Noise considerations of the Long Term Operating Plan

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*.

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.

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.

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.

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).

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 3 and Figure 4, 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 3

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 4

Notes for Figures 3 and 4:

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.

Single track analyses indicate that under the new operating arrangements the amount of traffic over most highly exposed residential areas will 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

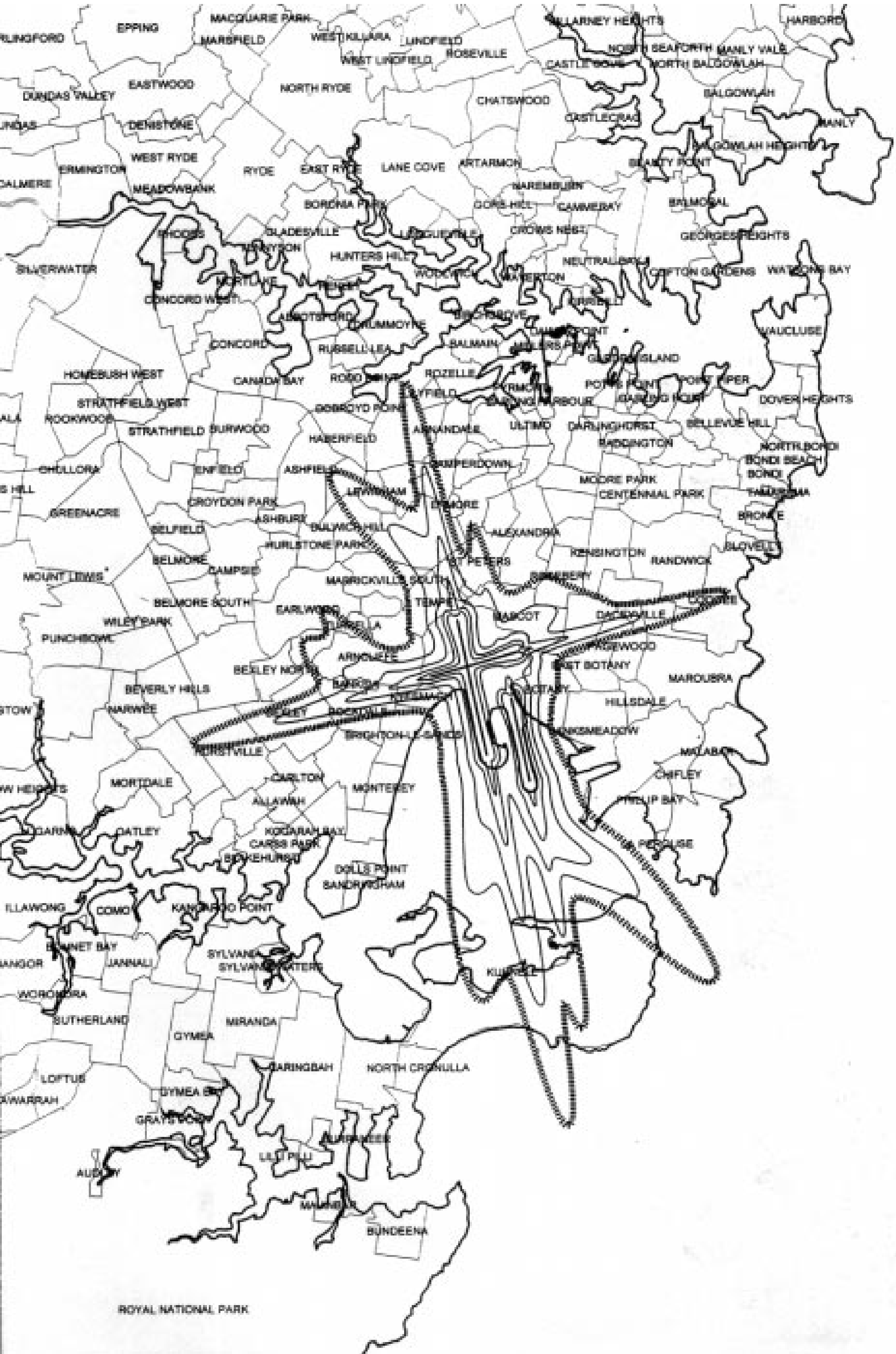
ANECs were produced for two scenarios using movement data from 1995. ANEC 1 was the first concept of the long term operating model for Sydney Airport and took into account a selection of modes in accordance with operational requirements and the need to achieve a balance in the distribution of noise between 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 5 and 6 and the ANEI contours for 1993 and 1995 are shown in figures 7 and 8 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 9. 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 5 to 9 appear on the following five pages.


