Environmental Research and Consultancy Department
Civil Aviation Authority

ERCD REPORT 1404

Noise Action Plan Contours for Heathrow Airport 2013

J Lee
L Edmonds

Prepared by the Civil Aviation Authority on behalf of Heathrow Airport Ltd, January 2015

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Summary

This report presents the year 2013 noise exposure contours which are required for Heathrow's Noise Action Plan and compares them to the contours for year 2012. The following noise metrics are assessed: L_{den}, L_{day}, $L_{evening}$, L_{night} and $L_{eq,6.5hr\ night}$. Trends from 2006 to 2013 are also examined.

January 2015

The authors of this report are employed by the Civil Aviation Authority. The work reported herein was carried out on behalf of Heathrow Airport Ltd.

Population data used in this report are based on 2011 Census data (updated for 2013) supplied by CACI Information Services.

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Glossary

ANCON	The UK civil aircraft noise contour model, developed and maintained by ERCD.
CAA	Civil Aviation Authority – the UK's independent specialist aviation regulator.
dB	Decibel units describing sound level or changes of sound level.
dBA	Units of sound level on the A-weighted scale, which incorporates a frequency weighting approximating the characteristics of human hearing.
DfT	Department for Transport (UK Government).
END	Environmental Noise Directive.
ERCD	Environmental Research and Consultancy Department of the CAA.
ICAO	International Civil Aviation Organization.
L_{day}	Equivalent sound level of aircraft noise in dBA for the average 12-hour annual day period (0700-1900 local time).
L_{den}	Equivalent sound level of aircraft noise in dBA for the average 24-hour annual period with 5 dB weightings for $L_{evening}$ and 10 dB weightings for L_{night}.
Leq	Equivalent sound level of aircraft noise in dBA, often called 'equivalent continuous sound level'.
$L_{eq,6.5hr\ night}$	Equivalent sound level of aircraft noise in dBA for the average 6.5-hour night quota period (2330-0600 local time).
$L_{evening}$	Equivalent sound level of aircraft noise in dBA for the average 4-hour annual evening period (1900-2300 local time).
L_{night}	Equivalent sound level of aircraft noise in dBA for the average 8-hour annual night period (2300-0700 local time).
NTK	Noise and Track Keeping monitoring system. The NTK system associates radar data from air traffic control radar with related data from both fixed (permanent) and mobile noise monitors at prescribed positions on the ground.
SID	Standard Instrument Departure.

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Executive Summary

This report presents year 2013 L_{den}, L_{day}, $L_{evening}$, L_{night} and $L_{eq,6.5hr\ night}$ noise contours for Heathrow Airport, and compares them with the contours for the previous year. Long-term trends from year 2006 to 2013 are also examined. This study was commissioned by Heathrow Airport Limited as part of their Noise Action Plan commitments.

Aircraft movements over the 2013 L_{den} period decreased slightly (by 0.4%) compared to 2012. The largest increase over the average 24-hour period was for the Airbus A320 with CFM engines (+16.5 movements). There were also noteworthy increases for the Boeing 777-300ER with General Electric engines (+14.0) and Airbus A330 (+8.8), while two of the newer types, the Airbus A380 (+8.5) and Boeing 787 (+5.1), also showed increases in 2013. The largest decrease in movements was for the Embraer ERJ (-19.9), followed by the Airbus A340-600 (-12.6). There were reductions in movements by two of the older aircraft types, the Boeing 737-300/400/500 series (-6.7) and Boeing 747-400 with Pratt & Whitney engines (-4.6).

The results show that L_{den} and L_{day} contour areas in year 2013 were broadly similar to 2012. However, significant reductions in contour areas were observed for $L_{evening,}$ which may be attributed to the reduction in movements over the evening period and in particular, to a 20% decrease in movements by the noise dominant B747-400 aircraft family. For L_{night}, notable contour area increases were seen which resulted from the 3% rise in annual night movements. The year 2013 $L_{eq,6.5hr\ night}$ 48 dBA contour area decreased slightly (despite a slight increase in movements) to 41.0 km^2, well within the 55 km^2 contour area objective set by the current night flying restrictions regime. The majority of movement increases over the 6.5-hour night were early morning arrivals from the Far East of the Airbus A380 and Boeing 777-200/300, in the hour 0500-0600.

The 2013 L_{den}, L_{day}, $L_{evening}$ and L_{night} contours showed population changes that were in general, disproportionately higher than the area changes described above. This was a result of the major update to the population database, which for year 2013 was based on the latest 2011 Census, in contrast to the 2012 population database that was derived from the earlier 2001 Census. Within the extent of the year 2013 55 dBA L_{den} contour, the population count was 5% higher with the 2013 database compared to 2012. This effect was even more pronounced at the higher contour levels, e.g. +9% within 60 dBA and +14% within 65 dBA, pointing to significant population encroachment in the vicinity of Heathrow. Similar patterns of population change were observed for the other noise metrics.

In terms of trends for the *outermost contour band* for each of the noise metrics, the L_{den} areas have been reasonably steady since 2009. Population and households have remained at levels slightly lower than the peak seen in 2011. Similar trends are observed for $L_{day.}$ For $L_{evening}$, however, the area has declined for the second successive year since 2011, with populations and households staying below the 2011 peak. L_{night} areas have remained at a similar level since 2011, but the population count increased markedly in 2013 due to the population database update. The $L_{eq,6.5hr\ night}$ contour area has been fairly stable over the past three years, staying at a level slightly below that of 2010; however, the fall in population and households seen in 2011 and 2012 reversed in 2013, following

an extension of the contour over parts of west London and also the major population database update.

Since 2006 there has been a 34% reduction in movements by the noise dominant B747-400 aircraft family. Newer aircraft types such as the Airbus A380 and Boeing 787 were not in service in 2006, but by 2013 the A380 had on average 25 movements per 24-hour day, and the 787 had 5 daily movements.

The 2013 *cumulative* areas were below 2006 levels for all the noise metrics; for example the 55 dBA L_{den} contour area of 219.3 km^2 in 2013 was 10% smaller than the 2006 figure of 244.7 km^2. However, in some cases, population counts were actually slightly higher in 2013 - this was due to significant population increases between 2006 and 2013 in the area around Heathrow.

An analysis of L_{den} noise changes between 2006 and 2013 (assuming the 2006 L_{den} base modal split in both years) revealed that most areas within the 2013 L_{den} 55 dBA contour experienced noise reductions of up to 2 dB. There were some areas that were exposed to increased noise levels of less than 1 dB. A small area over Egham experienced a change of more than 1 dB as a result of the mean tracks for the westerly DVR SIDs being positioned further to the west in 2013 compared to 2006.

An analysis of L_{night} noise changes between 2006 and 2013 (assuming the 2006 L_{night} base modal split in both years) revealed some significant noise increases in the vicinity of the northern runway. These resulted from a much higher usage of the northern runway in 2013 for night-time departures (the southern runway underwent a resurfacing programme in 2013). Areas in line with the southern runway showed noise decreases as fewer aircraft operated from this runway in 2013. When the effects of changes in north-south runway usage are also removed, most areas are seen to experience reductions in L_{night} noise levels between 2006 and 2013.

1 Introduction

1.1 This report presents the year 2013 noise exposure contours that have been generated by the Environmental Research and Consultancy Department (ERCD) of the Civil Aviation Authority (CAA) for the Heathrow Airport Ltd (HAL) Noise Action Plan. Contours have been produced for the following noise metrics: L_{den}, L_{day}, $L_{evening}$, L_{night} and $L_{eq,6.5hr\ night}$.

1.2 The L_{den}, L_{day}, $L_{evening}$ and L_{night} contours are based on annual movement data for the 2013 calendar year, whilst the $L_{eq,6.5hr\ night}$ contour is based on data from the night quota 2013 summer and 2013-14 winter seasons combined (i.e. the period 31 March 2013 – 30 March 2014).

1.3 The year 2013 contours are compared with those for year 2012 (**Ref 1**) to assess the changes in area, population and households enclosed. The contour trends from 2006 to 2013 are also examined.

2 Noise modelling methodology

ANCON

2.1 The noise contours were calculated with the UK civil aircraft noise model ANCON (version 2.3), which is developed and maintained by ERCD on behalf of the DfT. A technical description of the ANCON model can be found in R&D Report 9842 (**Ref 2**).

Flight tracks and profiles

2.2 The contours were modelled with mean departure and arrival ground tracks generated for the 2013 summer period. Average flight profiles of height, speed and thrust were also based on the latest available data at the time of assessment, which were for the 2012 summer period.

Traffic data

2.3 The contours were calculated using movement data extracted from the Heathrow Noise and Track Keeping (NTK) system, which stores radar data supplemented by daily flight plans. Breakdowns of the aircraft movements by ANCON type for the *average* 24-hour day, 12-hour day (0700-1900 local time), 4-hour evening (1900-2300 local time), 8-hour night (2300-0700 local time) and 6.5-hour night (2330-0600 local time) periods are summarised in **Tables A1-A5** of **Appendix A**. Detailed descriptions of the ANCON aircraft types are provided in **Table B1** of **Appendix B**.

Total movements 2006-2013

2.4 The annual average daily (24-hour) movements for the base year 2006 (**Ref 3**) and years 2009-2013 are summarised in **Table 2.1**. It can be seen that total movements fell in both 2009 and 2010 relative to 2006, but rose substantially in 2011 (by 6%) to a level 1% above the 2006 total, before falling back slightly in 2012 and 2013.

Table 2.1 Heathrow annual average 24-hour movements: 2006 & 2009-2013

Year	Total movements	% change relative to 2006
2006	1307.6	(n/a)
2009	1277.2	-2%
2010	1245.8	-5%
2011	1317.1	+1%
2012	1297.9	-1%
2013	1293.1	-1%

Aircraft Noise Classes 2006-2013

2.5 The 2013 traffic can be considered in terms of 'Noise Class' categories, which are ranked in ascending order of noise emission (i.e. from the quietest to the noisiest), as summarised in **Table 2.2** below for the annual average 24-hour period (along with year 2006 percentages for comparison):

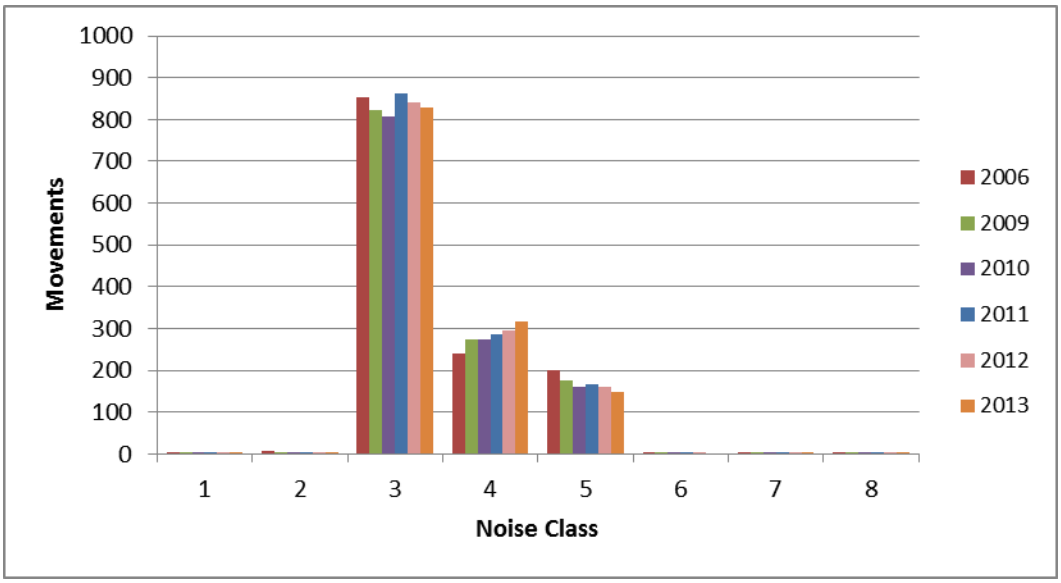
Table 2.2 Heathrow annual average 24-hour movements by Noise Class for year 2013

Noise Class	Description	Total	2013 Percentage	2006 Percentage
1	Small propeller	0.2	0%	(0%)
2	Large propeller	0.1	0%	(1%)
3	Short-haul jet *(e.g. A319, A320, A321)*	827.8	64%	(65%)
4	Wide-body twin *(e.g. B777-200, B787, A330)*	316.9	25%	(18%)
5	2nd generation wide-body 3,4 engine *(e.g. B747-400, A380)*	148.1	11%	(15%)
6	1st generation wide-body 3,4 engine *(e.g. B747-100)*	0.0	0%	(0%)
7	2nd generation narrow-body twin *(e.g. B737-200)*	0.0	0%	(0%)
8	1st generation narrow-body 3,4 engine *(e.g. B727)*	0.0	0%	(0%)
	Total	**1293.1**	100%	

2.6 The proportion of short-haul jet aircraft (Noise Class 3) has stayed almost the same between 2006 and 2013, but there has been a noticeable reduction in the proportion of older wide-body 3- or 4-engine types (Noise Class 5) and a significant rise in wide-body twin engine aircraft (Noise Class 4).

2.7 The chart in **Figure 2.1** illustrates the breakdown of total movements by Noise Class, for the years 2006 and 2009-2013. It can be seen that virtually all movements fall within Noise Classes 3, 4 and 5.

Figure 2.1 Heathrow annual average 24-hour movements by Noise Class for years 2006 and 2009-2013



2.8 Around two-thirds of movements are within Noise Class 3, i.e. short-haul aircraft such as the Airbus A319/A320/A321 family. Numbers within Noise Class 3 dropped from 2006 to 2010, but increased in 2011 to a level slightly higher than in 2006, before dropping back to near 2009 levels in 2013. The ANCON type EA320C[1] had the highest increase in 2013 per 24-hour day (+16.5 movements); this was offset by decreases in ERJ[2] (-19.9) and B733[3] (-6.7) movements (also see **Table A1**).

2.9 The next largest grouping is Noise Class 4: modern wide-body twin-engine aircraft (e.g. Boeing 777-200/300, Boeing 787-8), which accounted for a quarter of total movements in 2013. These have risen in frequency between 2009 and 2013. The largest increase in 2013 was for the B773G[4] (+14.0 movements). The number of

[1] Airbus A320 with CFM-56 engines

[2] Embraer 135/145

[3] Boeing 737-300/400/500 series

[4] Boeing 777-200LR/300ER with General Electric engines

EA33[5] movements also rose, by 8.8 per 24-hour day. Boeing 787 movements increased significantly compared to 2012 (+5.1).

2.10 The Noise Class 5 grouping: 2nd generation wide-body 3- and 4-engine aircraft (e.g. B747-400, A380), decreased in both 2009 and 2010, and since the small rise seen in 2011, have reduced steadily. The largest reduction in 2013 was for the EA346[6] (-12.6) ANCON type. Movements of one of the noisiest types, the B744P[7], dropped by 4.6 movements. There was, however, a notable increase for A380 aircraft (+8.5). Approximately 11% of total movements were within Noise Class 5 in 2013.

Fleet mix by ICAO noise chapter

2.11 An analysis of the certification noise levels of the aircraft operating at Heathrow in the year 2013 annual period indicated that approximately 97% of the fleet were compliant with the ICAO 'Chapter 4' noise standard, the remainder meeting the 'Chapter 3' noise standard.

2.12 Back in year 2006, the estimated percentage of 'Chapter 4'-compliant aircraft was 94%, and by 2009 this had reached 95%. The figure was slightly higher in 2010 and 2011 (96% in both years), and in 2012 and 2013 the compliance level was at 97%.

Runway modal splits

2.13 The contours were modelled with the actual runway modal splits, which are summarised in **Table 2.3** along with the modal splits for the previous year. In 2013, there were 7% more easterly movements over the average 24-hour (L_{den}) period compared to 2012.

Table 2.3 Heathrow average runway modal splits for 2012 and 2013

Modal split scenario	2012 (% west / % east)	2013 (% west / % east)
L_{den}	74 / 26	67 / 33
L_{day}	74 / 26	67 / 33
$L_{evening}$	76 / 24	64 / 36
L_{night}	75 / 25	69 / 31
$L_{eq,6.5hr\ night}$	68 / 32	76 / 24

[5] Airbus A330

[6] Airbus A340-500/600

[7] Boeing 747-400 series with Pratt and Whitney engines

Population database

2.14 Estimates were made of the numbers of people and households enclosed within the noise contours. The population data used in this report for the 2013 contours are a 2013 update of the latest 2011 Census supplied by CACI Limited[8]. This represents a major change compared to the 2012 contours, which employed a 2012 population update of the 2001 Census.

2.15 The CACI population database contains data referenced at the postcode level. Population and household numbers associated with each postcode are assigned to a single co-ordinate located at the postcode's centroid.

[8] www.caci.co.uk

3 Noise contour comparisons

3.1 The following Noise Action Plan contours for year 2013 are displayed in **Figures 3.1-3.5** (shown in black), overlaid onto the contours for 2012 (shown in red):

- L_{den}, from 55 to 75 dBA in 5 dB steps;
- L_{day}, from 55 to 75 dBA in 5 dB steps;
- $L_{evening}$, from 55 to 75 dBA in 5 dB steps;
- L_{night}, from 50 to 70 dBA in 5 dB steps; and
- $L_{eq,6.5hr\ night}$, 48 dBA.

