Environmental Research and Consultancy Department

Civil Aviation Authority

Heathrow Airport 2016 Summer Noise Contours and Noise Action Plan Contours

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Summary

Overview

1. This report presents Heathrow 2016 average summer 16-hour day and 8-hour night Leq contours, as well as 2016 annual L_{day}, $L_{evening}$, L_{night}, L_{den} and $L_{eq,6.5hr\ night}$ noise contours to meet the requirements of Heathrow Airport's Noise Action Plan. Supplementary metrics N65 and N70 annual 16-hour day contours, and N60 annual 8-hour night contours, have also been produced. Long-term trends from years 2006 to 2016 are examined and comparisons made with the 2006 (base year) and 2015 results.

2. Additional diagrams have been produced showing: single mode (i.e. 100% W and 100% E) contours; overflight contours and flight track density diagrams up to 4,000 ft amsl, based on the new 'overflight' metric proposed by the CAA; noise changes between 2006 and 2016, and noise changes between 2015 and 2016.

3. Although 2016 had the highest passenger traffic, the L_{den} 55 dBA contour had its smallest area and the fewest number of people living within it over the 11-year study period (2006-2016).

Movements in 2016

4. Average summer day movements at Heathrow decreased by 0.6% in 2016 compared to 2015. In contrast, summer night movements rose by 6%, which was solely due to an increase in departures. Most of the departure increases took place in the hours 2300-0000 and 0600-0700. The Boeing 787-9 aircraft type had the highest increase in numbers in both the summer day (+27) and night (+4) periods.

5. Aircraft movements over the 2016 annual L_{day} 12-hour period decreased by 0.2%. Similarly, there was a 0.3% decrease in movements over the annual $L_{evening}$ 4-hour period. However, annual L_{night} 8-hour movements rose by 3%. Total movements over the 2016 annual L_{den} average 24-hour period (1297.4) were marginally lower than in 2015 (1297.9). Movements were 5% higher for the 2016 $L_{eq,6.5hr\ night}$ period compared to 2015.

6. The largest increase in movements over the 2016 annual average 24-hour period was for the Boeing 787-9 (+27 movements). This was followed by increases for the Airbus A320 with CFM56 engines and the Airbus A319 with IAE V2500 engines (+7 movements each). The highest decreases were for the Airbus A319 with CFM56 engines (-17) and the Airbus A320 with IAE V2500 engines (-11). Boeing 747-400 aircraft movements fell by 14 per 24-hour day.

7. The estimated percentage of aircraft in the fleet mix meeting the ICAO Chapter 4 noise standard has risen from 94% in 2006 to 99% in 2014 through to 2016[1].

2016 summer Leq contours

8. The Leq noise modelling results for the average summer day (actual modal split) showed that contour areas have fallen by up to 4% in 2016 compared to 2015. This can be attributed to the ongoing introduction of more modern, quieter types such as the Boeing 787-9, and also to arrival noise adjustments made to the Airbus A319/A320/A321 types with IAE V2500 engines, which noise measurements indicated were quieter in 2016. Population and household counts within the contours mostly decreased.

9. Average summer night Leq contour areas, however, increased in 2016 by up to 8%. This was caused by a 6% rise in traffic, which was solely due to an increase in departures. Population and household counts increased for the most part in 2016.

2016 Noise Action Plan contours

10. The noise modelling results showed that the $L_{day,}$ $L_{evening}$ and L_{den} 5 dB contour band areas in 2016 were nearly all smaller than in 2015. A similar result was found for the cumulative contour areas. For example, the 2016 L_{den} 55 dBA contour area of 198.0 km^2 was 1% smaller than in 2015 (200.0 km^2). The area reductions can be attributed to a switch to more modern, quieter aircraft types such as the Airbus A380 and Boeing 787-9, and also to reductions in the arrival noise levels of ANCON aircraft types such as the EA319V and EA320V as identified by noise measurements undertaken in 2016. Populations and households within the contours mostly fell in unison with the area decreases.

11. The 2016 L_{night} contour areas were similar to 2015, with a 3% rise in annual 8-hour night movements offset by the switch to more modern, quieter aircraft types. A population count increase within the 50-55 dBA band in 2016 resulted from a higher percentage of easterly arrivals, which stretched the 50 dBA contour over Windsor. The 2016 $L_{eq,6.5hr\ night}$ 48 dBA contour area increased by 3% to 33.9 km^2 as movements rose by 5%. Despite the area increase, populations and households dropped as the contour moved away from populated parts of Kew because of the lower percentage of westerly arrivals in 2016.

Trends since 2006

12. An examination of the long-term trends between 2006 and 2016 showed that the annual L_{day} 55 dBA contour area has been fairly steady since 2009 after the initial high in 2006, though it dipped in 2010, 2015 and 2016. Populations and

[1] Chapter 4 compliance was 99.45% in 2016 according to data provided by HAL.

households fell to a low in 2010 after dropping steadily since 2006. Movements were also at a low in 2010. After rising in 2011, the population count increased in 2013 due to the population database update, before decreasing in 2015 and 2016 in line with the reduction in contour area.

13. The area, population and households within the annual $L_{evening}$ 55 dBA contour decreased in 2009 from the 2006 level as movements declined, but rose again to a high in 2011 as movements recovered. Since 2011 the area, population and households have generally followed a downward trend, apart from in 2013 when the population increased after a major update to the population database. Movements declined between 2011 and 2014, before rising in 2015 and levelling off in 2016.

14. For the annual L_{night} 50 dBA contour, aircraft movements and contour areas have been relatively stable since 2011. Prior to 2011 the area was higher but also at a steady level. The L_{night} population and household counts followed a downward trend from 2009 to 2012, but have been relatively high since 2013 due to various factors. There was a major update to the population database in 2013, when data from the 2011 Census was used for the first time, and runway resurfacing works in 2013 and 2014 affected the contour shape. A higher percentage of westerly movements and a reversion to a 'normal' usage split between the northern and southern runways influenced the contour shape in 2015.

15. After the 2006 base year, annual L_{den} 55 dBA contour areas were fairly flat between 2009 and 2013, but since then have mostly fallen as the Heathrow fleet continued its switch to more modern and quieter types such as the Airbus A380, Boeing 777-300ER and Boeing 787-8/9. Population and household counts have generally declined since 2011, although in 2013 the population count increased following a major update to the population database. Movements have been at a relatively steady level between 2006 and 2016, apart from a dip in 2010.

16. The $L_{eq,6.5hr\ night}$ 48 dBA area was at a high in the 2006 base year, but after dropping in 2009 and then rising to a high in 2010, has been trending downwards. Movements since 2011 have been steady. Following two years of population decreases in 2011 and 2012, the population rose in 2013 due to an extension of the contour over west London in line with the northern runway (the southern runway was resurfaced in 2013). However, in 2014 the population count fell to near 2012 levels as the contour area reduced, and declined further in 2015 as more movements of the Boeing 747-400 with Rolls-Royce engines were phased out. Another drop in population and households occurred in 2016 as a shift in the arrival modal split moved the contour away from populated parts of Kew.

17. Between the 2006 base year and 2016 there has been a 59% reduction in movements by Boeing 747-400 aircraft over the annual 24-hour period. Newer aircraft types such as the Airbus A380 and Boeing 787 were not in service in

2006, but by 2016 there were on average 50 movements of the Airbus A380 and 75 movements of the Boeing 787-8/9 over the average 24-hour period.

18. The 2016 *cumulative* contour areas were below 2006 base year levels for all the noise metrics considered. For example, the 2016 L_{den} 55 dBA contour area of 198.0 km^2 was 19% smaller than the area in 2006 (244.7 km^2). Despite the area decreases, population counts for some contour levels were higher in 2016. This was due to population encroachment around Heathrow between 2006 and 2016. Had the population database remained unchanged between 2006 and 2016, the population and household counts for the 2016 contours would have all been lower than in 2006. For example, the L_{den} 55 dBA population count in 2006 was 756,100, decreasing by 9% to 689,400 in 2016. Had the population remained at 2006 levels in 2016, the 2016 population count would have been 599,800, a decrease of 21% from 2006. This means that in the period 2006-2016 the reducing contour area meant that 66,700 people were effectively moved out of the L_{den} 55 dBA contour. This figure would have been 156,300 had the population not grown.

Noise change analysis

19. An analysis of L_{den} noise changes between 2006 and 2016 (assuming 2006 base year runway modal splits) revealed that most areas within the 2016 L_{den} 55 dBA contour have experienced noise reductions of up to 3 dB. There were a few areas that were exposed to increases in noise levels, of less than 1 dB. The largest of these areas was south of Windsor, which resulted from a higher movement rate on the CPT/SAM/GOG westerly departure routes[2] in 2016 compared to 2006. Around 94% of the area considered for noise changes was exposed to decreases in noise.

20. L_{den} noise changes between 2015 and 2016 (assuming the 2015 runway modal split) showed that most areas experienced decreases in noise of up to 1 dB. Some areas such as Battersea and Egham/Staines-upon-Thames were subjected to noise increases, of less than 1 dB.

21. An analysis of L_{night} noise changes between 2006 and 2016 (assuming the 2006 base year L_{night} runway modal split) showed that the vast majority of areas experienced reductions in noise levels of up to 3 dB. Over 99% of the area considered for noise changes was estimated to have experienced decreases in noise.

22. Noise changes for L_{night} between 2015 and 2016 (assuming the 2015 runway modal split) indicated some regions that were subjected to noise increases of

[2] Heathrow 2016 NPR/SID routes are shown in **Figure B1** of Appendix B. The GOG westerly departure route replaced SAM in 2015.

less than 1 dB. This included an area around the southern runway, which was used by a higher proportion of departures in 2016 compared to 2015.

'Noise events above' (N60 etc) contours

23. N65 and N70 annual 16-hour day contours, and N60 annual 8-hour night contours, have also been produced for 2016. The results showed that the areas of the N65 and N70 day contours, and N60 night contours, have decreased between 2006 and 2016. This reflects the phase-out of the noisiest aircraft types such as the Boeing 747-400 and the introduction of more modern, quieter types, e.g. Airbus A380, Boeing 777-300ER and Boeing 787-8/9. Population counts did not decrease in all cases, which can be explained by changes to contour shapes and primarily by the population encroachment that occurred in the areas surrounding Heathrow between 2006 and 2016.

24. An analysis of annual 16-hour day N65 changes between 2006 and 2016 (assuming the 2006 base year modal split) also showed that most areas have experienced reductions in the number of N65 events. However, there were some locations where the numbers of N65 events in 2016 increased due to higher movement rates on the CPT/GOG/SAM routes, a shift in the positioning of the DET (DVR) departure mean track and a higher usage of the southern runway for arrivals in 2016. Around 79% of the area considered for N65 changes either experienced decreases or was exposed to increases of less than 10 events. A similar analysis of N65 changes between 2015 and 2016 revealed that virtually all areas were subjected to changes of less than 10 events.

25. Annual 16-hour day N70 changes between 2006 and 2016 (assuming the 2006 runway modal split) indicated some areas where increases in N70 events occurred. These were due to higher movement rates on the CPT/GOG/SAM routes in 2016, a bias towards the southern runway for westerly departures in 2006 and the northern runway being favoured for westerly arrivals in 2006. Approximately 79% of the total area within the outer boundary of noise changes was either exposed to decreases in N70 events, or increases of less than 10 N70 events.

26. An examination of N60 changes between 2006 and 2016 (assuming the 2006 runway modal split) for the annual 8-hour night showed that all areas either experienced changes of less than 5 events or reductions of up to 20 events. The N60 changes between 2015 and 2016 indicated that most areas were subjected to changes of less than 2 events per night.

Chapter 1
Introduction

1.1 This report presents 2016 noise exposure contours that have been generated for London Heathrow Airport. Firstly, 2016 summer period contours are provided, which up until 2015 had been produced by ERCD on behalf of the Department for Transport (DfT). However, for this 2016 study, ERCD has been commissioned directly by Heathrow Airport Ltd (HAL). Secondly, contours meeting the requirements of the HAL Noise Action Plan have been produced using annual 2016 traffic data. Supplementary metric overflight contours, flight track density diagrams and N-contours (i.e. N65, N70 and N60) have also been generated.

1.2 The latest version of the UK civil aircraft noise model, ANCON (v2.3), has been used to estimate the noise exposure around Heathrow Airport. The model calculates the emission and propagation of noise from arriving and departing air traffic and is validated with noise measurements around Heathrow.

1.3 The noise exposure metric used for the summer period is the Equivalent Continuous Sound Level, or Leq 16-hour (0700-2300 local time), which is calculated over the 92-day summer period from 16 June to 15 September. The background to the use of this index is explained in DORA Report 9023 (**Ref 1**). The Leq 16-hour contours in this report have been plotted from 54 to 72 dBA in 3 dB steps. The Survey of Noise Attitudes (SoNA 2014)[3] found that the degree of annoyance (based on % of respondents highly annoyed) previously occurring at 57 dBA, now occurs at 54 dBA.

1.4 Night-time 8-hour Leq contours have also been calculated from 48 to 72 dBA in 3 dB steps in accordance with standard practice. Average summer night Leq contours were first calculated for Heathrow for 2013 following the publication of the Aviation Policy Framework in March 2013 (**Ref 3**).

1.5 ‘Single mode’ contours for the 16-hour day and 8-hour night have also been produced. These contours illustrate the noise exposure had the airport operated in fully westerly (‘100% W’) or easterly (‘100% E’) modes throughout the period of interest.

1.6 ‘Overflight’ contours for the average summer day and night periods using the definitions for an overflight proposed by the CAA (**Ref 4**) have been produced. Separate overflight diagrams are provided assuming 48.5 degree and 60 degree elevation angles (measured from the horizontal) as proposed in the CAA report,

[3] *Survey of Noise Attitudes 2014* (**Ref 2**), http://www.caa.co.uk/cap1506

using radar data up to an altitude of 4,000 ft amsl. Flight track density diagrams based on the above overflight metric definitions have also been produced.

1.7 Noise Action Plan contours for L_{day}, $L_{evening}$, L_{night} and L_{den} were based on annual movement data for the 2016 calendar year (1 January to 31 December), whilst the $L_{eq,6.5hr\ night}$ contour was based on data from the combined 2016 summer and 2016-17 winter night quota seasons (i.e. the period from 27 March 2016 to 26 March 2017).

1.8 Contours for the 2016 annual period have also been produced using the supplementary noise metrics N65 and N70 for daytime, and N60 for night-time. N-contours indicate the number of aircraft noise events exceeding a certain maximum sound level (L_{max}) at a given location. For example, N70 contours show the number of events exceeding 70 dBA L_{max}.

1.9 In summary, noise contours have been produced for the following noise metrics:

- Average summer 16-hour day Leq (0700-2300 local time);
- Average summer 8-hour night Leq (2300-0700 local time);
- Annual L_{day}, $L_{evening}$, L_{night}, L_{den} and $L_{eq,6.5hr\ night}$;
- N65 and N70 for the annual average 16-hour day (0700-2300 local time); and
- N60 for the annual average 8-hour night (2300-0700 local time).

1.10 Regarding the above metrics, the following can be noted:

- The summer day and night Leq contours have been used for airport noise in the UK for many decades;
- L_{day}, $L_{evening}$, L_{night} and L_{den} are required by the European Environmental Noise Directive (END) and allow comparison with other EU airports and other transport modes;
- HAL has advised that tracking the Leq 6.5-hour night metric is required by Heathrow's Terminal 5 planning consent;
- Virtually all annoyance and health impact research has been based on exposure measured using these time-averaged, Leq-based noise metrics;
- N60, N65 and N70 are event-based metrics, which some airports use to better understand the number of noise events that occur and where. There are no established dose-response assessments using these metrics.

1.11 The 2016 Noise Action Plan contours are compared with those from 2015 (**Ref 5**) and the 2006 base year (**Ref 6**) to assess the changes in area,

population and households enclosed. The long-term contour trends from 2006 to 2016 are also examined.

Chapter 2

Noise modelling methodology

ANCON noise model

2.1 The noise contours were calculated with the latest version of the UK civil aircraft noise model ANCON (version 2.3), which is developed and maintained by ERCD on behalf of the Department for Transport (DfT). A technical description of the ANCON model can be found in R&D Report 9842 (**Ref 7**).

2.2 ANCON is fully compliant with the European guidance on noise modelling, ECAC.CEAC Doc 29 (3rd edition), published in December 2005 (**Ref 8**). This guidance document represents internationally agreed best practice as implemented in modern aircraft noise models. An updated 4th edition was published in December 2016 (**Ref 9**) and will be incorporated in revised ANCON software for the 2017 contours.

Flight tracks

2.3 Mean departure and arrival flight tracks were generated from summer 2016 radar data. Mean tracks are the mathematical representation of an NPR/SID route swathe, consisting of a central track that defines the average aircraft position along the route swathe. Lateral dispersions across the route swathe were modelled by multiple sub-tracks derived from a statistical analysis of the underlying radar track data. The Heathrow NPR/SID routes for 2016 are shown in **Figure B1** of Appendix B.

Flight profiles

2.4 Average flight profiles of height, speed and thrust were also based on summer 2016 radar data. These profiles represent the aircraft heights, speeds and thrust settings at various distances from the runway, averaged across all the routes for each ANCON aircraft type (for departures and arrivals separately). Daytime flight profiles were generated as in previous years. However, a separate night-time departure profile was produced for the noise dominant aircraft type operating at night, the Boeing 747-400 with Rolls-Royce engines,[4] as it was sufficiently different from the daytime profile. All other aircraft types operating at night were modelled with daytime profiles.

[4] ANCON type = B744R

2.5 The application of reverse thrust following touchdown was modelled for all ANCON types where applicable. Reverse thrust was included in both the day and night contours.

Noise data

2.6 Noise levels for each ANCON aircraft type are checked and updated each year according to the latest noise measurements, so they represent the best available data.

2.7 At Heathrow, the Noise and Track-Keeping (NTK) system captures data from both fixed and mobile noise monitors around the airport. Noise event data for individual aircraft operations are matched to operational data provided by the airport. The Heathrow NTK system employs 12 fixed monitors positioned approximately 6.5 km from start-of-roll, together with a number of mobile monitors that can be deployed anywhere within the NTK radar coverage area.[5]

2.8 The noise data collected were screened by ERCD with reference to several criteria so that only reliable data were used in the analysis. First of all, noise data that lay outside a 'weather window' were discarded. This ensured that the data used were not affected by adverse meteorological conditions such as precipitation and strong winds. Secondly, the maximum noise level of the aircraft event had to exceed the noise monitor threshold by at least 10 dB to avoid underestimates of the Sound Exposure Level (SEL). Thirdly, only measurements obtained from aircraft operations that passed through a 60-degree inverted cone, centred at the noise monitor, were retained in order to minimise the effects of lateral attenuation and lateral directivity.[6]

2.9 The ANCON model calculates aircraft noise using a noise database expressing SEL as a function of engine power setting and slant distance to the receiver – also known as the 'Noise-Power-Distance' (NPD) relationship. The ANCON noise database is continually reviewed and updated with adjustments made annually when measurements show this to be necessary.

2.10 In 2016, the most significant adjustments were for the ANCON types EA319V, EA320V and EA321V on arrival, where noise measurements indicated lower noise levels of around 1 dB, mainly beyond 10 km from the landing threshold.

[5] Further information on the noise monitors can be found in CAP 1149 (**Ref 10**).

[6] *Lateral attenuation* is the excess sound attenuation caused by the ground surface, which can be significant at low angles of elevation. *Lateral directivity* is the non-uniform directionality of sound radiated laterally about the roll axis of the aircraft – this is influenced to a large extent by the positioning of the engines.

Traffic data

2.11 The contours were calculated using 2016 movement data extracted from the Heathrow NTK system, which stores radar data supplemented by daily flight plans. Breakdowns of the aircraft movements by ANCON aircraft type for the average summer day (0700-2300 local time) and night (2300-0700 local time), and the annual average 12-hour day (0700-1900 local time), 4-hour evening (1900-2300 local time), 8-hour night (2300-0700 local time), 24-hour day and 6.5-hour night (2330-0600 local time), are summarised in **Tables C1-C7** respectively of Appendix C. (Note: The summer and annual traffic numbers have been divided by 92 and 366[7] respectively in the tables to provide daily average figures). Detailed descriptions of individual ANCON aircraft types are provided in **Table D1** of Appendix D.

2.12 The average number of daily movements at Heathrow over the 2016 summer day period (1266.7) was 0.6% lower than in the previous year (2015: 1274.5). In contrast, the average summer night movements rose by 6% in 2016 to 84.4 (2015: 79.7), solely due to an increase in departures. Most of the departure increases were within the hours 2300-0000 (+2.3 per night) and 0600-0700 (+1.8 per night).

2.13 The largest movement decreases over the 2016 average summer 16-hour day period were for the ANCON types EA320V (-25) and EA319C (-21). The B744G and B744R also decreased by 9 and 4 movements per day respectively. The B789 had the largest movement increase (+27), followed by the EA320C (+15). The B789 also had the highest increase (+4) during the 2016 average summer 8-hour night period. The largest decrease at night was for the EA346 (-1).

2.14 The annual average 24-hour daily movements for the base year 2006 and years 2009-2016 are summarised in **Table 1**, along with the total annual movements in each year.

2.15 It can be seen that total movements decreased in both 2009 and 2010 relative to 2006, with the 2010 total being 5% lower than in 2006. However, in 2011 the total rose by 6% to a level 1% above the 2006 total. Movements dropped back in 2012 to a level 1% below that in 2006, and since then have remained at a steady level.

[7] 2016 was a leap year. For the 6.5-hour night, the total was divided by 364.

Table 1 Heathrow annual 24-hour movements for years 2006 & 2009-2016

Year	Total daily movements	Percentage change relative to 2006	Total annual movements
2006	1307.6	(n/a)	477,274
2009	1277.2	-2%	466,178
2010	1245.8	-5%	454,717
2011	1317.1	+1%	480,742
2012	1297.9	-1%	473,734
2013	1293.1	-1%	471,982
2014	1292.8	-1%	471,872
2015	1297.9	-1%	473,734
2016	1297.4	-1%	474,858

2.16 The allocations of traffic on each departure route and arrival runway are summarised in terms of the percentage of total daily operations for each of the L_{day}, $L_{evening}$, L_{night}, L_{den} and $L_{eq,6.5hr\ night}$ time periods, for 2006 and 2009-2016, in **Tables C8-a** to **C8-i**. Route allocations for the L_{den} and L_{night} periods are also shown as pie charts following **Table C8-i** for arrivals and for westerly/easterly departures. These charts illustrate how the proportion of flights on each route has changed over time.

2.17 The percentage allocations of traffic on each departure route and arrival runway are also summarised for single mode scenarios (i.e. 100% W departures, 100% W arrivals), for each of the L_{day}, $L_{evening}$, L_{night}, L_{den} and $L_{eq,6.5hr\ night}$ time periods, for 2006 and 2009-2016, in **Tables C9-a** to **C9-i**.

Aircraft noise classes

2.18 The 2016 Heathrow fleet mix can be considered in terms of aircraft 'Noise Class' categories A-H, which are ranked in ascending order of noise emission, i.e. from the quietest to the noisiest. Noise Class percentage breakdowns are summarised in **Table 2** for the 2016 annual 24-hour period, along with percentages from the 2006 base year for comparison.

Table 2 Heathrow 2016 annual average 24-hour movements by Noise Class

Noise Class	Description	2016 total	2016 percentage	2006 percentage
A	Small propeller	< 0.1	0.0%	< 0.1%
B	Large propeller	0.2	< 0.1%	0.6%
C	Narrow-body jets *(e.g. Airbus A320, Boeing 737-800)*	798.1	61.5%	65.3%
D	Wide-body twins *(e.g. Boeing 777, Boeing 787)*	371.7	28.7%	18.4%
E	Wide-body 3,4 engine *(e.g. Boeing 747-400, Airbus A380)*	127.4	9.8%	15.2%
F	1st generation wide-body 3,4 engine *(e.g. Boeing 747-100)*	< 0.1	0.0%	0.3%
G	2nd generation narrow-body twins *(e.g. Boeing 737-200)*	0.0	0.0%	0.0%
H	1st generation narrow-body 3,4 engine *(e.g. Boeing 727)*	< 0.1	0.0%	< 0.1%
	Total	**1297.4**	100.0%	100.00%

Note: Totals may not sum exactly due to rounding.

2.19 It can be seen that almost all movements in 2016 were within Noise Classes C, D or E. The proportion of narrow-body jet aircraft (Noise Class C) decreased by 4% between 2006 and 2016. There was also a reduction (by 5%) in the proportion of wide-body 3 or 4-engine types (Noise Class E). In contrast, the proportion of wide-body twin-engine aircraft (Noise Class D) increased by 10% between 2006 and 2016.

2.20 The chart in **Figure B2** of Appendix B illustrates the breakdown of total movements by Noise Class for 2006 and 2009-2016. Movements over the annual average 24-hour period in 2016 by ANCON aircraft type are summarised in **Table C6**. They are described in more detail in the following paragraphs.

2.21 Numbers within Noise Class C (narrow-body aircraft such as the Airbus A319, A320 and A321) dropped between 2006 and 2010, but increased in 2011 to a level higher than in 2006. Since 2011, numbers have gradually fallen back to near 2010 levels (**Figure B2**). Noise Class C movements made up 62% of total movements in 2016. Within Noise Class C the highest increases were for the EA320C and EA319V (both +7 movements). They were offset by decreases for the EA319C (-17 movements) and the EA320V (-11). The Airbus A319/320/321 aircraft family accounted for 90% of Noise Class C movements in 2016.

2.22 The next largest grouping was Noise Class D (wide-body twin-engine aircraft, such as the Boeing 777-200/300 and Boeing 787-8/9), which accounted for 29% of total movements in 2016. These have risen steadily in frequency between

2009 and 2016 (**Figure B2**). The largest increases within Noise Class D in 2016 were for the ANCON types B789 (+27 movements) and B788 (+5). The largest decrease was for the B763R, which was down by 7 movements. The newest aircraft types such as the Boeing 787-8/9 series (and to a lesser extent the Airbus A350-900) made up 21% of all Noise Class D movements, an increase from 2015 when the figure was 12%.

2.23 Movements of the Noise Class E grouping (wide-body 3 or 4-engine aircraft such as the Boeing 747-400 and Airbus A380) decreased in both 2009 and 2010 from the 2006 level, and after a small rise in 2011, have declined steadily through to 2016 (**Figure B2**). A tenth of the total movements were within Noise Class E in 2016. Within Noise Class E the largest reductions in 2016 were for the ANCON aircraft types B744G (-8 movements) and B744R (-6). There were increases for the EA38GP and EA38R (both +5 movements). The more modern Airbus A380 aircraft accounted for 39% of total Noise Class D movements in 2016, a rise from the previous year (2015: 30%).

Fleet mix by ICAO noise Chapter

2.24 An analysis of the certification noise levels of aircraft operating at Heathrow in 2016 indicated that an estimated 99%[8] of the fleet were compliant with the ICAO Chapter 4 noise standard, with the remainder meeting the Chapter 3 noise standard.

2.25 In the 2006 base year, the estimated percentage of Chapter 4-compliant aircraft was 94%, and by 2009 this had risen to 95%. The figure was higher in 2010 and 2011 (96% in both years), and in 2012 and 2013 the compliance level had reached an estimated 97%. The compliance level was at its highest from 2014 to 2016 at an estimated 99%.

Runway modal splits

2.26 In general, aircraft will take-off and land into a headwind to maximise lift during take-off and landing. The wind direction, which varies over the course of a year, will therefore have an important influence on the usage of runways.[9] The ratio of

[8] The percentage figure is an estimate because in some cases, detailed aircraft information (e.g. engine modifications) was not readily available, so some assumptions had to be made. Separate data provided by HAL indicated that the Chapter 4 compliance percentage was 99.45% in 2016.

[9] At Heathrow, a 'westerly preference' for aircraft operations is employed, which means that the airport will operate in westerly mode even if there is a light tailwind. This is done to reduce the use of easterly SIDs, which tend to overfly more populated areas compared to the westerly SIDs.

westerly (i.e. Runway 27L/27R) and easterly (i.e. Runway 09L/09R) operations is referred to as the *runway modal split*.

2.27 Two sets of contours have been produced for the 2016 summer 16-hour day:

(a) Using the 'actual' modal split over the Leq day period; and

(b) Assuming the 'standard' modal split over the Leq day period, i.e. the long-term modal split calculated from the 20-year rolling average. For 2016, this is the 20-year period from 1997 to 2016. Use of the standard modal split enables year-on-year comparisons without the runway usage significantly affecting the contour shape.

2.28 The 2016 and 2015 runway modal splits for the day and night summer periods are summarised in **Table 3**.

Table 3 Heathrow 2016 and 2015 summer runway modal splits

Time period	2016 actual split (W/E percentage)	2015 actual split (W/E percentage)	2016 standard split (W/E percentage)	2015 standard split (W/E percentage)
Summer 16-hour day (0700-2300)	86 / 14	78 / 22	79 / 21	78 / 22
Summer 8-hour night (2300-0700)	85 / 15	77 / 23	Data not available	Data not available

2.29 The annual noise contours were modelled with the 2016 actual West/East (W/E) runway modal splits, which are summarised in **Table 4** along with the modal splits for the previous year, and also the 5-year rolling average.

Table 4 Heathrow annual runway modal splits

Time period	2016 actual split (W/E percentage)	2015 actual split (W/E percentage)	5-year average 2012-2016 (W/E percentage)
12-hour day	70 / 30	72 / 28	70 / 30
4-hour evening	72 / 28	72 / 28	71 / 29
8-hour night	70 / 30	72 / 28	71 / 29
24-hour day	**70 / 30**	**72 / 28**	**71 / 29**
6.5-hour night	71 / 29	72 / 28	71 / 29

Note: The 6.5-hour night covers the period from the end of March in one year to the end of March in the following year. The 5-year average has been calculated over the period 2012-2016.

2.30 The runway modal splits percentages for each of the annual periods modelled (L_{day}, $L_{evening}$, L_{night}, L_{den} and $L_{eq,6.5hr\ night}$) are summarised in **Tables C10-a** to **C10-e** for 2006 and 2009-2016, for arrivals and departures separately.

2.31 A higher proportion of westerly movements at Heathrow tends to cause an increase in contour area. Conversely, a higher proportion of easterly movements at Heathrow tends to reduce the contour area. During easterly operations, departures from Runway 09L are restricted by the Cranford Agreement, resulting in the majority of departures operating from Runway 09R, whilst landings are on Runway 09L. This concentrates traffic onto fewer flight paths, reducing the contour area.

Topography

2.32 The topography around Heathrow Airport was modelled by accounting for terrain height. This was achieved by geometrical corrections for source-receiver distance and elevation 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.

2.33 ERCD holds Ordnance Survey terrain height data on a 200-metre by 200-metre grid for the whole of England. Interpolation was performed to generate height data at each of the calculation points on the receiver grid used by the ANCON noise model.

Population database

2.34 Estimates were made of the population and households enclosed within the noise contours. The population data used in this report for the 2016 contours are a 2016 update of the latest 2011 Census supplied by CACI Limited.[10] The CACI population database contains data referenced at the postcode level. Population and household numbers associated with each postcode are assigned to a single coordinate located at the postcode's centroid.

2.35 Within the extent of the 2016 L_{den} 55 dBA cumulative contour, the population count was 1% higher with the 2016 population database compared to the 2015 database.

2.36 It should be noted that Defra uses a different population database from the Office of National Statistics (June 2015) for the EU Environmental Noise Directive (END) strategic noise mapping, which will be used in Heathrow's

[10] www.caci.co.uk

new Noise Action Plan (NAP 2019-2023). The population counts in this report differ from Defra's figures.

Chapter 3
Results

2016 summer day actual Leq contours

3.1 The Heathrow 2016 summer day Leq noise contours generated with the actual 2016 summer day period runway modal split (86% west / 14% east) are shown in **Figure B3** of Appendix B. The contours are plotted from 54 to 72 dBA at 3 dB intervals and overlaid onto the 2015 contours.

3.2 Cumulative estimates of the areas, populations and households within the 2016 summer day actual modal split contours are provided in **Table 5**, along with the figures from 2015.

Table 5 Heathrow 2016 and 2015 summer day actual contours – area, population and household estimates

Leq (dBA)	Area (km^2)			Population			Households		
	2016	2015	change	**2016**	2015	change	**2016**	2015	change
> 54	184.9	187.9	-2%	616.6	585.6	+5%	254.3	237.7	+7%
> 57	101.5	102.5	-1%	247.1	258.3	-4%	96.0	101.0	-5%
> 60	56.0	56.7	-1%	116.7	119.7	-3%	42.4	45.6	-7%
> 63	31.6	32.7	-3%	44.3	45.9	-3%	15.4	17.3	-11%
> 66	18.7	19.4	-4%	13.5	14.0	-4%	4.6	5.3	-13%
> 69	8.9	9.3	-4%	3.3	3.1	+6%	1.2	1.2	0%
> 72	4.8	5.0	-4%	0.1	0.2	-50%	< 0.1	0.1	(n/a)

Note: Populations and households are given in thousands. The 2016 and 2015 population/household counts are based on 2016 and 2015 CACI updates of the 2011 Census respectively.

3.3 The 2016 summer day actual **57 dBA** Leq contour enclosed an area of 101.5 km^2 and a population of 247,100. The area was 1% smaller than in 2015 (102.5 km^2), whilst the population was 4% lower than in 2015 (258,300).

3.4 The reductions in contour area reflect the ongoing replacement of older, noisier types such as the Boeing 747-400 with quieter types such as the Airbus A380 and Boeing 787-8/9, and also arrival noise adjustments made to the ANCON

types EA319V, EA320V and EA321V in the light of 2016 noise measurements, which indicated lower noise levels compared to 2015.

3.5 The elongation of the arrival contour lobes in 2016 to the east of the airport can be explained by the 8% higher percentage of westerly operations in 2016 compared to 2015. Correspondingly the lower proportion of easterly operations in 2016 has contracted the arrival contour lobes near Windsor and the departure contour lobes in the vicinity of Osterley Park, Feltham and Twickenham.

2016 summer day standard Leq contours

3.6 The Heathrow 2016 summer day Leq noise contours generated with the *standard* 2016 summer day period runway modal split (79% west / 21% east) are shown in **Figure B4**. The contours are plotted from 54 to 72 dBA at 3 dB intervals and overlaid onto the 2015 contours.

3.7 Cumulative estimates of the areas, populations and households within the 2016 summer day standard modal split contours are provided in **Table 6**, along with the figures from 2015.

Table 6 Heathrow 2016 and 2015 summer day standard contours – area, population and household estimates

Leq (dBA)	Area (km^2)			Population			Households		
	2016	2015	change	**2016**	2015	change	**2016**	2015	change
> 54	184.3	187.9	-2%	588.8	585.6	+1%	240.9	237.7	+1%
> 57	99.6	102.5	-3%	249.2	258.3	-4%	96.5	101.0	-4%
> 60	55.1	56.7	-3%	116.4	119.7	-3%	42.1	45.6	-8%
> 63	31.5	32.7	-4%	41.8	45.9	-9%	14.7	17.3	-15%
> 66	18.5	19.4	-5%	12.6	14.0	-10%	4.3	5.3	-19%
> 69	8.8	9.3	-5%	3.0	3.1	-3%	1.1	1.2	-8%
> 72	4.7	5.0	-6%	0.1	0.2	-50%	< 0.1	0.1	(n/a)

Note: Populations and households are given in thousands. The 2016 and 2015 population/household counts are based on 2016 and 2015 CACI updates of the 2011 Census respectively.

3.8 The 2016 summer day standard **57 dBA** Leq contour enclosed an area of 99.6 km^2 and a population of 249,200. The 57 dBA area was 3% smaller than in 2015 (102.5 km^2), whilst the population was 4% lower than in 2015 (258,300).

3.9 Similar to the actual modal split contours, the reductions in contour area reflect the ongoing replacement of older, noisier types with quieter types such as the Airbus A380 and Boeing 787-8/9, and also arrival noise adjustments made to ANCON types such as the EA319V and EA320V, which noise measurements indicated were quieter in 2016.

2016 summer day single mode Leq contours

3.10 The Heathrow 2016 summer day Leq noise contours for 100% westerly and 100% easterly modes assuming the 2006 north-south runway usage are shown in **Figures B5** and **B6** respectively. The contours are plotted from 54 to 72 dBA at 3 dB intervals and overlaid onto the corresponding single mode contours for 2006.

3.11 Cumulative estimates of the areas, populations and households within the 2016 and 2006 summer day single mode contours are provided in **Tables 7** and **8**.

Table 7 Heathrow 2016 and 2006 summer day 100% W contours (assuming 2006 N-S runway usage) – area, population and household estimates

Leq (dBA)	Area (km^2)			Population			Households		
	2016	2006	change	**2016**	2006	change	**2016**	2006	change
> 54	188.1	215.6	-13%	654.5 (567.6)	638.6	+2% (-11%)	274.6 (256.8)	289.5	-5% (-11%)
> 57	106.2	126.5	-16%	253.7 (209.5)	297.0	-15% (-29%)	99.1 (88.7)	128.0	-23% (-31%)
> 60	57.2	69.4	-18%	114.6 (89.8)	113.7	+1% (-21%)	42.0 (36.1)	46.5	-10% (-22%)
> 63	32.0	38.5	-17%	47.5 (37.0)	50.5	-6% (-27%)	16.7 (14.7)	20.1	-17% (-27%)
> 66	19.0	23.4	-19%	13.8 (11.7)	18.3	-25% (-36%)	4.8 (4.3)	7.0	-31% (-38%)
> 69	9.1	13.0	-30%	3.6 (3.0)	5.2	-31% (-42%)	1.2 (1.2)	2.0	-40% (-42%)
> 72	4.9	6.7	-27%	0.5 (0.4)	1.1	-55% (-62%)	0.2 (0.1)	0.4	-50% (-66%)

Note: Populations and households are given in thousands. The 2016 population/household counts are based on a 2016 CACI update of the 2011 Census. The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census. Estimates for 2016 using the 2006 population database are shown in blue.

Table 8 Heathrow 2016 and 2006 summer day 100% E contours (assuming 2006 N-S runway usage) – area, population and household estimates

Leq (dBA)	Area (km^2)			Population			Households		
	2016	2006	change	**2016**	2006	change	**2016**	2006	change
> 54	173.5	196.6	-12%	484.4 (410.6)	516.9	-6% (-21%)	190.2 (173.7)	216.1	-12% (-20%)
> 57	94.5	112.7	-16%	295.2 (245.5)	324.6	-9% (-24%)	114.6 (102.5)	136.4	-16% (-25%)
> 60	49.5	63.4	-22%	154.0 (126.4)	169.4	-9% (-25%)	58.2 (51.6)	69.6	-16% (-26%)
> 63	26.3	35.0	-25%	57.1 (45.5)	71.9	-21% (-37%)	20.4 (17.9)	28.4	-28% (-37%)
> 66	14.2	18.9	-25%	12.1 (9.3)	22.3	-46% (-58%)	4.4 (3.8)	8.7	-49% (-57%)
> 69	8.0	10.6	-25%	2.3 (1.8)	3.6	-36% (-51%)	0.9 (0.8)	1.6	-44% (-53%)
> 72	4.6	6.2	-26%	0.7 (0.5)	0.9	-22% (-43%)	0.3 (0.2)	0.4	-25% (-43%)

Note: Populations and households are given in thousands. The 2016 population/household counts are based on a 2016 CACI update of the 2011 Census. The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census. Estimates for 2016 using the 2006 population database are shown in blue.

3.12 For the westerly single mode contours, the 2016 areas have all decreased relative to 2006, by up to 30%. The populations have mostly decreased, with the exception of the 54 and 60 dBA contours where there were increases of 2% and 1% respectively (this can be attributed to the effects of population encroachment between 2006 and 2016). Household counts in 2016 were all lower than in 2006.

3.13 For the easterly single mode contours, the 2016 areas have also all decreased relative to 2006, by up to 26%. Both population and household numbers were lower at all contour levels in 2016 compared to 2006.

3.14 Populations and household estimates for 2016 assuming the 2006 population database indicate that the contour populations would have decreased at all contour levels had there been no population encroachment between 2006 and 2016.

2016 summer night actual Leq contours

3.15 The Heathrow 2016 summer night Leq noise contours generated with the actual 2016 summer night period runway modal split (85% west / 15% east) are shown in **Figure B7**. The contours are plotted from 48 to 66 dBA at 3 dB intervals (the 69 and 72 dBA contours have been omitted for clarity) and overlaid onto the 2015 contours.

3.16 Cumulative estimates of the areas, populations and households within the 2016 summer night contours are provided in **Table 9**, along with the figures from 2015.

Table 9 Heathrow 2016 and 2015 summer night actual contours – area, population and household estimates

Leq (dBA)	Area (km^2)			Population			Households		
	2016	2015	change	**2016**	2015	change	**2016**	2015	Change
> 48	115.4	111.5	+3%	437.9	399.1	+10%	181.8	162.8	+12%
> 51	68.2	67.2	+1%	207.8	193.8	+7%	80.4	75.9	+6%
> 54	38.9	37.5	+4%	97.2	91.4	+6%	34.8	34.7	0%
> 57	20.5	19.0	+8%	47.4	42.3	+12%	16.2	15.9	+2%
> 60	10.3	9.6	+7%	15.8	14.0	+13%	5.1	5.1	0%
> 63	5.4	5.0	+8%	3.2	2.6	+23%	1.0	0.9	+11%
> 66	2.9	2.7	+7%	1.1	0.4	+175%	0.3	0.1	+200%
> 69	1.8	1.7	+6%	< 0.1	< 0.1	(n/a)	< 0.1	< 0.1	(n/a)
> 72	1.3	1.2	+8%	0.0	0.0	(-)	0.0	0.0	(-)

Note: Populations and households are given in thousands. The 2016 and 2015 population/household counts are based on 2016 and 2015 CACI updates of the 2011 Census respectively.

3.17 The 2016 night actual 48 dBA Leq contour enclosed an area of 115.4 km^2 and a population of 437,900. The 48 dBA area was 3% larger than in 2015 (111.5 km^2), whilst the population was 10% higher (2015: 399,100). Areas increased at all contour levels in 2016. The increases in the night contour area resulted from the 6% higher movements in 2016 compared to 2015. Most contour levels also had higher population and households counts in 2016 compared to 2015.

3.18 The effects of the 8% higher percentage of westerly operations in 2016 can be seen in the contour shapes, with extensions of the arrival contour lobes to the

east of the airport and the departure contour lobes over Egham and towards Slough, and a contraction of the arrival contour lobes in the vicinity of Windsor.

2016 summer night single mode Leq contours

3.19 The Heathrow 2016 summer night Leq noise contours for 100% westerly and 100% easterly modes assuming the 2006 north-south runway usage are shown in **Figures B8** and **B9** respectively. The contours are plotted from 48 to 66 dBA at 3 dB intervals (the 69 and 72 dBA contours have been omitted for clarity) and overlaid onto the corresponding single mode contours for 2006.

3.20 Cumulative estimates of the areas, populations and households within the 2016 and 2006 summer night single mode contours are provided in **Tables 10** and **11**.

Table 10 Heathrow 2016 and 2006 summer night 100% W contours (assuming 2006 N-S runway usage) – area, population and household estimates

Leq (dBA)	Area (km^2)			Population			Households		
	2016	2006	change	**2016**	2006	change	**2016**	2006	change
> 48	116.8	118.3	-1%	497.3	431.8	+15%	209.0	195.7	+7%
> 51	70.2	71.4	-2%	225.8	188.5	+20%	88.0	80.2	+10%
> 54	40.4	42.2	-4%	115.1	99.1	+16%	42.5	40.6	+5%
> 57	21.3	23.3	-9%	52.8	47.3	+12%	18.1	18.4	-2%
> 60	10.5	11.8	-11%	20.8	21.6	-4%	6.8	8.2	-17%
> 63	5.4	6.4	-16%	4.3	7.4	-42%	1.3	2.5	-48%
> 66	2.8	3.5	-20%	1.3	1.7	-24%	0.4	0.6	-33%
> 69	1.6	2.0	-20%	< 0.1	0.2	(n/a)	< 0.1	0.1	(n/a)
> 72	1.0	1.3	-23%	0.0	0.0	(-)	0.0	0.0	(-)

Table 11 Heathrow 2016 and 2006 summer night 100% E contours (assuming 2006 N-S runway usage) – area, population and household estimates

Leq (dBA)	Area (km^2)			Population			Households		
	2016	2006	change	**2016**	2006	change	**2016**	2006	change
> 48	112.0	112.0	0%	224.4	197.3	+14%	85.8	81.4	+5%
> 51	67.0	68.9	-3%	134.9	120.8	+12%	51.4	49.5	+4%
> 54	35.4	39.4	-10%	52.5	52.0	+1%	20.7	21.9	-5%
> 57	17.9	20.5	-13%	7.3	7.9	-8%	2.9	3.5	-17%
> 60	9.6	11.2	-14%	1.8	1.8	0%	0.7	0.8	-13%
> 63	5.2	6.2	-16%	1.1	0.7	+57%	0.4	0.3	+33%
> 66	2.8	3.4	-18%	0.1	0.2	-50%	< 0.1	0.1	+5%
> 69	1.5	1.9	-21%	0.0	0.0	(-)	0.0	0.0	(-)
> 72	0.9	1.1	-18%	0.0	0.0	(-)	0.0	0.0	(-)

Note: Populations and households are given in thousands. The 2016 population/household counts are based on a 2016 CACI update of the 2011 Census. The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census.

3.21 For the westerly single mode contours, areas have all decreased in 2016 relative to 2006. Populations and households, however, increased in 2016 especially at the lower level contours.

3.22 For the easterly single mode contours, the area was unchanged within the 48 dBA contour but lower at all the other contour levels. Similar to the westerly mode contours, there were population and household increases at the lower contour levels in 2016.

3.23 The above increases in population and households can be attributed to the effects of population encroachment around Heathrow between 2006 and 2016.

2016 summer day overflight contours and track density diagrams

3.24 Contours showing the number of 2016 average summer 16-hour day overflights (up to 4,000 ft amsl[11]) for 48.5 and 60 degree elevation angles[12] at the ground receiver (see **Ref 4**) are shown in **Figures B10** and **B11** respectively. The results for the 2016 summer day are overlaid onto the 2015 summer day results and plotted at levels of 5, 20 and 100 overflights per 16-hour day.

3.25 It should be noted that these overflight contours have been included in this report as a supplementary metric to provide insight into the number of aircraft flyover events that might be observed. As yet there is no research or established methods for assessing the impact or health outcomes of various levels of overflight.

3.26 Flight track density diagrams, which indicate the number of overflights using colour-shading, are provided in **Figures B10-a** to **B10-c** for the 2006, 2015 and 2016 summer day respectively assuming the 48.5 degree elevation angle. Corresponding diagrams for a 60 degree elevation angle can be found in **Figures B11-a** to **B11-c**.

2016 summer night overflight contours and track density diagrams

3.27 Contours showing the number of 2016 average summer 8-hour night overflights (up to 4,000 ft amsl) for 48.5 and 60 degree elevation angles are shown in **Figures B12** and **B13** respectively. The results for the 2016 summer night are overlaid onto the 2015 summer night results and plotted at levels 1, 5 and 20 overflights per 8-hour night.

3.28 Flight track density diagrams are provided in **Figures B12-a** to **B12-c** for the 2006, 2015 and 2016 summer night respectively assuming the 48.5 degree elevation angle. Corresponding diagrams for a 60 degree elevation angle can be found in **Figures B13-a** to **B13-c**.

[11] amsl = above mean sea level

[12] The elevation angle is defined as the angle between the ground and the aircraft as seen from the observer at ground level.

2016 Noise Action Plan contours

3.29 The following Noise Action Plan contours for 2016 are displayed in **Figures B14-B18** of Appendix B respectively, overlaid onto the 2015 contours:

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

3.30 The estimated areas, populations and households within the above 2016 contours are summarised in **Tables 12-16** respectively, along with the results for 2015. The 2016 population and household figures are based on a 2016 update of the 2011 Census supplied by CACI Ltd. (The 2015 population and household figures are based on a 2015 update of the 2011 Census).

3.31 **It should be noted that the 2016 L_{day}, $L_{evening}$, L_{den} and L_{night} population figures provided in this report differ from the 'official' numbers published by Defra for the Environmental Noise Directive (END) 'Round 3' strategic noise mapping exercise.** This is because Defra's consultants use a separate population database for strategic noise mapping purposes. However, the population figures presented in this report, which are all based on updated CACI data, will enable consistent comparisons to be made with population counts from previous years. For a comparison of the Defra (END) population figures versus the CAA/ERCD/CACI figures, see the L_{den} data in **Table C19** and the discussion in paragraph 3.64.

3.32 The statistics for L_{day}, $L_{evening}$, L_{night} and L_{den} 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.

3.33 However, for reference purposes, the 2016 results are also provided in *cumulative* format in **Tables C11-C15** of Appendix C, along with the 2015 figures. In addition, a comparison between the cumulative 2016 results and those from the 2006 base year are provided in **Tables C16-C20**. All the population and household figures in these tables are based on data supplied by CACI Ltd with the respective annual updates.

