Environmental Research and Consultancy Department
Directorate of Airspace Policy
Civil Aviation Authority

ERCD Report 0401

Noise Exposure Contours for Heathrow Airport 2003

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Prepared by the Civil Aviation Authority on behalf of the Department for Transport, London, July 2004

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SUMMARY

This report describes the calculations of the aircraft noise exposure around London Heathrow Airport for the year 2003 and compares both the input data and the resulting contours, together with the areas and populations within the contours, with those for 2002.

Prepared by the CAA on behalf of the Department for Transport, July 2004

The authors of this report are employed by the Civil Aviation Authority. The work reported herein was carried out on behalf of the Department for Transport.

Population data used in this report are based on 1991 and 2001 Census data (updated in 1999 and 2002) supplied by CACI Information Services.

EXECUTIVE SUMMARY

For every year, the Environmental Research and Consultancy Department (ERCD) of the Civil Aviation Authority estimates the noise exposures around the London Airports (Heathrow, Gatwick and Stansted) on behalf of the Department for Transport (DfT). The magnitude and extent of the aircraft noise around these airports are depicted on maps by *contours* of constant aircraft noise index (Leq) values. The contours are generated by a computer model validated with noise measurements, which calculates the emissions and propagation of noise from arriving and departing air traffic.

This report presents the results for London Heathrow Airport for the year 2003 and compares both the air traffic information and the noise contours with those for 2002. The 2003 contours shown in this report take into account the topography around Heathrow by accounting for terrain height in the modelling process. This is discussed in more detail in Section 1.6.

Estimates of the populations within the 2003 contours are based on the 2001 census (updated by CACI in 2002). Comparisons with the earlier 1991 census dated (updated in 1999) are also shown in this report.

The average daily aircraft movement rate was 0.9% lower in 2003 than in 2002. The actual modal split of runway direction in 2003 was 70% west - 30% east compared with 78% west – 22% east in 2002. The standard modal split (20 year average) in 2003 was 77% west – 23% east.

The total area within the 2003 terrain adjusted 57 dBA Leq (16-hour) contour remained unchanged at 126.9 square kilometres. The population within this contour increased by 2.1%.

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1 INTRODUCTION

1.1 The amount of aircraft noise experienced by people living around London (Heathrow) Airport during the summer (mid June – mid September) of each year is estimated by the Environmental Research and Consultancy Department of the Civil Aviation Authority on behalf of the Department for Transport (DfT). The noise exposure measure is the Equivalent Continuous Sound Level, Leq (16-hour) in dBA. The background to the use of this index is explained in DORA Report 9023 (Ref 1). The method by which noise maps, or contours of Leq, are prepared using the ANCON Noise Model is described in DORA Report 9120, R&D Report 9842 and ERCD Report 0104[1] (Refs 2, 3 and 4 respectively). Technical terms used here are described in those references.

1.2 This document contains small scale (1:200,000) diagrams of the 2003 Heathrow Leq contours. Contours overlaid on OS digital maps to scale 1:50,000, or in AutoCad DXF format on 3½ inch diskettes, are available for purchase from the Department for Transport, Aviation Environmental Division, Zone 1/33, Great Minster House, 76 Marsham Street, London SW1P 4DR, telephone 020-7944-5494, e-mail address aed@dft.gsi.gov.uk. The previous practice of producing translucent acetate overlays to scale 1:50,000 has now been discontinued.

1.3 This report provides supporting information and compares both the aircraft operations and the resulting noise contours with those for 2002 (Ref 5).

1.4 New analyses of radar and noise data were undertaken in 2003, and the calculations incorporate revised mean tracks and associated dispersions for departing aircraft, together with revised 'spurs' to model the arrival flight track dispersion. Height/speed departure and arrival profiles have also been updated for each aircraft type where the data has shown this to be necessary.

1.5 To remove the effect of year-on-year weather fluctuations on aircraft operations in order to clarify underlying trends, two sets of contours for 2003 have been generated; (i) the *actual* modal split and (ii) the "*standard*" modal split. In 2003 the actual modal split was 70% west - 30% east compared to 78% west – 22% east in 2002. For 2002 the standard modal split was 77% west - 23% east (based on the 20 year Leq period average 1983 to 2002 inclusive); for 2003 the standard modal split remained unchanged at 77% west – 23% east (based on the 20 year Leq period average 1984 to 2003 inclusive). This report compares actual and standard contours for 2002 and 2003.

1.6 The 2003 contours shown in this report take into account the topography around Heathrow by accounting for terrain height in the modelling process. This was achieved by geometrical corrections for source-receiver distance and elevation

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1 Work on this Report has, for some time, been integrated into updating European Noise Modelling Guidance, which will culminate in an updated ECAC.CEAC Document 29, 'Methodology for Computing Noise Contours around Civil Airports'. A proposal from the AIRMOD Technical Subgroup is to be considered by Directors General in Summer 2004. ERCD played a major role in the production of the proposal, in particular the formulation and implementation of revised algorithms for an improved lateral attenuation adjustment.

angles, other more complex effects such as lateral attenuation from uneven ground surfaces and noise screening/reflection effects due to topographical features were not taken into account. ERCD holds terrain height data[2] obtained from Ordnance Survey on a 200m by 200m grid for England and Wales. Interpolation was performed to generate height data at each of the calculation points on the 100m by 100m receiver grid for use by the ANCON noise model.

2 AIRCRAFT OPERATIONS

2.1 Flight Tracks

2.1.1 The 2003 calculations were based on updated mean tracks and track dispersions for all outbound routes from Runways 27L, 27R, 09R and 09L (see Figure 1 for route designations) together with separate mean tracks and dispersions for departures by Concorde on the Compton (CPT) routes from Runways 27L, 27R, 09R and 09L. These were determined from radar data (extracted from the airport's Noise and Track Keeping (NTK) monitoring system) for the summer of 2003. As in 2002, there were some departures from Runway 09L during the 2003 Leq period (2.8% of the total easterly departures) and mean tracks and track dispersions were defined for these operations.

2.1.2 Radar measurements of arrival tracks between the stacks and Runways 27L, 27R, 09L and 09R confirmed that the continued use of evenly spaced 'spurs' remained a realistic method for modelling the dispersion of arrival tracks about the extended runway centre lines. All these spur route segments joined the centre lines at distances greater than 10 kilometres from threshold – only a small number of aircraft joined at the shorter distances.

2.2 Flight Profiles and Noise Emissions

2.2.1 For 2003, the average flight profiles of height and speed versus track distance for each aircraft type were reviewed, and updated where necessary, for both departures and arrivals. For the 2003 calculations additional aircraft type variants were added to the database. These were the Canadair RJ 700 and the Airbus A340-500/600. Noise event levels were then determined from a database expressing SEL[3] as a function of engine power setting and slant distance to the receiver – the so-called 'noise-power-distance (NPD)' relationship. The engine power settings required for the aircraft to follow the measured average height and speed profiles were calculated from data describing aircraft performance characteristics within each of the different aircraft type categories.

2.2.2 Scheduled departures by Concorde normally followed the Compton (CPT) route. For westerly operations, the CPT route is relatively straight but on

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2 Meridian® 2 data revised 2003.

3 Sound Exposure Level in dBA; a measure of noise event level which accounts for both the duration and intensity of noise.

easterly operations it involved a 180° turn. Because large turns can affect climb rates, as in previous years, separate 'west' and 'east' climb profiles were used to describe Concorde departures.