3.2 The estimated areas, populations and households within the contours are summarised in **Tables 3.1-3.5**, along with the results for the previous year. As already noted, the 2013 population and household figures are based on a 2013 update of the 2011 Census supplied by CACI Ltd, whilst the 2012 figures are based on a 2012 update of the 2001 Census (also provided by CACI Ltd).

3.3 The statistics for L_{den}, L_{day}, $L_{evening}$ and L_{night} are presented in 5 dB contour *bands* (e.g. 55-60 dBA) in line with the requirements of the Environmental Noise Directive, and are not cumulative as is the case for the average summer day Leq contours published by the DfT.

3.4 However, for reference purposes, the 2012 and 2013 results are also provided in *cumulative* format in **Appendix C**. In addition, a comparison between the 2006 base year and 2013 *cumulative* results is provided in **Appendix D**. All the population and household figures in these two appendices are based on CACI data.

3.5 It should be noted that percentage changes in contour area are not necessarily accompanied by similar changes in enclosed population and households because populations are unevenly distributed around the airport. Thus the population counts can be highly sensitive to changes in contour shape.

3.6 Changes in population counts from year to year are also influenced by the effects of the annual update to the population database. The 2013 CACI database, which is based on the latest 2011 Census, indicated population growth in the order of 5% (from 2012) within the region bounded by the 2013 55 dBA L_{den} contour. At the higher contour levels, the population change resulting from the database update was even greater; for example, the change was +9% within the 60 dBA L_{den} contour and +14% for 65 dBA L_{den}. This implies that significant population encroachment has taken place in the vicinity of Heathrow.

3.7 It is also observed that within the 2013 55 dBA L_{den} contour, the ratio between populations and households is higher for the 2013 population database (2.44) than for the 2012 database (2.32). The 2013 population-to-households ratio is even greater for the higher contour levels, e.g. the ratio is 2.93 within the 2013 65 dBA L_{den} contour, compared to 2.55 for the 2012 population database.

3.8 A higher proportion of easterly movements at Heathrow tends to cause a decrease in contour area over periods when departures from Runway 09L are restricted (predominantly the day and evening in 2013). This effect results from the interaction between the noise generated from the two separate runways along with easterly operations in accordance with the 'Cranford Agreement', when the majority of departures operate from Runway 09R and landings are on Runway 09L. The effect on the contour area was less noticeable for the night period in 2013 because there was a more even usage of the two runways during easterly mode operations.

L_{den}

3.9 Overall aircraft movements decreased by 0.4% in 2013 compared to 2012. Reductions in average 24-hour movements of the B747-400 (-5.1), B777-200 (-9.3) and A340 (-14.5) aircraft were offset by increases in A380 (+8.5), A330 (+8.8) and B777-300 (+12.9) movements (see **Table A1**).

3.10 For L_{den}, the area of the outermost contour band for 2013 has increased by 2% from 2012 (**Table 3.1**), whilst areas for the higher contour bands show relatively small increases and decreases of up to 4%. The L_{day} contours also show minor area changes in 2013, and the increases in noise exposure over the night period described later, when weighted by 10 dB as part of the L_{den} calculation, offset the noise reductions in the $L_{evening}$ period.

3.11 Population counts increased by 1% for the outer contour band, but substantial population increases were observed for the higher contour bands (especially within the 65-70 dB band where the population increased by 27%), which can be attributed to the major changes to the 2013 population database described earlier. The large population increases are not generally reflected in the household figures because of the much higher population-to-households ratios found in the 2013 database.

3.12 The effects of the 7% higher proportion of easterly movements in 2013 can be seen on the contours (see **Figure 3.1**): the arrival contour lobe to the east of the airport retracted, along with the departure lobes turning to the north and south from Runways 27L/27R. Conversely, the western tip of the contour associated with arrivals to Runway 09L extended, along with the contour lobes from Runway 09R departures heading to the north and south.

L_{day}

3.13 Total movements in the 2012 L_{day} period fell slightly, by 0.3% (see **Table A2**).

3.14 The outermost 55-60 dBA band area for L_{day} was unchanged, and there were small increases and decreases for the higher bands of 1-2% (**Table 3.2**). Population counts, however, showed large increases at the higher contour bands, which can be attributed to the changes in the 2013 population database already described. The large population increases were not generally reflected in the household figures because of the much higher population-to-households ratios found in the 2013 database.

3.15 Like the L_{den} contours, the 55 dBA contour lobes due to departing aircraft from Runway 09R and turning to the north and south were significantly larger (**Figure 3.2**), because of the 7% higher proportion of easterly movements in 2013. There was an extension to the 55 dBA contour to the west of Windsor, associated with higher numbers of easterly arrivals to Runway 09L.

$L_{evening}$

3.16 Traffic during the $L_{evening}$ period fell by 1.5% (see **Table A3**), with the largest reductions being for the ERJ (-4.0), EA320V (-2.8), EA346 (-2.3) and B772G (-2.1). These reductions were offset by increases in aircraft types such as the EA321V (+4.3), EA320C (+3.8) and B773G (+3.1).

3.17 The areas of all the $L_{evening}$ contour bands decreased by up to 8% in 2013 (see **Table 3.3**). This can be attributed partly to the 1.5% reduction in traffic, but especially to a 20% reduction in movements by the noise dominant Boeing 747-400 aircraft family, which were replaced by quieter aircraft such as the Boeing 777-300ER series and Airbus A380.

3.18 Despite the general reductions in contour area, the higher contour bands showed significant increases in population counts, which may be attributed to the major update to the 2013 population database described earlier. As for L_{day}, the large population increases were not generally reflected in the household figures because of the much higher population-to-households ratios found in the 2013 database.

3.19 There was a 12% higher proportion of easterly movements in the 2013 $L_{evening}$ period, and this caused the easterly departure lobes that turn to the north and south to expand (see **Figure 3.3**), along with an elongation of the Runway 09L arrivals contour tip to the west of the airport, over Windsor. Conversely, the contour lobes from Runway 27L/27R departures that turn to the north and south, retracted significantly, as did the westerly arrival contour lobe over London.

L_{night}

3.20 For L_{night}, the area of the outermost contour band was unchanged, but the higher contour band areas increased significantly (**Table 3.4**). The area increases can be attributed to the 3% rise in overall L_{night} movements (see **Table A4**), two-thirds of which were departure increases, for example, the B763R was up by 1.2 due to

take-offs in the hour 2300-0000. The highest increase in arrivals was for the B773G (+1.8), largely due to early morning landings in the period 0500-0600.

3.21 There were noticeable extensions to the contour tips associated with arrivals to Runway 09L, to the west of the airport (see **Figure 3.4**); these resulted from the 6% higher percentage of easterly movements in 2013 over the L_{night} period. It should be noted that these changes in modal split did not have a major effect on the L_{night} contour area, as when in easterly mode at night around one third of departures operated from Runway 09L (and one third of arrivals on Runway 09R). This contrasted with the day and evening periods when the vast majority of easterly mode departures operated from Runway 09R and arrivals used Runway 09L.

3.22 Population counts increased markedly at some of the higher contour bands as a result of the 2013 population database update described earlier. For example, within the band 55-60 dBA, the population count was 24% higher.

$L_{eq,6.5hr\ night}$

3.23 The area of the 2013 48 dBA $L_{eq,6.5hr\ night}$ contour was 4% smaller in 2013 (see **Table 3.5**) despite the 2% increase in average movements per 6.5-hour night (note: the airport remained within the permitted night noise quota and movement limits). This was mainly the result of a 7% reduction in movements for the noise dominant Boeing 747-400 aircraft family along with a decrease in B767-300 arrivals (**Table A5**), which outweighed movement increases by other aircraft types. The main movement increases were early morning arrivals from the Far East by the Airbus A380 (with Rolls-Royce engines), Boeing 777-200 (Pratt & Whitney engines) and B777-300 (General Electric engines) between 0500 and 0600.

3.24 There was an 8% increase in westerly movements over the 6.5-hour night quota period in 2013, which is reflected in the contour lobe to the east of Heathrow which extends past Kew, and also in the shorter contour tips to the west (see **Figure 3.5**).

3.25 The 48 dBA $L_{eq,6.5hr\ night}$ contour area of 41.0 km^2 in 2013 was well within the 55 km^2 contour area objective set by the current night noise restrictions regime. Despite the area reduction in 2013, the population increased substantially by 24% due to: (a) the extension of the contour over densely populated areas of west London, and (b) the major update to the 2013 population database.

Contour trends 2006-2013

3.26 The area, population and household changes for the *outermost contour band* are shown graphically in **Figures 3.6-3.10** for L_{den}, L_{day}, $L_{evening}$, L_{night} and $L_{eq,6.5hr\ night}$[9] respectively, for years 2006 to 2013 (note: the population and household trends are based on updated CACI data). The percentage of westerly and easterly movements (i.e. the runway modal split) has also been indicated by the dashed lines on the charts.

3.27 The L_{den} area fell from 2006 to 2009, but has stayed at a similar level since 2009 (**Figure 3.6**). The L_{den} population and households declined from 2006 through to 2010, but increased markedly in 2011 despite the area staying almost constant, mainly due to the effects of the update to the population database for 2011, and also to a higher proportion of westerly movements. The frequency of movements has been steady since 2009, apart from a dip in 2010. The proportion of westerly operations in 2012 increased for the second successive year, but then fell significantly in 2013. The area increased very slightly in 2013 and the population count was higher following a major update to the 2013 population database.

3.28 There was a downward trend for the L_{day} area, population and households from 2006 through to 2010 (**Figure 3.7**). However, an increase in area in 2011 was also accompanied by a significant increase in populations and households, which to a large extent was due to the update to the population database in 2011, and also the 5% higher proportion of westerly movements. The L_{day} area, population and households fell in 2012 in line with the reduction in movements. The proportion of westerly operations in 2012 increased for the second year in a row. The contour area for 2013 remained the same as in 2012, but populations have increased due to the major database update for 2013. There was a drop in the percentage of westerly movements in 2013.

3.29 The $L_{evening}$ area showed a downward trend through to 2010, before rising slightly in 2011 and then falling back in both 2012 and 2013 to its lowest level since 2006 (**Figure 3.8**). Movement numbers have fallen two years in a row since the peak of 2011. Populations and households fell significantly in 2009, but steadily increased in 2010 and 2011, before dropping back in 2012 as the area declined. The 2013 population has not dropped in line with the area decrease because of the major update to the 2013 database. The proportion of westerly operations increased again in 2012 but fell significantly in 2013.

3.30 The L_{night} area was at a similar level to 2006 in 2010, before dropping back slightly in 2011 and 2012, and then staying unchanged in 2013 (**Figure 3.9**). There has been a noticeable downward trend in the population and households from 2009 to 2012, since the peak in 2009. However, in 2013 the population count rose sharply following the major update to the 2013 population database. As for L_{day} and $L_{evening}$,

[9] For $L_{eq,6.5hr\ night}$, only the 48 dBA contour level is considered, hence there is effectively a single contour band which is also the same as the 'cumulative' contour.

the proportion of westerly operations reduced significantly in 2013 following two years of rises.

3.31 The $L_{eq,6.5hr\ night}$ area fell in 2009, increased significantly in 2010 but then dropped markedly in 2011 (**Figure 3.10**). Since 2011 the area has been relatively steady. The population and household counts have moved in tandem with the area changes up to 2011. However, in 2012 the populations fell markedly despite the area increase as parts of the contour retracted from densely populated areas of west London. This followed a decrease in the percentage of westerly arrivals (in contrast to the other time periods), coupled with a significant reduction in arrival movements by the noise dominant B747-400 aircraft family. The area reduced slightly in 2013 following further reductions in B747-400 movements, but populations and households increased considerably as a result of the much higher proportion of westerly movements, which caused an extension of the contour over west London, and also because of the major 2013 population database update described earlier.

Cumulative results (2006 vs 2013)

3.32 The cumulative results in **Tables D1-D5** of **Appendix D** indicate that contour areas for 2013 were below the 2006 base year levels across all the noise metrics. For example, for L_{den} the 55 dBA contour area in 2013 was 219.3 km^2, 10% smaller than the 2006 area of 244.7 km^2.

3.33 **Figure D1** in **Appendix D** shows a comparison diagram of the 2006 and 2013 L_{den} contours.

3.34 However, in some cases the 2013 populations were only slightly lower (or even higher) than in 2006 - this was due to the significant increases in population found in the updated 2013 database (which was based on the latest 2011 Census), indicating that considerable population encroachment had taken place between 2006 and 2013 in the areas around Heathrow. To illustrate the impact of encroachment, year 2013 population and household figures, *produced assuming that the population database had remained the same as in 2006*, are given in blue in **Tables D1-D5**; these numbers confirm that the population and household counts would have dropped substantially across all the noise metrics had population encroachment not occurred between 2006 and 2013.

3.35 It is noteworthy that movements by the noise dominant B747-400 aircraft family have decreased from 135 movements per 24-hour day in 2006 (**Ref 3**) to 89 movements in 2013, a 34% reduction. Newer aircraft types such as the Airbus A380 and Boeing 787 were not in service in 2006, but by 2013 there was an average of 24.6 movements per 24-hour day for the A380 and 5.2 daily movements for the 787.

3.36 To eliminate the effects of the modal split change between 2006 and 2013, year 2013 contours have also been calculated *using the 2006 base year modal splits*. The areas and populations (for both the 2013 and 2006 population databases)

within the outer contour are summarised in **Table D6**, for each noise metric. The results show that the modal split change alone had a relatively small effect of less than 2% on the contour area across all metrics, and less than 3% on population counts (except for the 6.5-hour night where the change was around 5%).

3.37 In particular, for L_{den}, the year 2013 55 dBA contour area would have been 0.5% lower had the runway modal split (2013: 67% west / 33% east) been the same as in 2006 (70% west / 30% east). Likewise the population count would have been just 0.1% lower, suggesting that the variation in runway modal split between 2006 and 2013 only plays a relatively minor role in the long-term L_{den} noise exposure change.

3.38 To identify the areas where noise levels have increased or decreased whilst removing the effect of weather patterns on runway usage, a 'noise change' map has been produced (**Figure D2** in **Appendix D**), which compares the noise exposure between the year 2013 L_{den} noise contours *assuming the 2006 L_{den} base modal split* (70% west / 30% east), with the 2006 L_{den} base year contours. The year 2013 55 dBA L_{den} contour assuming the 2006 modal split has been taken as the outer boundary for the noise changes.

3.39 As expected, most areas have experienced noise reductions of up to 2 dB following the replacement of older, noisier aircraft types. Some areas have seen noise increases, but these were predominantly less than 1 dB. The region immediately to the south of Windsor shows noise increases that can be attributed largely to the CPT/SAM SID routes being more heavily used in 2013 (22% extra movements) than in 2006; this outweighed noise decreases that would have resulted from a transition to quieter aircraft types. The noise increase of greater than 1 dB over a small part of Egham can be attributed mainly to the positioning of the westerly mean tracks for the DVR SIDs in 2013, which were further to the west than in 2006. It is noteworthy that for the same modal split, there was a 25% higher usage of the northern runway for westerly departures in 2013 than in 2006. Conversely, there was a 20% lower usage of the southern runway in 2013 compared to 2006 for westerly departures.

3.40 A similar noise change diagram has also been produced for L_{night} (**Figure D3** in **Appendix D**). The year 2013 50 dBA L_{night} contour *assuming the 2006 L_{night} modal split* (72% west / 28% east) has been taken as the outer boundary of the noise changes. It can be seen that areas around the northern runway (outside the airport perimeter) show noise increases of up to 3 dB, and conversely, areas along the extended centreline of the southern runway have experienced significant noise decreases. The noise increases can be attributed to a much higher usage of the northern runway in 2013 for night departures compared to 2006, following the resurfacing programme for the southern runway[10] in 2013. There was a lower frequency of landings and take-offs on the southern runway during the night

[10] The northern runway was resurfaced in 2014, so a reversed pattern of runway usage would be expected for 2014.

period in 2013. Runway resurfacing will have an impact on the contours around once every decade or so.

3.41 To also remove the effects of the southern runway resurfacing programme on the long term L_{night} noise changes, the 2013 L_{night} contours have been recalculated with the same north-south runway distributions as in year 2006. A noise change diagram for L_{night} has then been produced which shows the changes from 2006 to 2013 assuming the 2006 runway split and 2006 north-south runway usage (see **Figure D4** in **Appendix D**). Without the effects of the southern runway resurfacing in 2013, it can be seen that the majority of areas experience reductions in noise levels. The contour lobe to the west of airport that points to the south is an area which is exposed to an increase in noise (mainly up to 1 dB). This has been caused primarily by the Runway 27L/27R DVR SID mean tracks being positioned further to the west in 2013 than in 2006.

