



AIRSERVICES AUSTRALIA

**Environment and Climate Change Unit
Environmental Assessment
of
Proposed Implementation of Runway Mode of Operation 15
(Mode 15) at Sydney Airport**

**ARMS Entry Number 183490
August 2008**

EO 08-191

DISCLAIMER

This report contains a summary of data collected from external and internal sources and Airservices Australia cannot warrant the accuracy of the data input derived from external sources. Airservices Australia does not accept any liability for any reliance placed on any data in this report by any third party and Airservices Australia accepts no liability for any interpretation of this data by third parties.

Version	Author	QA	Date
Final Draft	KO	PM/LT	Aug 2008
Final	KO	PM	Sep 2008

Airservices Australia

Head Office 25 Constitution Avenue
Canberra City ACT 2601
Australia

GPO Box 367
Canberra ACT 2601

Phone 02 6268 4111
Fax 02 6268 5683

Contents

Introduction	1
Proposal	1
Methodology	4
TNIP Input Methodology	5
Base case	6
Mode 15 case	7
Sample Day NFPMS Analysis Methodology	10
Assessment Results	11
TNIP Assessment	11
Assessment of sample Mode 9 day	21
Jet aircraft movement numbers - Departures	21
Jet aircraft movement numbers - Arrivals	22
Turboprop aircraft movement numbers - Arrivals	23
Runway 07 Departures	23
Runway 25 Arrivals	24
Jet aircraft departures tracks	24
Runway 34L Arrival tracks	24
Noise Levels	26
Single event maximum noise levels	26
N70 events	26
Emissions	29
LTOP Targets	29
Application of Mode 15	29
Community Consultation	30
Conclusion	31

Introduction

The Sydney Airport Runway End Safety Area (RESA) works will essentially remove, or reduce the availability of, the east-west runway Runway 07/25 for approximately 19 months while the works are underway beginning mid October 2008. Airservices has been researching options that may be available to mitigate the impact of the non-availability of the east-west runway and ensure that the noise mitigation from the Sydney Airport Long Term Operating Plan (LTOP) is maintained to the maximum extent practicable. A potential mitigation option arising from the research is the possible implementation of a new runway mode of operation, Mode 15.

This assessment has been undertaken to determine whether or not the proposed implementation of Mode 15 is likely to result in a significant environmental impact in terms of the requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Section 160 of the EPBC Act requires a Commonwealth agency adopting or implementing a plan for aviation airspace management involving aircraft operations that are likely to have a significant impact on the environment to obtain and consider advice from the Minister for the Environment, Heritage and the Arts.

The Department of the Environment, Water, Heritage and the Arts (DEWHA) EPBC Act *Policy Statement 1.2 Significant Impact Guidelines Actions on, or impacting upon, Commonwealth land and actions by Commonwealth agencies* provide assistance in deciding whether or not to submit a referral to DEWHA for a decision by the Australian Government Minister for the Environment, Heritage and the Arts on whether assessment and approval is required under the EPBC Act.

These guidelines advise that an action is likely to be significant if there is a real chance or possibility that the action will affect the health, safety, welfare or quality of life of the members of a community, through factors such as noise, odours, fumes, smoke, or other pollutants.

Proposal

Mode 15 has the potential to be used during non-peak periods as an alternative to existing LTOP modes that will not be available due to the restrictions on the use of Runway 07/25 during the RESA construction period. In order of preference, the proposed Mode 15 would be considered for use if Mode 4 simultaneous opposite direction parallel runway operations (SODPROPS) was not available and ahead of Mode 9 (Runway 34 Parallel operations). It could be used during non-peak periods at Sydney Airport, excluding the periods where the curfew is in operation, where there will not be any change to operations as a result of this proposal. The non-peak periods are:

Monday – Saturday: 0600 – 0700
Sunday: 0600 – 0800
Monday – Sunday: 1100-1500
Monday – Sunday: 2000 – 2300
Saturday: 1500 – 2000

The proposed Mode 15 would result in all jet departures from Runway 34R (with initial tracking to the east or north-east) except those heavy and long-haul jet departures operationally requiring the use of the longer Runway 34L. All arrivals will land on Runway 34L with final approach from the south.

Non-jet aircraft will continue to use either Runway 34L or Runway 34R for departure depending on their destination as they currently do when Mode 9 is in use.

Figure 1 shows the proposed Mode 15 operations.

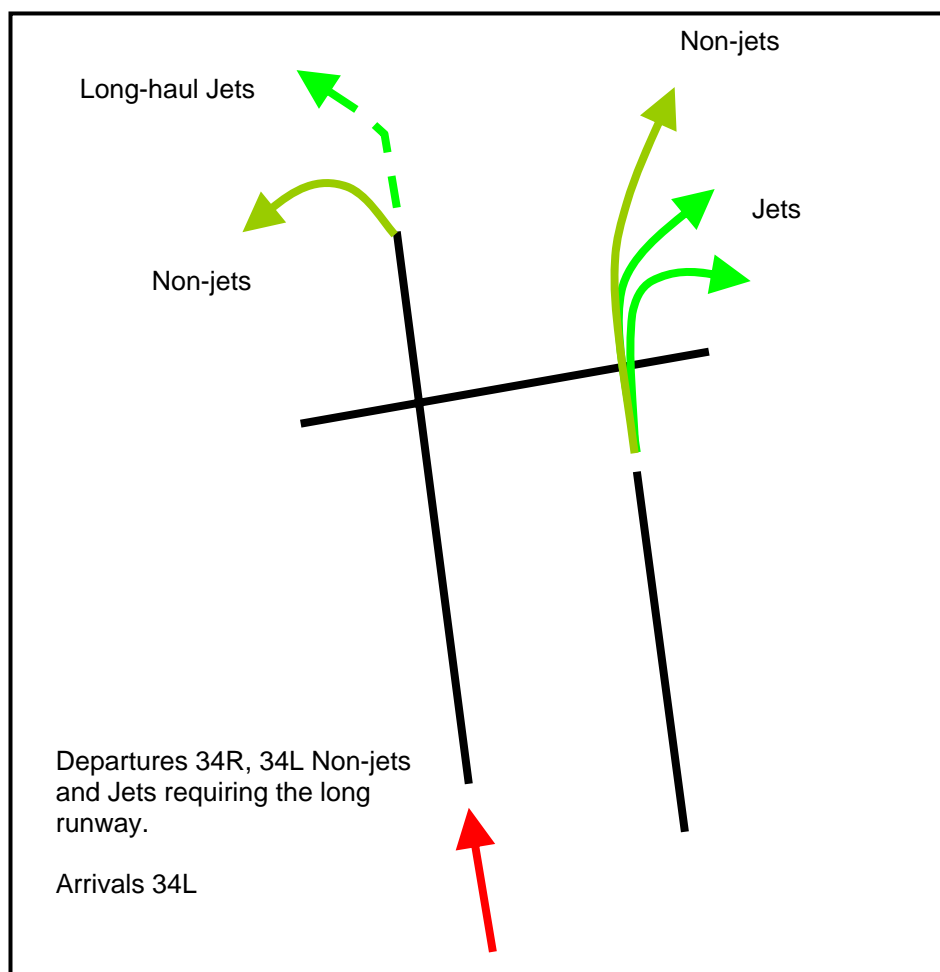


Figure 1 Mode 15 – Departures to East and North (Non-jets and jets requiring R34L), Arrivals from the South

The Runway 34R jet departure tracks proposed for Mode 15 are the same as for Modes 9 using Runway 34R departures, with the exception of departures via Richmond (RIC) or Katoomba (KAT). Departures to northern destinations (as far as Hervey Bay) will track via the existing ENTRA SID (the north eastern track) while departures to southern and eastern destinations will track via the existing MARUB SID (the eastern track). Departures to the western and north-western destination are expected to follow the existing MARUB departure to approximately 15 nautical miles from the airport before turning west.

Aircraft requiring Runway 34L for departure during Mode 15 will track via RIC or KAT as they do during Mode 9 operations with the exception that aircraft will be required to turn at 800 feet to ensure system safety. This differs from the current situation where aircraft tracking to KAT turn at 800 feet and aircraft tracking to RIC turn at 1,500ft.

Runway 34L arrival tracks will generally be the same as those used when Mode 4 (SODPROPS) is in operation with the exception that there may sometime be a requirement for arrivals to track to the east of the airport to solve specific traffic conflicts as they do during SODPROPS operations. Figures 2 & 3 show examples of the proposed Mode 15 departure and arrival flight tracks respectively.

There is no change to non-jet aircraft departures which will use the same runways and flight tracks as the existing Mode 9, therefore the analysis that follows focuses on jet operations.

Mode 15 has the potential to provide some respite for Kurnell residents from direct overflight of arriving traffic and some respite to communities to the north and northwest of the airport; however it increases the number of departures over communities to the east and north-east of the airport.

The use of Mode 15 would be a temporary measure implemented to mitigate the noise impacts of the total closure of Runway 07/25 for an expected period of 8 months from approximately October 2008 to June 2009.