2.2.3 At present, the climb profiles for other aircraft types, which operate on *both* straight and curved departure routes from either end of the airport, are averaged across *all* departure routes. For these types, the 2003 departure radar data showed that, on average, climb profiles for easterly and westerly departures were not significantly different.

2.3 Traffic Distribution by Aircraft Type and Route

2.3.1 The aircraft movements conventionally used to determine Leq are the daily averages of those which take place in the 16-hour day, 0700-2300 local time, during the 92-day period 16 June to 15 September inclusive. Table 1, which displays the distribution of movements by aircraft type, shows that the 2003 average Leq (16-hour) day movement rate was 0.9% lower than in 2002.

2.3.2 Table 2 compares the distribution of aircraft departures by route for 2002 and 2003. The percentages of use of each runway direction - the "modal split" - for 2003 were 70% west - 30% east compared to 78% west – 22% east in 2002.

2.3.3 The table below lists the 'average summer day' movements by eight noise classes of aircraft (ranked in ascending order of noise emission, i.e. from least to most noisy) during 2002 and 2003. Table 1 and Figure 2 (at the end of the Report) state which specific aircraft types fall into which categories.

NOISE CLASS	AIRCRAFT	AVERAGE NUMBER 2002	AVERAGE NUMBER 2003	PERCENTAGE OF TOTAL 2003 MOVEMENTS	CHANGE AS PERCENTAGE OF TOTAL 2002 MOVEMENTS
	PROPELLER AIRCRAFT				
1	Small props	1.1	0.8	0.1	0.0
2	Large props	9.6	9.5	0.8	0.0
	CHAPTER 3 JETS				
3	Short-haul	871.6	849.9	69.0	-1.7
4	Wide-body twins	210.7	203.4	16.5	-0.6
5	2nd gen wide body multis*	136.3	151.1	12.3	+1.2
	LARGE CHAPTER 2/3 JETS				
6	1st gen wide-body multis*	10.7	10.4	0.8	0.0
	2 nd GENERATION TWIN JETS				
7	Narrow body twins (including Chapter 2 and hushkitted versions)	0.3	4.1	0.3	+0.3
	1 st GENERATION JETS AND CONCORDE				
8	Narrow body multis (including hushkitted versions)	2.9	3.0	0.2	0.0
	TOTAL MOVEMENTS	1243.2	1232.2	100.0	-0.9

* Multi-engined (3 or 4) aircraft

2.3.4 It can be seen from the above table that the average number of movements of aircraft types in noise classes 5, 7 and 8 all showed a slight increase in 2003 whilst those in all other classes decreased. The largest decrease was in movements of the short-haul Chapter 3 Jet category (noise class 3) which fell from 871.6 movements per average day in 2002 to 849.9 movements per average day in 2003. The largest increase was in movements of the 2nd generation wide-body multis (noise class 5) which rose from 136.3 movements per average day in 2002 to 151.1 movements per average day in 2003. Of more concern for noise was the increase in movements by 2nd generation twin-jets (noise class 7) which rose from 0.3 per average day in 2002 to 4.1 per average day in 2003.

2.3.5 Figure 2 illustrates the changing distribution of traffic among these noise classes over the twenty years from 1984 to 2003[4] inclusive.

3 NOISE CONTOURS

3.1 'Actual' contours

3.1.1 The actual Leq contours for 2003 (i.e. those depicting actual terrain adjusted average mode Leq exposures), from 57 to 72 dBA in steps of 3dB, are overlaid on a background map in Figure 3. In Figure 4, three of these, for 57, 63 and 69 dBA Leq, are compared with the non-adjusted contours for 2002. In Figure 4, the effect on the contours by the change in modal split can be seen clearly. In 2003, contour 'fingers' associated with westerly departures are generally slightly shorter than in 2002 whilst the 'fingers' associated with easterly departures are slightly longer. The exception to this is the 57dBA Leq contour 'finger' associated with westerly departures on the Compton (CPT) route which has elongated slightly. The contours along and around this route are dominated by Concorde departures. The inclusion of the terrain adjustment has caused the tip of this particular contour level to elongate slightly because of the relatively high terrain around this particular location (western edge of Windsor Great Park).

4 The 1990 to 2003 percentages shown in Figure 2 relate to the average 16 hour Leq-day; before 1990 the percentages relate to the average 12 hour NNI-day (0700-1900 Local Time). Also, the percentages before 1992 are based on departures only, from 1992 they relate to total movements.

3.1.2 Also apparent from both Figures 3 and 4 are the unequal lengths of the 2002 and, to a lesser extent, the 2003 contour 'fingers' associated with departures and arrivals from/to Runways 27R and 27L. These reflect unequal usages of Runways 27R and 27L during both years due to runway resurfacing work. In 2002, Runway 27L was closed during the late evening and early hours of the night and this closure extended well into 2003. The actual percentage use of Runways 27R and 27L during the 2002 and 2003 Leq periods are tabulated below:

	2002		2003	
	27R	27L	27R	27L
Departures	37.1%	62.9%	46.9%	53.1%
Arrivals	64.3%	35.7%	53.5%	46.5%

3.1.3 In the 2002 Leq period, during periods of westerly operation, 93% of all Concorde departures and all Concorde arrivals used Runway 27R; during periods of easterly operation 94% of all Concorde departures and all arrivals used Runway 09L. In 2003, during periods of westerly operation, 78% of all Concorde departures and 58% of all Concorde arrivals used Runway 27R; during periods of easterly operation 67% of all Concorde departures used Runway 09R and 87% of all Concorde arrivals used Runway 09L. The disproportionate use of runway 09L for departures by Concorde in 2002 was a direct consequence of the runway re-surfacing work.

3.1.4 The total areas and populations[5] enclosed by each of the contours are listed below:

Leq LEVEL dBA	AREA SQ KM		PERCENTAGE CHANGE	POPULATION 000's		PERCENTAGE CHANGE
	2002 ACTUAL	2003 ACTUAL Terrain adj		2002 ACTUAL (1999 CACI data)	2003 ACTUAL (2002 CACI data) Terrain adj	
>57	126.9	126.9	0.0	258.3	263.7	+2.1
>60	71.9	71.1	-1.1	122.6	128.6	+4.9
>63	43.8	43.8	0.0	64.2	64.6	+0.6
>66	28.7	28.1	-2.1	29.3	28.8	-1.7
>69	16.4	15.6	-4.9	8.6	8.0	-7.0
>72	8.4	8.3	-1.2	2.9	2.5	-13.8

Percentage changes in contour areas and populations are not necessarily the same because the contours differ in shape as well as size.

5 The population estimates shown in this Report are based on 1991 census data (updated by CACI Ltd in 1999) and 2001 census data (updated by CACI Ltd in 2002). Note also that area and population figures presented in this Report are cumulative.

3.1.5 The table below compares the areas enclosed by each of the 2003 contours for both terrain and non-terrain adjusted scenarios. It can be seen that the inclusion of the terrain adjustment in the 2003 Heathrow contours has had only a relatively small effect. The area within the 57dBA Leq has increased very slightly by 0.6% whilst the area within the 72dBA Leq contour has decreased by 1.2%.

Leq LEVEL dBA	AREA SQ KM		PERCENTAGE CHANGE
	2003 ACTUAL Non-Terrain adj	2003 ACTUAL Terrain adj	
>57	126.1	126.9	+0.6
>60	71.5	71.1	-0.6
>63	44.0	43.8	-0.5
>66	28.1	28.1	0.0
>69	15.6	15.6	0.0
>72	8.4	8.3	-1.2

3.1.6 The next table compares the populations enclosed by each of the 2003 terrain adjusted contours using the earlier 1991 census data (updated in 1999) and the latest 2001 census data (updated in 2002).