EPPING
MACQUARIE PARK
MARSFIELD
WEST KILLARA
LINDFIELD
WEST LINDFIELD
ROSEVILLE
KILLARNEY HEIGHTS
HARBORD
MANLY VALE
NORTH BALGOWLAH
CASTLE COVE
EASTWOOD
NORTH RYDE
DUNDAS VALLEY
CHATSWOOD
BALGOWLAH
DENISTONE
CASTLECRAG
MANLY
WEST RYDE
ERMINGTON
RYDE
EAST RYDE
LANE COVE
ARTARMON
BEAUTY POINT
MEADOWBANK
NAREMBURN
BORONIA PARK
GORE HILL
CAMMERAY
BALMORAL
GLADESVILLE
CROWS NEST
GEORGES HEIGHTS
HUNTERS HILL
SILVERWATER
NEUTRAL BAY
WATSONS BAY
CONCORD WEST
ABBOTSFORD
BALMAIN
VAUCLUSE
CONCORD
RUSSELL LEA
HOMEBUSH WEST
CANADA BAY
ROZELLE
POINT PIPER
STRATHFIELD WEST
DOVER HEIGHTS
ROOKWOOD
STRATHFIELD
BURWOOD
ULTIMO
DARLINGHURST
BELLEVUE HILL
HABERFIELD
PADDINGTON
BONDI BEACH
BONDI
ENFIELD
ASHFIELD
CAMPERDOWN
MOORE PARK
CENTENNIAL PARK
CROYDON PARK
LEWISHAM
TAMARAMA
GREENACRE
ASHBURY
BRONTE
BELFIELD
ALEXANDRA
HURLSTONE PARK
ST PETERS
KENSINGTON
RANDWICK
CLOVELLY
BELMORE
CAMPSIE
MOUNT LEWIS
MARRICKVILLE SOUTH
ROSEBERY
COOGEE
BELMORE SOUTH
EARLWOOD
TEMPE
MASCOT
DACEYVILLE
WILEY PARK
TURRELLA
PUNCHBOWL
PAGEWOOD
BEXLEY NORTH
EAST BOTANY
MAROUBRA
BEVERLY HILLS
BOTANY
HILLSDALE
NARWEE
BEXLEY
BRIGHTON-LE-SANDS
BANKSMEADOW
HURSTVILLE
MALABAR
CARLTON
CHIFLEY
MORTDALE
MONTEREY
ALLAWAH
PHILLIP BAY
OATLEY
KOGARAH BAY
CARSS PARK
LA PEROUSE
DOLLS POINT
SANDRINGHAM
ILLAWONG
COMO
KANGAROO POINT
BONNET BAY
JANNALI
SYLVANIA
SYLVANIA WATERS
WORONORA
SUTHERLAND
MIRANDA
GYMEA
CARINGBAH
NORTH CRONULLA
LOFTUS
GYMEA BAY
GRAYS POINT
BURRANEER
LILLI PILLI
AUDLEY
MAIANBAR
BUNDEENA
ROYAL NATIONAL PARK