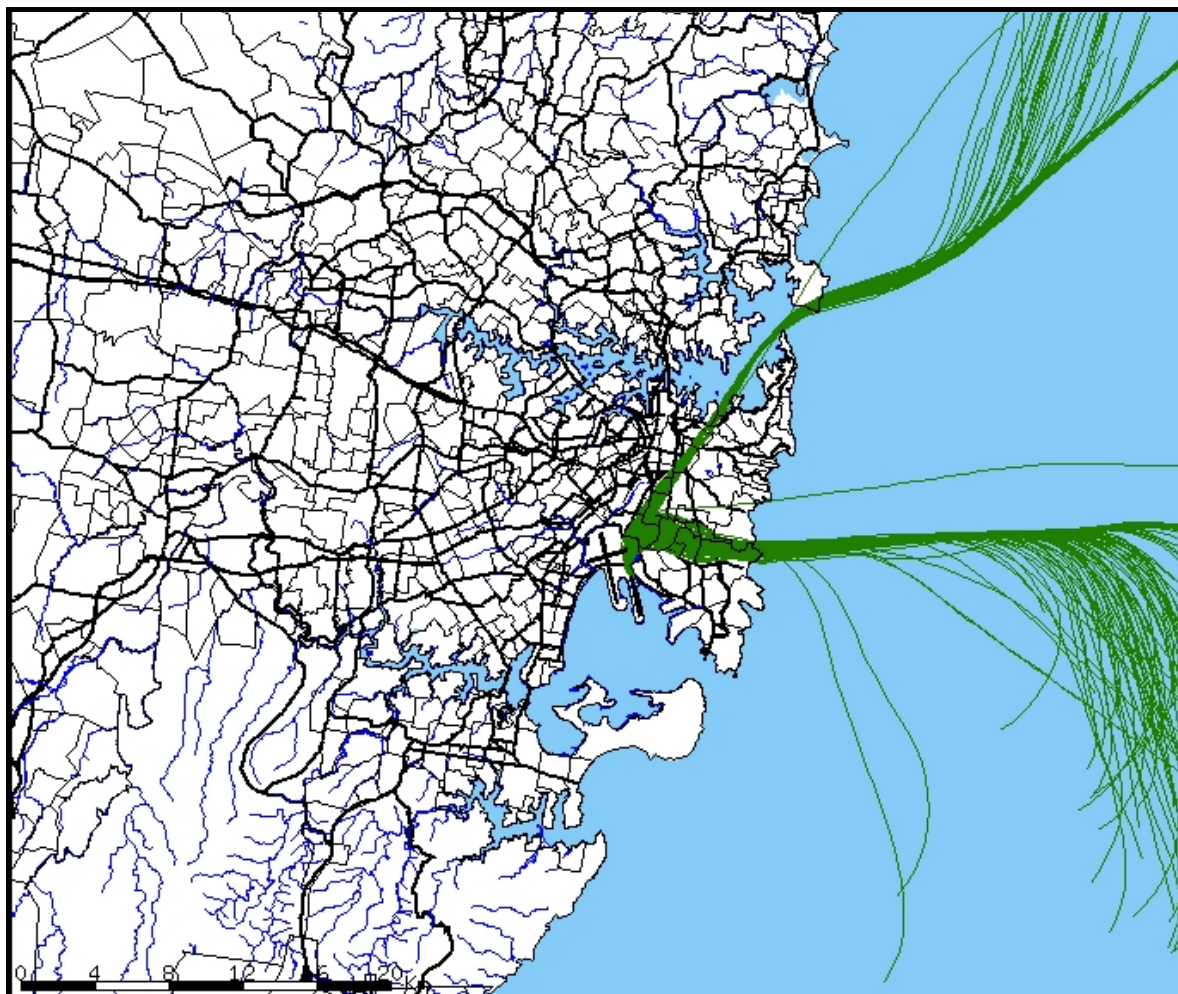


Figure 2 Example of Runway 34R jet departure tracks to be used with Mode 15

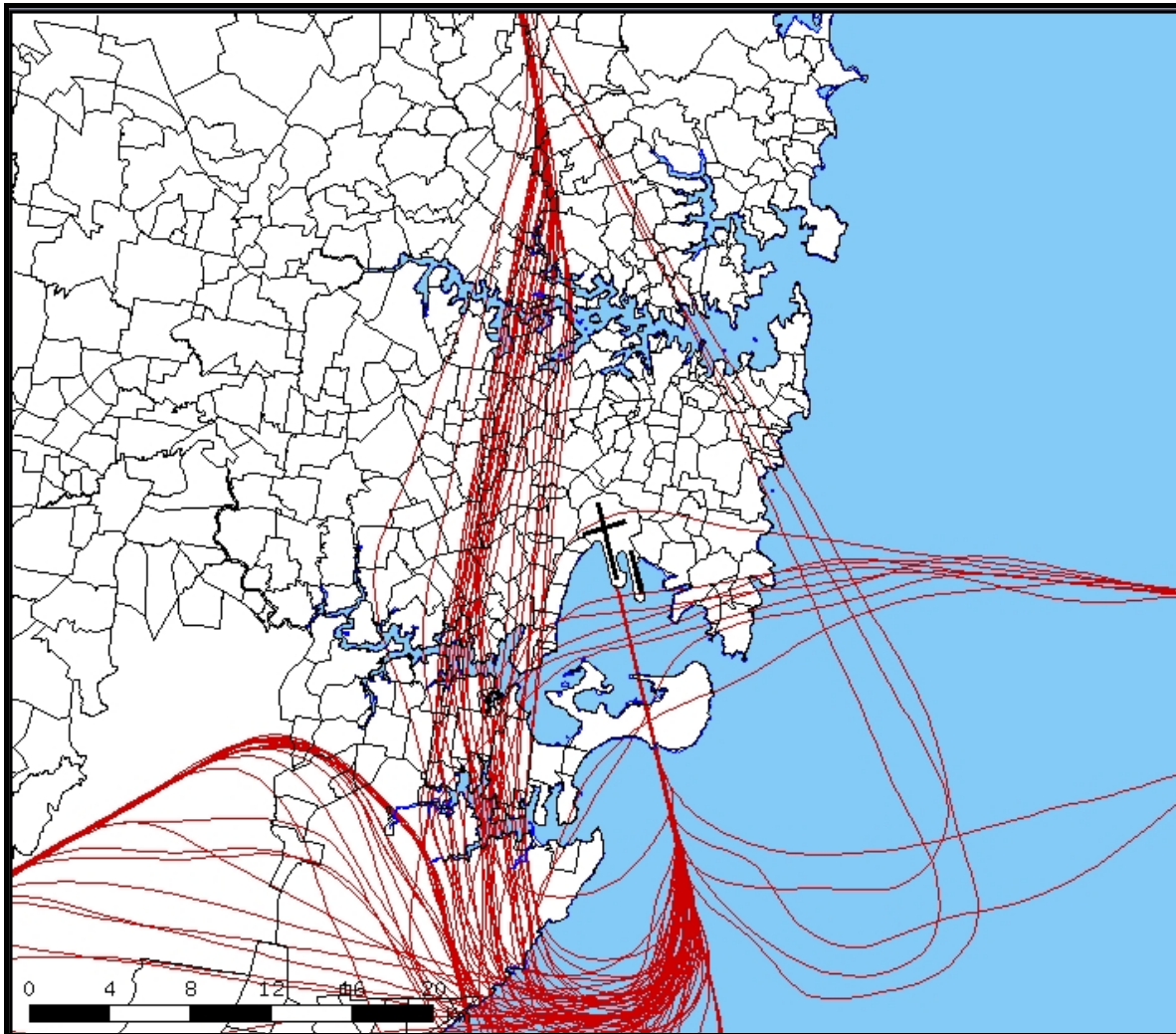


Figure 3 Indicative Runway 34L jet arrival tracks expected to be used with Mode 15. Note that while most arrivals will be to the west of the airport, the track to the east of the airport will be available to solve specific traffic conflicts.

Methodology

The proposal has the effect of moving some jet aircraft departures from Runway 34L to Runway 34R and all arriving aircraft onto Runway 34L during the non-peak periods identified previously. The assessment compares the expected change in jet aircraft operations and the potential respite change for communities around the airport as well as the proposed changes to flight tracks associated with the additional jet departures from Runway 34R.

As there is no change to the non-jet aircraft departures these operations were not considered in this analysis.

The assessment used the Department of Infrastructure, Transport, Regional Development and Local Government (Infrastructure) Transparent Noise Information Package (TNIP) to undertake the assessment of the expected outcome of the implementation of Mode 15, as well as an analysis of a single day of Noise and Flight

Path Monitoring System (NFPMS) data. The methodology for both analyses is detailed below.

The outcome of the analysis of the implementation of Mode 15 is directly related to the assumptions and methodology outlined in this report. It is however possible that there may be variations to these assumptions during day to day operations that could alter the expected outcomes detailed in this report.

TNIP Input Methodology

To determine the impact of the introduction of Mode 15, it was necessary to establish a “base case” against which to compare it.

Base Case

For the purpose of this assessment, the Base Case assumes the complete unavailability of Runway 07/25. The Base Case removes the following modes of operation:

- Mode 5
- Mode 7
- Mode 8
- Mode 12
- Mode 13
- Mode 14A

The only available modes in the base case are

- Mode 1 (Curfew)
- Mode 4 (SODPROPS)
- Mode 9
- Mode 10

The analysis for the base case uses a 12 month period of real data (1 May 2007 to 30 April 2008 – the test data). During this period, all the modes of operation were used except Mode 8. For the analysis, the movements that occurred when Modes 5, 7, 12, 13 or 14A were used were reassigned to Mode 9 or Mode 10. Table 1 shows the runway distributions for this process. Movements during Modes 5 and 14A were assigned to Mode 10, Mode 7 movements were assigned to Mode 9 and Modes 12 and 13 movements were allocated partially to Mode 9 and partially to Mode 10.

Mode 1 is mandatory between 23:00 and 06:00 and the LTOP preferred runway selection criteria require that Mode 4 are used to the greatest extent possible during the hours 06:00 to 23:00, as they have priority over all other modes. The analysis assumes that this was done for the period of the test data. Accordingly, for the analysis, movements from Modes 5, 7, 12, 13 and 14A were not reassigned to Mode 4, on the basis that those modes had been determined as unsuitable at the time by ATC.

Actual Mode Used	Arrival Runways	Departure Runways	Base Case Mode	Arrival Runways	Departure Runways
1	34L	16R	1	34L	16R
4	34L	16L, 16R, 34L	4	34L	16L, 16R, 34L
5	07, 16R	16L, 16R	10	16L, 16R	16L, 16R
7	34L, 34R	25, 34L	9	34L, 34R	34L, 34R
8	34L, 34R	25, 34L, 34R	9	34L, 34R	34L, 34R
9	34L, 34R	34L, 34R	9	34L, 34R	34L, 34R
10	16L, 16R	16L, 16R	10	16L, 16R	16L, 16R
12	07	07	9 (66%) 10 (34%)	34L, 34R 16L, 16R	34L, 34R 16L, 16R
13	25	25	9 (68%) 10 (32%)	34L, 34R 16L, 16R	34L, 34R 16L, 16R
14A	07, 16R	16L, 16R	10	16L, 16R	16L, 16R

Table 1 Base Case Runway Distributions

Table 1 shows the arrival and departure runways for each mode of operation. Where some runways are preferred over others, the preferred runways are shown in bold, and runways not bolded are only available for use if operationally required. Where there is more than one runway bolded (eg Mode 9) then the aircraft are allocated runways on the basis of the direction of the destination or point of origin, traffic flows and operational requirements.