Leq LEVEL dBA	POPULATION (000's)		PERCENTAGE CHANGE
	2003 (Terrain adj) ACTUAL (1999 CACI data)	2003 (Terrain adj) ACTUAL (2002 CACI data)	
>57	253.6	263.7	+4.0
>60	125.6	128.6	+2.4
>63	61.6	64.6	+4.9
>66	27.3	28.8	+5.5
>69	7.6	8.0	+5.3
>72	2.2	2.5	+13.6

Based on the updated 2001 census data (as updated by CACI in 2002), the population enclosed by the 57 dBA Leq contour was 4% higher than using the 1999 data with larger differences at the higher contour levels.

3.2 'Standard' contours

3.2.1 In Figure 5 the standard terrain adjusted 2003 contours (57, 63 and 69 dBA Leq) are compared with the non-adjusted 2002 contours. This shows what the noise exposures would have been if the 2002 and 2003 modal splits had mirrored the 20-year rolling average. The 2002 standard contours were based on the 20 year average modal split from 1983 to 2002 inclusive of 77% west - 23% east; those for 2003 were based on the 20 year average modal split from 1984 to 2003 inclusive which remained unchanged at 77% west - 23% east. The associated contour areas and populations are displayed below:

Leq LEVEL dBA	AREA SQ KM		PERCENTAGE CHANGE	POPULATION 000's		PERCENTAGE CHANGE
	2002 STANDARD	2003 STANDARD Terrain adj		2002 STANDARD (1999 CACI data)	2003 STANDARD (2002 CACI data) Terrain adj	
>57	126.6	129.3	+2.1	257.8	269.2	+4.4
>60	71.7	72.2	+0.7	123.3	122.6	-0.6
>63	43.8	44.1	+0.7	64.2	63.8	-0.6
>66	28.8	27.5	-4.5	29.7	27.0	-9.1
>69	16.3	15.8	-3.1	8.6	8.4	-2.3
>72	8.4	8.4	0.0	3.0	2.6	-13.3

3.2.2 The standard contours normally provide a clearer indication than the actual contours of 'fleet noise level' changes because they minimise the effect of any difference between the ratios of westerly to easterly operations for the two years**.** Figure 5 clearly shows the effect on the 2002 contours of the runway re-surfacing work particularly on the 57 dBA Leq contour associated with westerly arrivals where the contour under the extended centre line of Runway 27R is longer than in 2003. Also apparent from this figure (more so than Figure 4) is the elongation of the terrain adjusted 2003 57 dBA Leq contour associated with westerly Concorde departures on the Compton (CPT) route. As stated in section 3.1, the inclusion of terrain adjustments has caused this contour level to elongate because of the relatively high terrain around this particular location.

3.3 2003 average mode contours excluding Concorde movements

3.3.1 For previous years (those for 2000, 2001 and 2002) additional contours have been generated to show what the situation would have been if Concorde movements had not changed from their 1999 levels (4.2 per day).

3.3.2 In October 2003 Concorde retired from service so the contours for 2003 contours will be the last to include any Concorde movements. Consequently, for this report, additional terrain adjusted 2003 contours have been generated that exclude movements by Concorde.

3.3.3 Figures 6 and 7 illustrate these terrain adjusted contours using the actual year 2003 modal split of 70% west – 30% east and the standard modal split of 77%

west – 23% east. Particularly noticeable from these two figures is the reduction in the size of the contours underneath and to the side of the westerly CPT departure routes.

3.3.4 The contour areas and populations for these two scenarios are listed below:

Leq LEVEL dBA	AREA SQ KM Terrain adj		PERCENTAGE CHANGE	POPULATION 000's (2002 CACI data) Terrain adj		PERCENTAGE CHANGE
	2003 with Concorde movements at 03 levels ACTUAL	2003 excluding Concorde movements ACTUAL		2003 with Concorde movements at 03 levels ACTUAL	2003 excluding Concorde movements ACTUAL	
>57	126.9	110.2	-13.2	263.7	226.3	-14.2
>60	71.1	62.8	-11.7	128.6	106.6	-17.1
>63	43.8	38.9	-11.2	64.6	52.6	-18.6
>66	28.1	23.4	-16.7	28.8	18.3	-36.5
>69	15.6	12.2	-21.8	8.0	4.9	-38.8
>72	8.3	6.2	-25.3	2.5	1.4	-44.0

Leq LEVEL dBA	AREA SQ KM Terrain adj		PERCENTAGE CHANGE	POPULATION 000's (2002 CACI data) Terrain adj		PERCENTAGE CHANGE
	2003 with Concorde movements at 03 levels STANDARD	2003 excluding Concorde movements STANDARD		2003 with Concorde movements at 03 levels STANDARD	2003 excluding Concorde movements STANDARD	
>57	129.3	111.5	-13.8	269.2	224.5	-16.6
>60	72.2	63.8	-11.6	122.6	101.3	-17.4
>63	44.1	38.9	-11.8	63.8	53.4	-16.3
>66	27.5	23.5	-14.5	27.0	19.1	-29.3
>69	15.8	12.4	-21.5	8.4	5.1	-39.3
>72	8.4	6.2	-26.2	2.6	1.5	-42.3

4 HEATHROW TRAFFIC AND NOISE: HISTORICAL TRENDS

4.1 Figure 8 shows how the average mode 57 dBA Leq contours, based on actual modal splits, have changed since 1988 by comparison with the *total annual* aircraft movements.

4.2 The area figures give a better indication of the actual noise than the population figures because the latter are more susceptible to the 'modal split' between easterly and westerly operations[6]. This is particularly noticeable in 1995 which had an atypical modal split of 54% west – 46% east (compared with the 20-year average of 77% west – 23% east for that year). The recorded increase in enclosed population between 1998 and 1999 reflected demographic changes that occurred between the 1991 census and the subsequent update.

[6] Actual modal split data are used in this figure because contours based on standard modal split are a relatively recent innovation and data prior to 1995 are not available.

4.3 The sharp rate of decline in contour area recorded in the late eighties and early nineties has diminished. The area reductions in 2000 and 2001 reflect reduced numbers of Concorde movements in those years (2.5 per day in 2000 and 0.1 per day in 2001). This followed the grounding of Concorde following the crash at Paris, Charles de Gaulle airport in July 2000. Concorde movements in 2002 and 2003 never reached the level of 1999. The dashed line on the figure shows what the 2003 areas and populations would have been had there been no movements by Concorde.

4.4 Against the trend of a general decrease in contour area, the number of aircraft movements has risen steadily each year, the only trough occurring in 1991, the year of the Gulf War. The annual movement figure for 2001 was slightly lower than the preceding year and reflects the disruption to traffic following the events of September 11th. The annual movement figure for 2003 was about 0.6% lower than that for 2002.

