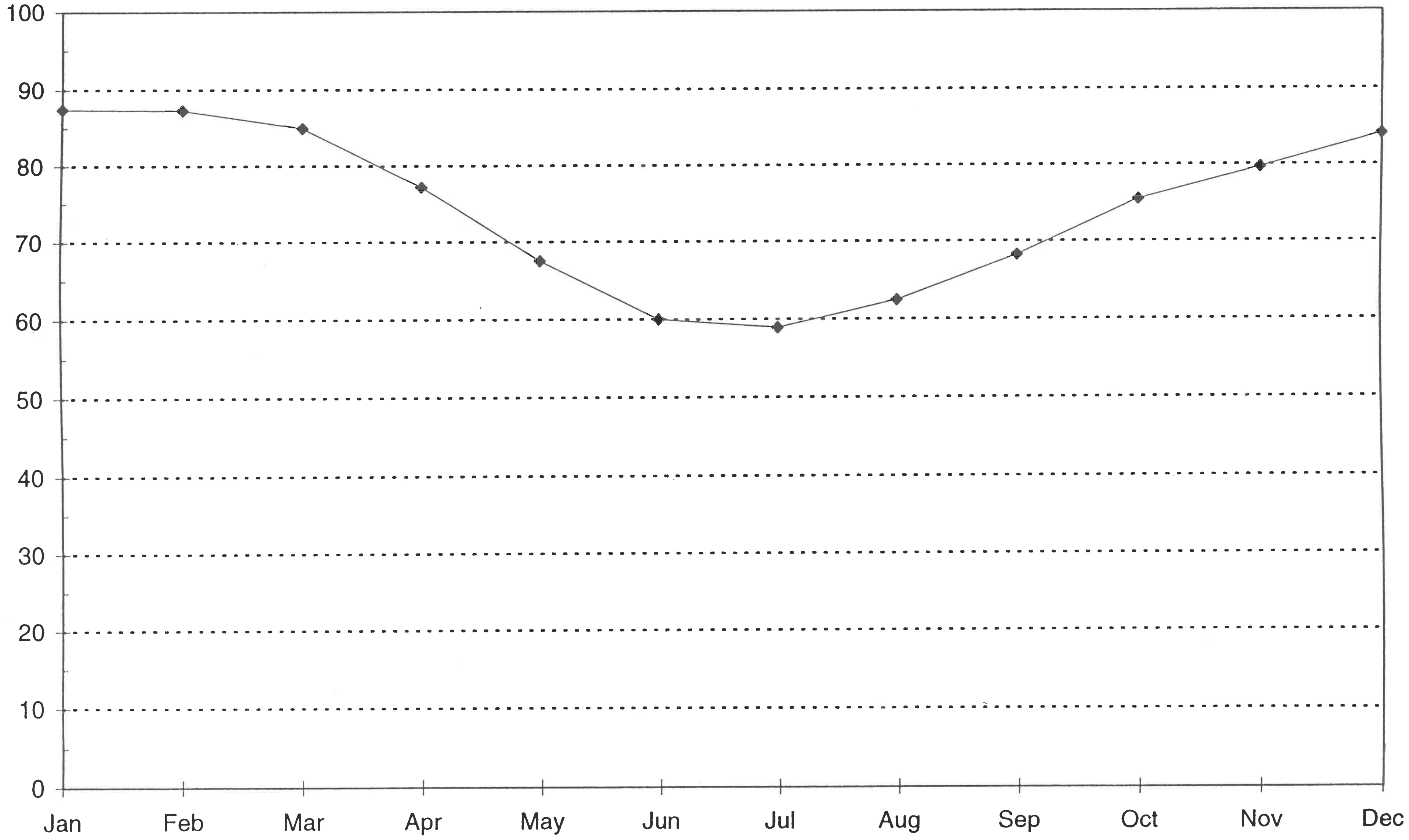
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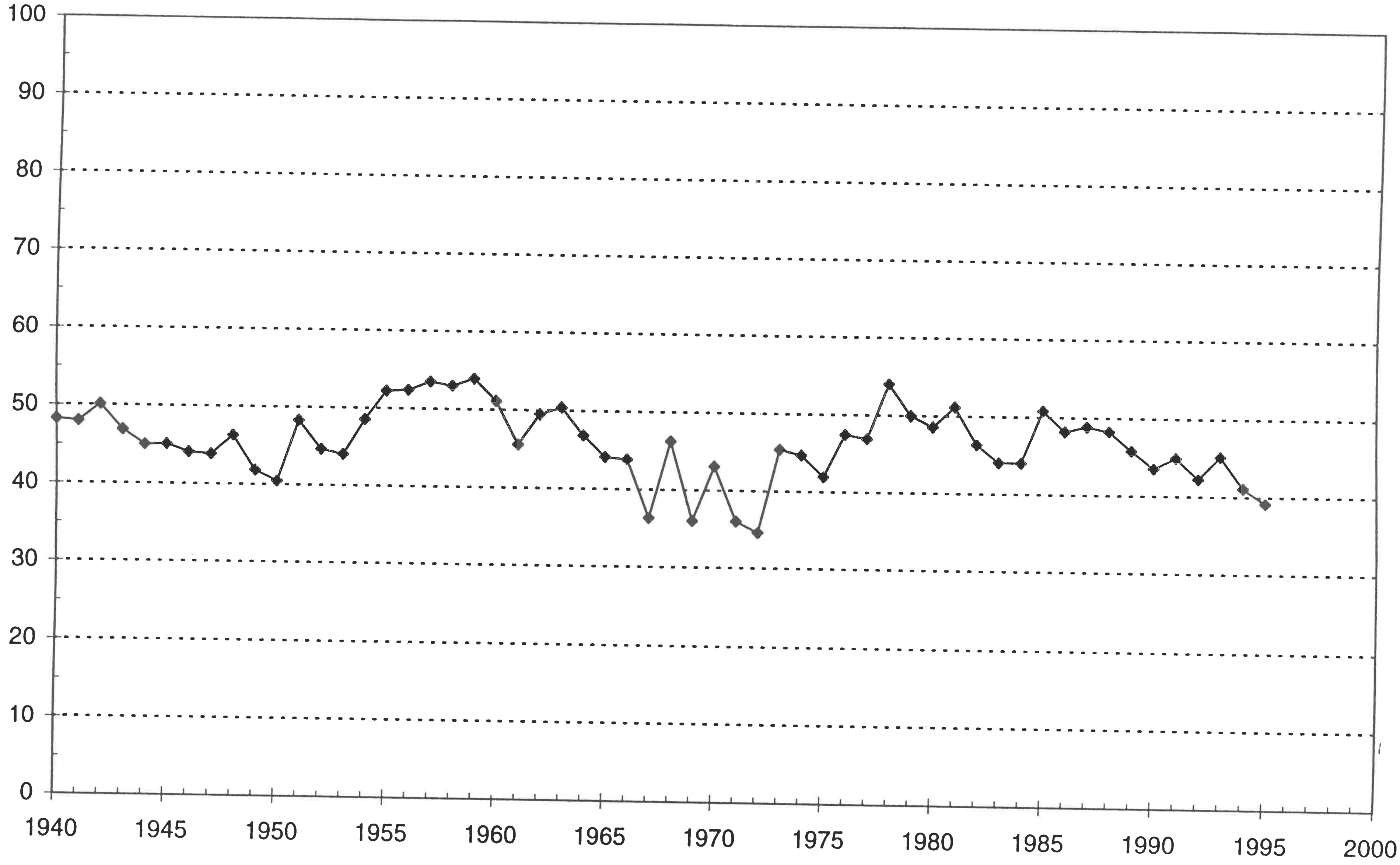

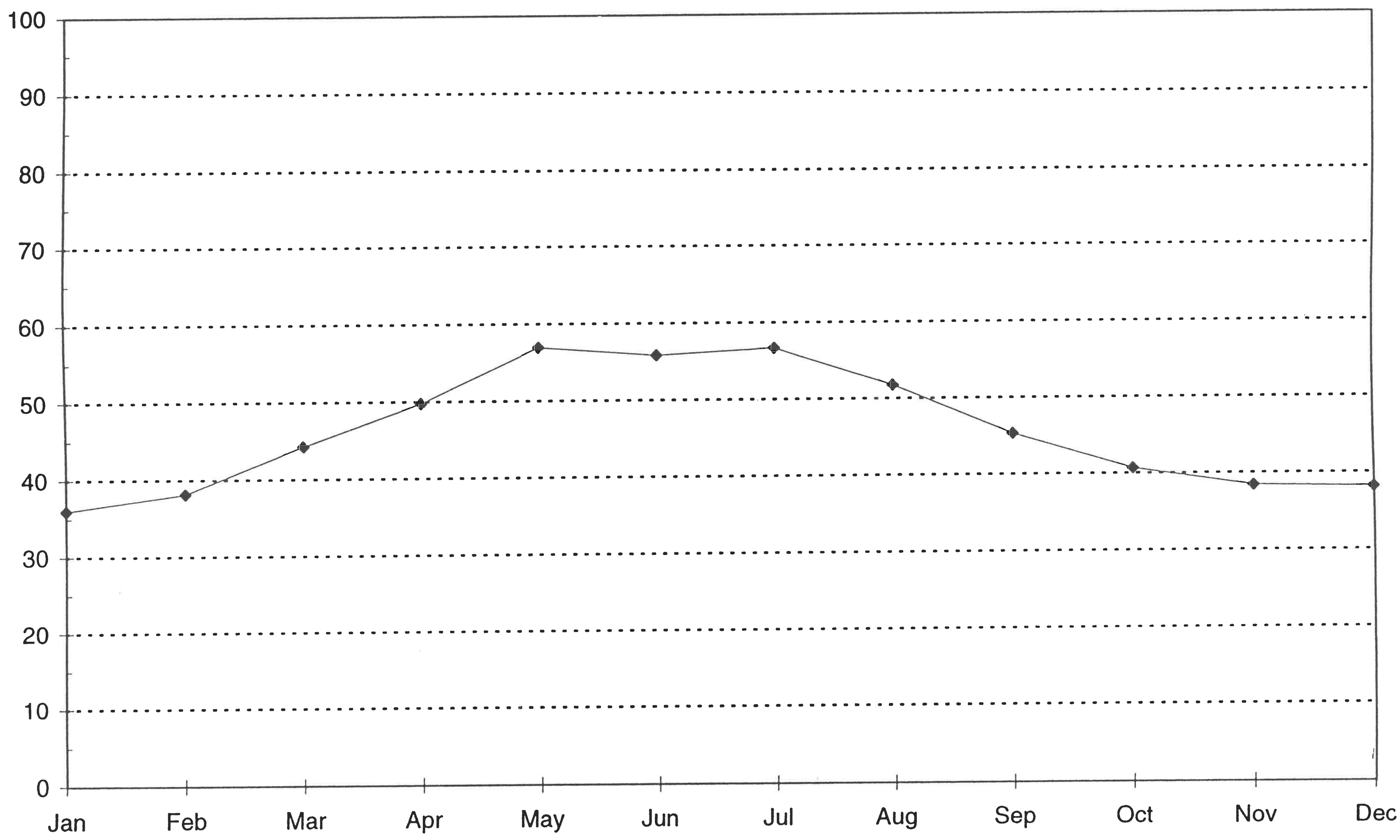
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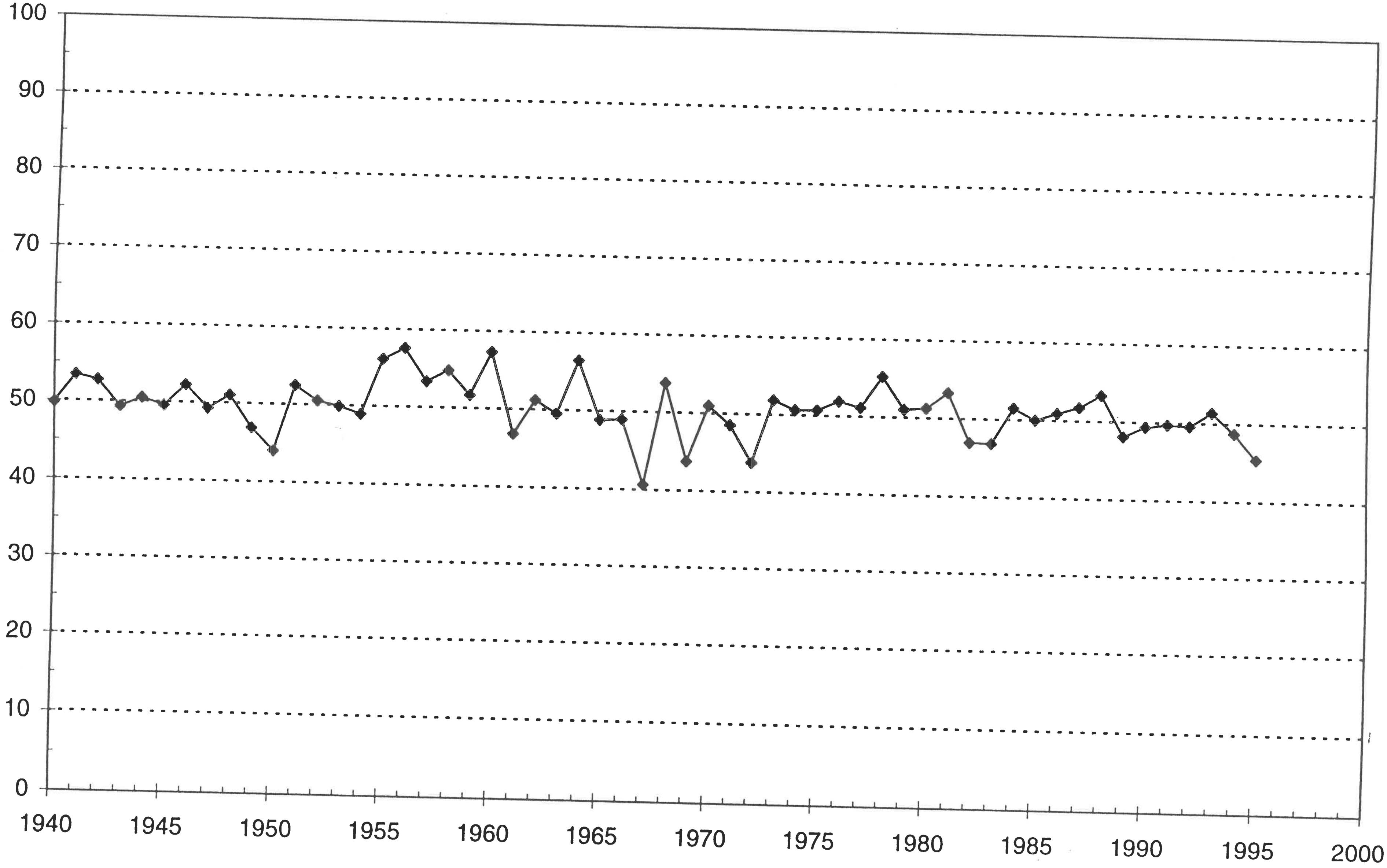
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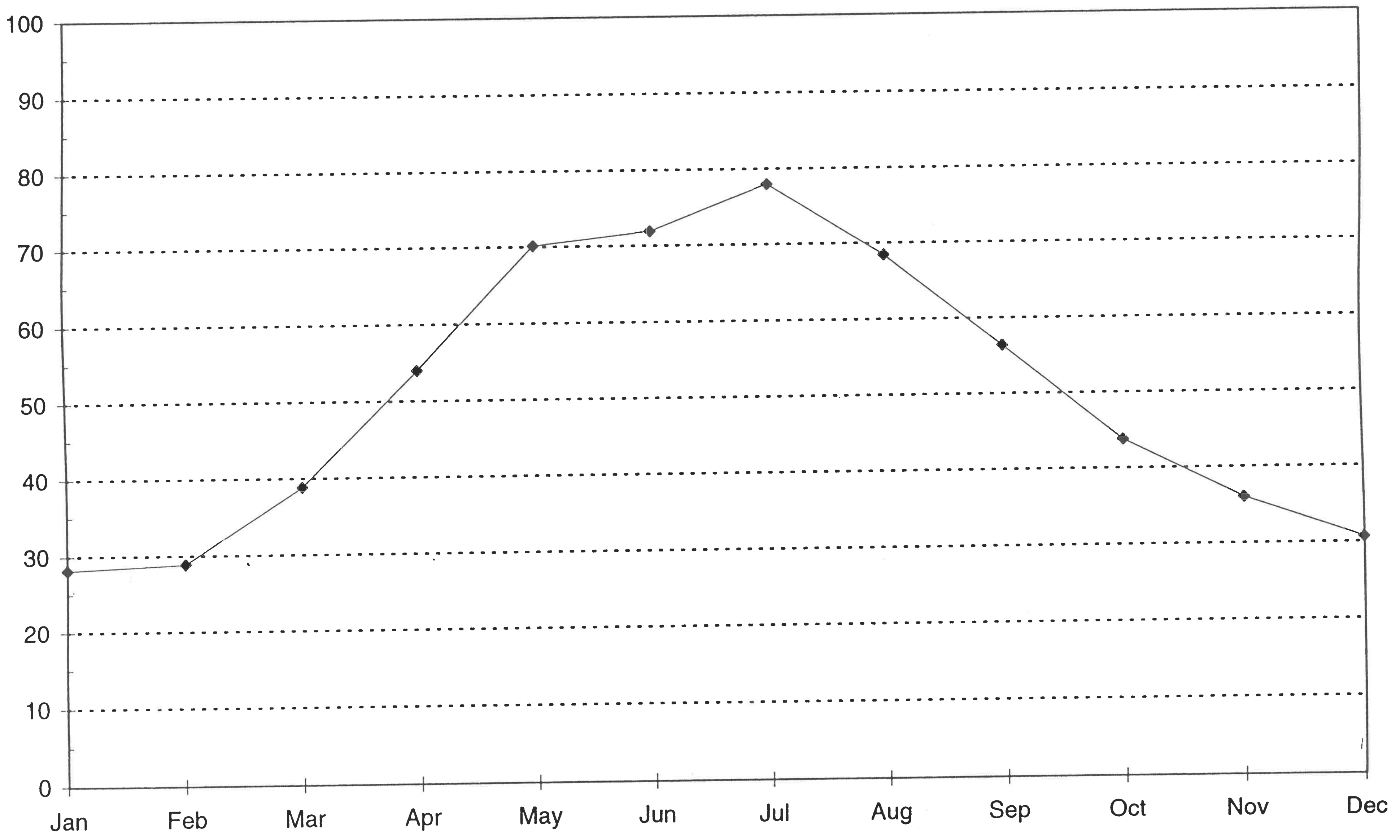
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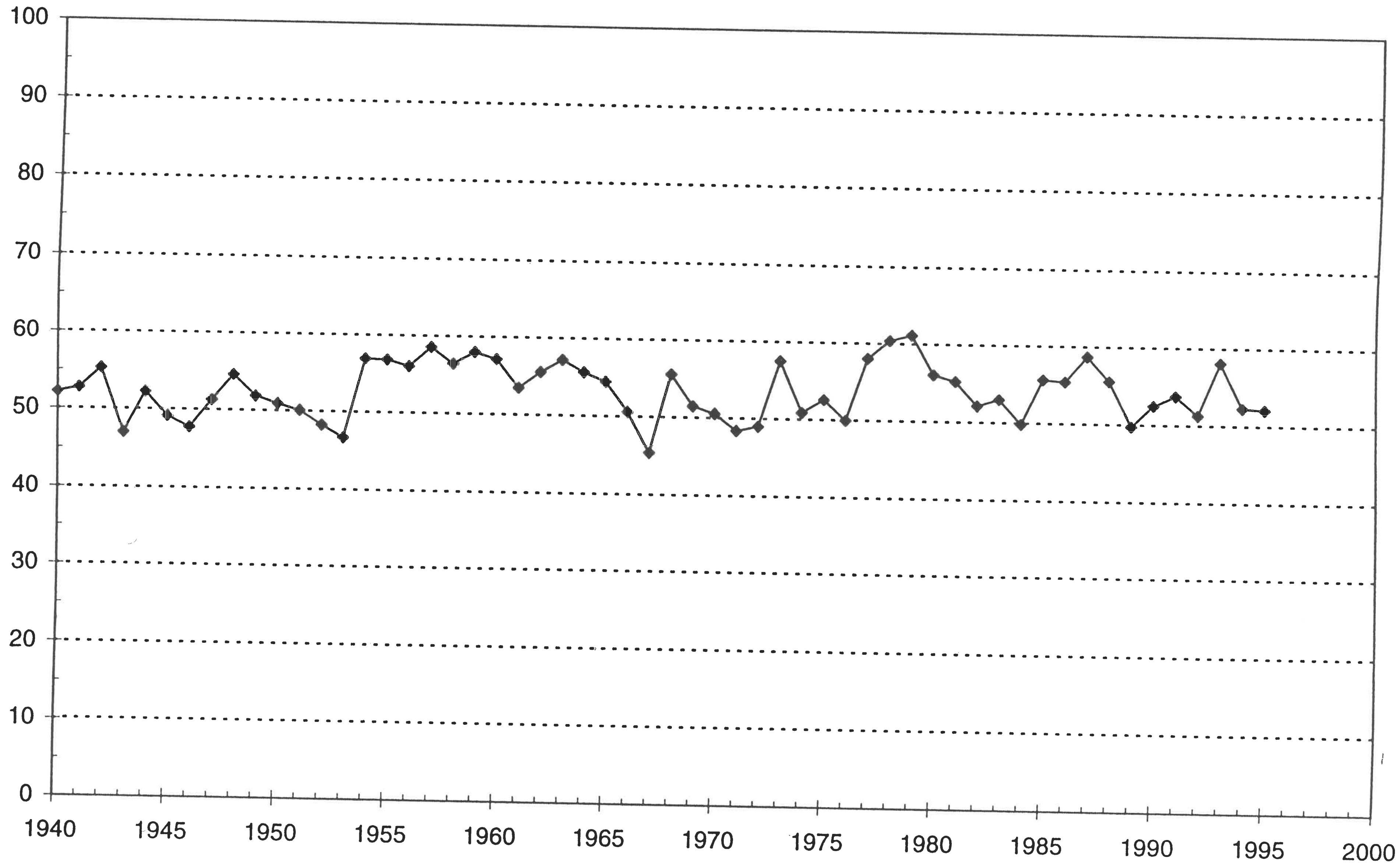
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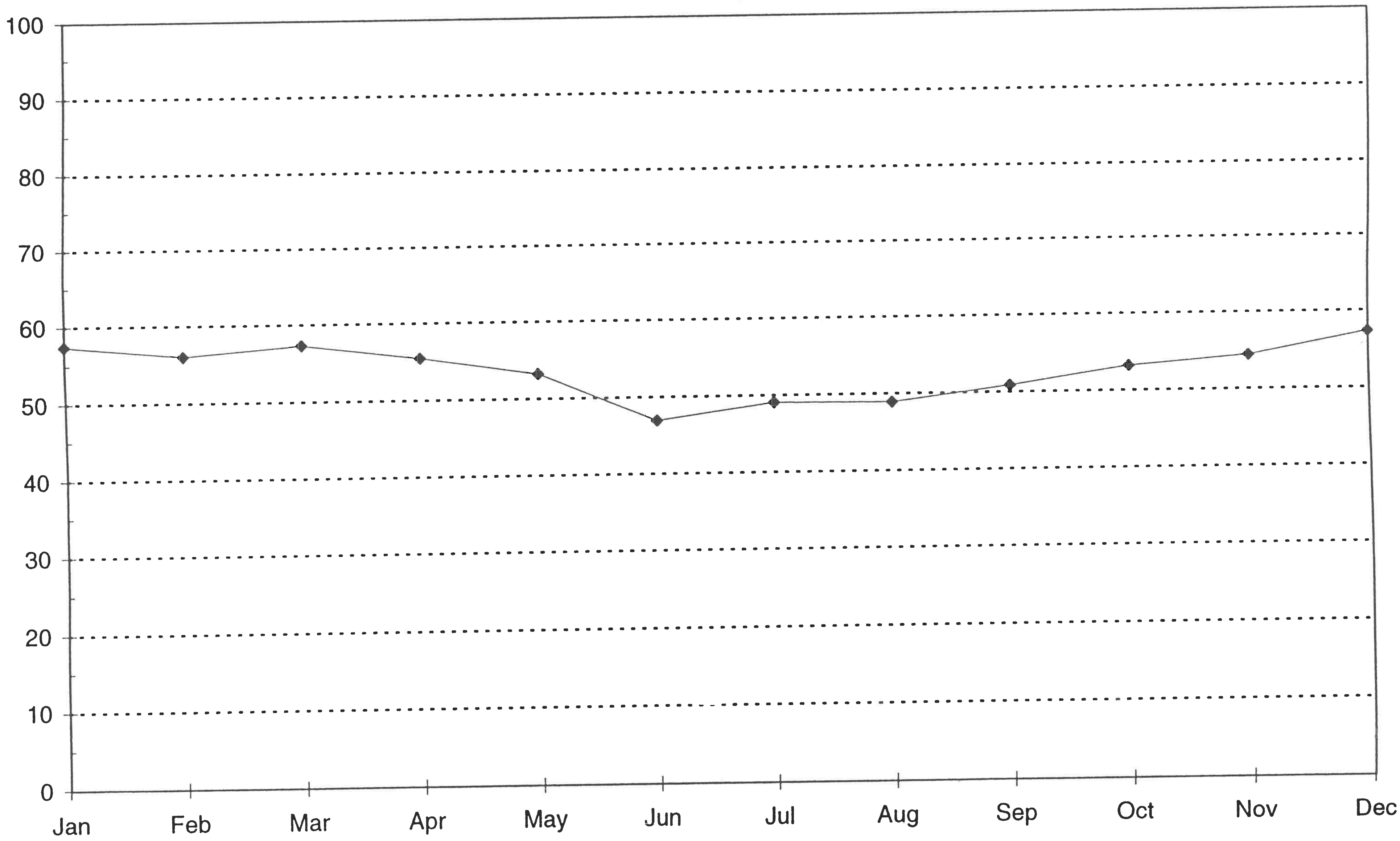

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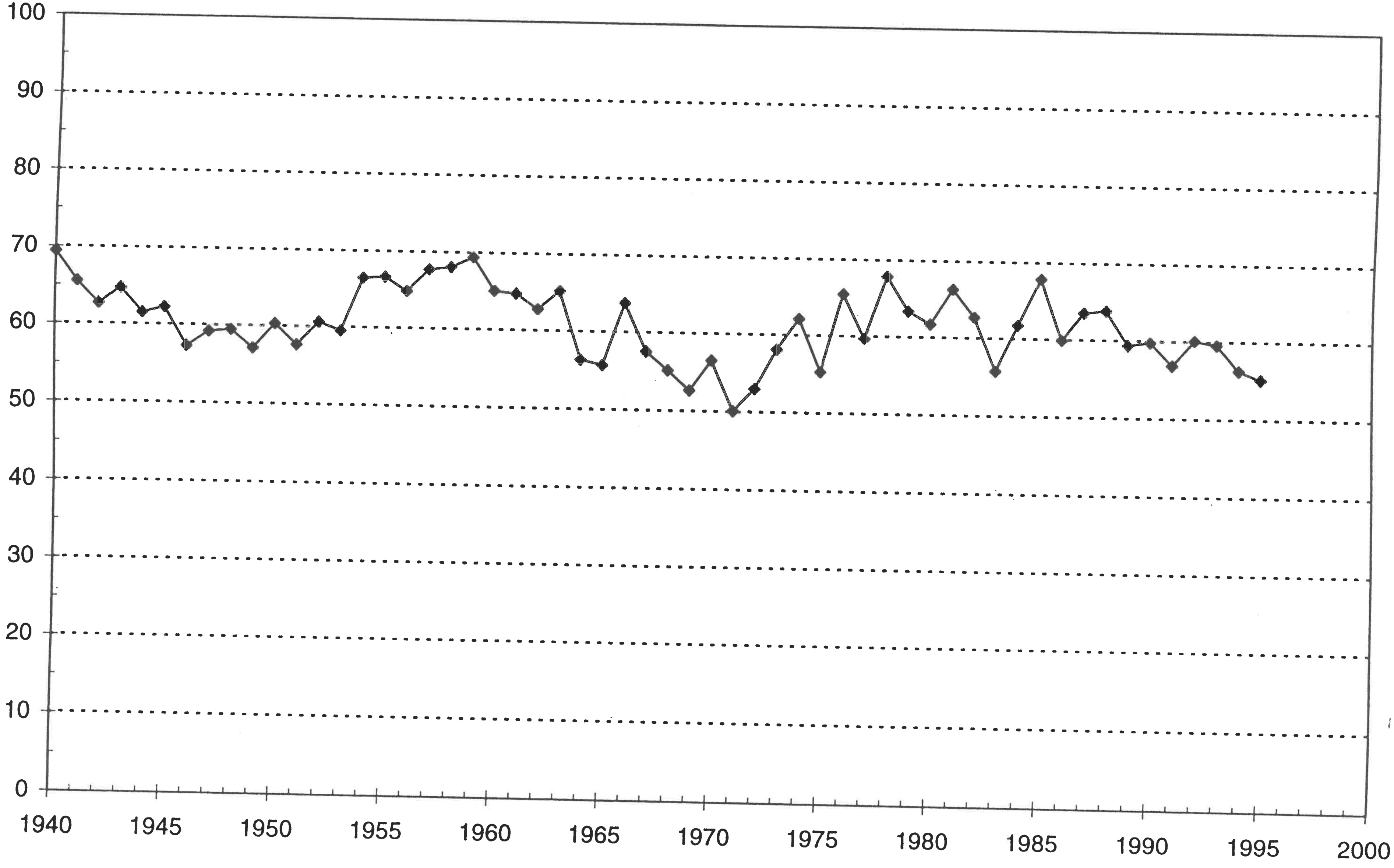