Operations that have used Modes 1 or 4 will continue to do so to the same extent and have not been altered in any way in the analysis.

Modes 12 and 13 have the lowest priority for allocation under LTOP. They are only used when there are strong winds which create crosswinds on Runways 16 and 34 which exceed the criteria for use, which is 20 knots on a dry runway or 15 knots on a wet runway. As Runways 07 and 25 are unavailable in the Base Case scenario, some aircraft may be able to accept higher levels of crosswind under safety criteria. Flights during these modes in the period of analysis, which number about 2% of all flights, are allocated to Mode 9 or 10 depending on whether there is downwind on Runway 16 or Runway 34 respectively, irrespective of crosswind. An analysis of actual wind conditions (as reported on ATIS) was undertaken to determine the downwind components, and found that in around 2/3 of cases there was more downwind on Runway 16. In reality, a proportion may elect to divert to another airport if the crosswind is excessive, but this is not factored into the analysis.

Mode 15 Case

For the purpose of this assessment, the Mode 15 Case also assumes the complete unavailability of Runway 07/25. As with the Base Case, the Mode 15 Case removes the following modes of operation:

- Mode 5
- Mode 7
- Mode 8

- Mode 12
- Mode 13
- Mode 14A

The only available modes in the Mode 15 Case are

- Mode 1 (Curfew)
- Mode 4 (SODPROPS))
- Mode 9
- Mode 10
- Mode 15

The analysis for the Mode 15 Case uses the same 12 month period of real data (1 May 2007 to 30 April 2008) as the Base Case. For the analysis, the movements that occurred when Modes 5, 7, 12, 13 or 14A were used were reassigned to Modes 9, 10 or 15, with preference given to Mode 15 over Modes 9 or 10. Table 2 shows the runway distributions for this process.

Mode 1 is mandatory between 23:00 and 06:00 and the LTOP preferred runway selection criteria require that Mode 4 are used to the greatest extent possible during the hours 06:00 to 23:00, as they have priority over all other modes. The analysis assumes that this was done for the period of the test data. Accordingly, for the analysis, movements from Modes 5, 7, 12, 13 and 14A were not reassigned to Mode 4, on the basis that those modes had been determined as unsuitable at the time by ATC.

Actual Mode Used	Arrival Runways	Departure Runways	Mode 15 Case Mode	Arrival Runways	Departure Runways
1	34L	16R	1	34L	16R
4	34L	16L, 16R, 34L	4	34L	16L, 16R, 34L
5	07, 16R	16L, 16R	10 (88%) 15 (12%)	16L, 16R 34L	16L, 16R 34R, 34L
7	34L, 34R	25, 34L	15	34L	34L, 34R
8	34L, 34R	25, 34L, 34R	15	34L	34L, 34R
9	34L, 34R	34L, 34R	9 (Peak) 15 (Off-peak)	34L, 34R 34L	34L, 34R 34R, 34L
10	16L, 16R	16L, 16R	10	16L, 16R	16L, 16R
12	07	07	9 (66% of peak) 10 (34%) 15 (66% of Off-peak)	34L, 34R 16L, 16R 34L	34L, 34R 16L, 16R 34R, 34L
13	25	25	9 (68% of peak) 10 (32%) 15 (68% of Off-peak)	34L, 34R 16L, 16R 34L	34L, 34R 16L, 16R 34R, 34L
14A	07, 16R	16L, 16R	10 (82%) 15 (18%)	16L, 16R 34L	16L, 16R 34R, 34L

Table 2 Mode 15 Case Runway Distributions

Table 2 shows the arrival and departure runways for each mode of operation. Where some runways are preferred over others, the preferred runways are shown in bold,

and runways not bolded are only available for use if operationally required. Where there is more than one runway bolded (eg Mode 9) then the aircraft are allocated runways on the basis of the direction of the destination or point of origin, traffic flows and operational requirements.

Operations that have used Modes 1 or 4 will continue to do so to the same extent, and have not been altered in any way in the analysis.

Modes 12 and 13 have the lowest priority for allocation under LTOP. They are only used when there are strong winds which create crosswinds on Runways 16 and 34 which exceed the criteria for use, which is 20 knots on a dry runway or 15 knots on a wet runway. As for the Base Case, Runways 07 and 25 are unavailable in the Mode 15 scenario, so some aircraft may be able to accept higher levels of crosswind under safety criteria. Flights during these modes in the period of analysis, which number about 2% of all flights, are allocated to Mode 9 or 10 depending on whether there is downwind on Runway 16 or Runway 34 respectively, irrespective of crosswind. An analysis of actual wind conditions (as reported on ATIS) was undertaken to determine the downwind components, and found that in around 2/3 of cases there was more downwind on Runway 16. In reality, a proportion may elect to divert to another airport if the crosswind is excessive.

The weather criteria for use of Mode 15 are the same as for Mode 9, and it is preferred for all operations in the Mode 15 Case except those on Mode 1 or 4. Mode 9 operations continue as Mode 9 operations in the Mode 15 Case only when traffic levels require it during the Peak periods, as shown in Table 3.

Hour From	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
00:00	Curfew	Curfew	Curfew	Curfew	Curfew	Curfew	Curfew
01:00	Curfew	Curfew	Curfew	Curfew	Curfew	Curfew	Curfew
02:00	Curfew	Curfew	Curfew	Curfew	Curfew	Curfew	Curfew
03:00	Curfew	Curfew	Curfew	Curfew	Curfew	Curfew	Curfew
04:00	Curfew	Curfew	Curfew	Curfew	Curfew	Curfew	Curfew
05:00	Curfew	Curfew	Curfew	Curfew	Curfew	Curfew	Curfew
06:00	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak
07:00	Peak	Peak	Peak	Peak	Peak	Peak	Off-Peak
08:00	Peak	Peak	Peak	Peak	Peak	Peak	Peak
09:00	Peak	Peak	Peak	Peak	Peak	Peak	Peak
10:00	Peak	Peak	Peak	Peak	Peak	Peak	Peak
11:00	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak
12:00	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak
13:00	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak
14:00	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak
15:00	Peak	Peak	Peak	Peak	Peak	Off-Peak	Peak
16:00	Peak	Peak	Peak	Peak	Peak	Off-Peak	Peak
17:00	Peak	Peak	Peak	Peak	Peak	Off-Peak	Peak
18:00	Peak	Peak	Peak	Peak	Peak	Off-Peak	Peak
19:00	Peak	Peak	Peak	Peak	Peak	Off-Peak	Peak
20:00	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak
22:00	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak
23:00	Curfew	Curfew	Curfew	Curfew	Curfew	Curfew	Curfew

Table 3 Peak Periods for Mode 9 Operations

In Peak periods, traffic levels generally require a parallel runway mode, so if Mode 9 or 10 were in use during a peak period, then the Mode 15 Case assigns the same mode. However, if Mode 9 is used in an Off-Peak period, which would be due to excessive crosswind on Runway 07 and 25, then those flights are assigned to Mode 15 in the Mode 15 Case. However, Mode 10 operations in an Off-Peak period would not be suitable for Mode 15.

Mode 7 and 8 are available when winds are from the north, north-west or west and all of these operations are assigned to Mode 15 in the Mode 15 Case.

Modes 5 and 14A are used when winds are from the south, south-east or south-west and traffic levels below that requiring parallel runway use, so most of these operations are assigned to Mode 10 in the Mode 15 Case. However, if the level of downwind on Runway 34 is up to 5 knots and the runway is completely dry, Mode 15 is suitable for these operations. 12% of Mode 5 operations and 18% of Mode 14A operations have been assigned to Mode 15 in the Mode 15 Case.

Sample Day NFPMS Analysis Methodology

The assessment used NFPMS flight track and aircraft movement data for Wednesday 30 April 2008. This day was selected as it represents a day of heavy use of Mode 9. Analysis of Sydney Airport Operational Statistics showed that Mode 9

was used for a total of nearly 16 hours out of the total 17 hours of the non-curfew period.

The NFPMS movement data for the non-peak periods outside the curfew hours were analysed to determine the number of operations on each runway.

Advice from Sydney Air Traffic Control (ATC) indicated that all jet aircraft (up to B767 or A330 aircraft on domestic sectors in accordance with current noise abatement procedures) departures would use Runway 34R during the periods of Mode 15 with the exception of aircraft that operationally required the longer runway (Runway 34L). Based on this it was agreed the heavy international aircraft (eg B747, B777, A340, A330) and long haul domestic aircraft (eg B737, A320 aircraft bound for destinations such as Perth, Darwin, Cairns, Townsville and Hamilton Island) would be likely to require Runway 34L.

All arrivals would use Runway 34L while non-jet aircraft would continue to use either Runway 34L or Runway 34R for departures depending on the direction of their destination as they would during Mode 9 operations.

The aircraft movement data for 30 April 2008 identified 124 jet departures from Runway 34L and 177 jet departures from Runway 34R. There were also 12 jet departures from Runway 25 associated with the use of Mode 7 (Runway 25 Departures, Runway 34 Arrivals) between 0600 and 0700, and in the absence of the east-west runway (Runway 07/25) it was assumed that these departures would have used Runway 34R unless they operationally required Runway 34L.

Assessment results

TNIP Assessment

The analysis undertaken using TNIP compared the expected situation with the east-west runway closed for a twelve month period from May 2007 – April 2008 and compared it to the situation likely to occur with the implementation of the proposed Mode 15.

