

A Note by DfT

Noise Impacts of Airport Developments considered in the National Consultation Documents

1. Introduction

1.1 This technical note presents the findings of work undertaken to assess the value of noise impacts caused by airport developments proposed in the National air transport consultation documents¹ and referenced in paragraph 3.13 of the discussion paper, *Aviation and the Environment: Using Economic Instruments*. It brings together work undertaken on runway options at the South East airports reported on in the *SERAS Stage Two Appraisal Findings Report*, and new work undertaken in respect of options at regional airports. In both cases, the same general approach has been followed:

- Aircraft noise contours for each option are produced for either 2015 or 2030.
- The total number of houses falling within different noise contours above the 57dBA contour are counted for each option.
- The value of these houses is estimated from the recorded prices of houses recently sold in the relevant areas.
- The tentative finding of past research, that a 1dBA change in noise levels above 57dBA results in an approximate 0.5% to 1% change in house prices, has been used to assess the effect on house values of different options. In practice, a 0.5% reduction in value for each 1dBA noise increase above 57dBA has been assumed.
- It has been assumed that new options come on stream in 2011 and that the noise contours associated with each option apply from 2011, causing a one-off reduction in house values in 2011.
- To assess the charge per passenger for each airport option necessary to compensate for the loss of house values, the reduction in house values is discounted back to 2000. The present value of charges for all relevant passengers equals the reduction in house values.

¹ Available online at www.aviation.dft.gov.uk

Further details of the methodology are given below, followed by the principal results. An assessment of the effect of the lower discount rate used in the updated Green book² can be found section 3.2.

² Available at www.hm-treasury.gov.uk/economic_data_and_tools/greenbook/data_greenbook_index.cfm

Methodology – Noise Contours

1.2 Table 1 shows the years for which noise contours were used for the different options.

At the South East airports, contours for 2015 were used at those airports where the options were only for one new runway, and contours for 2030 were used at those airports where there were multi-runway options.

Table 1: Noise Contour Years

Airport	Option	Year
Heathrow	Option E4	2015
Gatwick	Option 1	2030
	Option E1	2030
Stansted	Option 5	2030
	Option 11	2030
Luton	Option 2	2015
	Option E3	2015
Cliffe Marshes	Option A2	2030
Birmingham	Max Use	2030
	Close Spaced	2030
	Wide Spaced	2030
East Midlands	Existing	2001
	Max Use	2030
	Wide Spaced	2030
Rugby	Option 2A	2030
Glasgow	Option 5	2030
	Option 7	2030
Edinburgh	Option 5	2030
	Option 6	2030
	Option 8	2030
Manchester	1 New Runway	2030
	Ref Case	2030
	Hi Growth	2030
	70 MPPA	2030

Methodology - Household Counts

1.3 Both the South East and the regional household counts applied the same query function (within the MapInfo GIS software) to the Ordnance Survey's Codepoint data, which provides a centroid for each postcode in the country. Each centroid contains the number of residential addresses (households) within the postcode.

1.4 Where noise contours were only available at 3dBA intervals, it was assumed that a third of all addresses within the 3dBA band fell within each 1dBA contour.

Methodology - House Prices

- 1.5** For the South East airports, average house prices were used for the districts (local authority areas) in which the noise impacts would occur. Average house prices were based on sales recorded by HM Land Registry for 1998 to 2000.
- 1.6** For the regional airports, house prices for individual postcode districts were used (a postcode district being the outbound part of a postcode – e.g. M14 or SW8).
- 1.7** For the English airports, the house price data for each postcode district was taken from www.proviser.com and the figures were for quarter 2, 2002. For the Scottish airports, which have a different land registry, www.upmystreet.com was used. For consistency with the South East work, these house prices were factored back to quarter 4, 2000, with data taken from the Halifax Bank Of Scotland (HBOS) plc.

Methodology Summary

- 1.8** The approach aims to identify the total noise impact of each option and the charge that would need to be applied to all passengers to compensate for the overall loss of house value. It is not concerned with incremental changes in noise levels over a base case and the charge to be levied on incremental passengers.
- 1.9** There are a number of sources of error and uncertainty within the inputs to the estimation process including; the noise contours, the numbers of properties affected, the value of those properties and the effects of aircraft noise on property values. The house values used are all 2000 house prices or thereabouts. No allowance is made for real change in house prices from 2000.
- 1.10** The estimation process assumes that the noise impact of an option will take place in 2011, but the noise contours themselves are for 2015 or 2030. The estimated value of noise impacts in 2011 will therefore be over-stated, particularly for multi-runway options which could not be in place by 2011 or for regional airports where take-up of runway capacity may be slower than in the South East.
- 1.11** The supporting spreadsheets are available on request from Halcrow, by email from FranklinB@halcrow.com

2. Results

2.1 Table 3 below summarises the principal findings. It gives the numbers of houses subject to noise levels in excess of 57dBA for each option and the assumed value per house. It gives the estimated effect on house prices for each option as estimated for 2011 and discounted back to 2000 and the discounted average change in value for each house affected, i.e. the sum payable in 2000 to compensate house owners for a loss of value in 2011.