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Table 1:

DISTRIBUTION OF HEATHROW AVERAGE DAILY AIRCRAFT MOVEMENTS BY TYPE (0700-2300 LOCAL TIME, 16 JUNE - 15 SEPTEMBER)

AIRCRAFT TYPE(S)	NOISE CLASS	AVERAGE NUMBER 2002	AVERAGE NUMBER 2003	PERCENTAGE OF TOTAL 2003 MOVEMENTS	CHANGE AS PERCENTAGE OF TOTAL 2002 MOVEMENTS
Small Props	1	1.1	0.8	0.1	0.0
Large Props	2	9.6	9.5	0.8	0.0
B737-300,400,500	3	226.5	67.9	5.5	-12.8
B737-600,700	3	7.0	1.7	0.1	-0.4
B737-800,900	3	13.8	14.8	1.2	+0.1
B757E(RB211-535E4, E4B)	3	64.0	58.2	4.7	-0.5
B757C(RB211-535C)	3	9.8	0.6	0.0	-0.7
B757P (Pratt and Whitney)	3	1.2	1.8	0.1	0.0
BAe146	3	27.2	19.1	1.6	-0.7
A319C (CFM-56)	3	9.5	16.6	1.3	+0.6
A319V (IAE-V2500)	3	121.7	163.2	13.2	+3.3
A320C (CFM-56)	3	107.1	122.7	10.0	+1.3
A320V (IAE-V2500)	3	93.1	150.6	12.2	+4.6
A321C (CFM-56)	3	74.5	65.3	5.3	-0.7
A321V (IAE-V2500)	3	44.9	68.1	5.5	+1.9
Business Jet (Ch 3)	3	5.3	7.7	0.6	+0.2
Canadair RJ 100/200	3	5.5	6.0	0.5	0.0
Canadair RJ 700**	3	0.0	0.3	0.0	0.0
ERJ Embraer EMB 135/145	3	1.8	5.7	0.5	+0.3
F100	3	6.8	36.9	3.0	+2.4
MD80	3	43.2	31.1	2.5	-1.0
MD90	3	8.7	11.6	0.9	0.2
B767-200	4	1.9	1.4	0.1	0.0
B767-300G (General Electric)	4	21.8	12.8	1.0	-0.7
B767-300P (Patt and Whitney)	4	16.5	14.4	1.2	-0.2
B767-300R (Rolls Royce)	4	37.0	43.6	3.5	+0.5
B777-200G (General Electric)	4	30.0	27.4	2.2	-0.2
B777-200P (Pratt and Whitney)	4	18.5	18.3	1.5	0.0
B777-200R (Rolls Royce)	4	34.3	41.9	3.4	+0.6
B777-300R (Rolls Royce)	4	3.0	5.3	0.4	+0.2
A300	4	13.2	9.2	0.7	-0.3
A310	4	19.0	9.6	0.8	-0.8
A330	4	15.5	19.5	1.6	+0.3
B747-400G (General Electric)	5	28.0	22.7	1.8	-0.4
B747-400P (Pratt and Whitney)	5	21.6	19.8	1.6	-0.1
B747-400R (Rolls Royce)	5	60.2	65.7	5.3	+0.4
B747SP	5	1.4	1.4	0.1	0.0
A340-200/300	5	22.7	33.2	2.7	+0.8
A340-500/600**	5	0.0	4.4	0.4	+0.4
MD11	5	2.4	3.9	0.3	+0.1
B747-100*	6	0.5	0.2	0.0	0.0
B747-200,-300 (Ch 3)	6	7.1	7.1	0.6	0.0
DC10	6	2.4	2.4	0.2	0.0
Tristar	6	0.7	0.7	0.1	0.0
B737-200 (Ch3)	7	0.2	4.0	0.3	+0.3
Business Jet (Ch 2)	7	0.1	0.1	0.0	0.0
B707, DC8*	8	0.1	0.1	0.0	0.0
B727 (Ch 3)	8	0.4	0.2	0.0	0.0
Concorde	8	2.1	2.1	0.2	0.0
Tu154M*	8	0.3	0.4	0.0	0.0
VC10, IL62*	8	0.0	0.2	0.0	0.0
TOTAL MOVEMENTS		1243.2	1232.2	100.0***	-0.9

* In 2002 and 2003 all Chapter 3 versions.

** New types for 2003

*** May not sum exactly due to rounding

Table 2:

PERCENTAGE OF HEATHROW AVERAGE DAILY AIRCRAFT DEPARTURES BY ROUTE*
(0700-2300 LOCAL TIME, 16 JUNE - 15 SEPTEMBER)

WESTERLY DEPARTURE ROUTE	PERCENTAGE OF TOTAL DEPARTURES 2002	PERCENTAGE OF TOTAL DEPARTURES 2003	CHANGE (% OF TOTAL)
WOB/BPK	34.7	30.5	-4.2
DVR/DET	13.6	11.9	-1.7
MID	15.7	14.8	-0.9
CPT/SAM	14.0	12.8	-1.2
PERCENTAGE WEST	78.0	70.0	-8.0
EASTERLY DEPARTURE ROUTE	PERCENTAGE OF TOTAL DEPARTURES 2002	PERCENTAGE OF TOTAL DEPARTURES 2003	CHANGE (% OF TOTAL)
BUZ/BPK	9.7	12.9	+3.2
DVR/DET	3.6	5.0	+1.4
MID/SAM	5.9	8.0	+2.1
CPT	2.8	4.1	+1.3
PERCENTAGE EAST	22.0	30.0	+8.0

* See Figure 1.