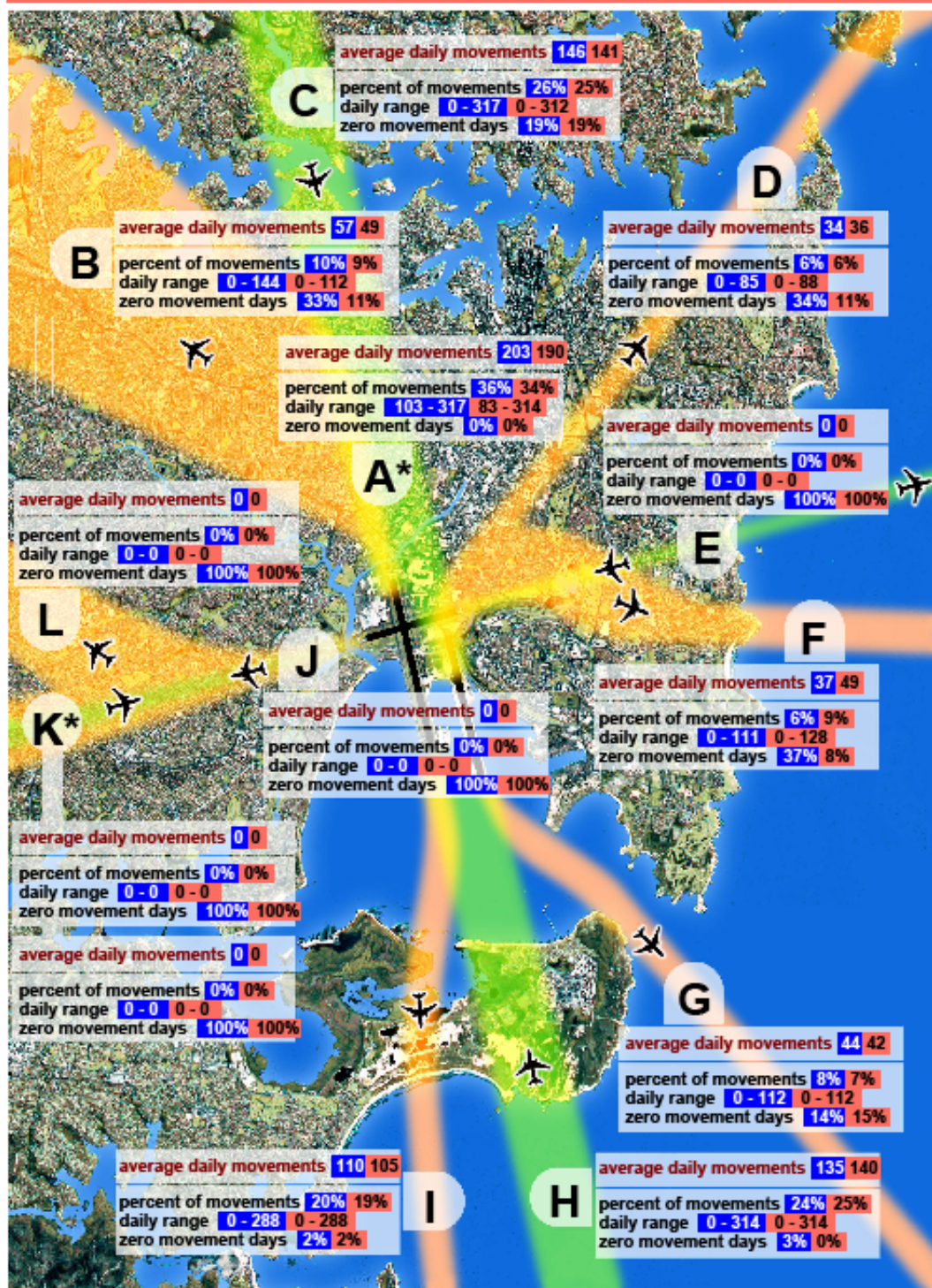
Five charts are included to provide the results of the TNIP analysis. Figures 4, 6, 7 and 8 show the jet flight path comparison charts results for the entire period and for the individual non-peak periods while Figure 5 shows the respite comparison results. In the charts the figures in blue relate to expected jet operations with the parallel runway closed for a year. The figures in red show what is expected if Mode 15 were to be implemented. The following paragraphs summarise each of the charts.

The respite chart in Figure 5 is determined by calculating the number of whole clock hours (eg 0700 to 0800) when there are no movements on the particular flight paths and reporting these as a percentage of the sum of all clock hours for the period in question. For example if there were no movements on a particular flight path during 50 clock hours in a 100 clock hour period then it would be reported as 50% respite.

Sydney Airport : Jet Flight Path Movements Comparison Chart

1 May 2007 to 30 April 2008, All Jets

1 May 2007 to 30 April 2008, All Jets



Total number of movements = **205,751 205,751**

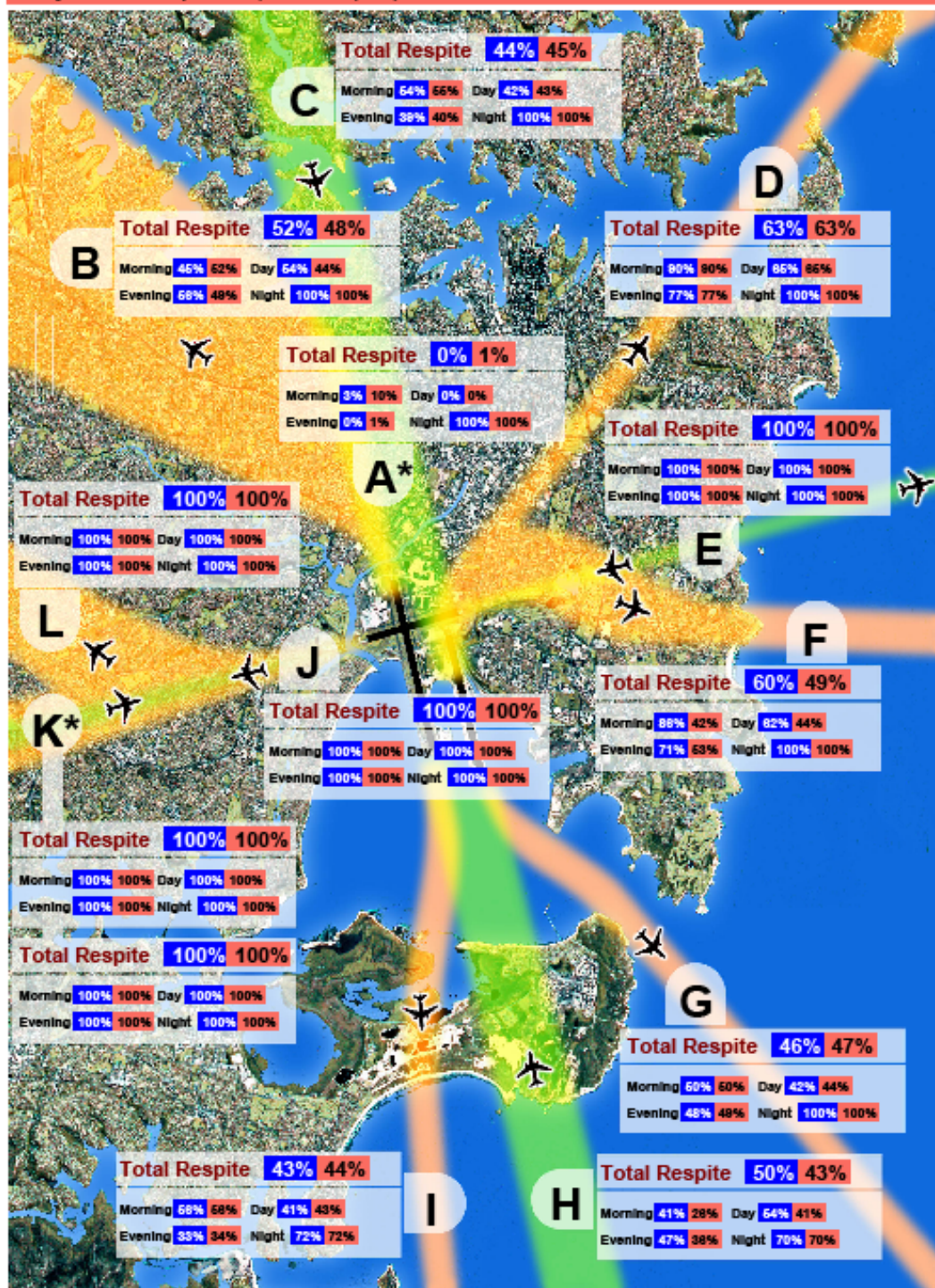
Note : Track A* is Tracks B and C combined. Track K* shows departures (top box) and arrivals (bottom box).

Figure 4 Comparison of flight path movements for all hours over the twelve month period

Sydney Airport : Jet Respite Comparison Chart

1 May 2007 to 30 April 2008, All Jets (R60)

1 May 2007 to 30 April 2008, All Jets (R60)



Note : Track A* is Tracks B and C combined. Track K* shows departures (top box) and arrivals (bottom box).

Total number of movements = **205,751 205,751**

A respite interval is a **60 60** minute period when there are no jet movements.

Morning: 06:00 to 07:00 Day: 11:00 to 15:00 Evening: 20:00 to 23:00 Night: 23:00 to 06:00

Total Respite: 06:00 to 23:00

Figures 5 Comparison of flight path respite for all hours over the twelve month period

Comparison of flight path movements for all hours over the twelve month period (Figures 4 & 5)

These charts show that Flight Path B, associated with Runway 34L departures, would experience a decrease in average daily movements from 57 to 49. The daily range of movements would also decrease from 0-144 to 0-112. However the total respite (ie a 60 minute period with no jet movements) for Track B shows a decrease from 52% to 48%. This is because the assumptions used in determining the use of Mode 15 involved some increase in the use of Mode 9 over Mode 10 (parallel Runway 16 operations). This results in a decrease in total respite (ie a 60 minute period with no jet movements). The proportion of days with zero overflights has also decreased from 33% to 11% for the same reason. However overall there is a reduction in the number of jet movements expected on Track B.

Flight Path C associated with Runway 16L/R arrivals shows a reduction in average daily movements from 146 to 141. The daily range of movements would also decrease from 0-317 to 0-312. This would result in an increase in total respite from 44% to 45% while the proportion of days with zero overflights remains the same.