Table 3.1 Heathrow L_{den} area, population and household estimates by contour band for years 2012 and 2013

L_{den} contour band (dBA)	2012	2013	Change	% Change
	Area (km^2)			
55 – 60	136.5	139.7	+3.2	+2%
60 – 65	48.5	46.9	-1.6	-3%
65 – 70	21.0	21.9	+0.9	+4%
70 – 75	7.0	6.9	-0.1	-1%
> 75	3.9	4.0	+0.1	+3%
	Population (thousands)			
55 – 60	545.7	550.9	+5.2	+1%
60 – 65	135.1	146.7	+11.6	+9%
65 – 70	38.8	49.3	+10.5	+27%
70 – 75	5.4	5.9	+0.5	+9%
> 75	0.1	0.1	0.0	0%
	Households (thousands)			
55 – 60	238.0	233.9	-4.1	-2%
60 – 65	57.2	56.4	-0.8	-1%
65 – 70	15.3	16.9	+1.6	+10%
70 – 75	2.0	1.9	-0.1	-5%
> 75	< 0.1	< 0.1	0.0	(n/a)

Table 3.2 Heathrow L_{day} area, population and household estimates by contour band for years 2012 and 2013

L_{day} contour band (dBA)	2012	2013	Change	% Change
	Area (km^2)			
55 – 60	102.7	102.4	-0.3	0%
60 – 65	34.4	34.0	-0.4	-1%
65 – 70	16.4	16.5	+0.1	+1%
70 – 75	5.0	4.9	-0.1	-2%
> 75	3.0	3.0	0.0	0%
	Population (thousands)			
55 – 60	321.8	323.9	+2.1	+1%
60 – 65	89.7	103.1	+13.4	+15%
65 – 70	16.7	19.3	+2.6	+16%
70 – 75	1.8	2.1	+0.3	+17%
> 75	< 0.1	< 0.1	0.0	(n/a)
	Households (thousands)			
55 – 60	138.1	131.5	-6.6	-5%
60 – 65	36.1	37.0	+0.9	+2%
65 – 70	6.4	6.3	-0.1	-2%
70 – 75	0.7	0.7	0.0	0%
> 75	< 0.1	< 0.1	0.0	(n/a)

Note: 2012 data are based on a 2012 CACI update of the 2001 Census, whilst the 2013 data is a 2013 CACI update of the 2011 Census.

Table 3.3 Heathrow $L_{evening}$ area, population and household estimates by contour band for years 2012 and 2013

$L_{evening}$ contour band (dBA)	2012	2013	Change	% Change
	Area (km^2)			
55 – 60	101.1	94.5	-6.6	-7%
60 – 65	32.5	30.7	-1.8	-6%
65 – 70	15.5	15.1	-0.4	-3%
70 – 75	4.8	4.4	-0.4	-8%
> 75	3.0	2.9	-0.1	-3%
	Population (thousands)			
55 – 60	294.4	292.7	-1.7	-1%
60 – 65	74.0	89.6	+15.6	+21%
65 – 70	12.8	14.0	+1.2	+9%
70 – 75	1.0	1.2	+0.2	+20%
> 75	0.0	0.0	0.0	(n/a)
	Households (thousands)			
55 – 60	124.2	116.3	-7.9	-6%
60 – 65	29.5	31.8	+2.3	+8%
65 – 70	4.8	4.7	-0.1	-2%
70 – 75	0.5	0.5	0.0	0%
> 75	0.0	0.0	0.0	(n/a)

Table 3.4 Heathrow L_{night} area, population and household estimates by contour band for years 2012 and 2013

L_{night} contour band (dBA)	2012	2013	Change	% Change
	Area (km^2)			
50 – 55	46.4	46.4	0.0	0%
55 – 60	18.2	20.2	+2.0	+11%
60 – 65	5.9	6.3	+0.4	+7%
65 – 70	1.7	2.0	+0.3	+18%
> 70	1.4	1.5	+0.1	+7%
	Population (thousands)			
50 – 55	137.2	146.8	+9.6	+7%
55 – 60	47.5	59.0	+11.5	+24%
60 – 65	10.7	12.0	+1.3	+12%
65 – 70	1.6	1.3	-0.3	-19%
> 70	0.0	0.0	0.0	(n/a)
	Households (thousands)			
50 – 55	59.2	59.3	+0.1	0%
55 – 60	18.7	20.4	+1.7	+9%
60 – 65	3.8	3.7	-0.1	-3%
65 – 70	0.5	0.4	-0.1	-20%
> 70	0.0	0.0	0.0	(n/a)

Note: 2012 data are based on a 2012 CACI update of the 2001 Census, whilst the 2013 data is a 2013 CACI update of the 2011 Census.

Table 3.5 Heathrow $L_{eq,6.5hr\ night}$ area, population and household estimates for years 2012 and 2013

$L_{eq,6.5hr\ night}$ contour (dBA)	**2012**	**2013**	**Change**	**% Change**
	Area (km^2)			
> 48	42.5	41.0	-1.5	-4%
	Population (thousands)			
> 48	106.9	132.9	+26.0	24%
	Households (thousands)			
> 48	42.7	47.9	+5.2	12%

Note: 2012 data are based on a 2012 CACI update of the 2001 Census, whilst the 2013 data is a 2013 CACI update of the 2011 Census.

4 Conclusion

4.1 Year 2013 Heathrow L_{den}, L_{day}, $L_{evening}$, L_{night} and $L_{eq,6.5hr\ night}$ contours have been modelled with the ANCON noise model and comparisons made with the contours from the previous year. The trends from 2006 to 2013 have also been examined for each noise metric.

4.2 Aircraft movements over the 2013 L_{den} period decreased by 0.4% compared to 2012. The 2013 L_{den} areas were 2% higher than in 2012 for the outermost contour band, with increases and decreases of up to 4% at the other contour bands. L_{day} movements reduced slightly, by 0.3%, and the area was unchanged for the outermost L_{day} contour band in 2013, with changes of up to 2% at the higher L_{day} contour bands. Significant area reductions for all contour bands were observed for $L_{evening}$, in line with the 1.5% decrease in movements, which included a 20% reduction in the number of B747-400 aircraft. The outer L_{night} contour band was unchanged in area, but significant increases occurred at the higher bands, as L_{night} movements rose by 3%. The 48 dBA $L_{eq,6.5hr\ night}$ contour area reduced to 41.0 km^2, which can be attributed mainly to a reduction in movements by B747-400 aircraft; this figure was well within the 55 km^2 contour area objective set by the current night flying restrictions regime.

4.3 The 2013 L_{den}, L_{day}, $L_{evening}$ and L_{night} contours showed population changes from 2012 that were generally disproportionately higher than the area changes described above. This was primarily a result of the major update to the 2013 population database, which was based on the latest 2011 Census, as opposed to the 2012 database which was derived from the earlier 2001 Census. Within the extent of the 2013 55 dBA L_{den} contours, the population change between the 2012 and 2013 databases was +5%, increasing to +14% at the 65 dBA L_{den} level. Changes to household counts were more in line with the area changes, because the population-to-households ratios in 2013 were much higher than in the previous 2012 population database.

4.4 In terms of trends for the *outermost contour band* for each of the noise metrics, the L_{den} areas have been fairly steady since 2009. Populations reached a low in 2010, but have been higher thereafter with population database updates playing a significant part. Similar trends are observed for L_{day}. The $L_{evening}$ area, populations and households have continued to decrease following the 2011 high, in line with the reduction in movements over this period. For L_{night} the areas have declined slightly since 2010 despite some increases in movements, chiefly because of lower numbers of the noise dominant B747-400 aircraft. L_{night} population and households showed a downward trend after 2009, but populations increased significantly in 2013 following the 2013 population database update. The $L_{eq,6.5hr\ night}$ has stayed at a relatively low level since 2011, and following two years of decreases the population has risen sharply in 2013 due to extension of the contour over west London (from an increase in westerly operations) and the 2013 population database update.

4.5 The 2013 *cumulative* areas were below 2006 levels for all the noise metrics; for example, the 2013 55 dBA L_{den} contour area of 219.3 km^2 was 10% smaller than the 2006 figure (244.7 km^2). However, the populations within the 2013 contours were not necessarily lower than the 2006 figures due to the effects of population encroachment in the area around Heathrow, as shown by the 2013 population database figures. However, had the population database been unchanged from 2006, the 2013 population and household numbers would have been substantially lower than in 2006.

4.6 An analysis of L_{den} noise changes from 2006 to 2013 indicated that most areas have experienced a noise reduction of up to 2 dB. Some areas experienced a noise increase of up to 1 dB, with a small part of Egham exposed to an increase of greater than 1 dB due to a shift in the positioning of the westerly DVR departure mean tracks in 2013.

4.7 An analysis of L_{night} noise changes between 2006 and 2013 showed significant increases in the vicinity of the northern runway, which resulted from a higher usage of this runway for departures in 2013 compared to 2006 (the southern runway underwent resurfacing in 2013). As the southern runway was less heavily used in 2013 by departures and arrivals, areas along its extended centreline experienced noise reductions. If the effects of changes in north-south runway distributions are removed, most areas are seen to be subject to reductions in noise over the annual night period.

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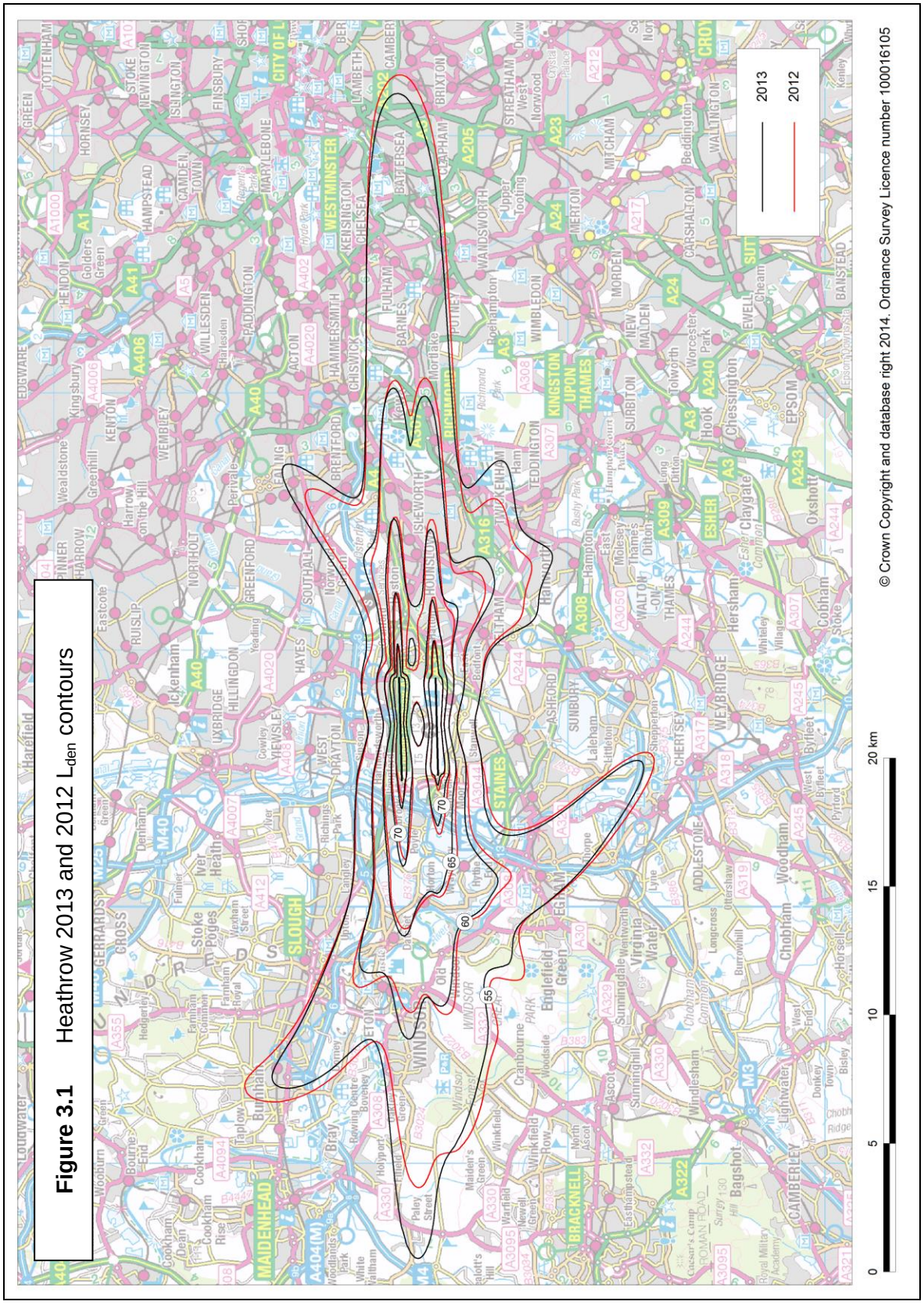