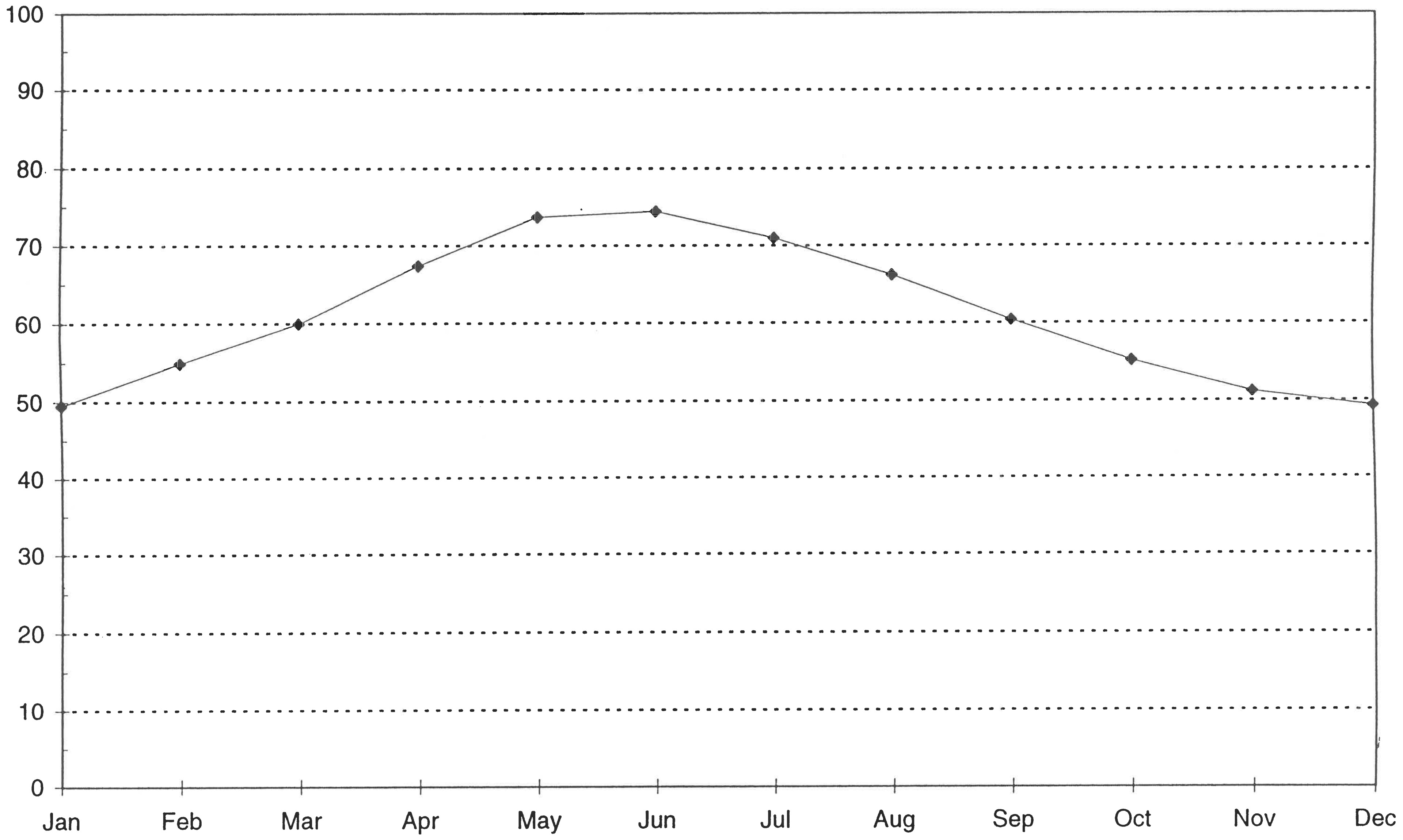
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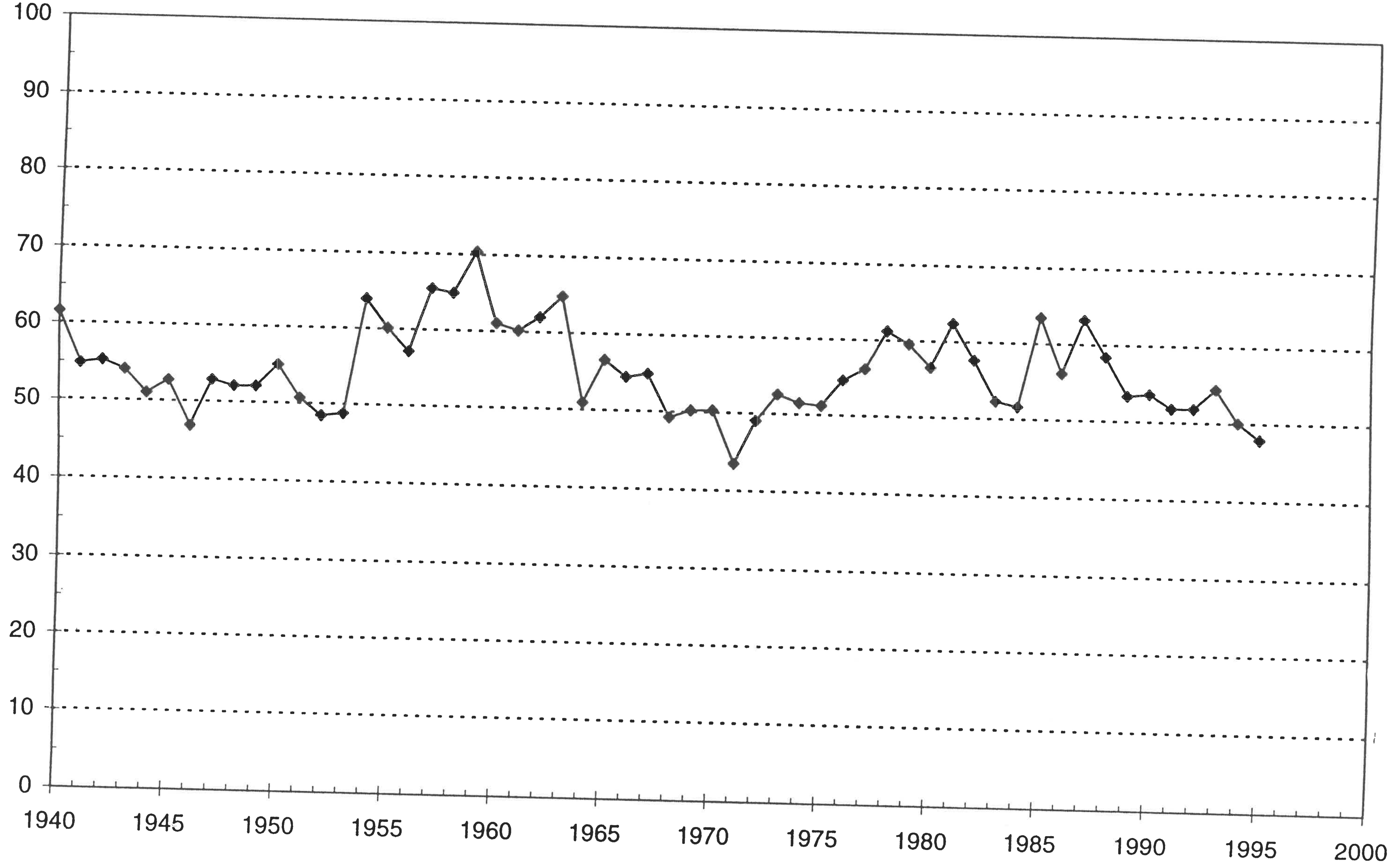
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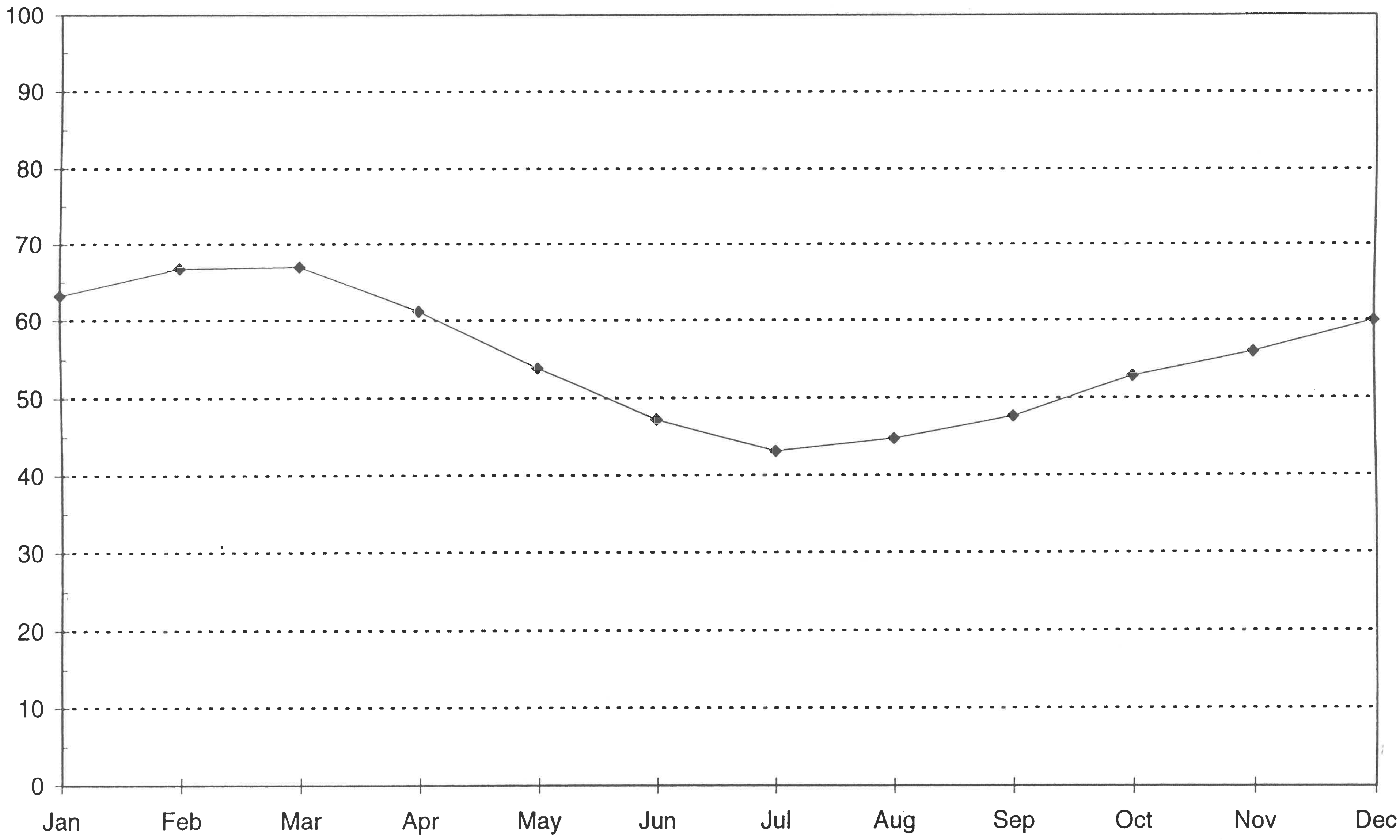


SYDNEY5A.XLC

9/10/96

Appendix 9

Single track analyses

Appendix : Single Track Analysis
Population Exposed to 70 dBA or more

Mode: 1
Departures on Runway: 16R
Arrivals on Runway: 34L

Rwy	Departure Route	B747/400	No. People >= 70dBA	B747/200	No. People >= 70dBA	B767	No. People >= 70dBA	B737	No. People >= 70dBA	SAAB 340	No. People >= 70dBA
16R	North	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	East	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	South	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	West	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	North-west	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
34L	Arrivals	Yes	700	Yes	700	Yes	0	Yes	0	Yes	0

Mode: 2
Departures on Runway: 16R
Arrivals on Runway: 34R 16R (HEAVY)

Rwy	Departure Route	B747/ 400	No. People >= 70dBA	B747/ 200	No. People >= 70dBA	B767	No. People >= 70dBA	B737	No. People >= 70dBA	SAAB 340	No. People >= 70dBA
16R	North	Yes	25,900	Yes	40,200	Yes	18,800	Yes	0	Yes	0
	East	Yes	25,900	Yes	40,200	Yes	18,800	Yes	0	Yes	0
	South	Yes	26,100	Yes	40,400	Yes	18,800	Yes	0	Yes	0
	West	Yes	26,100	Yes	40,400	Yes	18,800	Yes	0	Yes	0
	North-west	Yes	26,100	Yes	40,400	Yes	18,800	Yes	0	Yes	0
34R	Arrivals	No	N/A	No	N/A	Yes	700	Yes	700	Yes	0
16R	Arrivals	Yes	96,400	Yes	134,400	Yes	50,100	Yes	33,800	Yes	8900

Mode: 3
Departures on Runway: 16L 34L(HEAVY)
Arrivals on Runway: 34L

Rwy	Departure Route	B747/400	No. People >= 70dBA	B747/200	No. People >= 70dBA	B767	No. People >= 70dBA	B737	No. People >= 70dBA	SAAB 340	No. People >= 70dBA
16L	North	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	East	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	South	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	West	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	North-west	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0		
34L	North	Yes	177,900	Yes	238,000	No	N/A	No	N/A	No	N/A
	East	Yes	182,000	Yes	251,600	No	N/A	No	N/A	No	N/A
	South	Yes	178,900	Yes	244,200	No	N/A	No	N/A	No	N/A
	West	Yes	205,100	Yes	270,200	No	N/A	No	N/A	No	N/A
	North-west	Yes	188,800	Yes	259,200	No	N/A	No	N/A		
34L	Arrivals	Yes	700	Yes	700	Yes	0	Yes	0	Yes	0

Mode: 4
Departures on Runway: 16L 16R (Heavy)
Arrivals on Runway: 34L

Rwy	Departure Route	B747/400	No. People >= 70dBA	B747/200	No. People >= 70dBA	B767	No. People >= 70dBA	B737	No. People >= 70dBA	SAAB 340	No. People >= 70dBA
16L	North	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	East	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	South	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	West	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	North-west	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
16R	North	Yes	1,000	Yes	4,000	No	N/A	No	N/A	No	N/A
	East	Yes	1,000	Yes	4,000	No	N/A	No	N/A	No	N/A
	South	Yes	1,000	Yes	4,000	No	N/A	No	N/A	No	N/A
	West	Yes	1,000	Yes	4,000	No	N/A	No	N/A	No	N/A
	North-west	Yes	1,000	Yes	4,000	No	N/A	No	N/A	No	N/A
34L	Arrivals	Yes	700	Yes	700	Yes	0	Yes	0	Yes	0

Mode: 5
Departures on Runway: 16L&16R
Arrivals on Runway: 25 (16R Heavy)

Rwy	Departure Route	B747/ 400	No. People >= 70dBA	B747/ 200	No. People >= 70dBA	B767	No. People >= 70dBA	B737	No. People >= 70dBA	SAAB 340	No. People >= 70dBA
16L	North	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	East	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	South	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	West	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	North-west	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
16R	North	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	East	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	South	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	West	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	North-west	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
25	Arrivals	Yes	39,300	Yes	44,200	Yes	27,300	Yes	20,400	Yes	7,400
16R	Arrivals	Yes	96,400	Yes	134,400	Yes	50,100	Yes	33,800	Yes	8,900

Mode: 6
Departures on Runway: 07 34L (Heavy)
Arrivals on Runway: 34L & 34R

Rwy	Departure Route	B747/ 400	No. People >= 70dBA	B747/ 200	No. People >= 70dBA	B767	No. People >= 70dBA	B737	No. People >= 70dBA	SAAB 340	No. People >= 70dBA
07	North	Yes	81,700	Yes	105,800	Yes	62,500	Yes	28,500	Yes	4,600
	North (Early)	Yes	119,200	Yes	158,000	Yes	94,100	Yes	35,500	No	N/A
	East	Yes	81,700	Yes	105,800	Yes	62,500	Yes	28,500	Yes	4,600
	South	Yes	81,700	Yes	105,800	Yes	62,500	Yes	28,500	Yes	4,600
	West	Yes	81,700	Yes	105,800	Yes	62,500	Yes	28,500	Yes	4,600
	North-west	Yes	81,700	Yes	105,800	Yes	62,500	Yes	28,500	Yes	4,600
34L	North	Yes	177,900	Yes	238,000	No	N/A	No	N/A	No	N/A
	East	Yes	182,000	Yes	251,600	No	N/A	No	N/A	No	N/A
	South	Yes	178,900	Yes	244,200	No	N/A	No	N/A	No	N/A
	West	Yes	205,100	Yes	270,200	No	N/A	No	N/A	No	N/A
	North-west	Yes	188,800	Yes	259,200	No	N/A	No	N/A	No	N/A
34L	Arrivals	Yes	700	Yes	700	Yes	0	Yes	0	Yes	0
34R	Arrivals	No	N/A	No	N/A	Yes	700	Yes	700	Yes	0

Mode: 7

Departures on Runway: **25** 34L (Heavy)

Arrivals on Runway: **34R** 34L (Heavy)

Rwy	Departure Route	B747/400	No. People >= 70dBA	B747/200	No. People >= 70dBA	B767	No. People >= 70dBA	B737	No. People >= 70dBA	SAAB 340	No. People >= 70dBA
25	North	Yes	167,900	Yes	234,600	Yes	125,700	Yes	42,400	Yes	2,800
	East	Yes	175,000	Yes	273,500	Yes	125,200	Yes	42,400	Yes	Not Assessed
	South	Yes	141,100	Yes	180,200	Yes	112,000	Yes	45,400	Yes	2,800
	West	Yes	147,300	Yes	241,300	Yes	116,000	Yes	44,900	Yes	2,800
	North-west	Yes	184,100	Yes	282,500	Yes	131,800	Yes	44,200	Yes	3,300
	North-west (Early)	Yes	157,900	Yes	234,400	Yes	113,100	Yes	37,400	No	N/A
34L	North	Yes	177,900	Yes	238,000	No	N/A	No	N/A	No	N/A
	East	Yes	182,000	Yes	251,600	No	N/A	No	N/A	No	N/A
	South	Yes	178,900	Yes	244,200	No	N/A	No	N/A	No	N/A
	West	Yes	205,100	Yes	270,200	No	N/A	No	N/A	No	N/A
	North-west	Yes	188,800	Yes	259,200	No	N/A	No	N/A	No	N/A
34R	Arrivals	No	N/A	No	N/A	Yes	700	Yes	700	Yes	0
34L	Arrivals	Yes	700	Yes	700	Yes	0	Yes	0	Yes	0

Mode: 8

Departures on Runway: **25 & 34R** 34L (Heavy)

Arrivals on Runway: **34L & 34R**

Rwy	Departure Route	B747/400	No. People >= 70dBA	B747/200	No. People >= 70dBA	B767	No. People >= 70dBA	B737	No. People >= 70dBA	SAAB 340	No. People >= 70dBA
25	North	Yes	167,900	Yes	234,600	Yes	125,700	Yes	42,400	Yes	2,800
	East	Yes	175,000	Yes	273,500	Yes	125,200	Yes	42,400	Yes	Not Assessed
	South	Yes	141,100	Yes	180,200	Yes	112,000	Yes	45,400	Yes	2,800
	West	Yes	147,300	Yes	241,300	Yes	116,000	Yes	44,900	Yes	2,800
	North-west	Yes	184,100	Yes	282,500	Yes	131,800	Yes	44,200	Yes	3,300
	North-west (Early)	Yes	157,900	Yes	234,400	Yes	113,100	Yes	37,400	No	N/A
34R	North	No	N/A	No	N/A	Yes	64,600	Yes	38,800	Yes	600
	North (Early)	No	N/A	No	N/A	Yes	86,600	Yes	22,300	No	N/A
	East	No	N/A	No	N/A	No	N/A	No	N/A	No	N/A
	South	No	N/A	No	N/A	Yes	64,600	Yes	38,800	No	N/A
	West	No	N/A	No	N/A	No	N/A	No	N/A	No	N/A
	Norht-west	No	N/A	No	N/A	No	N/A	No	N/A	No	N/A
34L	North	Yes	177,900	Yes	238,000	No	N/A	No	N/A	No	N/A
	East	Yes	182,000	Yes	251,600	No	N/A	No	N/A	No	N/A
	South	Yes	178,900	Yes	244,200	No	N/A	No	N/A	No	N/A
	West	Yes	205,100	Yes	270,200	No	N/A	No	N/A	No	N/A
	North-west	Yes	188,800	Yes	259,200	No	N/A	No	N/A	No	N/A
34L	Arrivals	Yes	700	Yes	700	Yes	0	Yes	0	Yes	0
34R	Arrivals	No	N/A	No	N/A	Yes	700	Yes	700	Yes	0

Mode: 9
Departures on Runway: **34R & 34L**
Arrivals on Runway: **34R & 34L**

Rwy	Departure Route	B747/400	No. People >= 70dBA	B747/200	No. People >= 70dBA	B767	No. People >= 70dBA	B737	No. People >= 70dBA	SAAB 340	No. People >= 70dBA
34R	North	No	N/A	No	N/A	Yes	64,600	Yes	38,800	Yes	600
	North (Early)	No	N/A	No	N/A	Yes	86,600	Yes	22,300	No	N/A
	East	No	N/A	No	N/A	No	N/A	No	N/A	No	N/A
	South	No	N/A	No	N/A	Yes	64,600	Yes	38,800	No	N/A
	West	No	N/A	No	N/A	No	N/A	No	N/A	No	N/A
	North-west	No	N/A	No	N/A	No	N/A	No	N/A	No	N/A
34L	North	Yes	177,900	Yes	238,000	No	N/A	No	N/A	No	N/A
	East	Yes	178,900	Yes	244,200	Yes	110,200	Yes	43,500	Yes	Not Assessed
	South	Yes	205,100	Yes	270,200	No	N/A	No	N/A	Yes	12,100
	West	Yes	188,800	Yes	259,200	Yes	103,500	Yes	38,900	Yes	10,300
	North-west	Yes	178,200	Yes	252,400	Yes	109,400	Yes	40,400	Yes	10,200
34R	Arrivals	No	N/A	No	N/A	Yes	700	Yes	700	Yes	0
34L	Arrivals	Yes	700	Yes	700	Yes	0	Yes	0	Yes	0

Mode: **10**
Departures on Runway: **16L & 16R**
Arrivals on Runway: **16L & 16R**

Rwy	Departure Route	B747/400	No. People >= 70dBA	B747/200	No. People >= 70dBA	B767	No. People >= 70dBA	B737	No. People >= 70dBA	SAAB 340	No. People >= 70dBA
16L	**North**	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	East	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	South	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	West	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	North-west	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
16R	**North**	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	East	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	South	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	West	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	North-west	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
16L	**Arrivals**	No	N/A	No	N/A	Yes	46,000	Yes	29,200	Yes	5,100
16R	**Arrivals**	Yes	96,400	Yes	134,400	Yes	50,100	Yes	33,800	Yes	8,900

Mode: **11**
Departures on Runway: **16L & 16R**
Arrivals on Runway: **07, 16L & 16R**

Rwy	Departure Route	B747/ 400	No. People >= 70dBA	B747/ 200	No. People >= 70dBA	B767	No. People >= 70dBA	B737	No. People >= 70dBA	SAAB 340	No. People >= 70dBA
16L	North	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	East	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	South	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	West	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	North-west	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
16R	North	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	East	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	South	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	West	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	North-west	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
07	Arrivals	Yes	62,300	Yes	72,600	Yes	46,300	Yes	32,000	Yes	11,800
16L	Arrivals	No	N/A	No	N/A	Yes	46,000	Yes	29,200	Yes	5,100
16R	Arrivals	Yes	96,400	Yes	134,400	Yes	50,100	Yes	33,800	Yes	8,900

Mode: **12**
Departures on Runway: **07**
Arrivals on Runway: **07**

Rwy	Departure Route	B747/ 400	No. People >= 70dBA	B747/ 200	No. People >= 70dBA	B767	No. People >= 70dBA	B737	No. People >= 70dBA	SAAB 340	No. People >= 70dBA
07	North	Yes	81,700	Yes	105,800	Yes	62,500	Yes	28,500	Yes	4,600
	North (Early)	Yes	119,200	Yes	158,000	Yes	94,100	Yes	35,500	No	N/A
	East	Yes	81,700	Yes	105,800	Yes	62,500	Yes	28,500	Yes	4,600
	South	Yes	81,700	Yes	105,800	Yes	62,500	Yes	28,500	Yes	4,600
	West	Yes	81,700	Yes	105,800	Yes	62,500	Yes	28,500	Yes	4,600
	North-west	Yes	81,700	Yes	105,800	Yes	62,500	Yes	28,500	Yes	4,600
07	Arrivals	Yes	62,300	Yes	72,600	Yes	46,300	Yes	32,000	Yes	11,800

Mode: **13**
Departures on Runway: **25**
Arrivals on Runway: **25**

Rwy	Departure Route	B747/ 400	No. People >= 70dBA	B747/ 200	No. People >= 70dBA	B767	No. People >= 70dBA	B737	No. People >= 70dBA	SAAB 340	No. People >= 70dBA
25	**North**	Yes	167,900	Yes	234,600	Yes	125,700	Yes	42,400	Yes	2,800
	East	Yes	175,000	Yes	273,500	Yes	125,200	Yes	42,400	Yes	Not Assessed
	South	Yes	141,100	Yes	180,200	Yes	112,000	Yes	45,400	Yes	2,800
	West	Yes	147,300	Yes	241,300	Yes	116,000	Yes	44,900	Yes	2,800
	North-west	Yes	184,100	Yes	282,500	Yes	131,800	Yes	44,200	Yes	3,300
	North-west (Early	Yes	157,900	Yes	234,400	Yes	113,100	Yes	37,400	No	N/A
25	**Arrivals**	Yes	39,300	Yes	44,200	Yes	27,300	Yes	20,400	Yes	7,400

Mode: **14A**
Departures on Runway: **16L &16R**
Arrivals on Runway: **16R & 07**

Rwy	Departure Route	B747/ 400	No. People >= 70dBA	B747/ 200	No. People >= 70dBA	B767	No. People >= 70dBA	B737	No. People >= 70dBA	SAAB 340	No. People >= 70dBA
16L	**North**	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	East	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	South	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	West	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
	North-west	Yes	2,500	Yes	5,800	Yes	2,300	Yes	0	Yes	0
16R	**North**	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	East	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	South	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	West	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
	North-west	Yes	1,000	Yes	4,000	Yes	1,000	Yes	0	Yes	0
16R	**Arrivals**	Yes	96,400	Yes	134,400	Yes	50,100	Yes	33,800	Yes	8,900
07	**Arrivals**	Yes	62,300	Yes	72,600	Yes	46,300	Yes	32,000	Yes	11,800

Mode: **15**
Departures on Runway: **34R** 34L (Heavy)
Arrivals on Runway: **34L**

Rwy	Departure Route	B747/ 400	No. People >= 70dBA	B747/ 200	No. People >= 70dBA	B767	No. People >= 70dBA	B737	No. People >= 70dBA	SAAB 340	No. People >= 70dBA
34R	North	No	N/A	No	N/A	Yes	64,600	Yes	38,800	Yes	600
	North (Early)	No	N/A	No	N/A	Yes	86,600	Yes	22,300	No	N/A
	East	No	N/A	No	N/A	Yes	64,600	Yes	38,800	Yes	600
	South	No	N/A	No	N/A	Yes	64,600	Yes	38,800	Yes	600
	West	No	N/A	No	N/A	Yes	64,600	Yes	38,800	Yes	600
	North-west	No	N/A	No	N/A	Yes	64,600	Yes	38,800	Yes	600
34L	North	Yes	177,900	Yes	238,000	No	N/A	No	N/A	No	N/A
	East	Yes	182,000	Yes	251,600	No	N/A	No	N/A	No	N/A
	South	Yes	178,900	Yes	244,200	No	N/A	No	N/A	No	N/A
	West	Yes	205,100	Yes	270,200	No	N/A	No	N/A	No	N/A
	North-west	Yes	188,800	Yes	259,200	No	N/A	No	N/A	No	N/A
34L	Arrivals	Yes	700	Yes	700	Yes	0	Yes	0	Yes	0