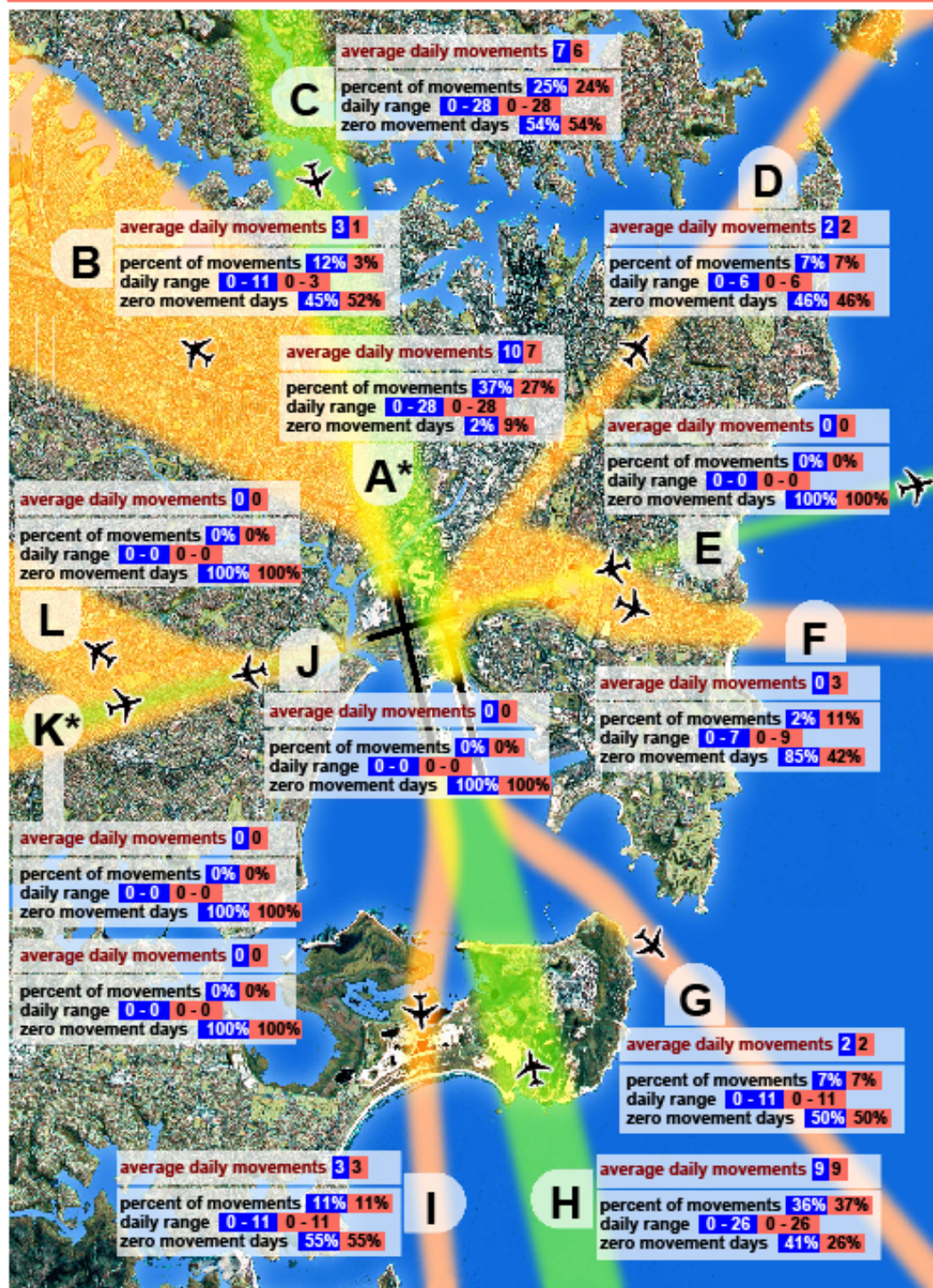
Flight Path D associated with departures from Runway 34R shows an increase in average daily movements from 34 to 36 and an increase in the daily range from 0-85 to 0-88 movements. The proportion of days with zero overflights has also decreased from 33% to 11%, however total respite remains the same.

Flight Path F also associated with departures from Runway 34R shows an increase in average daily movements from 37 to 49 and an increase in the daily range from 0-111 to 0-128 movements. Total Respite has decreased from 60% to 49% in response to the additional jet departures and the proportion of days with zero overflights has also decreased from 37% to 8%.

Sydney Airport : Jet Flight Path Movements Comparison Chart

1 May 2007 to 30 April 2008, 06:00 to 07:00, All Jets

1 May 2007 to 30 April 2008, 06:00 to 07:00, All Jets



Total number of movements = **9,423 9,423**

Note : Track A* is Tracks B and C combined. Track K* shows departures (top box) and arrivals (bottom box).

Figure 6 Comparison of flight path movements for period 0600 – 0700

Comparison of flight path movements for period 0600 – 0700 (Figure 6)

This chart shows that Flight Path B has a decrease in average daily movements from 3 to 1 and a decrease in the daily range from 0-11 to 0-3 from 0600-0700. The proportion of days when there are no overflights has increased from 45% to 52% during this sensitive period.

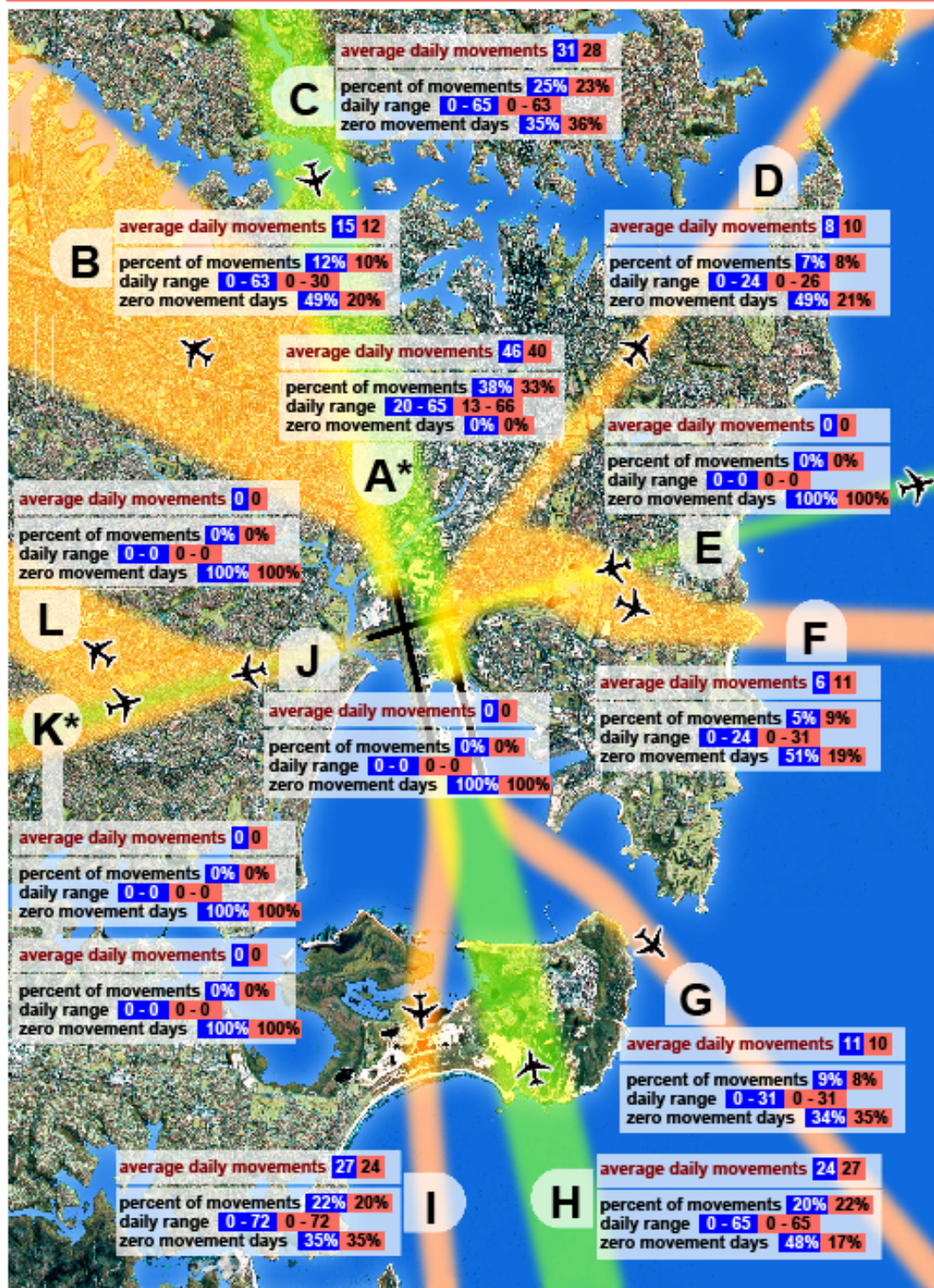
Flight Path C shows a reduction in average daily movements from 7 to 6. The daily range of movements and the proportion of days without overflights remain the same.

Flight Path D shows no change while Flight Path F shows an increase in average daily movements from 0 to 3 while the daily range increases from 0-7 to 0-9 movements. Flight Path F also shows a decrease in the proportion of days with no overflights from 85% to 42% during the 0600-0700 period.

Sydney Airport : Jet Flight Path Movements Comparison Chart

1 May 2007 to 30 April 2008, 11:00 to 15:00, All Jets

1 May 2007 to 30 April 2008, 11:00 to 15:00, All Jets



Note : Track A* is Tracks B and C combined. Track K* shows departures (top box) and arrivals (bottom box).

Figure 7 Comparison of flight path movements for period 1100 – 1500

Comparison of flight path movements for period 1100 – 1500 (Figure 7)

This chart shows that Flight Path B has a decrease in average daily movements from 15 to 12 and a decrease in the daily range from 0-63 to 0-30 from 1100-1500. The proportion of days when there are no overflights has however decreased from 49% to 20%.

Flight Path C shows a reduction in average daily movements from 31 to 28. The daily range of movements has decreased from 0-65 to 0-63 and the proportion of days without overflights has increased from 35% to 36%.