2.2 All values quoted in Table 3 are based on noise contours assuming Chapter 3 – 14dBA noise levels for new aircraft types. However, at South East airports, the original estimation of the noise impacts on house prices undertaken in Stage Two of SERAS was based on noise contours assuming Chapter 3 – 8dBA noise levels for new aircraft types. In Table 3 these estimates have been adjusted downwards to reflect an assumption of Chapter 3 – 14dBA, based on the difference in the number of houses within the 57dBA contours with these two assumptions. Therefore the value of the total noise impact and the required charge per passenger at South East airports are lower now than previously reported. The effects of the different assumptions on the Max Use and Option E4 cases at Heathrow are summarised in Table 2.

Table 2: Effects on House Prices at Heathrow

Noise level	Option	Houses affected, '000	Discounted value of house price change £million	Equivalent charge per passenger £
Chapter 3 –8dBA	Max Use	159.6	293.17	0.36
	Option E4	216.3	400.25	0.40
Chapter 3 –14dBA	Max Use	116.1	213.26	0.26
	Option E4	138.6	256.47	0.26

2.3 In Table 3, the discounted (2000) value of the noise impact ranges from £260million for option E4 at Heathrow, to £60 million for the largest option (70 mppa) at Manchester, £40 million for the wide-spaced option at Birmingham down and to ~ £2 million for the options at Edinburgh.

2.4 Charges per passenger needed to compensate for the loss of house values range from 26p for Option E4 at Heathrow, to 16p for the wide-spaced option at

Birmingham, 14p for the 70 mppa option at Manchester, and to 6p or less at the other airports.

Table 3: Valuation of Noise Impacts at South East and Regional Airports

Airport option	Number of houses affected, '000	Undiscounted value of house price impact, £million	Discounted value of house price impact, £million*	Average price change per house (based on discounted value)	Equivalent charge per passenger, £#
Heathrow (at £168,000 per house)					
Maximum Use ³	116.1	£404.84	£213.26	£1,840	£0.26
Option E4	138.6	£486.86	£256.47	£1,850	£0.26
Gatwick (at £154,000 per house)					
Option 1	3.9	£10.73	£5.65	£1,450	£0.01
Option E1	12.5	£41.85	£22.05	£1,760	£0.03
Stansted (at £137,000 per house)					
Option 5	5.6	£17.14	£9.03	£1,610	£0.02
Option 11	10.1	£34.28	£18.06	£1,790	£0.03
Luton (at £92,000 per house)					
Option 2	4.0	£6.10	£3.22	£800	£0.02
Option E3	3.0	£2.95	£1.55	£520	£0.01
Cliffe Marshes (at £123,000 per house)					
Option A2	5.30	£15.64	£8.24	£1,550	£0.02
Birmingham (between £46,000 and £62,000 per house)					
Max Use	22.3	£30.77	£16.21	£730	£0.09
Close Spaced	28.9	£42.07	£22.16	£770	£0.10
Wide Spaced	49.5	£76.91	£40.52	£820	£0.16
East Midlands (between £81,000 and £107,000 per house)					
Existing	0.3	£0.56	£0.29	£890	£0.01
Max Use	4.4	£8.78	£4.62	£1,060	£0.06
Wide Spaced	5.7	£9.80	£5.16	£910	£0.06
Rugby (at £118,000 per house)					

³ Heathrow Maximum Use figures quoted are with Chapter 3 – 14dBA noise levels for new aircraft. See section 6.2 of SERAS Stage Two Appraisal Supporting document number 18 “Economic Appraisal” for SERAS Stage Two work on noise impacts including results for ‘maximum use of existing runways’ at existing airports in the South East based on Chapter 3 – 8dBA noise levels for new aircraft.

Airport option	Number of houses affected, '000	Undiscounted value of house price impact, £million	Discounted value of house price impact, £million*	Average price change per house (based on discounted value)	Equivalent charge per passenger, £#
Glasgow (at £57,000 per house)					
Option 5	16.6	£16.05	£8.46	£510	£0.06
Option 7	18.5	£17.17	£9.04	£490	£0.06
Edinburgh (at £104,000 per house)					
Option 5	1.7	£4.13	£2.17	£1,320	£0.02
Option 6	2.1	£5.12	£2.70	£1,260	£0.02
Option 8	1.4	£2.85	£1.50	£1,070	£0.01
Manchester (between £85,000 and £149,000 per house)					
Hi Growth (55 mppa)	25.7	£59.36	£31.27	£1,220	£0.08
70 MPPA	43.6	£113.77	£59.93	£1,370	£0.14

Table notes

* Discounted from 2011 to 2000 at all airports

Assuming house price impact is spread from 2005 to 2030

Comparison with Previous Work on Noise Impacts

3.1 Table 4 compares the work that has been done on noise impacts for SERAS Stage Two and for the regional consultation documents, and comments on any differences.