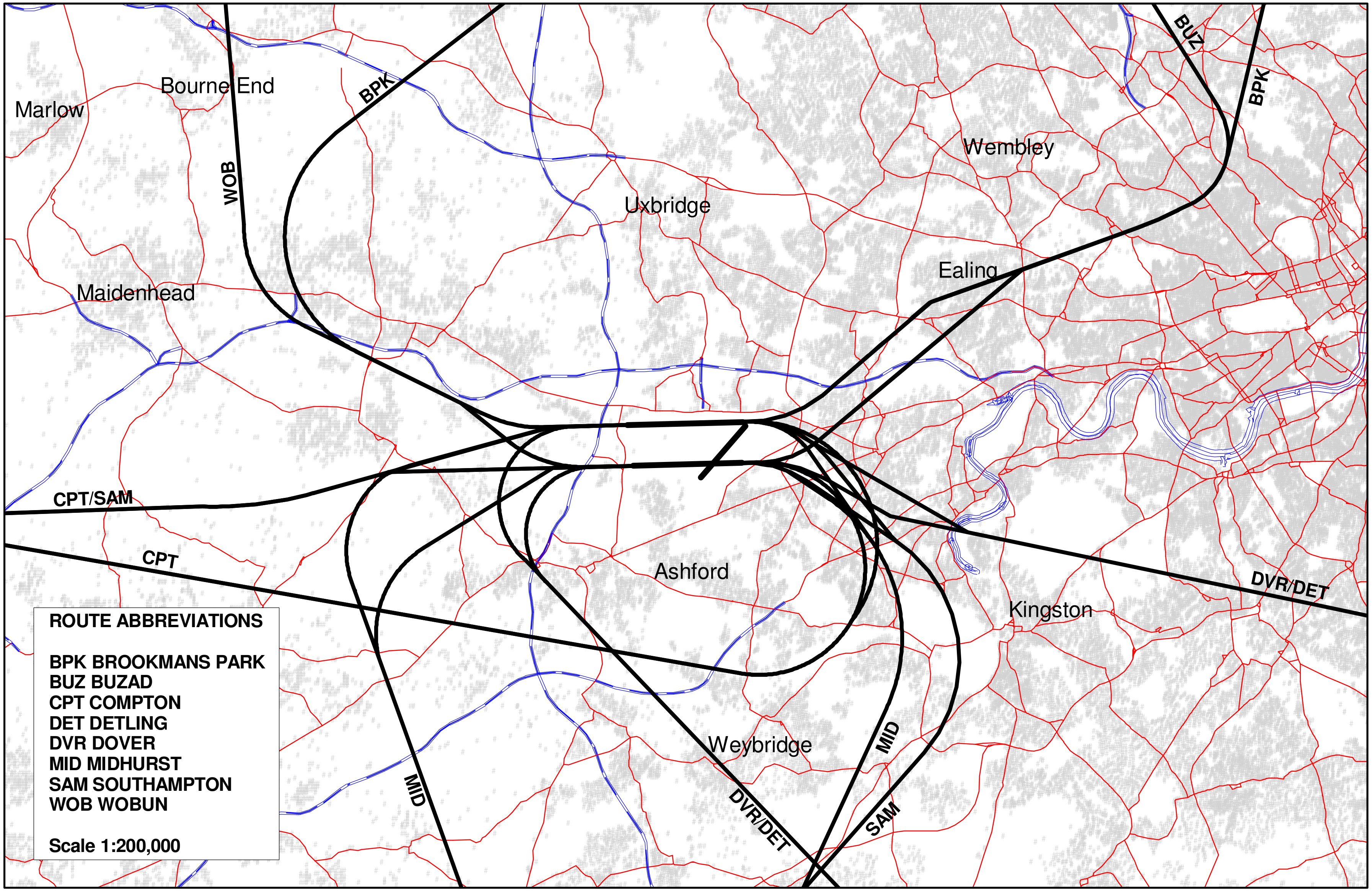
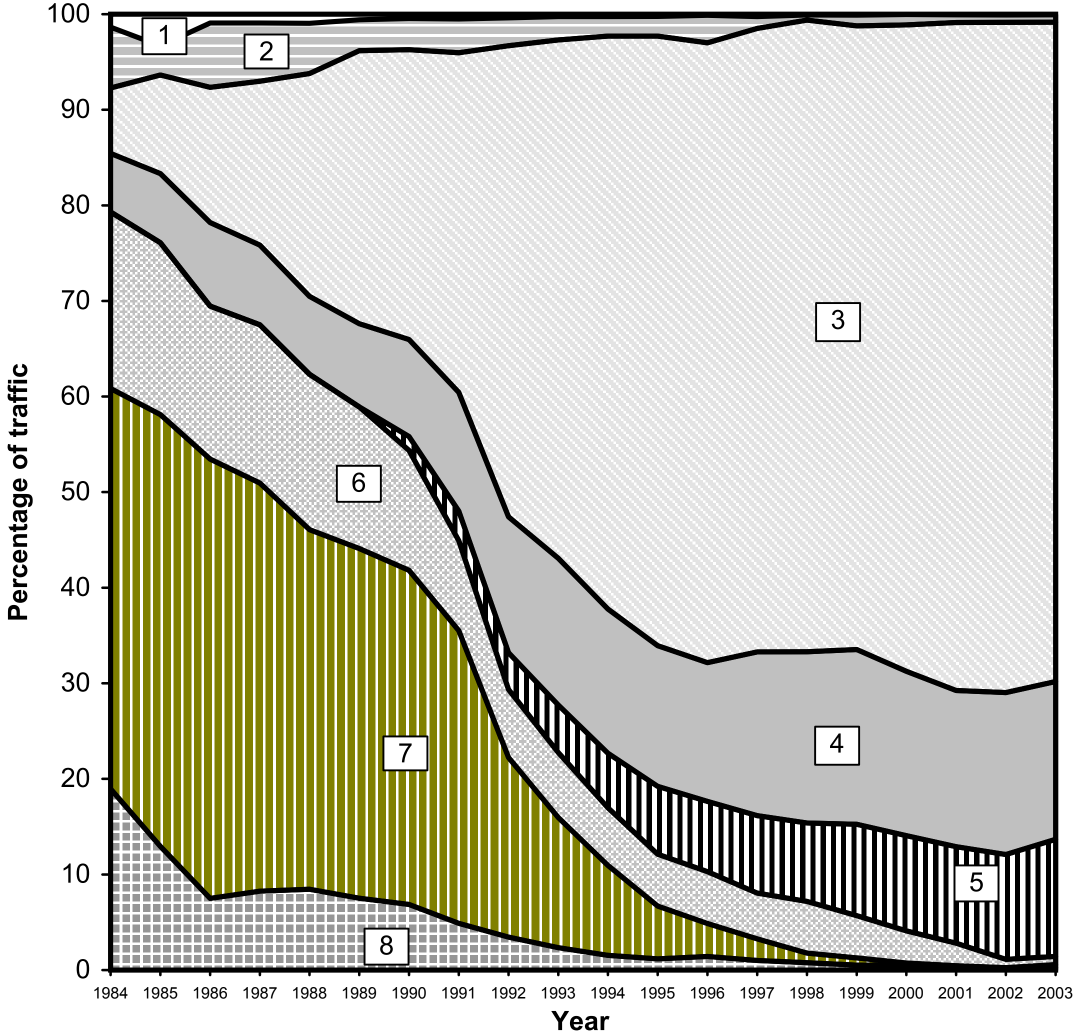


Figure 1: London Heathrow Airport Standard Instrument Departure Routes



Propeller aircraft:

1 Small props: Single and twin pistons and turboprop light, business and commuter aircraft

2 Large props: 2- & 4-propeller transports; eg SF340 BAe-ATP, ATR42, F50, HS748, Saab 2000, Electra, Hercules, Viscount, Vanguard

Chapter 3 jets:

3 Short-haul: eg A320, BAe146, B717, B737-300, B757, F100, MD80, RJ50, re-engined narrow-bodies, some business jets

4 Wide-body twins: A300, A310, A330, B767, B777

5 2nd gen. wide-body multis*: A340, MD11, B747-400

Large Chapter 2/3 jets:

6 1st gen. wide-body multis* (Chapter 2 & 3): 'Classic' 747, Tristar, DC-10, An124, IL76, IL86

2nd generation twin jets:

7 Narrow body twins (including hushkitted versions): eg F28,, BAC 1-11, DC-9, B737-200 other business jets

1st generation jets & Concorde: (including hushkitted versions)

8 eg Trident, 707, DC-8, B727, IL62, Tu154

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* Multi = 3- or 4- engined aircraft