Mode: 16

Departures on Runway: 34L

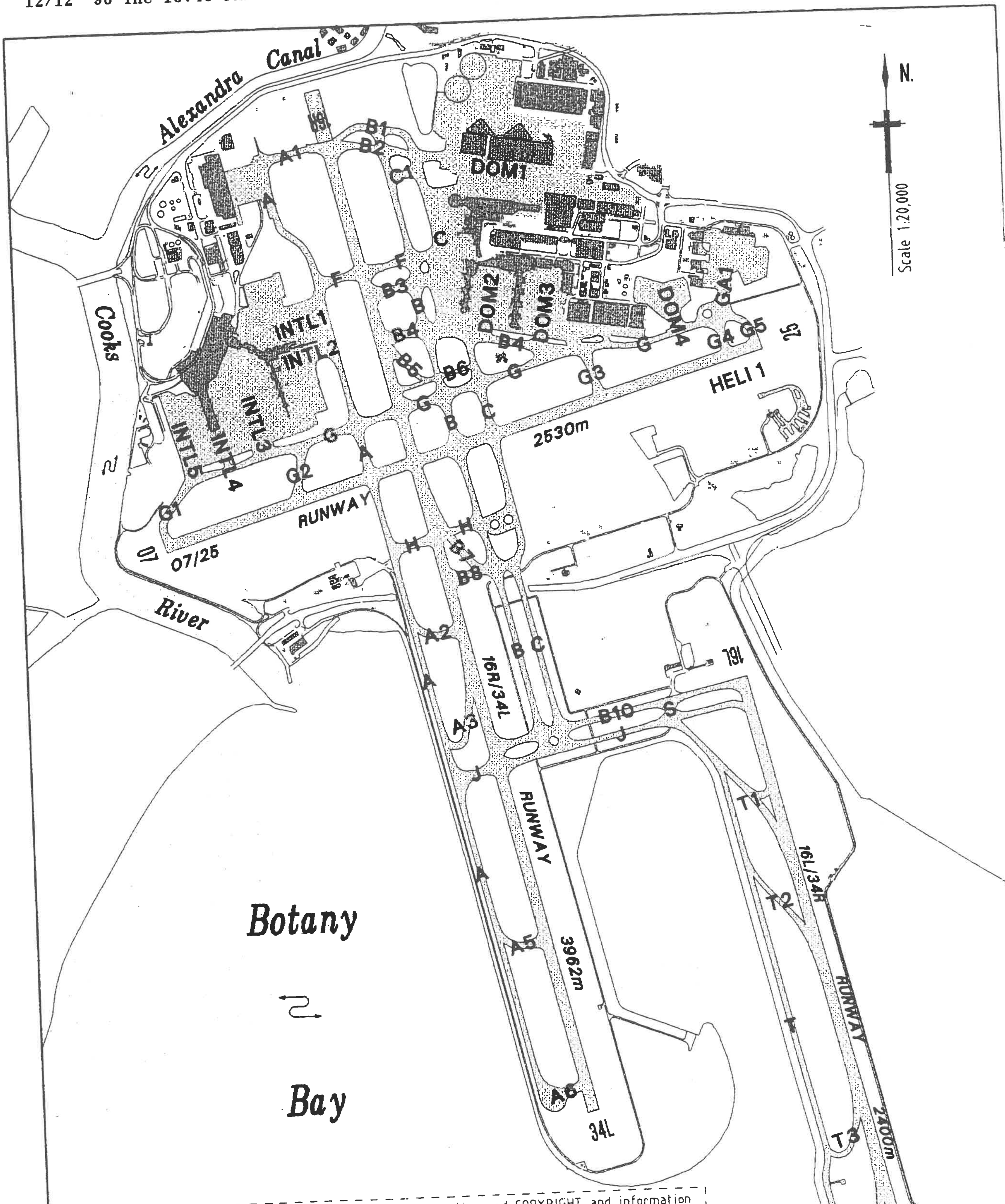
Arrivals on Runway: 34R

34L (Heavy)

Rwy	Departure Route	B747/ 400	No. People >= 70dBA	B747/ 200	No. People >= 70dBA	B767	No. People >= 70dBA	B737	No. People >= 70dBA	SAAB 340	No. People >= 70dBA
34L	North	Yes	177,900	Yes	238,000	Yes	110,200	Yes	43,500	Yes	8,600
	East	Yes	178,900	Yes	244,200	Yes	110,200	Yes	43,500	Yes	Not Assessed
	South	Yes	205,100	Yes	270,200	Yes	123,000	Yes	38,900	Yes	12,100
	West	Yes	188,800	Yes	259,200	Yes	103,500	Yes	38,900	Yes	10,300
	North-west	Yes	178,200	Yes	252,400	Yes	109,400	Yes	40,400	Yes	10,200
34R	Arrivals	No	N/A	No	N/A	Yes	700	Yes	700	Yes	0
34L	Arrivals	Yes	700	Yes	700	Yes	0	Yes	0	Yes	0

Appendix 10

FAC Airport diagram



ORDER	DRAWN	CHKD	AMENDMENTS	EXAMD	APPD	DATE	No
—	GWS						1

SYDNEY (KINGSFORD SMITH) AIRPORT FIELD LAYOUT

FAC Federal Airports Corporation
sydney airport

SCALE	1:20,000
DRAWING No	FSS 161
SHEET	4
	A4

Appendix 11

SACF Report on public consultation

REPORT ON COMMUNITY CONSULTATION ON THE LONG TERM OPERATING PLAN FOR SYDNEY AIRPORT

NOVEMBER 1996

Introduction

The Sydney Airport Community Forum (SACF) held, in association with Airservices Australia, six public meetings to enable affected communities to provide input on the draft long term operating plan being developed by the Airservices Australia Task Force.

The meetings were widely publicised and people encouraged to attend meetings and/or provide comments direct to the SACF Secretariat.

At the meetings, Airservices Australia made presentations on the possible flightpaths and runway usage patterns which are being considered for implementation. Kits of information were also provided at the meetings. There was opportunity for the public to ask questions and present ideas and concerns to the Task Force.

As well as the public meetings, comments and questions were received by way of written submissions and telephone on the Secretariat 1800 number. The Secretariat has logged the questions and comments on a data base. The Secretariat has also provided the technical questions to Airservices Australia for response. Separate documents are available which provide:

- details of the public meetings, including comments and questions raised
- details of all comments and questions provided in writing and on the telephone; and
- technical questions provided to Airservices Australia for response.

Summary of issues raised during the community consultation process

A number of issues were raised that related to the concept of **"equitably sharing the noise"**. These included:

- the need to specify whether the sharing of the noise is to be based on aircraft movements or on a composite measure of noise (which also takes into account factors such as aircraft type, height of overflight, time of day, etc.)
- a view that maximising movements to the south (ie. at least 55%), although the most direct way to pass over water, did not constitute an equitable share for the affected community in Kurnell

- take-offs were of greater concern to residents close to the airport while landings were of greater concern to residents further from the airport

- concerns that some suburbs were potentially affected by flightpaths associated with a significant number of the modes (as well as, in some cases, flightpaths over Bankstown)

- concerns that the effectiveness of any attempt to equitably share the noise would diminish with the continuing growth of traffic; and

- a view that more detailed information needed to be provided about numbers, types, and heights of overflights.

The need for **respite** and how this will be achieved was often raised. In particular, there were requests for:

- operational arrangements which (subject to weather) would allow the community to know well in advance the planned usage of modes for given days/time periods; and

- arrangements for easy access to daily information on conditions likely to affect usage of modes.

The inclusion of mode 6 within the set of ten preferred modes was sought as a means of providing additional respite to the north. On the other hand, the possible inclusion of mode 2 within the ten preferred modes was strongly opposed by communities to the south of the airport.

Safety issues associated with separation standards, crossing runways, and overflights of hazardous locations were raised. Efficiency considerations in relation to different modes were also raised. So too were air pollution and associated health impacts.

<u>Issues of an operational nature</u>

Suggestions were made on changes to flightpaths that will assist in meeting the Task Force's objectives including:

- flightpaths over non residential areas to the south of Sydney to provide relief to more populous areas

- adjustments so that the same tracks are not used for runway 34R and runway 07 departures and runway 25 arrivals

- the introduction of curved flightpaths on departure from runway 16R to take aircraft further away from Cronulla

- aircraft tracking further out to sea when departing from runway 07 before turning and coming back over land

- departures from runway 34L making a later easterly turn further north of the metropolitan area

- curved arrivals on to runway 34R to mitigate the impact on Kurnell

- the proposed closure of the West Pymble beacon; and

- further refinement of the trident proposal to maximise equity of noise distribution.

Other operational measures proposed as a means of mitigating noise were:

- ensuring that the long runway is only used by aircraft which have a clear operational requirement

- considering the use of ICAO A take-off procedures for departures to the west, south and east (off runway 07); and

- encouraging "cleaner" landings.

A number of queries were raised about the relationship with propeller aircraft flightpaths and the need for these to be described in the report. Flightpaths of aircraft using Bankstown during the curfew period at KSA were also a matter of concern.

<u>Issues relating to implementation</u>

There was a widely held concern that a system be put in place that guaranteed that any decisions on the plan were given proper effect and that Airservices be appropriately accountable for implementation.

The need for continuing co-operation with the military over use of airspace to improve the ability to direct aircraft over water and non residential areas was highlighted.

It was noted that the community should continue to have an ongoing input into the implementation and monitoring of the operating plan.

There was widespread scepticism about the noise levels attributed to given aircraft compared with what the community believed was currently the case. Comments were made that, with the current arrangements, planes appear to be flying lower than previously. As a result, there were a number of calls for a more extensive program of noise monitoring to assess the impact of the plan and to validate the modelled noise contours.

Some calls were made for a guarantee that aircraft would stay within designated flightpaths and that there should be penalties for aircraft straying outside prescribed corridors. There were other calls to have flexible flightpaths.

Issues of further process

The form of community consultation to be undertaken after the Airservices Australia report is provided to the Minister on 16 December 1996 was queried.

There was also concern about the process and factors to be considered in assessing environmental impacts of the proposed plan before it is put into effect.

Related policy issues (outside terms of reference)

There was overwhelming support for the current Sydney Airport curfew to remain.

There was overwhelming support for Sydney Airport aircraft movements to be capped at 80 or less per hour.

Many comments were made that the only solutions to the Sydney Airport noise issue were either to close the airport and/or to build a second airport outside the Sydney Basin.

Concerns were raised about the adequacy of the regulatory controls over future private airport lessees to ensure that noise issues will be adequately addressed.

Eligibility for the insulation program after the long term operating plan has been implemented will need to be considered.

General observations

The public at times found it difficult to accept that the meetings were presenting a proposed long term operating plan rather than providing details on what is happening now.

A few people expressed disenchantment that the noise spreading policy will mean it will be very difficult to plan to live in areas that are not noise affected. In fact many people accepted the proposal for equity but given the history of operations at KSA there was considerable cynicism about full implementation.

There was considerable misunderstanding of, and some concern about, the 70dB(A) contour information contained in the Airservices presentation.

It was stated there were not enough public meetings, and in particular more should have been held in Sydney's west.

Each meeting, because of it's location and it's attending audience, was quite different. There was a group of 20 or so aircraft noise lobbyists/agitators who attended most, if not all of the meetings, with the intent to have their issues raised and at times to disrupt proceedings or influence the meeting.

Notwithstanding some minor disruptions at some of the meetings, the public consultation stage was generally well received. While there was an existing deep cynicism about Sydney aircraft noise generally, many residents made favourable comments about the consultation process and were pleased to be involved in, and made aware of, the formulation of the proposed long term operating plan for Sydney Airport.

Sydney Airport Community Forum

December 1996

Appendix 12

Glossary of Terms

Glossary of Terms

AAIA	Australian Aviation Industry Association (* Now AICA- see below)
AATA	Australian Air Transport Association
ACC	Air Coordinating Committee
ADC	Aerodrome Control
ADCC	Aerodrome Control Coordinator
AIP	Aeronautical Information Publication
AICA	Aviation Industry Council of Australia
AIRAC	Aeronautical Information Regulation and Control
AMSL	Above mean sea level
ANEC	Australian Noise Exposure Concept
ANEF	Australian Noise Exposure Forecast
ANEI	Australian Noise Exposure Index
ATC	Air Traffic Control Enroute Control - ATC beyond 45 NM from the airport Terminal Area Control - ATC within 45 NM of the airport Tower Control Control - of aircraft on the airport or within close proximity to the airport
ATS	Air Traffic Services
BOM	Bureau of Meteorology
Buyout	The distance from a runway threshold that an arrival blocks a departure procedure.
CAAG	Coalition of Airport Action Groups
CASA	Civil Aviation Safety Authority
dB(A)	A-weighted sound level in decibels
DME	Distance Measuring Equipment (Navigation Aid)
EIS	Environmental Impact Statement
EP(IP) Act	Environmental Protection (Impact of Proposals) Act
FAC	Federal Airports Corporation
GPS	Global positioning System

IAF	Instrument Approach Fix
ICAO	International Civil Aviation Organisation
ILS	Instrument Landing System comprising a localiser for tracking guidance and a glide slope for descent guidance to the runway
IMC	Instrument Meteorological Conditions
INM	Integrated Noise Model
knot	Nautical Mile per hour
LA eq	Time average A-weighted sound pressure level
LA max	Maximum A-weighted sound pressure level
LAHSO	Land and Hold Short Operations on crossing runways
Localiser	An accurate tracking aid used for final approach - part of an ILS
NDB	Non Directional Beacon (Navigation Aid)
NFPMS	Noise and Flight Path Monitoring System
NM	Nautical Mile (1.852 km) The distance of arc subtended on the surface of the earth by one minute of latitude at the equator
NOTAM	Notices to Airmen
PARM	Parallel Approach Runway Monitor
RAAA	Regional Airlines Association of Australia
Restricted Area	Airspace designated for a specific purpose at the exclusion of other aviation activity unless a clearance is obtained.
RMO	Runway Mode of Operation
RNAV	Area Navigation System - navigation system carried by some aircraft
SACCC	Sydney Airport Community Consultative Committee
SACF	Sydney Airport Consultative Forum
SDT	Sabre Decision Technologies
SID	Standard Instrument Departure
SIMMOD	Simulation modelling of aircraft operations
SIMOPS	Simultaneous runway operations using crossing runways

SRD	Standard Radar Departure
STAR	Standard Arrival Route
TAAATS	The Australian Advanced Air Traffic System
TALOW	Take off and Landing Over water
TCU	Terminal Control Unit
Time	All times used in this report are expressed as local time according to a 24 hour clock e.g. 0600 - 6 am, 1500 - 3 pm, 1800 - 6 pm, 2100 - 9pm, 2300 - 11 pm
TMA	Terminal Area
TWR	Tower
UAR	Upper Air Route Review
VMC	Visual Meteorological Conditions
VOR	Very High Frequency Omnidirectional Range - navigation aid providing radials for aircraft tracking.

Appendix 2

Ministerial media statement 22 March 1996

MEDIA STATEMENT

Hon. John Sharp MP Minister for Transport and Regional Development

22 March 1996
TR3/96

NO TAKE-OFFS OVER SUBURBS TO NORTH FROM THIRD RUNWAY

The Government had no plans to use the third runway for take-offs that would result in aircraft flying over the suburbs to the north of Sydney Airport, the Minister for Transport and Regional Development, John Sharp, said today.

"This commitment was given during the election campaign and I restate it today" Mr Sharp said.

"Claims in the *Sydney Morning Herald* of Thursday, 21 March, that the direction I have issued to Airservices Australia means the Government has turned its back on its election commitment are completely wrong.

"Airservices Australia has been directed to report to me by 16 December 1996 on a proposed long-term operating plan for the airport. This includes a full review of flight paths.

"The possibility of take-offs to the north from the new runway is simply one option that Airservices Australia has been asked to look at.

"It has been put to the Government that aircraft can take off to the north on the new runway and turn to the east over largely non-residential areas to the sea. This is a real option which merits examination as part of the review process.

"The review will not be looking at options that have the largest aircraft taking off to the north from new runway; nor will it be looking at an option that has planes taking off from the new runway over the suburbs of Newtown, Annandale and Glebe.

"It is important to recognise that take-offs to the north from the new runway under any scenario will not occur before the Government considers a report from Airservices Australia on this matter. Airservices Australia will be consulting during the course of the review as necessary with the airlines and the community.

"Decisions on the need for, and extent of, any environmental assessment of the impact of the proposals developed by Airservices Australia will not be made until such time as Airservices Australia has reported to me.

"The Government will also be moving as soon as possible to repeal the mandatory flight corridors to the north of the airport, known as the Bennelong Funnel."

* * * * *

Media inquiries: John Wallis (06) 277 7680

Appendix 3

Terms of Reference

LONG TERM OPERATING PLAN FOR SYDNEY AIRPORT & ASSOCIATED AIRSPACE

TERMS OF REFERENCE FOR REVIEW

INTRODUCTION

1. On 20 March 1996 the Minister for Transport and Regional Development (the Minister), pursuant to Section 16 of the Air Services Act, directed Airservices Australia to:

   - take immediate steps to increase the use of the east/west runway at Sydney in order to distribute the noise generated by the airport more fairly, and

   - report by 16 December 1996 on a proposed long term operating plan for the airport and associated airspace.

POLICY PRINCIPLES

2. In accordance with the Direction from the Minister, the Review to develop the long term operating plan will be based on the following principles:

   - all three runways at the Airport, including the full length of the east/west runway, are to be available for use by jet and propeller aircraft;

   - maximum use is to be made of flightpaths over water and non-residential areas;

   - the capacity of the Airport is to be maintained to the maximum practicable extent but the programmed movement rate is not to exceed 80 movements per hour;

   - the safety of aviation operations is not to be compromised;

   - procedures involving independent use of the intersecting runways (such as the procedures known as SIMOPS) are not to be adopted.

3. The Review will also take account of Airservices' responsibilities under the Air Services Act 1995, in particular the requirements that Airservices must:

   - regard safety of air navigation as the most important consideration

   - exercise its powers and perform its functions in a manner that ensures that, as far as practicable, the environment is protected from:

     - the effects of the operation and use of aircraft; and

     - the effects associated with the operation and use of aircraft

   - perform its functions in a manner that is consistent with Australia's international obligations including the Chicago Convention.

4. The Review will, in conjuction with the Department of Defence, fully examine the scope for more effective use of airspace associated with Richmond and other military operations.

ORGANISATIONAL ARRANGEMENTS

5. A policy group, chaired by the Chief Executive of Airservices, will be responsible for monitoring the Review process. The policy group will comprise principals from the Departments of Transport & Regional Development, Environment Sport and Territories and Defence as well as representatives from the Civil Aviation Safety Authority, Federal Airports Corporation, Australian Aviation Industry Association, Australian Air Transport Association and Regional Airlines Association. It will meet on an "as required" basis.

6. The management of Australian airspace is a shared responsibility between Airservices and the Department of Defence. Accordingly, airspace design work will be undertaken under the auspices of the Defence/Airservices Air Coordinating Committee (ACC) which will serve as the Steering Committee for the project.

7. The ACC comprises the Deputy Chief of Air Staff (RAAF) and the General Manager, Air Traffic Services (Airservices Australia). The Chairman of the Australian Aviation Industry Association will be a member of the Steering Committee for the duration of the project.

8. A dedicated project team will be established and tasked with formulating proposals for longer term operating arrangements and airspace management options for the Sydney Basin. It will be headed by a Manager from Air Traffic Services Division (ATS). The team will include experts from Defence, flight operations, environmental and communication fields. The team will make full use of appropriate expertise available both in Australia and in other countries.

CONSULTATIONS

9. Consistent with its responsibilities under the Air Services Act 1995, Airservices will undertake consultations with interested parties including the aviation industry and affected communities. In particular, consultations will be held with:

(i) the body established by the Minister to replace the Sydney Airport Community Consultative Committee (SACCC)

(ii) aviation industry bodies including the New South Wales Regional Airspace Advisory Committee (RAPAC), the Australian Aviation Industry Association (AAIA), Australian Air Transport Association (AATA) and Regional Airlines Association (RAA).

(iii) Commonwealth agencies including the Federal Airports Corporation (FAC), Department of the Environment, Sport and Territories, Department of Transport & Regional Development and Department of Defence

(iv) NSW Government agencies

(v) relevant Local Government and community organisations.

10. Airservices will, at an early date, invite submissions from the public through advertisements in the press.

11. The Civil Aviation Safety Authority (CASA) will be closely involved in the process to ensure that development of revised operating arrangements are fully consistent with safety requirements.

TIMING

12. The Review will be completed in time for a report to be provided to the Minister by 16 December 1996.

Airservices Australia
15 April 1996

Appendix 4

Sydney Airport Community Forum Terms of Reference

MEDIA STATEMENT

Hon. John Sharp MP Minister for Transport and Regional Development

23 March 1996
TR4 /96

NEW CONSULTATIVE ARRANGEMENTS FOR SYDNEY AIRPORT

The Minister for Transport and Regional Development, John Sharp, said today that he would establish a consultative body for Sydney Airport to represent the community's interests

"Membership of the new body will be truly representative, and will streamline the cumbersome and unwieldy arrangements put in place by the previous government," Mr Sharp said

He said it would have about half the number of members of the previous committee but would achieve a proper breadth of representation.

"Some existing members of the Sydney Airport Community Consultative Committee may be reappointed," Mr Sharp said.

"The new body will include elected parliamentary representatives of both Liberal and Labor parties and selected range of mayors. The aviation industry will also be included.

"For the first time the body will also include members drawn directly from the community.

"The body will be the main channel for community consultation on future flight-path proposals which I have asked Airservices Australia to develop. It will also provide a continuing means of information exchange between aviation authorities and the community.

Because of these impending changes, Mr Sharp has asked the Chair of the Sydney Airport Community Consultative Committee to postpone the meeting of SACCC that was scheduled for Friday next, 29 March.

* * * *

Media inquiries: John Wallis (06) 277 7680

fm David Townsend

SYDNEY AIRPORT COMMUNITY FORUM

TERMS OF REFERENCE

Role

The role of the body is to act as a forum for

- the provision of advice to the Minister for Transport and Regional Development on the abatement of aircraft noise and related environmental problems at Sydney Airport

- consultation and information exchange between community representatives and aviation authorities on the Airport's operations

  - in particular it will be the main body for consultation on the long term operating plan for the Airport and associated airspace that is currently being developed by Airservices Australia.

Operating Arrangements

The body will meet no less than quarterly.

Sub-Committees may be established as required, to report to the main body.

The Chair will be nominated on an annual basis by the Minister for Transport and Regional Development.

Secretariat support services will be provided by the Federal Department of Transport and Regional Development.

The Sydney Airport Community Forum shall remain in existence for a period of three years.

SYDNEY AIRPORT COMMUNITY FORUM (SACF)
PROPOSED MEMBERSHIP

CATEGORY	REPRESENTATION
Federal MPs	Member for North Sydney (Chair for first year) Member for Barton Member for Cook Member for Grayndler Member for Lowe
State MPs	Member for Lane Cove Member for Port Jackson
Local Government	Mayor, Hurstville Council Mayor, Lane Cove Council Mayor, Marrickville Council Mayor, Randwick Council Mayor, Sutherland Shire Council
Community Representatives	Bennelong Community Inner West Community Kurnell Community Sydney Airport Forum Upper North Shore Community
Industry Representative	Australian Aviation Industry Association

Appendix 5

Public consultations including advertising copy etc

PRESENTATION OF SUBMISSIONS

TFSUB*0092:	Mr Stephen Blackadder, Counciller Stephen Holroyd, Deputy Mayor Counciller Brian Simpson, Rockdale City Council
TFSUB*0466:	Mr Michael Lockwood, Annandale
TFSUB*0529:	Mr Tim Aldrich, Riverview
TFSUB*0530:	Mr Michael Day, Kurnell
TFSUB*0767:	Mr N Chantler, Canterbury Residents Against Aircraft Noise
TFSUB*0822:	James McDonnell, Lane Cove
TFSUB*0958:	Mr Edward Griffin, Northbridge
TFSUB*1239:	Paul Tsiknas, Andrew Charitou, Canterbury Residents Against Aircraft Noise,
TFSUB*1268:	Mr John Akister, NSW Council for Civil Liberties
TFSUB*1306:	Ms Sandra Kwa, Residents Airport Action Committee
TFSUB*1307:	Ms Susan Hogan, Community Advisory Committee
TFSUB*1333:	Mr John Uren, PRAAAP
TFSUB*1339:	Mr & Mrs R Merton, Woronora Heights
TFSUB*1342:	Mr Peter Mattson, Cronulla
TFSUB*1343:	Ms Judith O'Hana, Lane Cove Airport Action Inc
TFSUB*1401:	Dr Long, Camperdown Residents Action Group
TFSUB*1466:	Christopher Brown, Chief Executive and Wayne Geddes, Deputy Chief Executive,Tourism Task Force, and Mr Nick Saphin, Consultant of Hill and Knowlton
TFSUB*1470:	Mayor Tania McCaffrey, North Sydney Council
TFSUB*1473:	Melinda Kereztes, Noel Blake, Council of Hornsby
TFSUB*1585:	Janette Barros, Leichhardt Council Airport Working Group

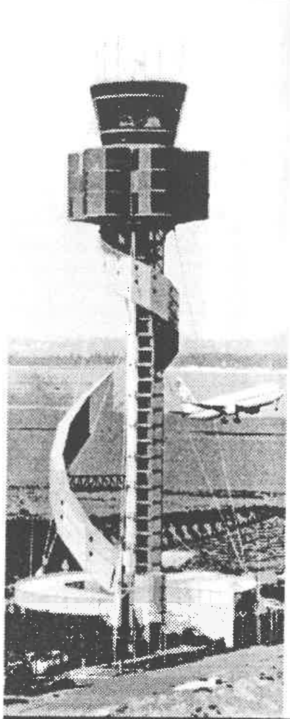
TFSUB*1592:	Mr John Webster, Managing Director, Sydney Heli-Scenic
TFSUB*1595:	Dr Garry Smith, Sutherland Shire Council
TFSUB*1609:	Ms Gretchen Fitzgerald, Hurlstone Park
TFSUB*1678:	Mr Robert McLelland, Member for Barton
TFSUB*1712:	Mr Peter Fitzgerald / AMAC
TFSUB*1716:	Mr Vincent Sicari, Haberfield
TFSUB*1720:	Mr Harrison, Maroubra
TFSUB*1722:	Alan Reeves, No Aircraft Noise Party
TFSUB*1731:	Mr Andrew Thompson, Member for Wentworth
TFSUB*1795:	Mr Terry Insley / Northshore Aircraft Action Group
TFSUB*1804:	Mr Colin Currie, Balmain
TFSUB*1824:	Ms Julie Anne Elro, FAC
TFSUB*1825:	Ms Alison Duncan, Northshore Aircraft Action Group
TFSUB*1826:	Mr Refshauge, Marrickville Council,
TFSUB*1827:	Mr Rob Haylock, Helicopter Association of Australia
TFSUB*1851:	Ms Sally Irwin, Bridge View Precinct, North Sydney
TFSUB*1942:	Mr Bob Lorschy, President, Civil Air
TFSUB*1961:	Mayor R Geddes, Ku-ring-gai Municipal Council
TFSUB*1961:	Mr John Clark, Representing Ku-ring-gai Council
TFSUB*2370:	Belinda Smith, Kurnell Flight Path Committee

Alan Boham

Bob Hayes

Ray Craigie

(The lat three made presentations to the TWG Rwy/TNA meetings on 26 and 27 July.)



SYDNEY AIRPORT OPERATING PLAN

PUBLIC SUBMISSIONS

Closing date extended to
WEDNESDAY 10 JULY 1996

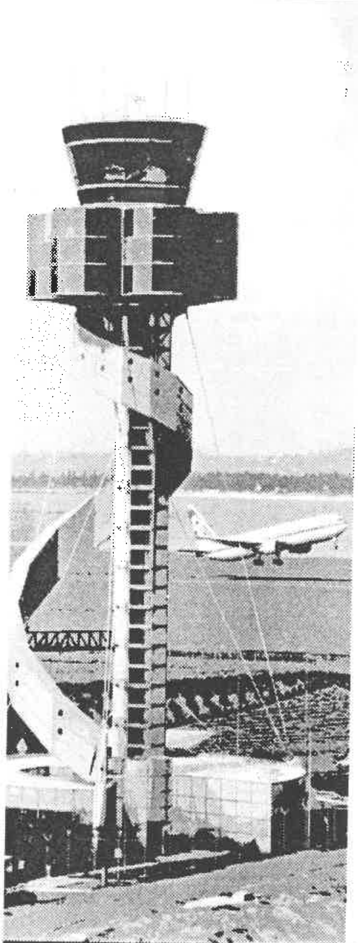
The Terms of Reference and further information can be obtained from Airservices Australia on (02) 567 3022

Submissions should be forwarded to:

The Manager
Air Traffic Management
Task Force
Airservices Australia
PO Box 372
MASCOT NSW 2020

AIRSERVICES AUSTRALIA

10x4 (13.7)
SMH



SYDNEY AIRPORT OPERATING PLAN
COMMUNITY CONSULTATION

On 20 March this year, the Minister for Transport and Regional Development issued a Direction to Airservices Australia to report by 16 December 1996 on a proposed long term operating plan for Sydney Airport and associated airspace.

The Task Force set up by Airservices Australia currently is examining possible modes of operation for the Airport and the Sydney basin.

The Sydney Airport Community Forum, the main body for community consultation on the review, and Airservices Australia, now invite all interested individuals and organisations to special public meetings at which Airservices will make presentations on the possible flight paths and runway usage patterns being considered.