Figure 3.1 Heathrow 2013 and 2012 L_{den} contours

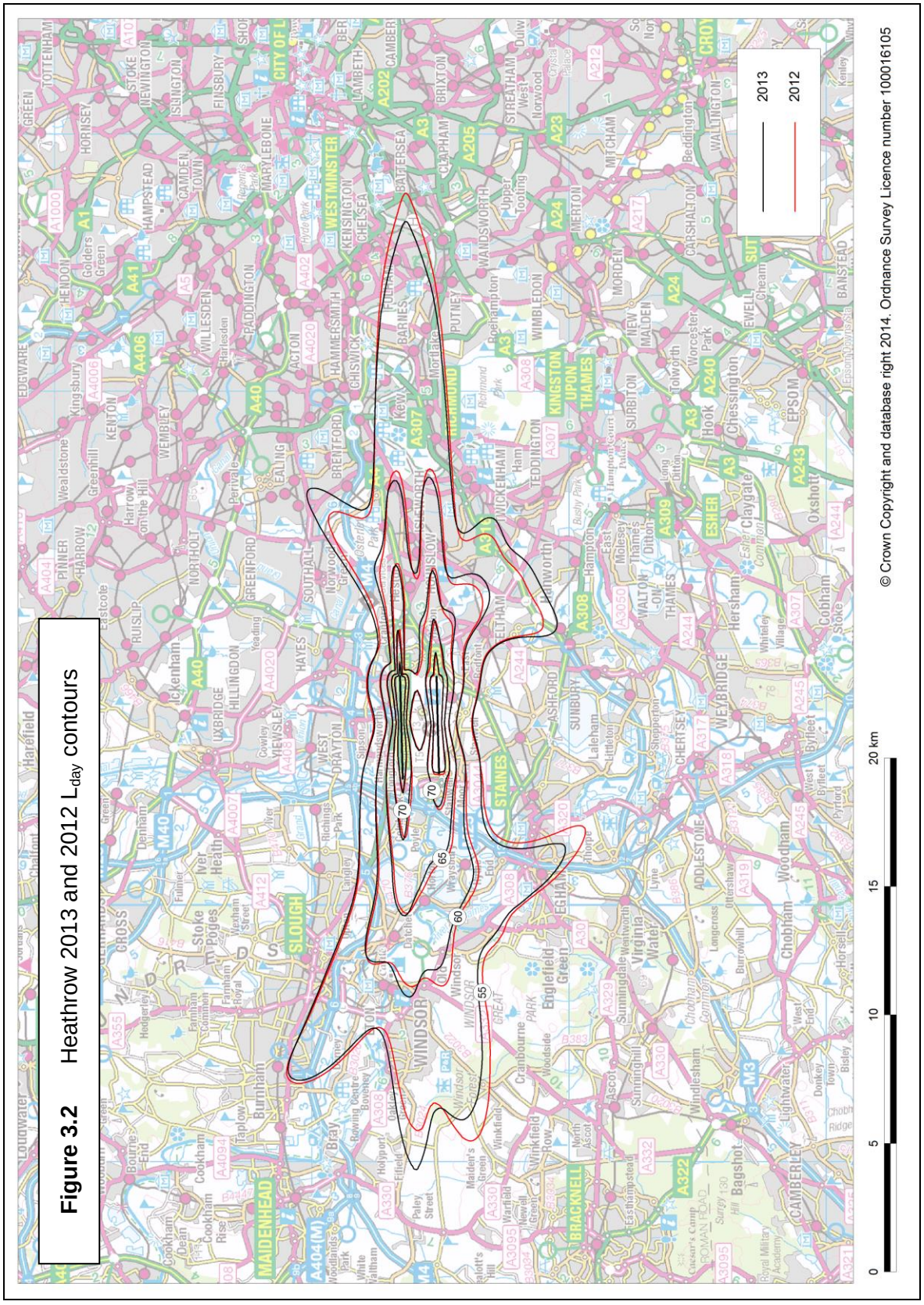


Figure 3.2 Heathrow 2013 and 2012 L_{day} contours

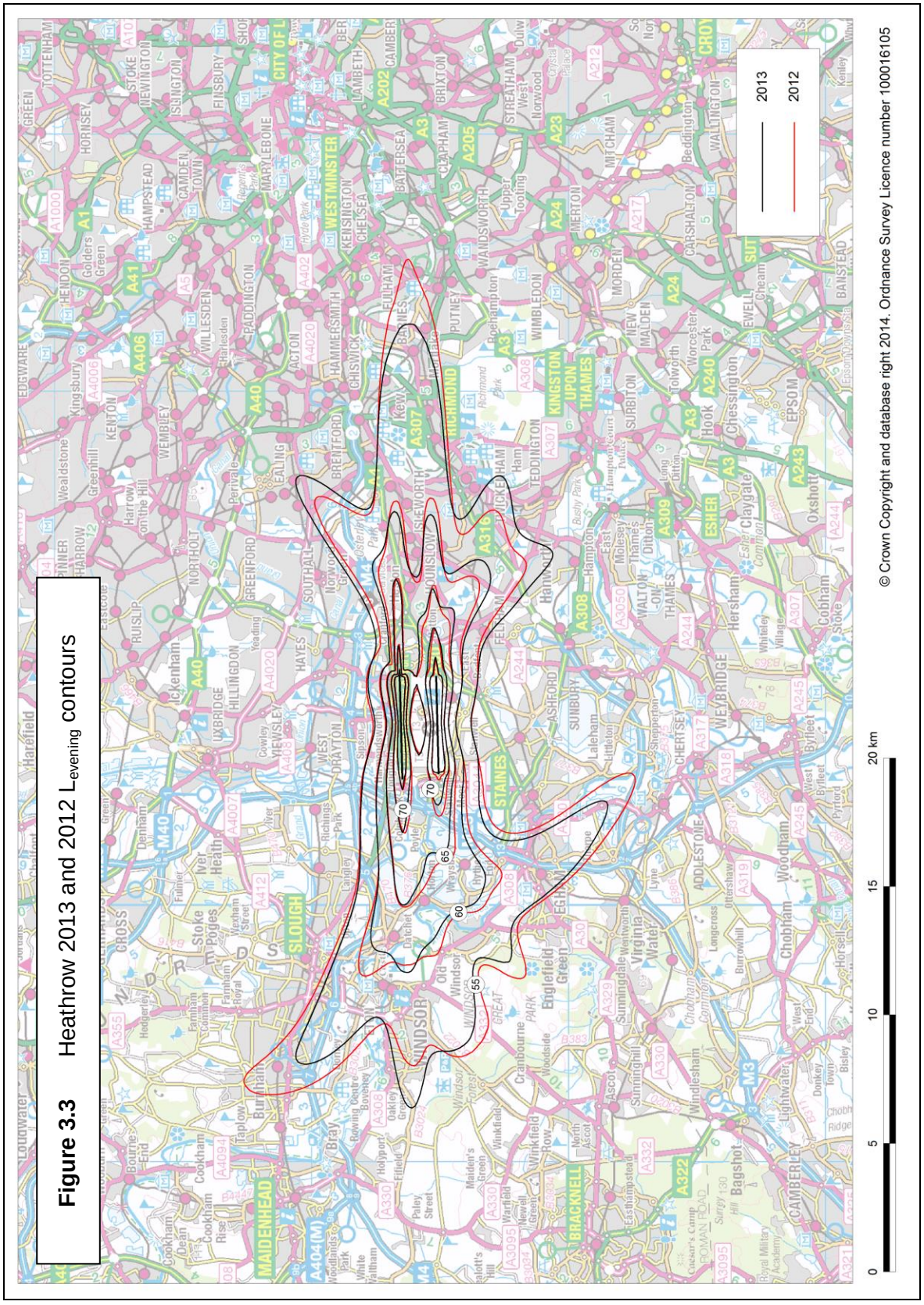


Figure 3.3 Heathrow 2013 and 2012 $L_{evening}$ contours

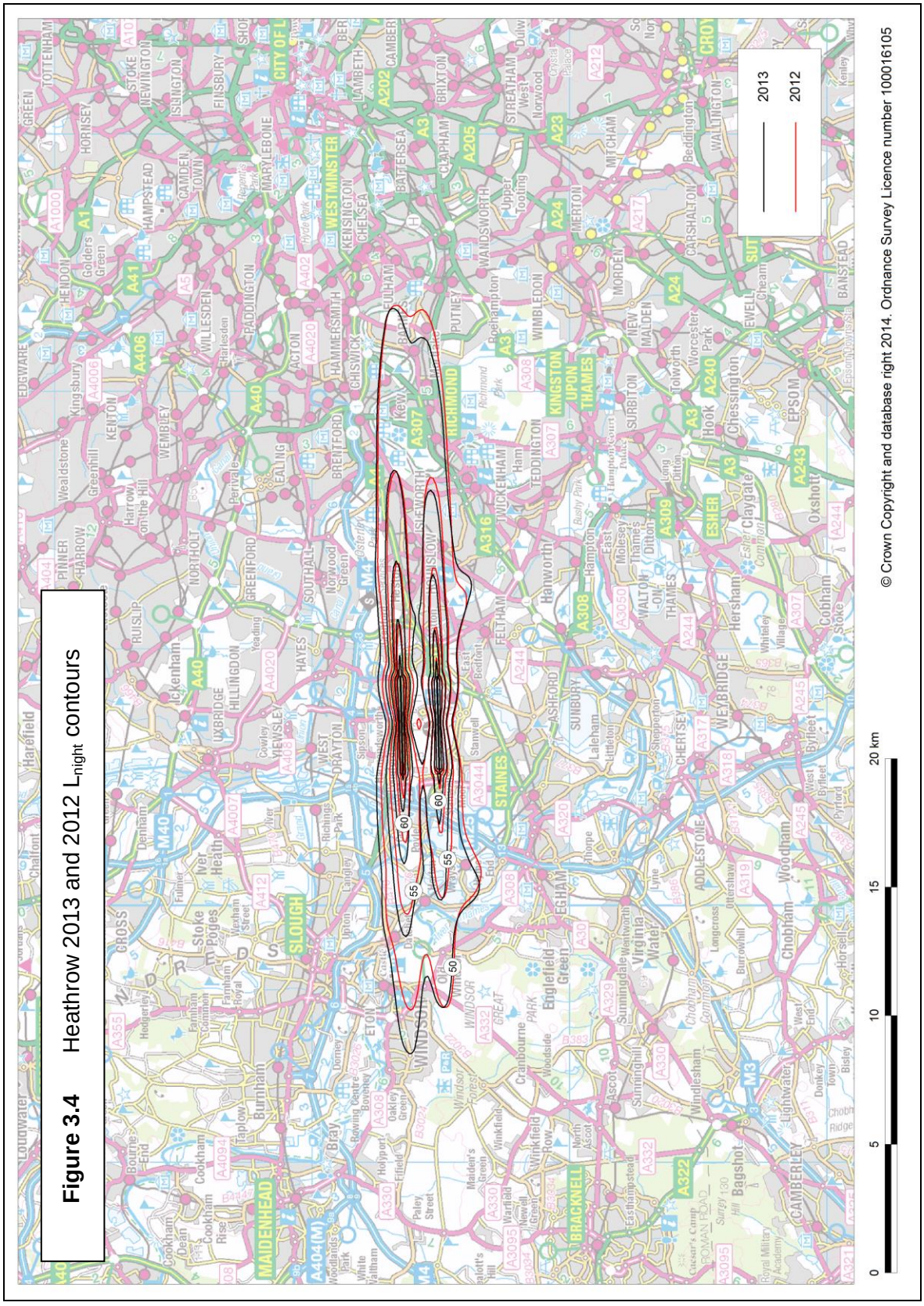


Figure 3.4 Heathrow 2013 and 2012 L_{night} contours

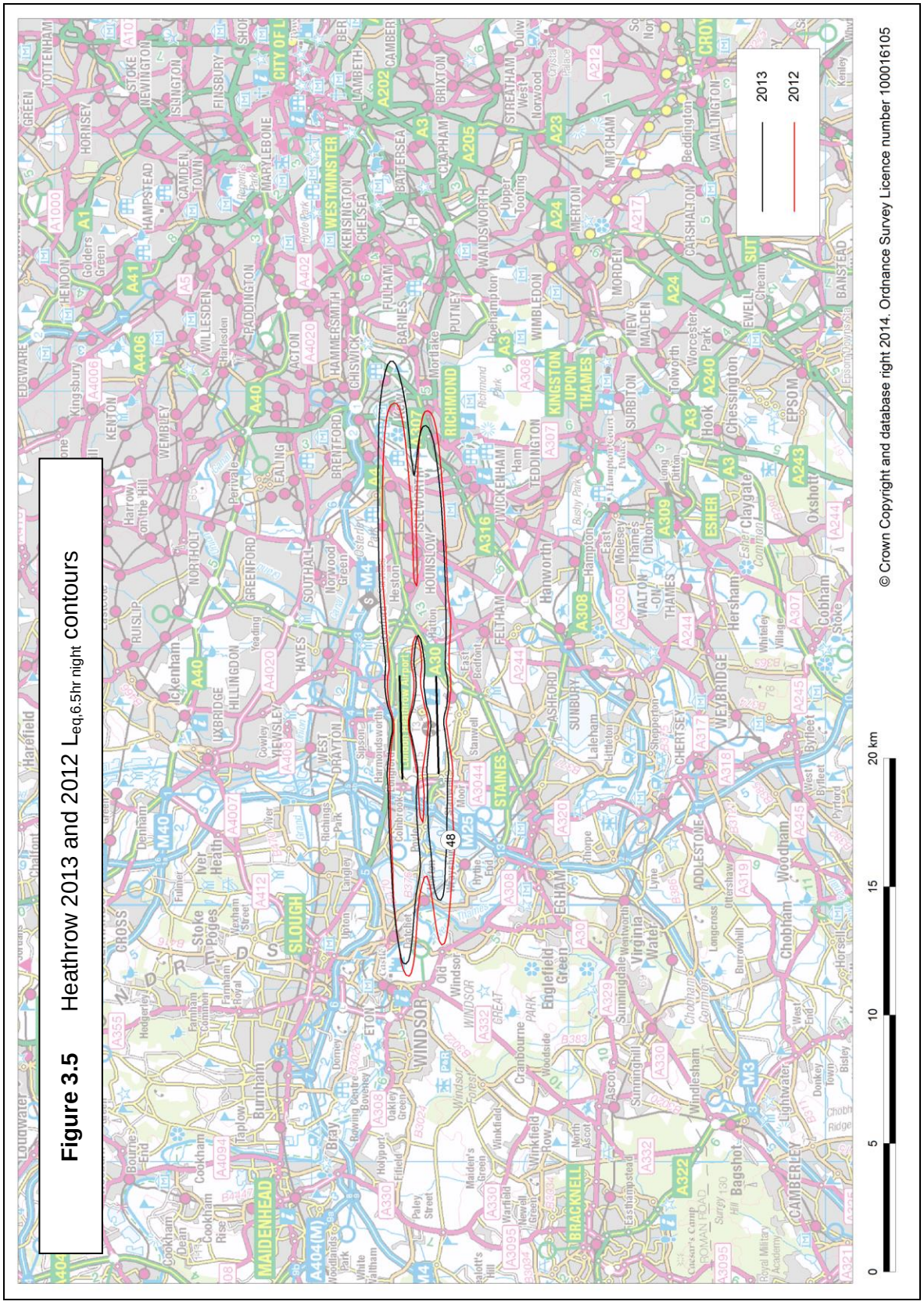


Figure 3.5 Heathrow 2013 and 2012 $L_{eq,6.5hr\ night}$ contours

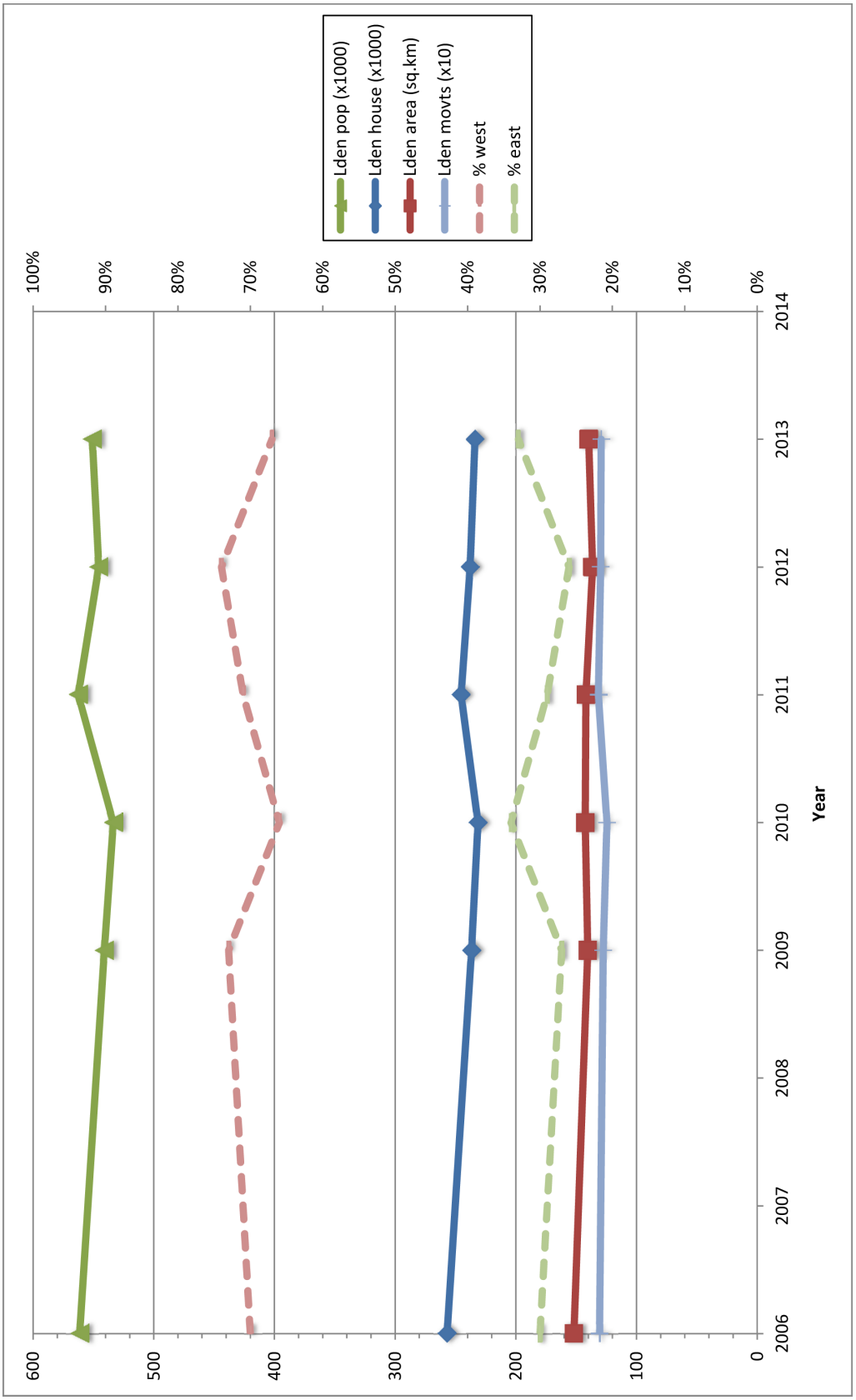


Figure 3.6 Heathrow 2006 to 2013 L_{den} 55-60 dBA contour band area, population and households trend

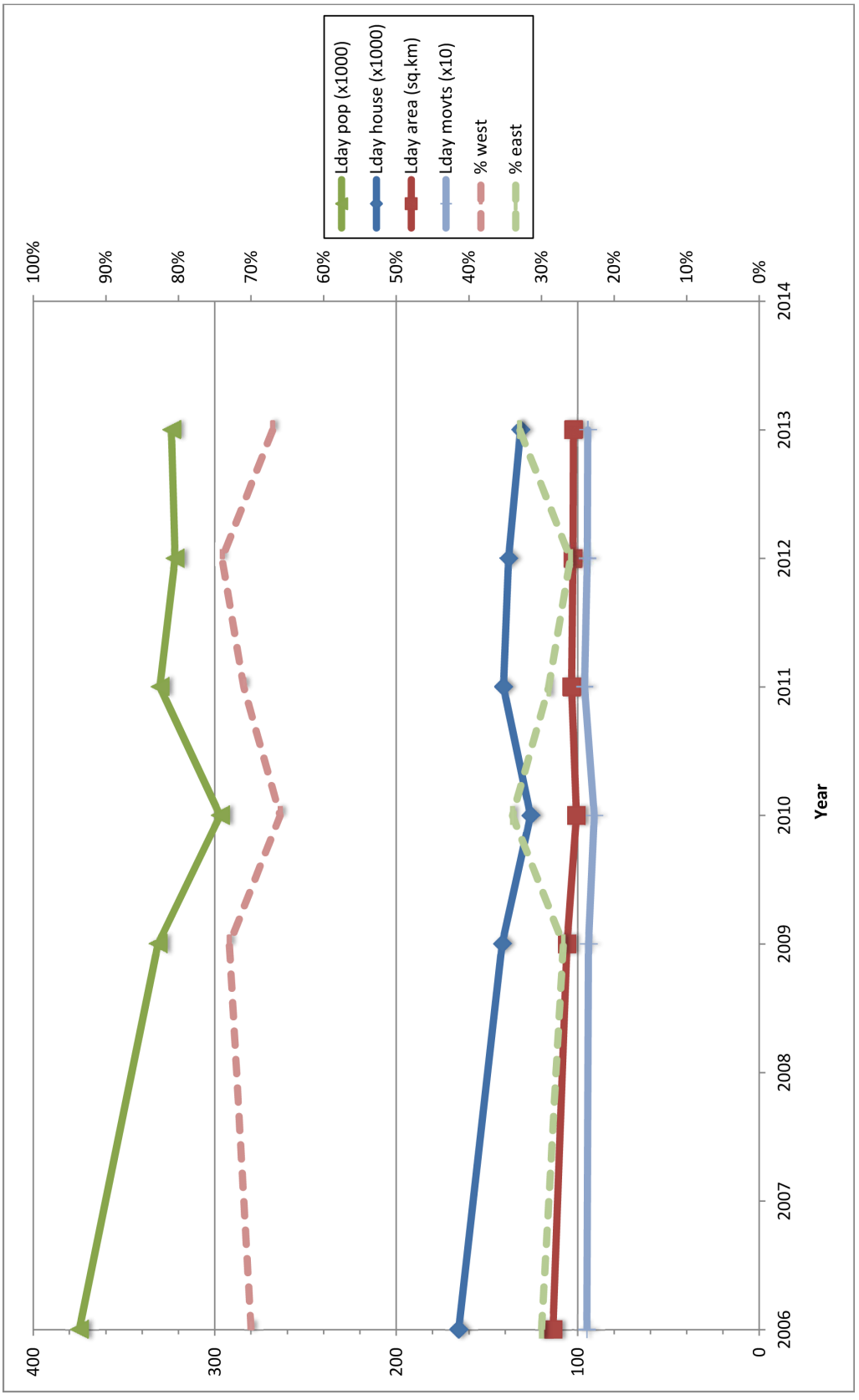


Figure 3.7 Heathrow 2006 to 2013 L_{day} 55-60 dBA contour band area, population and households trend