Figure 2: Noise Class of Heathrow aircraft 1984 - 2003

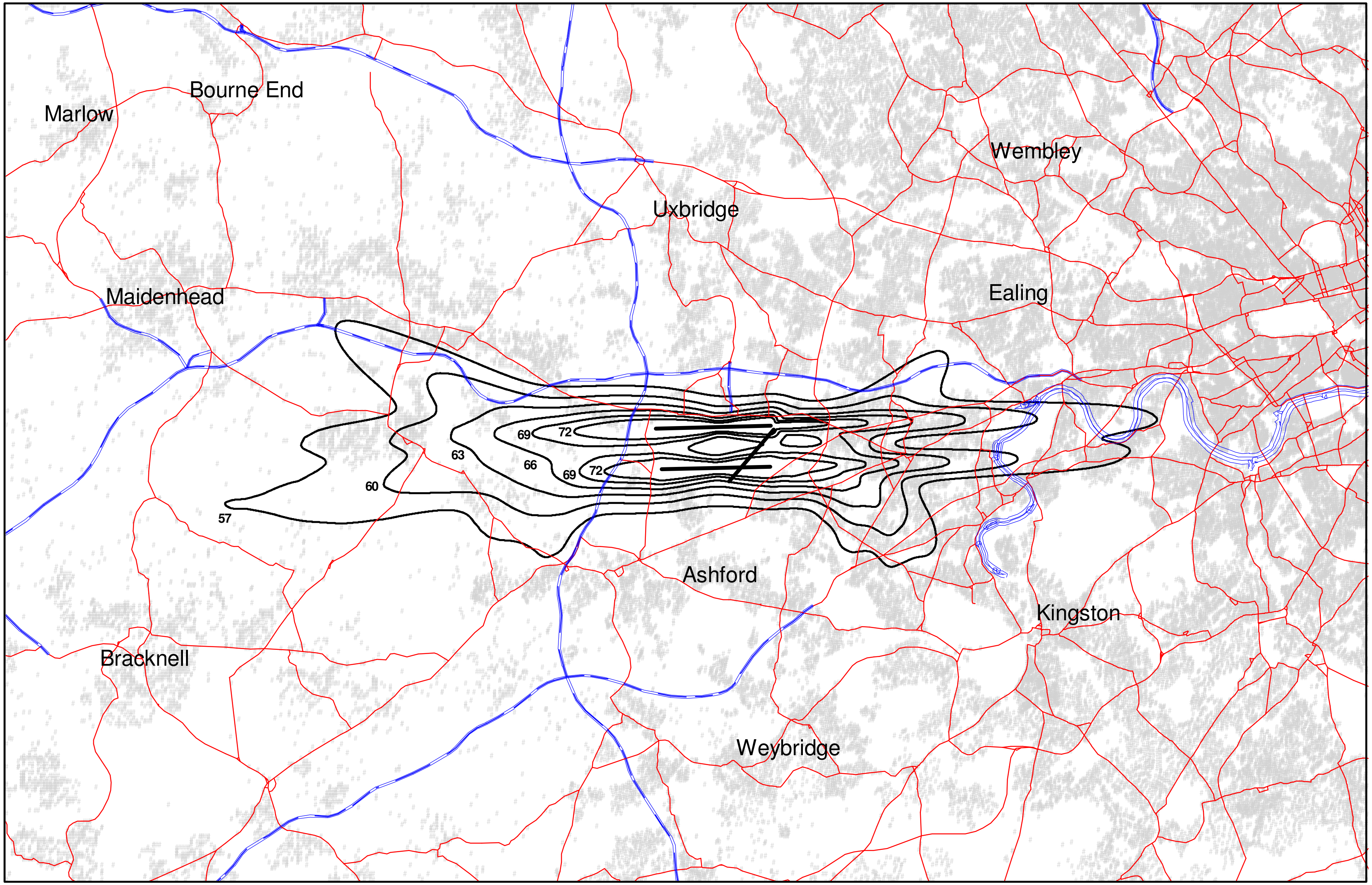

Figure 3: Heathrow actual 2003 average mode (70% west - 30% east) terrain adjusted 16hr Leq on population map

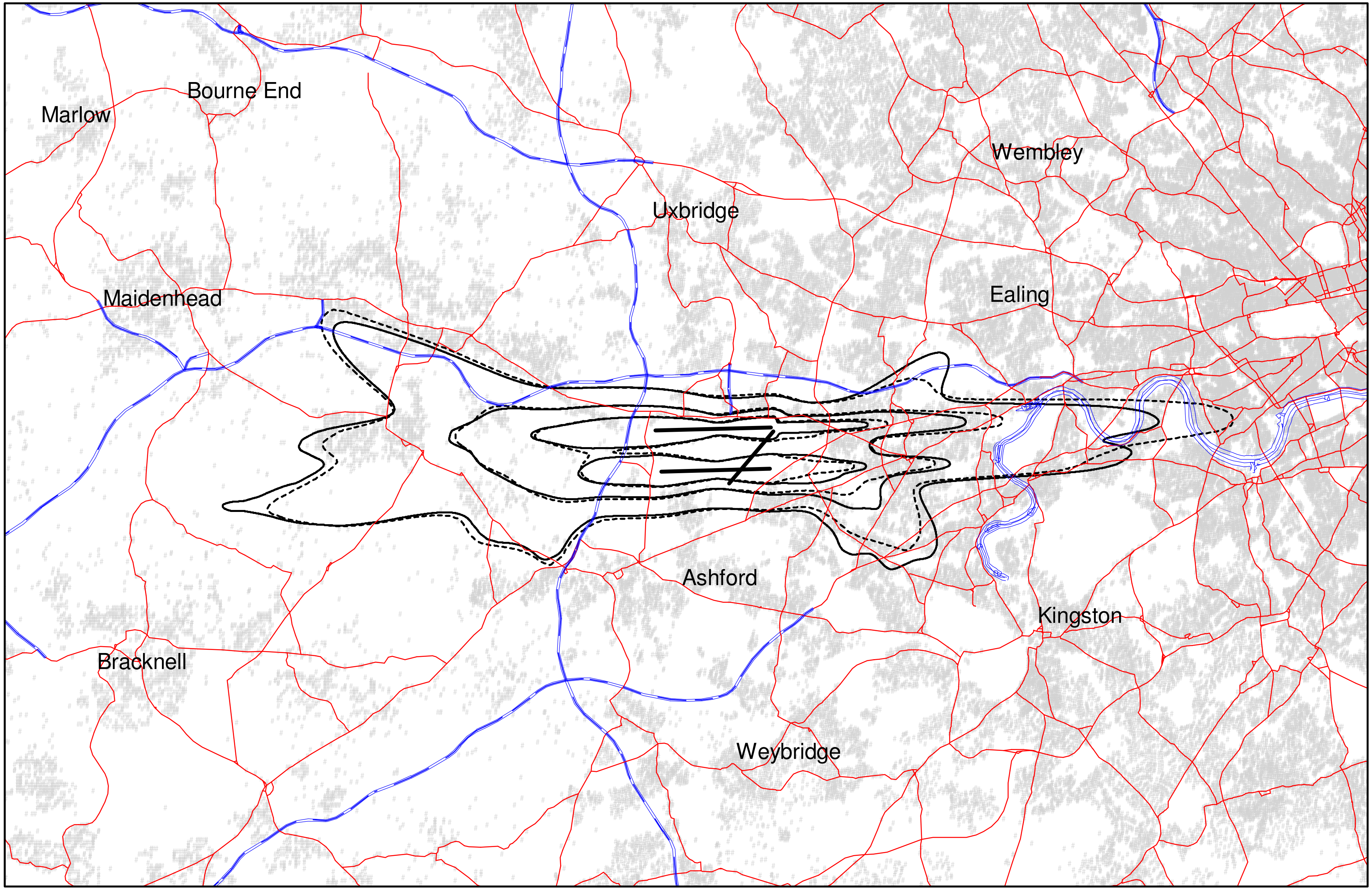

Figure 4: Heathrow actual 57, 63 and 69 Leq contours - 2002 dotted (78% west-22% east) - 2003 solid (70% west-30% east) (2003 contours include terrain adjustment)