PUBLIC MEETINGS

WILLOUGHBY: 7pm, Monday, 11 November, Willoughby Civic Centre, 409 Victoria Avenue, Chatswood

MARRICKVILLE: 7pm, Tuesday, 12 November, Marrickville Town Hall, Cnr Marrickville and Petersham Roads, Marrickville

RANDWICK: 7.30pm, Wednesday, 13 November, Randwick Town Hall, Cnr Avoca and Frances Sts, Randwick

DRUMMOYNE: 7pm, Thursday, 14 November, Drummoyne Civic Hall, Cnr Lyons Road and Marlborough St, Drummoyne

HURSTVILLE: 7pm, Friday, 15 November, South Hurstville RSL Club Auditorium, Cnr King Georges Road and Connells Point Road, South Hurstville.

CRONULLA: 6.30pm, Sunday, 17 November, Cronulla Sutherland Leagues Club (Sharks International) Auditorium, Captain Cook Drive, Woolooware.

These meetings will provide an important opportunity to understand how Sydney Airport and airspace over the Sydney basin may be utilised in the future and to raise issues of concern.

For further information, please contact Pam Cossey on **1800 812 069**

Joe Hockey MP Chairperson
SYDNEY AIRPORT COMMUNITY FORUM

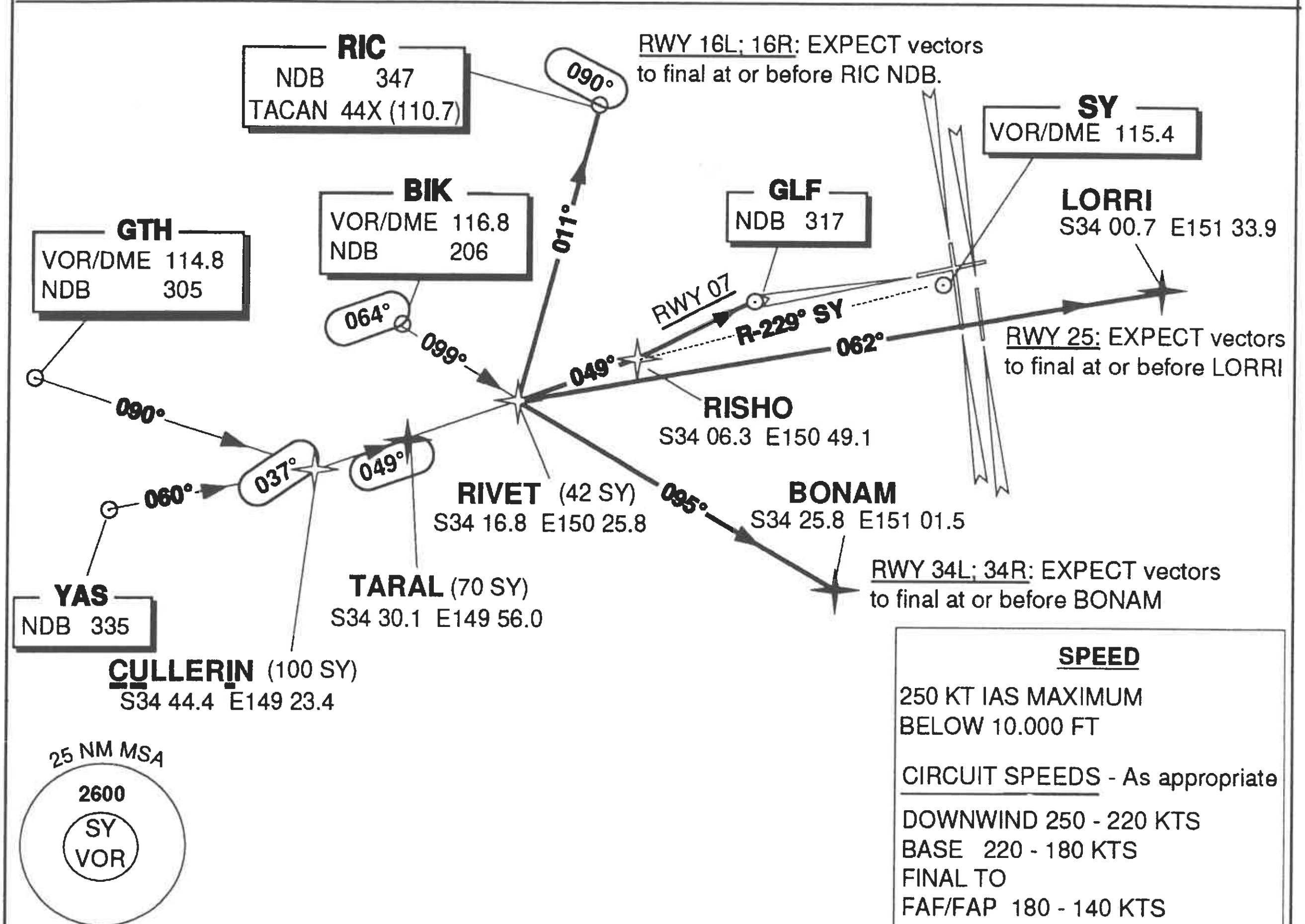
AIRSERVICES AUSTRALIA

18.5 cm W x 13 cm D   Sydney Morning Herald

Appendix 6

Draft Standard Arrival Routes and Standard Instrument Departures

STANDARD ARRIVAL ROUTE
RIVET (NUMBER) ARRIVAL (JET)
SYDNEY (KINGSFORD SMITH), NSW (YSSY)



SPEED

250 KT IAS MAXIMUM
BELOW 10.000 FT

CIRCUIT SPEEDS - As appropriate

DOWNWIND 250 - 220 KTS
BASE 220 - 180 KTS
FINAL TO
FAF/FAP 180 - 140 KTS

TRANSITIONS:

BINDOOK: From BIK VOR to RIVET
via BIK R-099° to RIVET.
Then follow ARRIVAL instructions.

YASS: From YAS NDB to RIVET
via 060° from YAS NDB to CUI.
then via SY R-229° to RIVET.
Then follow ARRIVAL instructions.

CULLERIN: From CUI to RIVET:
via SY R-229° to RIVET.
Then follow ARRIVAL instructions.

GRIFFITH: (RNAV ONLY) From GTH VOR to RIVET:
via GTH VOR R-090° to CUI,
then via SY R-229° to RIVET.
Then follow ARRIVAL instructions.

ARRIVAL: RIVET (number):

RWY 16L, 16R: From RIVET track 011° to RIC NDB.
EXPECT radar vectors to final approach at or before RIC.

RWY 34L, 34R: From RIVET track 095° to BONAM.
EXPECT radar vectors to final approach at or before BONAM.

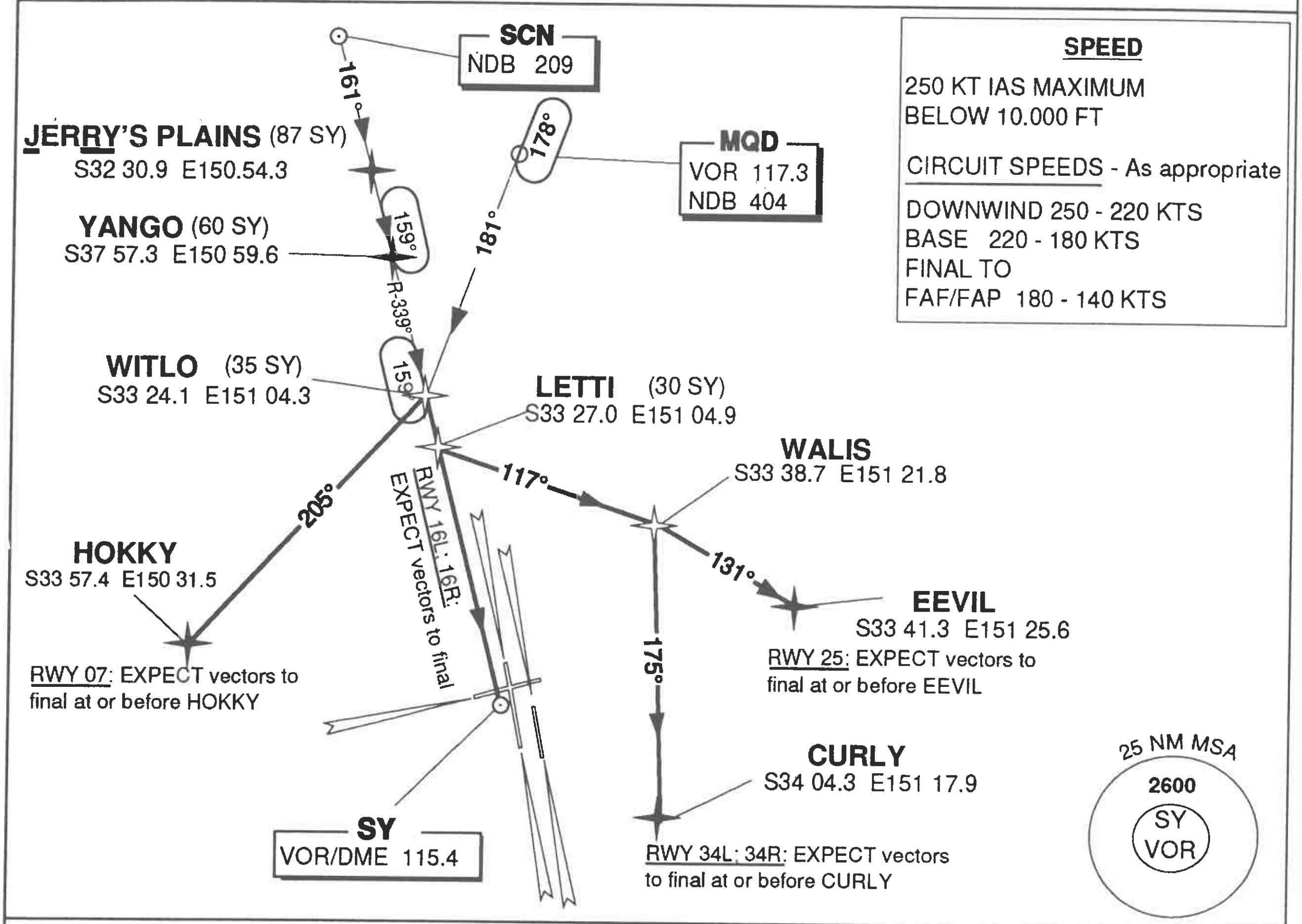
RWY 25: From RIVET track 062° to LORRI.
EXPECT radar vectors to final approach at or before LORRI.

RWY 07: From RIVET track SY R-229° to RISHO, then direct to GLF-L. Intercept RWY 07 LLZ.
Note: ACFT may be radar vectored to final approach.

Operational charts will include altitude restrictions for traffic management and to optimise altitude over residential areas where appropriate

This chart is representative only - not to be used for navigation

STANDARD ARRIVAL ROUTE
WITLO ONE ARRIVAL (JET)
SYDNEY (KINGSFORD SMITH), NSW (YSSY)



TRANSITIONS:

SCONE: From SCN NDB to WITLO:
via 161° SCN NDB to JRY, then
via SY R-339° to WITLO.
Then follow ARRIVAL instructions.

JERRY'S PLAINS: From JRY to WITLO:
via SY R-339° to WITLO.
Then follow ARRIVAL instructions.

McQUOID: From MQD VOR to WITLO:
via MQD R-181° to WITLO.
Then follow ARRIVAL instructions.

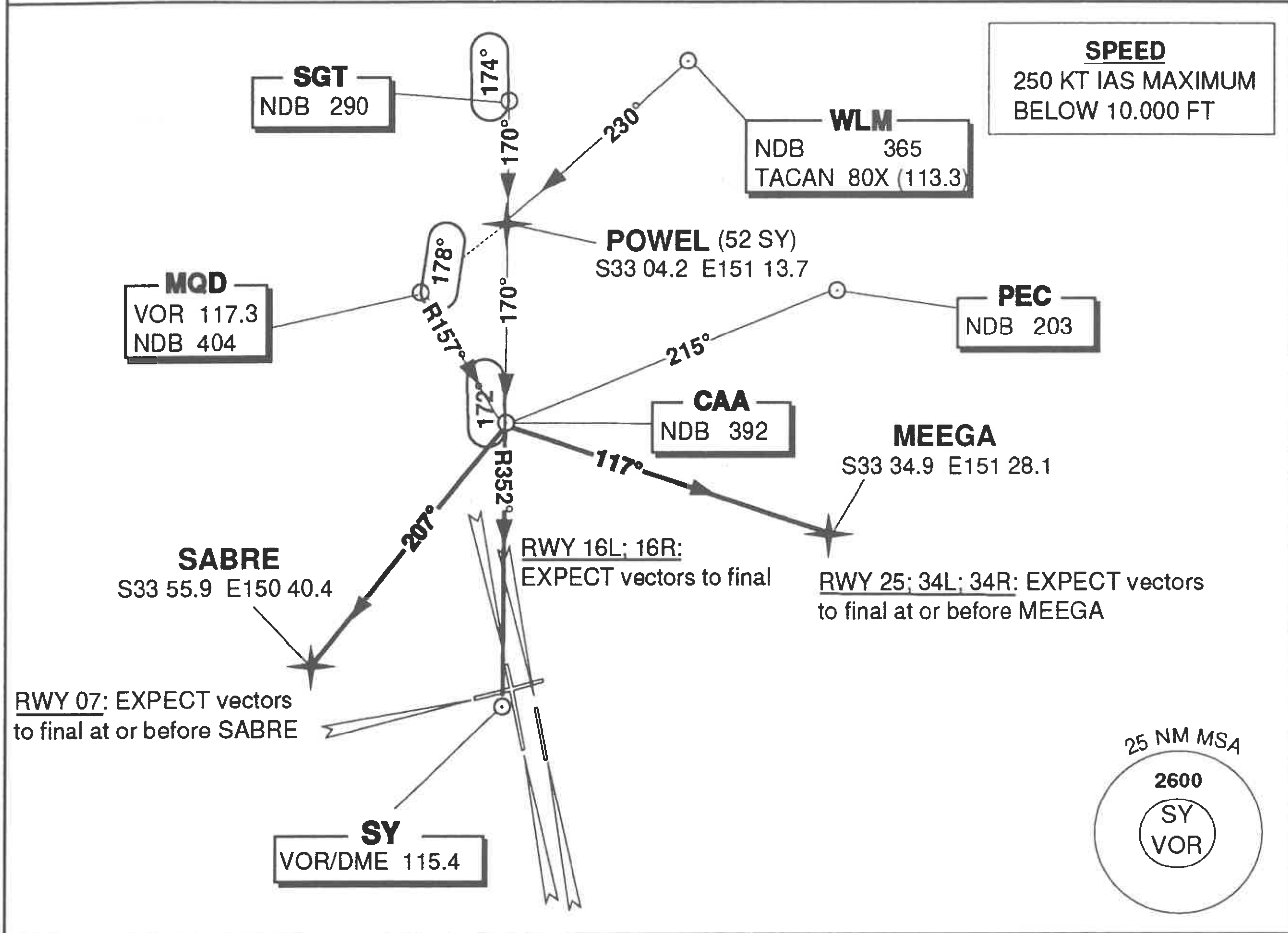
ARRIVAL: WITLO ONE:

RWY 16L, 16R:	From WITLO track via R-339 SY VOR. EXPECT radar vectors to final approach course.
RWY 34L, 34R:	From WITLO via SY R-339° to LETTI, then track 117° to WALIS, then 175° to CURLY. EXPECT radar vectors to final approach at or before CURLY.
RWY 25:	From WITLO via SY R-339° to LETTI, then track 117° to WALIS, then 131° to EEVIL. EXPECT radar vectors to final approach at or before EEVIL.
RWY 07:	For RWY 07: From WITLO track 205° to HOKKY. EXPECT radar vectors to final approach at or before HOKKY.

Operational charts will include altitude restrictions for traffic management and to optimise altitude over residential areas where appropriate

This chart is representative only - not to be used for navigation

STANDARD ARRIVAL ROUTE
CALGA (NUMBER) ARRIVAL (NON-JET)
SYDNEY (KINGSFORD SMITH), NSW (YSSY)



TRANSITIONS:

WILLIAMTOWN: From WLM NDB to CAA NDB:
via MQD R-050° to POWEL, then
track 170° to CAA NDB.
Then follow ARRIVAL instructions.

SINGLETON: From SGT NDB to CAA NDB:
via 170° from SGT NDB to
CAA NDB.
Then follow ARRIVAL instructions.

McQUOID: From MQD VOR to CAA NDB:
via MQD R-157° to CAA NDB.
Then follow ARRIVAL instructions.

AEROPELICAN: From PEC NDB to CAA NDB:
via 215° from PEC NDB to
CAA NDB.
Then follow ARRIVAL instructions.

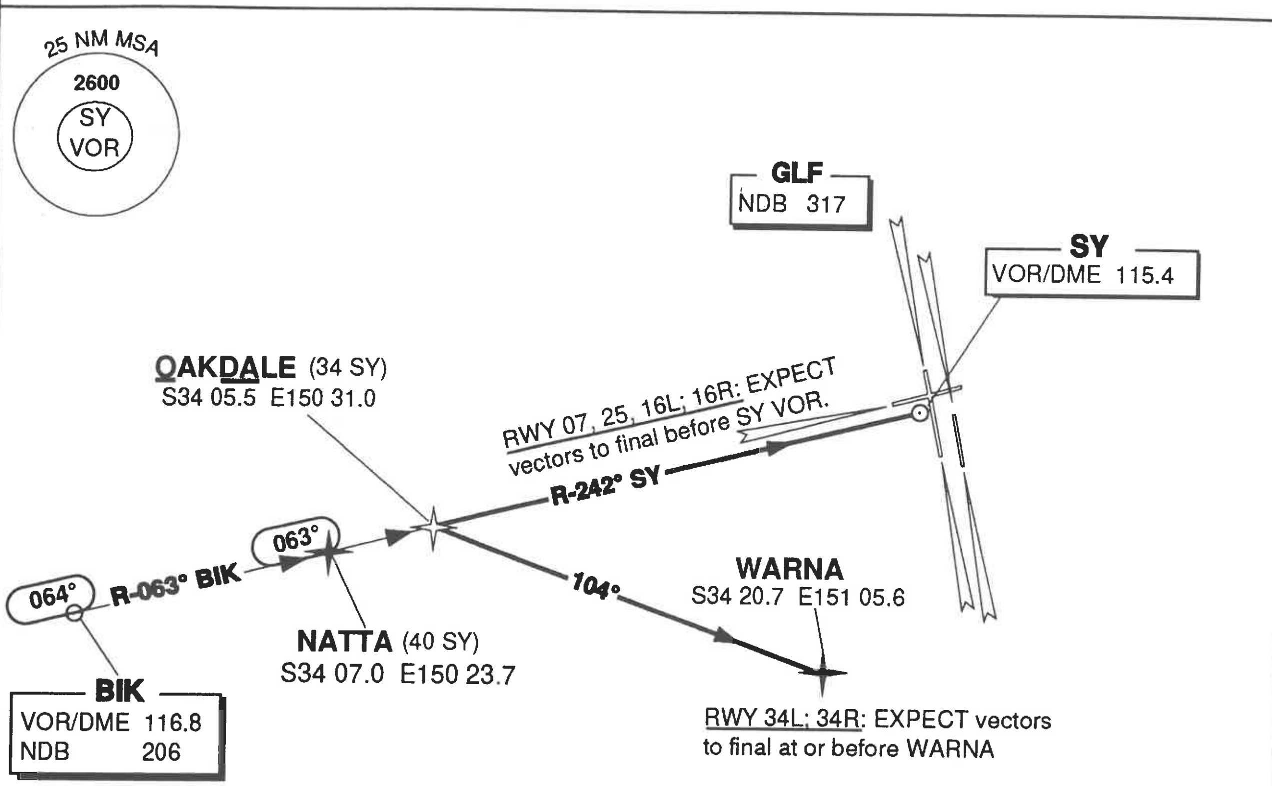
ARRIVAL: CALGA (number):

RWY 16L, 16R:	From CAA NDB track SY R-352°. EXPECT radar vectors to final approach.
RWY 25, 34L, 34R:	From CAA track117° CAA NDB to MEEGA. EXPECT radar vectors to final approach at or before MEEGA.
RWY 07:	From CAA track 207° CAA NDB to SABRE. EXPECT radar vectors to final approach at or before SABRE.

Operational charts will include altitude restrictions for traffic management and to optimise altitude over residential areas where appropriate

This chart is representative only - not to be used for navigation

STANDARD ARRIVAL ROUTE
OAKDALE (NUMBER) ARRIVAL (NON-JET)
SYDNEY (KINGSFORD SMITH), NSW (YSSY)



SPEED
250 KT IAS MAXIMUM
BELOW 10.000 FT

TRANSITIONS:

BINDOOK: From BIK VOR to ODA:
via BIK R-063° to ODA.
Then follow ARRIVAL instructions.

ARRIVAL: OAKDALE (number):

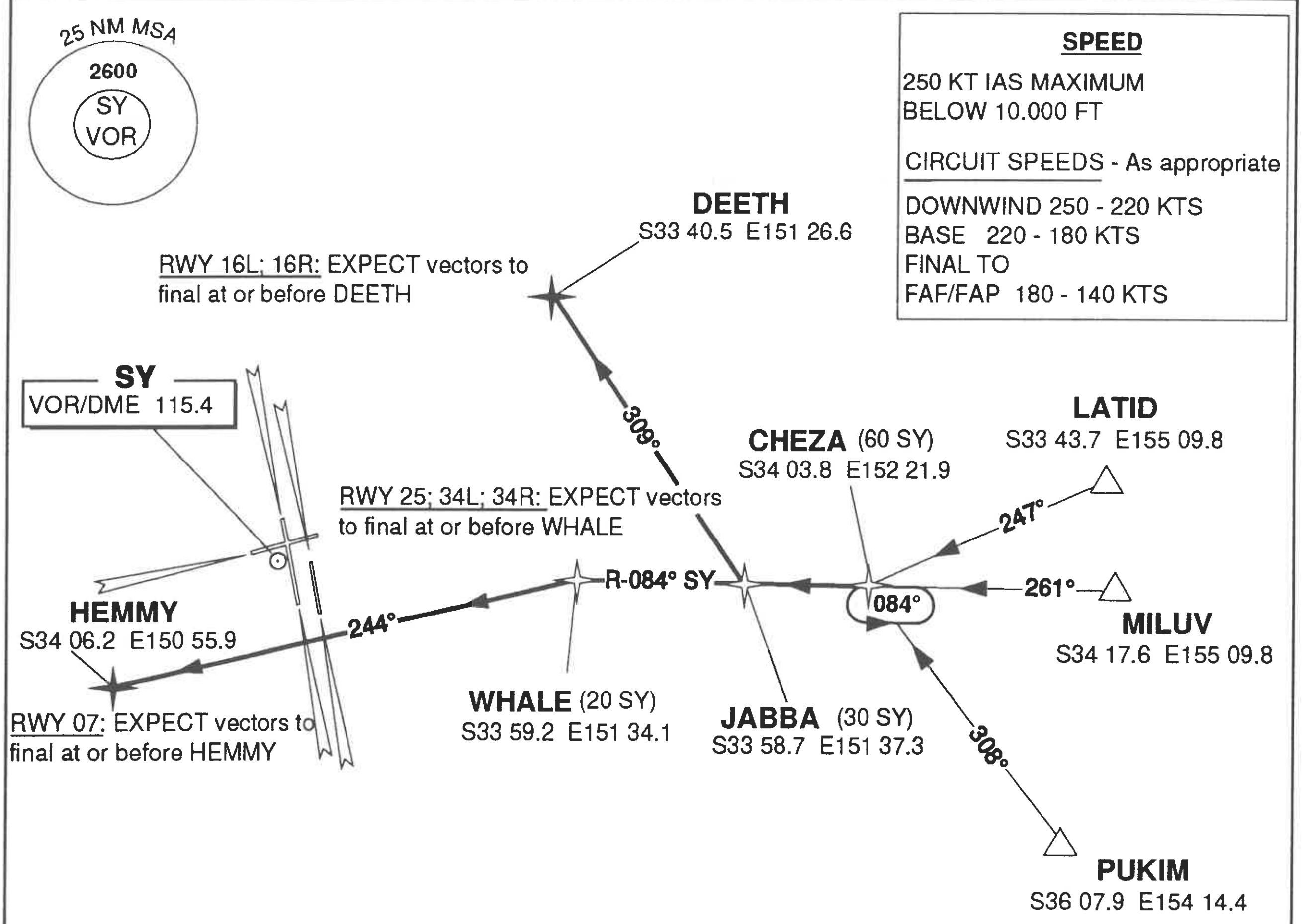
RWY 25, 07, 16L, 16R: At ODA track via R242° SY VOR.
EXPECT radar vectors to final approach before SY VOR.

RWY 34L, 34R: From ODA track 104° to WARNA.
EXPECT radar vectors to final approach at or before WARNA.

Operational charts will include altitude restrictions for traffic management and to optimise altitude over residential areas where appropriate

This chart is representative only - not to be used for navigation

STANDARD ARRIVAL ROUTE
CHEZA (NUMBER) ARRIVAL
SYDNEY (KINGSFORD SMITH), NSW (YSSY)



SPEED

250 KT IAS MAXIMUM
BELOW 10.000 FT

CIRCUIT SPEEDS - As appropriate

DOWNWIND 250 - 220 KTS
BASE 220 - 180 KTS
FINAL TO
FAF/FAP 180 - 140 KTS

TRANSITIONS:

LATID: From LATID to CHEZA:
Track 247° to CHEZA.
Then follow ARRIVAL instructions.

MILUV: From MILUV to CHEZA:
Track 261° to CHEZA.
Then follow ARRIVAL instructions.

PUKIM: From PUKIM to CHEZA:
Track 308° to CHEZA.
Then follow ARRIVAL instructions.

ARRIVAL: CHEZA (number):

RWY 16L, 16R: From CHEZA track SY R-084° to JABBA, then 309° to DEETH.
EXPECT radar vectors to final approach at or before DEETH.

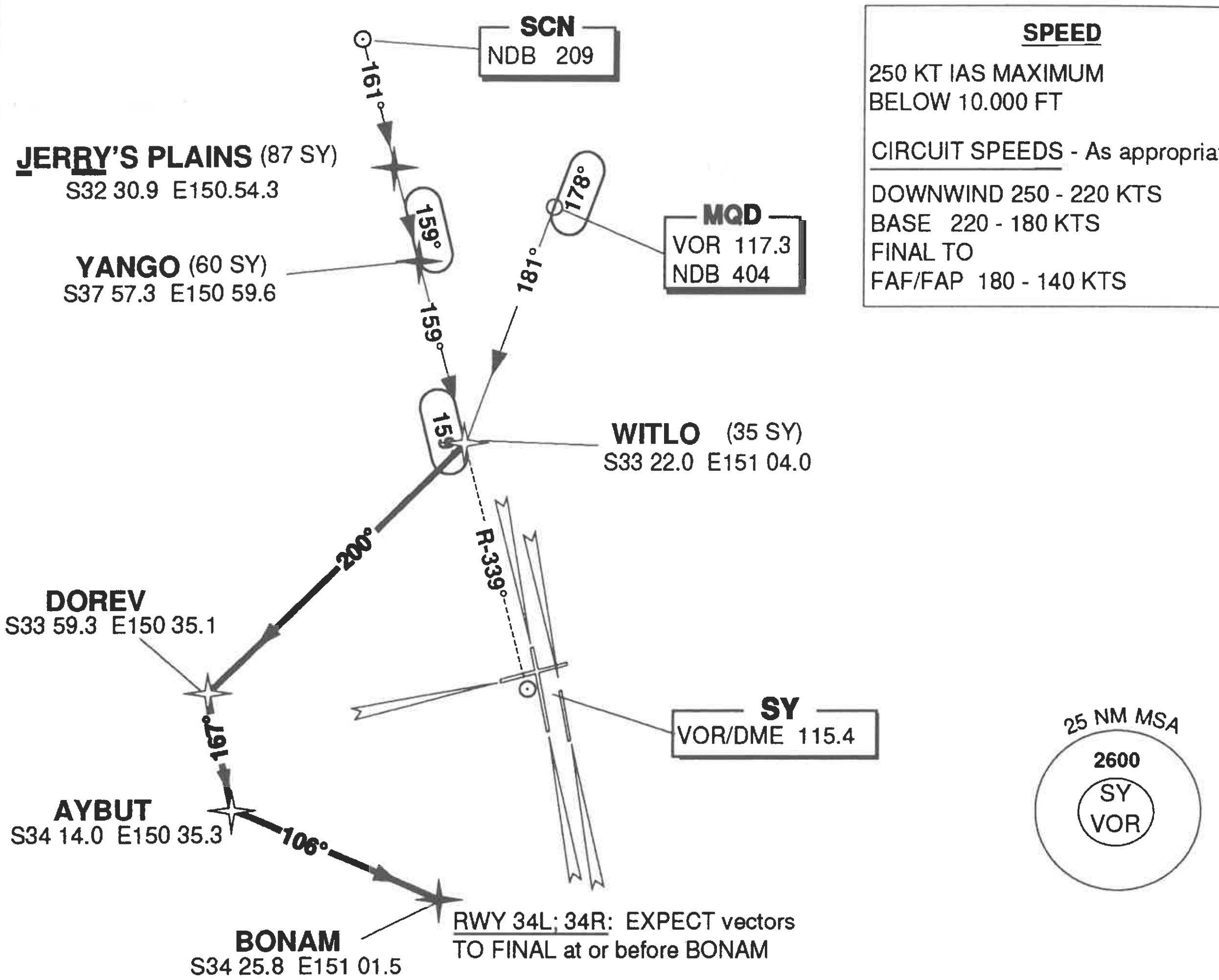
RWY 25: From CHEZA track SY R-084° to WHALE.
EXPECT radar vectors to final approach at or beforeWHALE.