EPPING
MACQUARIE PARK
MARSFIELD
WEST KILLARA
LINDFIELD
ROSEVILLE
WEST LINDFIELD
HARBORD
NORTH SEAFORTH
MANLY VALE
NORTH BALGOWLAH
DUNDAS VALLEY
EASTWOOD
NORTH RYDE
CHATSWOOD
BALGOWLAH
DENISTONE
CASTLECRAG
MANLY
WEST RYDE
ERMINGTON
RYDE
LANE COVE
ARTARMON
MEADOWBANK
NAREMBURN
BORONIA PARK
CAMMERAY
BALMORAL
GLADESVILLE
CROWS NEST
GEORGES HEIGHTS
SILVERWATER
HUNTERS HILL
NEUTRAL BAY
WATSONS BAY
MORTLAKE
CONCORD WEST
ABBOTSFORD
DRUMMOYNE
VAUCLUSE
CONCORD
RUSSELL LEA
BALMAIN
HOMEBUSH WEST
CANADA BAY
ROZELLE
POTTS POINT
POINT PIPER
STRATHFIELD WEST
DOVER HEIGHTS
ROOKWOOD
STRATHFIELD
BURWOOD
ANNANDALE
ULTIMO
DARLINGHURST
BELLEVUE HILL
HABERFIELD
PADDINGTON
NORTH BONDI
BONDI BEACH
BONDI
CHULLORA
ENFIELD
ASHFIELD
CAMPERDOWN
MOORE PARK
CENTENNIAL PARK
GREENACRE
CROYDON PARK
ASHBURY
BELFIELD
DULWICH HILL