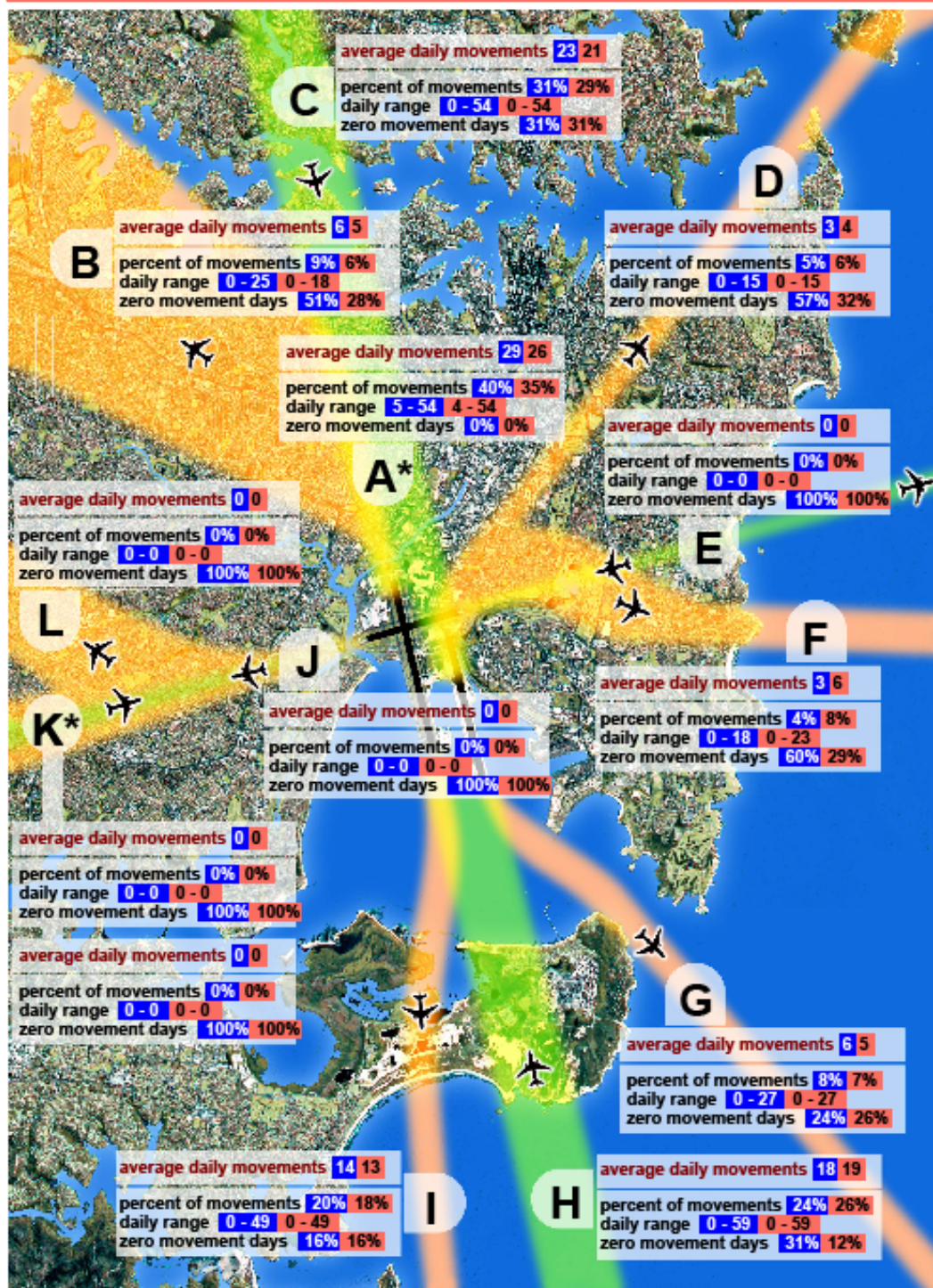
Flight Path D shows an increase in the average daily movements from 8 to 10 and the daily range has increased from 0-24 to 0-26. The proportion of days without overflights has decreased from 49% to 21%.

Flight Path F shows an increase in average daily movements from 6 to 11 and an increase in the daily range from 0-24 to 0-31 movements. The proportion of days with no overflights has decreased from 51% to 19%.

Sydney Airport : Jet Flight Path Movements Comparison Chart

1 May 2007 to 30 April 2008, 20:00 to 23:00, All Jets

1 May 2007 to 30 April 2008, 20:00 to 23:00, All Jets



Total number of movements = **27,004** **27,004**

Note : Track A* is Tracks B and C combined. Track K* shows departures (top box) and arrivals (bottom box).

Figure 8 Comparison of flight path movements for period 2000 – 2300

Comparison of flight path movements for period 2000 – 2300 (Figure 8)

This chart shows that Flight Path B has a decrease in average daily movements from 6 to 5 and a decrease in the daily range from 0-25 to 0-18 from 2000-2300. The proportion of days when there are no overflights has however decreased from 51% to 28%.

Flight Path C shows a reduction in average daily movements from 23 to 21. The daily range of movements and the proportion of days without overflights has not changed.

Flight Path D shows a decrease in the average daily movements from 3 to 4 and there has been no change in the daily range. However the proportion of days without overflights has decreased from 57% to 32%.

Flight Path F shows an increase in average daily movements from 3 to 6 and an increase in the daily range from 0–18 to 0–23 movements. The proportion of days with no overflights has decreased from 60% to 29%.

Assessment of sample Mode 9 day

The assessment of the sample day used NFPMS movement data for a single day as previously described. The analysis of any single day is likely to show a variation in the distribution of aircraft when compared to the macro picture from the analysis of the twelve months of data in the previous section. However it provides an example of the potential effect that the use of Mode 15 could have on a day of predominantly Mode 9 use.

Jet aircraft movement numbers - Departures

The NFPMS movement data for 30 April 2008 was used to determine that, in the absence of Runway 07/25, there would have been a total of 128 jet departures from Runway 34L and 187 departures from Runway 34R. During the non-peak periods there were 54 departures from Runway 34L and 75 departures from Runway 34R. This data was analysed and, based on the methodology described above, jet departures from Runway 34L were reallocated to Runway 34R during the non-peak period. The results of this are shown in Table 4.

Time period	Mode 9 Runway 34L Departures	Mode 9 Runway 34R Departures	Mode 15 Runway 34L Departures	Mode 15 Runway 34R Departures	Decrease in Runway 34L Departures	Increase in Runway 34R Departures
0600 - 0700	3	12	1	14	2	2
1100 - 1500	34	39	26	47	8	8
2000 - 2300	17	24	12	29	5	5
Total	54	75	39	90	15	15

Table 4 Changes in jet departure numbers from Runways 34L and 34R when Mode 15 is used.

The fifteen jet aircraft departures identified in the movement data that could be moved from Runway 34L to Runway 34R during Mode 15 would use one of two existing departure tracks as previously discussed. At this stage it is expected that MARUB will be the preferred track for jet departures that would have departed Runway 34L and tracked via RIC or KAT. It is important to note that airspace modelling and simulator work by ATC is an essential part of the evaluation process and this is scheduled for later in August 2008. The breakdown of aircraft assigned to Runway 34R departure tracks under Mode 15 is shown in Table 5.

Time period	Mode 9 R34R ENTRA track	Mode 9 R34R MARUB track	Mode 15 R34R ENTRA track	Increase on ENTRA track	Mode 15 R34R MARUB track	Increase on MARUB track
0600 - 0700	6	6	6	0	7	1
1100 - 1500	24	15	24	0	23	9
2000 - 2300	11	13	11	0	18	5
Total	41	34	41	0	49	15

Table 5 – Changes in jet aircraft numbers on the two Runway 34R tracks with departures via RIC/KAT using the MARUB track.

The data in Table 5 show that there would be no change to the jet departures on the ENTRA track (shown as Track D in Figure 4) while there would be an increase of fifteen movements throughout the day on the MARUB track (shown as Track F in Figure 4). This increase would be made up of one extra movement in the hour between 0600 and 0700, nine extra movements in the four hours between 1100 and 1500 and five extra movement in the three hours between 2000 and 2300.

The increase of 15 movements during the non-peak period equates to a 20% increase in Runway 34R jet departures during the non-peak periods and an 8 % increase in jet departures from this runway for the entire day.

Based on analysis of the NFPMS movement data for the 12 months from May 2007 to April 2008, it is estimated than Mode 15 would result in an additional 5,453 jet departures from Runway 34R. Consequently there would be a reduction of 2,955 jet departures from Runway 34L, a reduction of 1,779 jet departures from Runway 16R and a reduction of 719 jet departures from Runway 16L.

The data for 30 April 2008 also showed a decrease of 15 jet departures from Runway 34L. The decrease was made up of up of two movements in the hour between 0600 and 0700, eight movements in the four hours between 1100 and 1500 and five movements in the three hours between 2000 and 2300. As a result of the jet departures being moved to Runway 34R, Runway 34L had a 28% decrease in jet departures during the non-peak period which is a 12% decrease in jet departures from this runway for the entire day.

Jet aircraft movement numbers – Arrivals

All arrivals during Mode 15 operations are expected to land on Runway 34L. Advice from Sydney ATC is that all aircraft will track to the west of the airport for a left circuit onto Runway 34L with the exception of arrivals from the east which will track overhead the airport and join on downwind. This is consistent with the arrival tracks used when SODPROPS is in operation.

The NFPMS movement data for 30 April 2008 identified a total of 200 jet arrivals on Runway 34L and 108 jet arrivals on Runway 34R. This movement data was analysed and jet arrivals on Runway 34R were allocated to Runway 34L during the non-peak periods previously described. The results of this are shown in Table 6.

Time period	Mode 9 Runway 34L Arrivals	Mode 9 Runway 34R Arrivals	Mode 15 Runway 34L Arrivals	Mode 15 Runway 34R Arrivals	Increase in Runway 34L Arrivals	Decrease in Runway 34R Arrivals
0600 - 0700	21	4	25	0	4	4
1100 - 1500	38	17	55	0	17	17
2000 - 2300	29	13	42	0	13	13
Total	88	34	122	0	34	34

Table 6 Changes in jet arrivals to Runways 34L and 34R when Mode 15 is used.

The increase of 34 movements during the non-peak period equates to a 39% increase in Runway 34L jet arrivals during the non-peak periods and a 17% increase in jet arrivals to this runway for the entire day.

The use of Mode 15 will increase the number of aircraft using this Runway 34L arrival track, which will increase the environmental impact on communities beneath the downwind segment of the track.

Runway 34R had a 100% decrease in jet arrivals during the non-peak period which is a 31% decrease in jet arrivals to this runway for the entire day.

Turboprop aircraft movement numbers – Arrivals

The NFPMS movement data for 30 April 2008 identified a total of 64 turboprop arrivals on Runway 34L and 54 turboprop arrivals on Runway 34R.

This movement data was analysed and turboprop arrivals on Runway 34R were allocated to Runway 34L during the non-peak periods previously described. The results of this are shown in Table 7.