RWY 34L, 34R: From CHEZA track SY R-084° to WHALE.
EXPECT radar vectors to final approach at or before WHALE.

RWY 07: From CHEZA track SY R-084° to WHALE, then 244° to HEMMY.
EXPECT radar vectors to final approach at or before HEMMY.

Operational charts will include altitude restrictions for traffic management and to optimise altitude over residential areas where appropriate

This chart is representative only - not to be used for navigation



SPEED

250 KT IAS MAXIMUM
BELOW 10.000 FT

CIRCUIT SPEEDS - As appropriate

DOWNWIND 250 - 220 KTS
BASE 220 - 180 KTS
FINAL TO
FAF/FAP 180 - 140 KTS

TRANSITIONS:

SCONE: From SCN NDB to WITLO:
via 161° SCN NDB to JRY, then
via SY R-339° to WITLO.
Then follow ARRIVAL instructions.

JERRY'S PLAINS: From JRY to WITLO:
via SY R-339° to WITLO.
Then follow ARRIVAL instructions.

McQUOID: From MQD VOR to WITLO:
via MQD R-181° to WITLO.
Then follow ARRIVAL instructions.

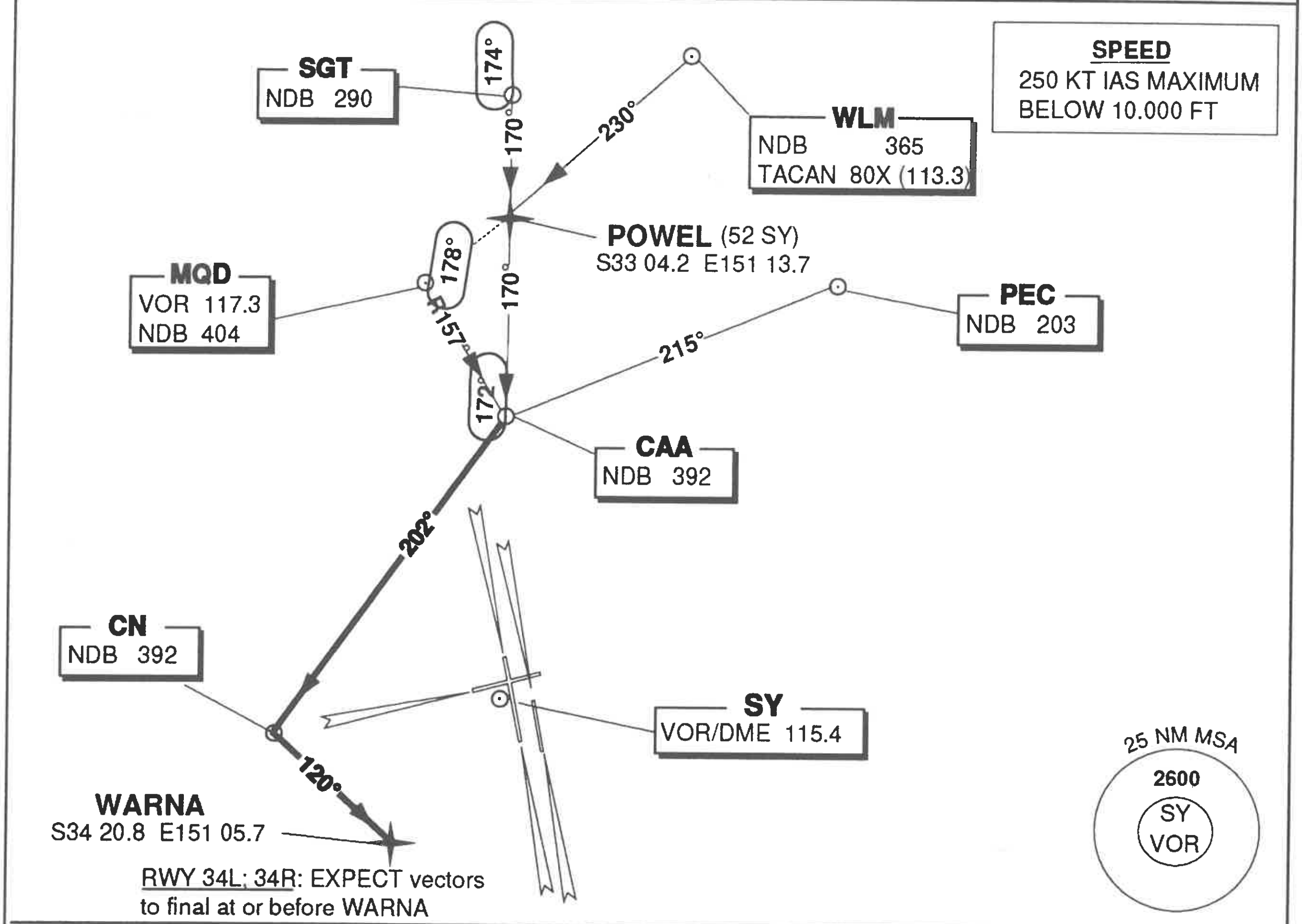
ARRIVAL: BONAM ONE:
RWY 34L, 34R: From WITLO track 200° to DOREV, then 167° to AYBUT, then 106° to BONAM.
EXPECT radar vectors to final approach at or before BONAM.

NOTE: This STAR for RWY 16/34 simultaneous opposite direction operations.

Operational charts will include altitude restrictions for traffic management and to optimise altitude over residential areas where appropriate

This chart is representative only - not to be used for navigation

STANDARD ARRIVAL ROUTE
WARNA ONE ARRIVAL (NON-JET)
SYDNEY (KINGSFORD SMITH), NSW (YSSY)



TRANSITIONS:

WILLIAMTOWN: From WLM NDB to CAA NDB:
via MQD R-050° to POWEL, then
track 170° to CAA NDB.
Then follow ARRIVAL instructions.

SINGLETON: From SGT NDB to CAA NDB:
via 170° from SGT NDB to
CAA NDB.
Then follow ARRIVAL instructions.

McQUOID: From MQD VOR to CAA NDB:
via MQD R-157° to CAA NDB.
Then follow ARRIVAL instructions.

AEROPELICAN: From PEC NDB to CAA NDB:
via 215° from PEC NDB to
CAA NDB.
Then follow ARRIVAL instructions.

ARRIVAL: WARNA ONE:

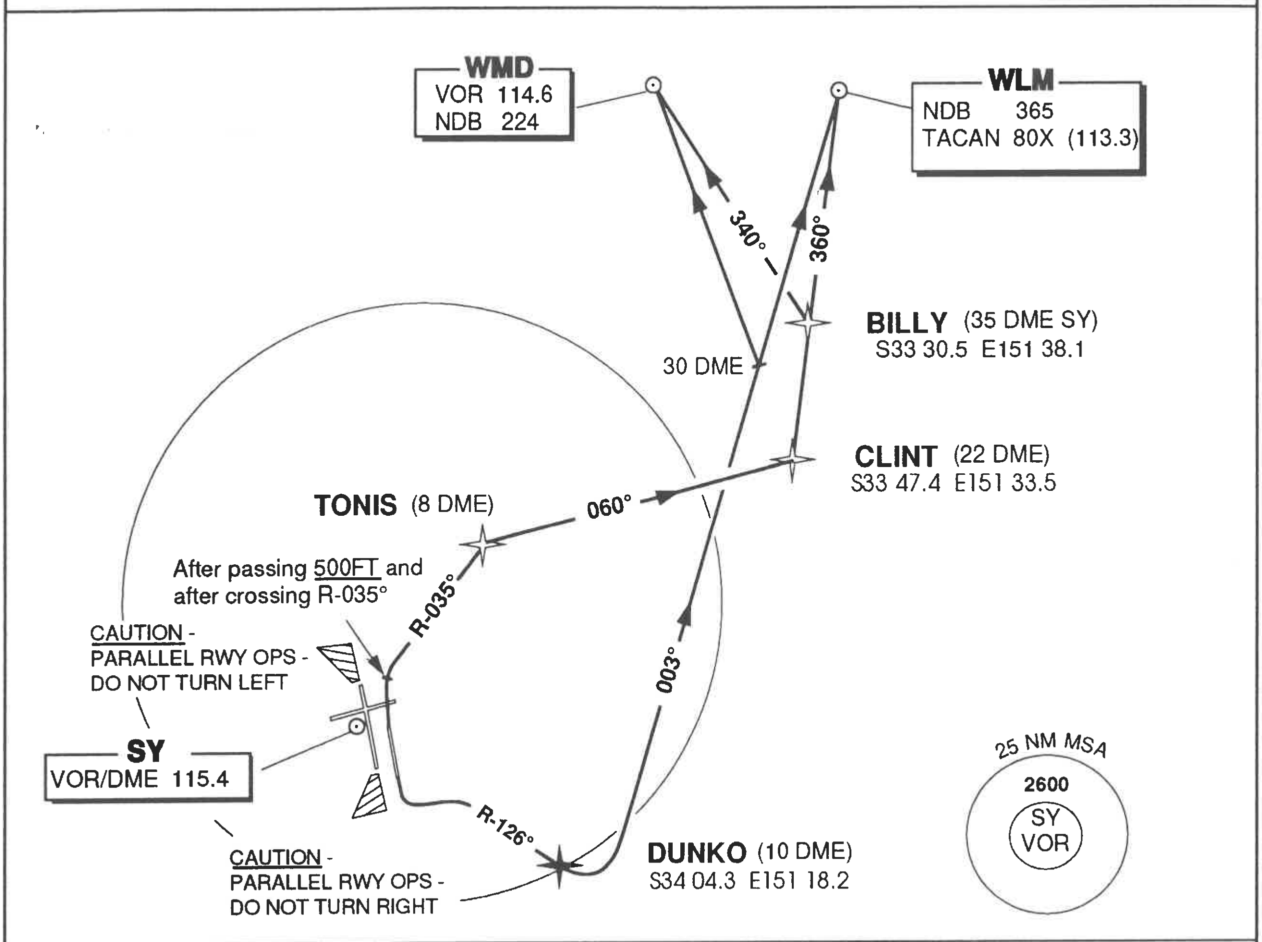
RWY 34L, 34R: From CAA NDB track 202° to CN NDB, then 120° from CN NDB to WARNA.
EXPECT radar vectors to final approach at or before WARNA.

NOTE: This STAR for RWY 16/34 simultaneous opposite direction operations.

Operational charts will include altitude restrictions for traffic management and to optimise altitude over residential areas where appropriate

This chart is representative only - not to be used for navigation

STANDARD INSTRUMENT DEPARTURES
RUNWAYS NORTH 34R & 16L (JET)
SYDNEY (KINGSFORD SMITH), NSW (YSSY)



WEST MAITLAND (WMD) (number) DEPARTURE
WILLIAMTOWN (WLM) (number) DEPARTURE

RWY 34R (JET)
. Track 335°
. At DER turn RIGHT track 350°
. After passing 500ft and after crossing SY R-035° turn RIGHT
. Intercept SY R-035° to TONIS
. At TONIS (8 DME SY) turn RIGHT track 060° to CLINT
. At CLINT (22 DME SY) turn LEFT track to WLM NDB

For WLM
. Track to WLM NDB.
For WMD
. At BILLY (30 DME SY) track direct to WMD VOR

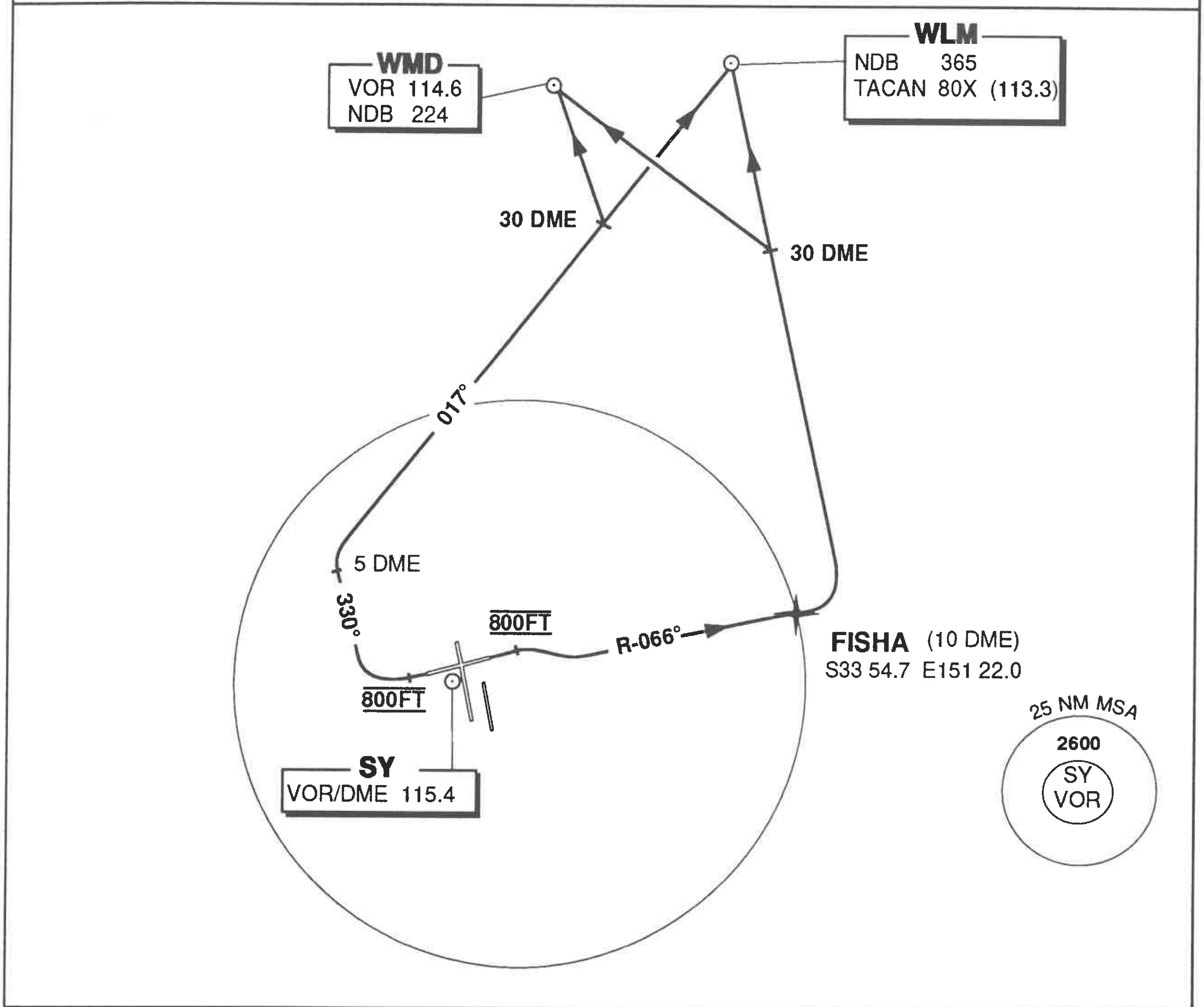
RWY 16L (JET)
. Track 155°
. At 600ft turn LEFT
. Intercept SY R-126°
. At DUNKO (10 DME SY) turn LEFT
. Track to WLM NDB.

For WLM
. Track to WLM NDB.
For WMD
. At 30 DME SY track direct to WMD VOR

This chart is representative only - not to be used for navigation

Operational charts will include climb gradients for obstacle clearance and to optimise altitude over residential areas where appropriate.

STANDARD INSTRUMENT DEPARTURES
RUNWAYS NORTH 25 & 07 (JET)
SYDNEY (KINGSFORD SMITH), NSW (YSSY)



WEST MAITLAND (WMD) (number) DEPARTURE
WILLIAMTOWN (WLM) (number) DEPARTURE

RWY 25 (JET)

. Track 242°
. At 800ft turn RIGHT track 330°
. At 5 DME SY turn RIGHT, track 017° to WLM NDB

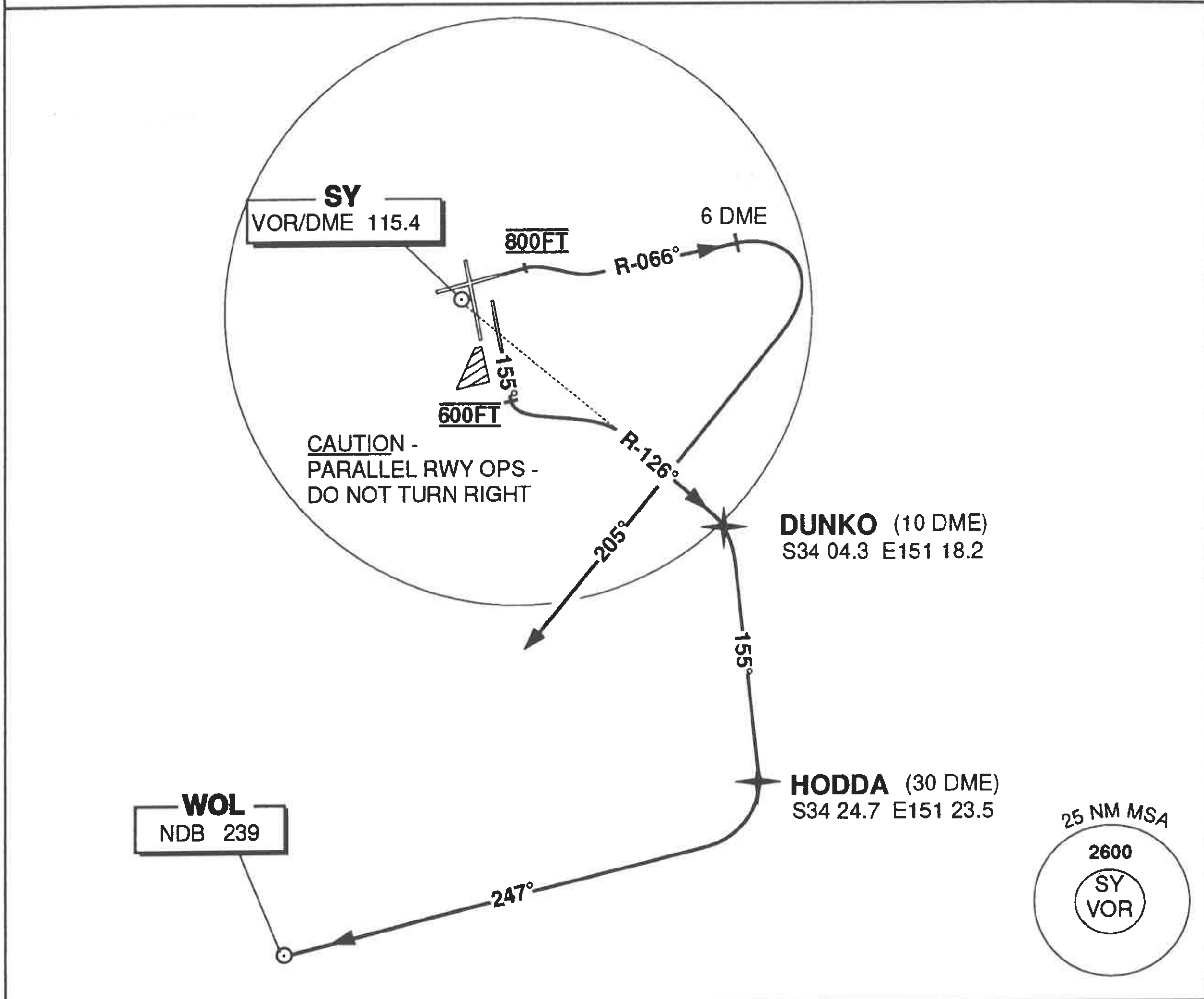
For WLM
. Track to WLM NDB.
For WMD
. At 30 DME SY track direct to WMD VOR

RWY 07 (JET)
. Track 062°
. At 800ft turn RIGHT
. Intercept SY R-066°
. At FISHA (10 DME SY) turn LEFT
. Track to WLM NDB.

For WLM
. Track to WLM NDB.
For WMD
. At 30 DME SY track direct to WMD VOR

This chart is representative only - not to be used for navigation
Operational charts will include climb gradients for obstacle clearance and to optimise altitude over residential areas where appropriate.

STANDARD INSTRUMENT DEPARTURES
RUNWAYS SOUTH 07 & 16L (JET)
SYDNEY (KINGSFORD SMITH), NSW (YSSY)



WOLLONGONG (WOL) (number) DEPARTURE

RWY 07 (JET)

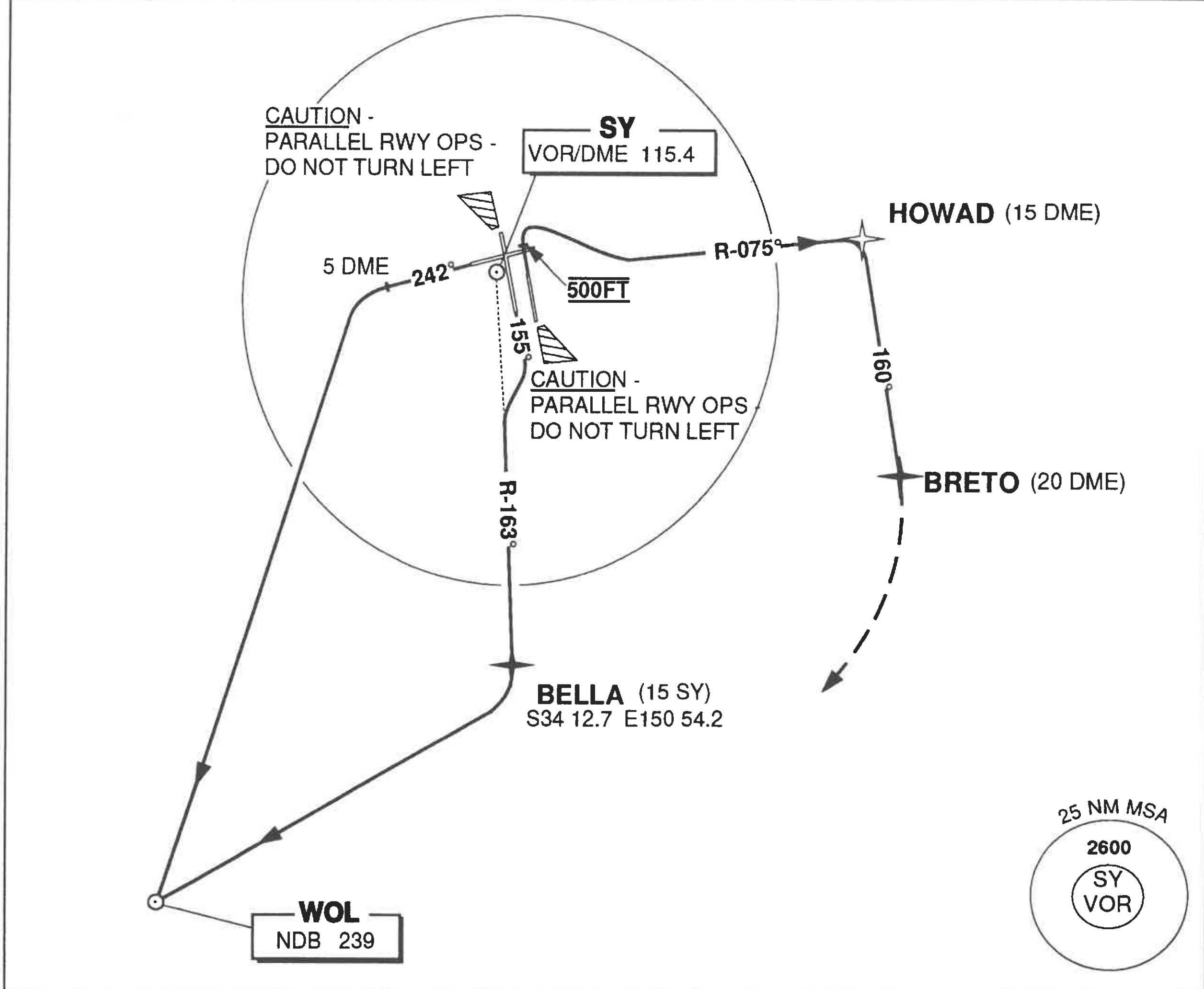
. Track 062°
. At 800ft turn RIGHT
. Intercept SY R-066°
. At 6 DME SY turn RIGHT track to WOL NDB.

RWY 16R (JET)

. Track 155°
. At 600ft turn LEFT
. Intercept SY R-126°
. At DUNKO (10 DME SY) turn RIGHT track 155°
. At HODDA (25 DME SY) turn RIGHT, track to WOL NDB.

This chart is representative only - not to be used for navigation

Operational charts will include climb gradients for obstacle clearance and to optimise altitude over residential areas where appropriate.



WOLLONGONG (WOL) (number) DEPARTURE

RWY 34R (JET)

. Track 335°
. At 500ft (mandatory) turn RIGHT
. Intercept R-075 SY VOR
. At HOWAD turn RIGHT track 160° to BRETO
. Expect radar vectors to WOL
at or before BRETO (20 DME SY).

RWY 16R (JET)

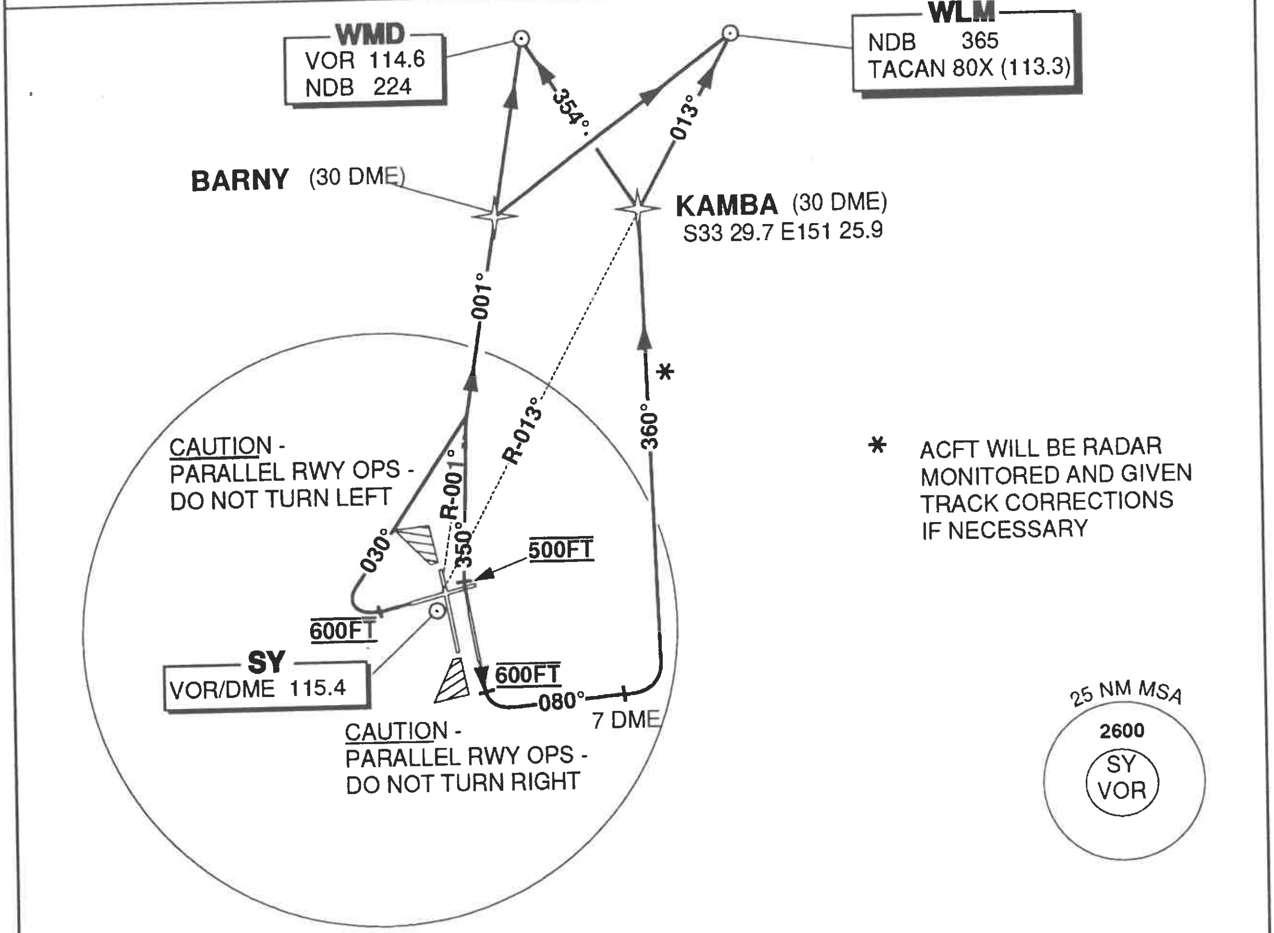
. Track 155°
. At 800ft turn RIGHT
. Intercept SY R-163°
. At BELLA (15 DME SY) turn RIGHT
track to WOL NDB.

RWY 25 (JET)

. Track 242°
. At 5 DME turn LEFT track to WOL NDB.

This chart is representative only - not to be used for navigation
Operational charts will include climb gradients for obstacle clearance and to optimise altitude over residential areas where appropriate.