3.34 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 and household counts can be quite sensitive to changes in contour shape.

3.35 Changes in contour population counts from year to year are also influenced by the effects of the annual update to the population database. Within the region bounded by the 2016 L_{den} 55 dBA contour, there was a 1% increase in the population count between 2015 and 2016.

2016 L_{day} contours

3.36 Total movements in the 2016 L_{day} period decreased by 0.2% from 2015 (see **Table C3**) to 948 per 12-hour day. The largest decreases were for the EA319C (-12 movements), EA320V (-8) and B744G (-7). These were offset by increases for the B789 (+19), EA319V (+9) and EA320C (+6). The departure noise dominant Boeing 747-400 aircraft had 10 fewer movements on average in 2016, whilst movements of the Airbus A380 increased by 7.

3.37 The outermost 55-60 dBA band area for L_{day} was 2% smaller in 2016 and there were also area decreases at the higher bands of up to 7% (see **Table 12**). (Note: the *cumulative* L_{day} contour areas reduced at all levels by up to 5%, as shown in **Table C11**). The area changes can be attributed to: (a) the ongoing replacement of older, noisier aircraft (e.g. the Boeing 747-400) by quieter types such as the Airbus A380, and (b) reductions in arrival noise produced by ANCON aircraft types such as the EA319V and EA320V, as identified by noise measurements undertaken in 2016.[13]

Table 12 Heathrow 2016 L_{day} contour band area, population and household estimates

L_{dav} (dBA)	Area (km^2)			Population			Households		
	2016	2015	change	**2016**	2015	change	**2016**	2015	change
55 – 60	94.2	96.4	-2%	302.5	311.9	-3%	124.5	126.9	-2%
60 – 65	32.6	33.3	-2%	100.2	102.5	-2%	36.6	39.2	-7%
65 – 70	15.1	15.7	-4%	16.8	18.3	-8%	5.7	6.9	-17%
70 – 75	4.3	4.6	-7%	1.3	1.8	-28%	0.4	0.6	-33%
> 75	2.7	2.8	-4%	< 0.1	< 0.1	(n/a)	< 0.1	< 0.1	(n/a)

Note: Populations and households are given in thousands. The 2016 and 2015 population/household counts are based on 2016 and 2015 CACI updates of the 2011 Census respectively.

[13] Because of the large number of factors that contribute to the measured noise data (e.g. different airlines, operating procedures etc.), it is difficult to disentangle the noise changes and attribute them to specific factors, such as a change in operational procedure.

3.38 Population counts for the 55-60 dBA contour band in 2016 were 3% lower than in 2015, and also lower at the other contour bands. There were similar percentage changes for the household counts. The 7% decrease in area at the 70-75 dBA contour band resulted in a 28% decrease in population and a 33% decrease in households.

3.39 The 2016 L_{day} contours are compared against the 2015 L_{day} contours in **Figure B14**. The contour shapes are broadly similar in both years. The 55 dBA contour lobe that turns to the north-west of the airport has retracted due to movement decreases of the Boeing 747-400 aircraft on the Runway 27L/27R BUZ/BPK[14] routes.

2016 $L_{evening}$ contours

3.40 Total movements in the 2016 $L_{evening}$ period decreased by 0.3% from 2015 (see **Table C4**) to 272 per 4-hour evening. The largest movement decreases were for the ANCON aircraft types EA319C (-4 movements) and EA320V (-3). The highest increase was for the B789 (+4).

3.41 The area of the 55-60 dBA $L_{evening}$ contour band decreased by 4% in 2016 (see **Table 13**). There were also reductions in area at most of the higher contour bands. (Note: the *cumulative* $L_{evening}$ contour areas reduced by up to 4%, as shown in **Table C12**). These area changes can be attributed to: (a) the replacement of older, noisier aircraft by quieter types such as the Boeing 787-9, and (b) reductions in arrival noise produced by ANCON aircraft types such as the EA319V and EA320V, as identified by noise measurements undertaken in 2016.

3.42 Reductions in population and household counts were found in the three outermost contour bands.

3.43 The 2016 $L_{evening}$ contours are compared against the 2015 $L_{evening}$ contours in **Figure B15**. As with the L_{day} contours, the 2016 and 2015 $L_{evening}$ contour shapes were similar.

[14] Heathrow 2016 NPR/SID routes are shown in **Figure B1** of Appendix B.

Table 13 Heathrow 2016 $L_{evening}$ contour band area, population and household estimates

$L_{evening}$ (dBA)	Area (km^2)			Population			Households		
	2016	2015	change	**2016**	2015	change	**2016**	2015	Change
55 – 60	81.8	85.4	-4%	256.7	260.9	-2%	103.5	104.8	-1%
60 – 65	28.3	29.1	-3%	80.2	82.4	-3%	28.5	31.3	-9%
65 – 70	13.4	13.9	-4%	10.4	12.0	-13%	3.7	4.6	-20%
70 – 75	3.9	4.1	-5%	0.8	0.8	0%	0.3	0.3	0%
> 75	2.6	2.6	0%	0.0	0.0	(n/a)	0.0	0.0	(n/a)

Note: Populations and households are given in thousands. The 2016 and 2015 population/household counts are based on 2016 and 2015 CACI updates of the 2011 Census respectively.

2016 L_{night} contours

3.44 Total movements over the 2016 L_{night} period increased by 3% from 2015 (see **Table C5**) to 78 per 8-hour night. Arrivals constituted 74% of total L_{night} movements. The largest movement increase was for the B789 (+4), whilst the largest decrease was for the EA346 (-2). The total night-time departures increased from 18.1 in 2015 to 20.2 in 2016. However, night-time arrival totals were almost unchanged.

3.45 The area of the outermost L_{night} 50-55 dBA contour band was marginally lower in 2016, but there were area increases at the 55-60 dB and 65-70 dB contour bands (see **Table 14**). (Note: the *cumulative* L_{night} contour areas showed no significant changes, see **Table C13**). The relatively small area changes can be attributed to a switch to quieter aircraft such as the Boeing 787-9, which offset the 3% rise in total movements.

3.46 There was a 2% increase in population within the 50-55 dBA band, but reductions at the higher bands. A similar pattern was evident for the household counts.

Table 14 Heathrow 2016 L_{night} contour band area, population and household estimates

L_{night} (dBA)	Area (km^2)			Population			Households		
	2016	2015	change	**2016**	2015	change	**2016**	2015	change
50 – 55	47.5	47.7	0%	158.8	155.8	+2%	64.7	62.6	+3%
55 – 60	17.9	17.8	+1%	51.5	55.0	-6%	18.2	20.9	-13%
60 – 65	5.6	5.6	0%	9.8	11.2	-13%	3.1	4.1	-24%
65 – 70	1.7	1.6	+6%	1.1	1.3	-15%	0.3	0.5	-40%
> 70	1.4	1.4	0%	0.0	0.0	(n/a)	0.0	0.0	(n/a)

Note: Populations and households are given in thousands. The 2016 and 2015 population/household counts are based on 2016 and 2015 CACI updates of the 2011 Census respectively.

3.47 The 2016 L_{night} contours are compared against the 2015 L_{night} contours in **Figure B16**. It can be seen that arrival noise was dominant over the night period. The shifts in the arrival contour tips for 2016 to the west of the airport can be explained by the changes to the runway splits for arrival movements – these splits were 69% west / 31% east in 2016 and 73% west / 27% east in 2015 (see **Table C10-c**). The 4% higher proportion of easterly arrival operations in 2016 extended the 50 dBA contour over parts of Windsor, thus producing the higher population count in the 50-55 dBA band.

2016 L_{den} contours

3.48 The total annual 24-hour aircraft movements in 2016 (1297) were 0.03% lower than in 2015 (see **Table C6**). The largest movement decreases were for the EA319C (-17), EA320V (-11) and B744G (-8). These reductions were offset by increases for the B789 (+27), EA320C (+7) and EA319V (+7). There was a 20% reduction in movements of the Boeing 747-400 aircraft in 2016 compared to 2015.

3.49 The area of the outermost L_{den} 55-60 dBA contour band in 2016 was effectively unchanged from 2015 (see **Table 15**). However, the higher contour band areas were all smaller, by up to 3%. (Note: the *cumulative* L_{den} contour areas reduced at all levels by up to 3%, as shown in **Table C14**). This resulted from the ongoing switch to more modern, quieter aircraft such as the Boeing 787-8/9 and Airbus A380, as well as reductions in arrival noise produced by certain ANCON aircraft types, such as the EA319V, EA320V and EA321V, as identified by noise measurements undertaken in 2016.

Table 15 Heathrow 2016 L_{den} contour band area, population and household estimates

L_{den} (dBA)	Area (km^2)			Population			Households		
	2016	2015	change	**2016**	2015	Change	**2016**	2015	change
55 – 60	123.6	123.5	0%	493.8	492.7	0%	211.6	206.9	+2%
60 – 65	45.6	46.7	-2%	151.1	155.0	-3%	59.1	61.0	-3%
65 – 70	19.4	19.9	-3%	39.7	42.4	-6%	13.8	16.0	-14%
70 – 75	6.1	6.3	-3%	4.8	5.3	-9%	1.6	2.0	-20%
> 75	3.4	3.5	-3%	< 0.1	0.1	(n/a)	< 0.1	< 0.1	(n/a)

Note: Populations and households are given in thousands. The 2016 and 2015 population/household counts are based on 2016 and 2015 CACI updates of the 2011 Census respectively.

3.50 The population and household counts were slightly higher for the 55-60 dBA contour band in 2016, whilst at the higher contour bands, decreases were found.

3.51 The 2016 L_{den} contours are compared against the 2015 L_{den} contours in **Figure B17**. Contour shapes were broadly similar between the two years, as was the case with the L_{day}, $L_{evening}$ and L_{night} contours.

2016 $L_{eq,6.5hr\ night}$ contours

3.52 Total movements in the 6.5-hour night period for 2016 increased by 5% to 16.8 (see **Table C7**) from the year before (2015: 16.0). The largest movement increases were for the ANCON aircraft types B789 (+1.1) and B772G (+0.8). These movement increases were offset by decreases for the B744R (-1.3) and B772R (-0.7). Total 6.5-hour night departures increased by 55% from 1.1 in 2015 to 1.6 in 2016. Total 6.5-hour night arrivals increased by 2% from 14.9 in 2015 to 15.2 in 2016.

3.53 The 48 dBA $L_{eq,6.5hr\ night}$ contour area of 33.9 km^2 in 2016 was 3% larger than in 2015 (see **Table 16**). This can be attributed to the 5% increase in movements over the 6.5-hour night period.

3.54 Populations and households within the 48 dBA contour dropped by 10% and 15% respectively.

Table 16 Heathrow 2016 $L_{eq,6.5hr\ night}$ contour band area, population and household estimates

$L_{eq,6.5hr\ night}$ (dBA)	Area (km^2)			Population			Households		
	2016	2015	change	**2016**	2015	Change	**2016**	2015	change
> 48	33.9	33.0	+3%	95.4	105.5	-10%	34.2	40.3	-15%

Note: Populations and households are given in thousands. The 2016 and 2015 population/household counts are based on 2016 and 2015 CACI updates of the 2011 Census respectively.

3.55 The 2016 $L_{eq,6.5hr\ night}$ 48 dBA contour is compared against the 2015 contour in **Figure B18**. The contour lobes to the east of the airport (around Kew) contracted in 2016, leading to the aforementioned population reductions. This contour contraction can be explained by the fact that the 2016 modal split for arrivals only was 69% west / 31% east (see **Table C10-e**), which was equivalent to a 3% lower percentage of westerly arrivals than in 2015, when the arrival runway split was 72% west / 28% east.

Long-term contour trends

3.56 Long-term area, population and household trends for the outermost cumulative contour are shown graphically in **Figures B19-B23** for L_{day}, $L_{evening}$, L_{night}, L_{den} and $L_{eq,6.5hr\ night}$ respectively, for the base year 2006 and 2009 through to 2016 (note: the population and household trends are all based on updated CACI data). It should also be noted that in previous reports this trend analysis has been conducted only for the outer contour band, e.g. L_{den} 55-60 dBA. While this change to the cumulative contours should better represent the full situations, it was found that the conclusions on the trends changed very little. The westerly and easterly movement percentages (i.e. the runway modal split) have also been indicated by the dashed lines on the charts.

3.57 Some factors that had an effect on the contours between 2006 and 2016 include the following:

- 2006:
    - ICAO Chapter 4 compliance estimated at 94% of the total fleet. (In the following years, the replacement of older, noisier types by quieter types will increase the Chapter 4 compliance percentage, leading to smaller contours).
- 2009:
    - Boeing 747-400 movements were 21% lower than in 2006, causing reductions in contour size.
- 2010:
    - Disruption from volcanic ash crisis, air traffic control strikes and adverse winter weather led to higher numbers of late running departures at night, thus increasing the size of the night-time contours;
    - Total movements were 5% lower than in 2006, helping to reduce contour areas relative to 2006;
    - A low in the percentage of westerly movements, tending to reduce contour areas.
- 2011:
    - Total movements were 6% higher than in 2010, tending to increase contour areas.

- 2013:
    - Southern runway closed at night due to the resurfacing programme, shifting the noise at night from the southern runway to the northern runway;
    - A low in the percentage of westerly movements, helping to reduce contour areas.
- 2014:
    - Northern runway closed at night due to the resurfacing programme, shifting the noise at night from the northern runway to the southern runway;
    - ICAO Chapter 4 compliance reached an estimated 99% of the total fleet (5% more than in 2006), reflecting higher numbers of newer, quieter aircraft and reducing contour areas compared to 2006;
    - Westerly departure trials between August and November, and easterly departure trials between July and November, shifting the distribution of departure noise to different areas.
- 2015:
    - Return to a 'normal' north-south runway usage split at night following the runway resurfacing works in 2013 and 2014, shifting some noise back to the northern runway;
    - Return to: (a) standard departure routes following the departure trials of 2014, and (b) distributions of departure noise experienced prior to 2014;
    - ICAO Chapter 4 compliance estimated at 99% of the total fleet, reflecting higher numbers of newer, quieter aircraft and reducing contour areas compared to 2006.
- 2016:
    - Ongoing phase-out of older, noisier aircraft types such as the Boeing 747-400 and replacement by more modern, quieter types such as the Airbus A380 and Boeing 787-8/9, helping to reduce contour areas compared to 2006.

3.58 There was a downward trend for the L_{day} 55 dBA area, population and households from 2006 through to 2010 (see **Figure B19**), when movements also fell to a low and the percentage of easterly operations was unusually high. However, an increase in area in 2011 was also accompanied by an increase in

populations and households, which to a large extent was due to the update to the population database in 2011, and also to the 5% higher proportion of westerly movements. From 2011 to 2014, the L_{day} area was relatively steady, before falling in 2015 and 2016 as noise levels reduced for certain ANCON aircraft types as identified by noise measurements, and as the fleet continued to switch to more modern, quieter aircraft types. Populations rose in 2013 following the major population database update, but fell after 2014 in line with the area reductions. The proportion of westerly movements was at its lowest in 2010 and 2013. Apart from 2010, total movements have been relatively steady, in the range of approximately 940-960 per 12-hour day.

3.59 The $L_{evening}$ 55 dBA area exhibited a downward trend from 2006 through to 2010 before rising in 2011, but since then, has been falling steadily through to 2016 (**Figure B20**). Movement numbers in the evening period declined from 2011 to 2014, but rose in 2015 and levelled off in 2016. Populations and households fell in 2009 from the 2006 levels, but increased in 2010 and 2011, and since then have fallen in unison with the area reductions apart from in 2013 when there was a major update to the 2013 population database. The percentage of westerly operations was at its lowest in 2010 and 2013.

3.60 The L_{night} 50 dBA area was at a similar level to 2006 in 2009 and 2010, before dropping back in 2011, and since then has remained at a steady level (**Figure B21**). Since 2011, L_{night} movements have been in the range of 75-78 per night. There was a downward trend in the population and households from 2009 to 2012 after the 2009 high. However, since 2012, population and household counts have been relatively high because of a range of factors. First, the population count rose in 2013 following the major update to the 2013 population database and the southern runway resurfacing programme, which increased arrival noise over Windsor. Around 60% of this population increase was due solely to the population database update. The population also then increased in 2015 as the contour shape changed following the northern runway resurfacing works in 2014 and the subsequent reversion to a ‘normal’ north/south runway usage in 2015, coupled with a higher percentage of westerly operations.

3.61 The L_{den} 55 dBA area fell between 2006 and 2009 as movements of the noise dominant Boeing 747-400 aircraft dropped by 21% (**Figure B22**). From 2009 to 2013 the area stayed at a similar level, but fell from 2014 through to 2016 as the fleet continued its switch to more modern, quieter aircraft such as the Airbus A380 and Boeing 787-8/9. The L_{den} population and households declined from 2006 through to 2010, but increased in 2011 despite the area staying almost constant, mainly due to the effects of the update to the 2011 population database, and also to a higher proportion of westerly movements. Between 2011 and 2016, the population and household counts generally followed a downward trend, apart from in 2013, when there was a major update to the 2013 population database. The frequency of movements has been fairly steady since the 2006

base year, apart from a dip in 2010, when disruptions from volcanic ash, air traffic control strikes and adverse winter weather meant the total was 5% below 2006 levels. There were lows in the proportions of westerly operations in 2010 and 2013.

3.62 The $L_{eq,6.5hr\ night}$ 48 dBA area was at a high in the 2006 base year, then dropped by 16% in 2009, and increased in 2010 when movements also rose (see **Figure B23**). The area then fell by 23% in 2011. From 2011 to 2013 the area was reasonably steady, but by 2015 had reduced by over 10%. The area rose by 3% in 2016 following a 5% increase in movements, which had previously seen little change between 2011 and 2015. Population and household counts moved broadly in line with the contour area from 2006 to 2011. However, in 2012 the population count fell despite an area increase as parts of the contour retracted from densely populated areas of west London, after the percentage of westerly movements had reduced. The area dropped by 4% in 2013, but the population count increased by 25% as the contour extended over west London in line with the northern runway. This population rise was caused by a combination of: (a) the southern runway resurfacing programme, which shifted movements to the northern runway, (b) a higher percentage of westerly operations, and (c) the major 2013 population database update based on the 2011 Census. Around 50% of the total population increase in 2013 was due solely to the population database update. The area and population/household counts declined in 2014 following a reduction in B744R movements and a shift in traffic to the southern runway whilst the northern runway underwent resurfacing works. In 2015 the area and population and household counts fell again as more B744R movements were replaced by quieter aircraft. The further decline in populations and households in 2016 resulted from a 3% shift in the runway modal split for arrivals in favour of easterly operations, which had the effect of pulling the contour away from populated areas in Kew.

Cumulative area, population and household counts – comparisons with 2006

3.63 The cumulative results in **Tables C16-C20** of Appendix C show that the 2016 annual contour areas were all below 2006 base year levels across all the noise metrics. For example, the L_{den} 55 dBA contour area in 2016 was 198.0 km^2, 19% smaller than the 2006 L_{den} 55 dBA area of 244.7 km^2.

3.64 Environmental Noise Directive (END) population figures from Defra have also been included in **Table C19** (in red) for the L_{den} cumulative contours. The Defra figures show a deviation of 1-2% from the CACI data for population counts at the 55, 60 and 65 dBA contour levels, and up to 3% variation for household counts at the same levels.

3.65 For the most part, population and household counts were lower in 2016 compared to 2006, in line with the area decreases; however, in a few cases the 2016 populations were higher than in 2006. For instance, the 2016 L_{day} 60 dBA contour population count was 7% higher than in 2006. The rises in population can be attributed to the effects of population encroachment between 2006 and 2016 in the areas around Heathrow. To illustrate the impact of encroachment, population and household counts for the 2016 contours have also been made using the 2006 population database. These counts, which are highlighted in blue in **Tables C16-C20**, confirm that the population and household counts would have dropped across all the noise metrics had there not been any population encroachment between 2006 and 2016. In the above example of the 2016 L_{day} 60 dBA contour, the population count would have fallen by 18% without encroachment.

3.66 The Heathrow noise contour area is largely controlled by movements of the Boeing 747-400 aircraft. Their numbers have decreased from an average of 135 movements per day in 2006 (**Ref 6**) to 56 movements in 2016, which amounts to a 59% reduction. Newer, quieter aircraft types such as the Airbus A380 and Boeing 787-8/9 were not in service in 2006, but by 2016 there was an average of 50 daily movements of the Airbus A380 and 75 daily movements of the Boeing 787-8/9. Such fleet changes helped to reduce the Heathrow contour areas between 2006 and 2016.

2016 L_{den} noise contours – comparisons with 2006

3.67 A diagram comparing the 2016 and 2006 L_{den} contours can be found in **Figure B24**. The contour lobes associated with departures turning to the north have shortened considerably, following the replacement of the Boeing 747-400 aircraft over this period of time by quieter types such as the Airbus A380 and Boeing 777-300ER. A similar change is seen in the contour lobe formed by westerly departures turning to the south (on the DVR/DET[15] route). Westerly arrival movements were more prevalent on the northern runway in 2006, thus the contour lobes to the east of the airport in 2006 were more expansive along the Runway 27R extended centreline compared to 2016.

3.68 To eliminate the effects of changes to the runway modal split and the north-south runway usage between 2006 and 2016, year 2016 L_{den} contours have also been produced using the 2006 base year runway modal split and the 2006 north-south runway usage (see **Figure B25**). The cumulative areas and populations within the resulting L_{den} contours are summarised in **Table C21**.

[15] See **Figure 1** for the Heathrow SID route diagram.

3.69 As the effects of the W/E and N/S runway splits have been removed, this means that the contour changes that are visible are due to the remaining changes including:

- Improvements to the aircraft fleet;
- Variations in the tracks actually flown;
- Variations of the number of each aircraft on each route.

3.70 It should be noted that noise from different events with the same aircraft type on the same track with the same fuel load can still vary due to procedural differences, whether standard procedures or those of individual pilots. The modelling attempts to reflect the average noise level for an aircraft, flight track, stage length (distance flown) and weather. As the ANCON model is continually updated to reflect actual and average noise levels, the results of the modelling should be as accurate as possible.

Noise change diagrams for L_{den}

3.71 In order to identify the areas where L_{den} noise levels have increased or decreased whilst excluding the effect of weather patterns on runway usage, a 'noise change' map has been produced to compare the noise exposure between the 2016 and 2006 L_{den} noise contours, assuming the 2006 runway modal splits in both cases[16] (see **Figure B26**). The 2006 L_{den} modal split was 70% west / 30% east. The 2016 L_{den} 55 dBA contour (assuming the 2006 modal split) has been used as the outer boundary of the noise changes.

3.72 As expected, most areas have experienced noise reductions of up to 3 dB, which reflects the phase-out of the older, noisier aircraft types between 2006 and 2016. However, a few areas have seen noise increases of less than 1 dB. The noise increase in the region immediately to the south of Windsor can be attributed to the CPT/SAM/GOG departure routes being used by 34% more traffic in 2016 compared to 2006. The noise increase over Egham resulted from a change in the positioning of the westerly mean tracks for the DET (previously DVR) departure routes, which were further to the west in 2016. It is estimated that 94% of the total area within the L_{den} noise change boundary experienced decreases in noise.

3.73 Another noise change diagram has been produced comparing the 2016 and 2006 L_{den} noise contours - this time assuming the 2006 runway modal split and

[16] That is, the 2016 L_{day}, $L_{evening}$ and L_{night} contours (the constituent parts of 2016 L_{den}) have been modelled with the 2006 L_{day}, $L_{evening}$ and L_{night} runway modal splits respectively.

the 2006 north-south runway usage in both cases (see **Figure B27**). A similar pattern of noise changes is seen in this diagram.

3.74 A further noise change map has been produced to compare the 2016 and 2015 L_{den} noise contours, assuming the 2015 runway modal splits in both cases[17] (see **Figure B28**). The 2015 L_{den} modal split was 72% west / 28% east. The year 2016 L_{den} 55 dBA contour (assuming the 2015 modal split) has been used as the outer boundary of the areas of noise change being considered. Most places have experienced noise reductions of up to 1 dB, but there are some areas, for example around Battersea and near Egham and Staines-upon-Thames where some noise increases (of less than 1 dB) can be identified.

3.75 A summary of the annual passengers, movements and 55 dBA L_{den} contour area, populations and households for 2006 and 2009-2016 are given in **Table 17**. Although 2016 had the highest passenger traffic since 2006, the L_{den} 55 dBA contour had the smallest area and the fewest number of people within.

Table 17 Heathrow annual passenger/movements and 55 dBA L_{den} area/population/households for 2006 & 2009-2016

Year	Passengers (mppa)	Annual movements	55 dBA L_{den} area	55 dBA L_{den} population	55 dBA L_{den} households
2006	67.5	477,274	244.7	756.1	338.5
2009	66.0	466,178	222.1	717.9	310.8
2010	65.9	454,717	222.3	712.2	305.5
2011	69.4	480,742	221.9	739.5	318.2
2012	70.0	473,734	216.9	725.0	312.5
2013	72.4	471,982	220.4	750.9	308.5
2014	73.4	471,872	210.7	704.3	288.3
2015	75.0	473,734	200.0	695.4	285.9
2016	75.7	474,858	198.0	689.4	286.1

2016 L_{night} noise contours – comparisons with 2006

3.76 A diagram comparing the 2016 and 2006 L_{night} contours can be found in **Figure B29**. Overall reductions in contour area between 2006 and 2016 can be

[17] That is, the 2016 L_{day}, $L_{evening}$ and L_{night} contours (the constituent parts of 2016 L_{den}) have been modelled with the 2015 L_{day}, $L_{evening}$ and L_{night} runway modal splits respectively.

seen. The cumulative areas, populations and households for these contours are summarised in **Table C18**. The 2016 L_{night} 50 dBA contour area of 74.0 km^2 was 12% smaller than in 2006 (84.4 km^2).

Noise change diagrams for L_{night}

3.77 A noise change diagram has also been produced comparing 2016 L_{night} with 2006 L_{night} assuming the 2006 L_{night} runway modal split (72% west / 28% east) in both cases (see **Figure B30**). The 2016 L_{night} 50 dBA contour with the 2006 L_{night} modal split has been taken as the outer boundary of the noise changes. It can be seen that virtually all areas have experienced reductions in noise levels of up to 3 dB, which reflects the replacement of the older, noisier types (especially the B744R) between 2006 and 2016. It is estimated that 99.6% of the total area within the L_{night} noise change boundary experienced decreases in noise.

3.78 An additional noise change diagram (see **Figure B31**) has been produced comparing 2016 L_{night} with 2015 L_{night} assuming the 2015 L_{night} runway modal split (69% west / 31% east) in both cases. The 2016 L_{night} 50 dBA contour with the 2015 L_{night} modal split has been taken as the outer boundary of the noise changes. An area of noise increase of up to 1 dB can be seen around the southern runway. This was likely to have been caused by the higher proportion of departures that took place from the southern runway in 2016 over the 8-hour night period compared to 2015.

2016 L_{night} single mode noise contours

3.79 Single mode 2016 L_{night} contours have also been produced using the 2006 L_{night} north-south runway usage (see **Figures B32** & **B33**). They are overlaid onto the corresponding single mode L_{night} contours for 2006. Cumulative estimates of the areas, populations and households within the 2016 and 2006 L_{night} single mode contours (assuming the 2006 north-south runway usage in both cases) are provided in **Tables 18** & **19**.

3.80 The contour areas for both 100% westerly and 100% easterly modes have all decreased in 2016 compared to 2006. Whilst populations have also decreased for the most part, population increases are seen for the 100% westerly single mode contours at the 50 and 55 dBA levels (see **Table 18**). This can be attributed to the effects of population encroachment between 2006 and 2016 around Heathrow.

Table 18 Heathrow 2016 and 2006 L_{night} 100% W contours (assuming 2006 N-S runway usage) – cumulative area, population and household estimates

L_{night} (dBA)	Area (km^2)			Population			Households		
	2016	2006	change	**2016**	2006	change	**2016**	2006	change
> 50	75.1	86.0	-13%	283.6	282.8	0%	113.4	124.8	-9%
> 55	28.1	35.2	-20%	83.4	78.2	+7%	29.6	31.5	-6%
> 60	8.7	11.9	-27%	20.4	23.7	-14%	6.6	9.0	-27%
> 65	2.9	4.3	-33%	2.2	2.9	-24%	0.6	1.0	-40%
> 70	1.2	1.6	-25%	< 0.1	< 0.1	(n/a)	< 0.1	< 0.1	(n/a)

Note: Populations and households are given in thousands. The 2016 population/household counts are based on a 2016 CACI update of the 2011 Census. The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census.

Table 19 Heathrow 2016 and 2006 L_{night} 100% E contours (assuming 2006 N-S runway usage) – cumulative area, population and household estimates

L_{night} (dBA)	Area (km^2)			Population			Households		
	2016	2006	change	**2016**	2006	change	**2016**	2006	change
> 50	71.5	82.1	-13%	123.0	140.7	-13%	47.2	57.6	-18%
> 55	25.1	32.3	-22%	17.3	28.8	-40%	7.3	12.6	-42%
> 60	8.3	11.3	-27%	1.7	1.7	0%	0.7	0.7	0%
> 65	2.8	4.2	-33%	0.2	0.4	-50%	0.1	0.2	-50%
> 70	1.0	1.6	-38%	0.0	0.0	(-)	0.0	0.0	(-)

Note: Populations and households are given in thousands. The 2016 population/household counts are based on a 2016 CACI update of the 2011 Census. The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census.

2016 N65 annual 16-hour day contours

3.81 N65 contours (i.e. contours showing the number of aircraft noise events above 65 dBA L_{max}) have been produced for the 2016 annual average 16-hour day period (0700-2300 local time), for which the runway modal split was 70% west / 30% east.

3.82 The N65 contours for both 2016 and 2006 (runway modal split 70% west / 30% east) are overlaid in **Figure B34** (only the 50, 200 and 500 noise event levels are shown in the diagram for clarity). At the 50 events level, it can be seen that the 2016 contours were generally smaller; however, there was an obvious extension to the contour lobe to the west of Windsor Forest. This was a consequence of a much higher movement rate on the westerly CPT/SAM/GOG departure routes in 2016 compared to 2006.

3.83 The estimated cumulative areas, populations and households are summarised in **Table 20** for N65 values of 50,100, 200 and 500 events.

Table 20 Heathrow 2016 and 2006 annual average 16-hour day N65 - cumulative contour area, population and household estimates

N65	Area (km^2)			Population			Households		
	2016	2006	change	**2016**	2006	Change	**2016**	2006	Change
> 50	189.5	223.6	-15%	492.0	589.6	-17%	196.6	259.9	-24%
> 100	111.3	120.3	-7%	318.7	304.6	+5%	126.2	130.9	-4%
> 200	60.5	64.6	-6%	160.1	128.8	+24%	60.2	53.8	+12%
> 500	7.2	10.8	-33%	0.6	0.7	-14%	0.3	0.3	0%

Note: Populations and households are given in thousands. The 2016 population/household counts are based on a 2016 CACI update of the 2011 Census. The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census.

3.84 The results show that the N65 contour areas have all reduced between 2006 and 2016, reflecting the progressive switch from the noisiest aircraft such as the Boeing 747-400 to quieter types such as the Airbus A380, Boeing 777-300ER and Boeing 787-8/9. For example, the 50 events contour area for 2016 was 15% smaller than in 2006. However, population counts have not fallen in all cases – this was largely due to the effects of population encroachment around Heathrow and also to changes in contour shape.

N65 annual 16-hour day change diagrams

3.85 An N65 'change' map has been produced comparing the 2016 and 2006 N65 results assuming the 2006 runway modal split (70% west / 30% east) in both cases (see **Figure B35**). The outer boundary for the changes is the 2016 N65 50 events contour assuming the 2006 runway modal split.

3.86 It can be seen that many areas have experienced reductions of up to 150 noise events (per annual 16-hour day) exceeding 65 dBA L_{max}. However, there were increases of up to 50 N65 events south of Windsor, which was due to the higher

movement rates on the westerly CPT/SAM/GOG departure routes as previously mentioned. An area in the vicinity of Egham also experienced increases of up to 50 N65 events, which was caused by the DET mean departure track being positioned more to the west in 2016 compared to 2006. A region to the east of the southern runway showed increases of up to 50 N65 events, with a much smaller area experiencing an increase of between 50 and 100 N65 events. This was caused by a higher proportion of westerly arrivals on the northern runway in 2006, whereas the westerly arrival split between the two runways in 2016 was more even. Around 79% of the total area within the outer boundary of noise event changes experienced either N65 decreases or changes of less than 10 N65 events.

3.87 Another N65 change map has been produced comparing the 2016 and 2015 N65 results, assuming the 2015 runway modal split (72% west / 28% east) in both cases (see **Figure B36**). The outer boundary for the changes is the 2016 N65 50 events contour (assuming the 2015 runway modal split). It can be seen that virtually all areas are either subjected to changes of less than 10 N65 events or reductions of up to 50 N65 events.

2016 N70 annual 16-hour day contours

3.88 N70 contours (i.e. contours showing the number of aircraft noise events above 70 dBA L_{max}) have also been produced for the 2016 annual average 16-hour day period (0700-2300 local time), for which the runway modal split was 70% west / 30% east.

3.89 The N70 contours for 2016 and 2006 (modal split 70% west / 30% east) are overlaid in **Figure B37** (only the 50, 200 and 500 noise event levels are shown in the diagram for clarity). At the 50 events level, there are contractions in the departure contour lobes near Slough and Egham reflecting the switch to quieter aircraft types. However, there was an extension to the departure contour lobe over Windsor Great Park. This was caused by a much higher movement rate on the westerly CPT/SAM/GOG departure routes in 2016 compared to 2006, as previously mentioned.

3.90 The estimated cumulative areas, populations and households are summarised in **Table 21** for N70 values of 50,100, 200 and 500 events.

Table 21 Heathrow 2016 and 2006 annual average 16-hour day N70 - cumulative contour area, population and household estimates

N70	Area (km^2)			Population			Households		
	2016	2006	change	**2016**	2006	Change	**2016**	2006	Change
> 50	85.7	96.6	-11%	213.1	202.6	+5%	81.8	84.4	-3%
> 100	52.2	58.0	-10%	117.9	109.4	+8%	42.6	44.8	-5%
> 200	32.6	35.0	-7%	59.5	45.7	+30%	20.8	17.6	+18%
> 500	0.9	1.2	-25%	0.0	0.0	(-)	0.0	0.0	(-)

Note: Populations and households are given in thousands. The 2016 population/household counts are based on a 2016 CACI update of the 2011 Census. The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census.

3.91 The results show that the N70 contour areas have reduced between 2006 and 2016 at all levels, reflecting the replacement of the noisiest aircraft such as the Boeing 747-400 and the introduction of quieter types such as the Airbus A380, Boeing 777-300ER and the Boeing 787-8/9. For example, the 50 events N70 contour area for 2016 was 11% smaller than in 2006. However, despite the area reductions, population counts have risen. This was largely due to the effects of population encroachment around Heathrow, and also to changes in contour shape.

3.92 The N70 contours for 2016 assuming both the 2006 runway modal split and the 2006 north-south runway usage are overlaid onto the 2006 contours in **Figure B38** (only the 50, 200 and 500 noise event levels are shown in the diagram for clarity). The estimated cumulative areas, populations and households are summarised in **Table 22** for N70 values of 50,100, 200 and 500 events.

Table 22 Heathrow 2016 and 2006 annual average 16-hour day N70 (assuming 2006 modal split and 2006 N-S runway usage) - cumulative area, population and household estimates

N70	Area (km^2)			Population			Households		
	2016	2006	change	**2016**	2006	Change	**2016**	2006	Change
> 50	85.2	96.6	-12%	207.7	202.6	+3%	79.4	84.4	-6%
> 100	51.1	58.0	-12%	112.9	109.4	+3%	40.4	44.8	-10%
> 200	30.6	35.0	-13%	46.5	45.7	+2%	16.0	17.6	-9%
> 500	1.1	1.2	-8%	0.0	0.0	(-)	0.0	0.0	(-)

Note: Populations and households are given in thousands. The 2016 population/household counts are based on a 2016 CACI update of the 2011 Census. The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census.

N70 annual 16-hour day change diagrams

3.93 An N70 'change' map has been produced comparing the N70 results for 2016 with those for 2006, assuming the 2006 modal split (70% west / 30% east) in both cases (see **Figure B39**). The outer boundary for the changes is the 2016 N70 50 events contour (assuming the 2006 runway modal split). It can be seen that many areas have experienced reductions of up to 150 N70 events. However, there were increases of between 10 and 50 N70 events over Windsor Great Park, which were due to the higher movement rates on the westerly CPT/SAM/GOG departure routes as previously mentioned. An area immediately to the west of the northern runway also experienced increases of between 10 and 50 N70 events. This can be explained by the westerly departures in 2006 being biased to the southern runway, whereas in 2016, the westerly departure split between the two runways was more even. An area to the east of the southern runway also showed increases up to 50-100 N70 events. This was caused by westerly arrivals in 2006 favouring the northern runway over the 16-hour day period, whereas the westerly arrival split between the two runways in 2016 was more even. Approximately 79% of the total area within the outer boundary of noise changes was either exposed to decreases in N70 events, or increases of less than 10 N70 events.

3.94 A further N70 change map has been produced comparing the N70 results for 2016 with 2006, assuming the 2006 runway modal split and the 2006 north-south runway usage in both cases (see **Figure B40**). The outer boundary for the changes is the 2016 N70 50 events contour (assuming the 2006 runway modal split and the 2006 north-south runway usage). With the effects of the 2006 north-south runway usage removed, the areas of N70 increases to the west of the northern runway and to the east of the southern runway are reduced in size. The percentage area within the outer boundary subjected to either decreases in N70 events, or increases of less than 10 N70 events, is 86%.

3.95 An N70 change map has also been produced comparing the 2016 and 2015 N70 results, assuming the 2015 runway modal split (72% west / 28% east) in both cases (see **Figure B41**). The outer boundary for the changes is the 2016 N70 50 events contour assuming the 2015 runway modal split. It can be seen that all areas are either subjected to changes of less than 10 N70 events per 16-hour day or reductions of up to 50 N70 events.

2016 N70 annual 16-hour day single mode contours

3.96 Single mode 2016 N70 annual 16-hour day contours have also been produced using the 2006 north-south runway usage (see **Figures B42** & **B43**). They are overlaid onto the corresponding single mode N70 contours for 2006.

3.97 Cumulative estimates of the areas, populations and households within the 2016 and 2006 N70 annual 16-hour day single mode contours (assuming the 2006 north-south runway usage) are provided in **Tables 23** & **24** for 100% westerly and 100% easterly modes respectively.

3.98 The areas of all the single mode contours have reduced in 2016 compared to 2006. For some contour levels the population counts have risen due to a combination of population encroachment and changes in contour shape.

Table 23 Heathrow 2016 and 2006 annual 16-hour day N70 100% W contours (assuming 2006 N-S runway usage) – cumulative area, population and household estimates

N70	Area (km^2)			Population			Households		
	2016	2006	change	**2016**	2006	Change	**2016**	2006	Change
> 50	92.9	109.8	-15%	191.3	208.8	-8%	73.8	87.7	-16%
> 100	52.8	62.4	-15%	114.2	114.5	0%	42.0	47.5	-12%
> 200	33.9	39.3	-14%	68.0	65.7	+4%	23.8	26.1	-9%
> 500	1.6	2.7	-41%	0.0	< 0.1	(n/a)	0.0	< 0.1	(n/a)

Note: Populations and households are given in thousands. The 2016 population/household counts are based on a 2016 CACI update of the 2011 Census. The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census.

Table 24 Heathrow 2016 and 2006 annual 16-hour day N70 100% E contours (assuming 2006 N-S runway usage) – cumulative area, population and household estimates

N70	Area (km^2)			Population			Households		
	2016	2006	change	**2016**	2006	Change	**2016**	2006	Change
> 50	70.6	90.3	-22%	222.7	270.5	-18%	85.7	113.7	-25%
> 100	43.5	51.8	-16%	129.5	125.1	+4%	48.4	50.3	-4%
> 200	27.3	33.0	-17%	57.1	58.9	-3%	21.0	24.1	-13%
> 500	12.2	13.4	-9%	4.1	4.1	0%	1.6	1.8	-11%

Note: Populations and households are given in thousands. The 2016 population/household counts are based on a 2016 CACI update of the 2011 Census. The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census.

2016 N60 annual 8-hour night contours

3.99 N60 contours (i.e. contours showing the number of aircraft noise events above 60 dBA L_{max}) have been produced for the 2016 annual average 8-hour night

period (2300-0700 local time), for which the runway modal split was 70% west / 30% east. The N60 contours for years 2016 and 2006 are overlaid in **Figure B44** for the noise event levels 10, 20 and 50. The L_{night} modal split in 2006 was 72% west / 28% east.

3.100 The estimated cumulative areas, populations and households are summarised in **Table 25**. The results show that the N60 contour areas have all reduced between 2006 and 2016, reflecting the replacement of the noisiest aircraft types, such as the Boeing 747-400. For example, the 10 events N60 contour area for 2016 was 6% smaller than in 2006. However, population counts have increased at the 10 and 20 event levels. This was due to the effects of population encroachment around Heathrow and to changes in the contour shape, for example, the extension of the 20 events N60 contour over Windsor in 2016.

Table 25 Heathrow 2016 and 2006 annual average 8-hour night N60 - cumulative contour area, population and household estimates

N60	Area (km^2)			Population			Households		
	2016	2006	change	**2016**	2006	Change	**2016**	2006	Change
> 10	178.8	190.2	-6%	874.8	858.1	+2%	372.9	397.2	-6%
> 20	89.0	92.3	-4%	437.1	405.6	+8%	180.5	183.3	-2%
> 50	0.1	3.7	-97%	0.0	< 0.1	(n/a)	0.0	< 0.1	(n/a)

Note: Populations and households are given in thousands. The 2016 population/household counts are based on a 2016 CACI update of the 2011 Census. The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census.

N60 annual 8-hour night change diagrams

3.101 An N60 'change' map has been produced comparing the 2016 and 2006 annual 8-hour night N60 results, assuming the 2006 runway modal split (72% west / 28% east) in both cases (see **Figure B45**). The outer boundary for the changes is the 2016 annual 8-hour night N60 10 events contour assuming the 2006 runway modal split. It can be seen that all areas are either subjected to changes of less than 5 N60 events per 8-hour night or reductions of up to 20 N60 events.

3.102 A further N60 change map has been produced comparing the 2016 and 2015 annual 8-hour night N60 results, assuming the 2015 runway modal split (72% west / 28% east) in both cases (see **Figure B46**). The outer boundary for the changes is the 2016 annual 8-hour night N60 10 events contour assuming the 2015 runway modal split. It can be seen that most areas are subjected to changes of less than 2 N60 events, with a relatively small area around the southern runway experiencing an increase of between 2 and 3 N60 events per 8-hour night.

Chapter 4
Conclusions

4.1 In 2016, there were 1266.7 average summer 16-hour day movements at Heathrow, which was 0.6% lower than in 2015 (1274.5). The area of the 57 dBA average summer day actual modal split Leq contour was 101.5 km^2, 1% smaller than in 2015 (102.5 km^2). The population count within this contour dropped by 4% to 247,100 (2015: 258,300). The 57 dBA standard modal split (79% west / 21% east) Leq contour area decreased by 3% to 99.6 km^2 (2015: 102.5 km^2), and the population reduced by 4% to 249,200 (2015: 258,300).

4.2 The 2016 average summer 8-hour night movement total (84.4) was 6% higher than in 2015 (79.7). This was due solely to an increase in departure movements, mostly in the hours 2300-0000 and 0600-0700. The area of the 48 dBA 8-hour night actual modal split (85% west / 15% east) Leq contour increased by 3% to 115.4 km^2 (2015: 111.5 km^2), with the population count rising by 10% to 437,900 (2015: 399,100).

4.3 The numbers of annual aircraft movements at Heathrow were 0.2% lower over the L_{day} period, 0.3% lower for $L_{evening}$, but 3% higher for L_{night}, compared to 2015. Similar to the summer night period, the L_{night} movement increase was caused by a rise in departures. Overall 24-hour L_{den} movements in 2016 (1297.4) were virtually unchanged from 2015 (1297.9). Movements over the 6.5-hour night period in 2016 were 5% higher compared to 2015.

4.4 The area of the outermost L_{day} contour band (55-60 dBA) in 2016 was 2% smaller than in 2015. There were also area decreases of up to 7% at the other L_{day} contour bands. Similarly, the outermost band for $L_{evening}$ (55-60 dBA) reduced by 4% in 2016 and there were reductions at the higher contour bands as well. The area of the outermost 2016 L_{night} contour band (50-55 dBA) was effectively unchanged from 2015, but increases occurred at two of the higher contour bands. The 2016 L_{den} area for the outermost contour band (55-60 dBA) was unchanged from 2015, but there were decreases of up to 3% at all the higher contour bands.

4.5 The *cumulative* contour areas in 2016 were smaller than in 2015 for L_{day}, $L_{evening}$ and L_{den}. For example, the 55 dBA L_{den} area of 198.0 km^2 in 2016 was 1% smaller than in 2015 (200.0 km^2). This can be attributed to the ongoing replacement of older, noisier types by more modern, quieter types such as the Airbus A380 and Boeing 787-8/9, and also to lower measured arrival noise levels in 2016 for ANCON types such as the EA319V and EA320V. Contour areas were unchanged for L_{night}, but 3% higher for $L_{eq,6.5hr\ night}$. Over the L_{night} period, the phase-out of noisier aircraft such as the Boeing 747-400 was offset by an

increase in total departure movements. The 5% increase in movements over the 6.5-hour night period more than offset the introduction of more modern, quieter aircraft types.

4.6 The 2016 L_{day} and $L_{evening}$ contour bands showed population and household changes from 2015 that were, for the most part, in line with the area reductions. For L_{night}, changes to the contour shape that resulted from a higher percentage of easterly arrival operations shifted the contour over Windsor, thereby causing an increase in population for the 50-55 dBA contour band. For 2016 L_{den}, the reduction in areas for the contour bands above 60 dBA resulted in decreases in the populations enclosed. The population and households within the 2016 $L_{eq,6.5hr\ night}$ 48 dBA contour fell by 10% and 15% respectively, despite the 3% area increase. This was caused by a shift to a lower percentage of westerly arrival operations, which had the effect of pulling the contour away from populated areas of Kew.

4.7 With respect to long-term trends, the L_{day} 55 dBA contour area has been reasonably steady since 2009 after the initial high in 2006. A dip in the L_{day} area in 2010 coincided with a low in aircraft movements and a relatively high percentage of easterly movements. The L_{day} area also dipped in 2015 and 2016 as noise levels reduced for certain ANCON aircraft types as identified by noise measurement data, and as the fleet mix continued to switch to more modern, quieter aircraft. Populations and households fell to a low in 2010 after dropping from the 2006 peak, but rose in 2011 and 2013 following updates to the population database. They dipped again in 2015 and 2016 in line with the area reductions.

4.8 The area, population and households within the $L_{evening}$ 55 dBA contour decreased in 2009 from the 2006 peak as movements declined, but rose to a high in 2011 as movements recovered. Since 2011 the area, population and households have followed a downward trend, although in 2013 the population count increased due to the major population database update. Movements declined between 2011 and 2014, but rose in 2015 and levelled off in 2016.

4.9 In terms of trends for the L_{night} 50 dBA contour, aircraft movements and contour areas have been relatively stable since 2011. Prior to 2011 the area was higher, but also at a steady level. The population and household counts followed a downward trend from 2009 through to 2012, but increased in 2013 after the population database update of 2013, which was based on the latest 2011 Census, and because of contour shape changes caused by the southern runway resurfacing programme in 2013. A higher percentage of westerly operations and a more even split between the northern and southern runways (after the northern runway resurfacing work carried out in 2014) influenced the contour shape in 2015. Populations have remained at a higher level since 2013.

4.10 After the 2006 high, the L_{den} 55 dBA contour area was fairly flat between 2009 and 2013, but since then has generally fallen as the Heathrow fleet switched to more modern and quieter types such as the Airbus A380 and Boeing 787-8/9. Populations and households trended downwards between 2011 and 2016, apart from a rise in population in 2013 due to the major population database update. Aircraft movements in the L_{den} period have been at a similar level since 2006, with the exception of a drop in 2010.

4.11 The $L_{eq,6.5hr\ night}$ 48 dBA area has followed a downward trend since 2011, whilst movements over this period have been steady. Following two years of population decreases in 2011 and 2012, the population rose in 2013 due to an extension of the contour over west London in line with the northern runway. This was caused by resurfacing works on the southern runway coupled with a higher percentage of westerly operations. In addition, there was a major update to the population database in 2013 based on the 2011 Census. However, in 2014, the population count returned to near 2012 levels as the contour area reduced, and fell again in 2015 as more B744R movements were phased out. A reduction in the percentage of westerly arrival operations in 2016 shifted the contour away from populated areas of Kew, which in turn reduced the population count despite the overall area increase.