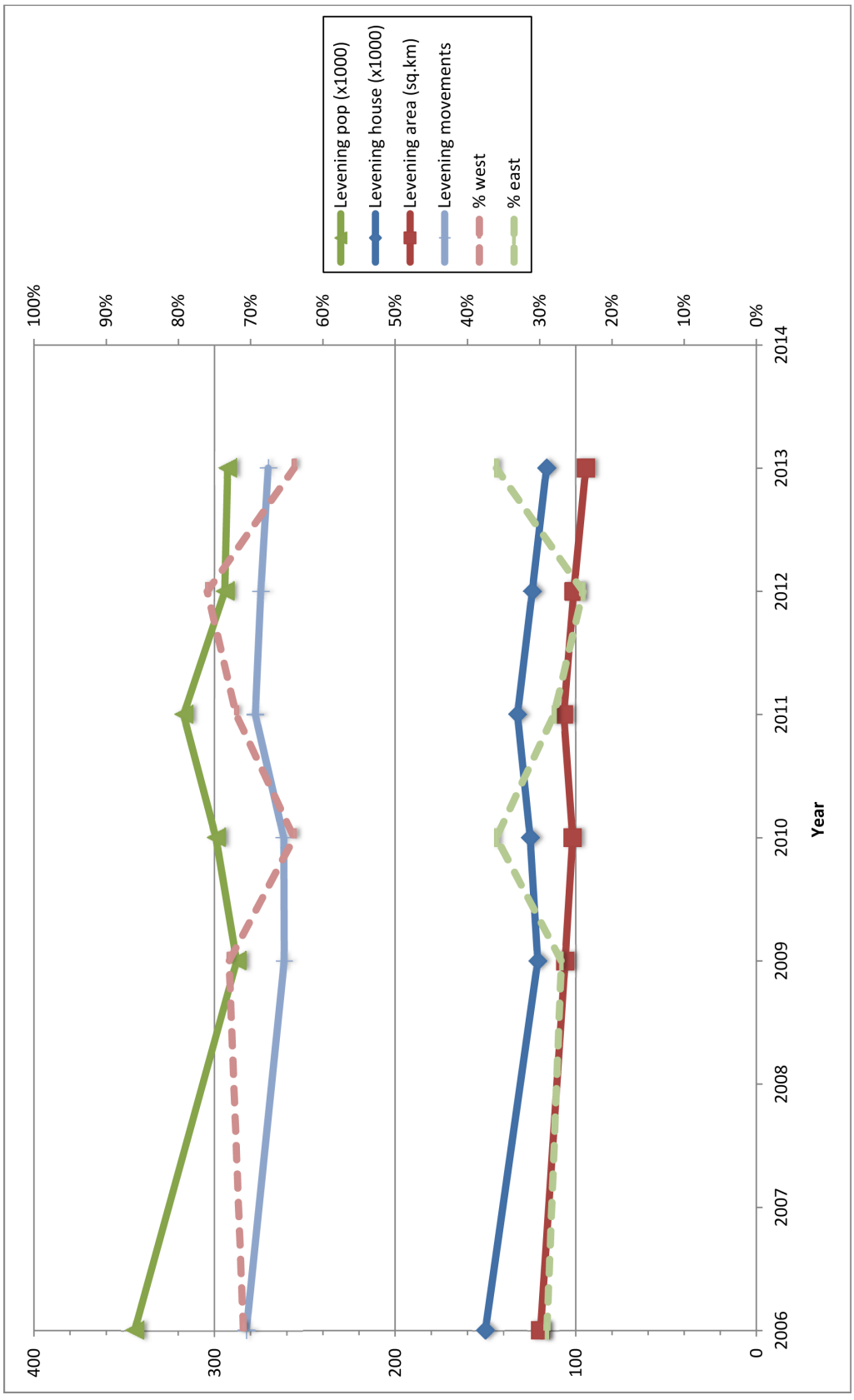


Figure 3.8 Heathrow 2006 to 2013 $L_{evening}$ 55-60 dBA contour band area, population and households trend

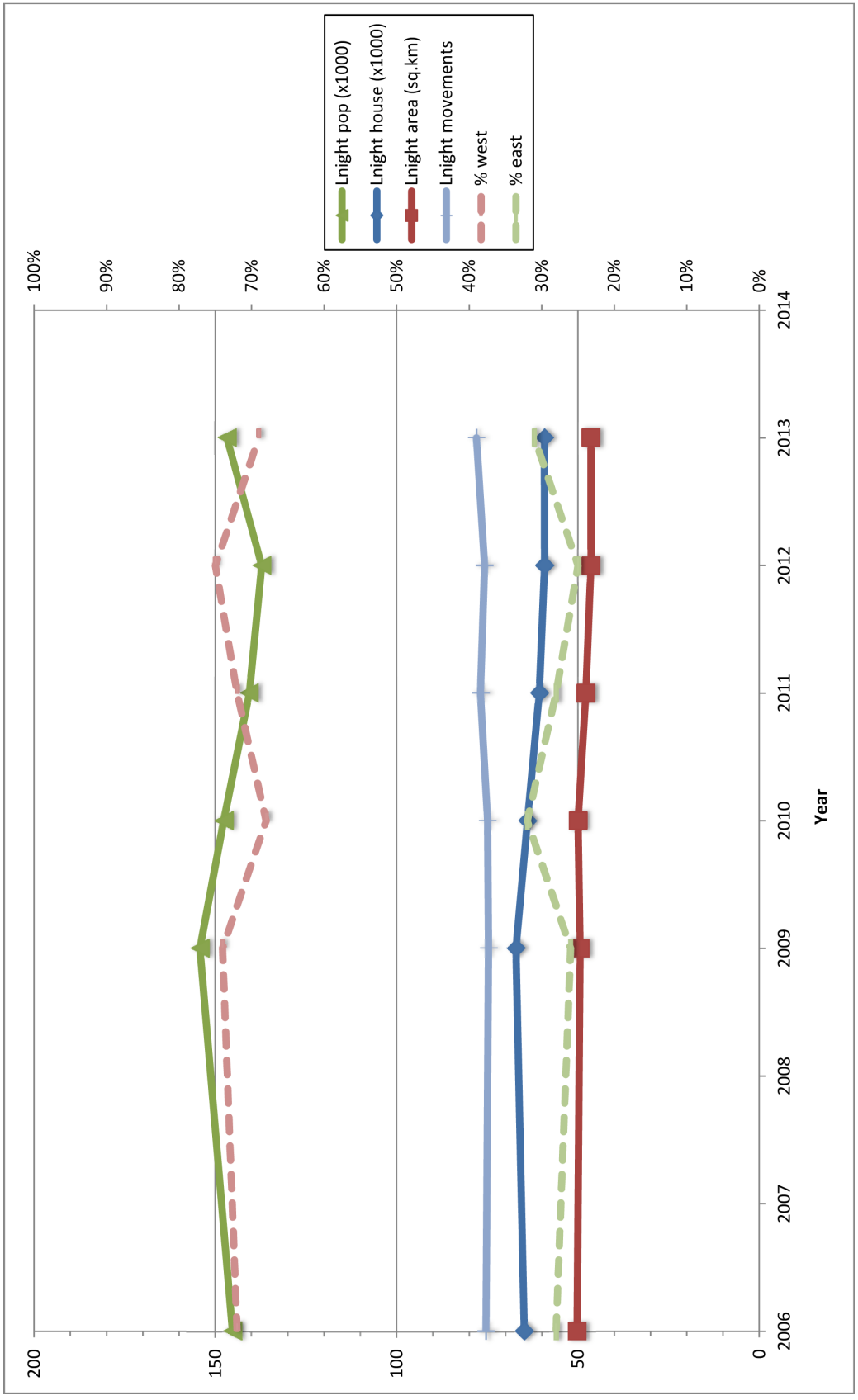
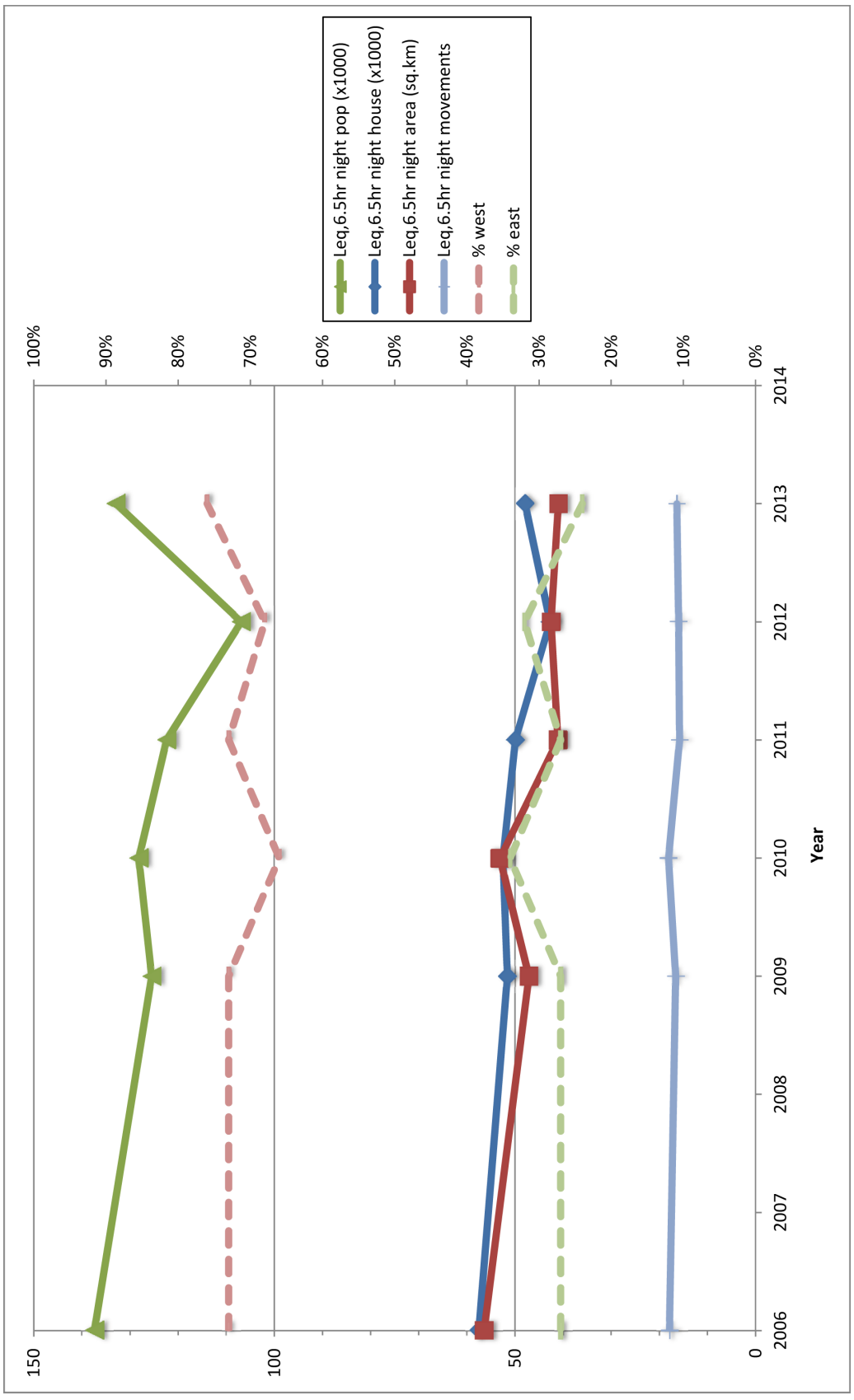


Figure 3.9 Heathrow 2006 to 2013 L_{night} 50-55 dBA contour band area, population and households trend

Figure 3.10 Heathrow 2006 to 2013 $L_{eq,6.5hr\ night}$ >48 dBA contour area, population and households trend



Appendix A – Traffic movements by ANCON type

Table A1 Heathrow traffic movements for the annual average 24-hour day by ANCON type for years 2012 and 2013

ANCON type	2012 departs	2012 arrivals	2012 total	2013 departs	2013 arrivals	2013 total	change departs	change arrivals	change total
B717	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B727	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	-0.1
B732	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B733	9.4	9.5	18.9	6.1	6.1	12.2	-3.4	-3.4	-6.7
B736	11.3	11.3	22.6	11.7	11.7	23.4	+0.4	+0.4	+0.9
B738	12.9	12.9	25.7	11.5	11.6	23.1	-1.3	-1.3	-2.6
B744G	4.3	4.3	8.7	5.2	5.2	10.5	+0.9	+0.9	+1.8
B744P	4.5	4.5	9.0	2.2	2.2	4.4	-2.3	-2.3	-4.6
B744R	38.1	38.1	76.3	36.9	37.0	73.9	-1.2	-1.1	-2.3
B747	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B747SP	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
B753	0.3	0.3	0.5	0.1	0.1	0.3	-0.1	-0.1	-0.3
B757C	0.7	0.7	1.3	0.7	0.7	1.3	0.0	0.0	0.0
B757E	8.8	8.8	17.6	7.7	7.7	15.4	-1.1	-1.1	-2.2
B757P	0.2	0.2	0.4	0.3	0.1	0.4	+0.1	-0.1	+0.1
B762	0.1	0.1	0.2	0.5	0.5	1.0	+0.4	+0.4	+0.8
B763G	8.5	8.5	17.0	8.3	8.3	16.6	-0.2	-0.2	-0.4
B763P	6.5	6.5	13.0	7.8	7.8	15.7	+1.3	+1.3	+2.6
B763R	21.1	21.1	42.1	22.5	22.7	45.3	+1.5	+1.6	+3.1
B764	8.0	8.0	16.0	6.4	6.4	12.7	-1.6	-1.6	-3.2
B772G	23.4	23.3	46.7	21.0	21.0	42.0	-2.4	-2.4	-4.7
B772P	5.0	5.0	10.0	5.3	5.3	10.6	+0.3	+0.3	+0.6
B772R	27.5	27.5	55.0	24.9	24.9	49.8	-2.6	-2.6	-5.2
B773G	24.7	24.7	49.4	31.8	31.7	63.4	+7.1	+7.0	+14.0
B773P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B773R	0.5	0.5	1.1	0.0	0.0	0.0	-0.5	-0.5	-1.1
B788	0.1	0.1	0.1	2.6	2.6	5.2	+2.5	+2.5	+5.1
BA46	2.2	2.2	4.4	0.8	0.8	1.6	-1.4	-1.4	-2.9
CRJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CRJ700	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CRJ900	0.6	0.6	1.1	0.8	0.8	1.6	+0.2	+0.2	+0.4
EA30	2.1	2.1	4.3	2.2	2.2	4.4	0.0	0.0	+0.1
EA31	0.3	0.3	0.7	0.2	0.2	0.4	-0.1	-0.1	-0.2
EA318	1.9	1.9	3.8	1.4	1.4	2.7	-0.5	-0.5	-1.1
EA319C	22.0	22.0	44.0	24.9	24.9	49.9	+2.9	+2.9	+5.8
EA319V	106.9	106.8	213.7	106.8	106.8	213.6	-0.1	0.0	-0.1
EA320C	57.2	57.2	114.4	65.5	65.4	130.9	+8.3	+8.2	+16.5
EA320V	103.1	103.1	206.2	102.6	102.9	205.5	-0.5	-0.2	-0.7
EA321C	17.8	17.7	35.5	19.5	19.5	39.0	+1.7	+1.8	+3.5
EA321V	46.2	46.1	92.3	47.3	47.2	94.5	+1.1	+1.1	+2.1
EA33	20.5	20.5	41.1	24.9	24.9	49.9	+4.4	+4.4	+8.8
EA34	6.0	6.0	12.0	5.1	5.1	10.1	-0.9	-0.9	-1.9
EA346	18.5	18.6	37.1	12.3	12.3	24.5	-6.3	-6.3	-12.6
EA38GP	3.0	3.0	6.0	5.0	5.0	10.0	+2.0	+2.0	+4.0
EA38R	5.1	5.1	10.1	7.3	7.4	14.6	+2.2	+2.3	+4.5
ERJ	10.0	10.0	20.1	0.1	0.1	0.2	-10.0	-10.0	-19.9
ERJ170	0.1	0.1	0.1	0.1	0.1	0.2	0.0	0.0	+0.1
ERJ190	2.0	1.9	3.9	2.3	2.3	4.6	+0.4	+0.4	+0.7
EXE2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EXE3	2.1	2.1	4.2	0.7	0.7	1.4	-1.4	-1.4	-2.9
FK10	3.3	3.3	6.5	2.4	2.4	4.8	-0.9	-0.9	-1.7
IL62	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L101	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L4P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ANCON type	2012 departs	2012 arrivals	2012 total	2013 departs	2013 arrivals	2013 total	change departs	change arrivals	change total
LTT	0.1	0.1	0.3	0.1	0.0	0.1	-0.1	-0.1	-0.2
MD11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MD80	1.9	1.9	3.8	0.6	0.6	1.3	-1.3	-1.3	-2.6
MD90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STT	0.1	0.1	0.2	0.1	0.1	0.2	0.0	0.0	0.0
TU54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	649.2	648.8	**1297.9**	646.5	646.7	**1293.1**	-2.7	-2.1	**-4.8**
							(-0.4%)	(-0.3%)	**(-0.4%)**

Note: totals may not sum exactly due to rounding.