STANDARD INSTRUMENT DEPARTURES
RUNWAYS NORTH (NON-JET)
SYDNEY (KINGSFORD SMITH), NSW (YSSY)



WEST MAITLAND (WMD) (number) DEPARTURE
WILLIAMTOWN (WLM) (number) DEPARTURE

RWY 34R (NON-JET)
. Track 335°
. At 500ft turn RIGHT track 350°
. Intercept and track SY R-001°

For WMD
. Track direct to WMD VOR
For WLM
. At BARNY (30 DME SY) turn right
. Track to WLM NDB

RWY 16L (NON-JET)
. Track 155°
. At 600ft turn LEFT track 080°
. At 7 DME SY turn LEFT track 360°
. Intercept SY R-013° by KAMBA (30 DME SY)

For WMD
. At KAMBA (30 DME SY) track direct to WMD VOR
For WLM
. Track to WLM NDB

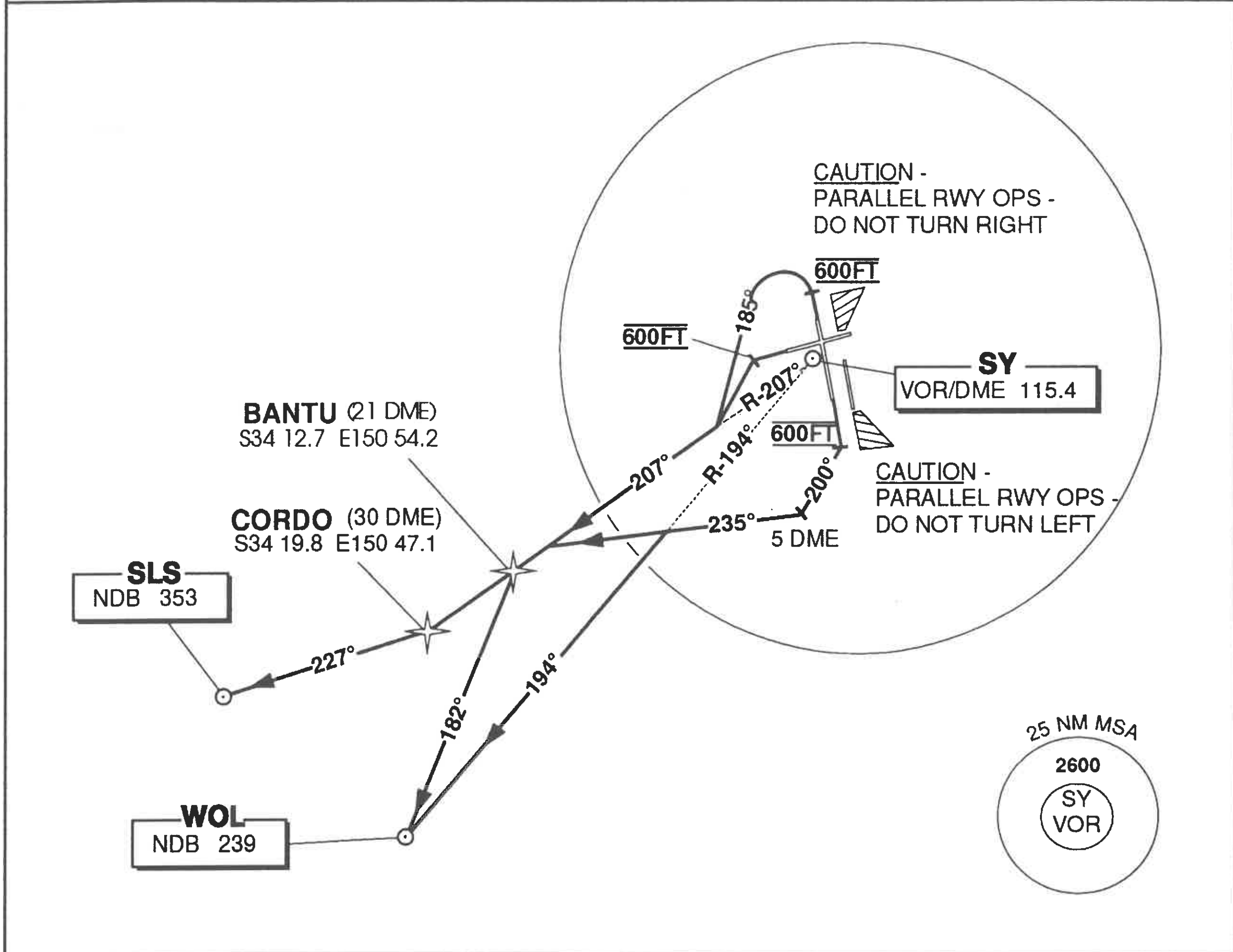
RWY 25 (NON-JET)
. Track 242°
. At 600ft turn RIGHT track 030°
. Intercept SY R-001°

For WMD
. Track direct to WMD VOR
For WLM
. At BARNY (30 DME SY) turn right
. Track to WLM NDB

SYDNEY AIR TRAFFIC MANAGEMENT TASK FORCE R:\COREL\SY_ATM\SY_SIDS\RWYS_NORTH_NON-JET

This chart is representative only - not to be used for navigation

Operational charts will include climb gradients for obstacle clearance and to optimise altitude over residential areas where appropriate.



WOLLONGONG (WOL) (number) DEPARTURE
SHELLYS (SLS) (number) DEPARTURE

RWY 34L (NON-JET)
. Track 335°
. At 600ft turn LEFT track 185°

For SLS
. Intercept and track SY R-207°
. At CORDO track 227° to SLS NDB
For WOL
. At BANTU (21 DME SY) track 182° to WOL NDB

RWY 16R (NON-JET)
. Track 155°
. At 600ft but not before DER, turn RIGHT
. Track 200°
. At 5 DME turn RIGHT track 235°

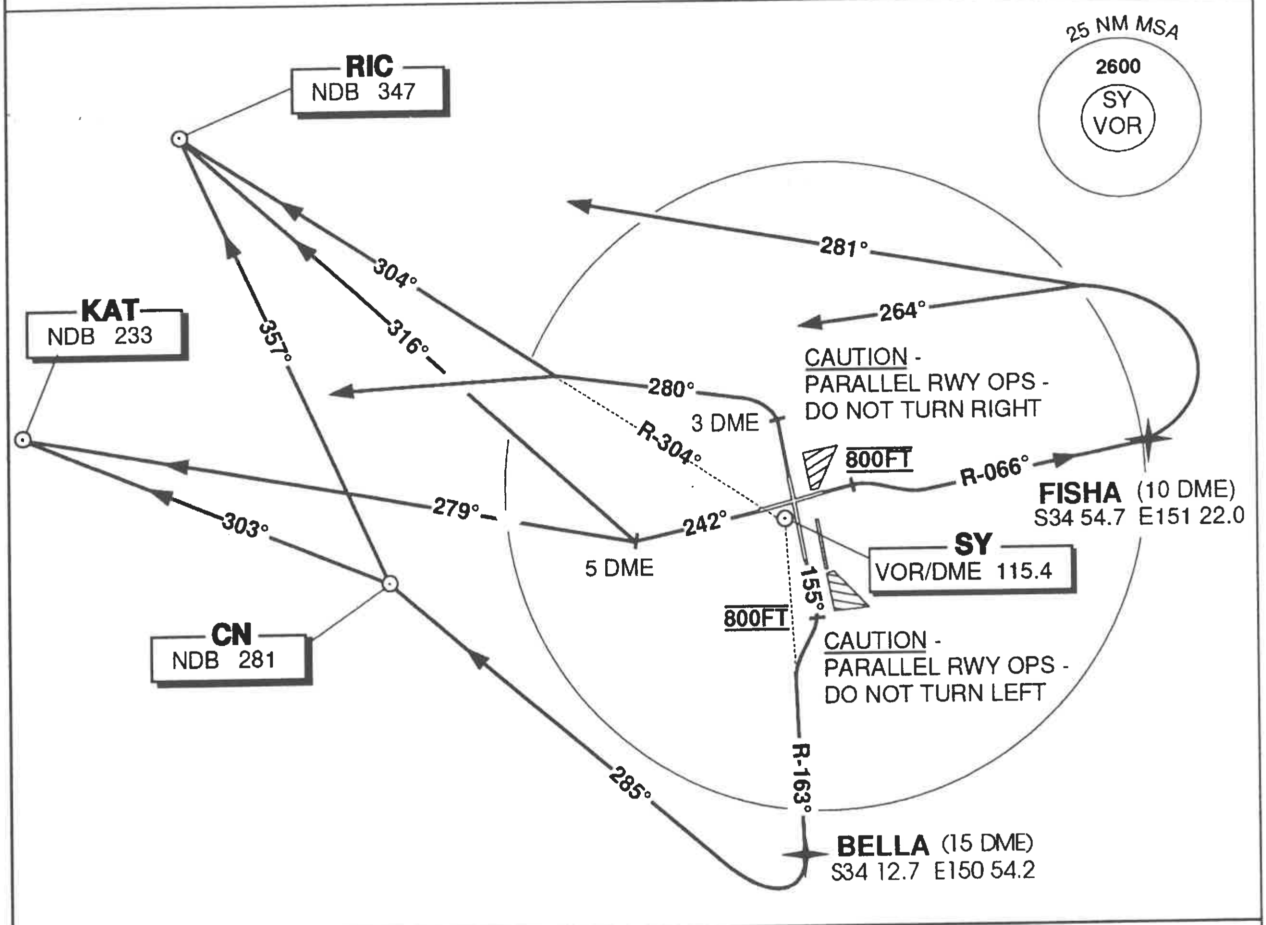
For SLS
. Intercept and track SY R-207°
. At CORDO track 227° to SLS NDB
For WOL
. Intercept and track SY R-194° to WOL NDB

RWY 25 (NON-JET)
. Track 242°
. At 600ft but not before DER, turn LEFT
. Intercept SY R-207°

For SLS
. At CORDO track 227° to SLS NDB
For WOL
. At BANTU (21 DME SY) track 182° to WOL NDB

This chart is representative only - not to be used for navigation
Operational charts will include climb gradients for obstacle clearance and to optimise altitude over residential areas where appropriate.

STANDARD INSTRUMENT DEPARTURES
RUNWAYS WEST (JET)
SYDNEY (KINGSFORD SMITH), NSW (YSSY)



RICHMOND (RIC) (number) DEPARTURE
KATOOMBA (KAT) (number) DEPARTURE

RWY 34L (JET)
. Track 335°
. At 3 DME turn LEFT track 280°

For RIC
. Intercept SY R-304° to RIC NDB
For KAT
. Crossing SY R-304° track direct to KAT NDB

RWY 16R (JET)
. Track 155°
. At 800ft turn RIGHT, intercept SY R-163°
. At BELLA (15 DME SY) turn RIGHT track to CN NDB

For RIC
. At CN track 357° to RIC NDB
For KAT
. At CN track 303° to KAT NDB

RWY 25 (JET)
. Track 242°

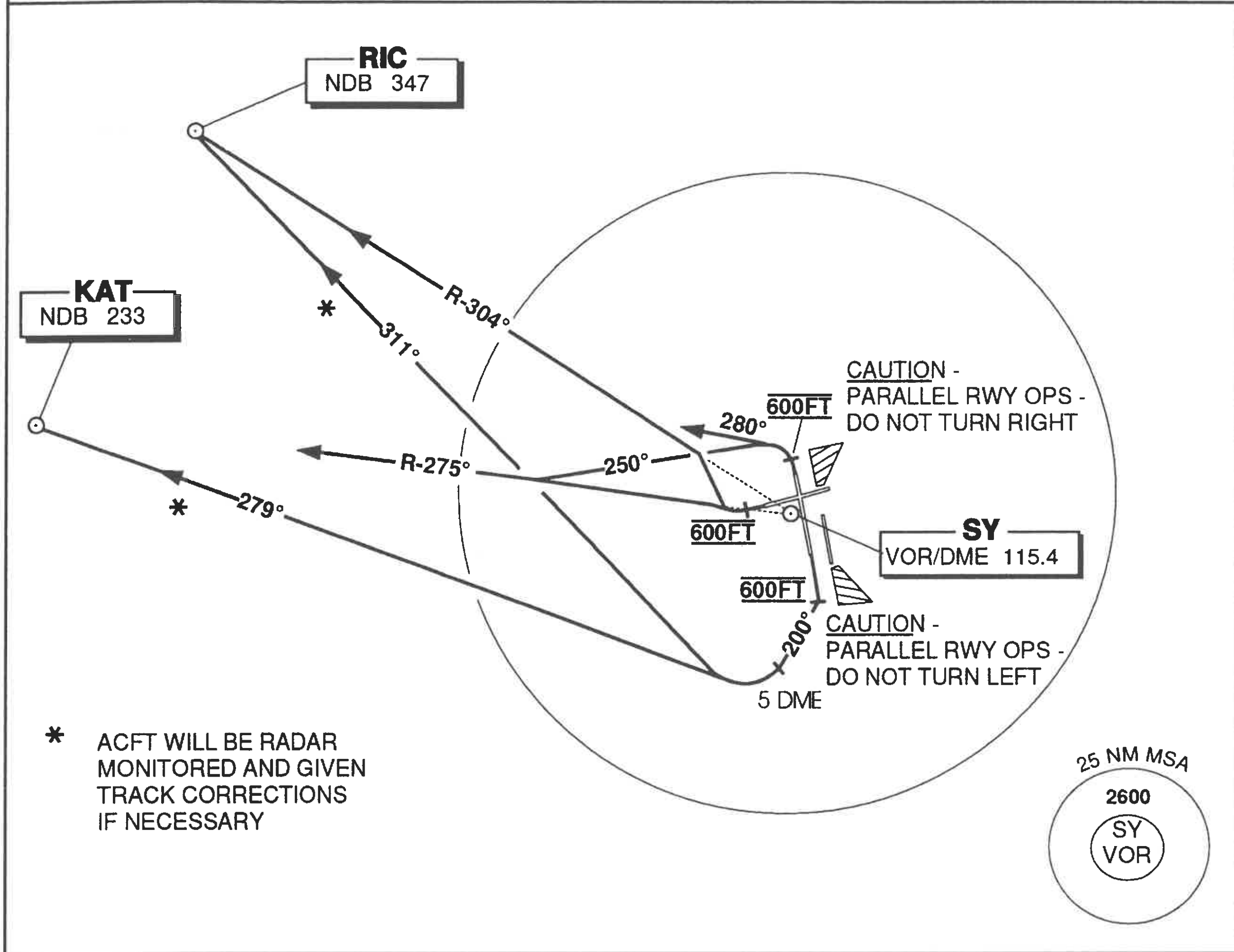
For RIC
. At 5 DME turn RIGHT track direct to RIC NDB
For KAT
. At 5 DME turn RIGHT track direct to KAT NDB

RWY 07 (JET)
. Track 062°
. At 800ft turn RIGHT
. Intercept SY R-066°
. At FISHA (10 DME SY) turn LEFT

For RIC
. Track to RIC NDB
For KAT
. Track to KAT NDB

This chart is representative only - not to be used for navigation
Operational charts will include climb gradients for obstacle clearance and to optimise altitude over residential areas where appropriate.

STANDARD INSTRUMENT DEPARTURES
RUNWAYS WEST (NON-JET)
SYDNEY (KINGSFORD SMITH), NSW (YSSY)



RICHMOND (RIC) (number) DEPARTURE
KATOOMBA (KAT) (number) DEPARTURE

RWY 34L (NON-JET)
. Track 335°
. At 600ft turn LEFT

For RIC
. Track 280°, intercept SY R-304° to RIC NDB
For KAT
. Trackk 250°, intercept SY R-275° to KAT NDB

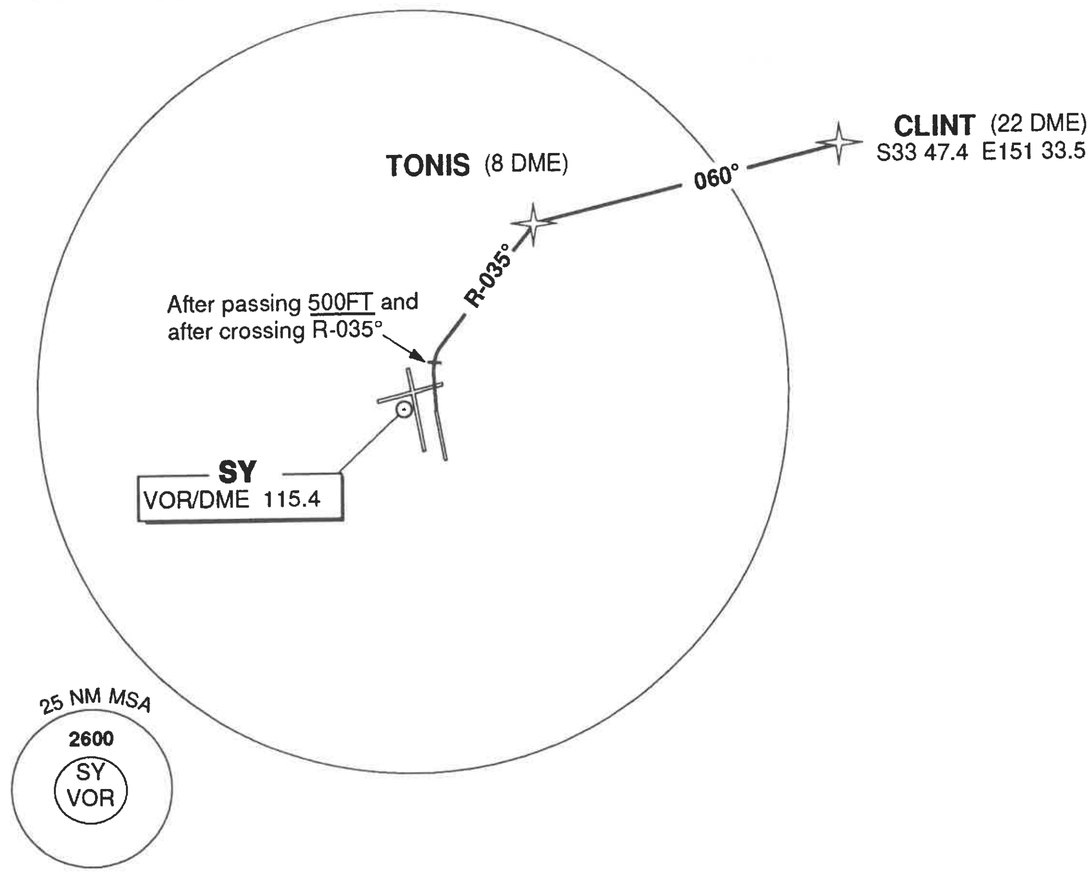
RWY 16R (NON-JET)
. Track 155°
. At 600ft turn RIGHT, track 200°
. At 5 DME turn RIGHT

For RIC
. Track direct to RIC NDB
For KAT
. Track direct to KAT NDB

RWY 25 (NON-JET)
. Track 242°

For RIC
. At 600ft turn RIGHT, intercept SY R-304° to RIC NDB
For KAT
. At 600ft intercept and track SY R-275° to KAT NDB

This chart is representative only - not to be used for navigation
Operational charts will include climb gradients for obstacle clearance and to optimise altitude over residential areas where appropriate.



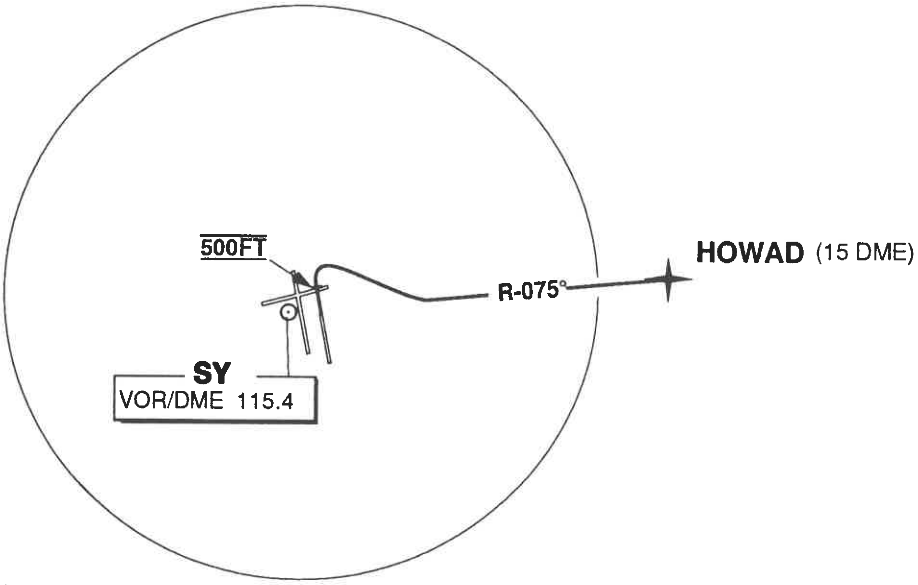
CLINT ONE DEPARTURE

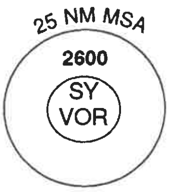
RWY 34R (JET)

. Minimum design climb gradient 4.5% to 500ft thence 3.3%
. Track 335°
. At DER turn RIGHT track 350°
. After passing 500FT and after crossing SY R-035° turn RIGHT
. Intercept SY R-035° to TONIS (8 DME SY)
. At TONIS turn RIGHT track 060° to CLINT
. Expect radar vectors at or before CLINT (22 DME SY)

This chart is representative only - not to be used for navigation

Operational charts will include climb gradients for obstacle clearance and to optimise altitude over residential areas where appropriate.





HOWAD ONE DEPARTURE

RWY 34R (JET)

. Minimum design climb gradient 3.4% to 500FT thence 3.3%
. Track 335°
. At 500FT (mandatory) turn RIGHT
. Intercept SY R-075
. Expect radar vectors at or before HOWAD (15 DME SY).

This chart is representative only - not to be used for navigation

Operational charts will include climb gradients for obstacle clearance and to optimise altitude over residential areas where appropriate.

Appendix 7

Sabre Design Technologies Capacity Study Report

Sydney Kingsford-Smith Airport Runway Capacity Study

Final Report

Prepared for:

AirServices Australia

Prepared by:

SABRE Decision Technologies℠

16 November 1996

OUTLINE

- EXECUTIVE SUMMARY
- INTRODUCTION

    GENERAL
    SENSITIVITY ANALYSES

- VERIFICATION
- RESULTS

    RMO 1
    RMO 2
    RMO 3
    RMO 4
    RMO 5
    RMO 6
    RMO 7
    RMO 8
    RMO 9
    RMO 10
    RMO 11
    RMO 12
    RMO 13
    RMO 14
    RMO 14A
    RMO 15
    RMO 16

- CONCLUSIONS
- RECOMMENDATIONS

EXECUTIVE SUMMARY

- Table 1 summarizes the simulation results of the sixteen proposed runway modes of operation (RMO). "Preliminary" means that no improvements were made to the airspace or airfield (i.e., the current configuration and procedures were used). "Sensitivity" means that the effects of airfield and/or airspace procedure improvements were tested

TABLE 1. Summary of Hourly Operations for Proposed Runway Modes of Operation

RMO	HOURLY OPS (preliminary)	HOURLY OPS (sensitivity)	DEPARTURE RUNWAYS	ARRIVAL RUNWAYS	TRAFFIC MIX (Arr % / Dep %)
1	23	n/a	16R	34L	56% / 44%
2	56	n/a	16R	34R / 16R (long haul)	47% / 53%
3	49	n/a	16L / 34L (long haul)	34L	42% / 58%
4	43	n/a	16L / 16R (long haul)	34L	35% / 65%
5	53	n/a	16L / 16R	25 / 16R (long haul)	47% / 53%
6	58	**67**	07 / 34L (long haul)	34L / 34R	65% / 35%
7	64	**73**	25 / 34L (long haul)	34L / 34R	58% / 42%
8	71*	**78-80***	25 / 34R / 34L (long haul)	34L / 34R	n/a
9	74	**82**	34L / 34R	34L / 34R	53% / 47%
10	73	**87**	16L / 16R	16L / 16R	55% / 45%
11	56*	n/a	16L / 16R	16L / 16R / 07	n/a
12	33	n/a	07	07	70% / 30%
13	33	n/a	25	25	67% / 33%
14	59	n/a	16L / 16R	16R / 07	41% / 59%
14A	66	**75**	16L / 16R	07	65% / 35%
15	55	n/a	34R / 34L (long haul)	34L	36% / 64%
16	62*	n/a	34L	34R / 34L (long haul)	n/a

* Estimated results; n/a = not applicable

- SDT believes that the hourly operations reported in Table 1 would be sustainable for several hours of operation because conservative runway procedures were used in the simulation. Higher operation levels may be obtainable during brief periods of peak operations, but SDT does not believe that higher hourly operations could be sustained for several hours of operation

EXECUTIVE SUMMARY

- The scope of this study included the complete airfield and the airspace for initial departure/final approach. The new terminal airspace structure required to accommodate the various RMO's may reduce the airfield capacity to lower levels than Table 1 shows, particularly during transition periods when the operating mode is switched. Also, no attempt has been made to estimate the effect of managing the complexities of the various RMO's on controller efficiency and a possible reduction in the capacity due to controller workload

- SDT does not endorse any particular RMO, especially those that require operations in the opposite direction (e.g., RMO 1) or those that require multiple intersecting operations (e.g., RMO 6). No risk analysis was performed for this study; SDT used its knowledge of procedures from the United States Federal Aviation Administration (FAA) manuals as well as interviews with Airservices Australia and tower personnel at Sydney Kingsford-Smith Airport (SYD) to estimate required procedure times for the various RMO's

INTRODUCTION - GENERAL

- Assumptions were presented in "Assumptions Document", finalized on October 11, 1996. Major assumptions included:

    - The airfield was modeled in detail, including all runway exits, taxiways, aprons and gates
    - The airspace consisted of final approach and initial departure routes to a maximum of a 20 nmi radius
    - Winds of 10 knots or less
    - Visual conditions
    - High efficiency for controllers
    - Arrival / Departure ratio of 50/50 for the schedule
    - Fleet mix of 20% light, 50% medium and 30% heavy aircraft
    - Long haul (aircraft requiring Runway 16R/34L) operations are 16% of jet arrivals and 19% of jet departures. Long haul operations were defined as arrivals of more the 2500 nmi to SYD and departures of more than 1500 nmi from SYD

- Changed landing roll distribution for commuters and light props on Runway 34L to have all aircraft exit by H

    - Only four data points were obtained during data collection (commuters were primarily using Runway 34R to land). One of those four aircraft exited at G during a non-peak time, and so it was allowed to taxi on the runway longer than would be normal
    - Without the assumption change, subsequent arrivals would have a missed approach in the simulation

- Realism is reflected in variability of the model. Randomness occurs in

    - Take-off / Landing roll distances
    - Sequence of the aircraft (i.e.. mixture of which type of aircraft follow one another)
    - Intrail spacing of the aircraft (up to 25% over the minimum standard)

- Figures included in the results section show the rolling hour runway capacities for each RMO. The rolling hours represent four hours of time that have been arbitrarily designated as 7:00 AM to 10:00 AM for the purpose of reporting

- The standard deviation for the results of each simulated RMO is represented by the difference between the reported "peak" and "sustained" number of operations. In most RMO's, this standard deviation ranged from 1 to 3 operations per hour

- Runway usage for each of the simulated RMO's is shown in Appendix B

INTRODUCTION - SENSITIVITY ANALYSES

- Based on the initial results, SDT and the Task Force decided to perform sensitivity analyses on selected RMO's in an attempt to achieve a sustained 80 operations per hour. The sensitivity analyses included both airfield and operational changes

  - RMO's 6, 7: Allow land-and-hold short operations on Runway 34L arrivals, and add high-speed exits to 34L and 34R
  - RMO 8: Estimate capacity improvements from RMO 6 and RMO 7 results
  - RMO's 9, 10: Add high speed runway exits to the arrival runways
  - RMO 14A: Relocate all departures south of 07 on 16R (to Taxiway H) except long haul operations

- The diagram on the following page shows the location of the additional high speed exits that were simulated. This layout represents proposed exits as they were being considered in October 1996; final high speed exit location will be determined at a later date

  Runway 34R

  - "T2a" will be midway between T3 and T2, continuing on to T
    - T2a intersects 34R 330m north of T3 and 290m south of T2
    - T2a intersects T 700m north of T3, 450m south of T2