4.12 The 2016 *cumulative* contour areas were below 2006 levels for all the annual noise metrics considered. In most cases, populations and households within the 2016 contours were also lower than in 2006. However, at some contour levels, populations and households were higher in 2016 - this was due to the population encroachment around Heathrow between 2006 and 2016. Population and household counts for the 2016 contours, carried out with the 2006 population database instead of the 2016 database, indicated that the 2016 counts would have all been lower than in 2006 if population encroachment had not occurred.

4.13 An assessment of L_{den} noise changes between 2006 and 2016, assuming the 2006 base year modal split in both cases, indicated that 94% of the area assessed has experienced noise reductions of up to 3 dB. A few places were exposed to a noise increase of less than 1 dB, amounting to approximately 6% of the total area under consideration. These included a region south of Windsor, overflown by the CPT/SAM/GOG westerly departure routes, which were more heavily used in 2016 than in 2006.

4.14 An analysis of L_{den} noise changes between 2015 and 2016, assuming the 2015 modal split in both cases, indicated that most areas have experienced noise reductions of up to 1 dB. Some areas around Battersea and Egham/Staines-upon-Thames were subjected to noise increases of less than 1 dB.

4.15 An analysis of L_{night} noise changes between 2006 and 2015, assuming the 2006 base year runway modal split in both cases, showed that over 99% of the area under consideration experienced reductions in noise of up to 3 dB. This reflects

the replacement of the older, noisier aircraft types operating at night, especially the B744R.

4.16 An assessment of L_{night} noise changes between 2015 and 2016, assuming the 2015 modal split in both cases, indicated some noise increases especially around the southern runway. This can be attributed to the relatively higher proportion of departures from the southern runway in 2016.

4.17 Single-mode contours produced for 2016 and 2006 L_{night} showed that areas have all reduced in 2016 compared to 2006. However, population counts increased at some of the contour levels - this can be attributed to the effects of population encroachment between 2006 and 2016.

4.18 N65 and N70 annual average 16-hour day contours, and N60 annual average 8-hour night contours, produced for years 2006 and 2016, showed that contour areas have decreased between 2006 and 2016 in all cases. This is indicative of the progressive replacement of the noisiest aircraft types, such as the Boeing 747-400, by quieter types such as the Airbus A380, Boeing 777-300ER and Boeing 787-8/9.

4.19 In some cases there were population and household increases in spite of the reductions in N-contour areas. These can be attributed to the effects of population encroachment around Heathrow and also to changes in contour shapes.

4.20 An assessment of N65 changes between 2006 and 2016, assuming the 2006 modal splits in both cases, showed that many areas have experienced reductions of up to 150 events per annual 16-hour day. However, there were increases of up to 50 events: (a) around Windsor Forest due to higher usage of the CPT/SAM/GOG routes in 2016, (b) near Egham due to a westerly shift in the positioning of the 2016 DET mean departure track relative to 2006, and (c) east of the southern runway, because the northern runway was used proportionately more for westerly arrivals in 2006, whereas westerly arrivals were fairly evenly split between the northern and southern runways in 2016. Approximately 79% of the total area assessed either experienced decreases in N65 events or increases of less than 10 N65 events.

4.21 An analysis of N65 changes between 2015 and 2016, assuming the 2015 modal split in both cases, indicated that virtually all areas are either subjected to changes of less than 10 events or reductions of up to 50 events.

4.22 An assessment of annual 16-hour day N70 changes between 2006 and 2016, assuming the 2006 runway modal split in both cases, revealed some areas where increases in N70 events occurred. These were due to: (a) higher movement rates on the CPT/GOG/SAM routes in 2016, (b) a bias towards usage of the southern runway for westerly departures in 2006, and (c) the northern runway being favoured for westerly arrivals in 2006.

4.23 An examination of annual 8-hour night N60 changes between 2006 and 2016, assuming the 2006 runway modal split in both cases, showed that all areas either experienced changes of less than 5 N60 events or reductions of up to 20 N60 events.

4.24 The N60 annual 8-hour night changes between 2015 and 2016 indicated that most areas are subjected to changes of less than 2 N60 events per night.

APPENDIX A

References

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APPENDIX B

Figures

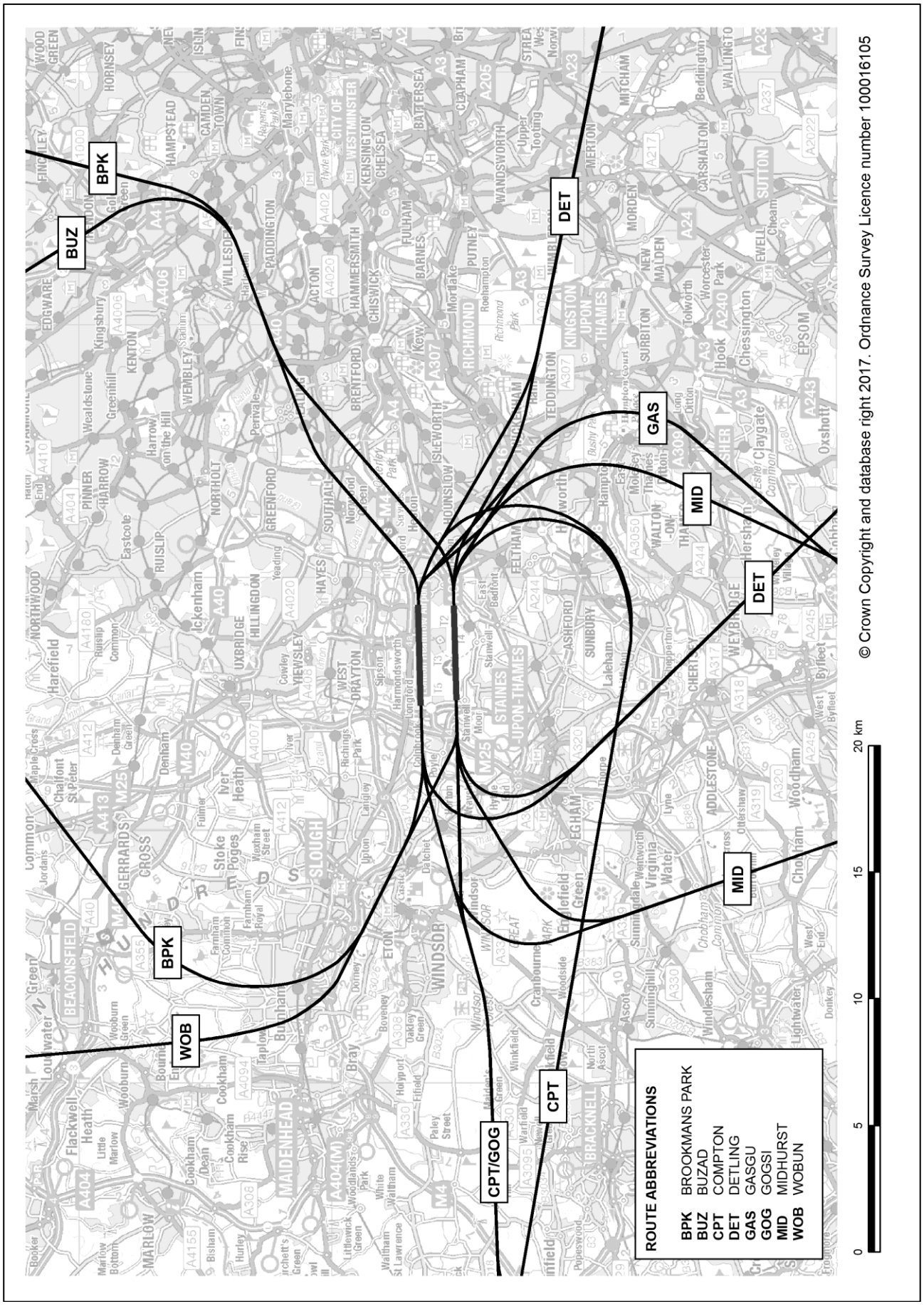
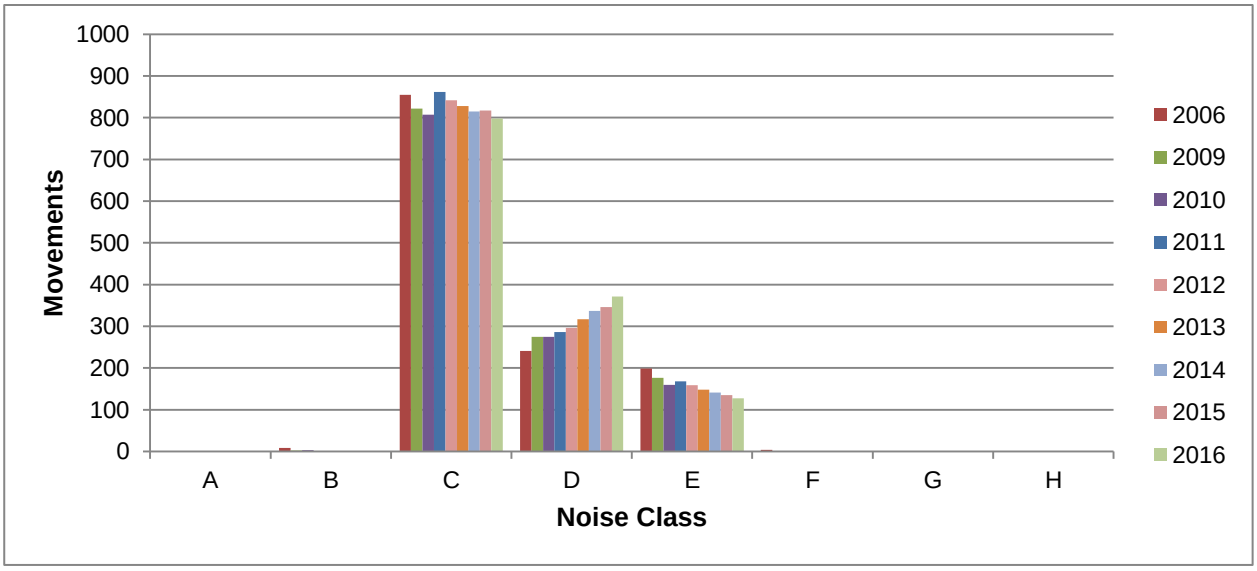


Figure B1 Heathrow NPR/SID routes

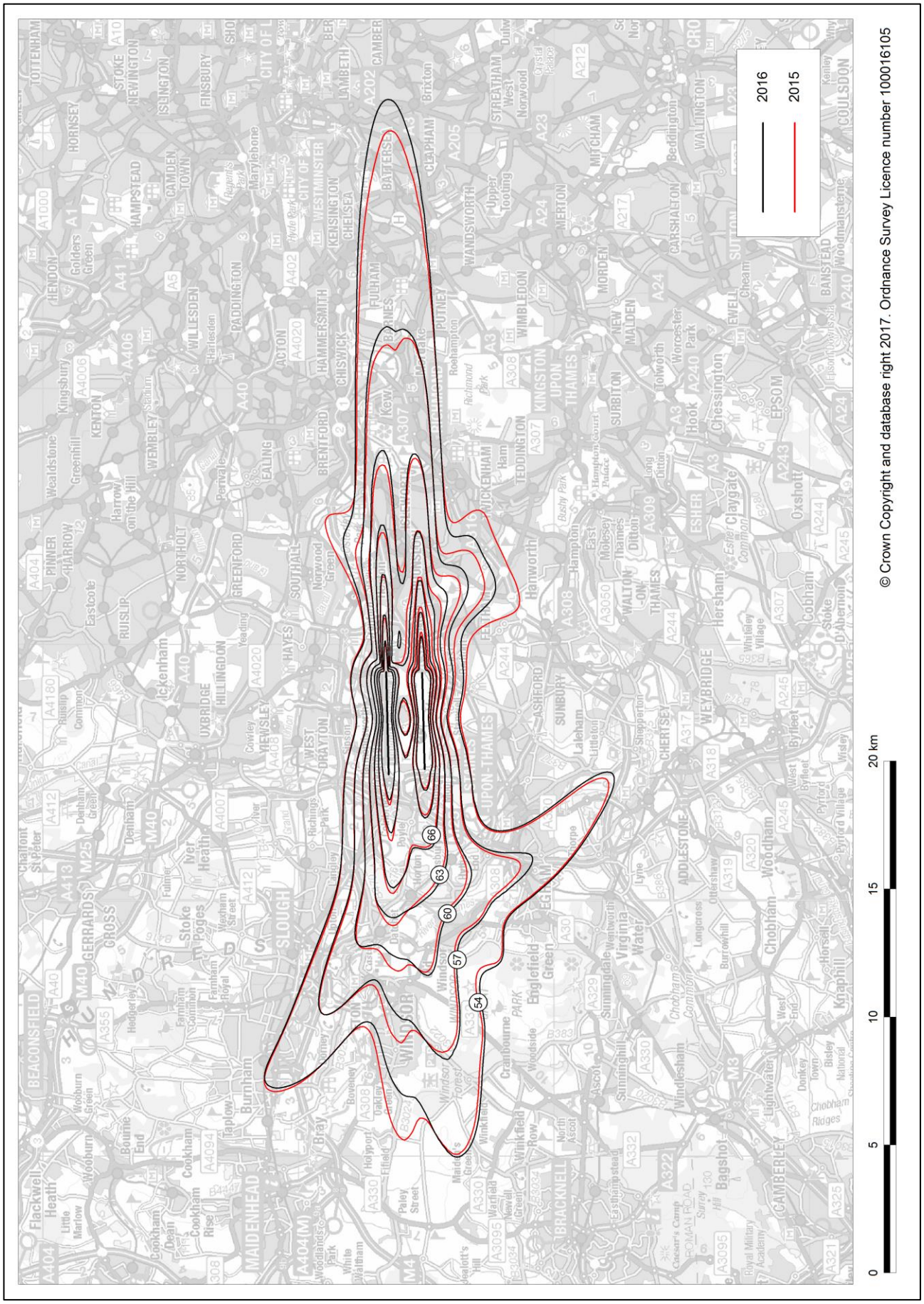
Figure B2 Heathrow annual average 24-hour movements by Noise Class



Note: Noise Class descriptions are given below:

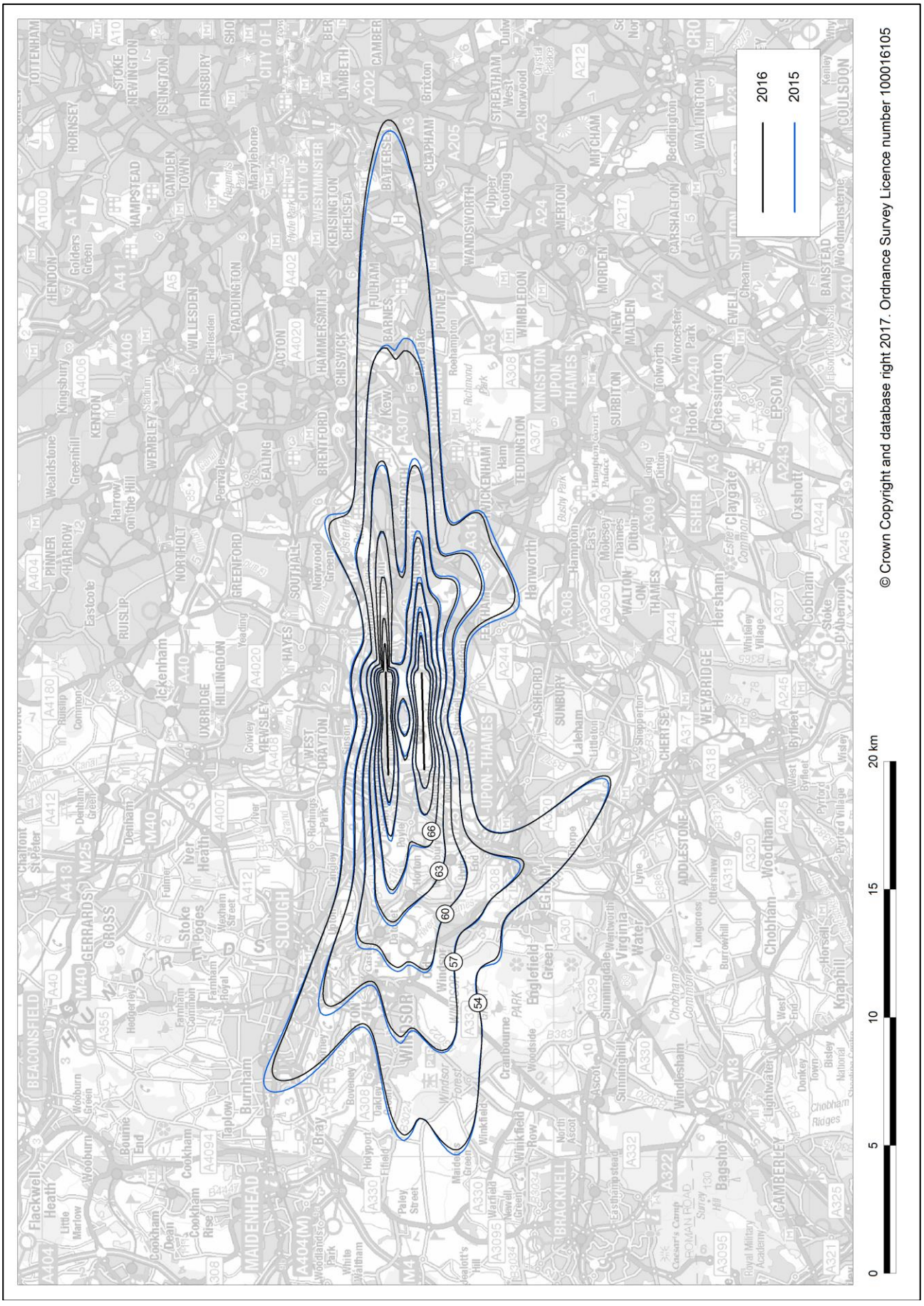
Noise Class	Description
A	Small propeller
B	Large propeller
C	Narrow-body jets *(e.g. Airbus A319, Airbus A320, Boeing 737-800)*
D	Wide-body twin engine *(e.g. Boeing 777, Boeing 787, Airbus A330)*
E	Wide-body 3,4 engine *(e.g. Boeing 747-400, Airbus A380)*
F	1st generation wide-body 3,4 engine *(e.g. Boeing 747-100)*
G	2nd generation narrow-body twin engine *(e.g. Boeing 737-200)*
H	1st generation narrow-body 3,4 engine *(e.g. Boeing 727)*

Figure B3 Heathrow 2016 and 2015 average summer day 54-72 dBA actual modal split Leq noise contours



Note: 2016 day actual modal split was 86% W / 14% E; 2015 day actual modal split was 78% W / 22% E.

Figure B4 Heathrow 2016 and 2015 average summer day 54-72 dBA standard modal split Leq noise contours



Note: 2016 day standard modal split was 79% W / 21% E; 2015 day standard modal split was 78% W / 22% E.

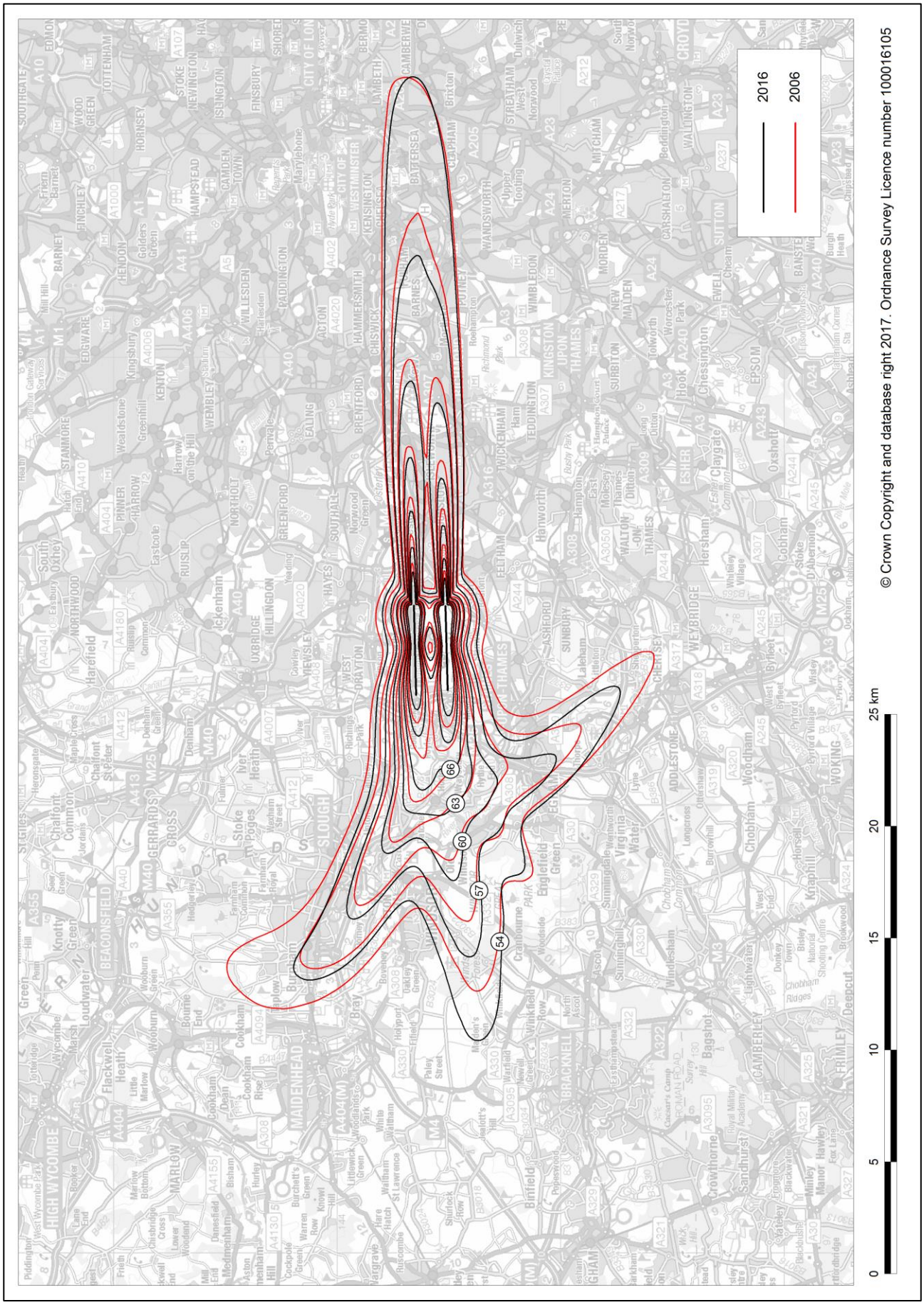


Figure B5 Heathrow 2016 and 2006 average summer day 54-72 dBA 100% W Leq noise contours (with 2006 N-S runway usage)

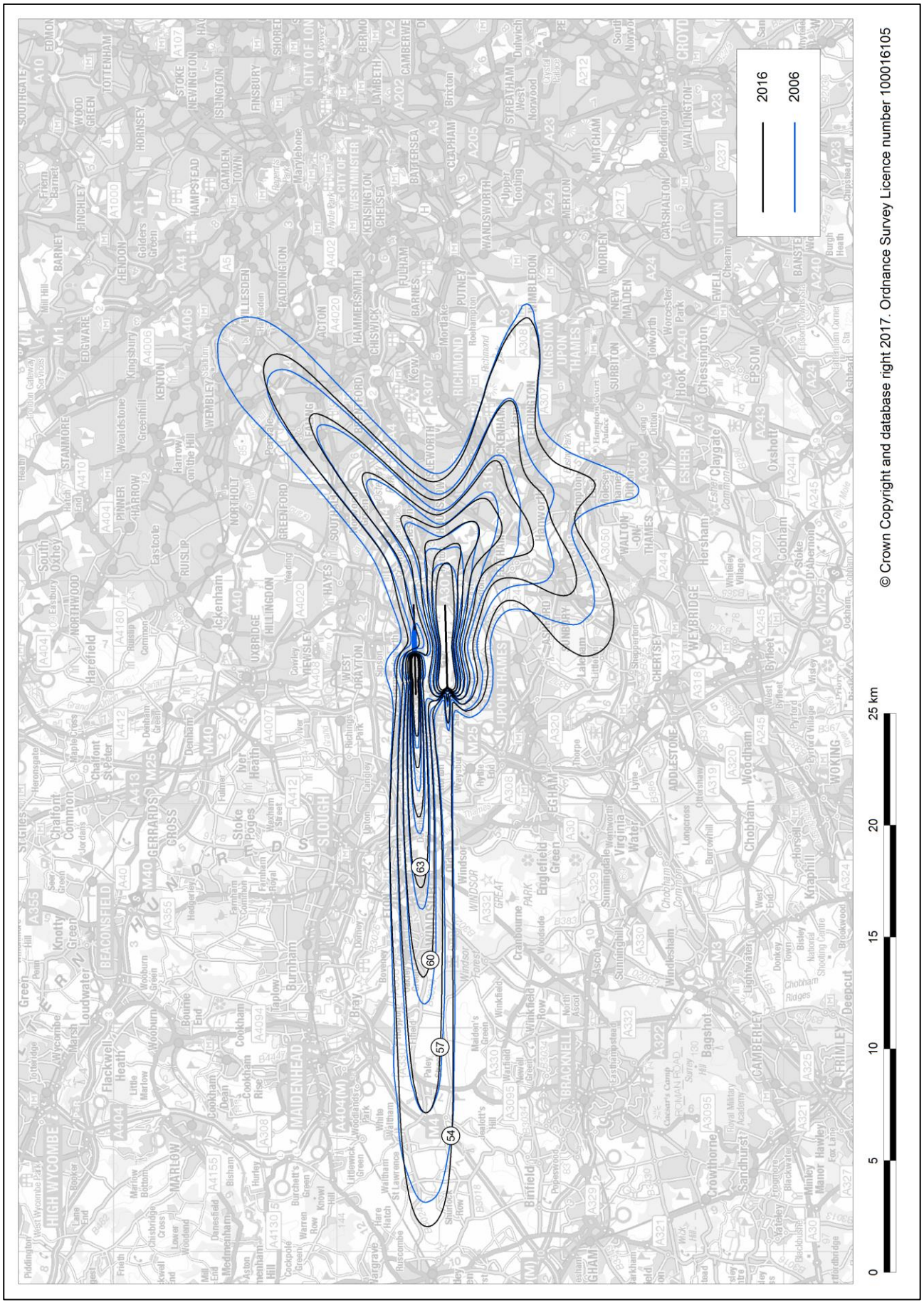
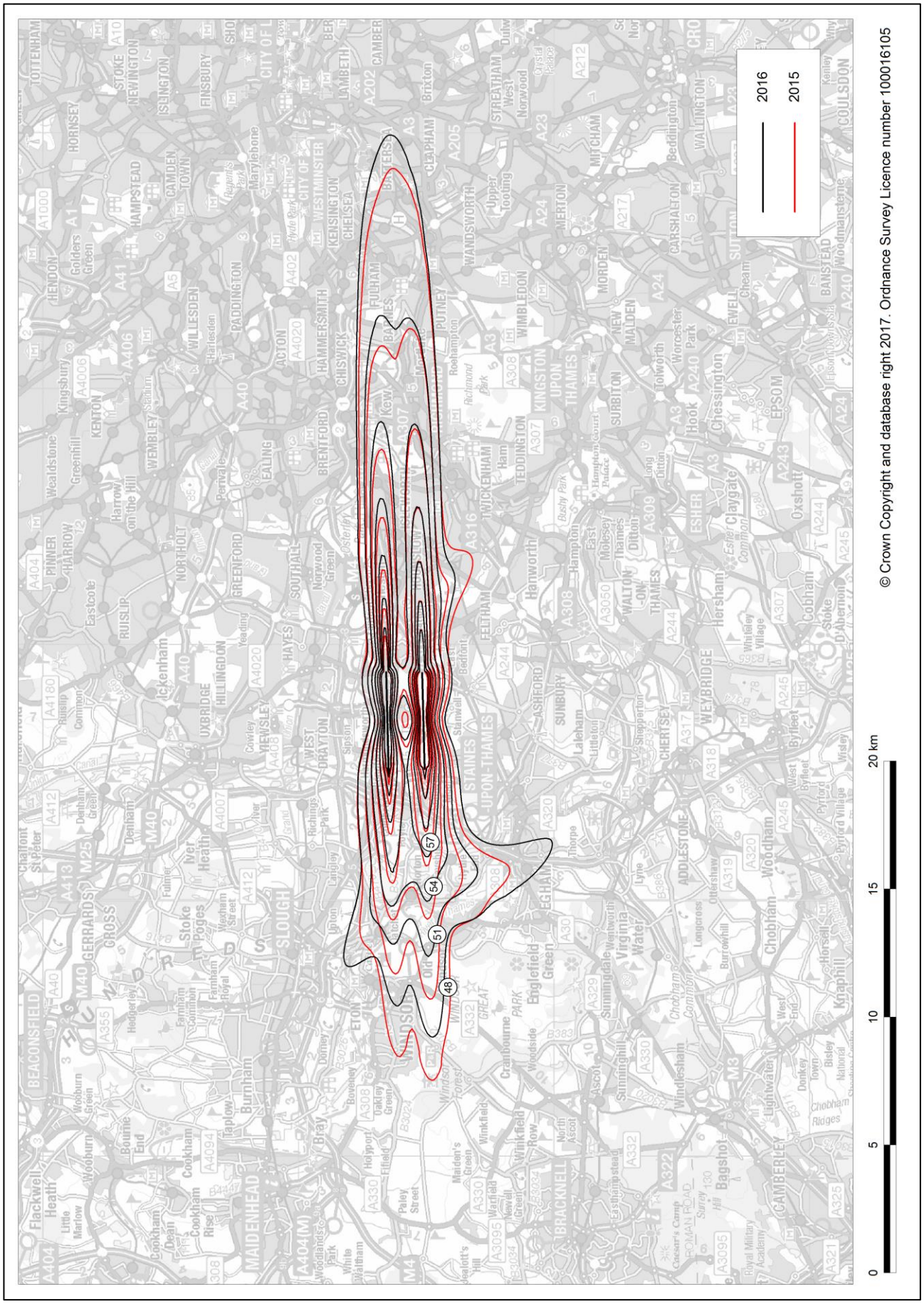


Figure B6 Heathrow 2016 and 2006 average summer day 54-72 dBA 100% E Leq noise contours (with 2006 N-S runway usage)

Figure B7 Heathrow 2016 and 2015 average summer night 48-66 dBA actual modal split Leq noise contours



Note: 2016 night actual modal split was 85% W / 15% E; 2015 night actual modal split was 77% W / 23% E.

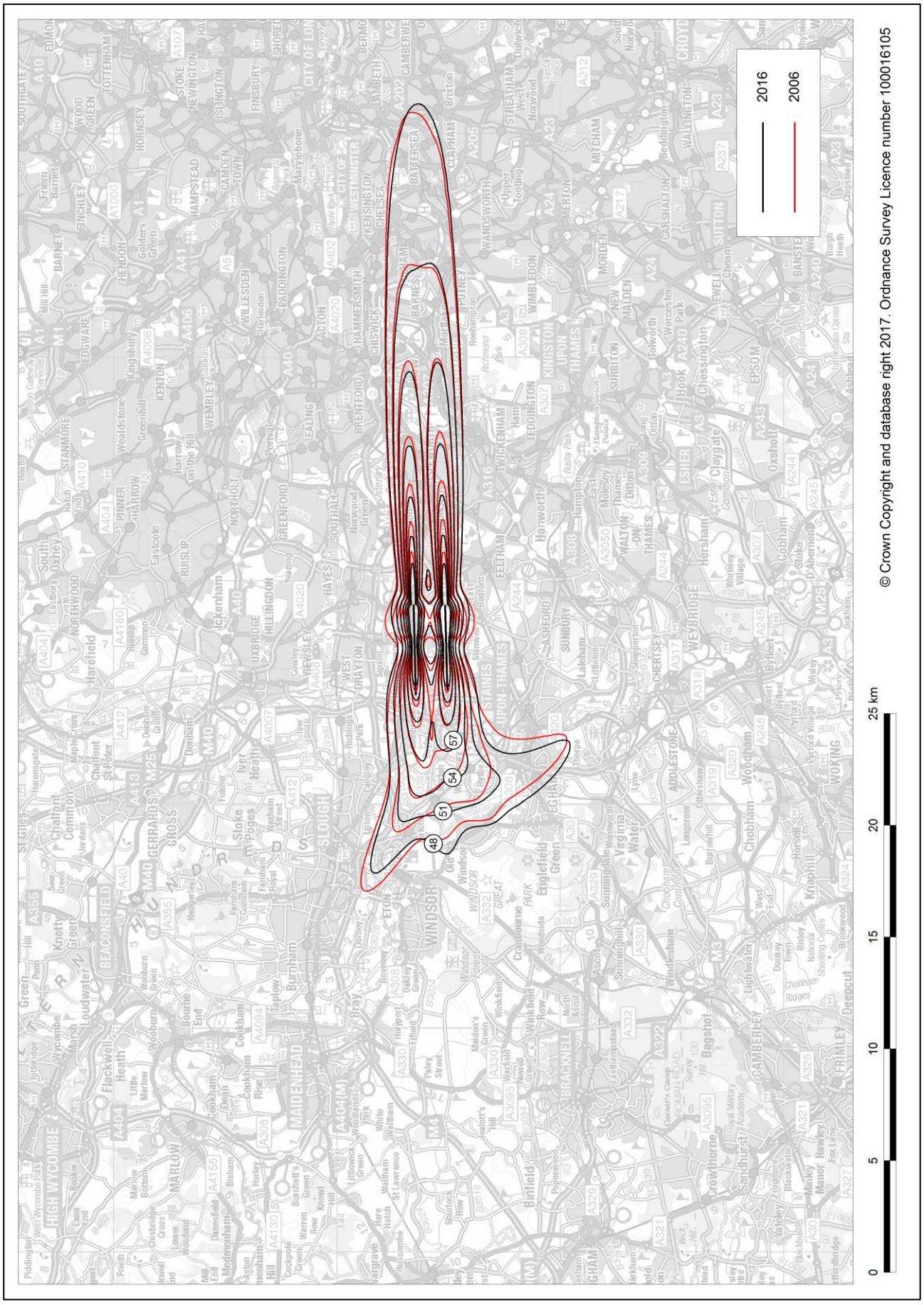
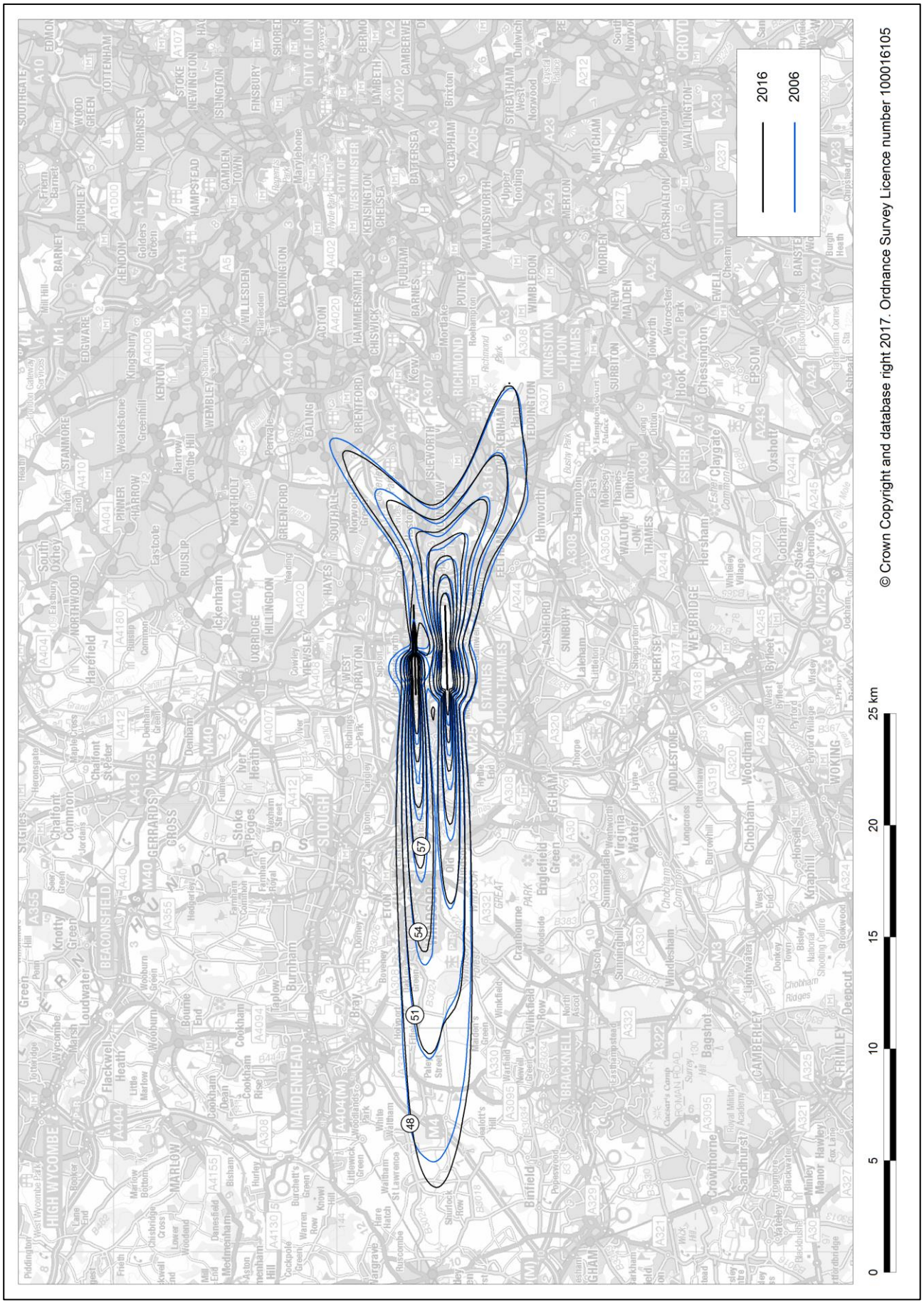


Figure B8 Heathrow 2016 and 2006 average summer night 48-66 dBA 100% W Leq noise contours (with 2006 N-S runway usage)

Figure B9 Heathrow 2016 and 2006 average summer night 48-66 dBA 100% E Leq noise contours (with 2006 N-S runway usage)



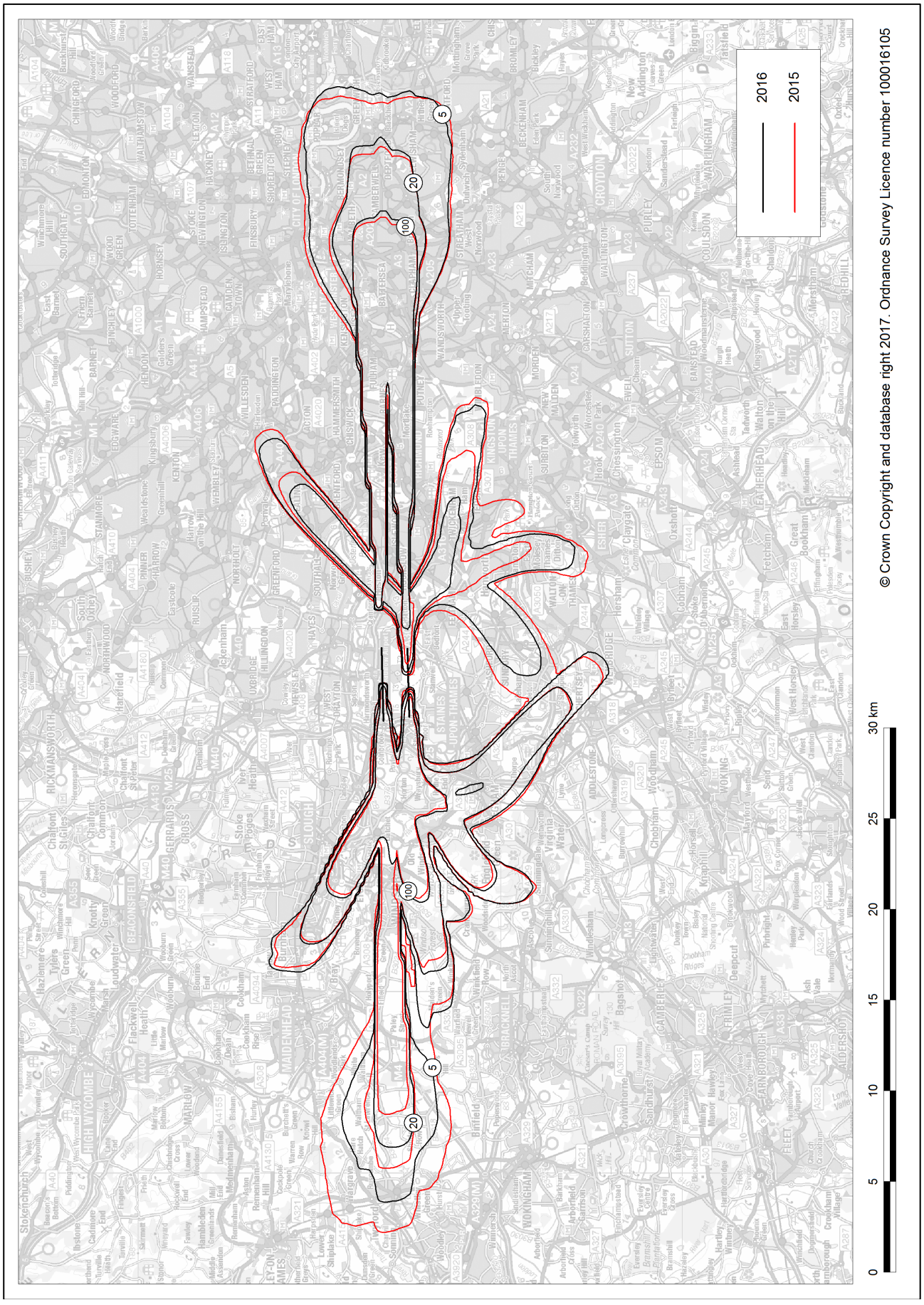


Figure B10 Heathrow 2016 and 2015 average summer day overflight contours (assuming 48.5 degree elevation angle)

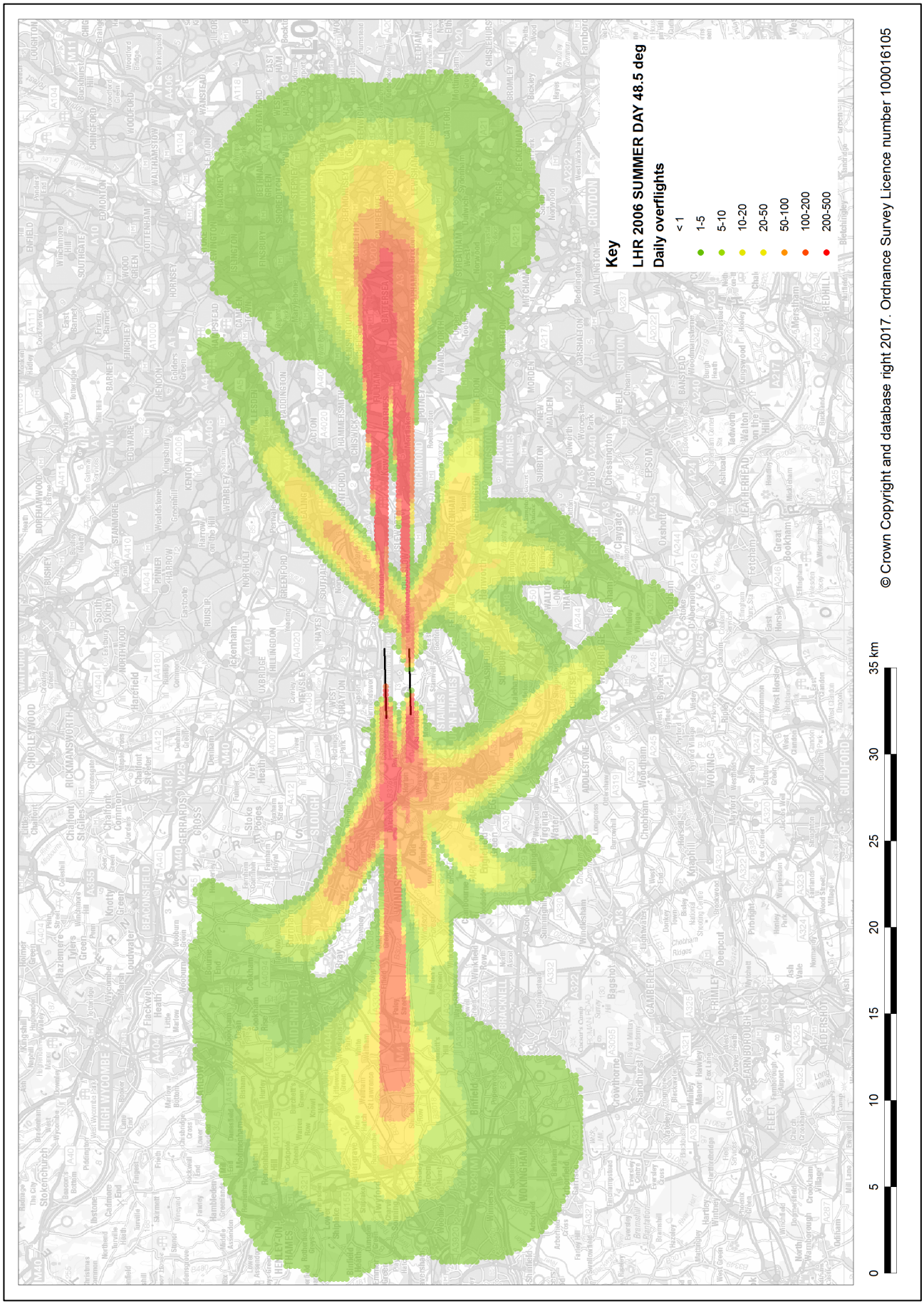


Figure B10-a Heathrow 2006 average summer day overflight track density diagram (assuming 48.5 degree elevation angle)

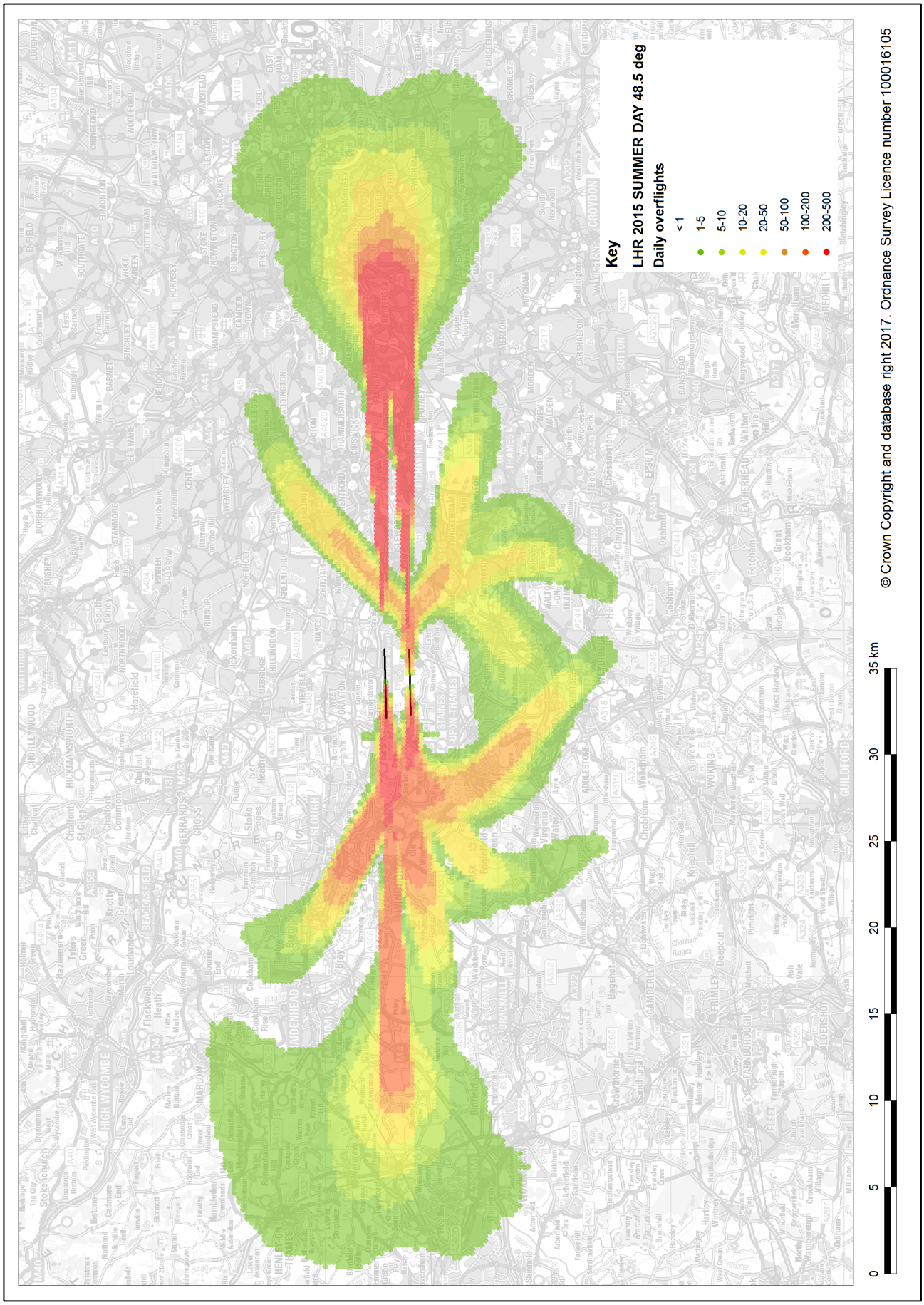


Figure B10-b Heathrow 2015 average summer day overflight track density diagram (assuming 48.5 degree elevation angle)