ALEXANDRIA
HURLSTONE PARK
KENSINGTON
RANDWICK
CLOVELLY
BELMORE
CAMPSIE
ST PETERS
MOUNT LEWIS
MARRICKVILLE SOUTH
BELMORE SOUTH
EARLWOOD
TEMPE
MASCOT
DACEYVILLE
WILEY PARK
PUNCHBOWL
ARNCLIFFE
EAST BOTANY
MAROUBRA
BEXLEY NORTH
BEVERLY HILLS
NARWEE
BOTANY
HILLSDALE
ROCKDALE
BRIGHTON-LE-SANDS
HURSTVILLE
MALABAR
CHIFLEY
MORTDALE
CARLTON
MONTEREY
ALLAWAH
PHILLIP BAY
OATLEY
KOGARAH BAY
CARSS PARK
BLAKEHURST
LA PEROUSE
DOLLS POINT
SANDRINGHAM
ILLAWONG
COMO
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BONNET BAY
JANNALI
SYLVANIA
SYLVANIA WATERS
KURNELL
WORONORA
SUTHERLAND
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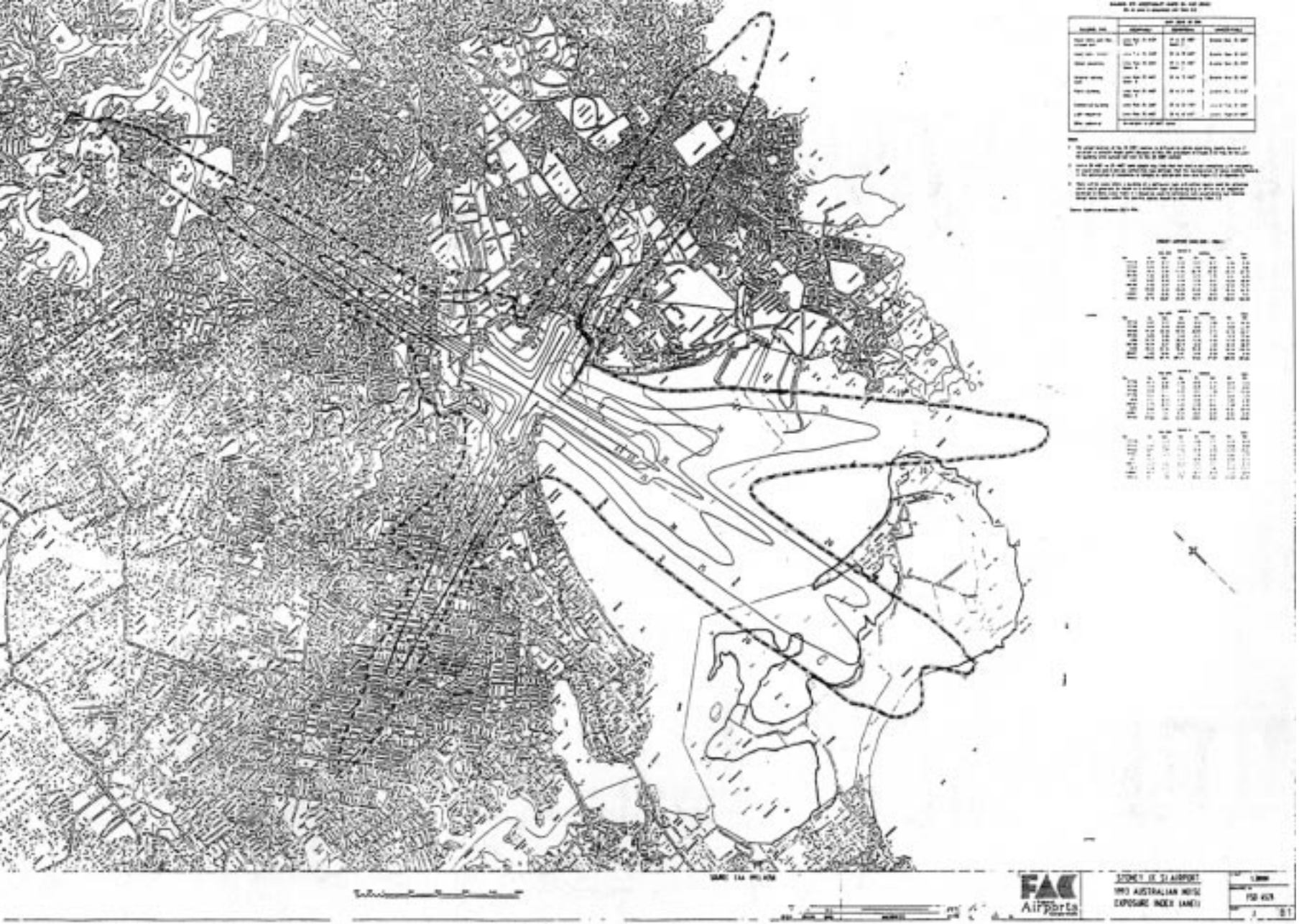
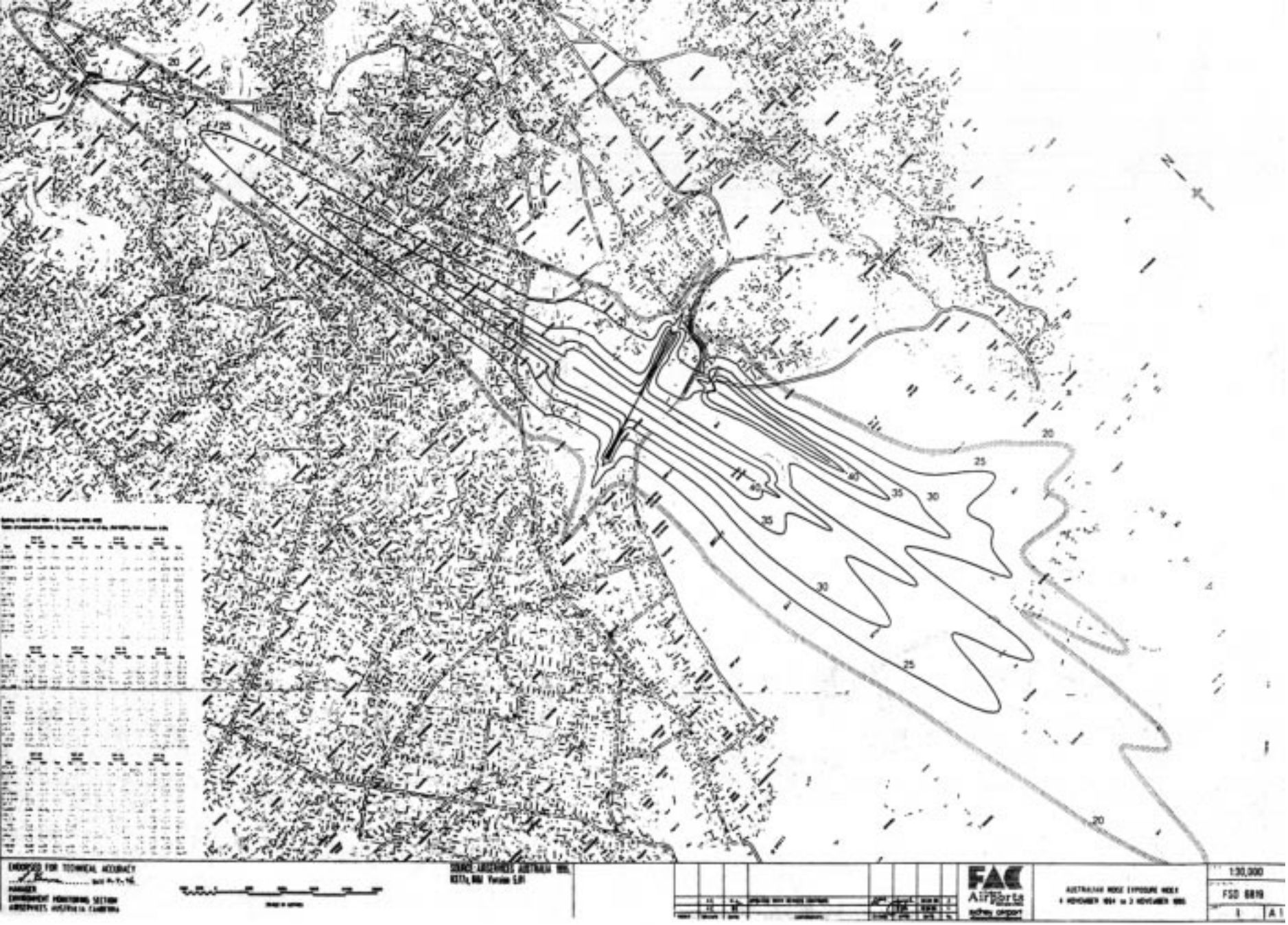
NORTH CRONULLA
LOFTUS
GYMEA BAY
GRAYS POINT
LILLI PILLI
AUDLEY
MAIANBAR
BUNDEENA
ROYAL NATIONAL PARK