  Runway 34L

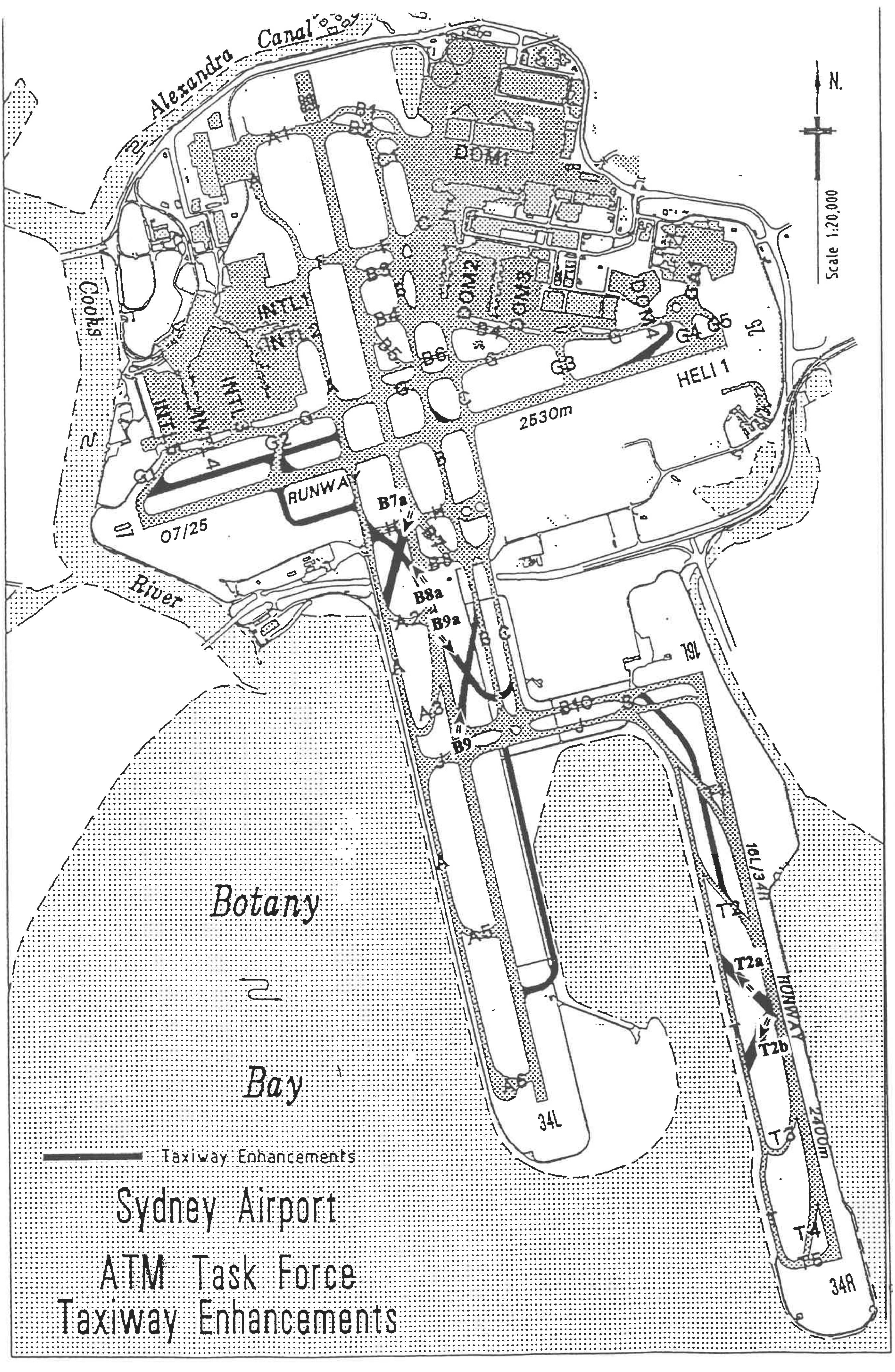
  - "B9" will be at the intersection of 34L and B10, continuing east to intersect B 415m north of B10
  - "B8a" will be at the intersection of 34L and B8, continuing west to the intersection of A and H

  Runway 16L

  - "T2b" will be midway between T2 and T3, continuing on to T
    - T2b intersects 34R 330m north of T3 and 290m south of T2
    - T2b intersects T 370m north of T3, 760m south of T2

  Runway 16R

  - "B7a" will be at the intersection of 16R and H, continuing west to the intersection of A and A2
  - "B9a" will be at the intersection of 16R and A2, continuing east through B to C. B9a intersects B 90m north of B10 and intersects C 140m north of B10



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INTRODUCTION - SENSITIVITY ANALYSES

- To simulate the proposed runway exits shown on the previous page, SDT made the following assumptions changes to the model:
  - In north arrival flow, Taxiway B flows north and is used by arrivals, and Taxiway C flows south and is used by departures
  - Landing roll distance distributions were modified to promote the use of the new exits if the aircraft type allowed. The original and new landing roll distributions can be seen in Appendix A
  - To reflect the shortened landing rolls, the arrival procedures were modified as follows:

Modified Runway Occupancy Times

Operations	Light Aircraft	Medium Aircraft	Heavy Aircraft
Arrivals to 34L	45 seconds	50 seconds	60 seconds
Arrivals to 34R	45 seconds	50 seconds	60 seconds
Arrivals to 16R	30 seconds	40 seconds	50 seconds
Arrivals to 16L	35 seconds	30 seconds	30 seconds

- To accommodate the land-and-hold-short operations (LAHSO) for Runway 34L arrivals, SDT made the following changes to the model:
  - For Runway 34L arrivals, SDT set the runway blocking time with Runway 07/25 departures to 0 seconds for light and medium aircraft (no LAHSO for heavy aircraft). The departure "buyout" distance remains at 2 nmi
  - For Runway 07/25 departures, SDT set the runway blocking time with Runway 34L arrivals to 0 seconds for light and medium aircraft
- Additionally, SDT reduced the buyout for departures to quantify the impact on runway capacity
  - Buyout is the distance from a runway threshold that an arrival blocks a departure procedure (e.g., a 3 nmi buyout means that no departure can be released when an arrival is within 3 nmi of landing)
  - The buyout was lowered to 2 nmi from the initial 3 nmi in an attempt to increase runway capacity (except buyout remained at 3 nmi for jumbo departures). The 2 nmi buyout is used at U.S. airports in visual conditions

Verification

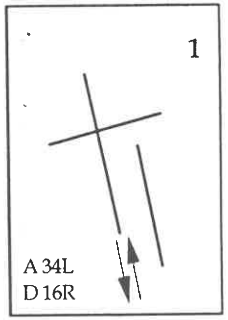
- Each Runway Mode Operation (RMO) simulated by SDT was verified through observations of the SIMMOD animation

    - Created an animation showing the movements of both arriving and departing aircraft on the airfield, runways, and in the terminal airspace
    - Examined each animation to ensure that aircraft were operating on the designated arrival and departure runways, using the assigned departure queues and runway exits, taxiing along the planned paths to and from the gates, and gating in the proper terminal areas
    - Ensured also that defined runway procedures were operating as intended and not conflicting

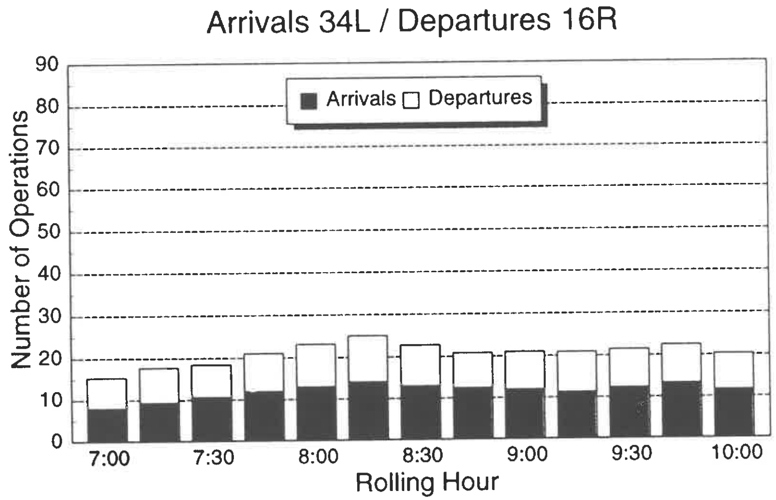
- For each RMO simulated, SDT reviewed the "echo" report produced by SIMMOD. This report outlines and summarizes all physical airspace and airfield constructs and all runway operation procedures. SDT verified that the information printed in the echo report matched the SDT assumptions document, manuals obtained from Airservices, and data gathered by SDT on-site at SYD

- Also for each RMO, SDT reviewed the "log" report produced by SIMMOD. This report details the flight activity throughout each simulation replication. SDT verified that procedure violations (missed approaches and aborted take-offs) did not affect the runway capacity and that no aircraft traffic gridlock occurred on the airfield which may impact runway capacity

RMO 1: Arrivals 34L / Departures 16R

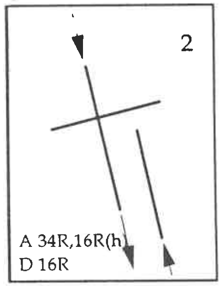


- SDT observed a sustained capacity of 23 operations per hour
  - Operations consisted of 13 arrivals and 10 departures
  - Peak observed capacity of 25 operations
- Figure 1 presents the simulation results for a rolling hour period

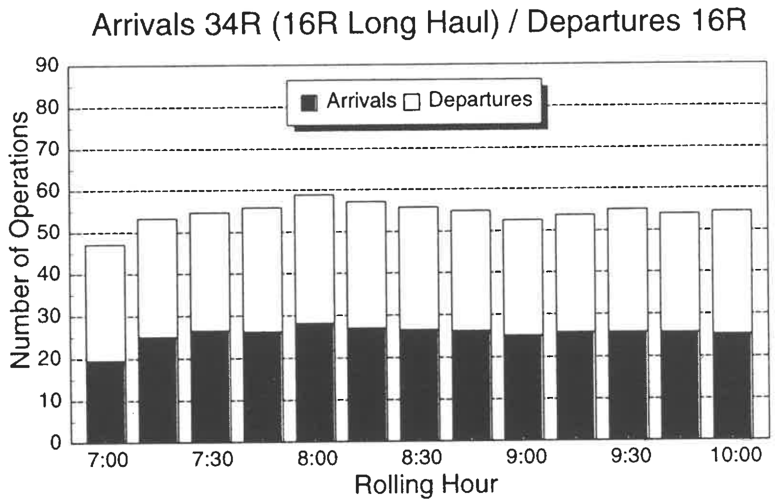


- This RMO is the current curfew operation and confines all operations to over-water
- Due to the interaction of arrivals and departures in opposite directions on Runway 16R/34L and the 20-mile buyout for 16R departures, significant aircraft spacing was required on the take-off and final approach tracks, thus limiting the capacity of the runway
- This RMO will not reach 80 operations per hour using only one runway. However, if only arrivals or only departures were operating for an extended period of time, the capacity for the active operation type could be increased (while decreasing the capacity of the other operation type)

RMO 2: Arrivals 34R and 16R (Long Haul) / Departures 16R

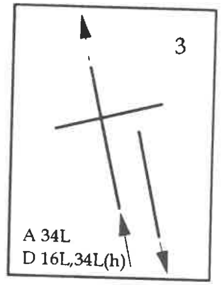


- SDT observed a sustained capacity of 56 operations per hour
  - Operations consisted of 26-27 arrivals and 29-30 departures
  - Peak observed capacity of 59 operations
- Figure 2 presents the simulation results for a rolling hour period

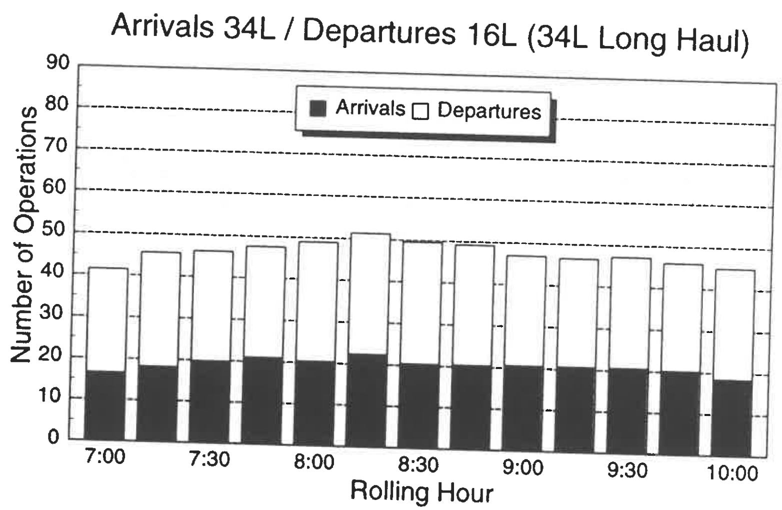


- This RMO confines the majority of operations to over-water. Long haul arrivals continue to use 16R
- Due to single runway use for arrivals and departures the capacity for this mode is limited
- This RMO will not reach 80 operations per hour. However, if new runway exits were provided on the arrivals' runway 34R, landing roll times could be decreased (which would decrease occupancy time) and capacity may be increased slightly (estimate 1-2 more departure operations per hour)

RMO 3: Arrivals 34L / Departures 16L and 34L (Long Haul)

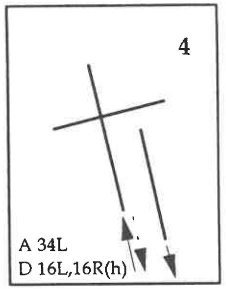


- SDT observed a sustained capacity of 49 operations per hour
  - Operations consisted of 20-21 arrivals and 28-29 departures
  - Peak observed capacity of 51 operations
- Figure 3 presents the simulation results for a rolling hour period

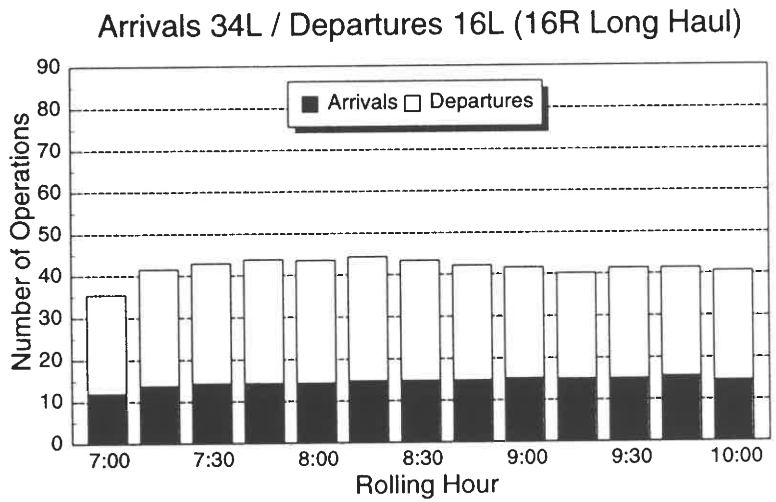


- This RMO confines the majority of operations to over-water. Long haul departures continue to depart to the north (34L)
- Due to single runway use for both departures and arrivals, capacity is limited in this mode. RMO 3 provides better capacity than RMO 4 since the operations on 34L are in the same direction
- This RMO will not reach 80 operations per hour. However, if new runway exits were provided on the arrivals' runway 34L, landing roll times could be decreased and capacity may be increased slightly (estimate 1-2 more departure operations per hour)

RMO 4: Arrivals 34L / Departures 16L and 16R (Long Haul)

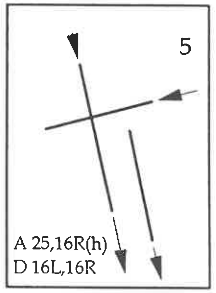


- SDT observed a sustained capacity of 43 operations per hour
  - Operations consisted of 15 arrivals and 28 departures
  - Peak observed capacity of 44 operations
- Figure 4 presents the simulation results for a rolling hour period

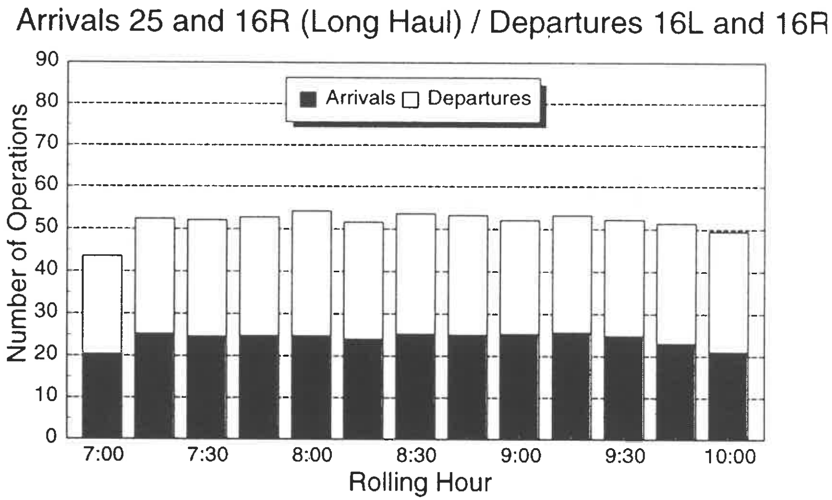


- This RMO confines all operations to over-water and uses mixed operations in the opposite direction on Runway 16R/34L
- Due to the interaction of arrivals and departures in opposite directions on Runway 16R/34L and the 20-mile buyout for 16R departures, significant aircraft spacing was required on the take-off and final approach tracks, thereby limiting the capacity of the runway
- This RMO will not reach 80 operations per hour. However, if new runway exits were provided on the arrivals' runway 34L, landing roll times could be decreased and capacity may be increased slightly. Additionally, if the period of use for the RMO does not include long haul departures, the arrival capacity could be increased

RMO 5: Arrivals 25 and 16R (Long Haul) / Departures 16R and 16L

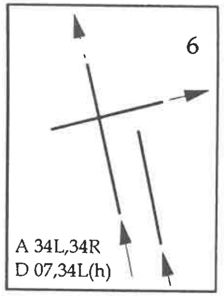


- SDT observed a sustained capacity of 53 operations per hour
  - Operations consisted of 25 arrivals and 28 departures
  - Peak observed capacity of 54 operations
- Figure 5 presents the simulation results for a rolling hour period

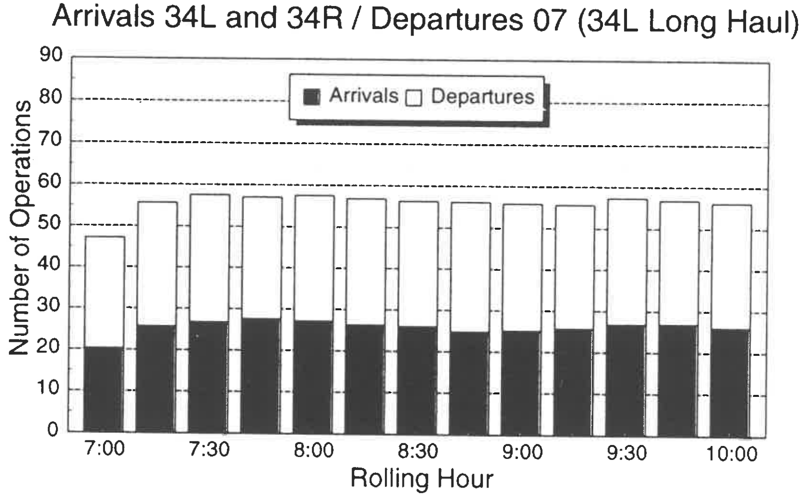


- This RMO confines departures to over-water and directs the majority of arrivals from the east
- The capacity of RMO 5 does not quite reach the capacity seen in RMO 14 (59 operations; arrivals on 07 rather than 25) because arrivals to Runway 25 in RMO 5 require a longer procedure time than arrivals to Runway 07 in RMO 14 since the intersection with Runway 16R is further from the 25 end than the 07 end (by 349 meters). Also, RMO 5 had the long haul restriction imposed on the 16R arrival runway while RMO 14 did not
- Taxi crossings of active runways will increase controller workload such that efficiency and capacity may be reduced from this calculated capacity
- This RMO will not reach 80 operations per hour. If land-and-hold-short operations (LAHSO) were used for the intersecting arrival runways, some improvement to the capacity could be realized, but the capacity would not reach 80 operations per hour

RMO 6: ARRIVALS 34L AND 34R / DEPARTURES 07 AND 34L (LONG HAUL)



- SDT observed a sustained capacity of 58 operations per hour
  - Operations consisted of 27 arrivals and 31 departures if all non long haul arrivals were placed on 34R
  - Operations consisted of 38 arrivals and 20 departures if arrivals were balanced between 34L and 34R
  - Peak observed capacity of 59 operations
- Figure 6 presents the simulation results for a rolling hour period

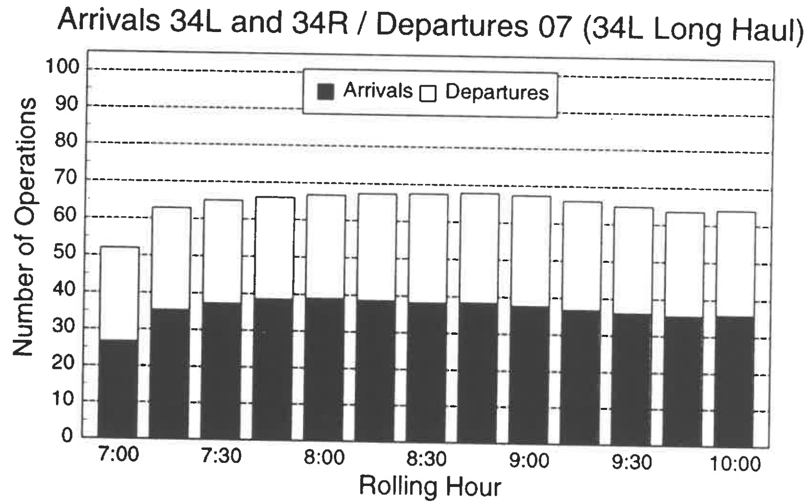


- This RMO confines arrivals to over-water, and runs the majority of departures eastward (the quick route to the ocean). This RMO also has intersecting runways (34L and 07)
- Arrival capacity is limited due to inefficient exit locations on both runways, intersecting runway operations, and the need for slightly increased spacing on the arrival track to 34L. Departure capacity is limited by intersecting runway operations
- The current airfield is restricted around the Runway 07 departure queue area by a single taxiway. The simulation assumed that the ground congestion could be effectively managed; in actual practice, this may require more controller resources and/or taxiway improvements to manage
- This RMO may be very complex for air traffic controllers with the missed approach route of 34R crossing the departure route of 07

Sensitivity Analyses - Findings
RMO 6: Arrivals 34L and 34R / Departures 07 and 34L (Long Haul)

- This RMO was selected for sensitivity analysis to determine if it could reach 80 operations per hour. New runway exits for 34L and 34R were added and LAHSO was used with 34L arrivals. SDT observed a sustained capacity of 67 operations per hour when both the new exits and land-and-hold-short operations were used (initial buyout of 3 nmi was maintained)
  - ✈ Operations consisted of 37 arrivals and 30 departures
  - ✈ Peak observed capacity of 68 operations

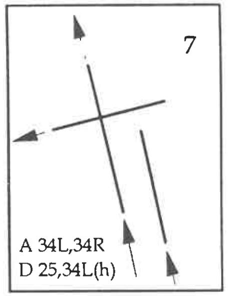
- Figure 6s presents the simulation results for a rolling hour period



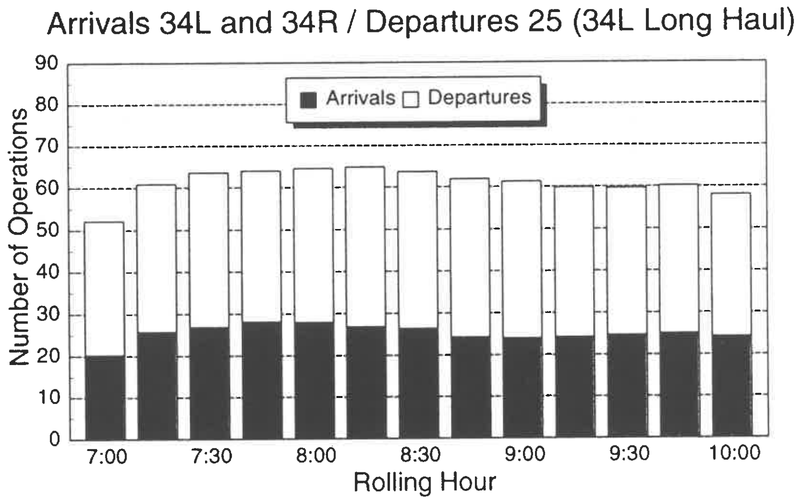
- When the new runway exits were simulated without land-and-hold-short operations, SDT observed a sustained capacity of 61 operations per hour (39 arrivals and 24 departures)

- If the 34L buyout was reduced to 2 nmi, the sustained capacity would increase to 68 operations (38 arrivals and 30 departures)

RMO 7: ARRIVALS 34R AND 34L / DEPARTURES 25 AND 34L (LONG HAUL)



- SDT observed a sustained capacity of 64 operations per hour
  - Operations consisted of 27 arrivals and 37 departures if all non long haul arrivals were placed on 34R
  - Operations consisted of 37 arrivals and 27 departures if arrivals were balanced between 34L and 34R
  - Peak observed capacity of 65 operations
- Figure 7 presents the simulation results for a rolling hour period



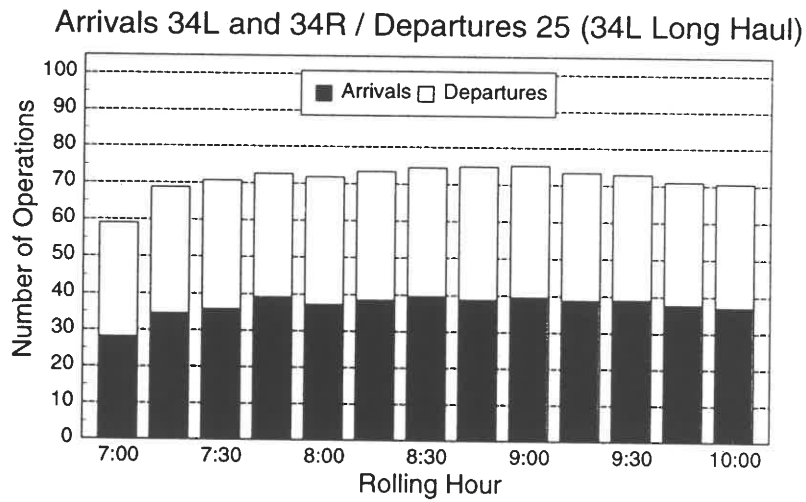
- This RMO confines arrivals to over-water, and runs the majority of departures westward. Runways 34L and 25 intersect
- RMO 7 has more departure capacity than RMO 6 due to the fanning departure tracks which decreases the required departure procedure time by 20 seconds and because Runway 34R is independent of Runway 25 (Runway 34R is dependent with Runway 07 in RMO 6 for its missed approach route)
- Arrival capacity is limited due to inefficient exit locations on both runways, intersecting runway operations, and the need for slightly increased spacing on the arrival track to 34L. Departure capacity is limited by intersecting runway operations
- The current airfield is restricted around Runway 25 and the departure queue area blocks the entrance to the domestic apron. The simulation assumed that the ground congestion could be effectively managed; in actual practice, this may require more controller resources and/or taxiway improvements

Sensitivity Analyses - Findings
RMO 7: Arrivals 34L and 34R / Departures 25 and 34L (Long Haul)

- This RMO was selected for sensitivity analysis to determine if it could attain 80 operations per hour. New runway exits for 34L and 34R were used and LAHSO was applied to 34L arrivals. SDT observed a sustained capacity of 73 operations per hour when both the new exits and land-and-hold-short operations were used (the initial buyout of 3 nmi was maintained)

  - Operations consisted of 38 arrivals and 35 departures
  - Peak observed capacity of 75 operations

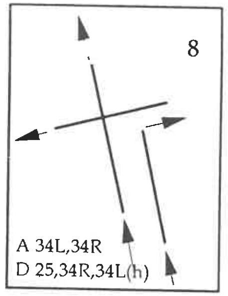
- Figure 7s presents the simulation results for a rolling hour period



- When the new runway exits were simulated without land-and-hold-short operations, SDT observed a sustained capacity of 69 operations per hour (38 arrivals and 31 departures)

- If the 34L buyout was reduced to 2 nmi, the sustained capacity would increase to 75 operations (39 arrivals and 36 departures)

RMO 8: Arrivals 34L and 34R / Departures 25, 34R and 34L (Long Haul)

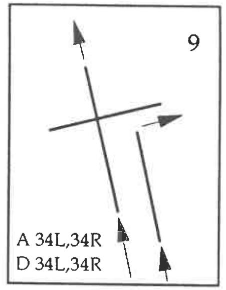


- The sustained capacity is estimated to be 70-72 operations per hour
  - RMO 7, which uses the same arrival runways and one less departure runway (34R), has a capacity of 64
  - RMO 9, which uses the same arrival and departure runways without the intersecting operations on Runway 25 of this RMO, has a capacity of 74 with a peak of 15 departures off 34R
  - RMO 8 should produce capacity results between RMO 7 and RMO 9
- This RMO confines arrivals to over-water, and distributes departures to the east, west, and to the north (long hauls).
- In addition, this mode may be very complex for the air traffic controllers
- This RMO would also have a complex airfield operation
  - Arrivals to 34R must cross the active runway 25 when taxiing north to their gates
  - Departures to 34R must cross the active runway 25 when taxiing south to their departure queue
  - Departures to 34L must cross the active runway 25 when taxiing south to their departure queue
- With so many crossings of Runway 25, significant use of that runway by departures will increase controller workload and possibly decrease controllers' efficiency and the hourly capacity