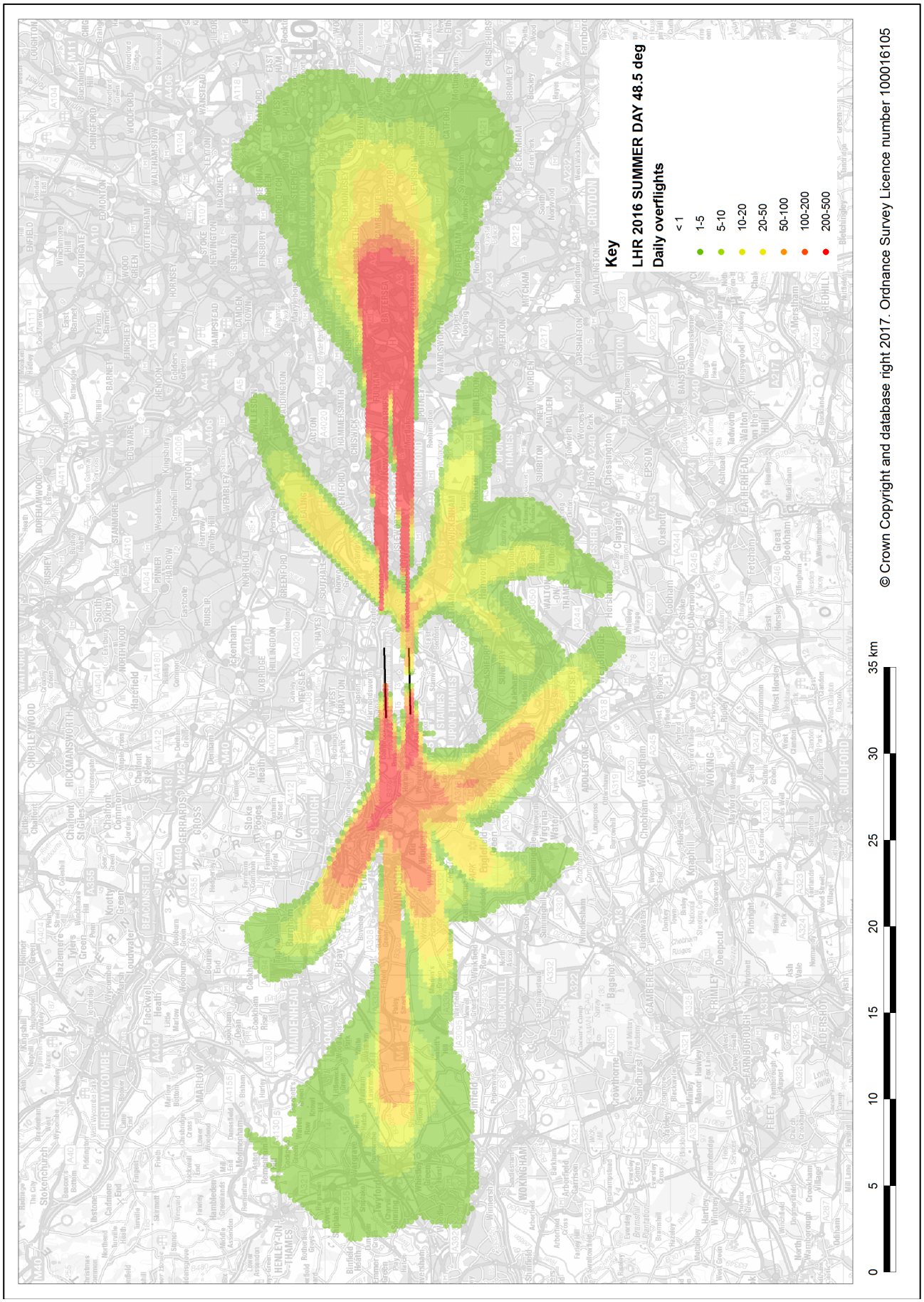


Figure B10-c Heathrow 2016 average summer day overflight track density diagram (assuming 48.5 degree elevation angle)

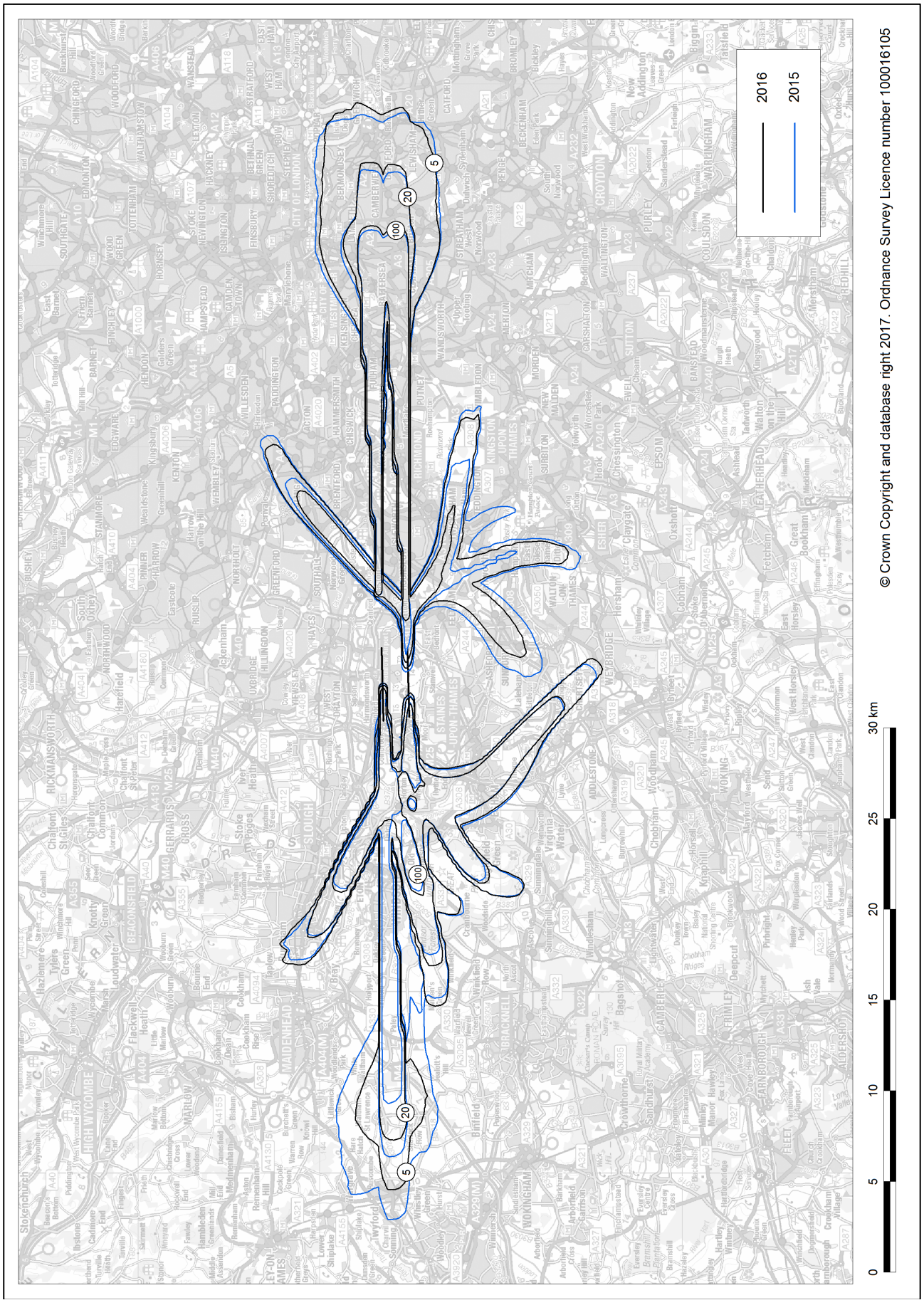


Figure B11 Heathrow 2016 and 2015 average summer day overflight contours (assuming 60 degree elevation angle)

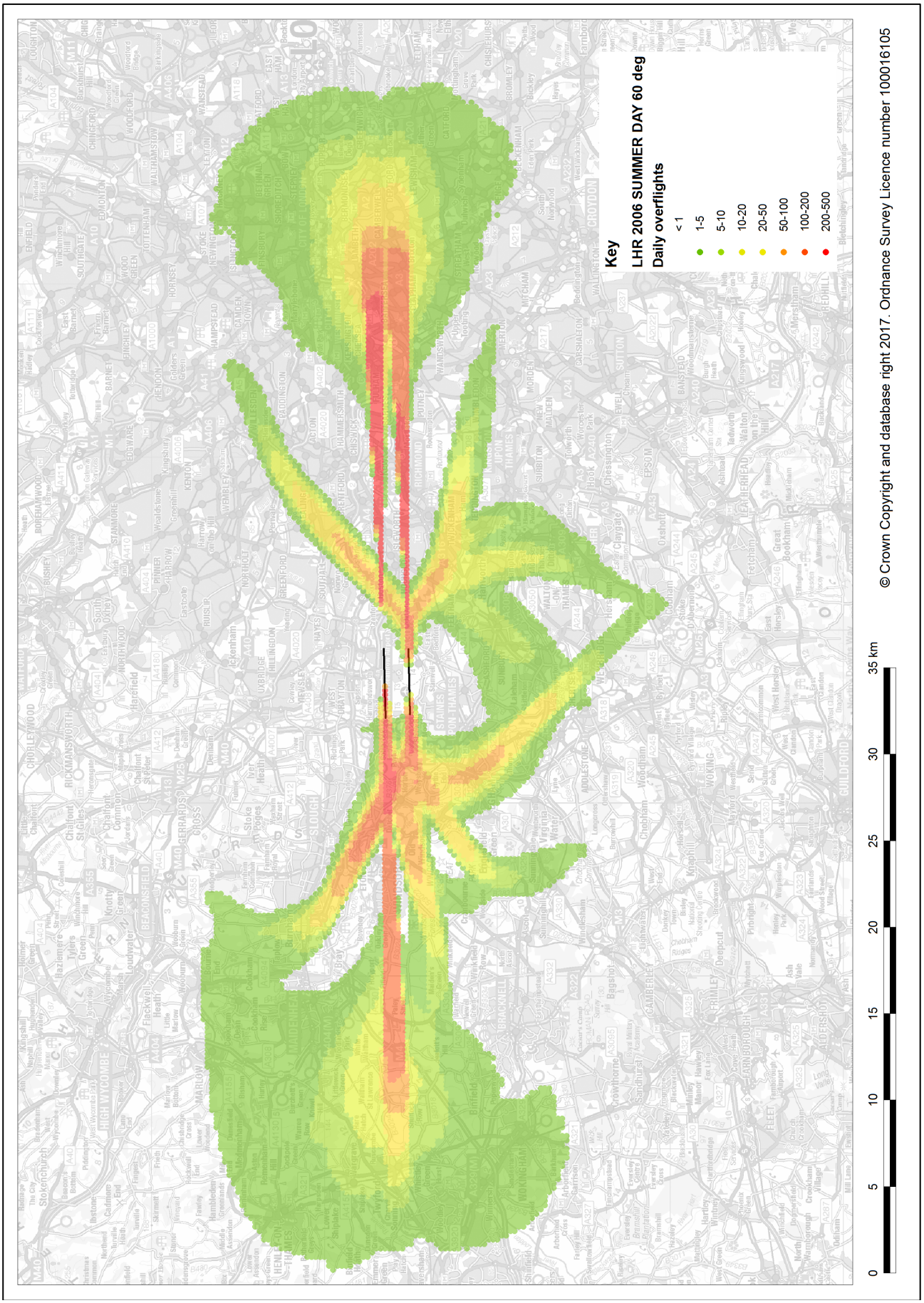


Figure B11-a Heathrow 2006 average summer day overflight track density diagram (assuming 60 degree elevation angle)

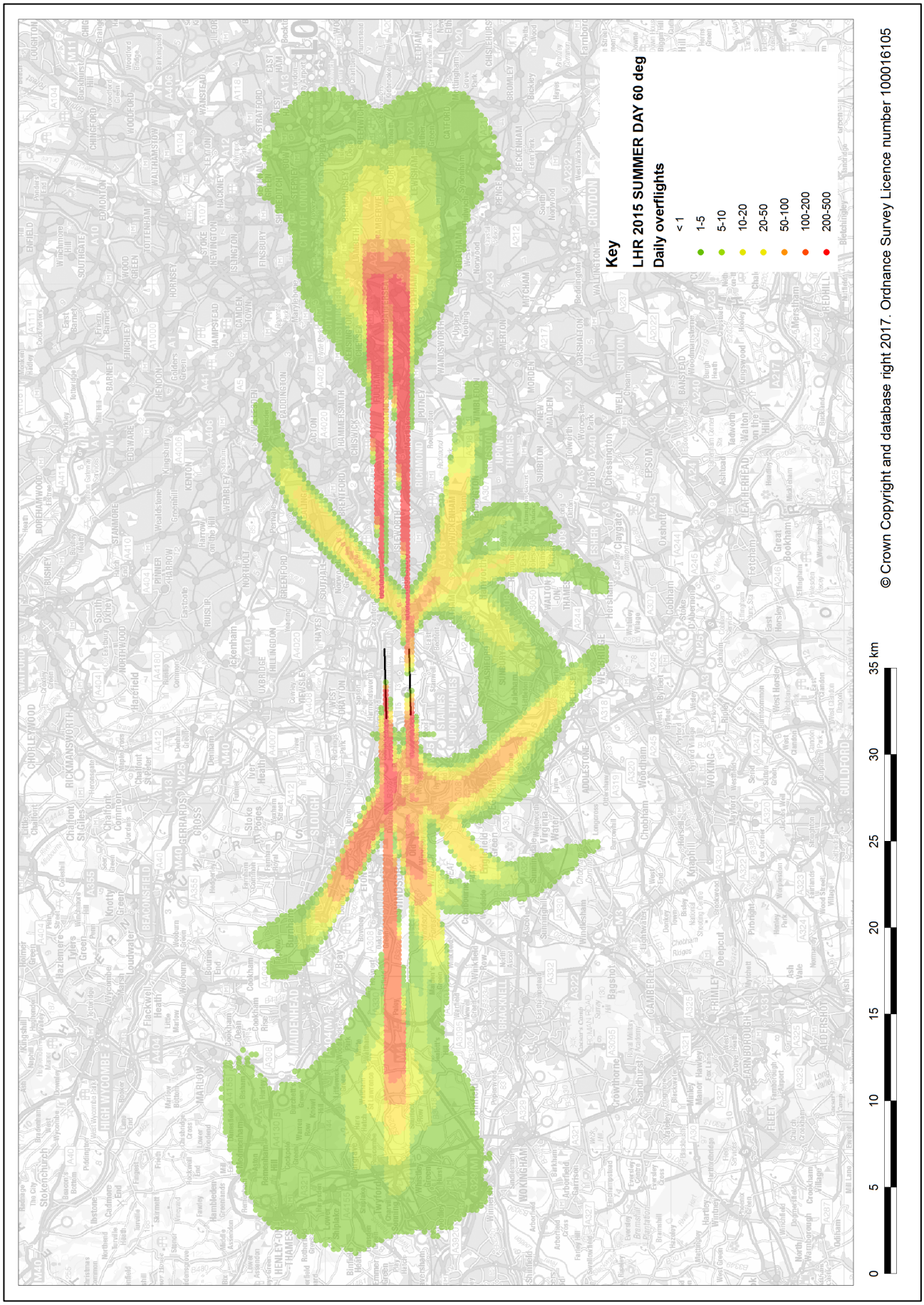


Figure B11-b Heathrow 2015 average summer day overflight track density diagram (assuming 60 degree elevation angle)

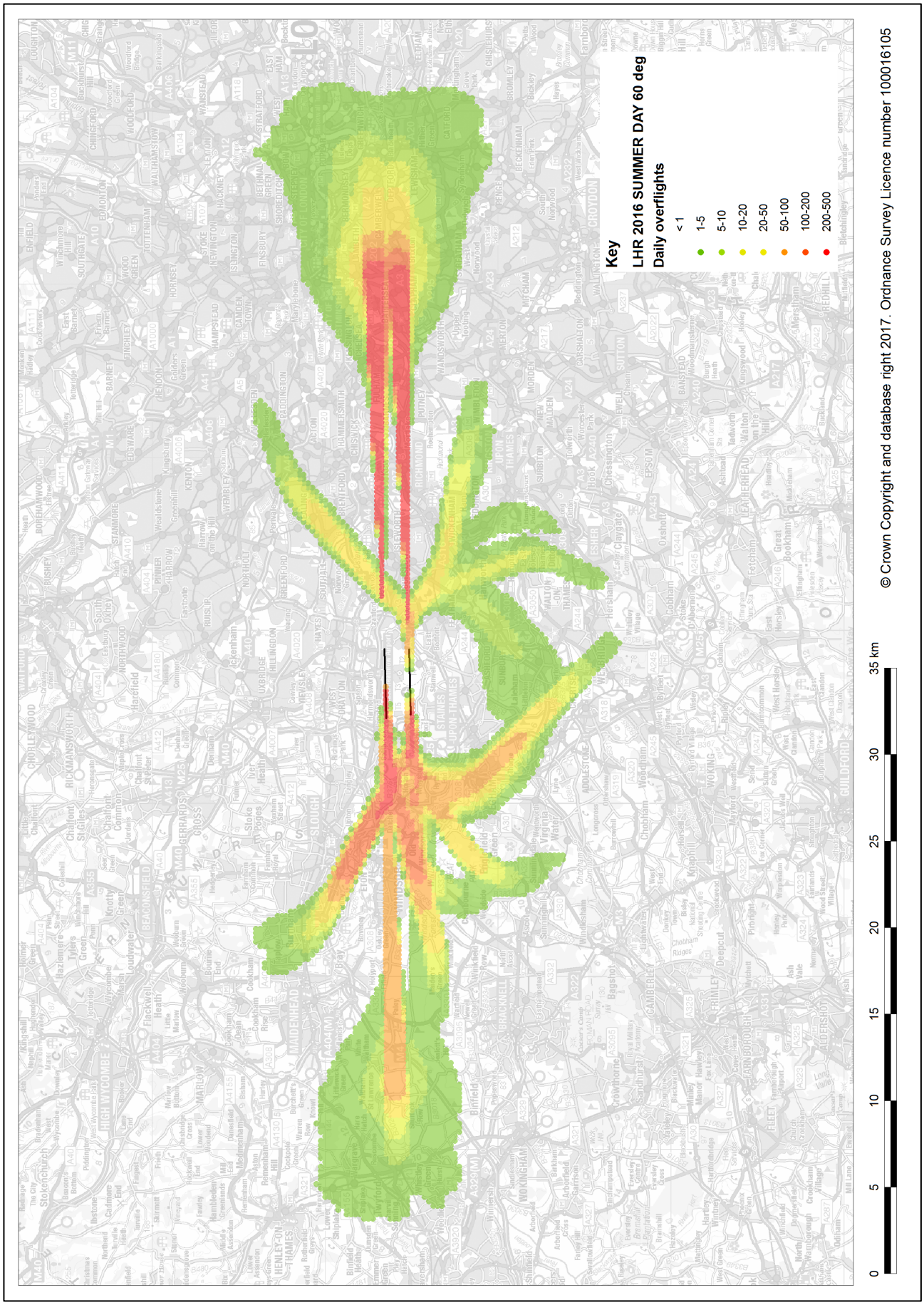


Figure B11-c Heathrow 2016 average summer day overflight track density diagram (assuming 60 degree elevation angle)

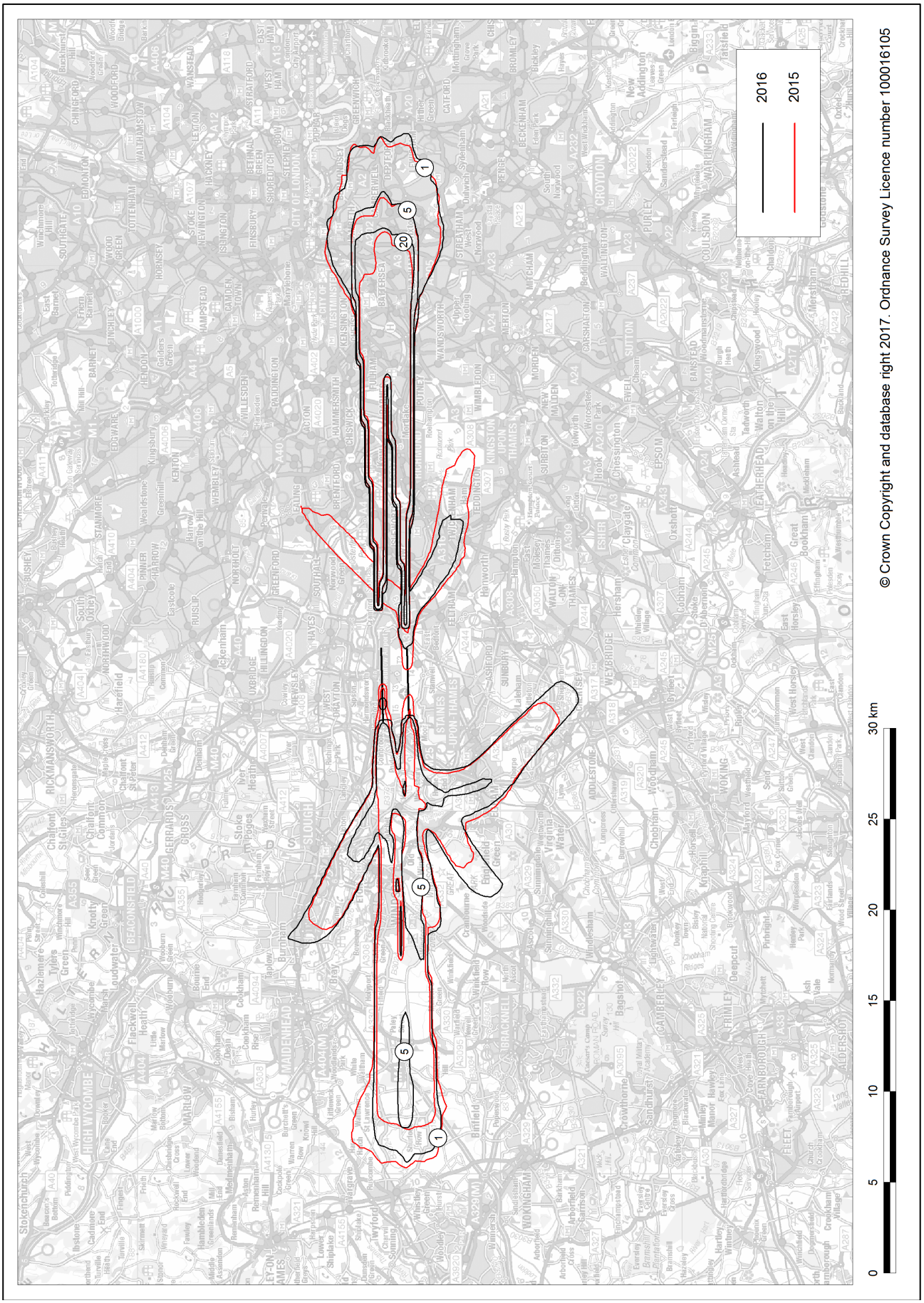


Figure B12 Heathrow 2016 and 2015 average summer night overflight contours (assuming 48.5 degree elevation angle)

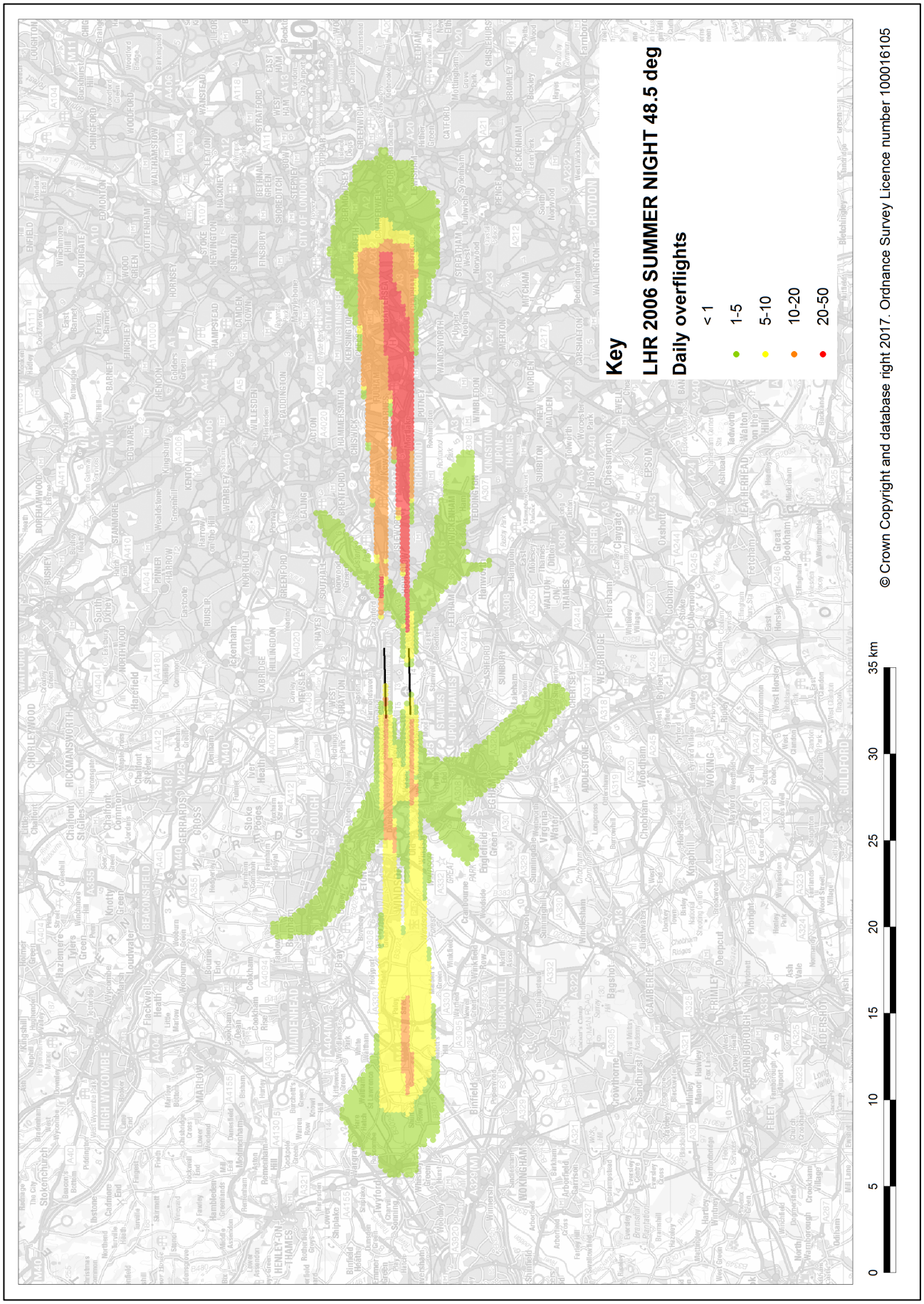


Figure B12-a Heathrow 2006 average summer night overflight track density diagram (assuming 48.5 degree elevation angle)

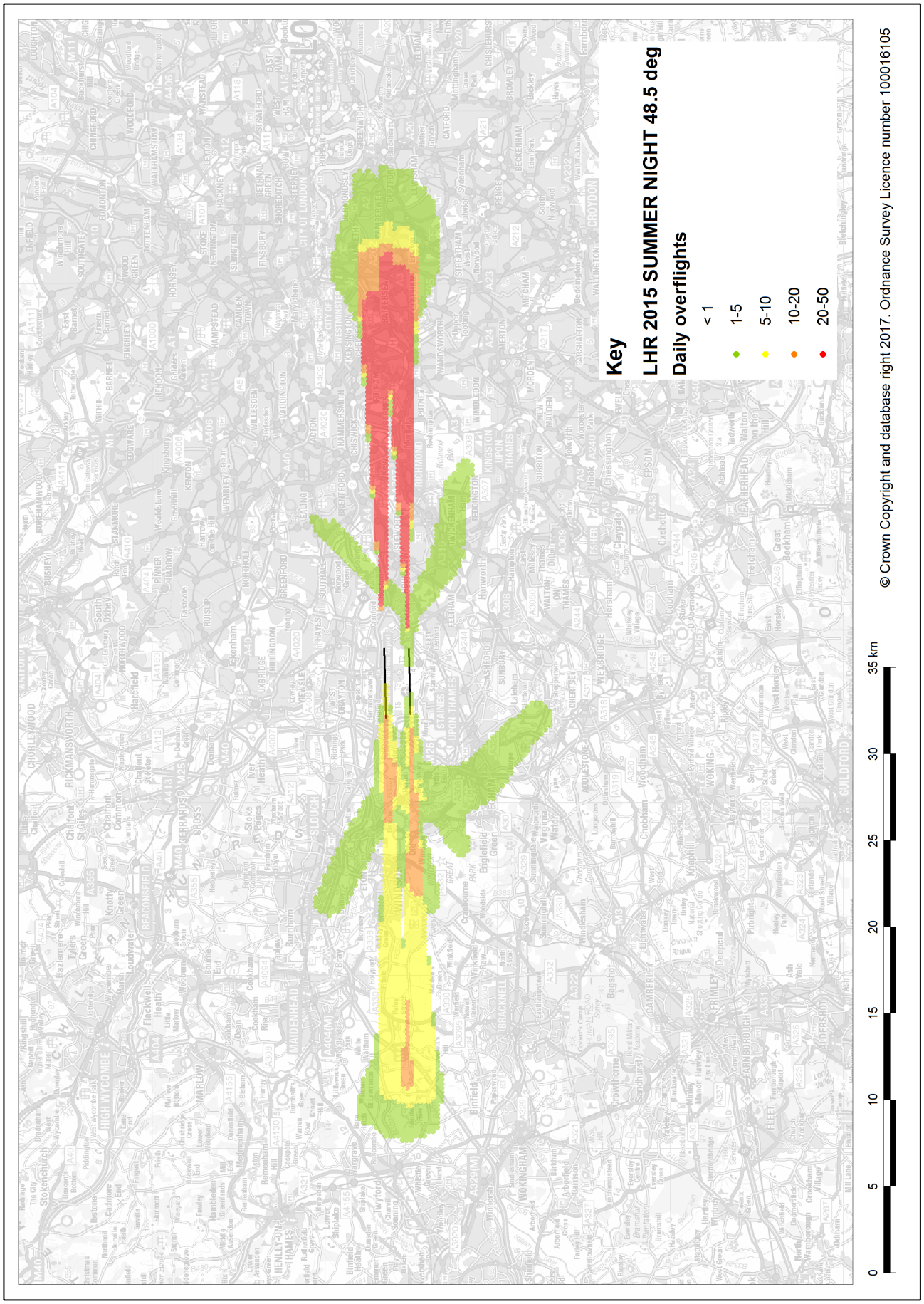


Figure B12-b Heathrow 2015 average summer night overflight track density diagram (assuming 48.5 degree elevation angle)

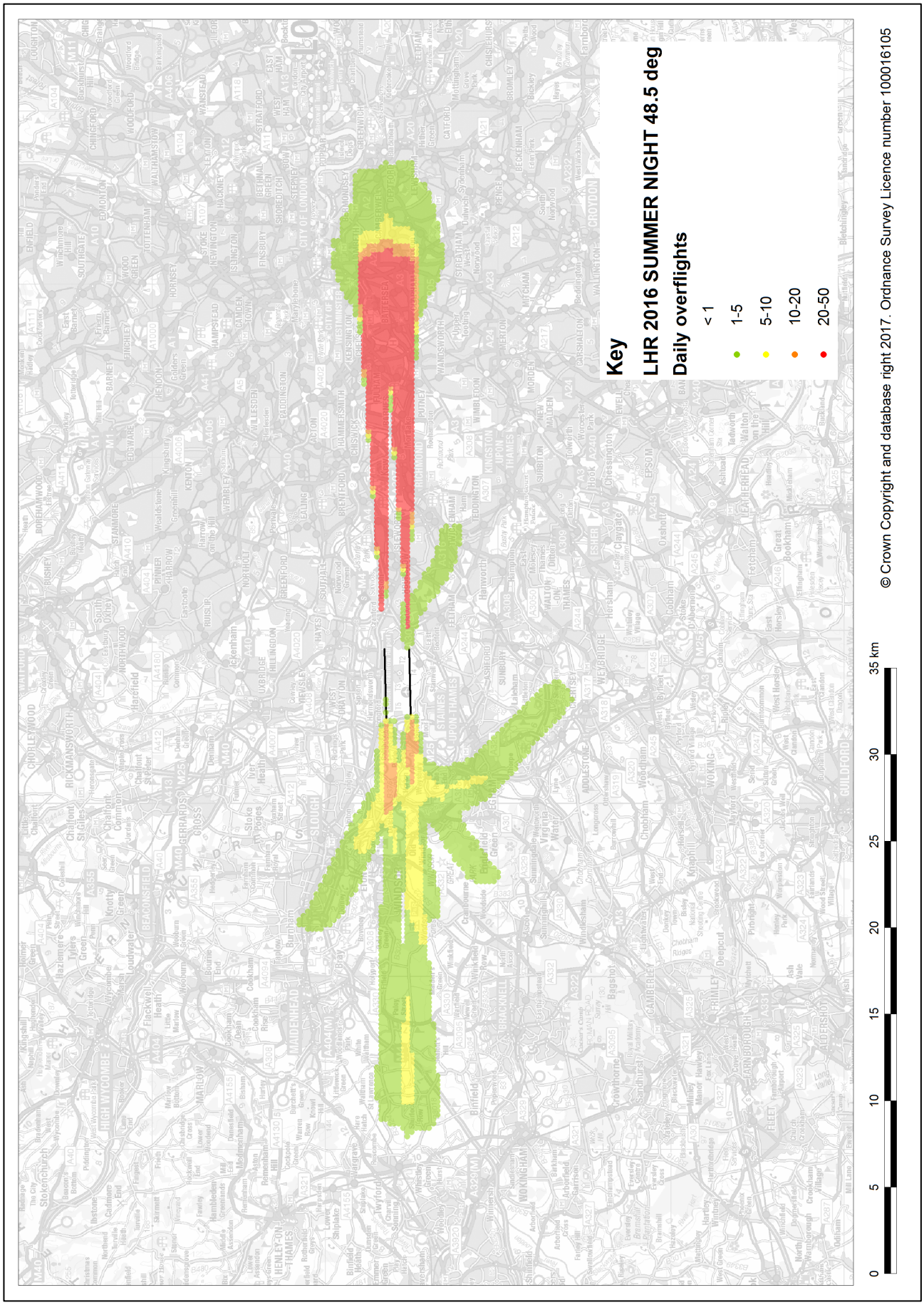


Figure B12-c Heathrow 2016 average summer night overflight track density diagram (assuming 48.5 degree elevation angle)

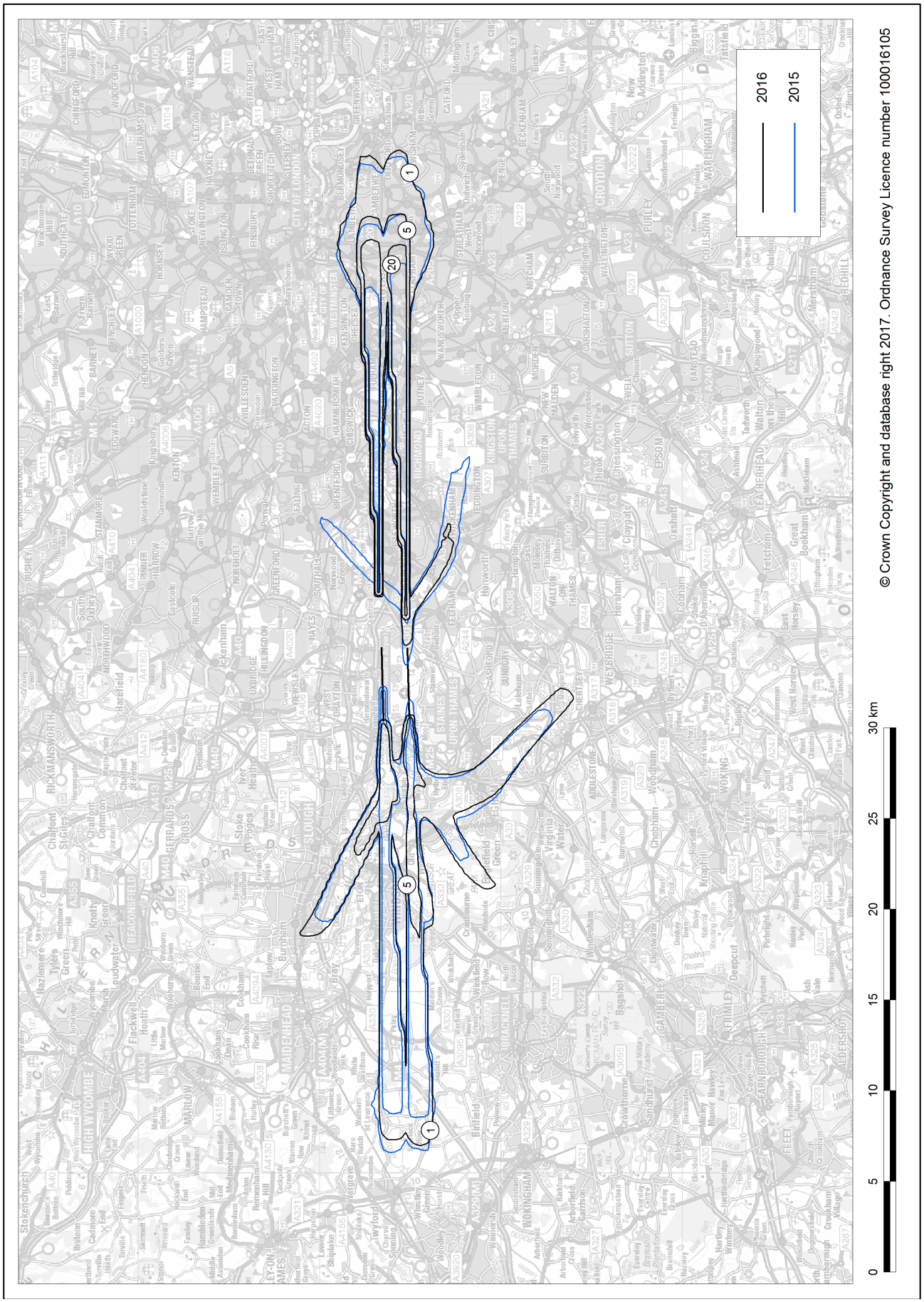


Figure B13 Heathrow 2016 and 2015 average summer night overflight contours (assuming 60 degree elevation angle)

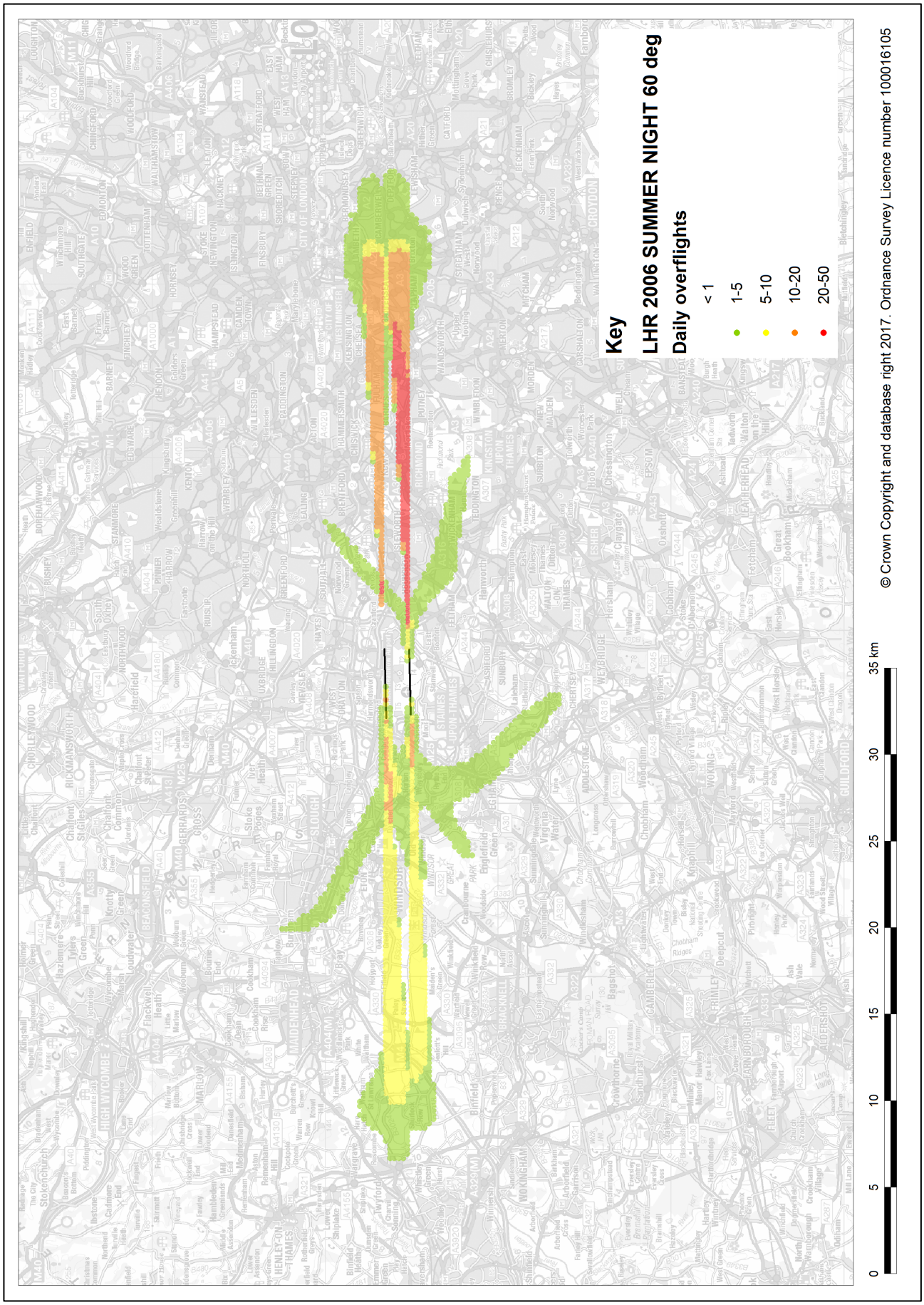


Figure B13-a Heathrow 2006 average summer night overflight track density diagram (assuming 60 degree elevation angle)

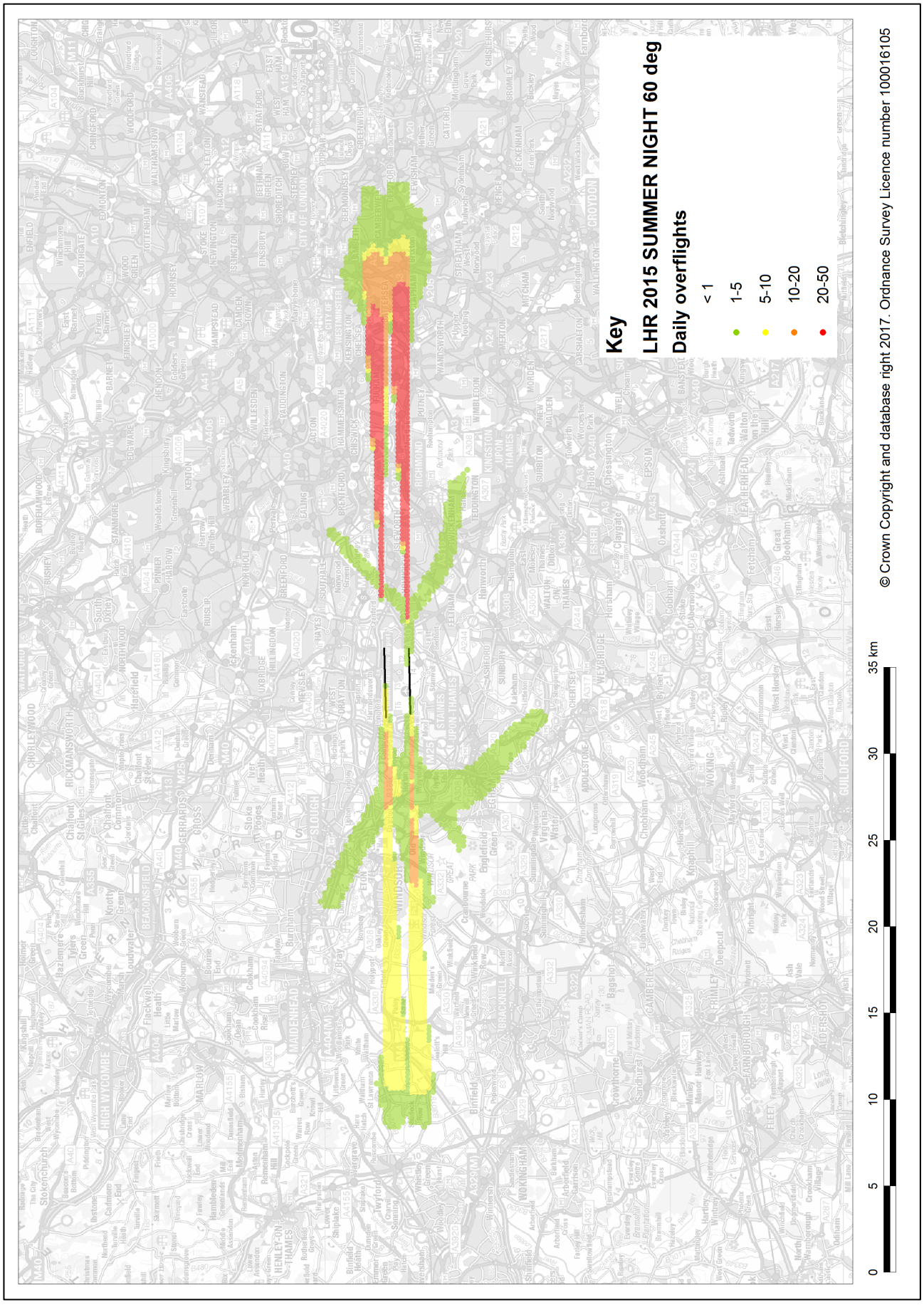


Figure B13-b Heathrow 2015 average summer night overflight track density diagram (assuming 60 degree elevation angle)

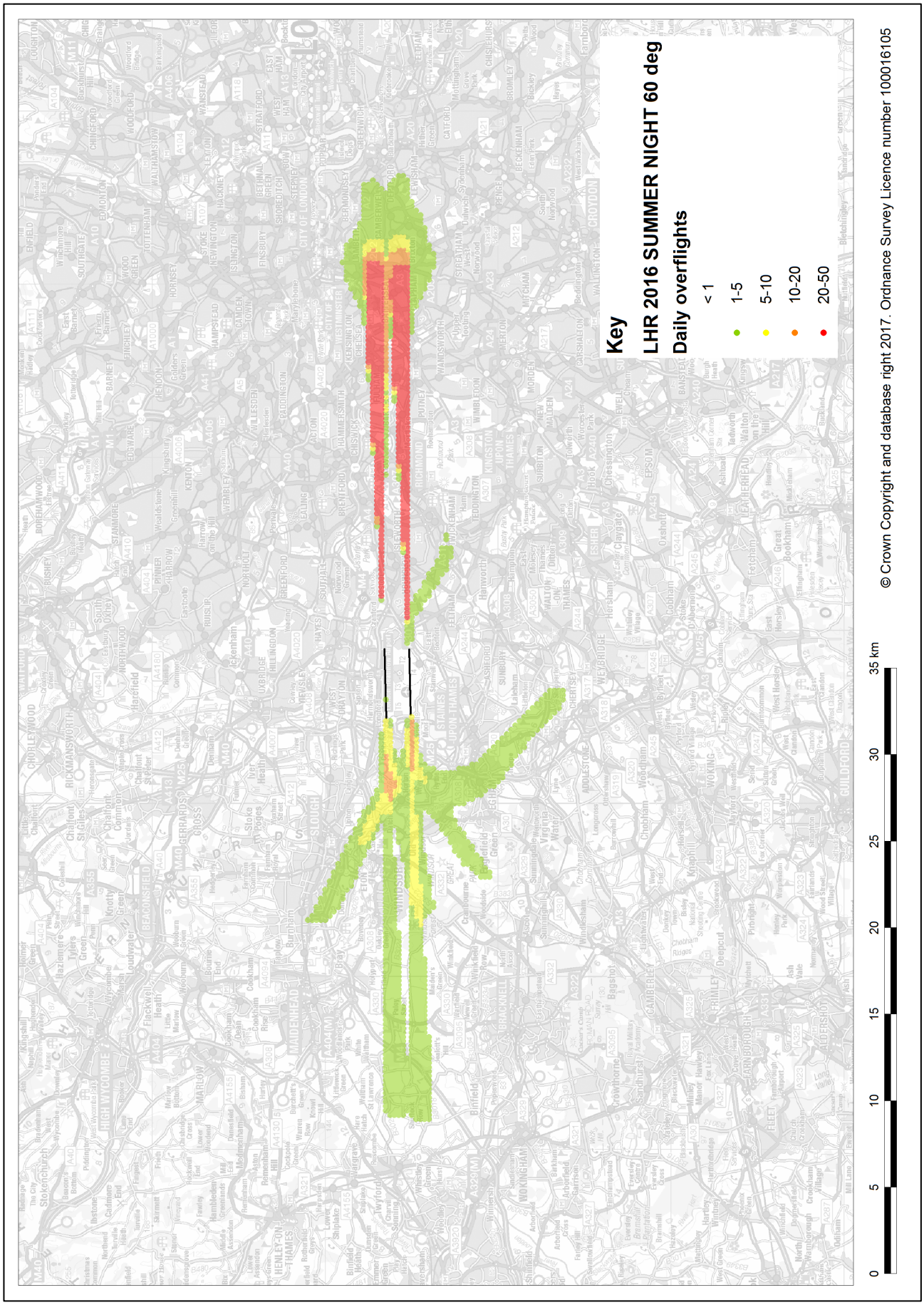


Figure B13-c Heathrow 2016 average summer night overflight track density diagram (assuming 60 degree elevation angle)