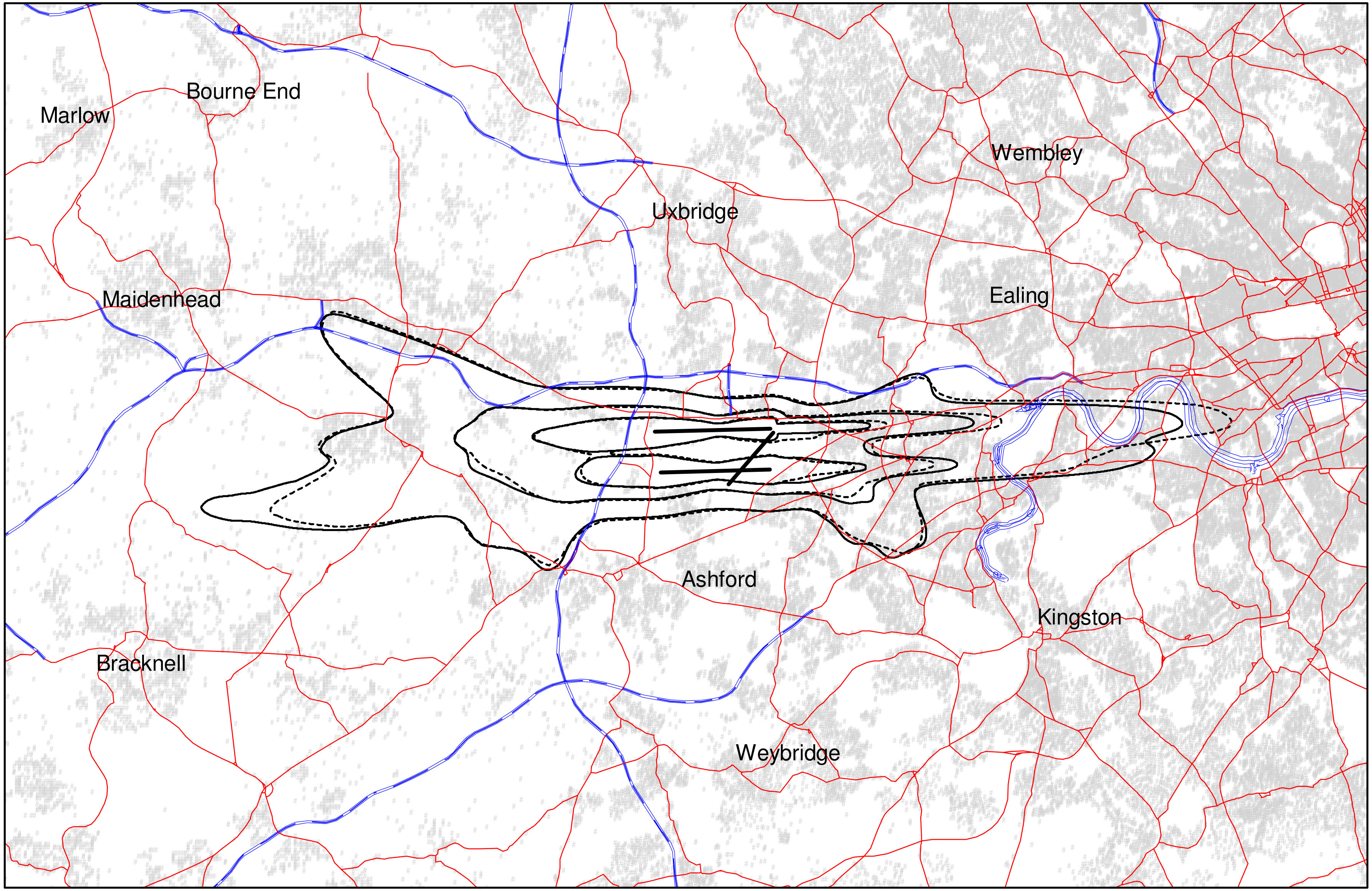

Figure 5: Heathrow standard 57, 63 and 69 Leq contours - 2002 dotted (77% west-23% east) - 2003 solid (77% west-23% east) (2003 contours include terrain adjustment)

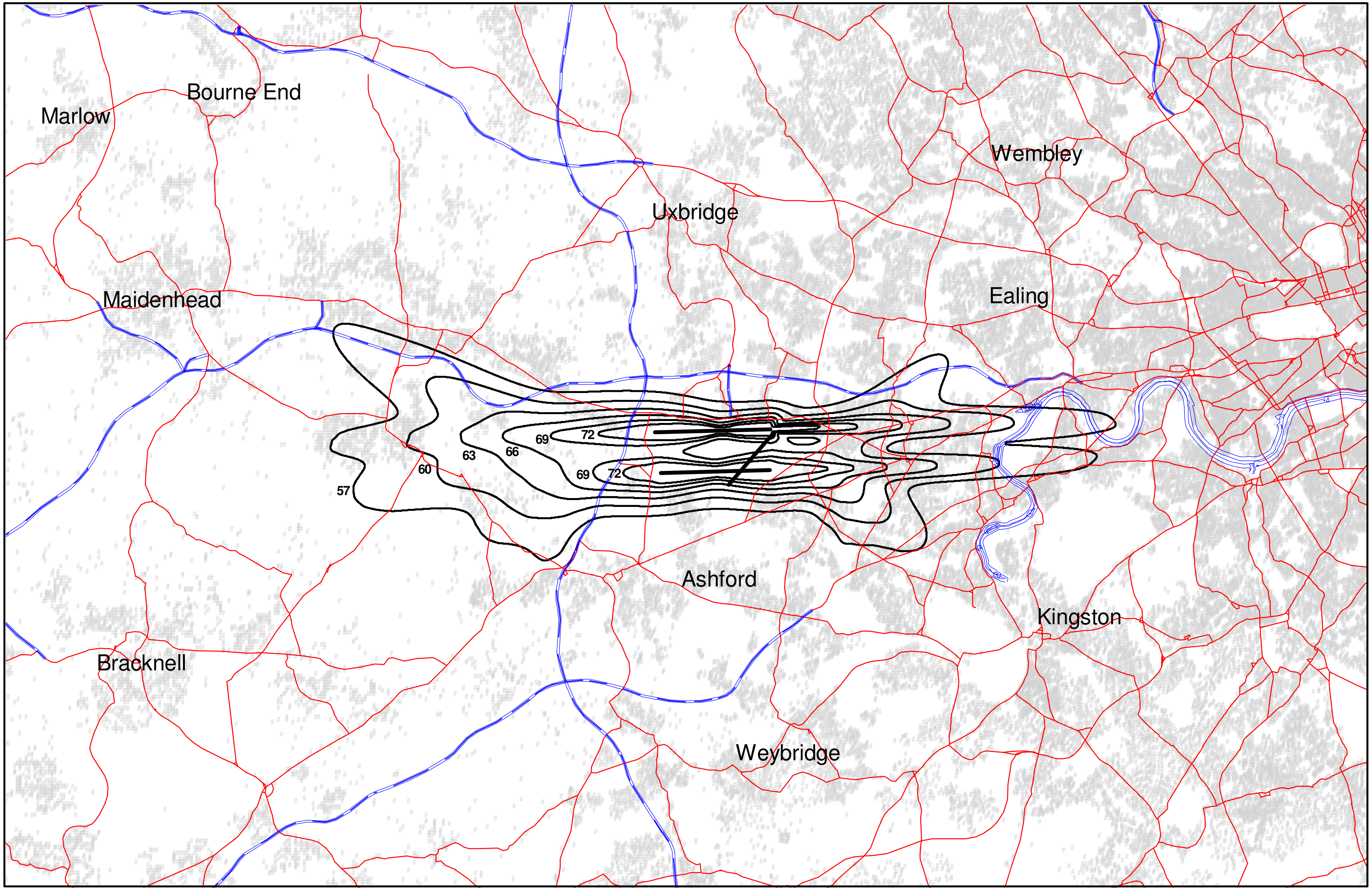

Figure 6: Heathrow 2003 average mode excluding Concorde movements (actual modal split 70% west - 30% east) terrain adjusted 16hr Leq on population map