Table A2 Heathrow traffic movements for the annual average 12-hour day (0700-1900 local time) by ANCON type for years 2012 and 2013

ANCON type	2012 departs	2012 arrivals	2012 total	2013 departs	2013 arrivals	2013 total	change departs	change arrivals	change total
B717	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B727	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
B732	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B733	7.1	7.6	14.7	4.8	4.9	9.7	-2.2	-2.8	-5.0
B736	7.8	8.9	16.7	8.3	9.9	18.2	+0.5	+1.0	+1.6
B738	9.3	10.6	19.9	8.5	9.4	17.9	-0.7	-1.2	-2.0
B744G	3.9	3.7	7.6	4.7	4.5	9.2	+0.7	+0.9	+1.6
B744P	1.9	3.1	5.0	1.5	1.5	3.0	-0.4	-1.6	-2.0
B744R	27.8	23.9	51.7	27.2	22.6	49.8	-0.6	-1.3	-1.9
B747	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B747SP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B753	0.1	0.1	0.1	0.1	0.1	0.2	0.0	0.0	0.0
B757C	0.0	0.1	0.1	0.0	0.2	0.2	0.0	0.0	+0.1
B757E	7.5	5.1	12.6	6.4	3.9	10.2	-1.2	-1.2	-2.4
B757P	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
B762	0.1	0.1	0.1	0.3	0.5	0.7	+0.2	+0.4	+0.6
B763G	8.0	5.7	13.7	7.9	5.2	13.1	-0.1	-0.5	-0.6
B763P	5.6	3.8	9.4	7.3	5.8	13.0	+1.6	+2.0	+3.6
B763R	16.6	13.6	30.1	16.1	15.0	31.1	-0.5	+1.5	+1.0
B764	8.0	6.2	14.1	6.3	4.8	11.1	-1.6	-1.4	-3.0
B772G	18.0	13.6	31.6	16.7	11.9	28.6	-1.3	-1.7	-3.0
B772P	4.0	3.9	7.9	4.2	3.6	7.8	+0.2	-0.3	-0.1
B772R	21.8	20.4	42.2	19.6	19.0	38.6	-2.2	-1.5	-3.7
B773G	14.0	19.1	33.2	18.1	24.0	42.0	+4.1	+4.8	+8.9
B773P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B773R	0.5	0.3	0.8	0.0	0.0	0.0	-0.5	-0.3	-0.8
B788	0.1	0.1	0.1	2.2	2.4	4.6	+2.1	+2.3	+4.4
BA46	1.5	2.0	3.5	0.6	0.6	1.3	-0.9	-1.4	-2.3
CRJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CRJ700	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CRJ900	0.5	0.6	1.0	0.6	0.7	1.4	+0.2	+0.2	+0.3
EA30	1.2	1.3	2.5	1.2	1.3	2.5	+0.1	0.0	+0.1
EA31	0.2	0.3	0.4	0.1	0.2	0.3	0.0	-0.1	-0.1
EA318	1.8	1.2	3.0	1.4	0.9	2.3	-0.4	-0.3	-0.7
EA319C	15.8	14.5	30.3	18.7	18.0	36.7	+2.9	+3.5	+6.4
EA319V	85.6	79.3	164.9	86.2	78.1	164.2	+0.6	-1.2	-0.6
EA320C	41.2	43.1	84.3	47.8	48.6	96.4	+6.5	+5.6	+12.1
EA320V	81.3	72.8	154.2	83.4	74.0	157.4	+2.0	+1.2	+3.2
EA321C	13.7	13.9	27.6	14.2	16.0	30.2	+0.4	+2.2	+2.6
EA321V	37.7	34.3	72.0	37.2	32.2	69.4	-0.5	-2.1	-2.6
EA33	12.4	13.2	25.6	15.6	17.8	33.4	+3.2	+4.6	+7.8
EA34	2.8	4.4	7.2	2.6	4.2	6.7	-0.2	-0.2	-0.4
EA346	9.5	12.6	22.1	5.3	7.1	12.4	-4.2	-5.5	-9.7
EA38GP	1.2	1.9	3.2	3.0	3.3	6.3	+1.8	+1.4	+3.1
EA38R	2.1	1.2	3.2	2.9	3.0	6.0	+0.8	+1.9	+2.7
ERJ	8.5	7.3	15.8	0.0	0.0	0.1	-8.5	-7.3	-15.8
ERJ170	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0
ERJ190	1.3	1.4	2.7	1.6	1.7	3.3	+0.4	+0.2	+0.6
EXE2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EXE3	1.7	1.5	3.2	0.5	0.5	1.0	-1.1	-1.1	-2.2
FK10	2.2	3.0	5.2	1.1	2.0	3.1	-1.1	-1.0	-2.1
IL62	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L101	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L4P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LTT	0.1	0.1	0.2	0.0	0.0	0.0	-0.1	0.0	-0.1
MD11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MD80	1.6	1.7	3.4	0.5	0.5	1.0	-1.1	-1.2	-2.3
STP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STT	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0

ANCON type	2012 departs	2012 arrivals	2012 total	2013 departs	2013 arrivals	2013 total	change departs	change arrivals	change total
TU54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	486.0	461.9	**947.8**	484.7	460.1	**944.8**	-1.2	-1.7	**-3.0**
							(-0.3%)	(-0.4%)	**(-0.3%)**

Note: totals may not sum exactly due to rounding.

Table A3 Heathrow traffic movements for the annual average 4-hour evening (1900-2300 local time) by ANCON type for years 2012 and 2013

ANCON type	2012 departs	2012 arrivals	2012 total	2013 departs	2013 arrivals	2013 total	change departs	change arrivals	change total
B717	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B727	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B733	1.8	1.8	3.6	0.8	1.2	2.0	-1.0	-0.6	-1.6
B736	3.5	2.4	5.8	3.4	1.8	5.2	-0.1	-0.6	-0.6
B738	2.8	2.2	5.0	2.3	2.1	4.4	-0.5	-0.1	-0.6
B744G	0.4	0.1	0.4	0.6	0.2	0.8	+0.2	+0.2	+0.4
B744P	2.2	0.5	2.7	0.5	0.3	0.8	-1.8	-0.2	-2.0
B744R	9.8	1.4	11.2	8.8	1.2	10.0	-1.0	-0.2	-1.2
B747SP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B753	0.2	0.2	0.4	0.0	0.1	0.1	-0.2	-0.2	-0.3
B757C	0.5	0.5	1.0	0.4	0.5	0.9	-0.1	-0.1	-0.2
B757E	1.2	2.6	3.8	1.3	2.7	4.0	+0.1	+0.1	+0.2
B757P	0.2	0.1	0.3	0.3	0.1	0.4	+0.1	0.0	+0.1
B762	0.0	0.0	0.1	0.2	0.0	0.2	+0.2	0.0	+0.1
B763G	0.4	1.6	2.1	0.4	1.6	2.0	-0.1	0.0	-0.1
B763P	0.8	1.3	2.2	0.5	0.6	1.1	-0.3	-0.7	-1.0
B763R	3.8	6.3	10.1	4.6	6.3	10.9	+0.7	+0.1	+0.8
B764	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B772G	4.7	1.8	6.5	3.4	1.0	4.4	-1.3	-0.8	-2.1
B772P	1.0	0.2	1.2	1.0	0.2	1.2	+0.1	0.0	+0.1
B772R	5.3	1.4	6.8	4.7	1.7	6.4	-0.6	+0.3	-0.3
B773G	10.2	1.9	12.1	12.9	2.3	15.2	+2.7	+0.4	+3.1
B773R	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B788	0.0	0.0	0.0	0.4	0.1	0.5	+0.4	+0.1	+0.5
BA46	0.7	0.2	0.9	0.2	0.1	0.3	-0.6	-0.1	-0.6
CRJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CRJ700	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CRJ900	0.1	0.0	0.1	0.2	0.1	0.2	+0.1	0.0	+0.1
EA30	0.3	0.8	1.2	0.3	0.9	1.2	0.0	+0.1	0.0
EA31	0.2	0.1	0.2	0.1	0.0	0.1	-0.1	0.0	-0.1
EA318	0.2	0.7	0.8	0.0	0.4	0.5	-0.1	-0.2	-0.4
EA319C	4.5	7.0	11.5	5.0	6.3	11.3	+0.5	-0.7	-0.2
EA319V	19.5	26.4	45.8	18.6	27.1	45.7	-0.9	+0.7	-0.1
EA320C	13.3	13.9	27.2	14.6	16.4	31.0	+1.3	+2.6	+3.8
EA320V	19.3	29.5	48.7	18.0	27.9	45.9	-1.3	-1.5	-2.8
EA321C	3.1	3.8	6.9	4.4	3.3	7.7	+1.3	-0.5	+0.8
EA321V	7.0	11.2	18.2	8.3	14.3	22.6	+1.2	+3.1	+4.3
EA33	7.8	2.7	10.5	8.7	3.5	12.2	+0.8	+0.8	+1.7
EA34	2.7	0.6	3.3	2.1	0.5	2.5	-0.6	-0.1	-0.7
EA346	8.4	1.9	10.3	6.4	1.6	8.0	-2.0	-0.3	-2.3
EA38GP	1.6	1.0	2.5	1.8	1.2	2.9	+0.2	+0.2	+0.4
EA38R	2.6	0.8	3.3	3.7	0.5	4.2	+1.1	-0.3	+0.9
ERJ	1.4	2.6	4.0	0.0	0.0	0.0	-1.4	-2.6	-4.0
ERJ170	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
ERJ190	0.4	0.5	0.9	0.5	0.6	1.2	+0.1	+0.2	+0.3
EXE2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EXE3	0.3	0.4	0.7	0.1	0.1	0.3	-0.2	-0.2	-0.4
FK10	1.0	0.3	1.2	1.3	0.4	1.7	+0.3	+0.1	+0.4
L4P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LTT	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
MD80	0.3	0.2	0.4	0.1	0.1	0.2	-0.1	-0.1	-0.2
MD90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	143.6	130.8	**274.3**	140.8	129.5	**270.3**	-2.8	-1.2	**-4.0**
							(-2.0%)	(-0.9%)	**(-1.5%)**

Note: totals may not sum exactly due to rounding.

Table A4 Heathrow traffic movements for the annual average 8-hour night (2300-0700 local time) by ANCON type for years 2012 and 2013

ANCON type	2012 departs	2012 arrivals	2012 total	2013 departs	2013 arrivals	2013 total	change departs	change arrivals	change total
B727	0.0	0.0	0.0	0.0	0.0	0.0	-0.0	0.0	-0.0
B733	0.6	0.0	0.6	0.5	0.0	0.5	-0.1	+0.0	-0.1
B736	0.1	0.0	0.1	0.0	0.0	0.0	-0.0	-0.0	-0.1
B738	0.8	0.0	0.8	0.7	0.0	0.7	-0.1	-0.0	-0.1
B744G	0.0	0.6	0.6	0.0	0.5	0.5	-0.0	-0.1	-0.1
B744P	0.4	1.0	1.3	0.2	0.4	0.6	-0.1	-0.5	-0.7
B744R	0.6	12.8	13.4	0.9	13.2	14.2	+0.4	+0.4	+0.8
B747SP	0.0	0.0	0.0	0.0	0.0	0.0	-0.0	0.0	-0.0
B753	0.0	0.0	0.0	0.0	0.0	0.0	+0.0	0.0	+0.0
B757C	0.2	0.0	0.2	0.3	0.0	0.3	+0.1	0.0	+0.1
B757E	0.1	1.1	1.2	0.0	1.2	1.2	-0.0	+0.0	-0.0
B757P	0.0	0.0	0.0	0.0	0.0	0.0	+0.0	-0.0	-0.0
B762	0.0	0.0	0.0	0.0	0.0	0.0	+0.0	+0.0	+0.0
B763G	0.1	1.2	1.2	0.0	1.4	1.5	-0.0	+0.2	+0.2
B763P	0.1	1.4	1.4	0.0	1.5	1.5	-0.0	+0.1	+0.1
B763R	0.7	1.2	1.9	1.9	1.4	3.3	+1.2	+0.1	+1.4
B764	0.0	1.8	1.8	0.0	1.5	1.6	0.0	-0.2	-0.2
B772G	0.6	8.0	8.6	0.8	8.1	9.0	+0.2	+0.1	+0.3
B772P	0.0	0.9	0.9	0.0	1.5	1.5	-0.0	+0.6	+0.6
B772R	0.3	5.6	6.0	0.6	4.3	4.8	+0.2	-1.4	-1.2
B773G	0.4	3.7	4.1	0.8	5.4	6.2	+0.3	+1.8	+2.1
B773R	0.0	0.2	0.2	0.0	0.0	0.0	0.0	-0.2	-0.2
B788	0.0	0.0	0.0	0.0	0.2	0.2	+0.0	+0.2	+0.2
BA46	0.0	0.0	0.0	0.0	0.0	0.0	+0.0	-0.0	+0.0
CRJ900	0.0	0.0	0.0	0.0	0.0	0.0	+0.0	+0.0	+0.0
EA30	0.6	0.0	0.6	0.6	0.0	0.7	+0.0	-0.0	+0.0
EA31	0.0	0.0	0.0	0.0	0.0	0.0	-0.0	0.0	-0.0
EA318	0.0	0.0	0.0	0.0	0.0	0.0	-0.0	0.0	-0.0
EA319C	1.7	0.4	2.2	1.3	0.6	1.8	-0.4	+0.1	-0.3
EA319V	1.9	1.2	3.0	2.0	1.7	3.7	+0.1	+0.5	+0.6
EA320C	2.7	0.2	2.9	3.2	0.3	3.5	+0.5	+0.1	+0.6
EA320V	2.5	0.8	3.3	1.3	0.9	2.2	-1.2	+0.1	-1.1
EA321C	0.9	0.1	1.0	0.9	0.2	1.1	-0.0	+0.1	+0.0
EA321V	1.5	0.6	2.1	1.8	0.7	2.5	+0.3	+0.1	+0.4
EA33	0.3	4.6	5.0	0.7	3.6	4.3	+0.4	-1.0	-0.6
EA34	0.5	1.1	1.6	0.4	0.4	0.8	-0.1	-0.6	-0.7
EA346	0.7	4.0	4.7	0.6	3.5	4.1	-0.1	-0.5	-0.6
EA38GP	0.2	0.1	0.3	0.2	0.5	0.7	+0.0	+0.4	+0.4
EA38R	0.4	3.1	3.5	0.6	3.8	4.4	+0.2	+0.7	+0.9
ERJ	0.1	0.1	0.2	0.0	0.0	0.0	-0.1	-0.1	-0.2
ERJ170	0.0	0.0	0.0	0.0	0.0	0.0	+0.0	-0.0	-0.0
ERJ190	0.3	0.0	0.3	0.2	0.0	0.2	-0.1	-0.0	-0.1
EXE2	0.0	0.0	0.0	0.0	0.0	0.0	+0.0	0.0	+0.0
EXE3	0.1	0.2	0.3	0.1	0.1	0.1	-0.1	-0.1	-0.2
FK10	0.1	0.0	0.1	0.0	0.0	0.0	-0.1	-0.0	-0.1
LTT	0.0	0.0	0.0	0.0	0.0	0.0	+0.0	+0.0	+0.0
MD80	0.0	0.0	0.0	0.0	0.0	0.0	+0.0	0.0	+0.0
STP	0.0	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
STT	0.0	0.0	0.1	0.1	0.1	0.1	+0.0	+0.0	+0.0
Total	19.6	56.1	**75.8**	21.0	57.0	**78.0**	+1.4	+0.9	**+2.2**
							(+6.9%)	(+1.6%)	**(+3.0%)**

Note: totals may not sum exactly due to rounding.

Table A5 Heathrow traffic movements for the average 6.5-hour night (2330-0600 local time) by ANCON type for years 2012 and 2013

ANCON type	2012 departs	2012 arrivals	2012 total	2013 departs	2013 arrivals	2013 total	change departs	change arrivals	change total
B733	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B736	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B738	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
B744G	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B744P	0.1	0.3	0.4	0.0	0.0	0.0	0.0	-0.3	-0.3
B744R	0.3	5.1	5.4	0.2	5.1	5.3	-0.1	0.0	-0.1
B757C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B757E	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B762	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B763G	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B763P	0.0	0.6	0.6	0.0	0.3	0.3	0.0	-0.4	-0.4
B763R	0.1	0.0	0.1	0.2	0.1	0.2	+0.1	+0.1	+0.1
B764	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B772G	0.2	1.0	1.1	0.2	1.1	1.3	0.0	+0.1	+0.1
B772P	0.0	0.1	0.1	0.0	0.5	0.5	0.0	+0.5	+0.5
B772R	0.1	1.0	1.1	0.1	0.8	0.9	0.0	-0.2	-0.2
B773G	0.1	1.8	1.9	0.1	2.1	2.2	0.0	+0.3	+0.4
B788	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA319C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA319V	0.0	0.2	0.3	0.1	0.1	0.2	0.0	-0.1	-0.1
EA320C	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0
EA320V	0.1	0.2	0.3	0.1	0.2	0.2	0.0	0.0	-0.1
EA321C	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
EA321V	0.1	0.1	0.2	0.1	0.1	0.3	0.0	0.0	+0.1
EA33	0.1	0.4	0.4	0.1	0.0	0.2	+0.1	-0.3	-0.3
EA34	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
EA346	0.1	0.9	1.1	0.1	0.9	1.0	0.0	0.0	0.0
EA38GP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA38R	0.1	2.1	2.3	0.1	2.9	3.0	0.0	+0.8	+0.7
ERJ	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
ERJ190	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EXE2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EXE3	0.0	0.1	0.1	0.0	0.0	0.1	0.0	-0.1	-0.1
LTT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MD11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STT	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0
Total	1.8	14.2	**16.0**	1.8	14.6	**16.4**	0.0	+0.4	**+0.4**
							(0%)	(+2.9%)	**(+2.3%)**

Notes:

- Totals may not sum exactly due to rounding.
- The night quota period for year 2013 (summer and winter seasons combined) was 31 March 2013 to 30 March 2014.