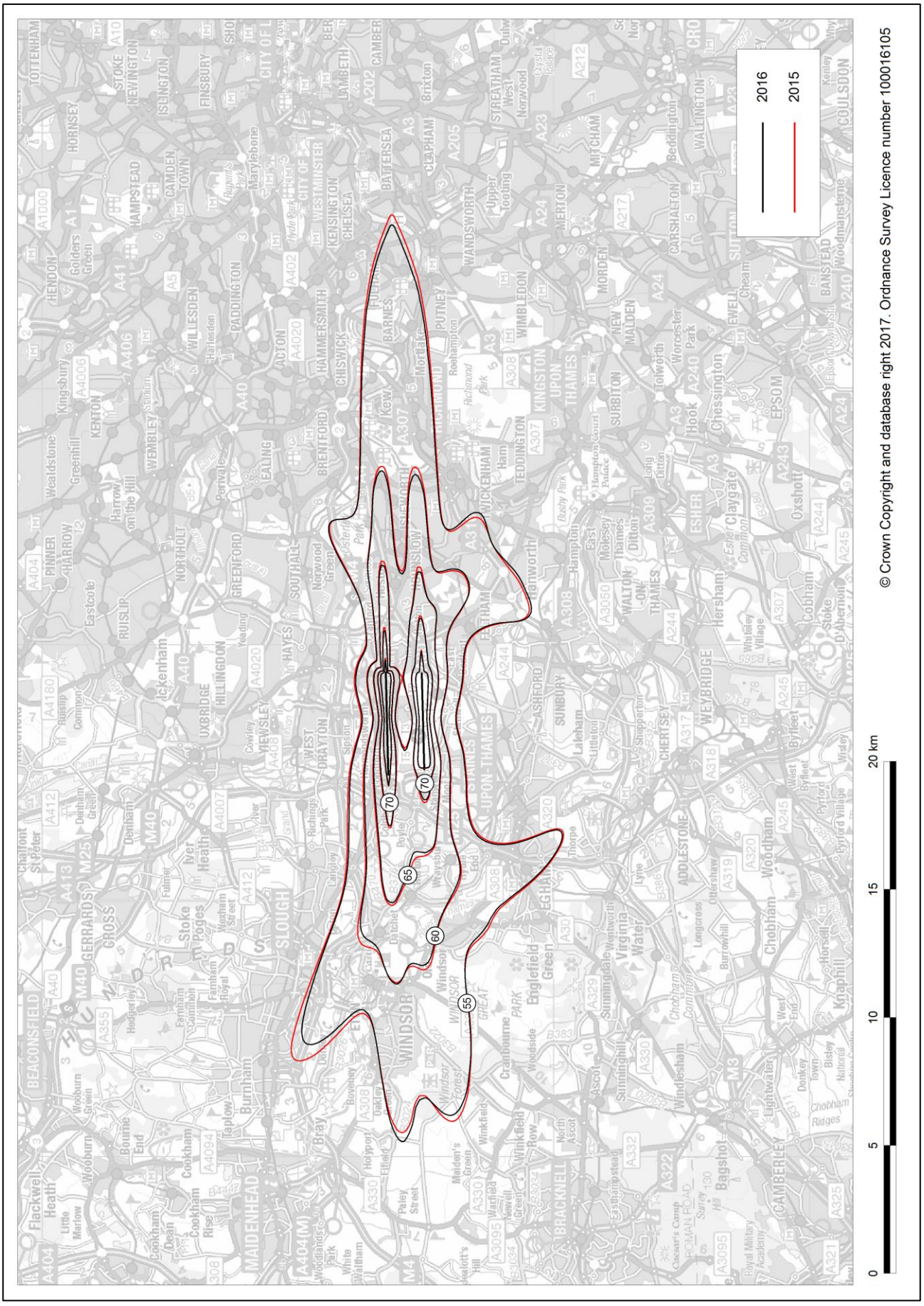
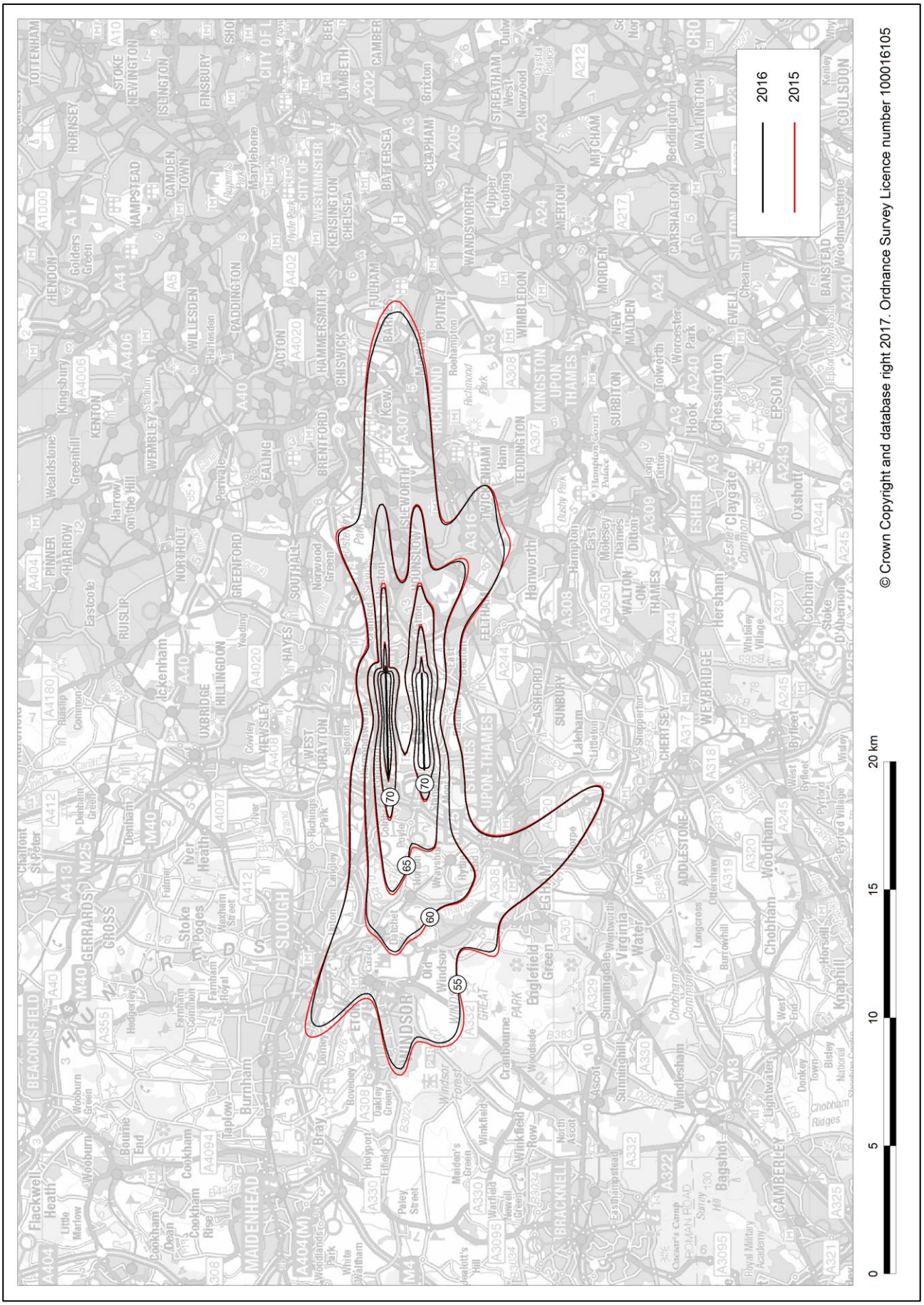


Figure B14 Heathrow 2016 and 2015 L_{day} noise contours

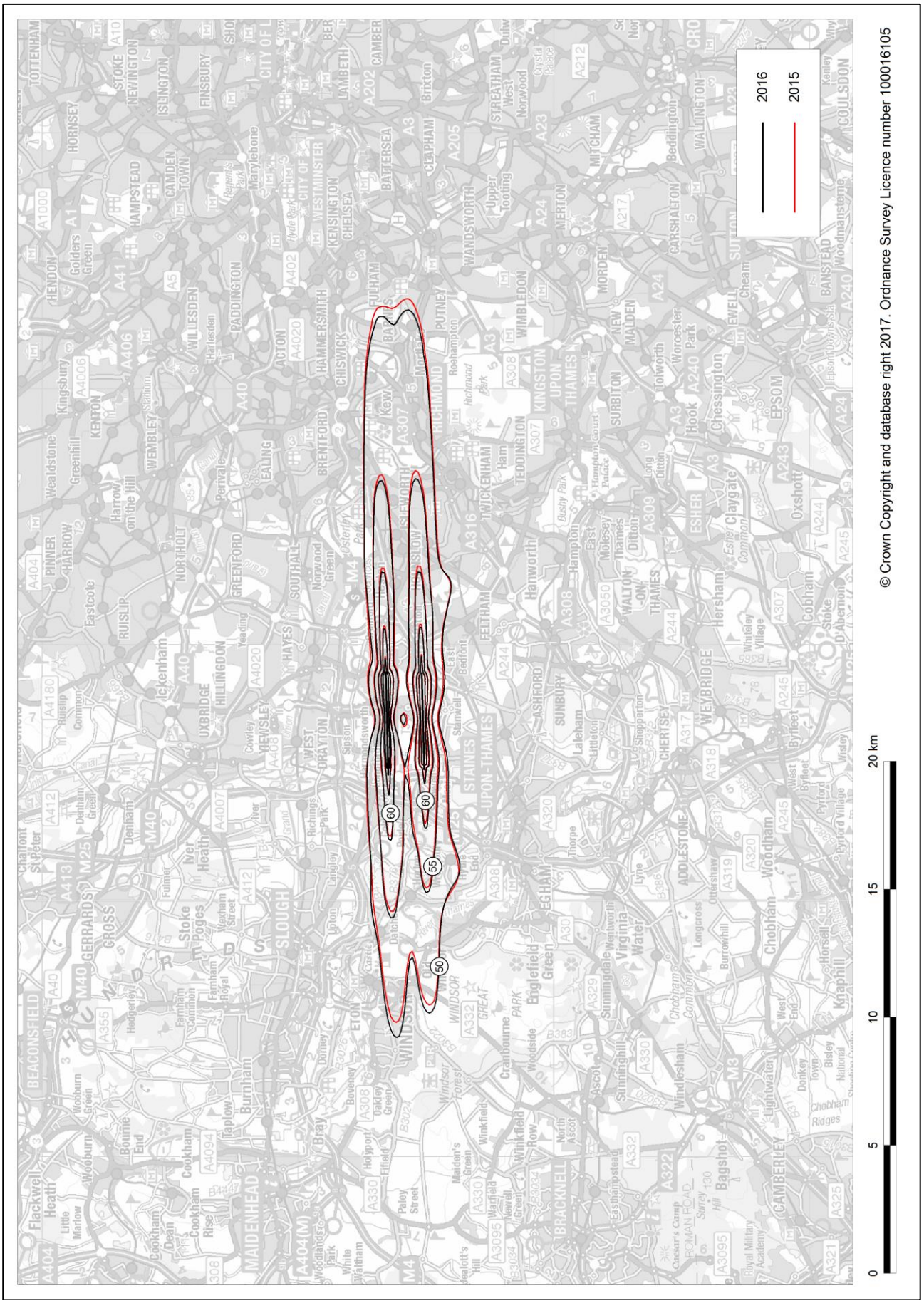
Note: 2016 L_{day} modal split was 70% W / 30% E; 2015 L_{day} modal split was 72% W / 28% E.

Figure B15 Heathrow 2016 and 2015 $L_{evening}$ noise contours



Note: 2016 $L_{evening}$ modal split was 72% W / 28% E; 2015 $L_{evening}$ modal split was 72% W / 28% E.

Figure B16 Heathrow 2016 and 2015 L_{night} noise contours



Note: 2016 L_{night} modal split was 70% W / 30% E; 2015 L_{night} modal split was 72% W / 28% E.

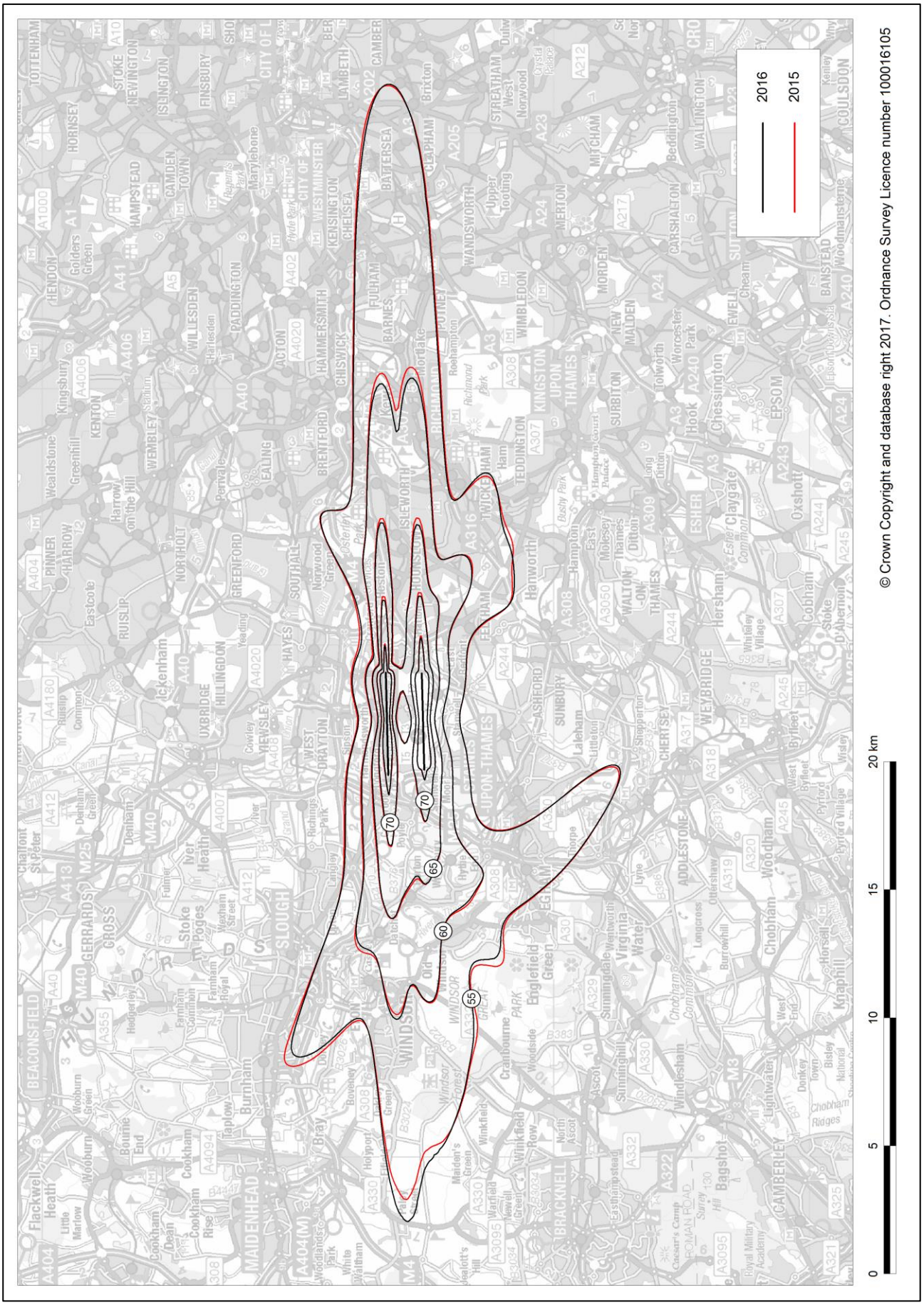
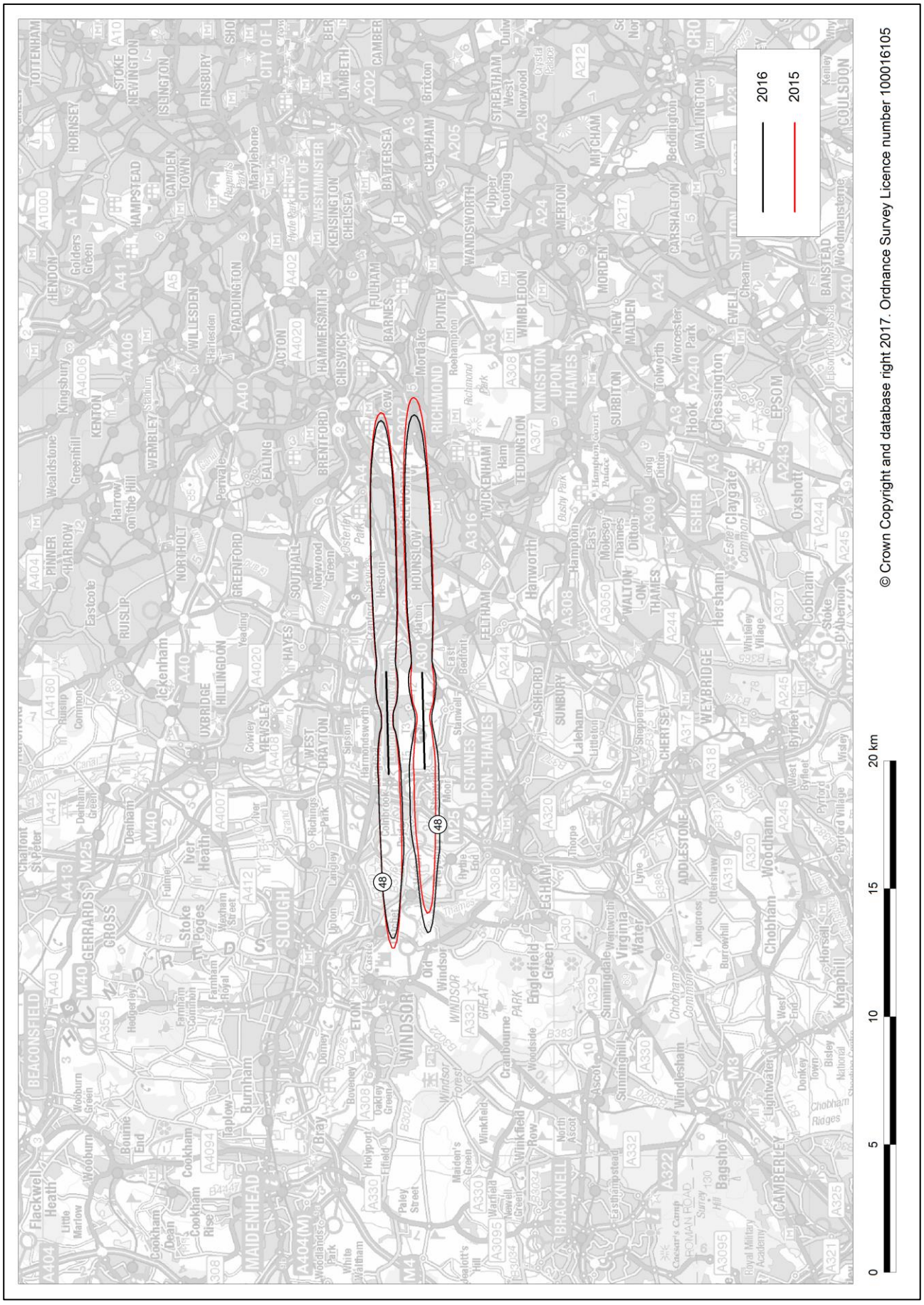


Figure B17 Heathrow 2016 and 2015 L_{den} noise contours

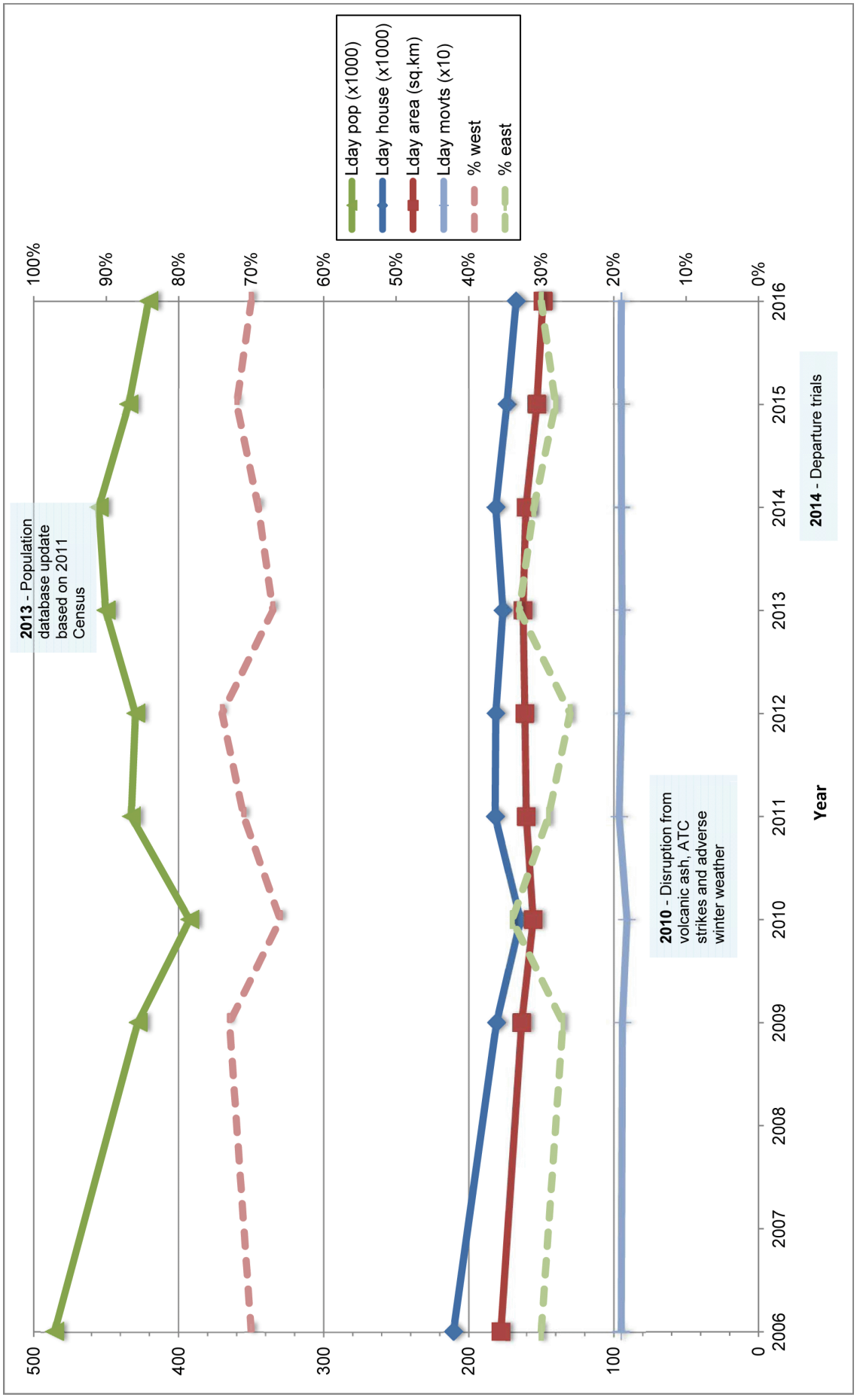
Note: 2016 L_{den} modal split was 70% W / 30% E; 2015 L_{den} modal split was 72% W / 28% E.

Figure B18 Heathrow 2016 and 2015 $L_{eq,6.5hr\ night}$ noise contours



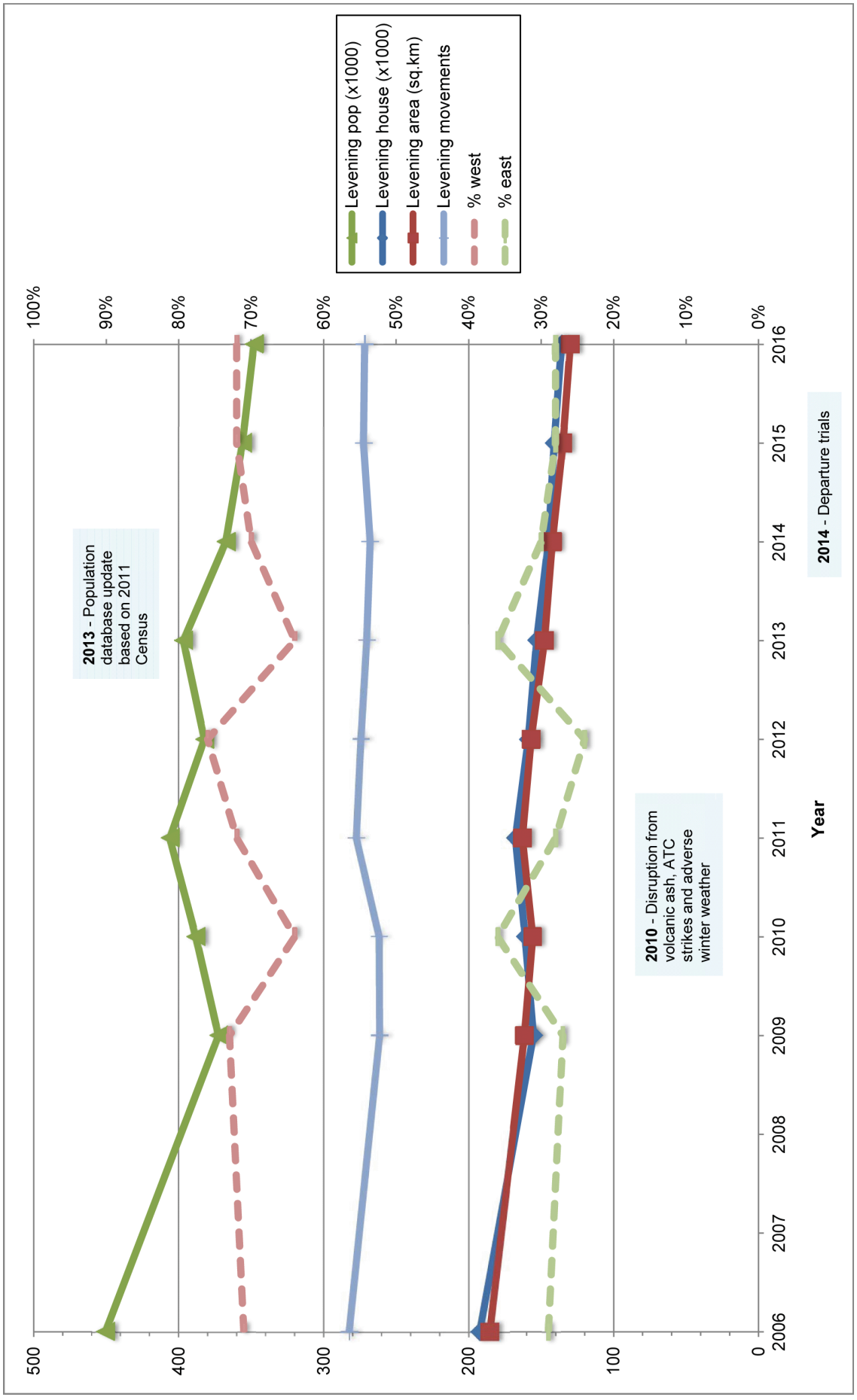
Note: 2016 $L_{eq,6.5hr\ night}$ modal split was 71% W / 29% E; 2015 $L_{eq,6.5hr\ night}$ modal split was 72% W / 28% E.

Figure B19 Heathrow 2006 to 2016 L_{day} 55 dBA area, population and household trends



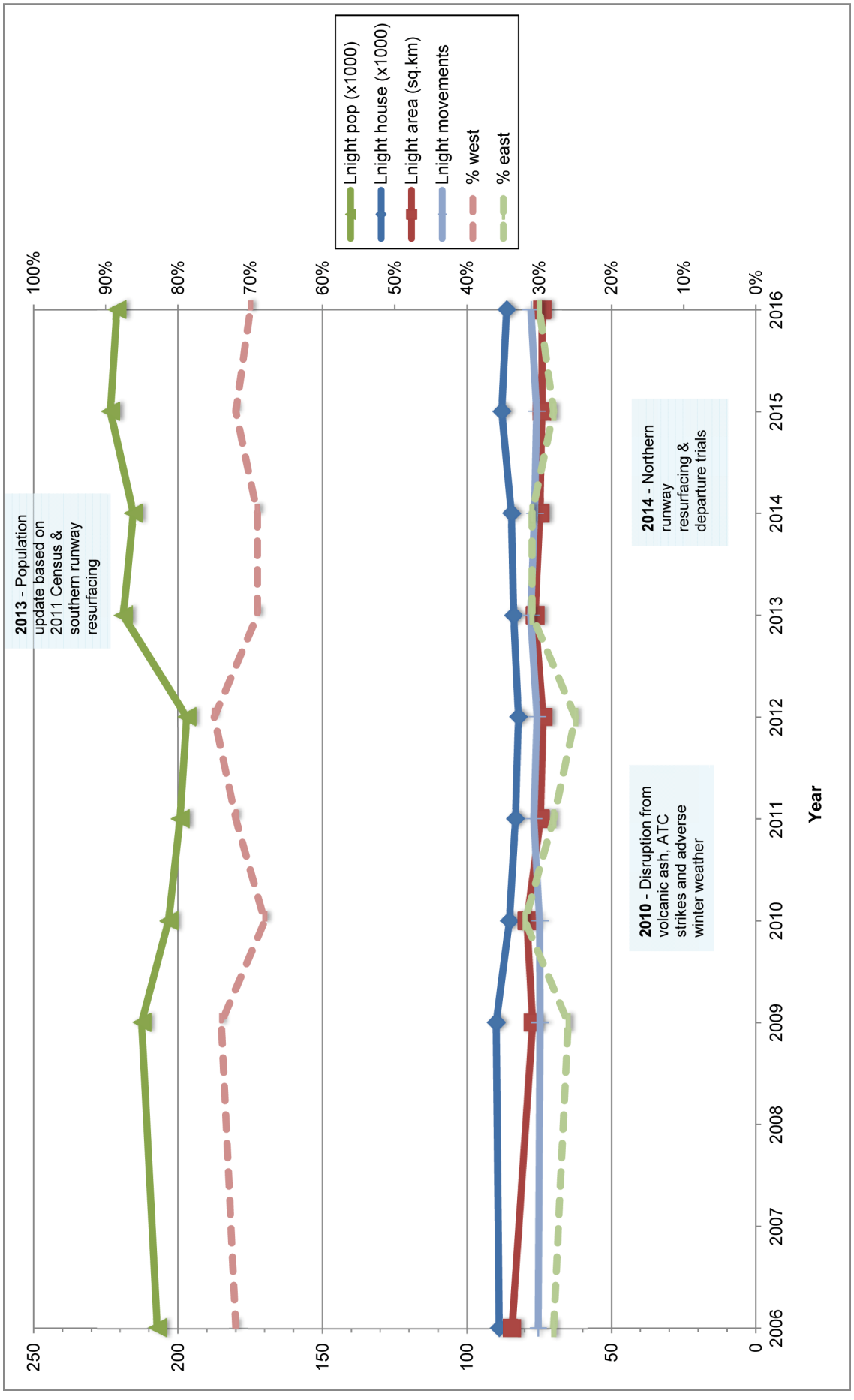
Note: There are no contour data for 2007 and 2008, and the lines joining the 2006 and 2009 data points are not meant to imply that the levels for 2007 and 2008 can be interpolated.

Figure B20 Heathrow 2006 to 2016 $L_{evening}$ 55 dBA area, population and household trends



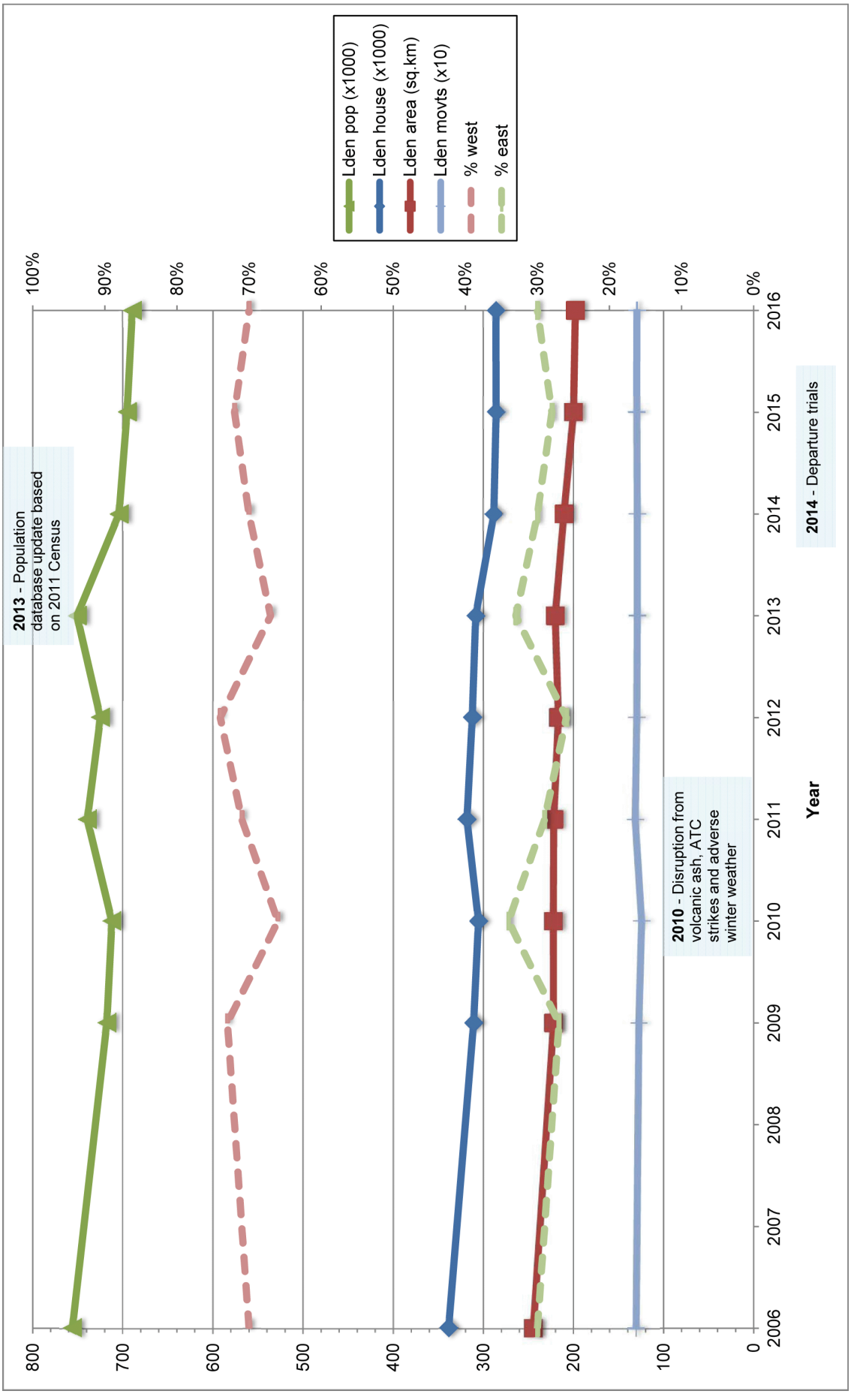
Note: There are no contour data for 2007 and 2008, and the lines joining the 2006 and 2009 data points are not meant to imply that the levels for 2007 and 2008 can be interpolated.

Figure B21 Heathrow 2006 to 2016 L_{night} 50 dBA area, population and household trends



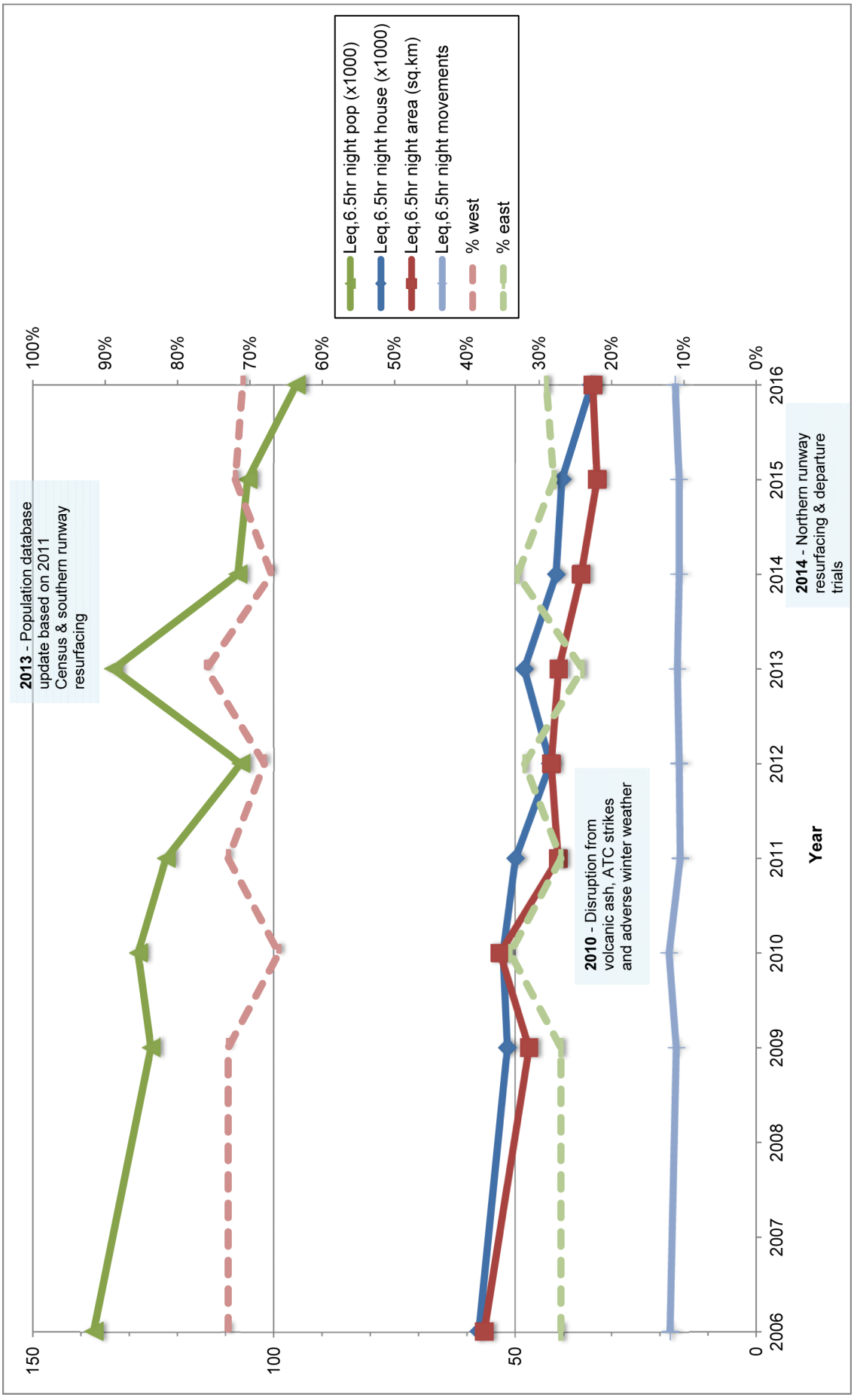
Note: There are no contour data for 2007 and 2008, and the lines joining the 2006 and 2009 data points are not meant to imply that the levels for 2007 and 2008 can be interpolated.

Figure B22 Heathrow 2006 to 2016 L_{den} 55 dBA area, population and household trends



Note: There are no contour data for 2007 and 2008, and the lines joining the 2006 and 2009 data points are not meant to imply that the levels for 2007 and 2008 can be interpolated.

Figure B23 Heathrow 2006 to 2016 $L_{eq,6.5hr\ night}$ 48 dBA area, population and household trends



Note: There are no contour data for 2007 and 2008, and the lines joining the 2006 and 2009 data points are not meant to imply that the levels for 2007 and 2008 can be interpolated.

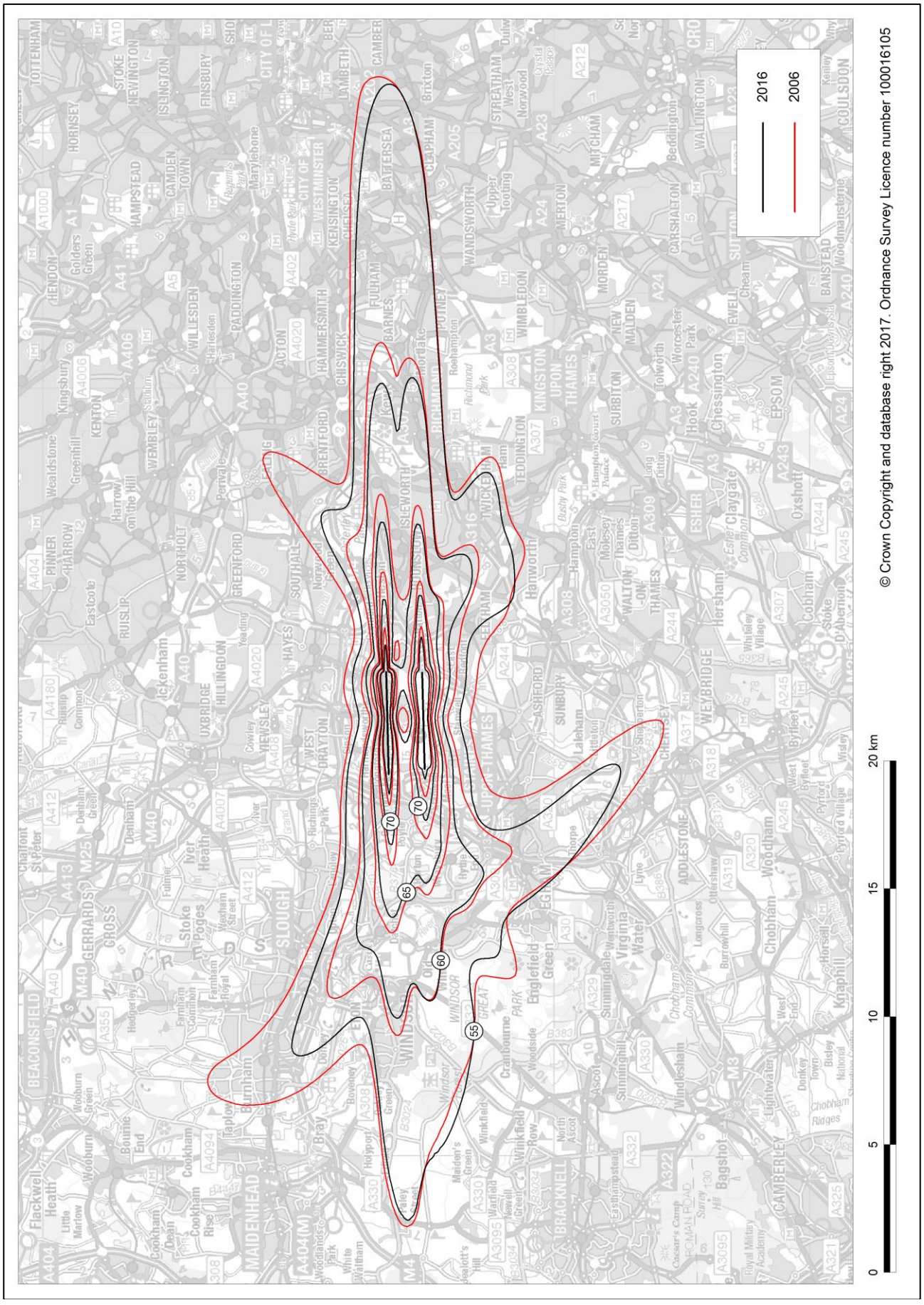
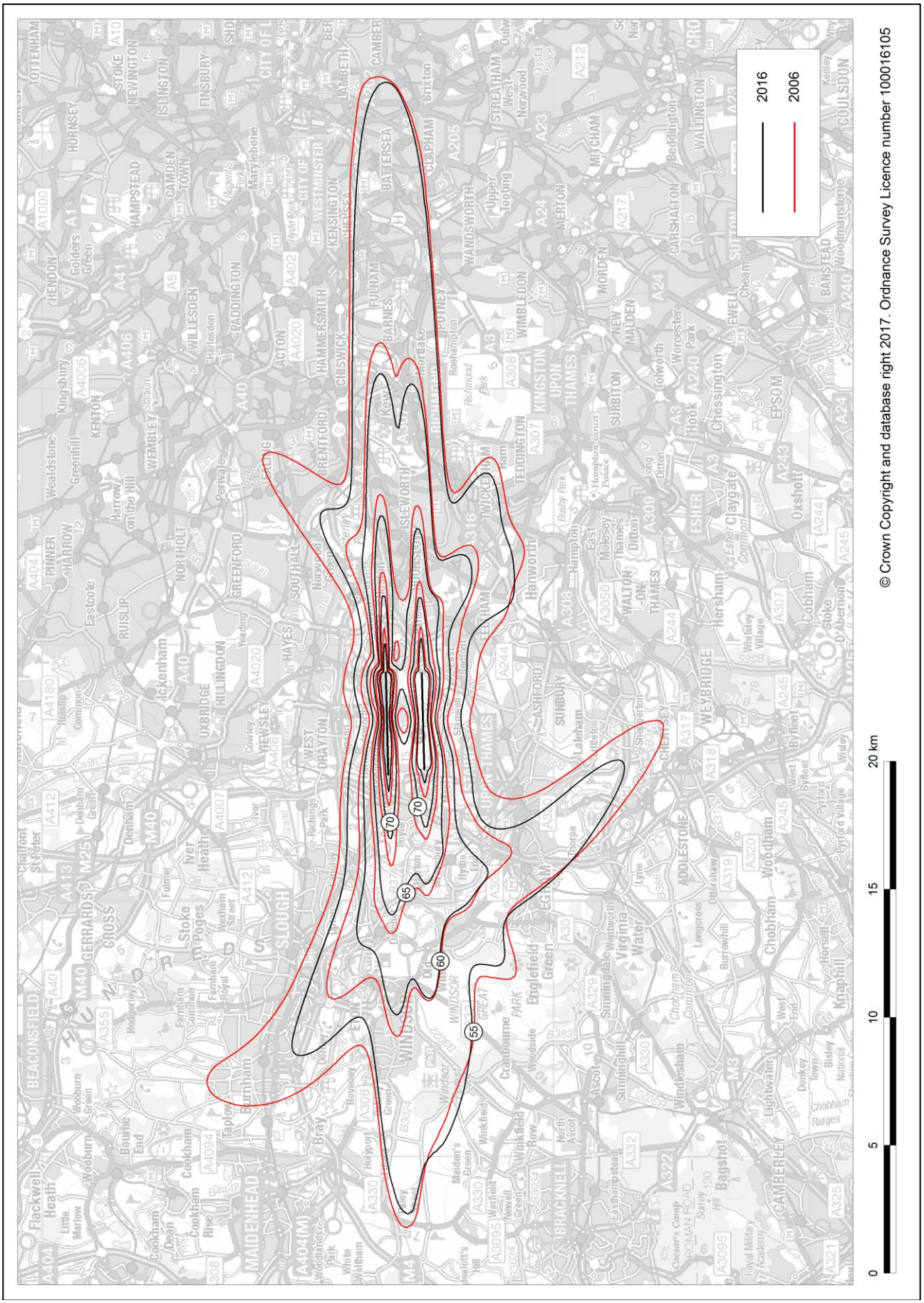


Figure B24 Heathrow 2016 and 2006 L_{den} noise contours

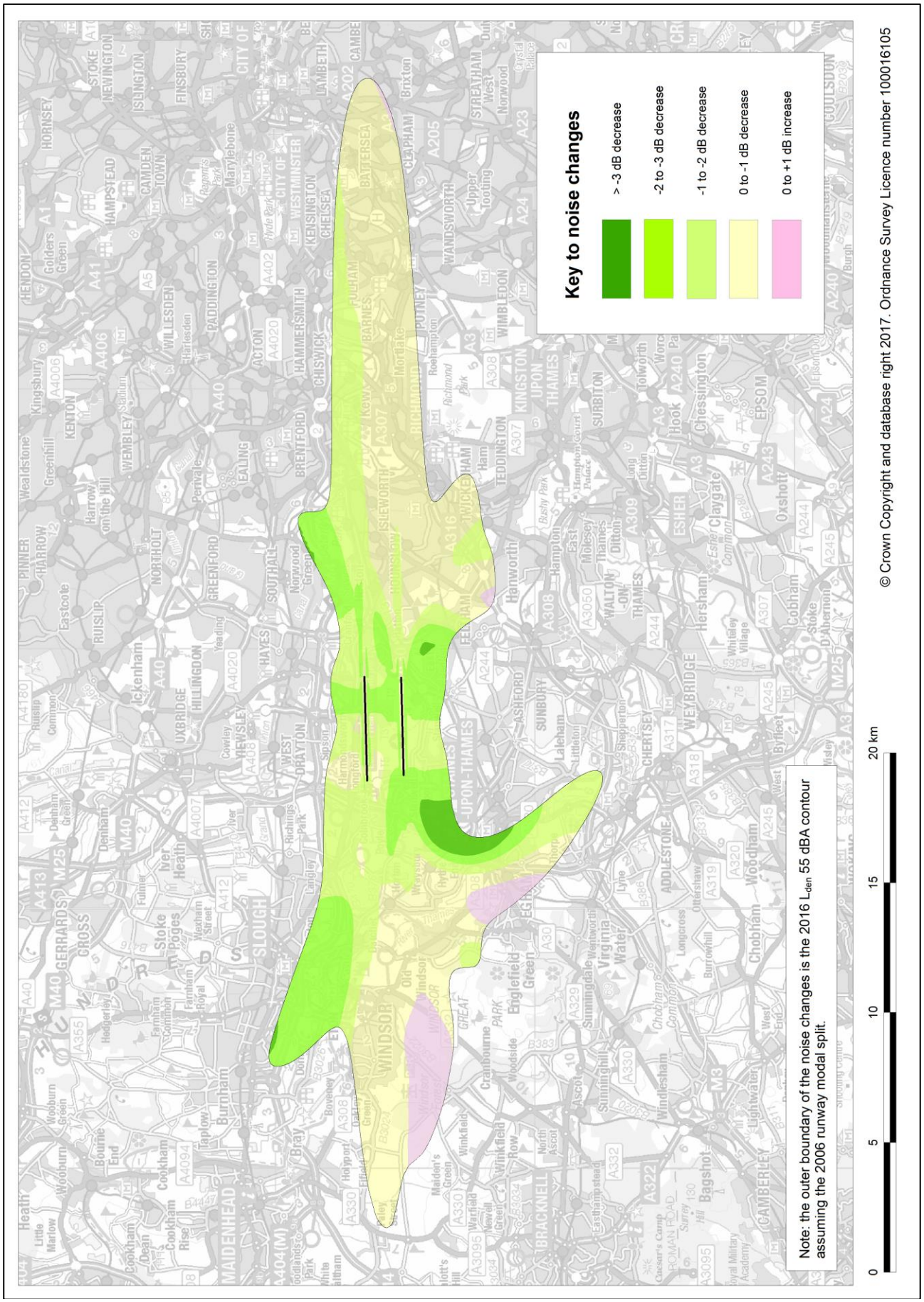
Note: 2016 L_{den} modal split was 70% W / 30% E; 2006 L_{den} modal split was 70% W / 30% E.