Time period	Mode 9 Runway 34L Arrivals	Mode 9 Runway 34R Arrivals	Mode 15 Runway 34L Arrivals	Mode 15 Runway 34R Arrivals	Increase in Runway 34L Arrivals	Decrease in Runway 34R Arrivals
0600 - 0700	0	1	1	0	1	1
1100 - 1500	20	14	34	0	14	14
2000 - 2300	8	6	14	0	6	6
Total	28	21	49	0	21	21

Table 7 Changes in turboprop arrivals to Runways 34L and 34R when Mode 15 is used.

The increase of 21 movements during the non-peak period equates to a 75% increase in Runway 34L turboprop arrivals during the non-peak periods and a 33% increase in jet arrivals to this runway for the entire day.

The use of Mode 15 will increase the number of aircraft using this Runway 34L arrival track, which will increase the environmental impact on communities beneath the downwind segment of the track.

Runway 34R had a 100% decrease in turboprop arrivals during the non-peak period which is a 39% decrease in turboprop arrivals to this runway for the entire day.

Runway 07 Departures

Departures from Runway 07 will be reduced during the RESA project. NFPMS movement data for the calendar year 2007 showed approximately the average number of departures on Runway 07 was less than 2 jets and less than 1 turbo-prop per day.

Runway 25 Arrivals

Arrivals on Runway 25 will be reduced during the RESA project due to the unavailability of this runway. NFPMS movement data for the calendar year 2007 showed the average number of arrivals on Runway 25 was approximately 18 jets and 7 turboprops per day.

Jet aircraft departure tracks

The implementation Mode 15 will result in some aircraft departing Runway 34R via the MARUB track being required to turn back to the west and track to either KAT or RIC. This will require a new Standard Instrument Departure (SID) shown in Figure 9. This SID will require aircraft to re-cross the coast at or above 15,000ft before overflying the Cronulla-Bundeena area.

The expected noise from these overflights are considered in the Noise Levels section of this report and are not expected to result in an adverse impact due to the altitude of the aircraft concerned.

Aircraft requiring Runway 34L for departure during Mode 15 will track via RIC or KAT as they do during Mode 9 operations with the exception that aircraft will be required to turn at 800 feet to ensure system safety. This differs from the current situation where aircraft tracking to KAT turn at 800 feet and aircraft tracking to RIC turn at 1,500ft. However this is not expected to have an adverse environmental impact as there is already an overlap in the tracks of aircraft currently turning at the different altitudes.

Runway 34L Arrival tracks

Runway 34L arrival tracks will be the same as those used when Mode 4 (SODPROPS) is in operation with the exception that there may sometime be a requirement for arrivals to track to the east of the field rather than to the west as they do during SODPROPS operations. The current expectation is that the track to east will be similar to that flown during the operation of Mode 9.



Figure 9 Proposed Runway 34L Jet SID – West via MARUB

Noise Levels

Single event maximum noise levels

The maximum noise levels from a single aircraft overflight for either arrivals or departures will not change as the proposed introduction of Mode 15 will not result in new aircraft types operating on the existing flight tracks. There will however be a change in movement numbers on some tracks as discussed above.

The new SID for aircraft departing Runway 34R that would have departed from Runway 34L and tracked via RIC or KAT is shown in Figure 9. Aircraft following this SID will be at or above 15,000ft prior to re-crossing the coast in the Cronulla - Bundeena area. Noise modelling indicates that single event maximum noise levels (LAMAX) for common aircraft types such as the A320, A330, B737-800 and B767-300 at 15,000ft are expected to range between 52 dB(A) and 63 dB(A).

These single event maximum noise levels are below the level of 70 dB(A) generally considered to be the external sound level below which no difficulty with reliable communication from radio, television or conversational speech in a typical room with windows open is expected. (Reference - *Department of Transport and Regional Services, 2000, Expanding Ways to Describe and Assess Aircraft Noise*, pp23-35).

N70 events

The N70 chart for operations with Mode 15 (Figure 9) shows a decrease in the extent of the 20 event contour for the area to the north-west of the airport when compared to the N70 chart for operations without Mode 15 (Figure 10). This indicates that these areas will experience a reduction in the number of events over 70 dB(A).

However, the N70 chart for the Mode 15 operations also shows an increase in the extent of the 50 and 20 event contours over the areas to the east of the airport when compared to the N70 chart for the operations without Mode 15. Therefore while the absolute noise levels from individual overflights will not change, the number of noise events above 70 dB(A) will increase for areas to the east of the airport.