Appendix B – ANCON type descriptions

Table B1 Description of ANCON aircraft types

ANCON Type	Type Description
B717	Boeing 717
B727	Boeing 727 (Chapter 2&3)
B732	Boeing 737-200 (Chapter 2&3)
B733	Boeing 737-300/400/500 series
B736	Boeing 737-600/700 series
B738	Boeing 737-800/900 series
B747	Boeing 747-100 & 200/300 series certificated to Chapter 3
B744G	Boeing 747-400 series with General Electric engines
B744P	Boeing 747-400 series with Pratt and Whitney engines
B744R	Boeing 747-400 series with Rolls-Royce engines
B747SP	Boeing 747SP series
B753	Boeing 757-300
B757C	Boeing 757-200 series with RB211-535C engines
B757E	Boeing 757-200 series with RB211-535E4/E4B engines
B757P	Boeing 757-200 series with Pratt and Whitney engines
B762	Boeing 767-200 series
B763G	Boeing 767-300 series with General Electric engines
B763P	Boeing 767-300 series with Pratt and Whitney engines
B763R	Boeing 767-300 series with Rolls-Royce engines
B764	Boeing 767-400 series
B772G	Boeing 777-200 series with General Electric engines
B772P	Boeing 777-200 series with Pratt and Whitney engines
B772R	Boeing 777-200 series with Rolls-Royce engines
B773G	Boeing 777-200LR/300ER series with General Electric engines
B773P	Boeing 777-300 series with Pratt and Whitney engines
B773R	Boeing 777-300 series with Rolls-Royce engines
B788	Boeing 787-8 series
BA46	BAe 146/Avro RJ series
CRJ	Bombardier Regional Jet 100/200
CRJ700	Bombardier Regional Jet 700
CRJ900	Bombardier Regional Jet 900

ANCON Type	Type Description
DC87	McDonnell Douglas DC8-70 series
DC10	McDonnell Douglas DC10 series
EA30	Airbus A300 series
EA31	Airbus A310 series
EA318	Airbus A318 series
EA319C	Airbus A319 series with CFM-56 engines
EA319V	Airbus A319 series with AE-V2500 engines
EA320C	Airbus A320 series with CFM-56 engines
EA320V	Airbus A320 series with AE-V2500 engines
EA321C	Airbus A321 series with CFM-56 engines
EA321V	Airbus A321 series with AE-V2500 engines
EA33	Airbus A330 series
EA34	Airbus A340-200/300/500 series
EA346	Airbus A340-500/600
EA38GP	Airbus A380 with Engine Alliance GP7000 engines
EA38R	Airbus A380 with Rolls-Royce Trent 900 engines
ERJ	Embraer EMB135/145 series
ERJ170	Embraer E-170
ERJ190	Embraer E-190
EXE2	Chapter 2 executive jets
EXE3	Chapter 3 executive jets
FK10	Fokker 70/100 series
L101	Lockheed L1011-TriStar series
L4P	Large four-engined propeller
LTT	Large twin-turboprop
MD11	McDonnell-Douglas MD11 series
MD80	McDonnell-Douglas MD80 series
SP	Single piston
STP	Small twin-piston
STT	Small twin-turboprop
TU54	Tupolev Tu-154 series

Appendix C – 2012 and 2013 noise contour results in cumulative format

Table C1 Heathrow L_{den} area, population and household cumulative estimates for years 2012 and 2013

L_{den} (dBA)	2012	2013	Change	% Change
	Area (km^2)			
> 55	216.9	219.3	+2.4	+1%
> 60	80.4	79.6	-0.8	-1%
> 65	31.8	32.7	+0.9	+3%
> 70	10.9	10.8	-0.1	-1%
> 75	3.9	4.0	+0.1	3%
	Population (thousands)			
> 55	725.0	752.9	+27.9	+4%
> 60	179.3	202.0	+22.7	+13%
> 65	44.2	55.3	+11.1	+25%
> 70	5.5	6.0	+0.5	+9%
> 75	0.1	0.1	0.0	0%
	Households (thousands)			
> 55	312.5	309.1	-3.4	-1%
> 60	74.5	75.2	+0.7	1%
> 65	17.3	18.9	+1.6	9%
> 70	2.0	2.0	0.0	0%
> 75	< 0.1	< 0.1	0.0	(n/a)

Table C2 Heathrow L_{day} area, population and household cumulative estimates for years 2012 and 2013

L_{day} (dBA)	2012	2013	Change	% Change
	Area (km^2)			
> 55	161.3	160.7	-0.6	0%
> 60	58.7	58.3	-0.4	-1%
> 65	24.3	24.4	+0.1	0%
> 70	7.9	7.9	0.0	0%
> 75	3.0	3.0	0.0	0%
	Population (thousands)			
> 55	429.8	448.3	+18.5	+4%
> 60	108.2	124.4	+16.2	+15%
> 65	18.5	21.4	+2.9	+16%
> 70	1.8	2.1	+0.3	+17%
> 75	< 0.1	< 0.1	0.0	(n/a)
	Households (thousands)			
> 55	181.2	175.6	-5.6	-3%
> 60	43.2	44.1	+0.9	2%
> 65	7.1	7.0	-0.1	-1%
> 70	0.7	0.7	0.0	0%
> 75	< 0.1	< 0.1	0.0	(n/a)

Note: 2012 data are based on a 2012 CACI update of the 2001 Census, whilst the 2013 data is a 2013 CACI update of the 2011 Census.

Table C3 Heathrow $L_{evening}$ area, population and household cumulative estimates for years 2012 and 2013

$L_{evening}$ (dBA)	2012	2013	Change	% Change
	Area (km^2)			
> 55	156.9	147.6	-9.3	-6%
> 60	55.8	53.1	-2.7	-5%
> 65	23.3	22.4	-0.9	-4%
> 70	7.8	7.3	-0.5	-6%
> 75	3.0	2.9	-0.1	-3%
	Population (thousands)			
> 55	382.2	397.5	+15.3	+4%
> 60	87.8	104.8	+17.0	+19%
> 65	13.8	15.2	+1.4	+10%
> 70	1.0	1.2	+0.2	+20%
> 75	0.0	0.0	0.0	(n/a)
	Households (thousands)			
> 55	158.9	153.2	-5.7	-4%
> 60	34.7	36.9	+2.2	+6%
> 65	5.2	5.1	-0.1	-2%
> 70	0.5	0.5	0.0	0%
> 75	0.0	0.0	0.0	(n/a)

Table C4 Heathrow L_{night} area, population and household cumulative estimates for years 2012 and 2013

L_{night} (dBA)	2012	2013	Change	% Change
	Area (km^2)			
> 50	73.7	76.5	+2.8	+4%
> 55	27.3	30.0	+2.7	+10%
> 60	9.1	9.9	+0.8	+9%
> 65	3.2	3.6	+0.4	+13%
> 70	1.4	1.5	+0.1	+7%
	Population (thousands)			
> 50	197.0	219.1	+22.1	+11%
> 55	59.8	72.3	+12.5	+21%
> 60	12.3	13.3	+1.0	+8%
> 65	1.6	1.3	-0.3	-19%
> 70	0.0	0.0	0.0	(n/a)
	Households (thousands)			
> 50	82.2	83.8	+1.6	+2%
> 55	23.0	24.6	+1.6	+7%
> 60	4.4	4.1	-0.3	-7%
> 65	0.5	0.4	-0.1	-20%
> 70	0.0	0.0	0.0	(n/a)

Note: 2012 data are based on a 2012 CACI update of the 2001 Census, whilst the 2013 data is a 2013 CACI update of the 2011 Census.

Table C5 Heathrow $L_{eq,6.5hr\ night}$ area, population and household estimates for years 2012 and 2013

$L_{eq,6.5hr\ night}$ (dBA)	2012	2013	Change	% Change
	Area (km^2)			
> 48	42.5	41.0	-1.5	-4%
	Population (thousands)			
> 48	106.9	132.9	+26.0	24%
	Households (thousands)			
> 48	42.7	47.9	+5.2	12%

Note: 2012 data are based on a 2012 CACI update of the 2001 Census, whilst the 2013 data is a 2013 CACI update of the 2011 Census.

Appendix D – 2006 and 2013 noise contour results in cumulative format

Table D1 Heathrow L_{den} area, population and household cumulative estimates for years 2006 and 2013

L_{den} (dBA)	2006	2013	Change	% Change
	Area (km^2)			
> 55	244.7	219.3	-25.4	-10%
> 60	92.7	79.6	-13.1	-14%
> 65	37.1	32.7	-4.4	-12%
> 70	13.7	10.8	-2.9	-21%
> 75	5.0	4.0	-1.0	-20%
	Population (thousands)			
> 55	756.1	752.9 (669.3)	-3.2 (-86.8)	0% (-11%)
> 60	194.6	202.0 (166.6)	+7.4 (-28.0)	+4% (-14%)
> 65	54.3	55.3 (44.9)	+1.0 (-9.4)	+2% (-17%)
> 70	9.6	6.0 (5.2)	-3.6 (-4.4)	-38% (-46%)
> 75	0.7	0.1 (< 0.1)	-0.6 (n/a)	-86% (n/a)
	Households (thousands)			
> 55	338.5	309.1 (298.7)	-29.4 (-39.8)	-9% (-12%)
> 60	81.6	75.2 (69.5)	-6.4 (-12.1)	-8% (-15%)
> 65	21.4	18.9 (17.6)	-2.5 (-3.8)	-12% (-18%)
> 70	3.5	2.0 (1.9)	-1.5 (-1.6)	-43% (-46%)
> 75	0.3	< 0.1 (< 0.1)	(n/a) (n/a)	(n/a) (n/a)

Note: 2006 data are based on a 2006 CACI update of the 2001 Census, whilst the 2013 data is a 2013 CACI update of the 2011 Census. 2013 data assuming the population database had stayed unchanged from 2006 are shown in brackets in blue.

Table D2 Heathrow L_{day} area, population and household cumulative estimates for years 2006 and 2013

L_{day} (dBA)	2006	2013	Change	% Change
	Area (km^2)			
> 55	177.7	160.7	-17.0	-10%
> 60	64.0	58.3	-5.7	-9%
> 65	27.2	24.4	-2.8	-10%
> 70	9.3	7.9	-1.4	-15%
> 75	3.5	3.0	-0.5	-14%
	Population (thousands)			
> 55	485.6	448.3 (388.6)	-37.3 (-97.0)	-8% (-20%)
> 60	111.0	124.4 (100.5)	+13.4 (-10.5)	+12% (-9%)
> 65	24.1	21.4 (18.0)	-2.7 (-6.1)	-11% (-25%)
> 70	2.8	2.1 (1.6)	-0.7 (-1.2)	-25% (-43%)
> 75	< 0.1	< 0.1 (< 0.1)	(n/a) (n/a)	(n/a) (n/a)
	Households (thousands)			
> 55	210.5	175.6 (166.0)	-34.9 (-44.5)	-17% (-21%)
> 60	44.9	44.1 (40.4)	-0.8 (-4.5)	-2% (-10%)
> 65	9.2	7.0 (6.8)	-2.2 (-2.4)	-24% (-26%)
> 70	1.0	0.7 (0.7)	-0.3 (-0.3)	-30% (-30%)
> 75	< 0.1	< 0.1 (< 0.1)	(n/a) (n/a)	(n/a) (n/a)

Note: 2006 data are based on a 2006 CACI update of the 2001 Census, whilst the 2013 data is a 2013 CACI update of the 2011 Census. 2013 data assuming the population database had stayed unchanged from 2006 are shown in brackets in blue.

Table D3 Heathrow $L_{evening}$ area, population and household cumulative estimates for years 2006 and 2013

$L_{evening}$ (dBA)	2006	2013	Change	% Change
	Area (km^2)			
> 55	185.6	147.6	-38.0	-20%
> 60	66.1	53.1	-13.0	-20%
> 65	28.1	22.4	-5.7	-20%
> 70	10.0	7.3	-2.7	-27%
> 75	3.8	2.9	-0.9	-24%
	Population (thousands)			
> 55	450.5	397.5 (341.2)	-53.0 (-109.3)	-12% (-24%)
> 60	106.3	104.8 (85.2)	-1.5 (-21.1)	-1% (-20%)
> 65	20.5	15.2 (13.1)	-5.3 (-7.4)	-26% (-36%)
> 70	2.4	1.2 (0.8)	-1.2 (-1.6)	-50% (-67%)
> 75	< 0.1	0.0 (0.0)	(n/a) (n/a)	(n/a) (n/a)
	Households (thousands)			
> 55	192.6	153.2 (143.8)	-39.4 (-48.8)	-20% (-25%)
> 60	42.4	36.9 (34.0)	-5.5 (-8.4)	-13% (-20%)
> 65	7.9	5.1 (5.1)	-2.8 (-2.8)	-35% (-35%)
> 70	1.0	0.5 (0.3)	-0.5 (-0.7)	-50% (-70%)
> 75	< 0.1	0.0 (0.0)	0.0 (n/a)	(n/a) (n/a)

Note: 2006 data are based on a 2006 CACI update of the 2001 Census, whilst the 2013 data is a 2013 CACI update of the 2011 Census. 2013 data assuming the population database had stayed unchanged from 2006 are shown in brackets in blue.

Table D4 Heathrow L_{night} area, population and household cumulative estimates for years 2006 and 2013

L_{night} (dBA)	2006	2013	Change	% Change
	Area (km^2)			
> 50	84.4	76.5	-7.9	-9%
> 55	34.2	30.0	-4.2	-12%
> 60	11.9	9.9	-2.0	-17%
> 65	4.5	3.6	-0.9	-20%
> 70	1.8	1.5	-0.3	-17%
	Population (thousands)			
> 50	207.2	219.1 (185.8)	+11.9 (-21.4)	+6% (-10%)
> 55	62.0	72.3 (57.3)	+10.3 (-4.7)	+17% (-8%)
> 60	16.3	13.3 (11.4)	-3.0 (-4.9)	-18% (-30%)
> 65	1.7	1.3 (1.1)	-0.4 (-0.6)	-24% (-35%)
> 70	< 0.1	0.0 (0.0)	(n/a) (n/a)	(n/a) (n/a)
	Households (thousands)			
> 50	88.9	83.8 (78.8)	-5.1 (-10.1)	-6% (-11%)
> 55	24.1	24.6 (22.3)	+0.5 (-1.8)	+2% (-7%)
> 60	6.0	4.1 (4.0)	-1.9 (-2.0)	-32% (-33%)
> 65	0.6	0.4 (0.4)	-0.2 (-0.2)	-33% (-33%)
> 70	< 0.1	0.0 (0.0)	0.0 (n/a)	(n/a) (n/a)

Note: 2006 data are based on a 2006 CACI update of the 2001 Census, whilst the 2013 data is a 2013 CACI update of the 2011 Census. 2013 data assuming the population database had stayed unchanged from 2006 are shown in brackets in blue.

Table D5 Heathrow $L_{eq,6.5hr\ night}$ area, population and household estimates for years 2006 and 2013

$L_{eq,6.5hr\ night}$ (dBA)	2006	2013	Change	% Change
	Area (km^2)			
> 48	56.4	41.0	-15.4	-27%
	Population (thousands)			
> 48	137.4	132.9 (108.3)	-4.5 (-29.1)	-3% (-21%)
	Households (thousands)			
> 48	57.5	47.9 (44.3)	-9.6 (-13.2)	-17% (-23%)

Notes:

- 2006 population data are based on 2006 CACI update of the 2001 Census, whilst the 2013 is based on a 2013 update of the 2011 Census. 2013 data assuming the population database had stayed unchanged from 2006 are shown in brackets in blue.
- 2006 results are based on data recorded over the 2006 calendar year. 2013 results are based on data recorded from 31 March 2013 to 30 March 2014.