Figure B25 Heathrow 2016 and 2006 L_{den} noise contours (assuming 2006 runway modal split and 2006 N-S runway usage)



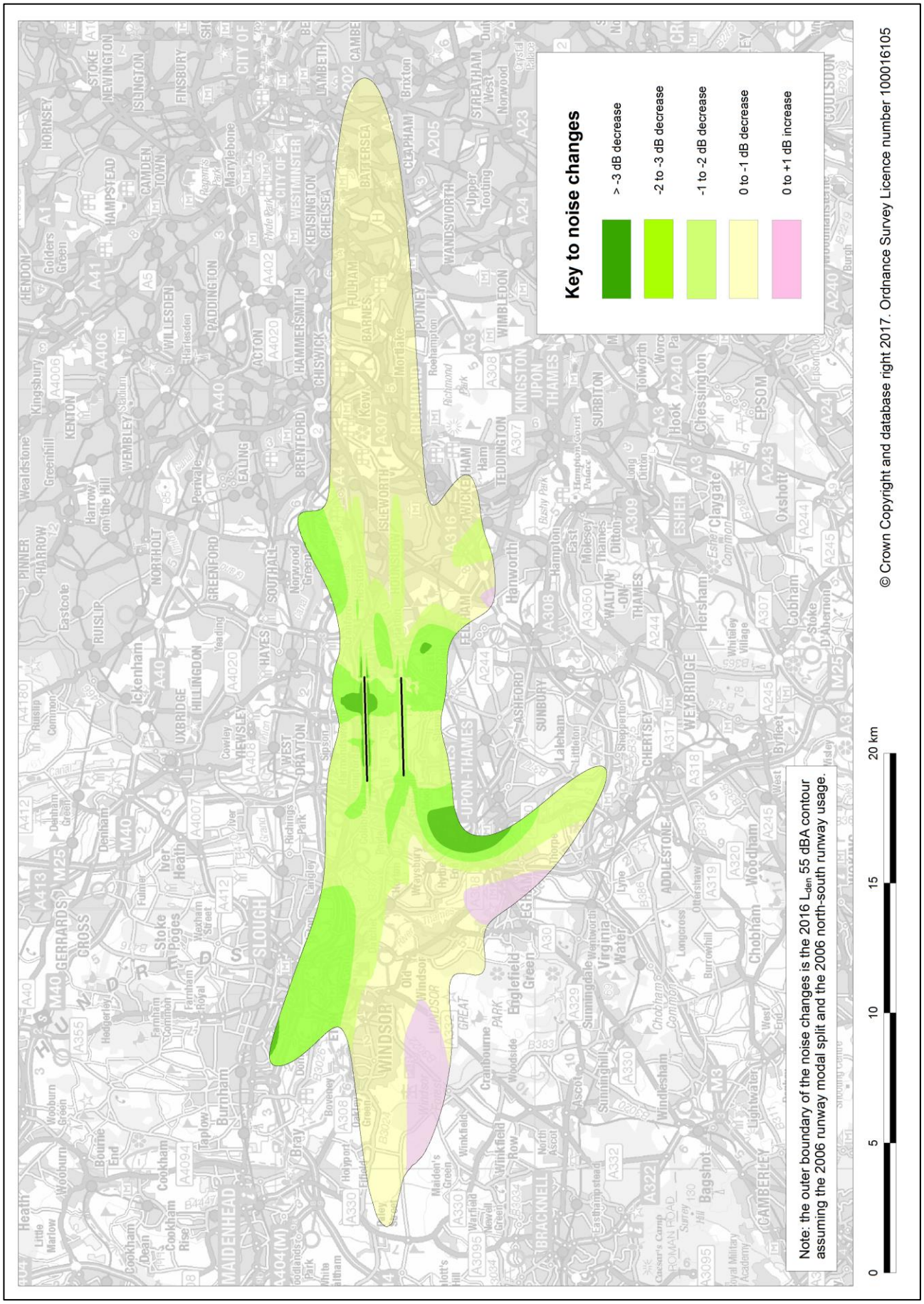
Note: 2006 L_{den} modal split was 70% W / 30% E.

Figure B26 Heathrow noise change map for 2016 vs 2006 L_{den} (assuming 2006 runway modal split)



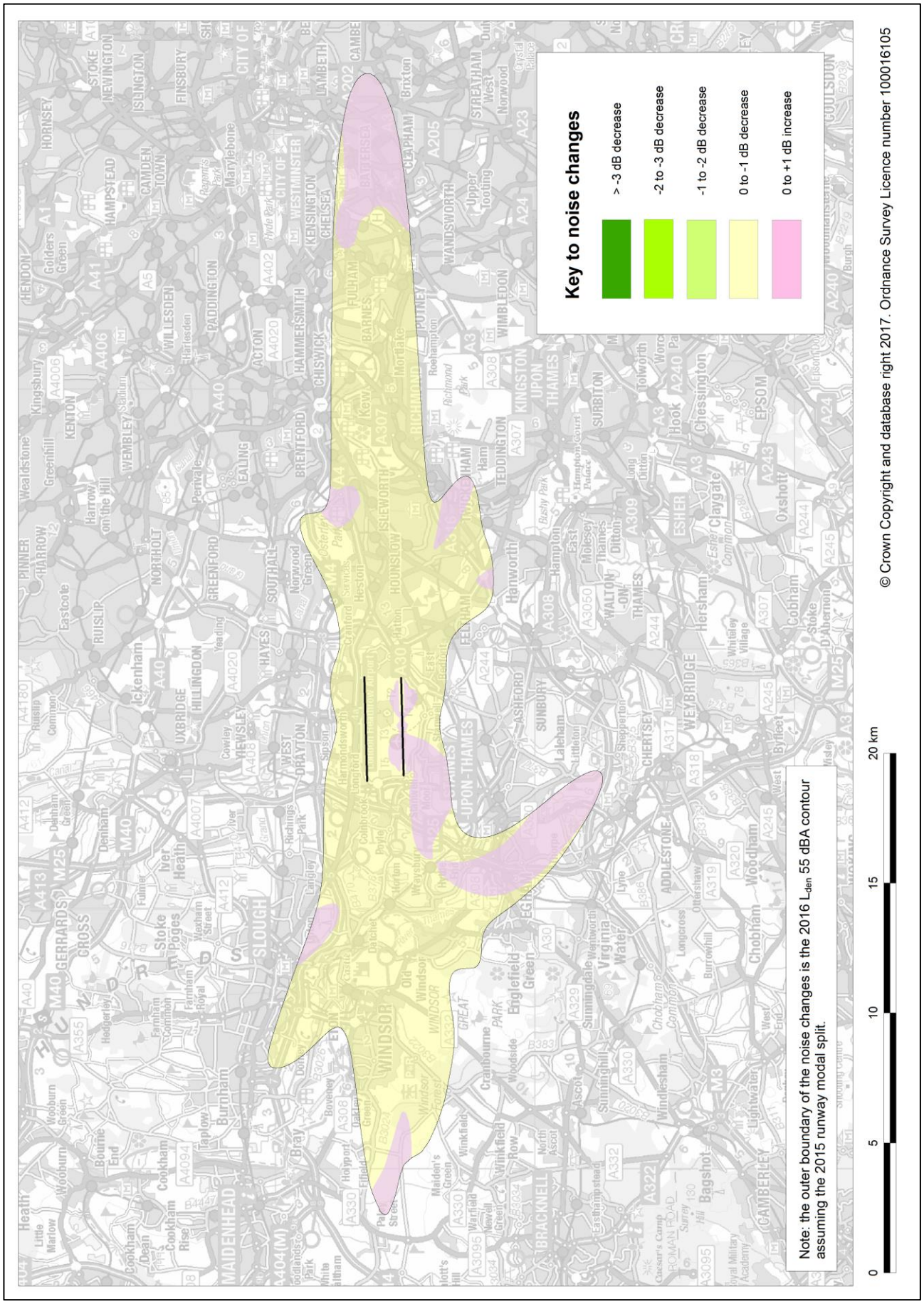
Note: 2006 L_{den} modal split was 70% W / 30% E.

Figure B27 Heathrow noise change map for 2016 vs 2006 L_{den} (assuming 2006 runway modal split and 2006 N-S runway usage)



Note: 2006 L_{den} modal split was 70% W / 30% E.

Figure B28 Heathrow noise change map for 2016 vs 2015 L_{den} (assuming 2015 runway modal split)



Note: 2015 L_{den} modal split was 72% W / 28% E.

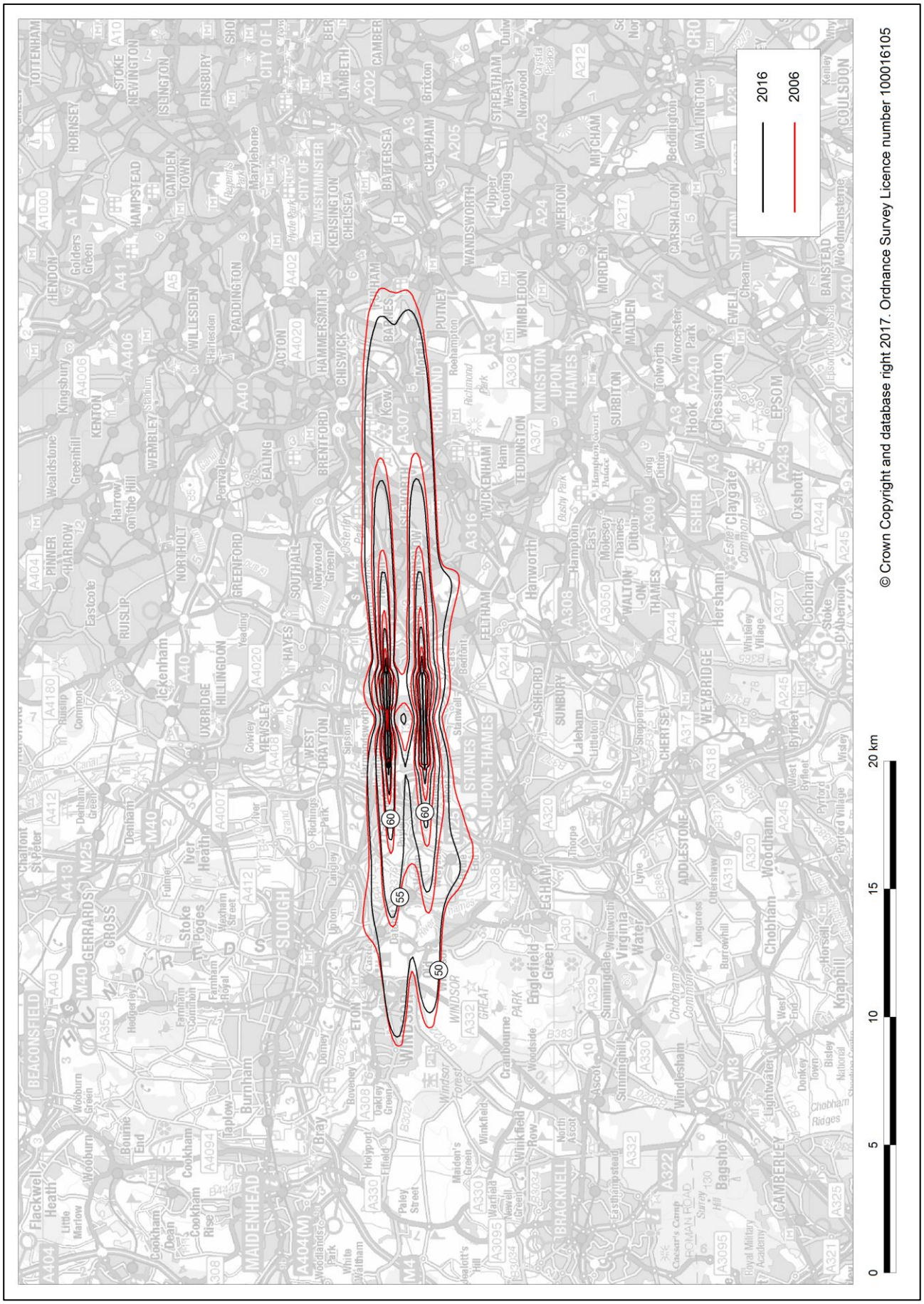
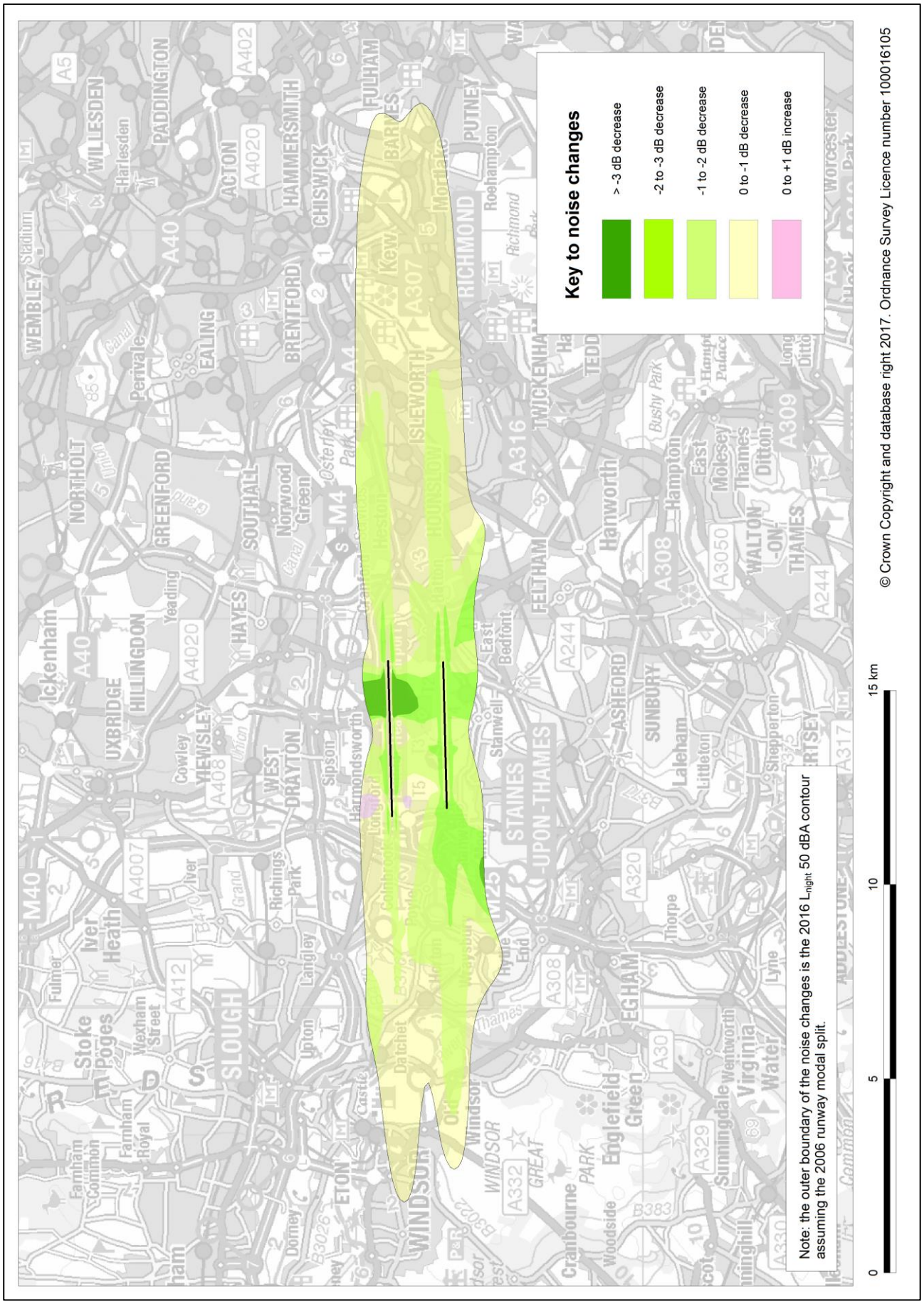


Figure B29 Heathrow 2016 and 2006 L_{night} noise contours

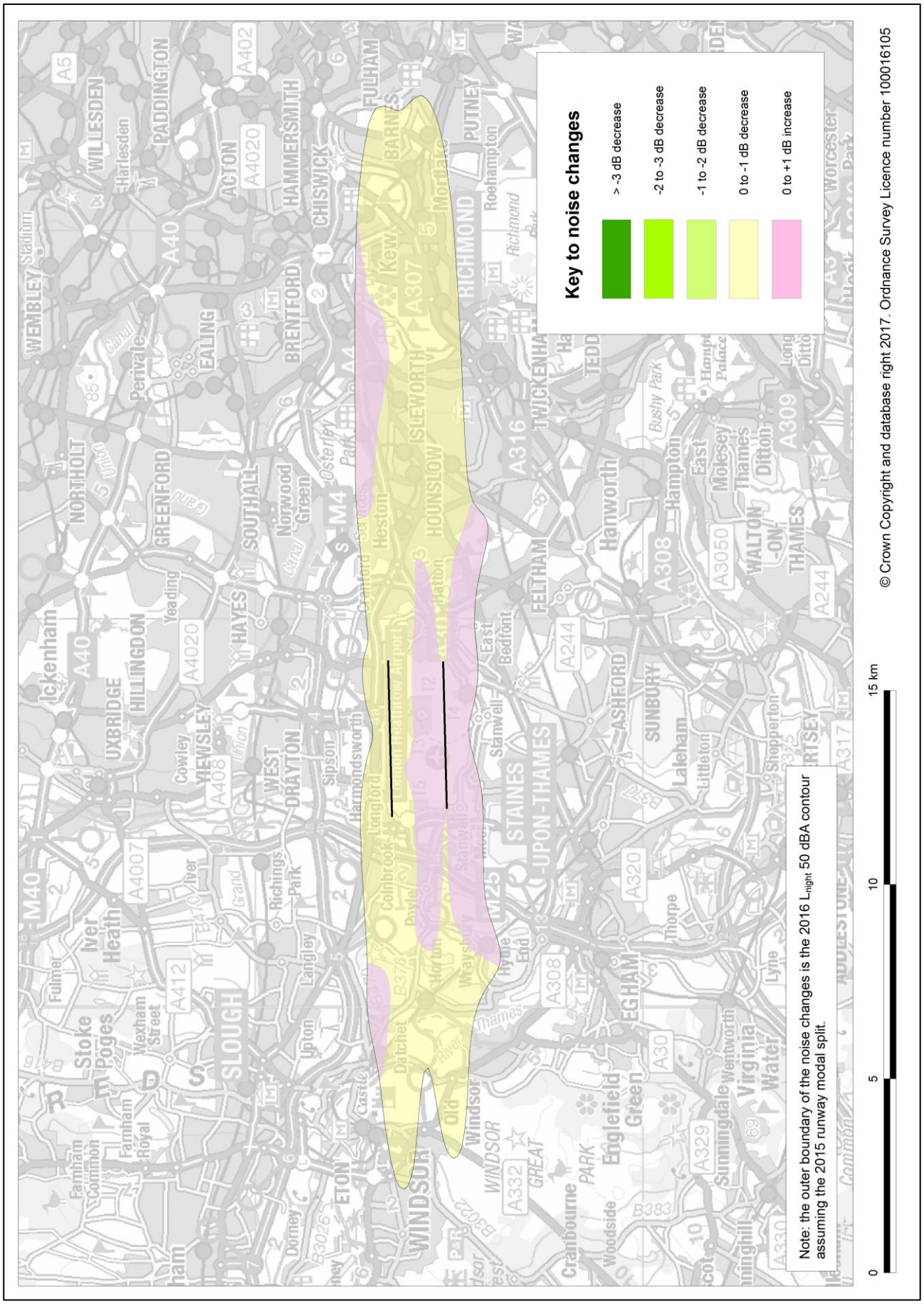
Note: 2016 L_{night} modal split was 70% W / 30% E; 2006 L_{night} modal split was 72% W / 28% E.

Figure B30 Heathrow noise change map for 2016 vs 2006 L_{night} (assuming 2006 runway modal split)



Note: 2006 L_{night} modal split was 72% W / 28% E.

Figure B31 Heathrow noise change map for 2016 vs 2015 L_{night} (assuming 2015 runway modal split)



Note: 2015 L_{night} modal split was 72% W / 28% E.

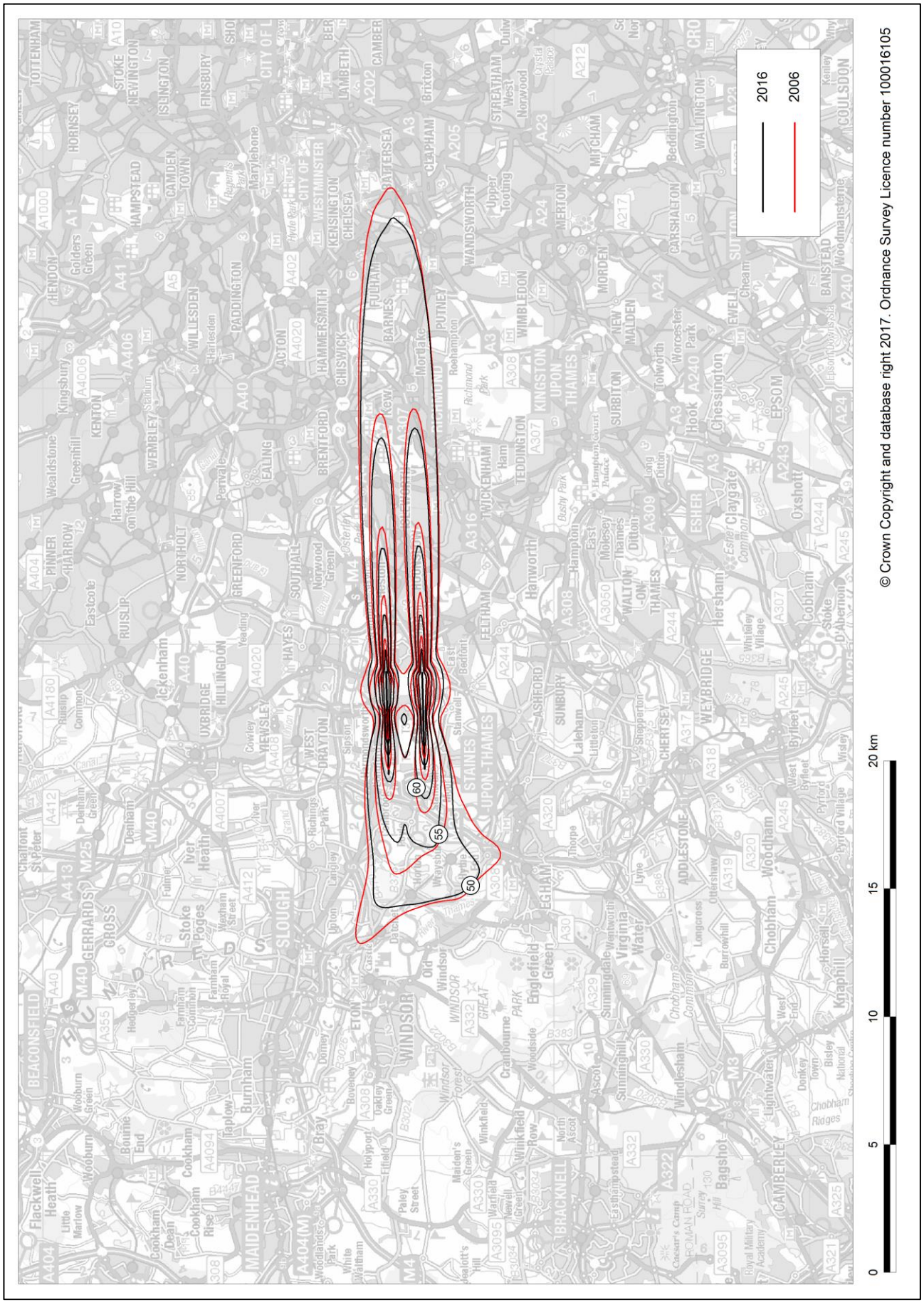
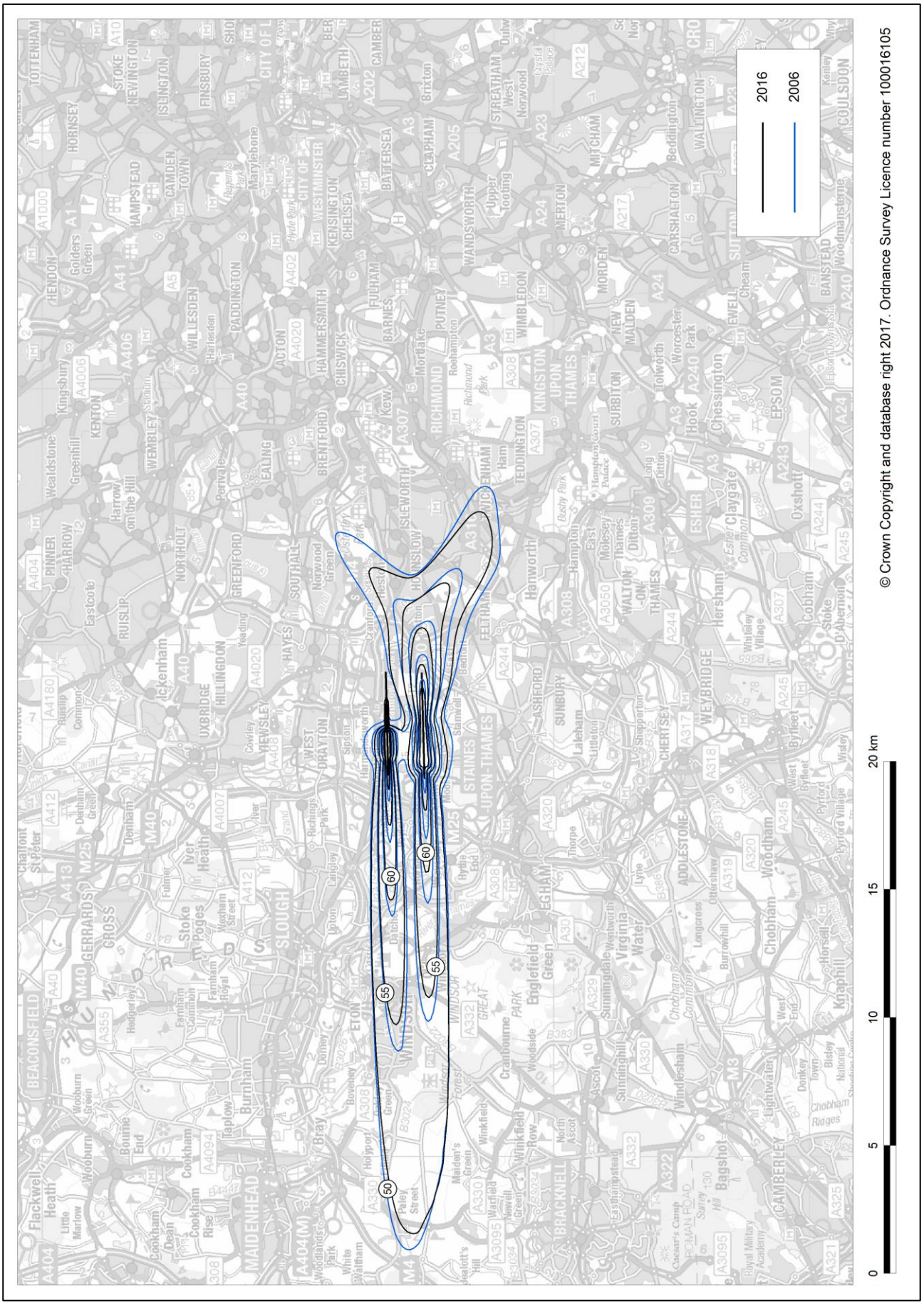


Figure B32 Heathrow 2016 and 2006 L_{night} 50-70 dBA 100% W Leq noise contours (assuming 2006 N-S runway usage)

Figure B33 Heathrow 2016 and 2006 L_{night} 50-70 dBA 100% E Leq noise contours (assuming 2006 N-S runway usage)



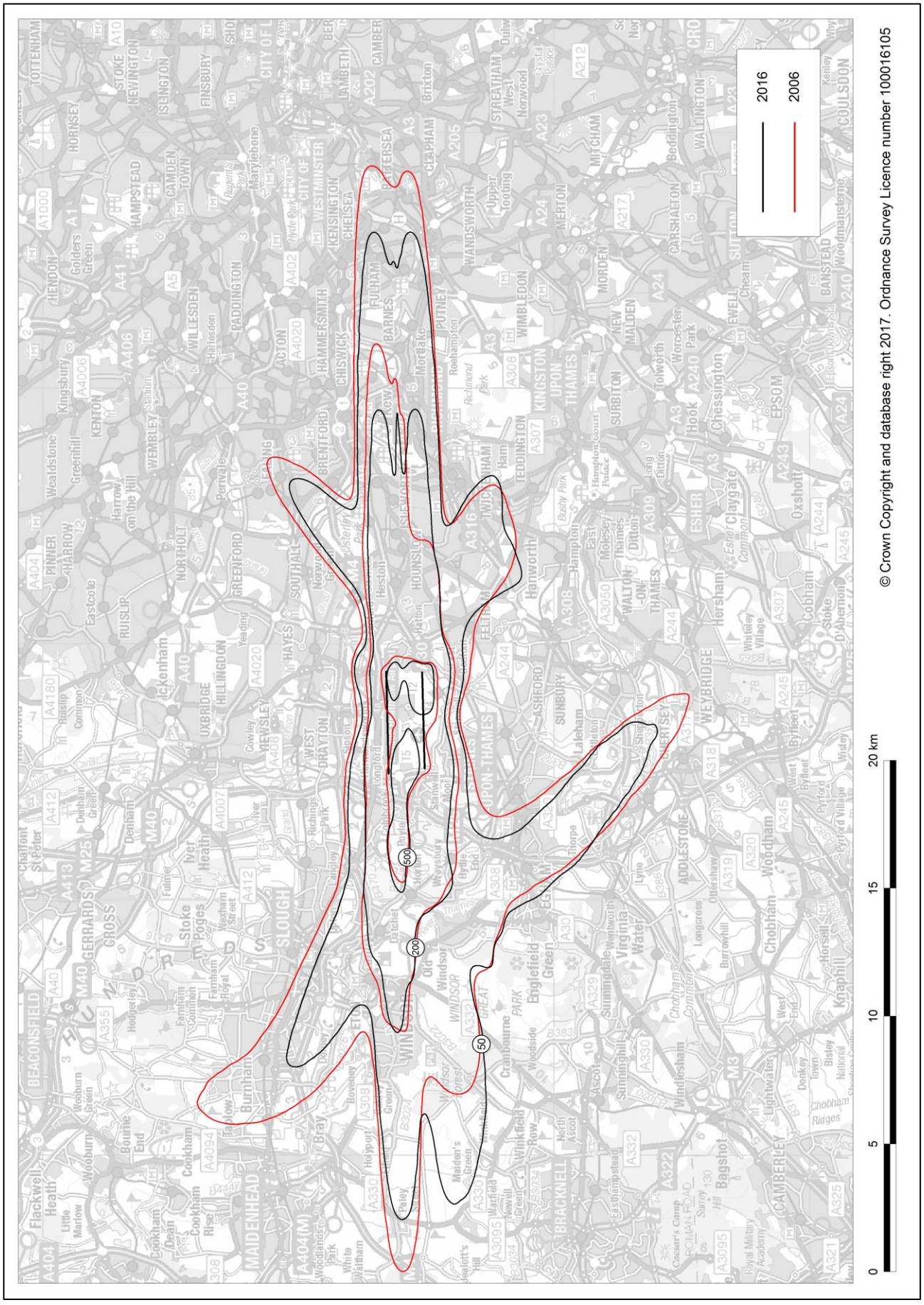
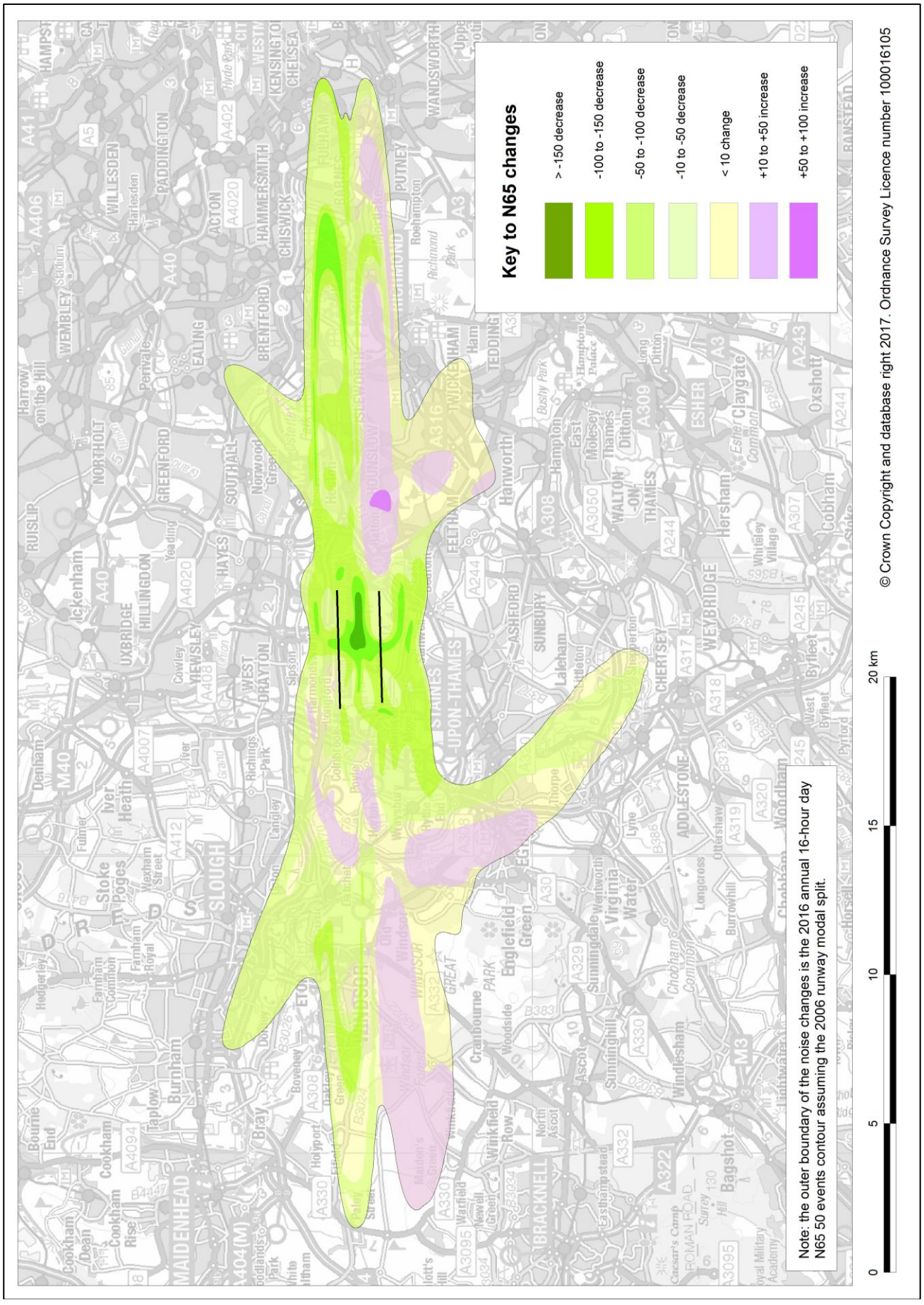


Figure B34 Heathrow 2016 and 2006 annual 16-hour day N65 contours

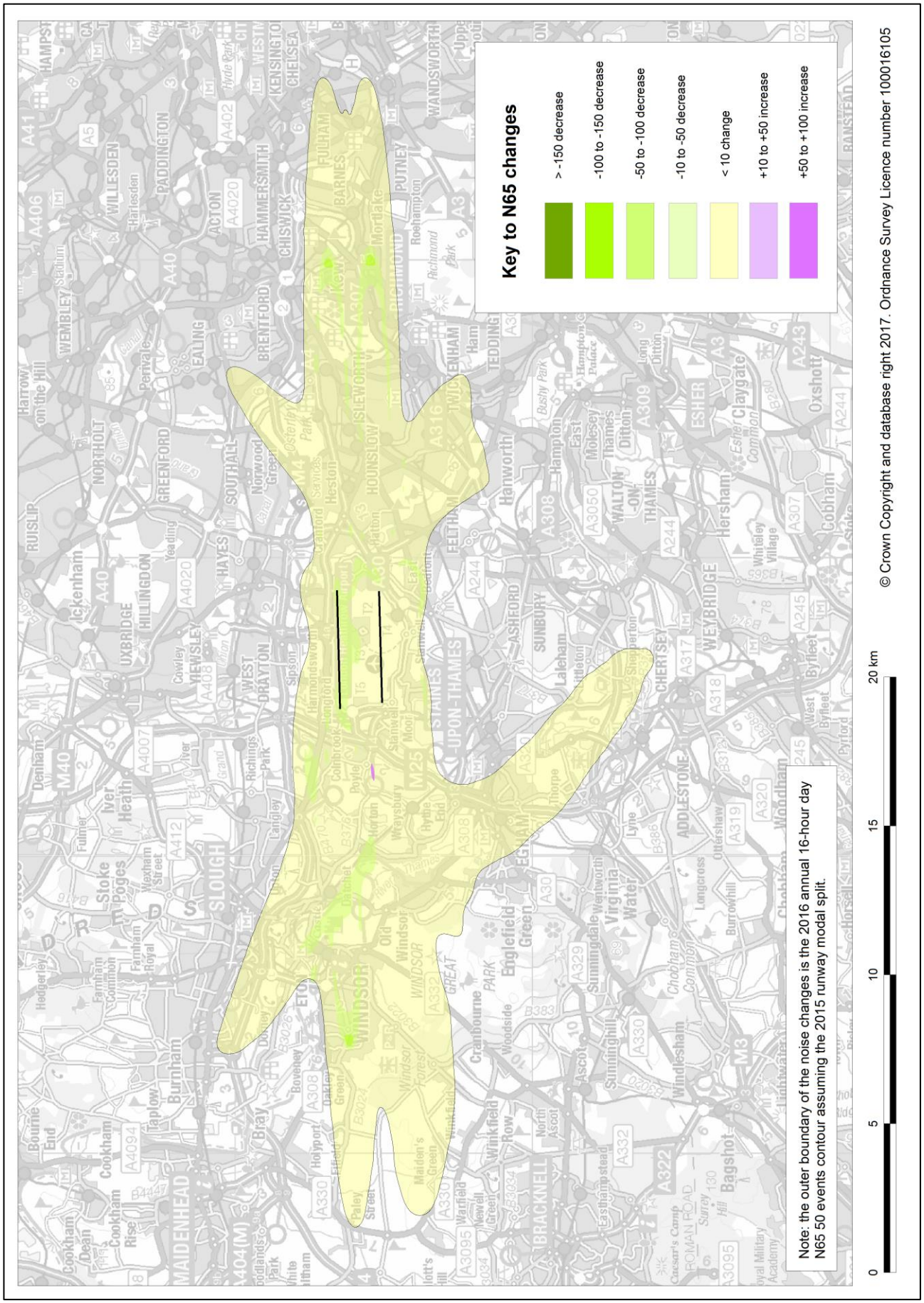
Note: 2016 annual 16-hour day modal split was 70% W / 30% E; 2006 annual 16-hour day modal split was 70% W / 30% E.

Figure B35 Heathrow change map for 2016 vs 2006 annual 16-hour day N65 (assuming 2006 runway modal split)



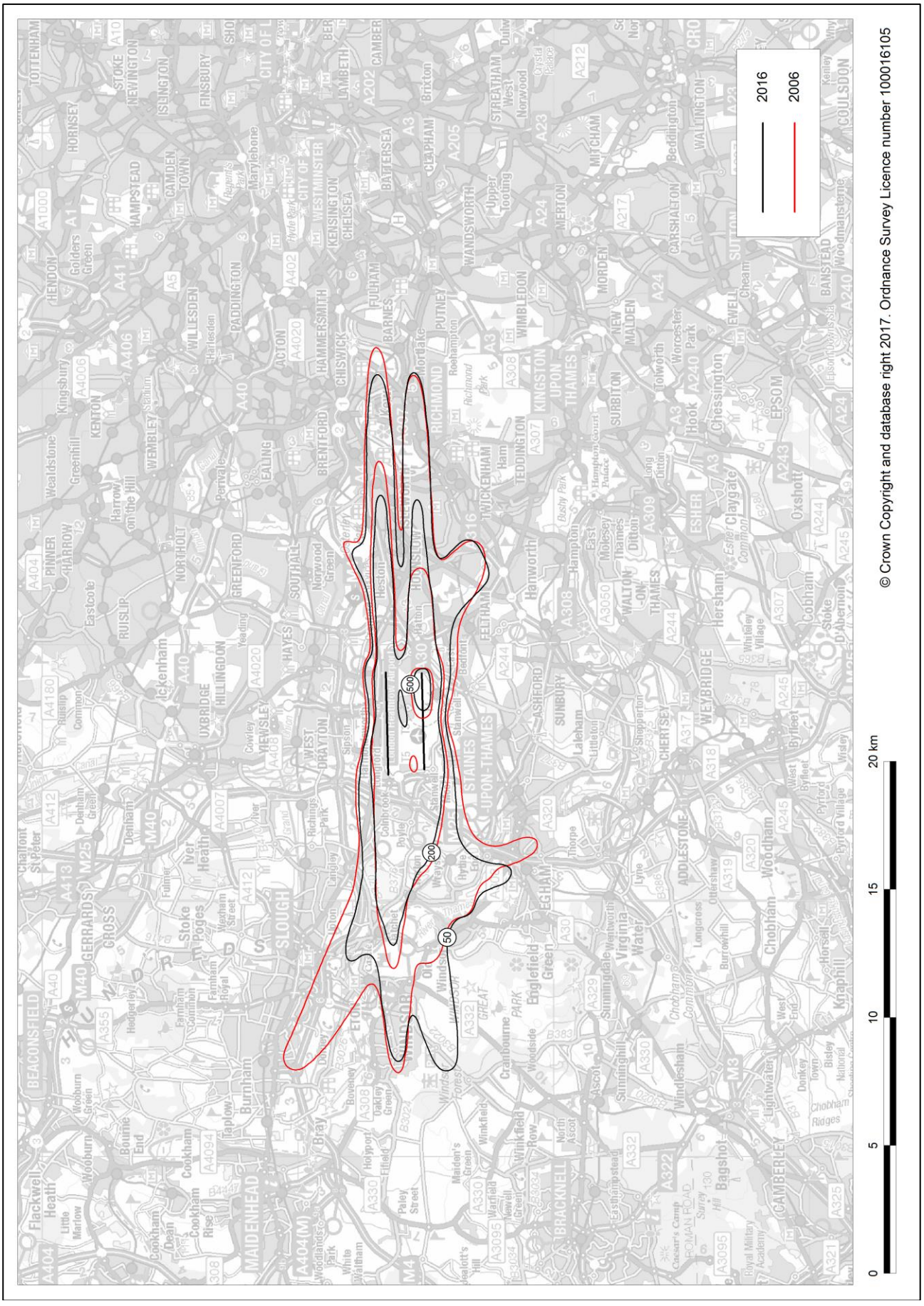
Note: 2006 annual 16-hour day modal split was 70% W / 30% E.