Table 4: Comparison of Noise Impact Work

		SERAS Stage Two and Regional Con Doc Noise Work		Halcrow Noise Work February 2003		Differences		
Airport option	Year	Number of houses affected, '000	Size of 57dBA Contour (sq km)	Number of houses affected, '000	Size of 57dBA Contour (sq km)	Number of houses affected, '000	Size of 57dBA Contour (sq km)	Comment
Heathrow								
Option E4	2015	216.3	211.9	138.6	155.7	-77.7	-56.3	SERAS Stage Two noise contours based on Chapter 3-8dBA, all noise contours in February 2003 work based on chapter 3-14dBA
Gatwick								
Option 1	2030	6.8	118.5	3.9	87.1	-2.9	-31.5	As above
Option E1	2030	17.6	238.4	12.5	177.5	-5.1	-60.9	As above
Stansted								
Option 5	2030	10.0	176.9	5.6	126.7	-4.4	-50.2	As above
Option 11	2030	13.9	302.6	10.1	190.0	-3.8	-112.6	As above
Luton								
Option 2	2015	6.1	43.6	4.0	35.4	-2.1	-8.2	As above
Option E3	2015	4.6	40.8	3.0	32.5	-1.6	-8.3	As above

		SERAS Stage Two and Regional Con Doc Noise Work		Halcrow Noise Work February 2003		Differences		
Airport option	Year	Number of houses affected, '000	Size of 57dBA Contour (sq km)	Number of houses affected, '000	Size of 57dBA Contour (sq km)	Number of houses affected, '000	Size of 57dBA Contour (sq km)	Comment
Option A2	2030	10.3	251.6	5.30	81.3	-5	-170.3	As above
Birmingham								
Max Use	2030	21.8	30.3	22.3	30.2	0.5	-0.1	The differences in the numbers of houses affected are due to the use of different data sources. The regional Con Doc work used household count data from CACI that is 1991 census, and regional and local information from 1998-99. Halcrow used household count data from Ordnance Survey based on Royal Mail delivery points. The small differences in contour sizes are due to differing computation methods.
Close Spaced	2030	28.6	41.2	28.9	41.0	0.3	-0.2	As above
Wide Spaced	2030	48.4	62.9	49.5	62.7	1.1	-0.2	As above
East Midlands								
Existing	2001	#	#	0.3	7.7			
Max Use	2030	4.8	34.1	4.4	34.0	-0.421	-0.1	As above
Wide Spaced	2030	6.4	69.7	5.7	69.5	-0.696	-0.2	As above
Rugby								
Option 2A	2030	3.4	112.7	3.6	112.4	0.187	-0.3	As above
Glasgow								
Option 5	2030			16.6				
Option 7	2030	18.4	24.9	18.5	24.8	0.1	-0.1	As above

		SERAS Stage Two and Regional Con Doc Noise Work		Halcrow Noise Work February 2003		Differences		
Airport option	Year	Number of houses affected, '000	Size of 57dBA Contour (sq km)	Number of houses affected, '000	Size of 57dBA Contour (sq km)	Number of houses affected, '000	Size of 57dBA Contour (sq km)	Comment
Option 5	2030	1.5	20.7	1.7	20.6	0.2	-0.1	As above
Option 6	2030	1.9	24.5	2.1	24.4	0.2	-0.1	As above
Option 8	2030	1.2	30.6	1.4	28.7	0.2	-1.9	As above. The difference in contour sizes arises from the use of different contours that either avoid or do not avoid overflying the village of Crammond.
Manchester								
Hi Growth (55 mppa)	2030	#	#	25.7	57.6			
70 MPPA	2030	#	#	43.6	75.8			Noise contours previously based on segregated mode operation, now based on mixed mode.

Table Notes

Data unavailable

3.2 Examples of charges per passenger arising from the Treasury's new Green Book⁴ revision of the discount rate from 6% to 3.5% are given below in table 5. The effects of changing the discount rate are small. The total house price decrease from the noise impact is discounted from 2011 to 2000, but the annual charge per passenger spreads this cost over the period 2005-2030 [also expressed in 2005 prices]. Therefore, the lower discount rate has a lesser effect on the house price effect of the noise impact (as it is only discounted from 2011 to 2000) than the charge per passenger which is discounted over a longer period.

Table 5: Principal Inputs to Valuation of Noise Impacts at South East and Regional Airports (above 57db, under Chapter 3 - 14dBA). Comparison of charges per passengers under 3.5% and 6% discount rates

Airport option	Equivalent charge per passenger, £# (6%)	Equivalent charge per passenger, £# (3.5%)
Heathrow Option E4	£0.26	£0.23
Birmingham Wide Spaced	£0.16	£0.14
Manchester 70 mppa (mixed mode)	£0.14	£0.12

⁴ Available at www.hm-treasury.gov.uk/economic_data_and_tools/greenbook/data_greenbook_index.cfm