Table D6 Heathrow area and population estimates for year 2013 using year 2006 modal splits

Contour	Modal split	Pop. database	Area (km^2)	Population (thousands)
2013 L_{den} (55 dB)	**2013 (67/33)**	**2013**	**219.3**	**752.9**
2013 L_{den} (55 dB)	2006 (70/30)	2013	218.3 (-0.5%)	752.4 (-0.1%)
2013 L_{den} (55 dB)	2006 (70/30)	2006	218.3	667.5
2006 L_{den} (55 dB)	*2006 (70/30)*	*2006*	*244.7*	*756.1*
2013 L_{day} (55 dB)	**2013 (67/33)**	**2013**	**160.7**	**448.3**
2013 L_{day} (55 dB)	2006 (70/30)	2013	160.7 (-)	455.7 (+1.7%)
2013 L_{day} (55 dB)	2006 (70/30)	2006	160.7	396.5
2006 L_{day} (55 dB)	*2006 (70/30)*	*2006*	*177.7*	*485.6*
2013 $L_{evening}$ (55 dB)	**2013 (64/36)**	**2013**	**147.6**	**397.5**
2013 $L_{evening}$ (55 dB)	2006 (71/29)	2013	149.0 (+0.9%)	385.9 (-2.9%)
2013 $L_{evening}$ (55 dB)	2006 (71/29)	2006	149.0	331.9
2006 $L_{evening}$ (55 dB)	*2006 (71/29)*	*2006*	*185.6*	*450.5*
2013 L_{night} (50 dB)	**2013 (69/31)**	**2013**	**76.5**	**219.1**
2013 L_{night} (50 dB)	2006 (72/28)	2013	76.8 (+0.4%)	216.9 (-1.0%)
2013 L_{night} (50 dB)	2006 (72/28)	2006	76.8	184.0
2006 L_{night} (50 dB)	*2006 (72/28)*	*2006*	*84.4*	*207.2*
2013 $L_{eq,6.5hr\ night}$ (48 dB)	**2013 (76/24)**	**2013**	**41.0**	**132.9**
2013 $L_{eq,6.5hr\ night}$ (48 dB)	2006 (73/27)	2013	41.6 (+1.5%)	125.9 (-5.3%)
2013 $L_{eq,6.5hr\ night}$ (48 dB)	2006 (73/27)	2006	41.6	102.7
2006 $L_{eq,6.5hr\ night}$ (48 dB)	*2006 (73/27)*	*2006*	*56.4*	*137.4*

Note: the area and population percentage changes are relative to the year 2013 actual modal split contour and 2013 population database results (in bold). The 2006 results are given in italics for reference.

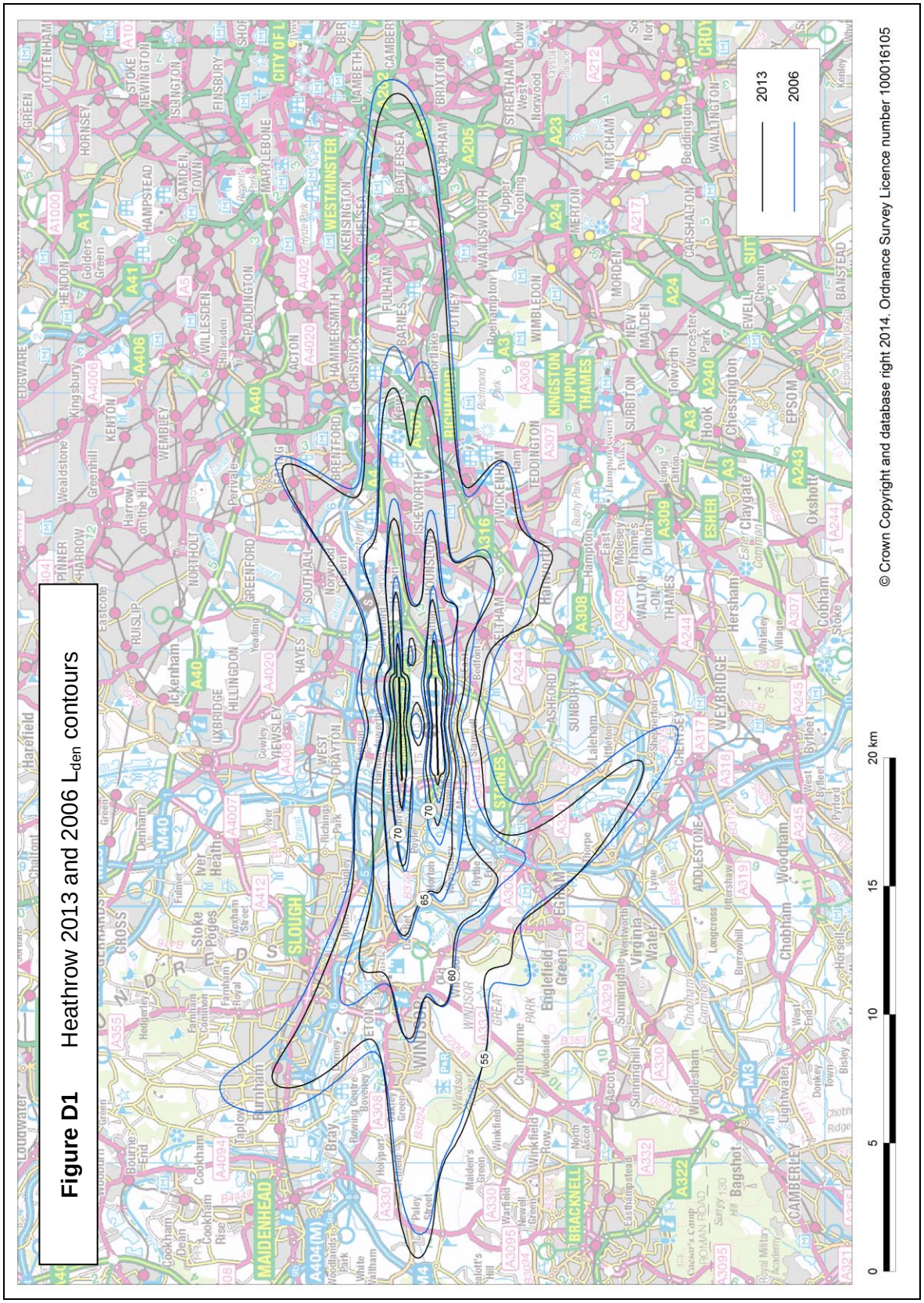


Figure D1 Heathrow 2013 and 2006 L_{den} contours

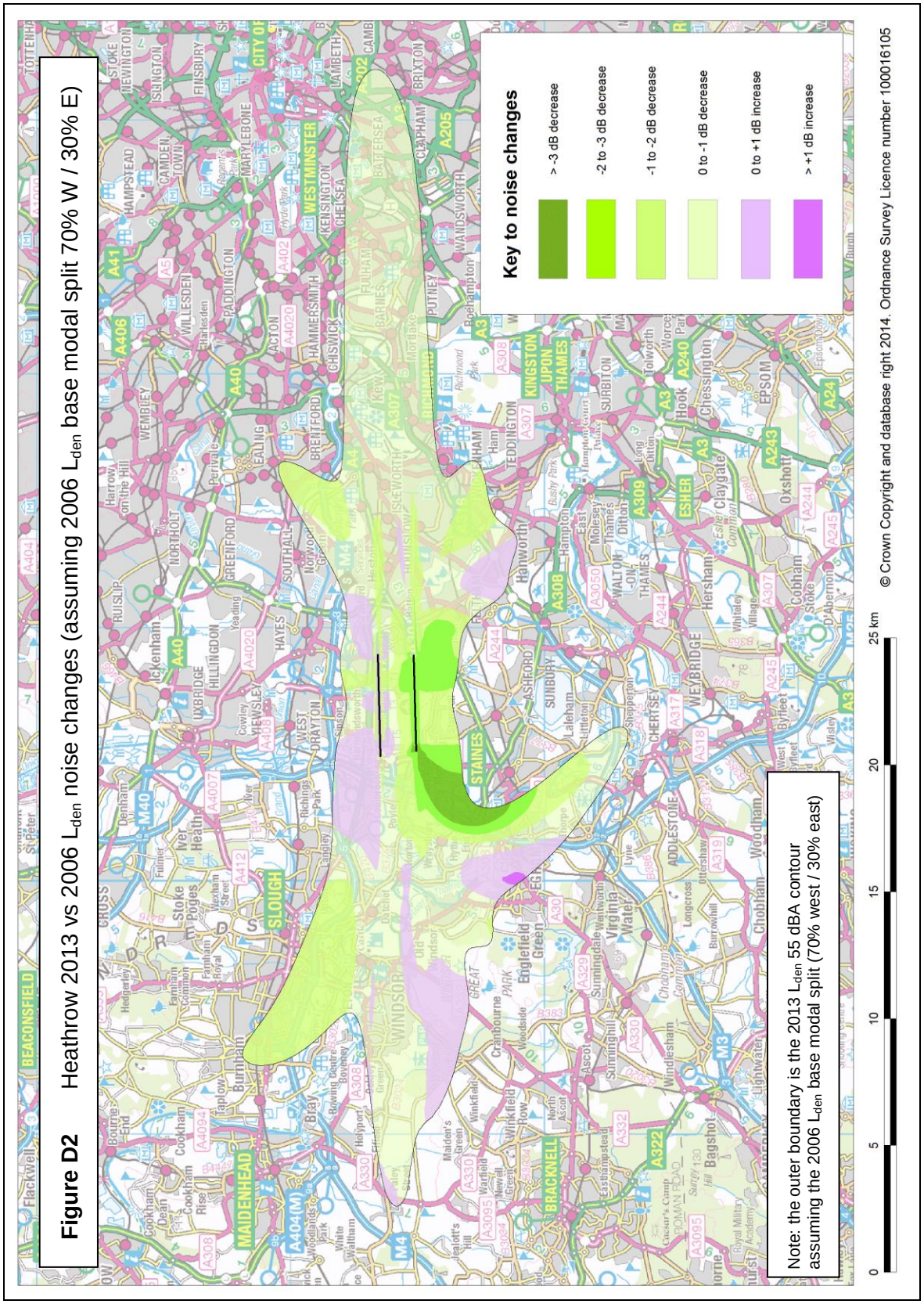


Figure D2 Heathrow 2013 vs 2006 L_{den} noise changes (assuming 2006 L_{den} base modal split 70% W / 30% E)

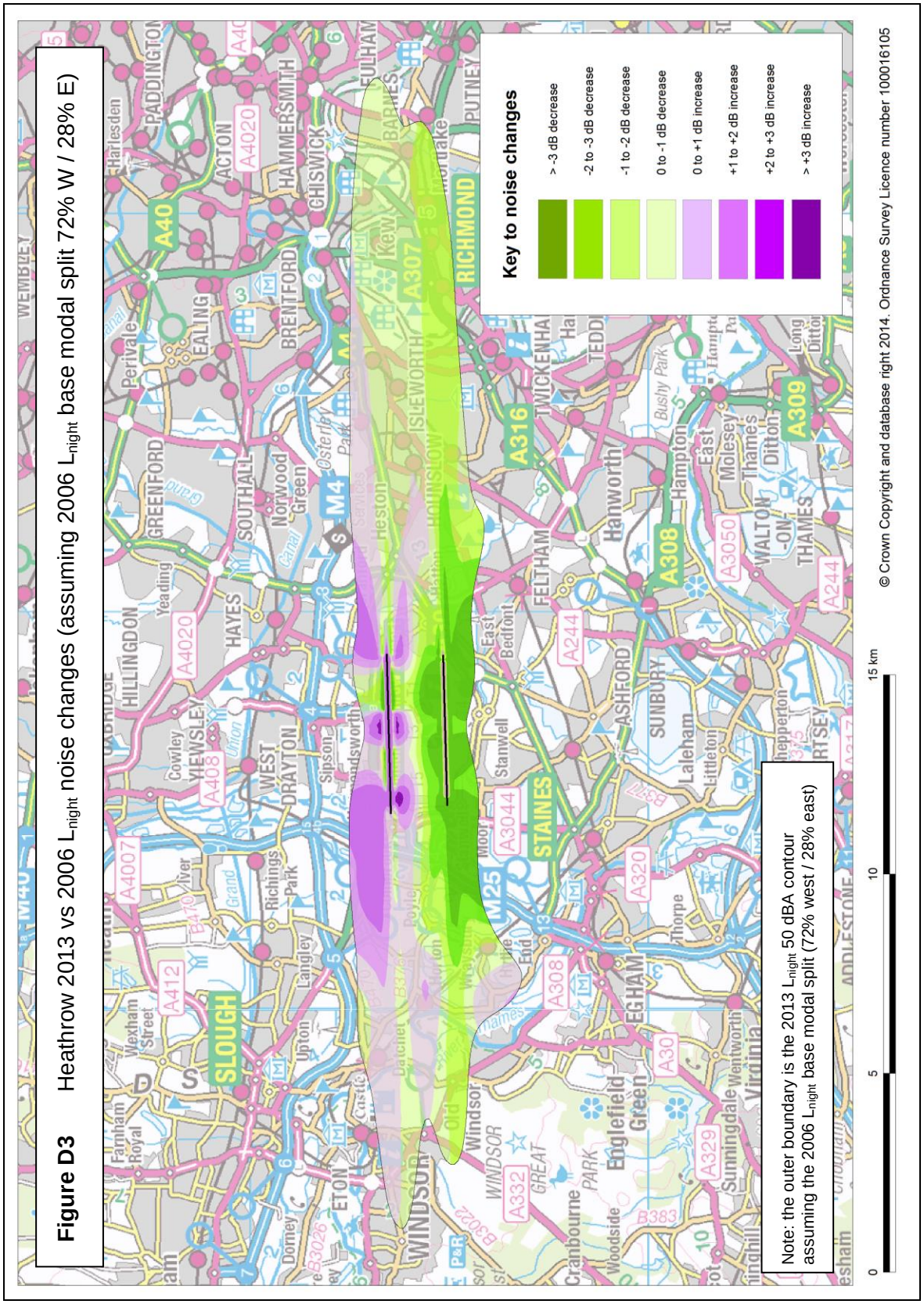


Figure D3 Heathrow 2013 vs 2006 L_{night} noise changes (assuming 2006 L_{night} base modal split 72% W / 28% E)

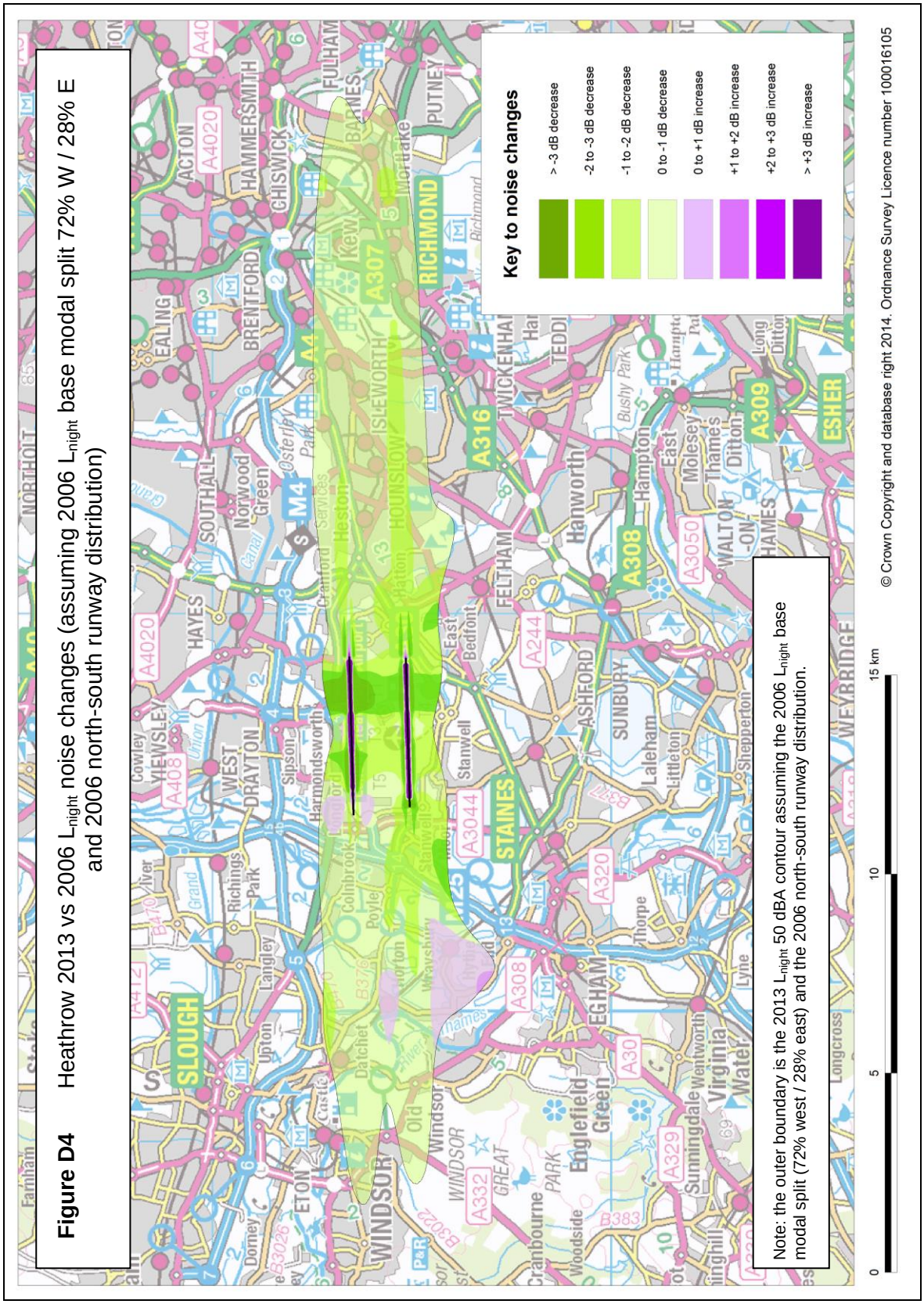


Figure D4 Heathrow 2013 vs 2006 L_{night} noise changes (assuming 2006 L_{night} base modal split 72% W / 28% E and 2006 north-south runway distribution)