Figure B36 Heathrow change map for 2016 vs 2015 annual 16-hour day N65 (assuming 2015 runway modal split)



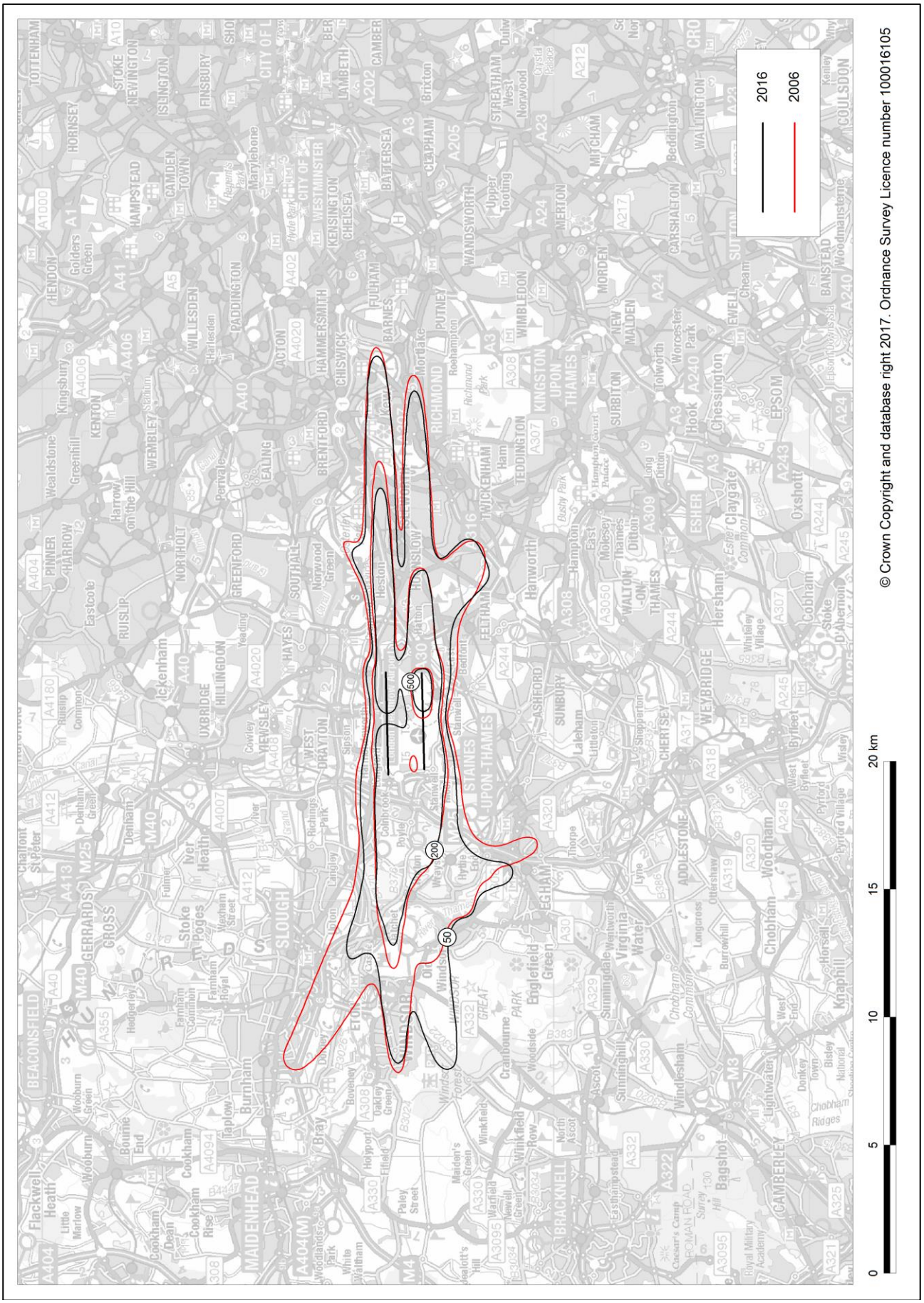
Note: 2015 annual 16-hour day modal split was 72% W / 28% E.

Figure B37 Heathrow 2016 and 2006 annual 16-hour day N70 contours



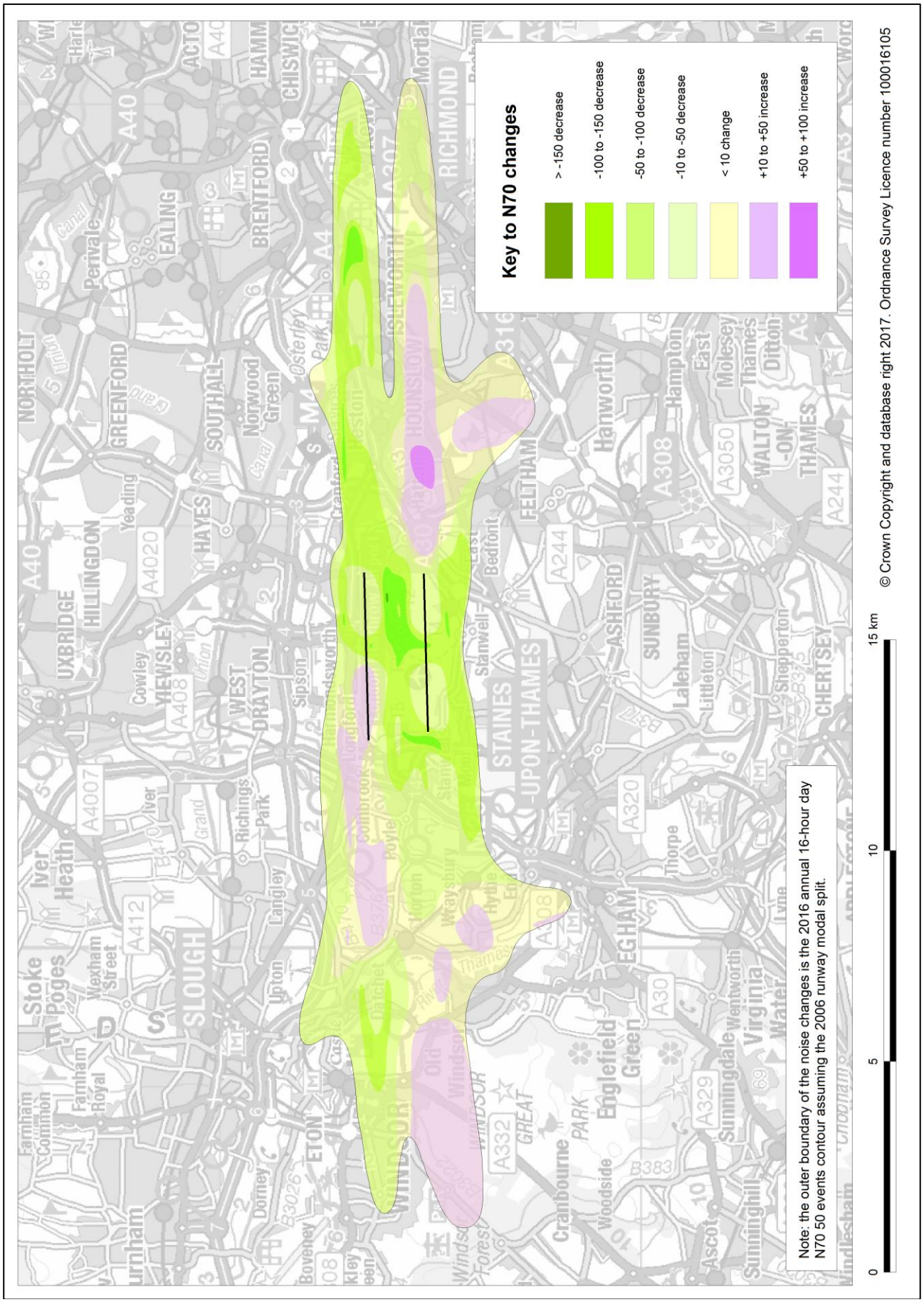
Note: 2016 annual 16-hour day modal split was 70% W / 30% E; 2006 annual 16-hour day modal split was 70% W / 30% E.

Figure B38 Heathrow 2016 and 2006 annual 16-hour day N70 contours (assuming 2006 modal split and 2006 N-S runway usage)



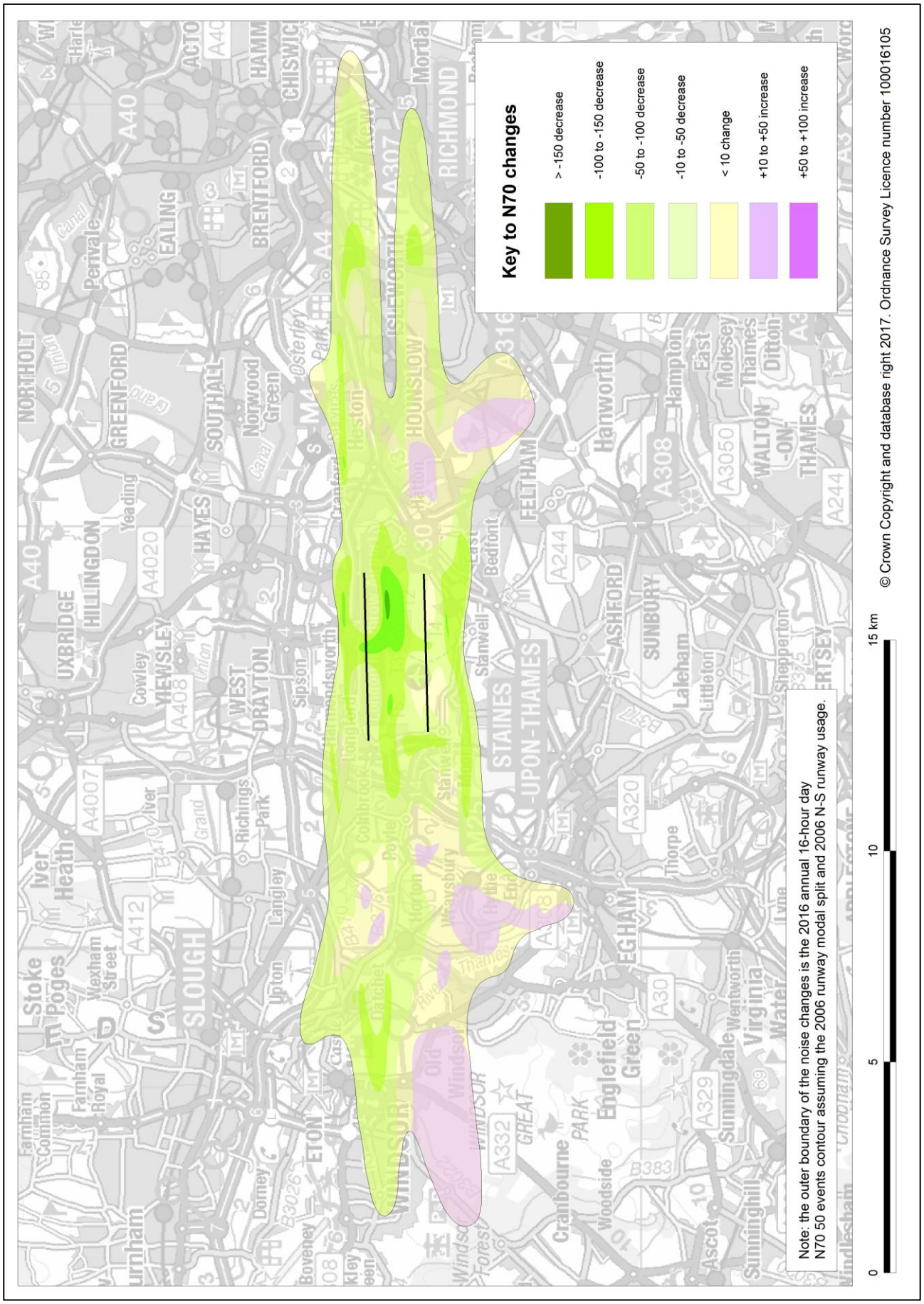
Note: 2006 annual 16-hour day modal split was 70% W / 30% E.

Figure B39 Heathrow change map for 2016 vs 2006 annual 16-hour day N70 (assuming 2006 runway modal split)



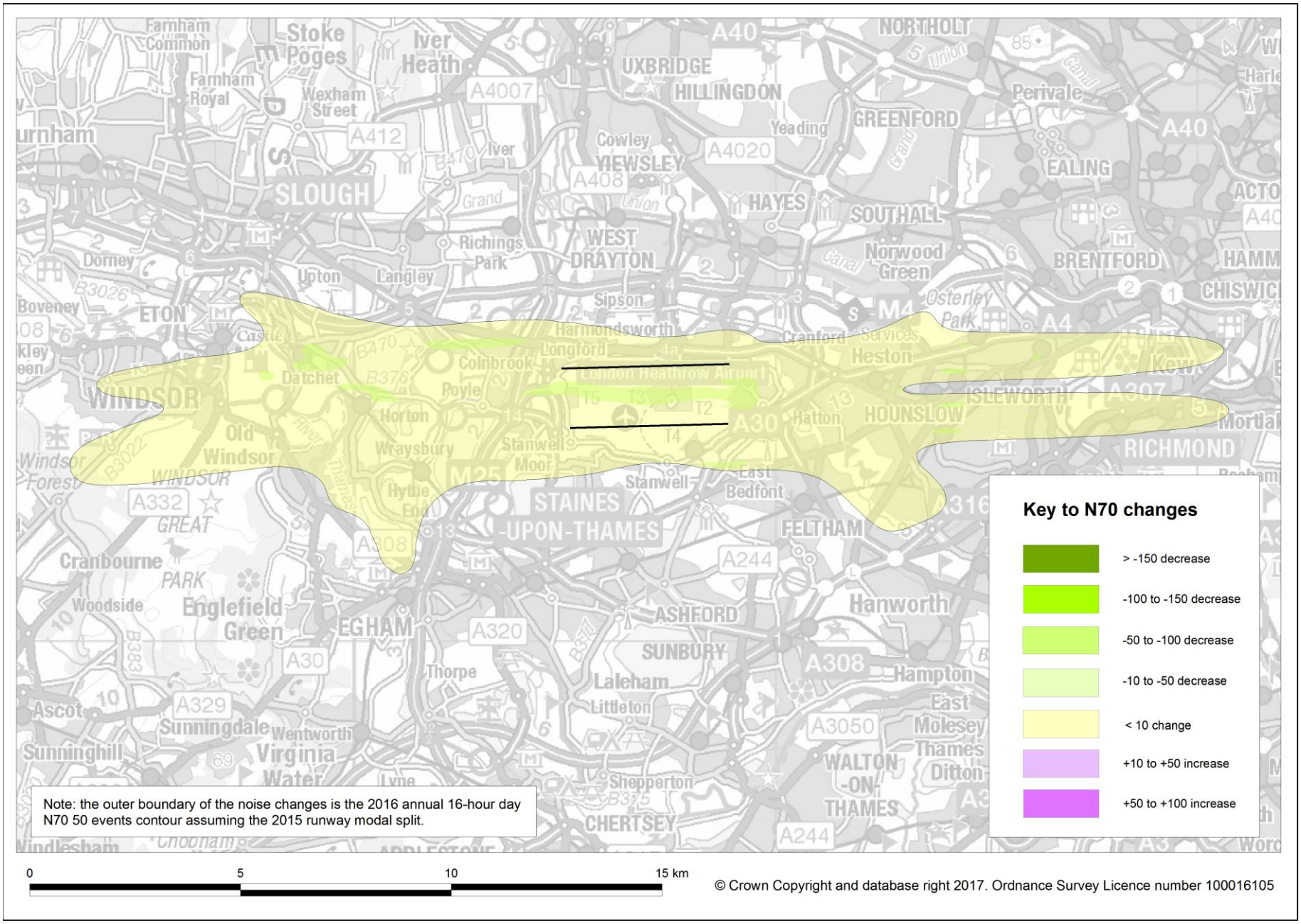
Note: 2006 annual 16-hour day modal split was 70% W / 30% E.

Figure B40 Heathrow change map for 2016 vs 2006 annual 16-hour day N70 (with 2006 runway modal split and 2006 N-S runway usage)



Note: 2006 annual 16-hour day modal split was 70% W / 30% E.

Figure B41 Heathrow change map for 2016 vs 2015 annual 16-hour day N70 (assuming 2015 runway modal split)



Note: 2015 annual 16-hour day modal split was 72% W / 28% E.

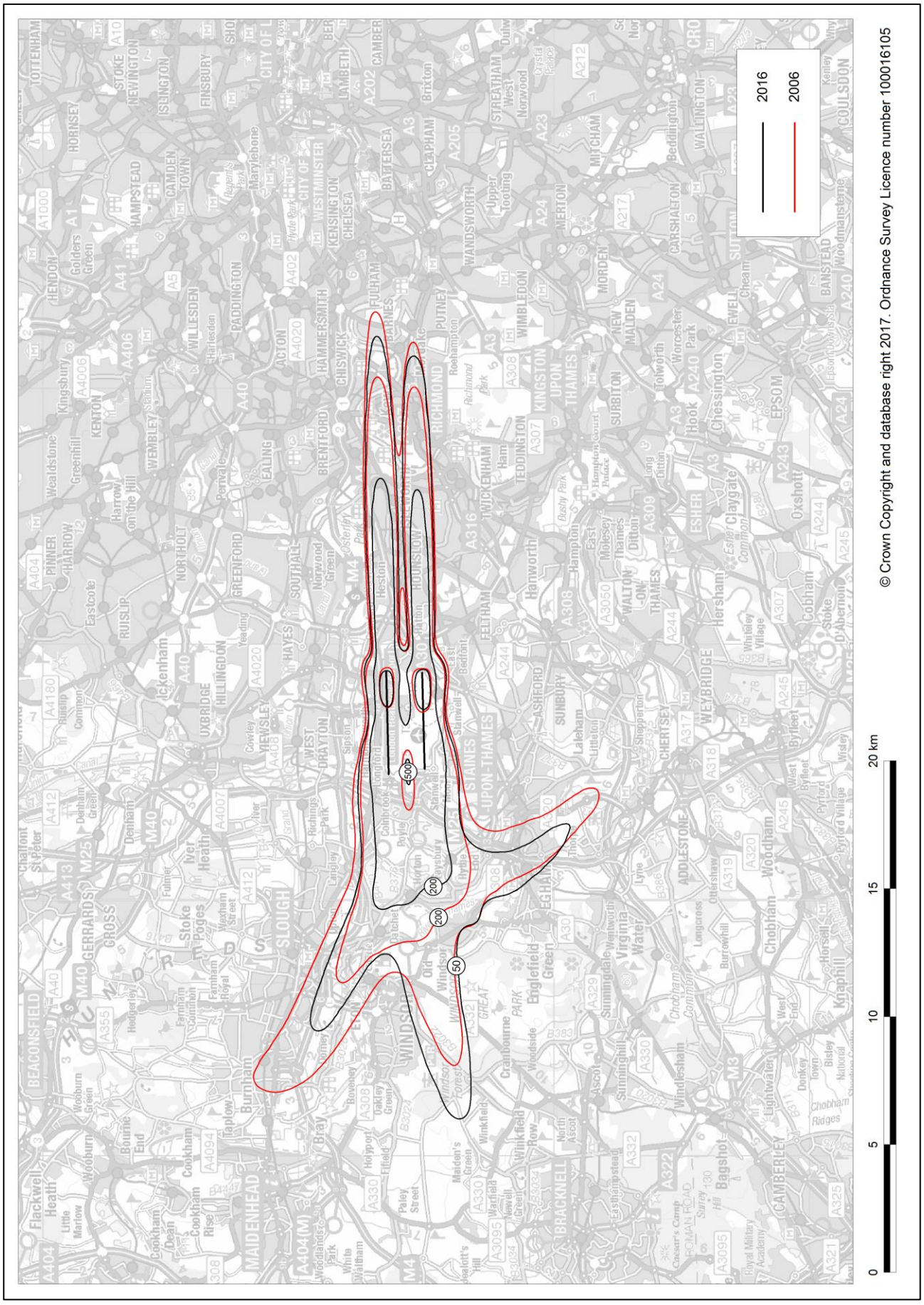


Figure B42 Heathrow 2016 and 2006 annual 16-hour day N70 100% W contours (assuming 2006 N-S runway usage)

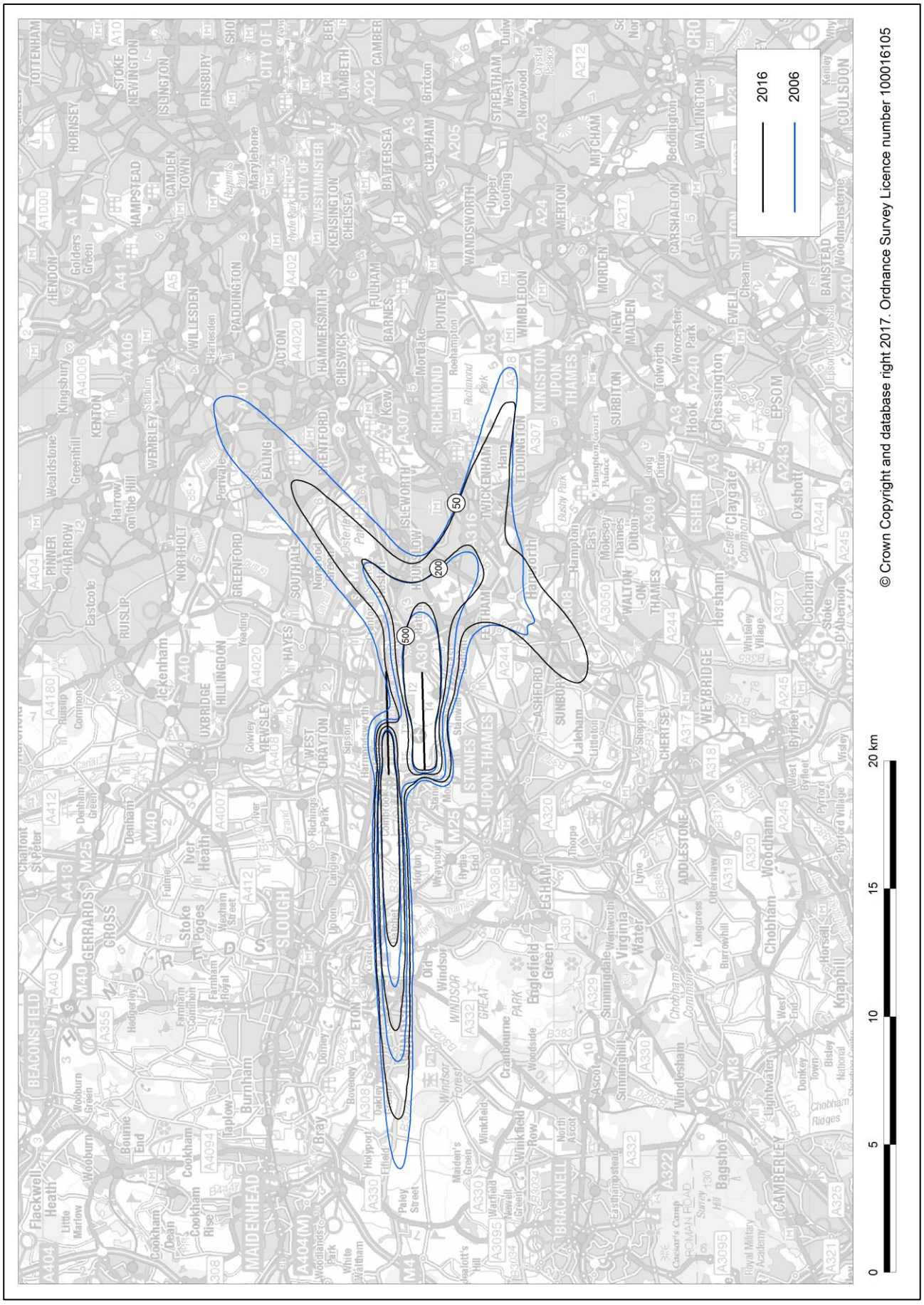
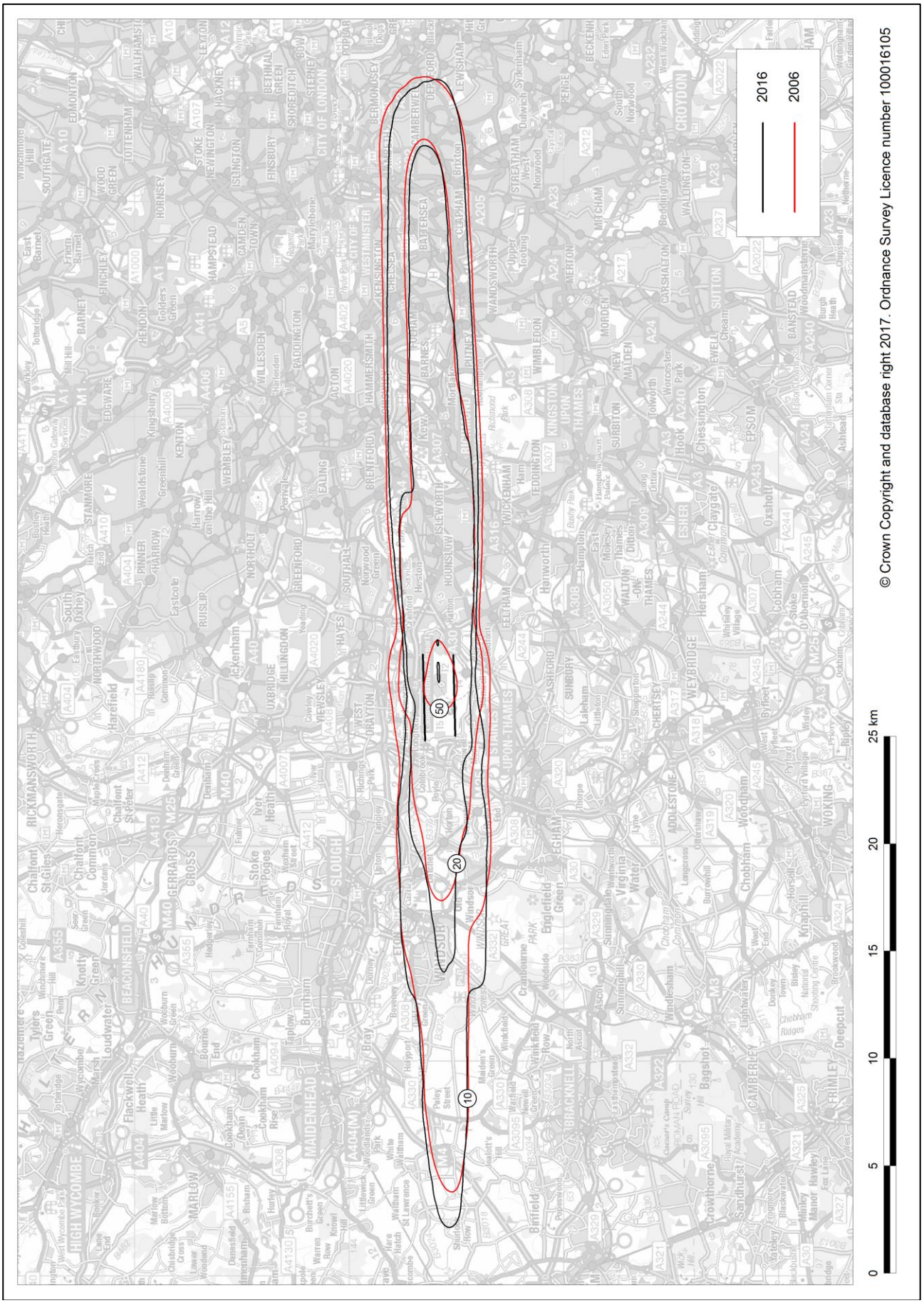


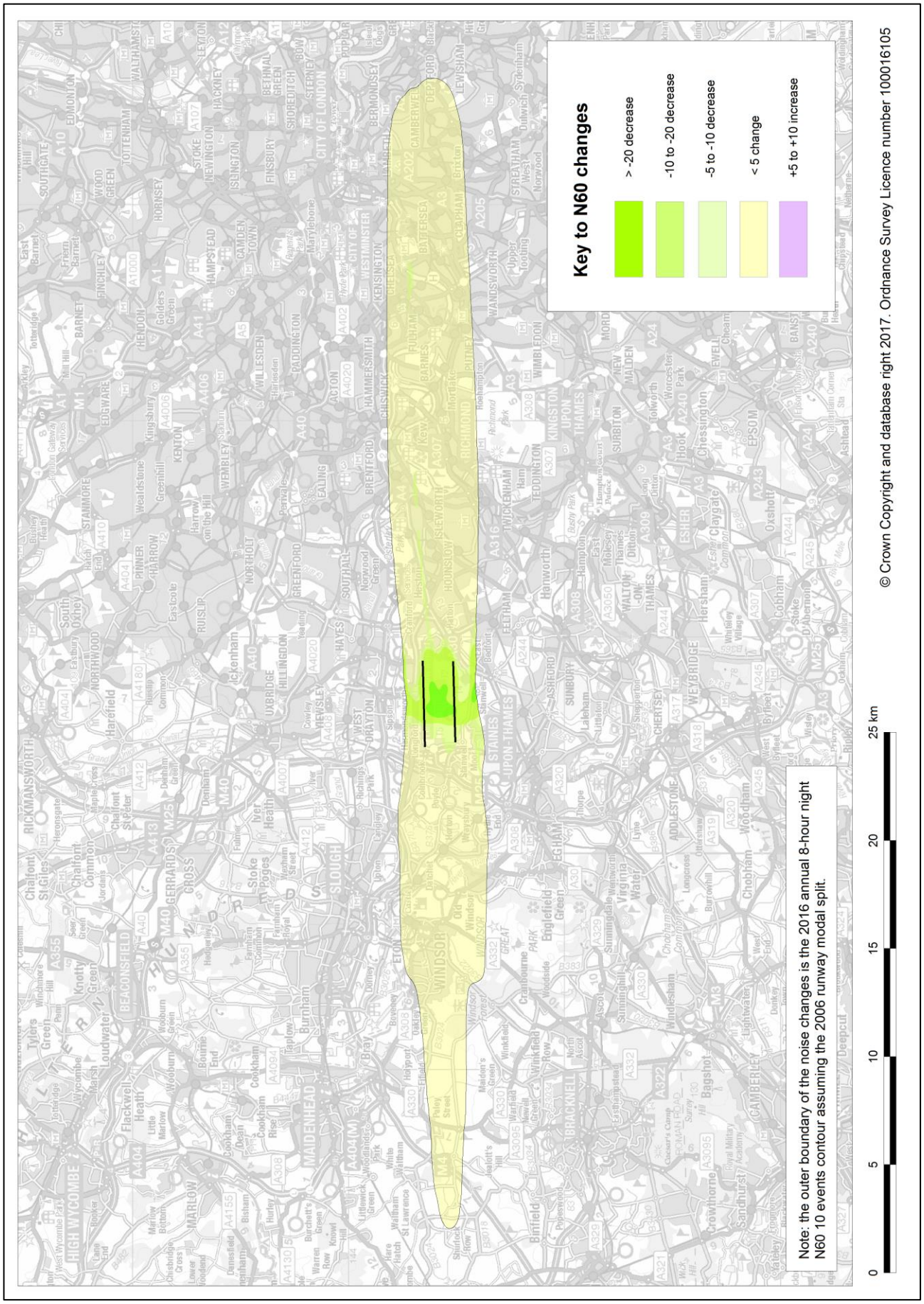
Figure B43 Heathrow 2016 and 2006 annual 16-hour day N70 100% E contours (assuming 2006 N-S runway usage)

Figure B44 Heathrow 2016 and 2006 annual 8-hour night N60 contours



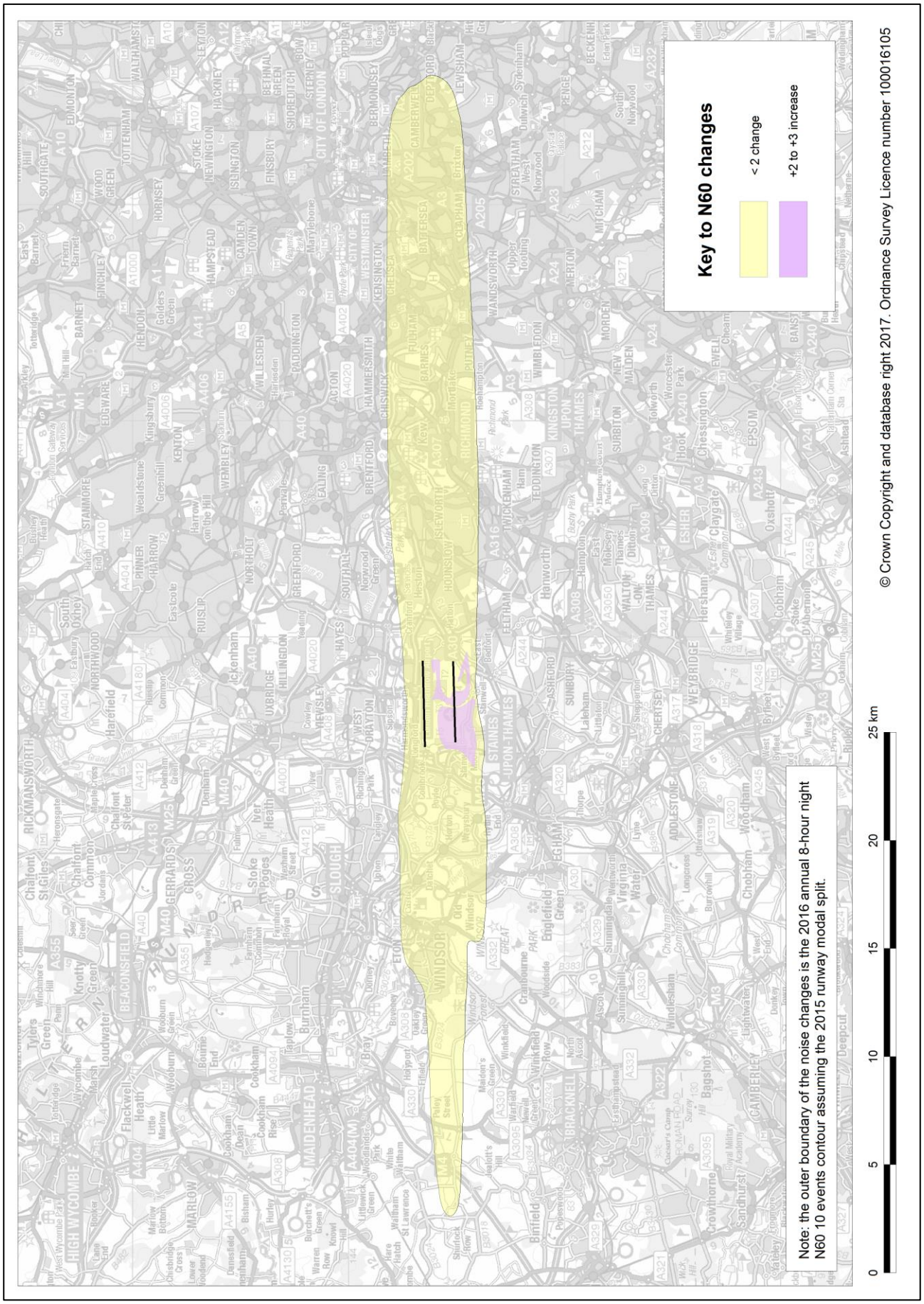
Note: 2016 annual 8-hour night modal split was 70% W / 30% E; 2006 annual 8-hour night modal split was 72% W / 28% E.

Figure B45 Heathrow change map for 2016 vs 2006 annual 8-hour night N60 (assuming 2006 runway modal split)



Note: 2006 annual 8-hour night modal split was 72% W / 28% E.

Figure B46 Heathrow change map for 2016 vs 2015 annual 8-hour night N60 (assuming 2015 runway modal split)



Note: 2015 annual 8-hour night modal split was 72% W / 28% E.

APPENDIX C

Tables

Table C1 Heathrow 2015 and 2016 average summer 16-hour day traffic movements by ANCON type

ANCON type	2015 departs	2016 departs	Change departs	2015 arrivals	2016 arrivals	Change arrivals	2015 total	2016 total	Change total
B717	0.1	0.0	-0.1	0.1	0.0	-0.1	0.2	0.0	-0.2
B732	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B733	3.2	2.1	-1.1	3.8	2.4	-1.4	7.1	4.5	-2.5
B736	11.3	14.6	+3.3	11.4	15.3	+3.9	22.7	29.9	+7.2
B738	11.3	8.5	-2.7	12.1	9.4	-2.8	23.4	17.9	-5.5
B744G	5.1	0.3	-4.8	4.9	0.3	-4.6	10.0	0.7	-9.4
B744P	1.5	1.5	0.0	1.2	1.2	+0.1	2.7	2.8	+0.1
B744R	28.1	27.0	-1.2	20.7	18.1	-2.6	48.8	45.1	-3.8
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
B748	0.0	0.2	+0.1	0.0	0.2	+0.2	0.0	0.3	+0.3
B753	0.6	0.0	-0.6	0.6	0.0	-0.6	1.2	0.0	-1.2
B757C	0.2	0.0	-0.1	0.6	0.1	-0.4	0.7	0.2	-0.5
B757E	5.0	3.2	-1.8	4.7	3.2	-1.4	9.7	6.4	-3.3
B757P	1.1	1.1	0.0	0.2	0.4	+0.2	1.3	1.4	+0.1
B762	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
B763G	10.5	9.3	-1.1	9.4	7.8	-1.7	19.9	17.1	-2.8
B763P	9.9	10.0	+0.1	7.2	7.7	+0.5	17.1	17.7	+0.5
B763R	15.4	11.4	-3.9	16.2	12.2	-3.9	31.5	23.6	-7.9
B764	3.3	4.9	+1.6	3.3	4.9	+1.6	6.6	9.8	+3.2
B772G	19.2	15.4	-3.8	13.7	12.1	-1.6	32.9	27.5	-5.4
B772P	5.7	5.0	-0.7	4.7	4.2	-0.5	10.4	9.1	-1.3
B772R	18.4	15.9	-2.5	15.8	15.2	-0.6	34.2	31.1	-3.1
B773G	44.2	44.8	+0.6	34.7	37.1	+2.4	78.9	81.9	+3.0
B788	16.2	19.2	+3.0	14.5	18.2	+3.7	30.7	37.4	+6.7
B789	4.3	19.9	+15.7	3.8	15.4	+11.6	8.0	35.3	+27.3
BA46	1.0	0.7	-0.4	1.0	0.7	-0.4	2.1	1.3	-0.7
CRJ	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1
CRJ900	1.0	0.9	-0.1	1.0	0.9	-0.1	2.0	1.9	-0.2
EA30	1.3	1.5	+0.3	2.0	2.5	+0.5	3.3	4.0	+0.8
EA31	0.3	0.0	-0.2	0.3	0.0	-0.2	0.5	0.1	-0.4
EA318	1.0	1.1	+0.2	1.0	1.1	+0.2	2.0	2.3	+0.3

ANCON type	2015 departs	2016 departs	Change departs	2015 arrivals	2016 arrivals	Change arrivals	2015 total	2016 total	Change total
EA319C	27.4	16.8	-10.5	27.4	16.8	-10.6	54.8	33.6	-21.1
EA319V	90.5	95.0	+4.4	89.5	94.4	+4.9	180.0	189.3	+9.3
EA320C	62.5	70.1	+7.7	65.6	73.1	+7.4	128.1	143.2	+15.1
EA320V	134.9	122.4	-12.5	135.3	122.8	-12.5	270.2	245.1	-25.0
EA321C	11.0	9.9	-1.0	12.2	11.0	-1.2	23.2	21.0	-2.2
EA321V	47.9	49.4	+1.5	47.7	50.3	+2.5	95.6	99.7	+4.1
EA33	24.7	25.0	+0.3	21.3	22.4	+1.1	46.0	47.5	+1.5
EA34	1.8	2.7	+0.9	1.7	2.9	+1.3	3.4	5.6	+2.2
EA346	9.1	7.2	-2.0	7.0	5.7	-1.3	16.1	12.8	-3.3
EA359	0.0	0.7	+0.7	0.0	0.6	+0.6	0.0	1.3	+1.3
EA38GP	8.6	11.3	+2.7	8.2	10.9	+2.7	16.8	22.2	+5.3
EA38R	12.6	15.8	+3.2	6.9	9.6	+2.7	19.5	25.4	+5.9
ERJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
ERJ170	0.7	0.0	-0.7	0.8	0.0	-0.7	1.5	0.1	-1.4
ERJ190	2.3	2.8	+0.5	2.3	3.0	+0.7	4.6	5.8	+1.2
EXE3	0.3	0.2	-0.1	0.2	0.2	-0.1	0.5	0.3	-0.2
FK10	3.0	2.0	-1.0	3.0	2.0	-1.0	6.0	4.0	-2.0
LTT	0.1	0.1	0.0	0.1	0.1	0.0	0.2	0.3	+0.1
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	656.5	**650.3**	**-6.2**	618.0	**616.5**	**-1.5**	1274.5	**1266.7**	**-7.7**
			(-0.9%)			**(-0.2%)**			**(-0.6%)**

Note: Changes and totals have been calculated *before* rounding.

Table C2 Heathrow 2015 and 2016 average summer 8-hour night traffic movements by ANCON type

ANCON type	2015 departs	2016 departs	Change departs	2015 arrivals	2016 arrivals	Change arrivals	2015 total	2016 total	Change total
B733	0.6	0.4	-0.2	0.0	0.1	0.0	0.6	0.4	-0.2
B736	0.1	0.8	+0.7	0.0	0.2	+0.2	0.1	1.0	+0.9
B738	0.9	0.8	-0.1	0.0	0.0	0.0	0.9	0.8	-0.1
B744G	0.0	0.0	0.0	0.2	0.0	-0.2	0.2	0.0	-0.1
B744P	0.1	0.1	+0.1	0.5	0.4	0.0	0.5	0.6	0.0
B744R	1.7	0.9	-0.8	9.1	9.7	+0.6	10.8	10.7	-0.1
B748	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B757C	0.4	0.1	-0.3	0.0	0.0	0.0	0.4	0.1	-0.3
B757E	0.0	0.1	0.0	0.4	0.1	-0.3	0.4	0.2	-0.3
B757P	0.0	0.0	0.0	0.8	0.7	-0.2	0.8	0.7	-0.1
B763G	0.0	0.1	0.0	1.0	1.6	+0.6	1.1	1.7	+0.6
B763P	0.0	0.2	+0.1	2.7	2.4	-0.3	2.8	2.6	-0.2
B763R	0.9	1.1	+0.1	0.1	0.3	+0.1	1.1	1.3	+0.3
B764	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B772G	0.9	1.6	+0.8	6.5	4.9	-1.5	7.3	6.6	-0.8
B772P	0.0	0.0	0.0	1.0	0.9	-0.2	1.1	0.9	-0.2
B772R	1.2	1.7	+0.5	3.8	2.4	-1.4	5.0	4.1	-0.9
B773G	0.7	1.1	+0.4	10.2	8.8	-1.4	10.8	9.9	-1.0
B788	0.6	0.5	-0.1	2.3	1.5	-0.8	3.0	2.1	-0.9
B789	0.3	0.3	0.0	0.8	4.9	+4.1	1.0	5.2	+4.1
BA46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CRJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA30	0.8	1.0	+0.2	0.0	0.0	0.0	0.8	1.0	+0.2
EA318	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA319C	0.9	0.9	0.0	0.9	1.0	+0.1	1.8	1.9	+0.1
EA319V	0.6	1.2	+0.6	1.6	1.9	+0.2	2.3	3.1	+0.8
EA320C	3.6	3.6	-0.1	0.5	0.6	+0.1	4.1	4.2	0.0
EA320V	1.8	2.0	+0.2	1.5	1.7	+0.2	3.3	3.7	+0.5
EA321C	1.3	1.2	-0.1	0.1	0.1	0.0	1.4	1.3	-0.1
EA321V	0.7	1.5	+0.8	0.8	0.6	-0.3	1.5	2.0	+0.5
EA33	0.9	2.1	+1.2	4.4	4.8	+0.4	5.3	6.9	+1.6
EA34	0.5	0.8	+0.3	0.7	0.5	-0.1	1.2	1.3	+0.2

ANCON type	2015 departs	2016 departs	Change departs	2015 arrivals	2016 arrivals	Change arrivals	2015 total	2016 total	Change total
EA346	0.4	0.2	-0.2	2.6	1.7	-0.9	3.1	1.9	-1.1
EA359	0.0	0.0	0.0	0.0	0.1	+0.1	0.0	0.1	+0.1
EA38GP	0.2	0.4	+0.2	0.6	0.8	+0.2	0.8	1.2	+0.4
EA38R	0.2	0.2	0.0	6.0	6.5	+0.5	6.2	6.7	+0.5
ERJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	+0.1
ERJ190	0.1	0.2	+0.1	0.0	0.0	0.0	0.1	0.2	+0.1
EXE3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
FK10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	20.6	**25.3**	**+4.7**	59.2	**59.1**	**0.0**	79.7	**84.4**	**+4.7**
			(+23.1%)			**(-0.1%)**			**(+5.9%)**

Note: Changes and totals have been calculated *before* rounding.

Table C3 Heathrow 2015 and 2016 annual 12-hour day traffic movements by ANCON type

ANCON type	2015 departs	2016 departs	Change departs	2015 arrivals	2016 arrivals	Change arrivals	2015 total	2016 total	Change total
B717	0.0	0.0	0.0	0.1	0.0	-0.1	0.1	0.0	-0.1
B727	0.0	0.0	0.0	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	0.1	0.0	-0.1
B733	2.0	1.5	-0.5	2.1	1.6	-0.5	4.1	3.2	-1.0
B736	6.8	8.2	+1.4	8.3	9.9	+1.6	15.1	18.1	+3.0
B738	9.2	7.6	-1.6	9.6	8.2	-1.4	18.8	15.7	-3.1
B744G	3.9	0.3	-3.6	3.9	0.5	-3.5	7.8	0.8	-7.1
B744P	0.7	0.7	0.0	0.7	0.8	+0.1	1.3	1.5	+0.1
B744R	22.4	21.2	-1.2	18.0	15.7	-2.2	40.3	36.9	-3.4
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
B748	0.0	0.1	0.0	0.1	0.1	+0.1	0.1	0.2	+0.1
B753	0.2	0.1	-0.2	0.2	0.1	-0.2	0.5	0.1	-0.3
B757C	0.0	0.0	0.0	0.1	0.2	0.0	0.1	0.2	0.0
B757E	4.1	2.8	-1.3	2.1	1.8	-0.3	6.2	4.6	-1.6
B757P	0.6	0.8	+0.2	0.2	0.4	+0.2	0.8	1.2	+0.4
B762	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1
B763G	9.4	8.7	-0.8	6.6	6.0	-0.7	16.1	14.7	-1.4
B763P	9.0	10.0	+1.0	5.5	7.1	+1.5	14.5	17.1	+2.6
B763R	13.3	10.1	-3.2	10.2	7.3	-2.9	23.5	17.4	-6.1
B764	4.0	4.0	+0.1	3.8	3.4	-0.4	7.8	7.5	-0.3
B772G	14.1	12.3	-1.8	12.3	10.4	-1.9	26.4	22.7	-3.7
B772P	4.2	3.8	-0.4	4.1	3.7	-0.5	8.3	7.5	-0.8
B772R	13.5	13.3	-0.2	14.2	14.4	+0.2	27.7	27.7	0.0
B773G	26.5	25.8	-0.7	30.8	30.9	+0.1	57.3	56.7	-0.7
B773R	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B788	11.7	13.8	+2.1	13.3	15.1	+1.8	25.0	28.9	+3.9
B789	3.2	12.7	+9.5	3.6	13.3	+9.7	6.7	26.0	+19.2
BA46	0.9	0.5	-0.3	0.9	0.6	-0.3	1.8	1.1	-0.7
CRJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CRJ900	1.0	0.6	-0.3	1.0	0.7	-0.3	1.9	1.4	-0.6
CS100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ANCON type	2015 departs	2016 departs	Change departs	2015 arrivals	2016 arrivals	Change arrivals	2015 total	2016 total	Change total
EA30	1.2	1.1	-0.1	1.1	1.0	-0.1	2.3	2.1	-0.2
EA31	0.2	0.1	-0.1	0.2	0.1	-0.2	0.4	0.1	-0.3
EA318	1.0	1.1	+0.1	1.0	1.1	+0.1	2.0	2.3	+0.2
EA319C	19.8	14.1	-5.7	20.6	13.9	-6.7	40.5	28.0	-12.5
EA319V	69.5	73.9	+4.4	63.8	68.1	+4.3	133.3	142.0	+8.7
EA320C	45.7	47.9	+2.2	47.7	51.7	+4.0	93.3	99.6	+6.2
EA320neo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA320V	104.2	99.6	-4.6	92.9	89.7	-3.2	197.1	189.3	-7.8
EA321C	8.5	7.1	-1.4	10.1	8.9	-1.2	18.7	16.0	-2.6
EA321V	37.6	39.4	+1.8	31.4	32.8	+1.4	69.1	72.2	+3.1
EA33	15.5	15.4	-0.2	16.7	16.7	+0.1	32.2	32.1	-0.1
EA34	0.8	1.2	+0.4	1.1	1.5	+0.4	1.9	2.7	+0.8
EA346	5.2	5.0	-0.1	6.3	5.0	-1.3	11.5	10.0	-1.5
EA359	0.0	0.3	+0.3	0.1	0.7	+0.6	0.1	1.0	+0.9
EA38GP	5.4	6.8	+1.4	5.9	8.0	+2.1	11.3	14.8	+3.5
EA38R	7.3	9.3	+2.0	6.1	7.7	+1.6	13.4	17.0	+3.6
ERJ	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
ERJ170	0.4	0.0	-0.4	0.0	0.0	0.0	0.4	0.0	-0.4
ERJ190	2.1	1.8	-0.3	2.7	2.4	-0.3	4.8	4.3	-0.5
EXE2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EXE3	0.3	0.2	-0.1	0.3	0.2	-0.1	0.6	0.4	-0.2
FK10	1.5	1.2	-0.3	2.4	1.6	-0.8	3.9	2.8	-1.1
L4P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LTT	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.0
MD80	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	487.1	**484.7**	**-2.4**	462.3	**463.1**	**+0.8**	949.4	**947.7**	**-1.7**
			(-0.5%)			**(+0.2%)**			**(-0.2%)**

Note: Changes and totals have been calculated *before* rounding.