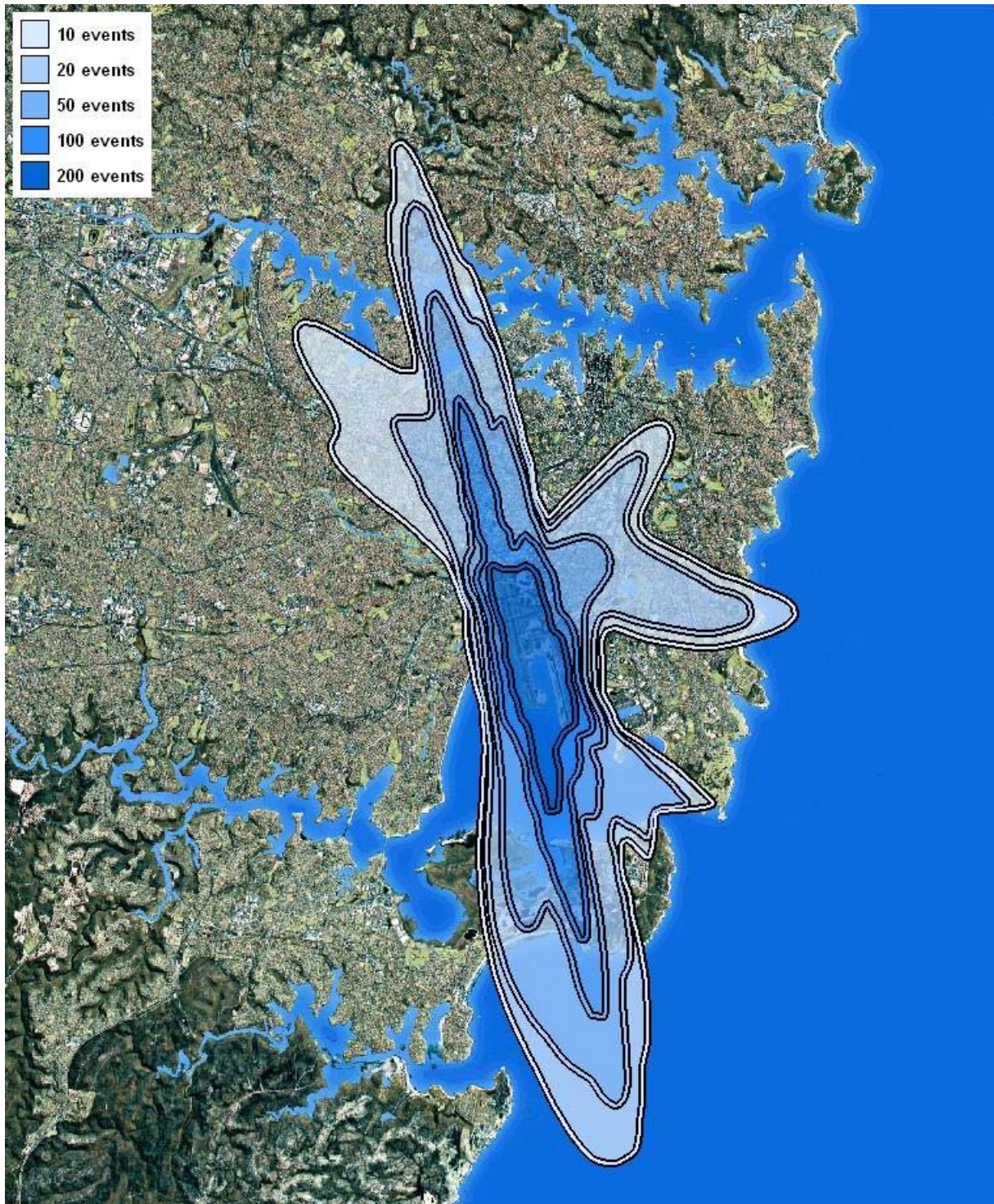


Figure 9 N70 Chart for Mode 15 operations over the twelve month period

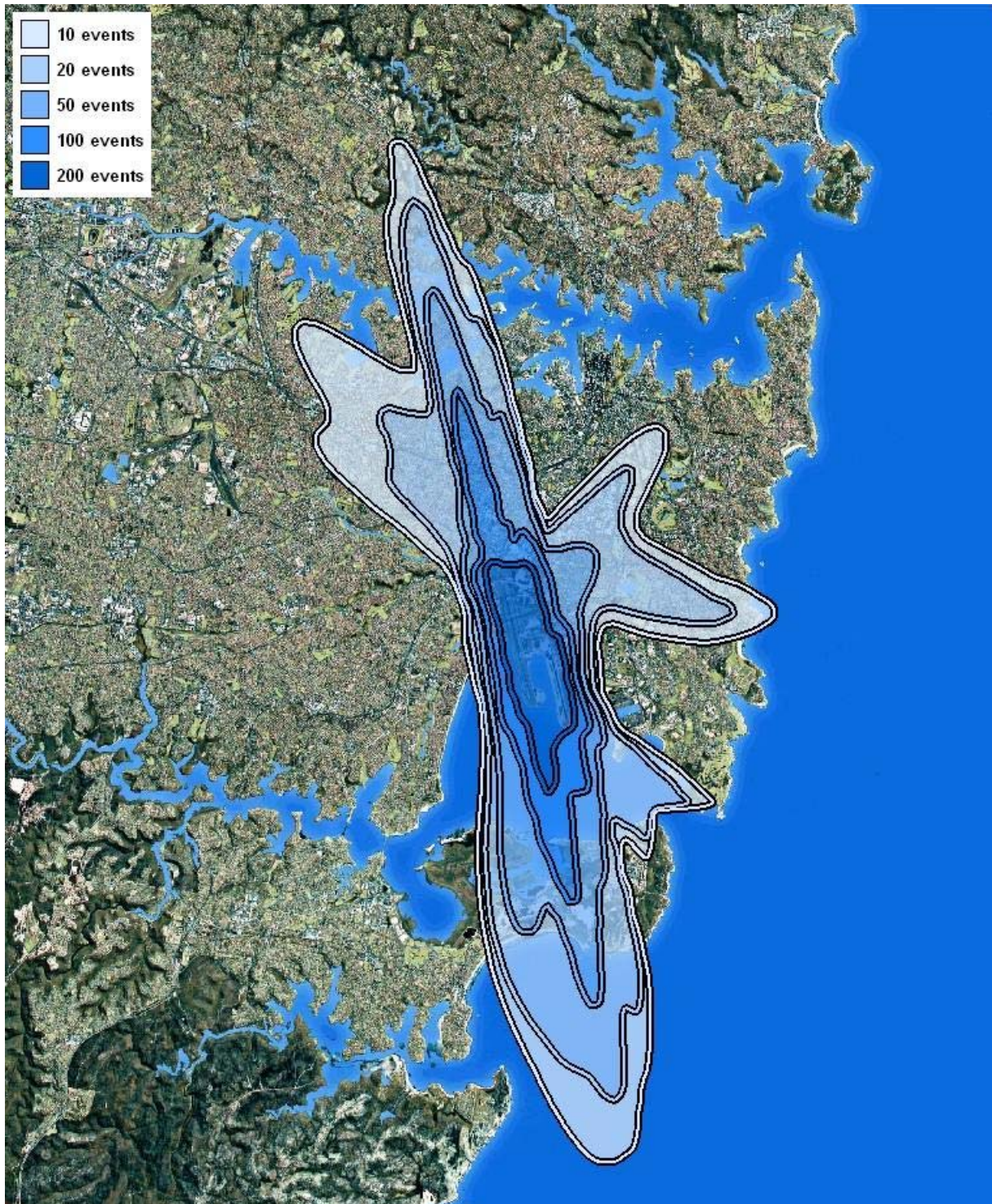


Figure 10 N70 Chart for operations without Mode 15 over the twelve month period

Emissions

The use of Mode 15 will not result in any increase in track miles flown for aircraft departing for destinations to the north (as far as Hervey Bay), east or south. However aircraft departing via RIC or KAT will be required to track to a point 15 nautical miles from the airport prior to turning west to track back to RIC or KAT. The departure will add approximately 50 nautical miles to departures held below conflicting MARLN STAR Arrivals, and approximately 40 nautical miles when there is no conflicting arrival traffic.

Using ICAO CAEP Rule of Thumb guidelines for first order approximations the additional track miles is expected to increase fuel burn by approximately 11kg per nautical mile. In the worst case, when an additional 50 nautical miles is flown, this equates to approximately 550kg of fuel or 1738kg of CO₂ per flight. Based on the NFPMS movement data for 30 April 2008 ten of the fifteen departures moved from Runway 34L to Runway 34R during the non-peak times would be required to fly the extra track miles. Therefore the total additional fuel burn for this day would have been approximately 5,500kg which equates to approximately 17,380kg of CO₂ emissions.

LTOP Targets

The LTOP defines target movement percentages to the north, east, south and west.

This analysis showed that the implementation of Mode 15 is likely to result in the impact on the LTOP runway end targets shown in Table 8.

	LTOP Target	East-west runway closed (Jets)	East-west runway closed with Mode 15 implemented (Jets)
North	17%	36%	34%
East	13%	13%	15%
West	15%	0%	0%
South	55%	52%	51%

Table 8 Runway end impact percentages. Note these are based on using jet movements only for May 2007 – April 2008. Slight changes would be expected if non-jet movements were included.

The data in Table 8 indicates that the use of Mode 15 is likely to see a reduction in the percentage of movements to the north from 36% to 34% and an increase in the movements to the east to 15% which is above the LTOP target of 13%.

The percentage movements to the south are likely to decrease from 52% to 51%, while there is no change to the movement percentage to the west.

Application of Mode 15

The assessment of the potential impact of the introduction of Mode 15 has relied on advice from Sydney ATC as to the aircraft types that would be operationally able to use Runway 34R, within the requirements of the current noise abatement procedures. On this basis as previously stated it is assumed that long-haul aircraft including domestic flights to destinations such as Cairns, Perth and Darwin would continue to use Runway 34L for departure.

The outcome of the analysis of the implementation of Mode 15 is directly related to the assumptions and methodology outlined in this report. It is however possible that there may be variations to these assumptions during day to day operations that could alter the expected outcomes.

For example, the analysis of NFPMS movement data for this assessment identified operations to destinations such as Cairns, Perth and Darwin that have on occasions departed from Runway 34R. If it is possible, in terms of operational requirements, for some of these aircraft to operate from Runway 34R during Mode 15 rather than remain on Runway 34L, then additional benefits might be obtainable for communities to the immediate north and north-west. However the additional impact on communities to the east of the airport would also need to be considered.

Community Consultation

Community consultation is an important aspect of the environmental assessment process as this is a major aspect to be considered when determining whether an action is likely to be significant under the EPBC Act, and the views of the communities around the airport, particularly to the east, will be important in making such a determination.

Consultation was undertaken with the members of the LTOP Implementation Monitoring Committee on 12 August 2008. This meeting included regular IMC members as well as additional representatives from the Sydney Airport CF in order to ensure that communities around the airport were appropriately represented.

The Mode 15 proposal was presented at this IMC meeting. There were no objections raised by the community representatives. The implementation of Mode 15 was considered to be an appropriate potential mitigation measure..

A further Mode 15 presentation was provided to the community representatives of the SACF on 15 August 2008 with similar outcomes.

Conclusion

The use of Mode 15 would be a temporary measure implemented to mitigate the noise impacts of the total closure of Runway 07/25 for an expected period of 8 months from approximately October 2008 to June 2009.

The results of the TNIP analysis indicate that the implementation of Mode 15 could provide respite to areas to the immediate north and the north-west of the airport during non-peak periods by transferring some jet departures to Runway 34R.

The extra jet departures from Runway 34R will be spread between the two existing departure tracks and will result in some increase in the daily range of aircraft movements as well as a decrease in the number of days without overflights and decrease in total respite.

The implementation of Mode 15 will provide respite to Kurnell during non-peak periods when all arrivals are transferred to Runway 34L.

The results of the sample Mode 9 day analysis identified 15 jet aircraft departures that could have been reallocated from Runway 34L to Runway 34R during Mode 15 operations in non peak periods. The additional traffic would depart via the MARUB track over the eight hour period.

The introduction of Mode 15 is likely to increase jet departures from Runway 34R by approximately 5,453 movements over a 12 month period.

At this stage it is expected that aircraft that would have departed Runway 34L and tracked via RIC or KAT that can operationally use Runway 34R, within the limitations of the current noise abatement requirements, will depart via the MARUB track to a point 15 nautical miles east of the airport. These aircraft will use a new Standard Instrument Departure (SID) which will require aircraft to re-cross the coast at or above 15,000ft before overflying the Cronulla-Bundeena area. At this altitude the noise level on the ground is expected to range between 52 dB(A) and 62 dB(A) which is below the level of 70 dB(A) generally considered to be the external sound level below which no difficulty with reliable communication from radio, television or conversational speech in a typical room with windows open is expected.

Aircraft requiring Runway 34L for departure during Mode 15 will track via RIC or KAT as they do during Mode 9 operations with the exception that aircraft will be required to turn at 800 feet to ensure system safety. This differs from the current situation where aircraft tracking to KAT turn at 800 feet and aircraft tracking to RIC turn at 1,500ft. However this is not expected to have an adverse environmental impact as there is already an overlap in the tracks of aircraft currently turning at the different altitudes.

There is likely to be an increase in fuel burn and hence engine emissions associated with the implementation of Mode 15 due to additional track miles, estimated to be between 40 and 50 nautical miles, associated with departures via KAT and RIC using Runway 34R. In the worst case this equates to an additional fuel burn of 550kg per flight or 1,738kg of CO₂ per flight. Based on the NFPMS movement data for 30 April 2008 ten of the fifteen departures moved from Runway 34L to Runway 34R during the non-peak times would be required to fly the extra track miles. Therefore the total additional fuel burn for this day would have equated to approximately 5,500kg which equates to approximately 17,380kg of CO₂ emissions.

The use of Mode 15 will increase the number of aircraft using this Runway 34L arrival track, which will increase the environmental impact on communities beneath the downwind segment of the track. However as this track is the same as that used when SODPROPS is operation the increase in overflights would also occur with any increase in the use of SODPROPS, which is the noise preferred runway mode at the airport.

The assessment of the potential impact of the introduction of Mode 15 has relied on advice from Sydney ATC as to the aircraft that would be operationally able to use Runway 34R. On this basis it was assumed that long-haul aircraft including domestic flights to destinations such as Cairns, Perth and Darwin would continue to use Runway 34L. The analysis of NFPMS movement data for this assessment identified operations to these destinations that have on occasions departed from Runway 34R. If it is possible for some of these aircraft to operate from Runway 34R during Mode 15 rather than remain on Runway 34L, then additional benefits might be obtainable for communities to the immediate north and north-west. However the additional impact on communities to the east of the airport would also need to be considered.

In conclusion, this assessment has found that Mode 15 has the potential to reduce the number of overflights for communities to the immediate north and north-west of the airport and Kurnell during non-peak periods, however the increase in movements to the east of the airport, while relatively small in numbers on a per day basis, shows a potential to increase the range of daily movements, decrease the number of days without overflight and reduce total respite for these communities.

Based on this assessment it is concluded that the proposal to implement Mode 15 poses a real possibility that the action will be seen by the community to affect the health, safety, welfare or quality of life of the members of a community, through noise. If this is the case, the proposal is likely to have a significant impact on the environment. As a result it was considered necessary to undertake community consultation on the proposed implementation of Mode 15 through the LTOP IMC and the SACF.

The results of these consultations were important factors in determining whether or not the proposal to implement Mode 15 as a temporary measure is likely to have a significant environmental impact.

The community representatives of the LTOP IMC and SACF were provided with a presentation on the proposed implementation of Mode 15 and no objections were raised. Mode 15 is considered therefore to be an appropriate mitigation measure against the environmental impact of the Sydney RESA project.

The consultation undertaken is considered to be an appropriate means of mitigating the environmental impact of the Sydney RESA project.

As a result of the outcome of the community consultation, and the temporary nature of the proposal, the implementation of Mode 15 is recommended.