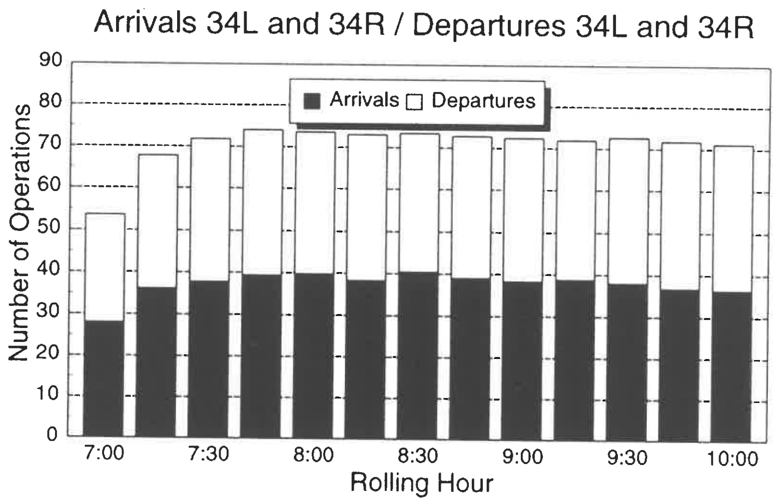
Sensitivity Analyses - Findings
RMO 8: Arrivals 34L and 34R / Departures 25, 34R and 34L (Long Haul)

- This RMO was selected for sensitivity analysis to evaluate if it could attain 80 operations per hour. SDT estimates a sustained capacity of 78-80 operations per hour when the new runway exits and land-and-hold-short operations are used and the buyout is reduced to 2 nmi
  - RMO 7, when using land-and-hold-short operations and the new runway exits, had an improved capacity from 64 to 73 operations per hour
  - RMO 9, when using the new runway exits and the reduced buyout, had an improved capacity from 74 to 82 operations per hour
  - RMO 8 should produce capacity results between RMO 7 and RMO 9
- The increase of nine operations per hour in both RMO 7 and RMO 9 suggest that the same operational and airfield improvements would increase RMO 8 by the same magnitude from its base of 70-72
- This mode may be very complex for the air traffic controllers

RMO 9: Arrivals 34R and 34L / Departures 34R and 34L



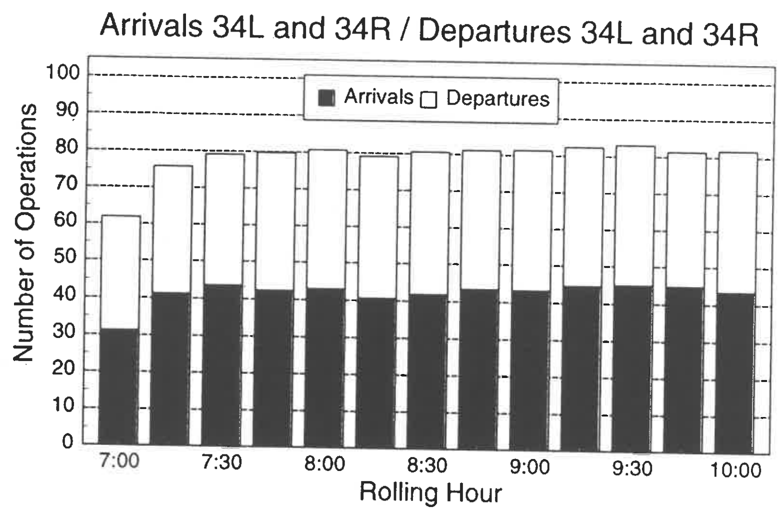
- SDT observed a sustained capacity of 74 operations per hour
  - ✈ Operations consisted of 39 arrivals and 35 departures
  - ✈ Peak observed capacity of 75 operations
- Figure 9 presents the simulation results for a rolling hour period



- This RMO confines arrivals to over-water, and directs departures to the east (from 34R) and to the north
- Balancing the departures evenly between 34L and 34R initially produced a capacity of 71 operations. All prop departures were segregated from large departures to increase capacity to 74. Capacity may be limited by inefficient runway exits on both arrival runways

Sensitivity Analyses - Findings
RMO 9: Arrivals 34L and 34R / Departures 34L and 34R

- Sensitivity analysis was performed on this RMO to determine whether 80 operations per hour could be achieved. SDT observed a sustained capacity of 82 operations per hour when the new runway exits were used and the buyout was reduced to 2 nmi
  - ✈ Operations consisted of 43-44 arrivals and 38-39 departures
  - ✈ Peak observed capacity of 83 operations
- Figure 9s presents the simulation results for a rolling hour period

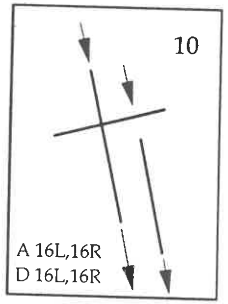


- The high-speed exit locations used in the model for the arrival runways did not prove to be advantageous for high frequency use by the small and medium commuter aircraft (As previously stated, new exits were located using the best information available at the time of the analysis; refer to p. 6)
  - ✈ The assumptions used for the landing roll exit percentages in RMO 9 may have been too low because the distances were estimated from the on-site data collection effort during which very few light and medium aircraft landed on 34L
  - ✈ If the landing exit locations are accurate, then the "T2a" exit for Runway 34R should be placed 90 meters further north to allow a higher percentage of aircraft to use that exit (estimate usage of 40% for light and medium commuters if relocated vs. 6% and 20% usage, respectively, with the proposed location as shown)

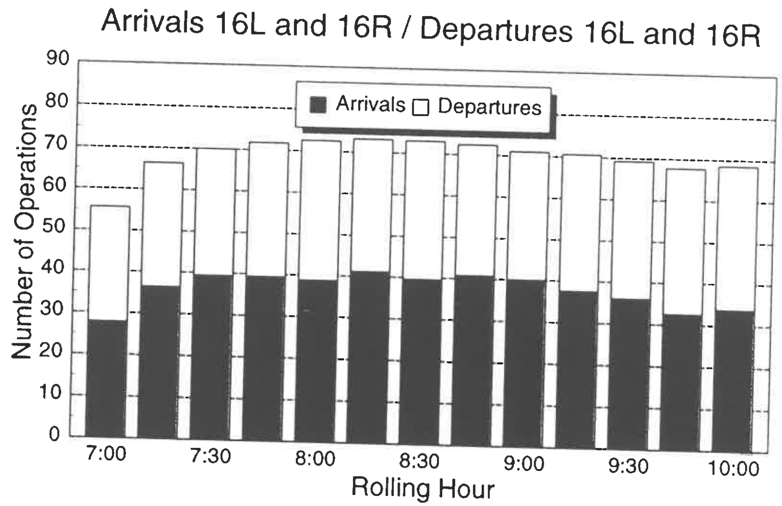
Sensitivity Analyses - Findings
RMO 9: Arrivals 34L and 34R / Departures 34L and 34R

- The effect of allowing jet departures from intersection J on Runway 34L was also tested
  - All jets except B747 were allowed to depart from J rather than the runway end
  - If the buyout distance remained at 2 nmi, then no improvement was seen
  - If the buyout was reduced to 1.5 nmi, then 3 additional operations per hour could be obtained (The distance from the runway end to the J intersection is 1328 meters, so a reduction in the buyout distance between arrivals to 34L and departures at intersection J would be feasible)

RMO 10: Arrivals 16R and 16L / Departures 16R and 16L



- SDT observed a sustained capacity of 73 operations per hour
  - Operations consisted of 40 arrivals and 33 departures
  - Peak observed capacity of 74 operations
- Figure 10 presents the simulation results for a rolling hour period



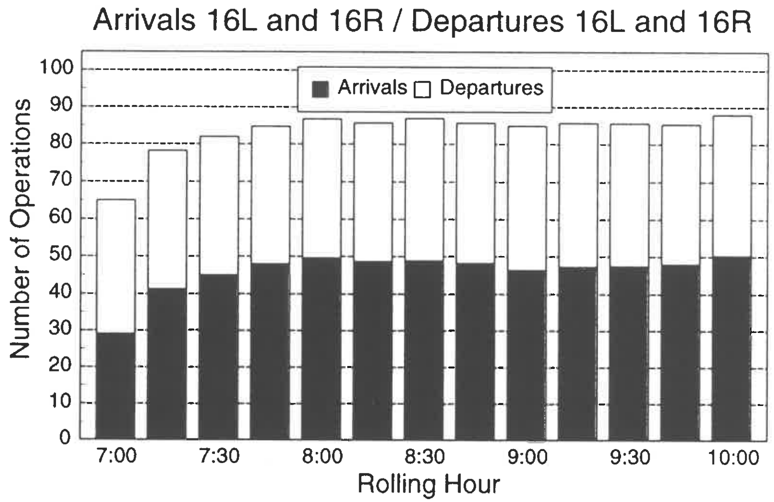
- This RMO confines arrivals to north approaches and departures to the south over water
- Arrivals were assigned 50%/50% between 16L and 16R and departures were assigned 52%/48% between 16L and 16R to attain the 73 operations per hour. Capacity may be limited by inefficient runway exits on both arrival runways

Sensitivity Analyses - Findings
RMO 10: Arrivals 16L and 16R / Departures 16L and 16R

- Sensitivity analysis was performed on this RMO to determine whether 80 operations per hour could be achieved. SDT observed a sustained capacity of 87 operations per hour when the new runway exits were used and the buyout was reduced to 2 nmi

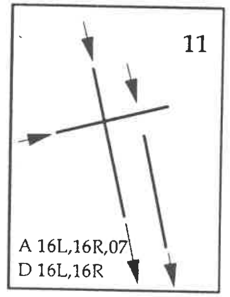
  - Operations consisted of 49 arrivals and 38 departures
  - Peak observed capacity of 88 operations

- Figure 10s presents the simulation results for a rolling hour period



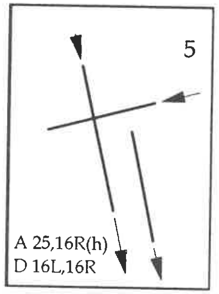
- RMO 10 produced a significantly higher capacity than RMO 9 due to more optimal location of the new high-speed exits on the arrival runways (As stated in the Introduction, the final placement of the new runway exits had not been determined at the time of this analysis)

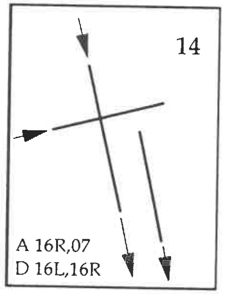
RMO 11: ARRIVALS 16R, 16L AND 07 / DEPARTURES 16R AND 16L



- The sustained capacity is estimated to be 56 operations per hour

  - RMO 5, which uses the same departure runways and a intersecting arrival runway (25), has a capacity of 53
  - RMO 14, which uses the same arrival and departure runways with the exception of 16L arrivals, has a capacity of 59
  - RMO 11 should produce capacity results slightly lower than RMO 14 due to arrivals on 16L crossing Runway 07 (while airborne) but RMO 11 should produce higher capacity results than RMO 5 due to an additional arrival runway



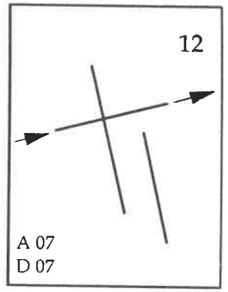


- This RMO confines departures to over-water, and distributes arrivals from the north and west

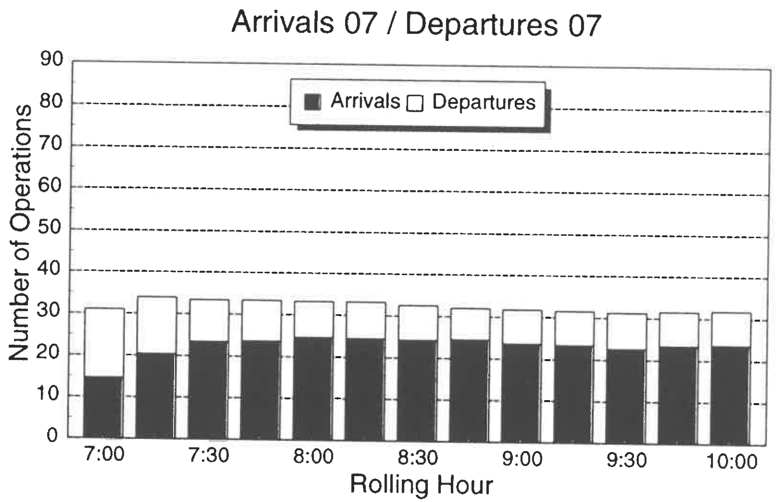
- This mode is also very difficult from an air traffic control standpoint with the 16L and 16R arrivals crossing the 07 arrivals

- This RMO will not attain 80 operations per hour and no airfield changes will improve the capacity significantly

RMO 12: Arrivals 07 / Departures 07

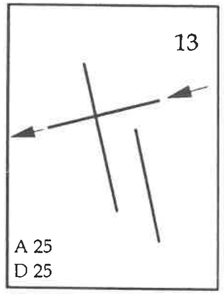


- SDT observed a sustained capacity of 33 operations per hour
  - Operations consisted of 23 arrivals and 10 departures
  - Peak observed capacity of 34 operations
- Figure 12 presents the simulation results for a rolling hour period

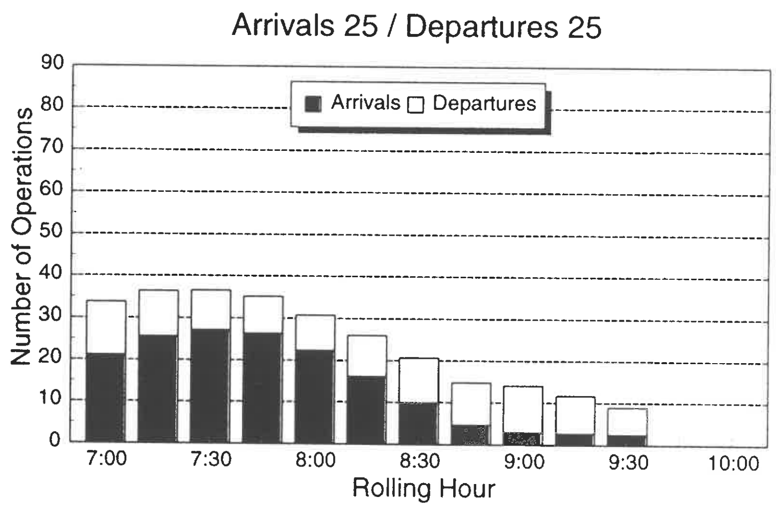


- This RMO will be used in the event of strong winds from the east
- RMO 12 may achieve a sustainable capacity of 37 operations per hour if the landing rolls of the arriving aircraft in the simulation had been shortened to better match its runway exit geometry. However, as no observations were made of 07 operations during data collection it was agreed that the observed landing rolls to Runway 25 would be used (refer to Assumptions Document)
- Additional separation could be maintained between consecutive arrivals to ensure that more departures will operate per hour. This would not necessarily increase the overall capacity, but rather equalize the number arrivals with the number of departures if the demand was equally divided between arrivals and departures
- This RMO will not attain 80 operations per hour with only one runway in use

RMO 13: ARRIVALS 25 / DEPARTURES 25

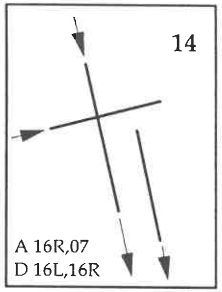


- SDT observed a sustained capacity of 33 operations per hour
  - Operations consisted of 22 arrivals and 11 departures
  - Peak observed capacity of 37 operations
- Figure 13 presents the simulation results for a rolling hour period

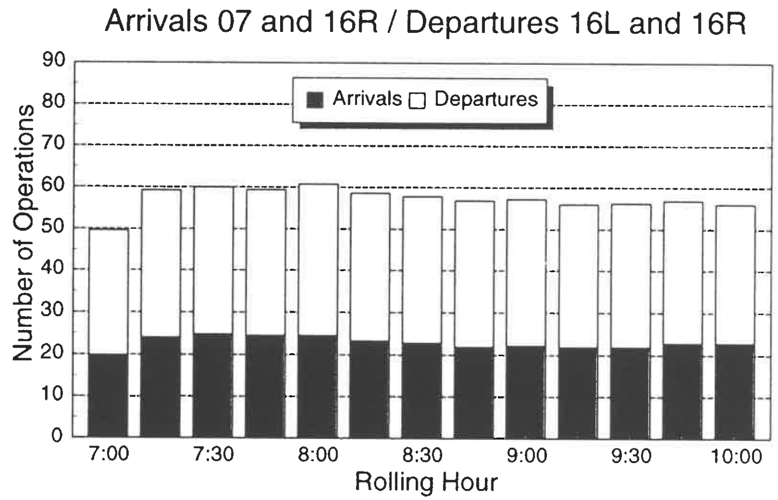


- This RMO will be used in the event of strong winds from the west
- The reduced separation time for subsequent departures on 25 than on 07 (by 20 seconds due to the availability of fanned departure headings) did not improve the capacity over RMO 12 due to the infrequency of back-to-back departures
- The arrival/departure demand mix was 50%/50% in this case (as for all RMO's). If the arrival/departure mix favored departures (e.g., 40%/60% or 30%/70%), then the hourly sustainable capacity should improve beyond 33 operations, because more back-to-back departures could take place
- This RMO will not attain 80 operations per hour with only one runway in use

RMO 14: Arrivals 16R and 07 / Departures 16R and 16L

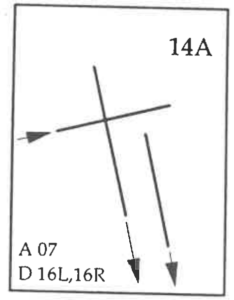


- SDT observed a sustained capacity of 59 operations per hour
  - Operations consisted of 24 arrivals and 35 departures
  - Peak observed capacity of 61 operations
- Figure 14 presents the simulation results for a rolling hour period

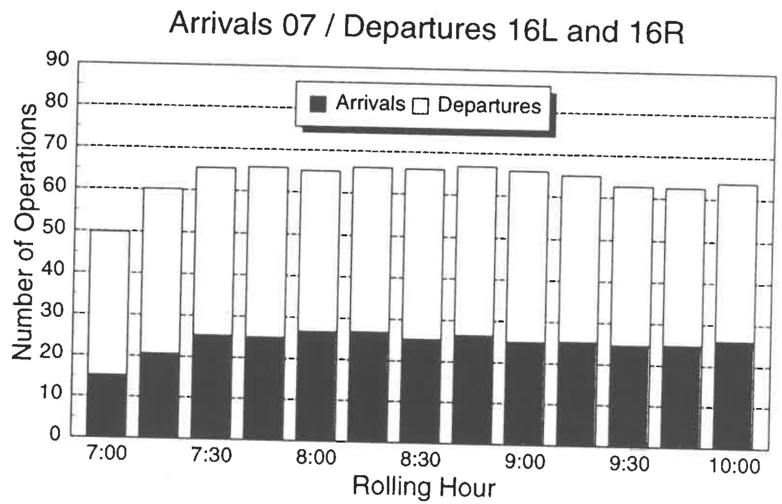


- This RMO confines departures over water and distributes arrivals from the north and west
- This capacity was reached by assigning 21% of arrivals to Runway 16R and 79% of arrivals to Runway 07. An initial assignment of 25% of the arrivals to 16R produced a capacity of only 50 operations
- The introduction of crossing arrivals on intersecting Runways 07 and 16R which requires staggered approaches produced a smaller capacity for RMO 14 than that of RMO 14A with a single arrival runway
- The proximity of the runway intersection to the thresholds of 07 (1273 meters) and 16R (998 meters) prohibits the use of LAHSO
- This RMO will not attain 80 operations per hour due to the arrival runways intersecting and the inability to use LAHSO

RMO 14A: Arrivals 07 / Departures 16R and 16L



- SDT observed a sustained capacity of 66 operations per hour
  - Operations consisted of 26 arrivals and 40 departures
  - Peak observed capacity of 67 operations
- Figure 14A presents the simulation results for a rolling hour period

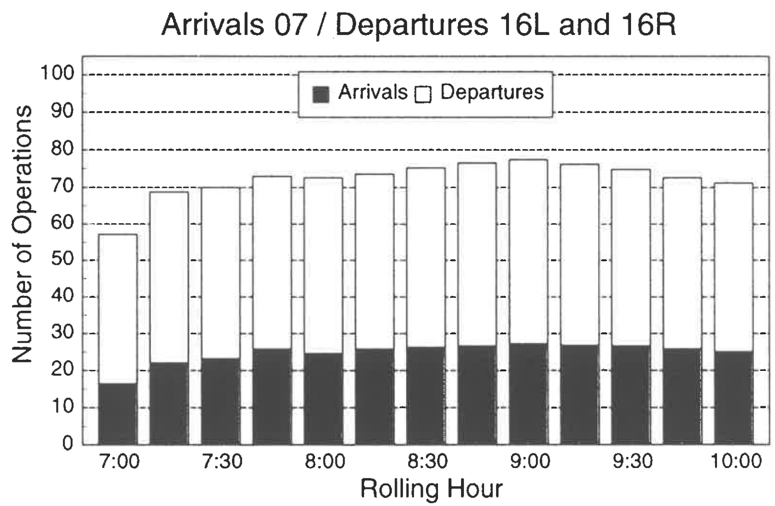


- This RMO confines departures over water and arrivals from the west
- This capacity was reached by assigning 55% of the departures to 16L and 45% to 16R

SENSITIVITY ANALYSES - FINDINGS

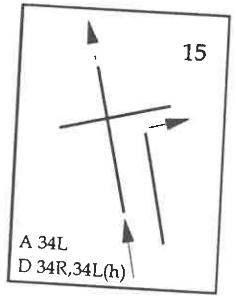
RMO 14A: ARRIVALS 07 / DEPARTURES 16L AND 16R (FROM H EXCEPT LONG HAUL)

- Sensitivity analysis was performed to determine if this RMO could attain 80 operations per hour by allowing all 16R departures (non long haul aircraft only) to begin take-off from the Taxiway H intersection
  - The distance of 16R from Taxiway H to the southern threshold is nearly 2200 meters, the same length as Runway 16L
  - Departures from the H intersection of 16R would be independent of arrivals to Runway 07
- SDT observed a sustained capacity of 75 operations per hour when non long haul departures on 16R were moved south of 07
  - Operations consisted of 26 arrivals and 49 departures
  - Peak observed capacity of 77 operations
- Figure 14a_s presents the simulation results for a rolling hour period

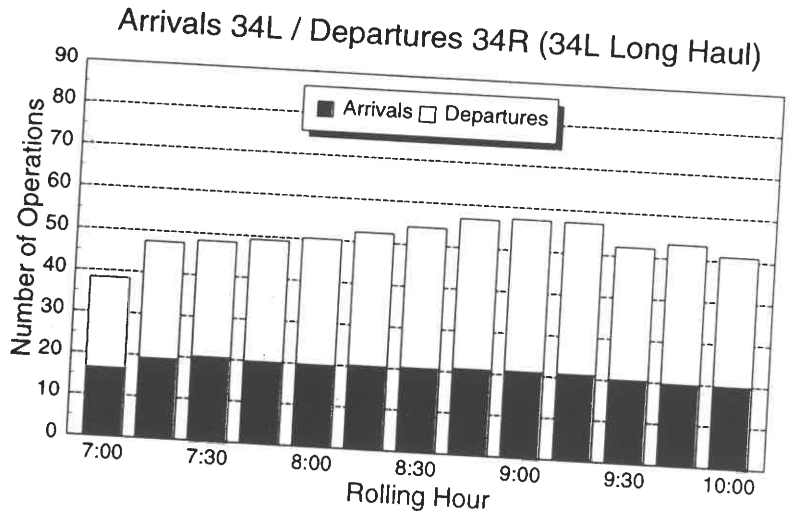


- This scenario assumed that ground controllers could efficiently manage the runway crossing of 07 at Taxiways B and C (departures to the H intersection of 16R would taxi south on B and departures to 16L would taxi south on C)
  - The model predicted 39 delayed crossings with an average delay of 24 seconds during a four-hour period
  - Arriving light and medium commuter aircraft may either have to taxi longer on Runway 07 to exit at G3 rather than B or C, or departures may have to be held north of Taxiway G to allow arriving aircraft to use the B/C exits when required

RMO 15: Arrivals 34L / Departures 34R and 34L (Long Haul)

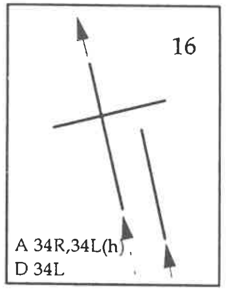


- SDT observed a sustained capacity of 55 operations per hour
  - Operations consisted of 20 arrivals and 35 departures
  - Peak observed capacity of 57 operations
- Figure 15 presents the simulation results for a rolling hour period



- This RMO confines arrivals to over-water, and directs the majority of departures eastward
- Arrival capacity is limited due to inefficient exit locations on the arrival runway and the need for slightly increased spacing on the arrival track to 34L
- This RMO may attain over 60 operations per hour. However, new runway exits for 34L and 34R would be required. The addition of new exits to 34L would probably remove the need for the increased spacing in the arrival track

RMO 16: ARRIVALS 34R AND 34L (LONG HAUL) / DEPARTURES 34L



- The sustained capacity is estimated to be 62 operations per hour

  - RMO 9, which had arrivals on Runways 34R and 34L and departures on Runways 34R and 34L, has a capacity of 74 with a peak of 15 departures off 34R
  - Without departures off 34R, the capacity of RMO 16 should be 10-15 operations less per hour than RMO 9

- This RMO confines arrivals to over-water and distributes departures to the north. This was the predominant mode used at SYD until October 17, 1996 when 34R departures were introduced

- This RMO would only approach 80 operations per hour with one departure runway if the number of arrivals was significantly higher than the number of departures, such as a 70%/30% arrival/departure mix. Also, new runway exits for both 34L and 34R would be required to allow arrivals to exit the runways more quickly, thereby decreasing runway occupancy times

CONCLUSIONS

- For the runway modes of operation that use intersecting runways (RMO 6 and 7), the airfield and operations improvements provided significant gains in sustained runway capacity, given the fleet mix and arrivals/departures mix used
  - Adding new high-speed runway exits improved the runway capacities by 2-4 operations per hour
  - Using land-and-hold-short operations on 34L arrivals improved capacities by 4-6 operations per hour
  - Using the combination of the new exits and land-and-hold-short operations improved capacities by 9 operations per hour
  - Additionally, reducing the 34L buyout distances to 2 nmi improved the capacity in each case by 1-2 operations
- For the runway modes of operation that use parallel runways (RMO 9 and 10), the airfield and operations improvements provided significant gains in sustained runway capacity
  - Adding new high-speed runway exits improved the runway capacities by 3-4 operations per hour; combined with the reduced separations, the capacity increased by 8 operations per hour for RMO 9 and 14 operations per hour for RMO 10
  - The "T2a" high speed exit on Runway 34R may need to be located farther north (approximately 90 meters) to increase capacity
- For RMO 14A, moving the non long haul departures to Taxiway H provided significant gains in sustained runway capacity
  - These departures operated independently of Runway 07 arrivals, and produced an overall increase of 11 operations per hour
  - The drawback to this scenario would be the increased number of runway crossings and management of the B and C intersections at Runway 07
- If all new high-speed exit locations were accessible to larger percentages of flights (that would otherwise be taxiing on the runway), capacity improvements may be gained over the reported increased capacities due to shorter runway occupancy times
  - SDT used the airport layout drawing and controller input available at the time of the analysis to determine the locations of the exits
  - The locations of some of these exits did not prove to be advantageous for frequent use or did not prevent aircraft from taxiing on the arrival runways after landing-roll completion, especially on Runway 34R

Conclusions

- RMO's 5, 6, 7, 8, 11, 14, and 14A involve operations on intersecting runways. These modes may require additional controller resources and/or additional training for efficient operation in the air and on the ground (As stated previously, airspace was not modeled in this study, thus actual capacity may differ from capacities evaluated here due to airspace conflicts)

- As stated in the Assumptions Document, SDT assumed that the airfield would be unconstrained (i.e., would not decrease the available runway capacity) for all the analyses. Also, aircraft delays were not considered in the analyses. In actual circumstances, improvements may be needed to the departure queue/taxiway areas of Runways 25/07 to prevent excessive ground delays, particularly in RMO's 6 and 7. Also, many of the RMO's may require additional ground controller resources to efficiently manage runway crossings

- Because only final approach and initial departure routes were modeled in the airspace, aircraft were not sequenced to minimize separation requirements (i.e., light always trailing other light aircraft rather than a light trailing a heavy aircraft). However, the effect of "optimal" sequencing could be tested if a "real" schedule with the entire new terminal airspace was simulated

- The effect of moving the displaced threshold on Runway 16L (now 480 meters; scheduled to move by 288 meters) can be estimated from the sensitivity analysis performed for the addition of high-speed exits to Runway 16L (the distance to the new exits simulated is approximately the same as the movement of the displaced threshold). Moving the threshold should allow 3 more operations per hour (assuming no other improvements)

Recommendations

- High speed runway exits should be added to increase capacity. Additional analysis should be performed to determine optimal placement of the exits

- Risk analysis should be conducted before opposite direction modes are used in high traffic hours

- Additional simulation analyses should be performed with a complete terminal airspace of the new RMO's

  - Airspace may be a constraint on the overall capacity of the system
  - Switching from one RMO to another during the day may reduce capacity for a significant period of time
  - A future schedule (e.g., 2000) could be simulated, thereby making predictions of delay more realistic

- Analysis with a daily schedule of forecast demand (e.g., year 2000) should be conducted to determine if proposed RMO's or RMO changes will result in acceptable delays to the scheduled carriers