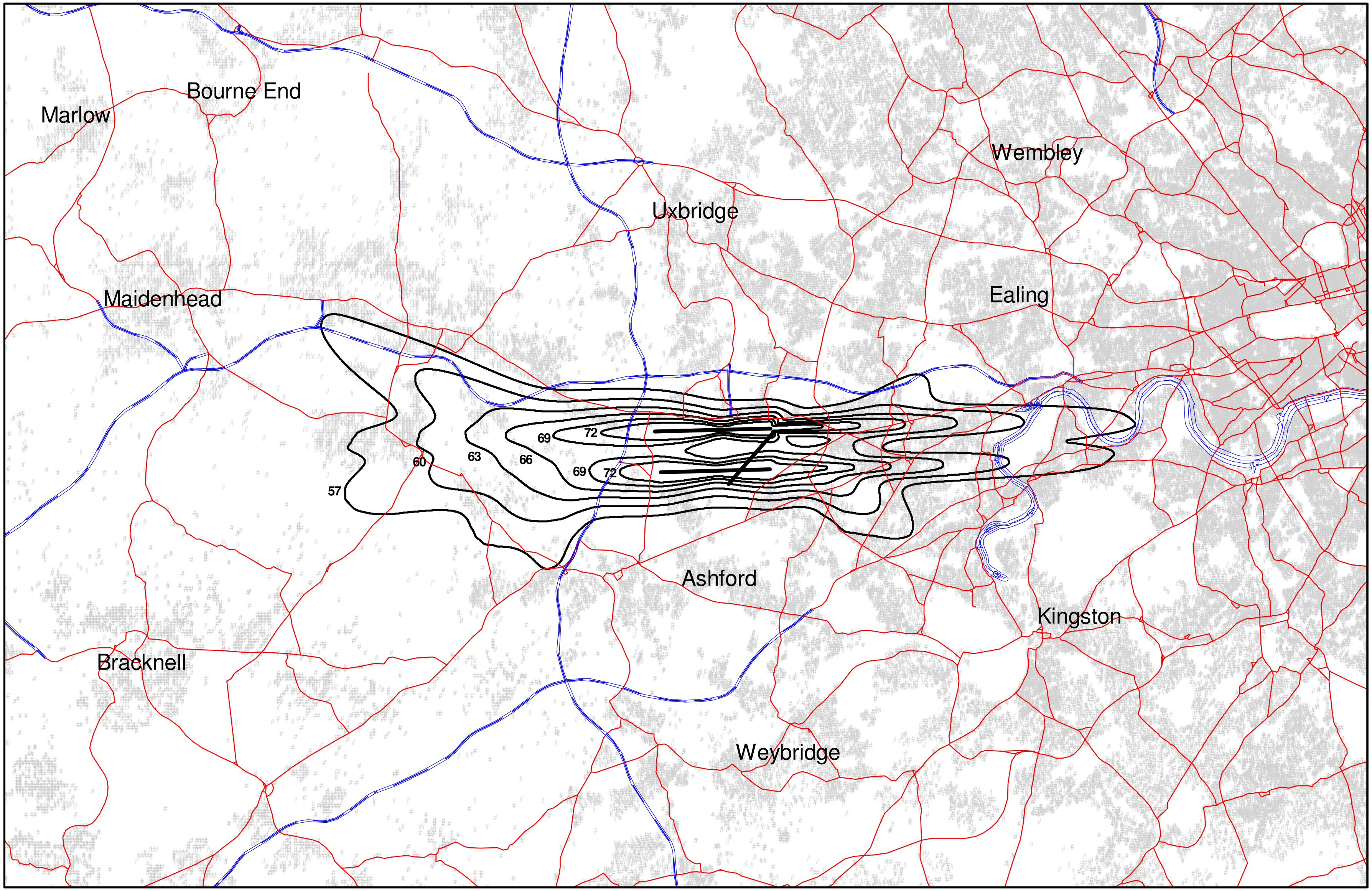

Figure 7: Heathrow 2003 average mode excluding Concorde movements (standard modal split 77% west - 23% east) terrain adjusted 16hr Leq on population map

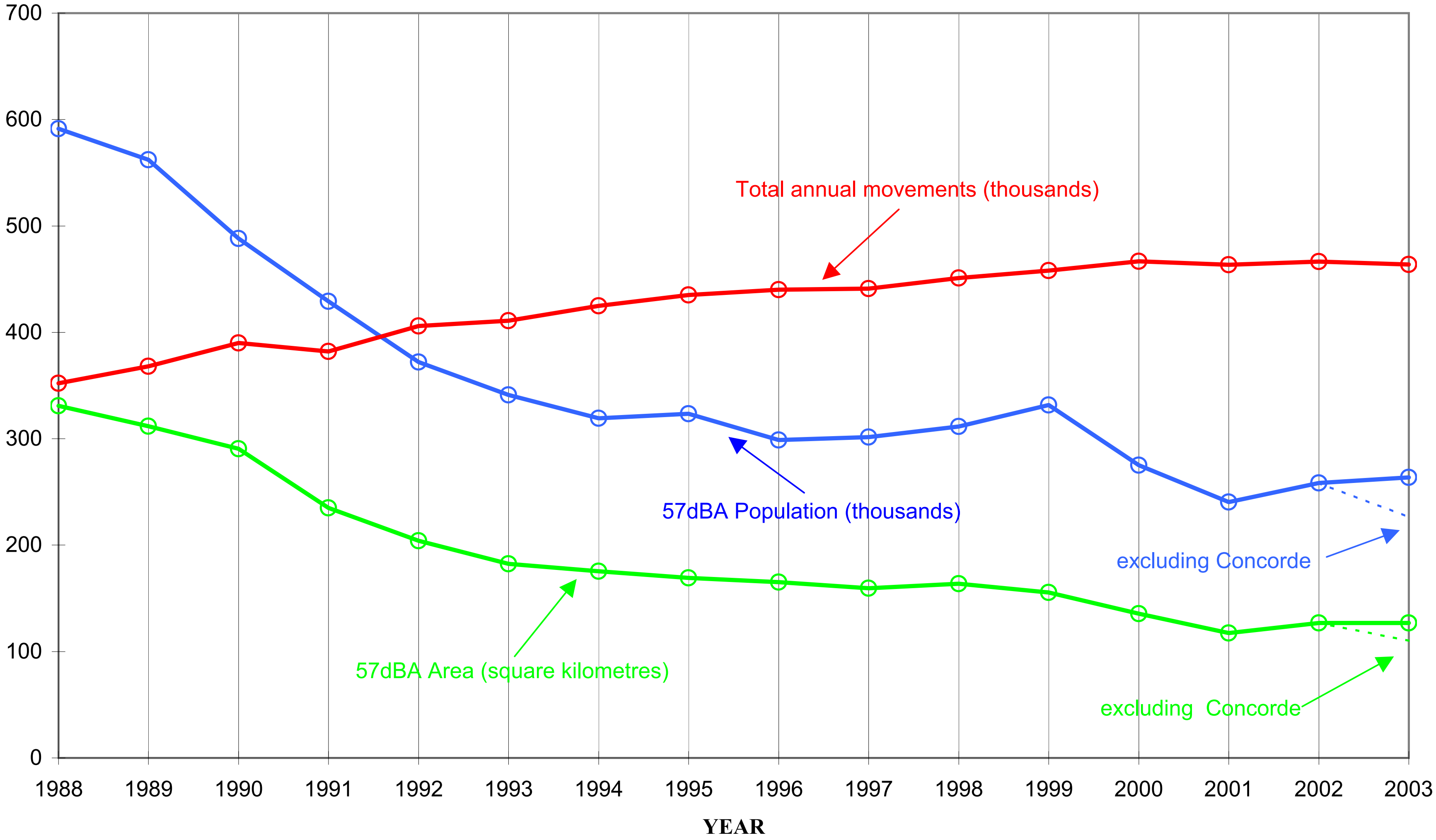

Figure 8: Heathrow traffic and noise 1988 - 2003