SYDNEY (K S) AIRPORT
1993 AUSTRALIAN NOISE EXPOSURE INDEX (ANEI)



ENDORSED FOR TECHNICAL ACCURACY

..... DATE 4-7-96

MANAGER

ENVIRONMENT MONITORING SECTION

AIRSERVICES AUSTRALIA CANBERRA

SOURCE: AIRSERVICES AUSTRALIA 1996,

INTEL MAP Version 5.01

FAC

Airports

AUSTRALIAN NOISE EXPOSURE INDEX

1:30,000

FSD 6818

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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	1996 ANEI (N377a) >=30	1996 ANEI (N377a) >=25	1996 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	10460	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	1950	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	38870	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

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%. 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 9. 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 is very clear evidence that the noise impact in high noise areas has been dissipated and that there is now 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).

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.

The use of full length departures for jet aircraft on runway 34L 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.

To achieve maximum benefits, specific noise abatement departure procedures are necessary. 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.

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.

Noise Distribution and Monitoring

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.

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.

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.

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. 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.

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.

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 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 10 which gives the expected range of use of each Mode in the operating plan. The ANEC 2 contour on page xx is based on traffic levels falling within the range for the individual Modes depicted in the pie chart. For comparison purposes, Figure 11 depicts the actual utilisation of runway Modes during parallel runway operations in 1995.

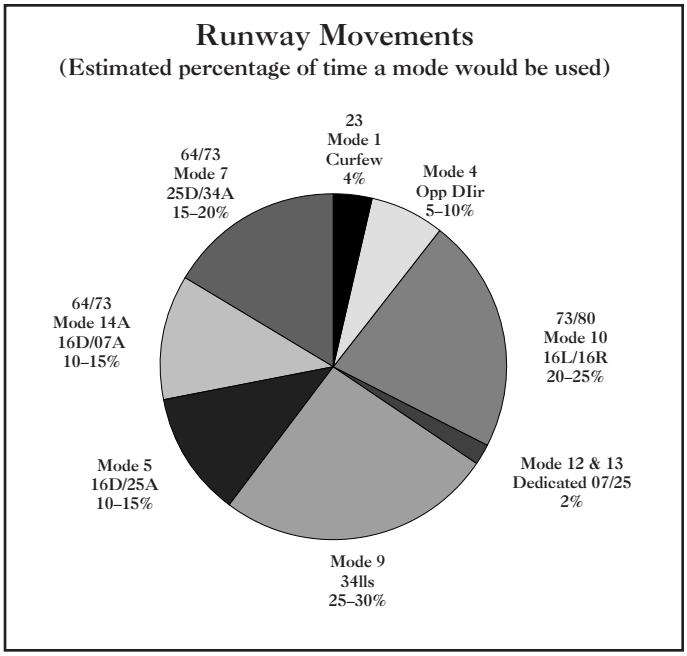

Figure 10

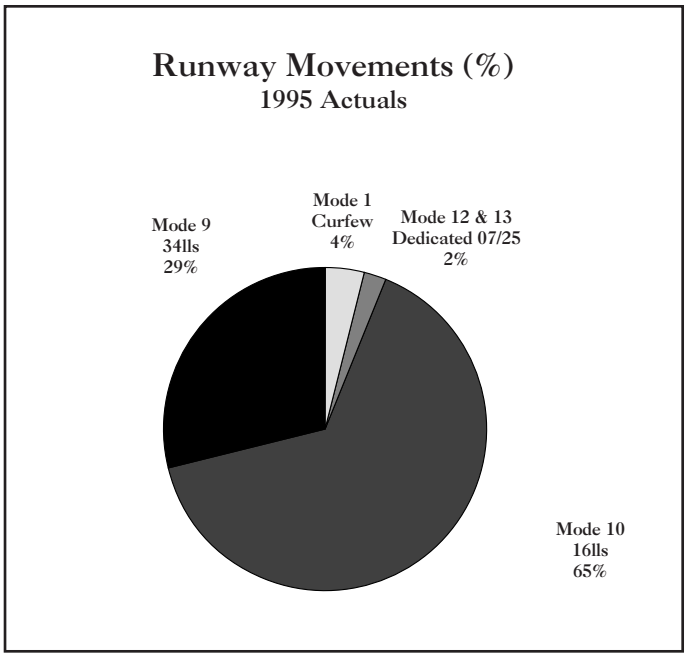

Figure 11

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 with arrivals on Runways 34L&R

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 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 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.

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.

Figure 12

Sydney Airport – 270,000 Movements a Year

(Based on a 17-hour day excluding 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.

Figures 12 and 13 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 13 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 – 360,000 Movements a Year

(Based on a 17-hour day excluding curfew period)

Figure 13

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.