Table C4 Heathrow 2015 and 2016 annual 4-hour evening traffic movements by ANCON type

ANCON type	2015 departs	2016 departs	Change departs	2015 arrivals	2016 arrivals	Change arrivals	2015 total	2016 total	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
B732	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B733	0.3	0.2	0.0	0.6	0.5	-0.1	0.9	0.7	-0.2
B736	3.2	3.7	+0.5	1.8	2.6	+0.8	5.0	6.3	+1.3
B738	2.4	2.6	+0.2	2.8	2.7	0.0	5.2	5.3	+0.1
B744G	0.7	0.1	-0.6	0.3	0.0	-0.3	1.0	0.2	-0.9
B744P	0.4	0.3	0.0	0.2	0.2	-0.1	0.6	0.5	-0.1
B744R	6.0	4.7	-1.3	1.2	1.1	-0.2	7.2	5.8	-1.4
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
B748	0.0	0.1	+0.1	0.0	0.0	0.0	0.0	0.1	+0.1
B753	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
B757C	0.2	0.1	-0.1	0.4	0.0	-0.3	0.6	0.1	-0.5
B757E	1.1	1.1	0.0	2.7	2.1	-0.6	3.8	3.2	-0.6
B757P	0.1	0.2	+0.1	0.1	0.2	+0.1	0.2	0.4	+0.1
B762	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B763G	0.1	0.1	-0.1	1.6	1.2	-0.4	1.8	1.3	-0.5
B763P	0.2	0.2	0.0	1.1	0.6	-0.4	1.2	0.8	-0.4
B763R	1.6	1.2	-0.4	5.1	4.7	-0.4	6.7	5.9	-0.8
B764	0.0	0.0	0.0	0.0	0.5	+0.5	0.0	0.5	+0.5
B772G	4.9	4.6	-0.3	1.0	1.7	+0.7	5.9	6.3	+0.3
B772P	1.0	0.9	-0.1	0.1	0.2	+0.1	1.2	1.2	0.0
B772R	3.7	3.6	-0.1	0.8	1.4	+0.6	4.5	5.0	+0.5
B773G	15.7	16.7	+1.0	3.2	3.8	+0.6	18.8	20.5	+1.7
B773R	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B788	4.5	4.8	+0.3	0.9	2.2	+1.3	5.4	7.0	+1.6
B789	1.6	5.7	+4.2	0.2	0.5	+0.3	1.7	6.2	+4.5
BA46	0.1	0.2	+0.1	0.1	0.1	0.0	0.2	0.2	+0.1
CRJ900	0.0	0.1	+0.1	0.0	0.0	0.0	0.0	0.1	+0.1
CS100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA30	0.3	0.6	+0.2	1.1	1.5	+0.5	1.4	2.1	+0.7

ANCON type	2015 departs	2016 departs	Change departs	2015 arrivals	2016 arrivals	Change arrivals	2015 total	2016 total	Change total
EA31	0.1	0.0	-0.1	0.0	0.0	0.0	0.1	0.0	-0.1
EA318	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	+0.1
EA319C	6.2	3.9	-2.3	6.4	4.8	-1.6	12.6	8.7	-3.9
EA319V	16.5	15.5	-1.0	22.0	21.4	-0.6	38.5	36.9	-1.6
EA320C	15.5	16.8	+1.3	16.2	15.9	-0.3	31.8	32.7	+1.0
EA320V	22.5	21.6	-0.9	35.2	33.0	-2.3	57.7	54.5	-3.2
EA321C	3.1	2.9	-0.2	2.4	1.9	-0.5	5.5	4.8	-0.7
EA321V	7.4	7.3	-0.1	13.4	14.4	+1.0	20.9	21.7	+0.9
EA33	8.5	9.1	+0.7	3.6	4.0	+0.4	12.1	13.1	+1.0
EA34	1.1	1.4	+0.3	0.2	0.9	+0.7	1.4	2.3	+1.0
EA346	4.4	2.2	-2.2	1.4	1.0	-0.5	5.8	3.2	-2.7
EA359	0.1	0.6	+0.6	0.0	0.2	+0.2	0.1	0.8	+0.7
EA38GP	2.4	3.6	+1.2	1.2	1.3	+0.1	3.6	4.8	+1.2
EA38R	4.7	5.0	+0.4	0.1	0.1	0.0	4.7	5.1	+0.4
ERJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERJ170	0.0	0.0	0.0	0.4	0.0	-0.4	0.4	0.0	-0.4
ERJ190	0.9	0.8	-0.1	0.5	0.5	-0.1	1.4	1.3	-0.1
EXE3	0.1	0.1	0.0	0.1	0.1	0.0	0.2	0.1	0.0
FK10	1.6	1.1	-0.5	0.6	0.7	+0.1	2.2	1.8	-0.4
L4P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LTT	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	143.3	**143.9**	**+0.6**	129.3	**127.9**	**-1.4**	272.6	**271.8**	**-0.8**
			(+0.4%)			**(-1.1%)**			**(-0.3%)**

Note: Changes and totals have been calculated *before* rounding.

Table C5 Heathrow 2015 and 2016 annual 8-hour night traffic movements by ANCON type

ANCON type	2015 departs	2016 departs	Change departs	2015 arrivals	2016 arrivals	Change arrivals	2015 total	2016 total	Change total
B733	0.4	0.3	-0.1	0.0	0.0	0.0	0.4	0.4	-0.1
B736	0.1	0.7	+0.6	0.0	0.1	+0.1	0.1	0.7	+0.7
B738	0.7	0.7	0.0	0.0	0.0	0.0	0.8	0.8	0.0
B744G	0.0	0.0	0.0	0.4	0.0	-0.4	0.4	0.0	-0.4
B744P	0.1	0.1	0.0	0.3	0.2	0.0	0.4	0.3	-0.1
B744R	0.8	0.5	-0.3	10.1	9.6	-0.5	10.9	10.2	-0.8
B747	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B748	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	0.3	0.1	-0.2	0.0	0.0	0.0	0.3	0.1	-0.2
B757E	0.0	0.0	0.0	0.4	0.0	-0.4	0.5	0.1	-0.4
B757P	0.0	0.0	0.0	0.4	0.4	0.0	0.4	0.4	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	1.3	1.6	+0.3	1.3	1.6	+0.3
B763P	0.0	0.1	0.0	2.6	2.6	0.0	2.7	2.7	0.0
B763R	0.9	0.9	0.0	0.5	0.3	-0.1	1.3	1.2	-0.1
B764	0.0	0.0	0.0	0.2	0.1	-0.1	0.2	0.1	-0.1
B772G	0.7	1.0	+0.2	6.3	5.7	-0.6	7.0	6.7	-0.4
B772P	0.0	0.0	0.0	1.0	0.9	-0.1	1.0	0.9	-0.1
B772R	0.8	1.1	+0.4	3.1	2.2	-0.8	3.8	3.3	-0.5
B773G	0.6	0.6	0.0	8.8	8.4	-0.5	9.4	9.0	-0.4
B788	0.4	0.5	+0.1	2.5	1.8	-0.7	2.9	2.3	-0.6
B789	0.1	0.2	0.0	1.2	4.8	+3.7	1.3	5.0	+3.7
BA46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CRJ	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	0.7	0.8	+0.2	0.0	0.0	0.0	0.7	0.8	+0.2
EA318	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA319C	1.4	1.2	-0.3	0.5	0.5	0.0	2.0	1.7	-0.3
EA319V	0.8	1.1	+0.3	1.2	1.0	-0.1	2.0	2.2	+0.2
EA320C	3.0	3.3	+0.3	0.5	0.4	0.0	3.5	3.8	+0.3
EA320V	2.4	2.5	+0.1	1.0	1.0	0.0	3.4	3.4	+0.1

ANCON type	2015 departs	2016 departs	Change departs	2015 arrivals	2016 arrivals	Change arrivals	2015 total	2016 total	Change total
EA321C	1.0	0.9	-0.1	0.1	0.1	0.0	1.1	1.0	-0.1
EA321V	0.8	1.2	+0.4	1.0	0.7	-0.3	1.8	1.9	0.0
EA33	0.6	1.0	+0.4	4.4	4.8	+0.4	5.0	5.8	+0.8
EA34	0.0	0.4	+0.3	0.7	0.7	0.0	0.7	1.1	+0.3
EA346	0.7	0.2	-0.5	2.5	1.5	-1.0	3.2	1.7	-1.5
EA359	0.0	0.0	0.0	0.0	0.1	+0.1	0.0	0.1	+0.1
EA38GP	0.1	0.2	0.0	0.9	1.3	+0.4	1.0	1.5	+0.5
EA38R	0.1	0.1	0.0	6.0	6.7	+0.7	6.1	6.8	+0.7
ERJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERJ170	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERJ190	0.2	0.2	0.0	0.0	0.0	0.0	0.2	0.2	0.0
EXE3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FK10	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	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	18.1	**20.2**	**+2.1**	57.8	**57.7**	**-0.1**	75.9	**77.9**	**2.0**
			(+11.5%)			**(-0.2%)**			**(+2.6%)**

Note: Changes and totals have been calculated *before* rounding.

Table C6 Heathrow 2015 and 2016 annual 24-hour day traffic movements by ANCON type

ANCON type	2015 departs	2016 departs	Change departs	2015 arrivals	2016 arrivals	Change arrivals	2015 total	2016 total	Change total
B717	0.0	0.0	0.0	0.1	0.0	-0.1	0.1	0.0	-0.1
B727	0.0	0.0	0.0	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	0.1	0.0	-0.1
B733	2.7	2.1	-0.6	2.7	2.1	-0.6	5.4	4.2	-1.2
B736	10.1	12.6	+2.5	10.1	12.6	+2.5	20.1	25.1	+5.0
B738	12.3	10.9	-1.5	12.4	10.9	-1.5	24.7	21.8	-2.9
B744G	4.6	0.5	-4.2	4.6	0.5	-4.2	9.2	0.9	-8.3
B744P	1.2	1.2	0.0	1.2	1.2	0.0	2.3	2.3	0.0
B744R	29.2	26.4	-2.8	29.3	26.4	-2.9	58.5	52.9	-5.6
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
B748	0.1	0.2	+0.1	0.1	0.2	+0.1	0.1	0.3	+0.2
B753	0.3	0.1	-0.2	0.3	0.1	-0.2	0.5	0.1	-0.4
B757C	0.5	0.2	-0.3	0.5	0.2	-0.3	1.0	0.3	-0.7
B757E	5.2	3.9	-1.3	5.2	3.9	-1.3	10.4	7.8	-2.6
B757P	0.7	1.0	+0.3	0.7	1.0	+0.3	1.5	2.0	+0.5
B762	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1
B763G	9.6	8.8	-0.8	9.6	8.8	-0.8	19.2	17.6	-1.6
B763P	9.2	10.3	+1.1	9.2	10.3	+1.1	18.4	20.6	+2.1
B763R	15.8	12.3	-3.5	15.8	12.3	-3.5	31.6	24.6	-7.0
B764	4.0	4.1	+0.1	4.0	4.1	0.0	8.0	8.1	+0.1
B772G	19.7	17.8	-1.9	19.7	17.8	-1.9	39.4	35.6	-3.7
B772P	5.3	4.8	-0.5	5.3	4.8	-0.5	10.5	9.6	-0.9
B772R	18.0	18.0	0.0	18.0	18.0	0.0	36.0	36.0	-0.1
B773G	42.7	43.1	+0.4	42.8	43.0	+0.2	85.5	86.1	+0.6
B773P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B773R	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B788	16.6	19.1	+2.5	16.6	19.1	+2.5	33.3	38.2	+5.0
B789	4.8	18.6	+13.7	4.9	18.6	+13.7	9.7	37.1	+27.4
BA46	1.0	0.7	-0.3	1.0	0.7	-0.3	1.9	1.4	-0.6
CRJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CRJ900	1.0	0.7	-0.2	1.0	0.7	-0.2	1.9	1.5	-0.5

ANCON type	2015 departs	2016 departs	Change departs	2015 arrivals	2016 arrivals	Change arrivals	2015 total	2016 total	Change total
CS100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA30	2.2	2.5	+0.4	2.2	2.5	+0.4	4.3	5.0	+0.7
EA31	0.3	0.1	-0.2	0.3	0.1	-0.2	0.5	0.2	-0.4
EA318	1.0	1.2	+0.1	1.0	1.2	+0.2	2.1	2.4	+0.3
EA319C	27.5	19.2	-8.3	27.6	19.2	-8.4	55.1	38.4	-16.7
EA319V	86.9	90.6	+3.7	86.9	90.5	+3.6	173.8	181.1	+7.3
EA320C	64.2	68.0	+3.8	64.4	68.0	+3.7	128.6	136.1	+7.5
EA320neo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA320V	129.0	123.6	-5.4	129.1	123.6	-5.5	258.1	247.3	-10.9
EA321C	12.6	10.9	-1.8	12.7	10.9	-1.8	25.3	21.8	-3.5
EA321V	45.9	47.9	+2.0	45.9	47.9	+2.0	91.7	95.8	+4.0
EA33	24.6	25.5	+0.9	24.7	25.5	+0.8	49.3	51.0	+1.7
EA34	2.0	3.1	+1.1	2.0	3.1	+1.1	4.0	6.1	+2.1
EA346	10.3	7.5	-2.8	10.3	7.4	-2.8	20.5	14.9	-5.7
EA359	0.1	1.0	+0.9	0.1	1.0	+0.9	0.2	2.0	+1.8
EA38GP	7.9	10.5	+2.6	7.9	10.5	+2.6	15.9	21.0	+5.2
EA38R	12.1	14.4	+2.4	12.1	14.4	+2.3	24.2	28.9	+4.7
ERJ	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0
ERJ170	0.4	0.0	-0.4	0.4	0.0	-0.4	0.9	0.1	-0.8
ERJ190	3.2	2.9	-0.3	3.2	2.9	-0.3	6.4	5.8	-0.6
EXE2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EXE3	0.4	0.3	-0.1	0.4	0.3	-0.1	0.8	0.5	-0.3
FK10	3.1	2.3	-0.7	3.1	2.3	-0.8	6.1	4.6	-1.5
L4P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LTT	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.2	0.0
MD11	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	648.5	**648.8**	**+0.3**	649.4	**648.7**	**-0.7**	1297.9	**1297.4**	**-0.4**
			(0.0%)			**(-0.1%)**			**(0.0%)**

Note: Changes and totals have been calculated *before* rounding.

Table C7 Heathrow 2015 and 2016 6.5-hour night traffic movements by ANCON type

ANCON type	2015 departs	2016 departs	Change departs	2015 arrivals	2016 arrivals	Change arrivals	2015 total	2016 total	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	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
B744G	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B744P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B744R	0.1	0.1	0.0	2.9	1.6	-1.3	3.0	1.7	-1.3
B748	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	0.0	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	0.1	0.0	0.0
B757P	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	0.0	0.0	0.8	0.8	0.0	0.8	0.8	0.0
B763R	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0
B764	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B772G	0.1	0.2	+0.1	1.3	2.1	+0.8	1.4	2.2	+0.8
B772P	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0
B772R	0.1	0.2	+0.1	0.9	0.1	-0.8	1.0	0.3	-0.7
B773G	0.1	0.2	+0.1	2.8	3.0	+0.3	2.9	3.2	+0.4
B788	0.1	0.1	0.0	0.5	0.1	-0.5	0.6	0.1	-0.4
B789	0.0	0.1	0.0	1.0	2.0	+1.0	1.0	2.0	+1.1
BA46	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	0.0	0.0	0.1	0.1	0.0	0.2	0.2	0.0
EA320C	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0
EA320V	0.1	0.1	0.0	0.2	0.3	+0.1	0.3	0.3	+0.1
EA321C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA321V	0.0	0.1	+0.1	0.1	0.1	0.0	0.1	0.2	+0.1
EA33	0.1	0.1	0.0	0.1	0.4	+0.3	0.2	0.5	+0.3
EA34	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
EA346	0.0	0.1	0.0	0.3	0.0	-0.3	0.3	0.1	-0.2

ANCON type	2015 departs	2016 departs	Change departs	2015 arrivals	2016 arrivals	Change arrivals	2015 total	2016 total	Change total
EA359	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	3.6	4.3	+0.7	3.6	4.3	+0.7
ERJ	0.0	0.0	0.0	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
EXE3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FK10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1.1	**1.6**	**+0.6**	14.9	**15.2**	**+0.3**	16.0	**16.8**	**+0.9**
			(+54.8%)			**(+1.8%)**			**(+5.3%)**

Note: Changes and totals have been calculated *before* rounding.

Table C8-a Heathrow 2006 route distributions (percentage of daily total)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09L_BPK	0.0%	0.0%	0.0%	0.0%	0.0%
09L_BUZ	0.0%	0.0%	0.0%	0.0%	0.0%
09L_CPT	0.0%	0.0%	0.0%	0.0%	0.0%
09L_DVR	0.0%	0.0%	0.0%	0.0%	0.0%
09L_MID	0.0%	0.0%	0.0%	0.0%	0.0%
09L_SAM	0.0%	0.0%	0.0%	0.0%	0.0%
09R_BPK	3.2%	3.9%	1.5%	3.3%	0.9%
09R_BUZ	3.3%	2.2%	0.7%	2.9%	0.3%
09R_CPT	1.9%	1.2%	0.3%	1.6%	0.2%
09R_DVR	3.6%	4.4%	2.6%	3.7%	1.5%
09R_MID	2.4%	3.1%	1.7%	2.5%	0.5%
09R_SAM	0.9%	0.6%	0.4%	0.8%	0.2%
27L_BPK	4.5%	5.4%	2.8%	4.6%	2.3%
27L_CPT	2.3%	1.6%	0.5%	2.0%	0.5%
27L_DVR	5.0%	7.0%	4.5%	5.4%	3.8%
27L_MID	3.2%	4.1%	2.7%	3.4%	0.9%
27L_SAM	1.4%	1.2%	0.7%	1.3%	0.6%
27L_WOB	4.5%	3.2%	1.3%	4.0%	0.8%
27R_BPK	3.2%	4.0%	1.6%	3.3%	1.0%
27R_CPT	1.5%	1.1%	0.3%	1.3%	0.2%
27R_DVR	3.5%	4.4%	2.7%	3.6%	1.4%
27R_MID	2.2%	2.9%	1.6%	2.3%	0.4%
27R_SAM	0.9%	0.7%	0.4%	0.8%	0.2%
27R_WOB	3.4%	2.3%	0.9%	3.0%	0.5%
09L_ARRIVAL	14.4%	12.8%	11.5%	13.9%	9.0%
09R_ARRIVAL	0.3%	0.5%	9.3%	0.8%	14.4%
27L_ARRIVAL	14.2%	13.9%	26.6%	14.9%	33.4%
27R_ARRIVAL	20.4%	19.5%	25.4%	20.5%	26.7%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table C8-b Heathrow 2009 route distributions (percentage of daily total)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09L_BPK	0.0%	0.0%	0.1%	0.0%	0.1%
09L_BUZ	0.0%	0.0%	0.0%	0.0%	0.0%
09L_CPT	0.0%	0.0%	0.0%	0.0%	0.1%
09L_DVR	0.0%	0.0%	0.1%	0.0%	0.1%
09L_MID	0.0%	0.0%	0.0%	0.0%	0.1%
09L_SAM	0.0%	0.0%	0.0%	0.0%	0.0%
09R_BPK	3.0%	4.0%	1.4%	3.1%	1.0%
09R_BUZ	2.5%	1.7%	0.6%	2.2%	0.4%
09R_CPT	2.2%	1.2%	0.3%	1.9%	0.4%
09R_DVR	2.9%	4.3%	2.4%	3.1%	1.4%
09R_MID	2.2%	2.9%	1.2%	2.3%	0.8%
09R_SAM	0.7%	0.7%	0.9%	0.7%	0.1%
27L_BPK	3.8%	5.1%	1.5%	3.9%	0.4%
27L_CPT	2.5%	1.4%	0.4%	2.1%	0.1%
27L_DVR	4.4%	6.1%	2.8%	4.6%	0.8%
27L_MID	2.9%	3.9%	1.3%	3.0%	0.4%
27L_SAM	0.9%	0.9%	1.2%	1.0%	0.1%
27L_WOB	3.8%	2.4%	0.7%	3.3%	0.1%
27R_BPK	4.0%	4.9%	1.9%	4.1%	1.1%
27R_CPT	2.6%	1.4%	0.5%	2.2%	0.4%
27R_DVR	4.6%	5.9%	3.7%	4.8%	2.0%
27R_MID	3.0%	3.8%	1.6%	3.1%	1.0%
27R_SAM	1.0%	0.9%	1.4%	1.0%	0.3%
27R_WOB	4.0%	2.2%	0.9%	3.5%	0.6%
09L_ARRIVAL	12.8%	12.1%	12.2%	12.6%	14.0%
09R_ARRIVAL	0.4%	0.4%	7.2%	0.8%	8.4%
27L_ARRIVAL	18.3%	16.3%	26.7%	18.4%	29.7%
27R_ARRIVAL	17.5%	17.5%	28.8%	18.2%	36.1%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table C8-c Heathrow 2010 route distributions (percentage of daily total)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09L_BPK	0.0%	0.0%	0.2%	0.0%	0.7%
09L_BUZ	0.0%	0.0%	0.0%	0.0%	0.0%
09L_CPT	0.0%	0.0%	0.0%	0.0%	0.1%
09L_DVR	0.0%	0.0%	0.2%	0.0%	0.7%
09L_MID	0.0%	0.0%	0.1%	0.0%	0.3%
09L_SAM	0.0%	0.0%	0.0%	0.0%	0.1%
09R_BPK	3.8%	5.1%	1.9%	4.0%	1.2%
09R_BUZ	2.9%	2.1%	0.5%	2.6%	0.2%
09R_CPT	2.8%	1.4%	0.5%	2.4%	0.3%
09R_DVR	3.7%	5.6%	3.0%	4.1%	1.9%
09R_MID	2.8%	3.9%	1.3%	2.9%	1.0%
09R_SAM	0.9%	1.0%	0.9%	0.9%	0.2%
27L_BPK	3.1%	3.5%	2.0%	3.1%	1.2%
27L_CPT	2.2%	1.0%	0.6%	1.9%	0.3%
27L_DVR	3.6%	4.2%	3.3%	3.7%	1.5%
27L_MID	2.4%	2.9%	1.2%	2.4%	1.0%
27L_SAM	0.8%	0.7%	0.9%	0.8%	0.2%
27L_WOB	2.9%	1.5%	0.4%	2.4%	0.1%
27R_BPK	4.0%	5.2%	2.3%	4.2%	1.3%
27R_CPT	2.8%	1.4%	0.7%	2.4%	0.2%
27R_DVR	4.5%	6.3%	3.7%	4.8%	2.0%
27R_MID	2.9%	4.0%	1.3%	3.0%	0.9%
27R_SAM	1.0%	1.1%	1.1%	1.0%	0.2%
27R_WOB	3.6%	2.3%	0.6%	3.2%	0.3%
09L_ARRIVAL	15.9%	15.8%	14.5%	15.8%	14.0%
09R_ARRIVAL	0.8%	0.8%	8.9%	1.3%	14.1%
27L_ARRIVAL	17.9%	18.1%	25.3%	18.4%	28.8%
27R_ARRIVAL	14.5%	12.1%	24.5%	14.6%	27.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table C8-d Heathrow 2011 route distributions (percentage of daily total)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09L_BPK	0.0%	0.0%	0.1%	0.0%	0.3%
09L_BUZ	0.0%	0.0%	0.0%	0.0%	0.1%
09L_CPT	0.0%	0.0%	0.0%	0.0%	0.0%
09L_DVR	0.0%	0.0%	0.1%	0.0%	0.4%
09L_MID	0.0%	0.0%	0.1%	0.0%	0.2%
09L_SAM	0.0%	0.0%	0.0%	0.0%	0.0%
09R_BPK	3.6%	4.5%	1.3%	3.6%	0.4%
09R_BUZ	2.5%	1.5%	0.5%	2.2%	0.2%
09R_CPT	2.5%	1.0%	0.4%	2.0%	0.0%
09R_DVR	3.1%	4.2%	2.2%	3.3%	0.6%
09R_MID	2.4%	2.9%	1.2%	2.4%	0.2%
09R_SAM	0.8%	0.8%	0.9%	0.8%	0.1%
27L_BPK	3.9%	5.2%	1.8%	4.0%	0.6%
27L_CPT	2.7%	1.2%	0.5%	2.3%	0.1%
27L_DVR	4.4%	5.6%	3.3%	4.6%	1.2%
27L_MID	2.9%	3.6%	1.7%	3.0%	0.5%
27L_SAM	1.0%	1.0%	1.0%	1.0%	0.1%
27L_WOB	3.3%	1.9%	0.6%	2.9%	0.2%
27R_BPK	4.0%	5.4%	2.2%	4.2%	0.6%
27R_CPT	2.7%	1.3%	0.6%	2.3%	0.2%
27R_DVR	4.4%	5.8%	3.5%	4.6%	1.2%
27R_MID	2.9%	3.7%	1.7%	3.0%	0.4%
27R_SAM	1.0%	1.0%	1.2%	1.0%	0.2%
27R_WOB	3.4%	2.0%	0.7%	2.9%	0.2%
09L_ARRIVAL	13.6%	12.6%	11.6%	13.2%	7.9%
09R_ARRIVAL	0.5%	0.6%	9.6%	1.1%	16.0%
27L_ARRIVAL	17.3%	17.5%	26.0%	17.8%	31.2%
27R_ARRIVAL	17.4%	16.9%	27.1%	17.8%	37.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table C8-e Heathrow 2012 route distributions (percentage of daily total)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09L_BPK	0.0%	0.0%	0.1%	0.0%	0.1%
09L_BUZ	0.0%	0.0%	0.0%	0.0%	0.1%
09L_CPT	0.0%	0.0%	0.0%	0.0%	0.0%
09L_DVR	0.0%	0.0%	0.1%	0.0%	0.3%
09L_MID	0.0%	0.0%	0.1%	0.0%	0.2%
09L_SAM	0.0%	0.0%	0.0%	0.0%	0.1%
09R_BPK	3.0%	3.8%	1.4%	3.1%	1.1%
09R_BUZ	1.9%	1.5%	0.5%	1.7%	0.3%
09R_CPT	2.5%	1.0%	0.3%	2.0%	0.2%
09R_DVR	2.8%	3.4%	2.2%	2.9%	0.7%
09R_MID	2.1%	2.3%	1.1%	2.1%	0.5%
09R_SAM	0.6%	0.7%	0.8%	0.7%	0.1%
27L_BPK	3.7%	5.2%	1.8%	3.9%	0.8%
27L_CPT	3.1%	1.4%	0.4%	2.6%	0.2%
27L_DVR	4.5%	5.8%	3.6%	4.7%	1.5%
27L_MID	3.0%	3.5%	1.6%	3.0%	0.8%
27L_SAM	1.0%	1.0%	1.1%	1.0%	0.3%
27L_WOB	3.0%	2.1%	0.6%	2.7%	0.3%
27R_BPK	4.1%	5.6%	2.1%	4.3%	1.0%
27R_CPT	3.4%	1.5%	0.4%	2.9%	0.1%
27R_DVR	5.0%	6.1%	4.1%	5.2%	1.3%
27R_MID	3.3%	3.9%	1.6%	3.3%	0.7%
27R_SAM	1.0%	1.1%	1.2%	1.1%	0.3%
27R_WOB	3.3%	2.4%	0.7%	3.0%	0.2%
09L_ARRIVAL	12.1%	10.9%	10.2%	11.7%	17.3%
09R_ARRIVAL	0.6%	0.6%	8.4%	1.0%	11.3%
27L_ARRIVAL	18.2%	18.8%	27.7%	18.9%	28.4%
27R_ARRIVAL	17.8%	17.4%	27.8%	18.3%	31.7%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table C8-f Heathrow 2013 route distributions (percentage of daily total)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09L_BPK	0.0%	0.2%	0.7%	0.1%	0.6%
09L_BUZ	0.0%	0.0%	0.1%	0.0%	0.3%
09L_CPT	0.0%	0.0%	0.0%	0.0%	0.1%
09L_DVR	0.0%	0.3%	1.5%	0.2%	0.8%
09L_MID	0.0%	0.1%	0.5%	0.0%	0.5%
09L_SAM	0.0%	0.1%	0.2%	0.0%	0.1%
09R_BPK	3.9%	5.4%	1.2%	4.1%	0.3%
09R_BUZ	2.6%	2.1%	0.4%	2.3%	0.1%
09R_CPT	3.2%	1.6%	0.3%	2.7%	0.0%
09R_DVR	3.6%	4.3%	2.2%	3.7%	0.5%
09R_MID	2.7%	3.5%	1.0%	2.8%	0.3%
09R_SAM	0.8%	1.0%	0.9%	0.8%	0.1%
27L_BPK	3.6%	4.4%	1.1%	3.6%	0.5%
27L_CPT	2.8%	1.3%	0.3%	2.3%	0.1%
27L_DVR	4.0%	4.3%	2.5%	4.0%	0.8%
27L_MID	2.6%	2.9%	1.1%	2.6%	0.4%
27L_SAM	0.9%	0.9%	0.9%	0.9%	0.1%
27L_WOB	3.0%	2.0%	0.5%	2.7%	0.2%
27R_BPK	3.7%	4.8%	2.2%	3.9%	1.0%
27R_CPT	2.9%	1.4%	0.4%	2.4%	0.2%
27R_DVR	4.3%	5.0%	5.0%	4.5%	2.0%
27R_MID	2.7%	3.3%	2.0%	2.8%	1.1%
27R_SAM	0.9%	1.1%	1.1%	0.9%	0.3%
27R_WOB	3.2%	2.2%	0.6%	2.8%	0.3%
09L_ARRIVAL	15.3%	16.5%	14.7%	15.5%	14.5%
09R_ARRIVAL	0.7%	0.7%	7.6%	1.1%	6.1%
27L_ARRIVAL	16.7%	15.3%	23.5%	16.8%	23.9%
27R_ARRIVAL	15.9%	15.3%	27.3%	16.5%	44.9%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table C8-g Heathrow 2014 route distributions (percentage of daily total)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09L_BPK	0.0%	0.0%	0.1%	0.0%	0.1%
09L_BUZ	0.0%	0.0%	0.0%	0.0%	0.0%
09L_CPT	0.0%	0.0%	0.0%	0.0%	0.0%
09L_DVR	0.0%	0.1%	0.1%	0.0%	0.1%
09L_MID	0.0%	0.0%	0.1%	0.0%	0.1%
09L_SAM	0.0%	0.0%	0.0%	0.0%	0.1%
09R_BPK	3.5%	4.6%	1.4%	3.6%	0.4%
09R_BUZ	2.6%	1.9%	0.5%	2.3%	0.2%
09R_CPT	2.9%	1.3%	0.2%	2.4%	0.2%
09R_DVR	3.5%	4.3%	2.9%	3.6%	1.1%
09R_MID	2.3%	2.7%	1.4%	2.3%	0.4%
09R_SAM	0.8%	1.1%	1.0%	0.8%	0.2%
27L_BPK	3.7%	5.0%	1.8%	3.9%	0.7%
27L_CPT	2.7%	1.5%	0.3%	2.3%	0.2%
27L_DVR	4.2%	5.2%	3.9%	4.4%	1.7%
27L_MID	2.6%	3.1%	2.0%	2.7%	1.1%
27L_SAM	0.9%	1.2%	1.1%	1.0%	0.3%
27L_WOB	3.2%	2.2%	0.5%	2.9%	0.3%
27R_BPK	3.8%	5.2%	1.7%	4.0%	0.3%
27R_CPT	2.9%	1.5%	0.3%	2.4%	0.1%
27R_DVR	4.4%	5.4%	3.0%	4.5%	1.0%
27R_MID	2.7%	3.3%	1.5%	2.8%	0.4%
27R_SAM	0.9%	1.2%	1.0%	1.0%	0.2%
27R_WOB	3.4%	2.3%	0.5%	3.0%	0.2%
09L_ARRIVAL	14.3%	13.3%	11.9%	14.0%	11.2%
09R_ARRIVAL	0.6%	0.8%	11.6%	1.3%	19.0%
27L_ARRIVAL	17.2%	17.0%	27.5%	17.8%	38.6%
27R_ARRIVAL	16.8%	15.9%	23.6%	17.0%	21.9%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table C8-h Heathrow 2015 route distributions (percentage of daily total)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09L_BPK	0.0%	0.0%	0.3%	0.0%	0.2%
09L_BUZ	0.0%	0.0%	0.0%	0.0%	0.0%
09L_CPT	0.0%	0.0%	0.1%	0.0%	0.1%
09L_DET	0.0%	0.1%	0.3%	0.0%	0.2%
09L_MID	0.0%	0.0%	0.1%	0.0%	0.1%
09L_SAM	0.0%	0.0%	0.1%	0.0%	0.1%
09R_BPK	2.9%	3.6%	1.3%	3.0%	0.3%
09R_BUZ	2.1%	1.5%	0.3%	1.9%	0.1%
09R_CPT	3.0%	1.2%	0.2%	2.4%	0.0%
09R_DET	3.7%	4.8%	2.1%	3.8%	0.4%
09R_MID	2.1%	2.5%	1.0%	2.1%	0.1%
09R_SAM	0.7%	0.8%	0.8%	0.8%	0.1%
27L_BPK	3.8%	4.9%	1.9%	3.9%	0.6%
27L_CPT	3.3%	1.4%	0.3%	2.7%	0.2%
27L_DET	4.6%	6.0%	3.2%	4.8%	1.2%
27L_MID	2.7%	3.2%	1.6%	2.8%	0.5%
27L_SAM	0.9%	1.1%	1.0%	0.9%	0.2%
27L_WOB	3.1%	2.0%	0.5%	2.7%	0.2%
27R_BPK	3.7%	5.1%	2.1%	3.9%	0.6%
27R_CPT	3.3%	1.5%	0.3%	2.7%	0.1%
27R_DET	4.6%	6.1%	3.2%	4.9%	0.8%
27R_MID	2.8%	3.4%	1.6%	2.8%	0.4%
27R_SAM	0.9%	1.1%	0.9%	1.0%	0.1%
27R_WOB	3.1%	2.1%	0.5%	2.8%	0.1%
09L_ARRIVAL	13.2%	12.5%	12.4%	13.0%	15.9%
09R_ARRIVAL	0.5%	0.5%	8.5%	1.0%	10.6%
27L_ARRIVAL	17.5%	17.5%	28.3%	18.1%	35.3%
27R_ARRIVAL	17.5%	16.9%	27.0%	17.9%	31.6%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Note: the SAM routes were renamed GOG (27L/27R) and GAS (09L/09R) in 2015, but the SAM name has been retained in this table for ease of comparison with the earlier tables.

Table C8-i Heathrow 2016 route distributions (percentage of daily total)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09L_BPK	0.0%	0.0%	0.1%	0.0%	0.1%
09L_BUZ	0.0%	0.0%	0.0%	0.0%	0.0%
09L_CPT	0.0%	0.0%	0.0%	0.0%	0.0%
09L_DET	0.0%	0.0%	0.1%	0.0%	0.3%
09L_MID	0.0%	0.0%	0.0%	0.0%	0.1%
09L_SAM	0.0%	0.0%	0.0%	0.0%	0.1%
09R_BPK	3.3%	3.9%	1.6%	3.3%	0.3%
09R_BUZ	2.2%	1.3%	0.5%	1.9%	0.1%
09R_CPT	3.1%	1.1%	0.4%	2.5%	0.0%
09R_DET	3.7%	5.2%	2.5%	4.0%	0.3%
09R_MID	2.3%	2.6%	1.3%	2.3%	0.3%
09R_SAM	0.7%	0.9%	0.9%	0.8%	0.0%
27L_BPK	4.0%	4.9%	2.6%	4.1%	1.2%
27L_CPT	3.4%	1.4%	0.5%	2.8%	0.3%
27L_DET	4.2%	6.1%	3.6%	4.5%	2.3%
27L_MID	2.9%	3.4%	1.0%	2.9%	0.9%
27L_SAM	0.9%	1.1%	1.9%	1.0%	0.3%
27L_WOB	2.8%	1.6%	0.5%	2.4%	0.4%
27R_BPK	3.9%	5.1%	2.2%	4.0%	0.6%
27R_CPT	3.4%	1.4%	0.3%	2.8%	0.0%
27R_DET	4.2%	6.5%	3.0%	4.6%	1.2%
27R_MID	0.9%	3.5%	0.9%	1.4%	0.5%
27R_SAM	2.7%	1.2%	1.6%	2.3%	0.2%
27R_WOB	2.8%	1.7%	0.4%	2.4%	0.2%
09L_ARRIVAL	14.1%	12.8%	13.5%	13.8%	14.0%
09R_ARRIVAL	0.5%	0.4%	9.5%	1.1%	13.8%
27L_ARRIVAL	17.0%	17.1%	25.9%	17.6%	32.0%
27R_ARRIVAL	17.2%	16.7%	25.2%	17.6%	30.5%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Note: the SAM routes were renamed GOG (27L/27R) and GAS (09L/09R) in 2015, but the SAM name has been retained in this table for ease of comparison with the earlier tables.

*Pie charts based on **Tables C8-a** to **C8-i**:*

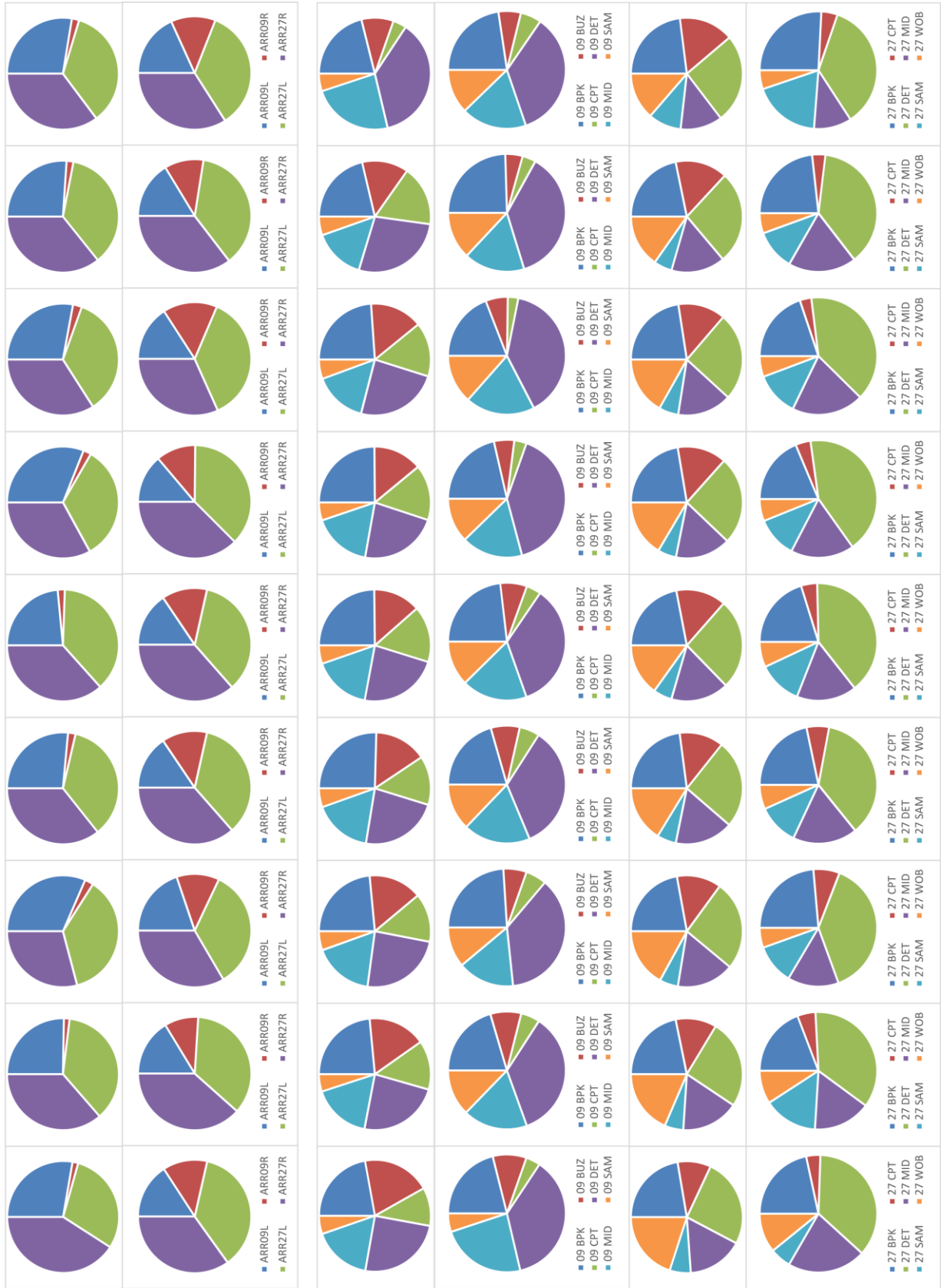


Table C9-a Heathrow 2006 route distributions (single mode operations)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09L_BPK	0.0%	0.0%	0.1%	0.0%	0.0%
09L_BUZ	0.0%	0.0%	0.1%	0.0%	0.0%
09L_CPT	0.0%	0.0%	0.0%	0.0%	0.0%
09L_DVR	0.0%	0.0%	0.0%	0.0%	0.0%
09L_MID	0.0%	0.0%	0.0%	0.0%	0.0%
09L_SAM	0.0%	0.0%	0.0%	0.0%	0.0%
09R_BPK	21.2%	25.5%	21.0%	22.2%	25.5%
09R_BUZ	21.6%	14.4%	9.2%	19.6%	8.5%
09R_CPT	12.3%	7.8%	3.9%	11.0%	6.5%
09R_DVR	23.3%	28.4%	37.0%	24.9%	40.7%
09R_MID	15.8%	19.8%	23.5%	17.0%	13.9%
09R_SAM	5.7%	4.0%	5.1%	5.3%	4.9%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27L_BPK	12.6%	14.2%	13.8%	13.0%	18.2%
27L_CPT	6.5%	4.2%	2.3%	5.8%	4.0%
27L_DVR	14.1%	18.5%	22.5%	15.4%	29.6%
27L_MID	9.0%	10.9%	13.5%	9.5%	7.4%
27L_SAM	3.8%	3.3%	3.6%	3.7%	5.1%
27L_WOB	12.7%	8.4%	6.3%	11.5%	5.9%
27R_BPK	9.0%	10.6%	7.9%	9.3%	8.0%
27R_CPT	4.2%	2.9%	1.6%	3.8%	1.9%
27R_DVR	9.7%	11.6%	13.7%	10.3%	11.0%
27R_MID	6.2%	7.6%	8.2%	6.6%	3.1%
27R_SAM	2.6%	1.8%	2.2%	2.4%	1.9%
27R_WOB	9.5%	6.0%	4.6%	8.6%	3.9%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
09L_ARRIVAL	98.2%	96.5%	55.4%	94.3%	38.4%
09R_ARRIVAL	1.8%	3.5%	44.6%	5.7%	61.6%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27L_ARRIVAL	41.1%	41.6%	51.2%	42.0%	55.6%
27R_ARRIVAL	58.9%	58.4%	48.8%	58.0%	44.4%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table C9-b Heathrow 2009 route distributions (single mode operations)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09L_BPK	0.0%	0.1%	1.9%	0.1%	1.9%
09L_BUZ	0.0%	0.0%	0.9%	0.0%	0.9%
09L_CPT	0.0%	0.0%	2.4%	0.0%	2.4%
09L_DVR	0.0%	0.2%	2.0%	0.1%	2.0%
09L_MID	0.0%	0.1%	1.6%	0.0%	1.6%
09L_SAM	0.0%	0.0%	0.3%	0.0%	0.3%
09R_BPK	22.4%	26.8%	20.9%	23.4%	20.9%
09R_BUZ	18.6%	11.6%	9.3%	17.0%	9.3%
09R_CPT	16.5%	8.0%	8.4%	14.5%	8.4%
09R_DVR	21.5%	28.9%	33.2%	23.2%	33.2%
09R_MID	16.0%	19.7%	17.1%	16.8%	17.1%
09R_SAM	4.9%	4.6%	2.0%	4.8%	2.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27L_BPK	10.1%	13.1%	5.8%	10.7%	5.8%
27L_CPT	6.6%	3.7%	1.7%	5.9%	1.7%
27L_DVR	11.7%	15.7%	10.6%	12.6%	10.6%
27L_MID	7.8%	10.0%	5.9%	8.3%	5.9%
27L_SAM	2.5%	2.4%	0.7%	2.5%	0.7%
27L_WOB	10.2%	6.1%	1.9%	9.2%	1.9%
27R_BPK	10.7%	12.7%	14.6%	11.1%	14.6%
27R_CPT	6.8%	3.6%	6.1%	6.1%	6.1%
27R_DVR	12.2%	15.2%	26.3%	12.9%	26.3%
27R_MID	8.1%	9.7%	14.0%	8.5%	14.0%
27R_SAM	2.7%	2.3%	4.1%	2.6%	4.1%
27R_WOB	10.8%	5.6%	8.4%	9.6%	8.4%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
09L_ARR	96.8%	96.7%	62.8%	93.8%	62.6%
09R_ARR	3.2%	3.3%	37.2%	6.2%	37.4%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27L_ARR	51.0%	48.1%	48.1%	50.2%	45.2%
27R_ARR	49.0%	51.9%	51.9%	49.8%	54.8%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table C9-c Heathrow 2010 route distributions (single mode operations)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09L_BPK	0.2%	0.2%	2.2%	0.3%	9.1%
09L_BUZ	0.2%	0.0%	0.5%	0.2%	0.7%
09L_CPT	0.2%	0.1%	0.3%	0.1%	1.6%
09L_DVR	0.2%	0.1%	2.4%	0.3%	10.8%
09L_MID	0.1%	0.1%	1.2%	0.2%	4.9%
09L_SAM	0.0%	0.0%	0.5%	0.1%	1.5%
09R_BPK	22.2%	26.5%	21.4%	23.1%	17.7%
09R_BUZ	17.0%	11.2%	6.0%	15.4%	4.3%
09R_CPT	16.5%	7.1%	5.5%	14.1%	5.1%
09R_DVR	21.5%	29.3%	34.8%	23.7%	26.5%
09R_MID	16.4%	20.2%	14.9%	17.2%	15.5%
09R_SAM	5.3%	5.2%	10.2%	5.5%	2.3%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27L_BPK	9.0%	10.4%	11.1%	9.4%	12.8%
27L_CPT	6.6%	2.9%	3.2%	5.7%	3.2%
27L_DVR	10.6%	12.4%	18.1%	11.3%	16.2%
27L_MID	7.1%	8.4%	6.7%	7.4%	10.5%
27L_SAM	2.3%	2.1%	5.2%	2.4%	2.9%
27L_WOB	8.5%	4.4%	2.4%	7.3%	1.0%
27R_BPK	12.0%	15.3%	12.7%	12.7%	14.7%
27R_CPT	8.4%	4.0%	4.0%	7.3%	2.3%
27R_DVR	13.4%	18.4%	20.4%	14.7%	21.6%
27R_MID	8.4%	11.8%	7.1%	9.1%	9.1%
27R_SAM	2.9%	3.1%	6.0%	3.0%	2.6%
27R_WOB	10.8%	6.7%	3.1%	9.6%	3.1%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
09L_ARR	95.4%	95.0%	61.9%	92.4%	50.0%
09R_ARR	4.6%	5.0%	38.1%	7.6%	50.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27L_ARR	55.4%	60.0%	50.8%	55.9%	51.6%
27R_ARR	44.6%	40.0%	49.2%	44.1%	48.4%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table C9-d Heathrow 2011 route distributions (single mode operations)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09L_BPK	0.0%	0.0%	1.4%	0.0%	11.6%
09L_BUZ	0.0%	0.0%	0.3%	0.0%	3.5%
09L_CPT	0.0%	0.0%	0.2%	0.0%	0.6%
09L_DVR	0.0%	0.0%	2.1%	0.1%	17.1%
09L_MID	0.0%	0.0%	1.0%	0.0%	8.6%
09L_SAM	0.0%	0.0%	0.2%	0.0%	1.4%
09R_BPK	24.1%	30.3%	19.9%	25.4%	15.2%
09R_BUZ	17.0%	10.2%	7.1%	15.2%	7.0%
09R_CPT	16.8%	6.6%	5.1%	14.2%	1.6%
09R_DVR	20.8%	28.0%	33.6%	22.8%	22.0%
09R_MID	16.1%	19.5%	17.3%	16.9%	8.5%
09R_SAM	5.2%	5.5%	11.9%	5.4%	3.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27L_BPK	10.6%	13.9%	9.7%	11.3%	11.9%
27L_CPT	7.5%	3.1%	2.9%	6.4%	1.6%
27L_DVR	12.0%	14.9%	17.3%	12.8%	22.0%
27L_MID	8.0%	9.6%	8.9%	8.4%	8.8%
27L_SAM	2.7%	2.7%	5.2%	2.7%	1.3%
27L_WOB	9.2%	5.1%	3.4%	8.1%	3.6%
27R_BPK	10.8%	14.2%	11.8%	11.6%	12.1%
27R_CPT	7.4%	3.4%	3.5%	6.4%	3.2%
27R_DVR	11.9%	15.4%	18.5%	12.9%	22.2%
27R_MID	8.0%	9.8%	8.8%	8.5%	6.9%
27R_SAM	2.6%	2.8%	6.2%	2.8%	2.9%
27R_WOB	9.3%	5.2%	3.7%	8.2%	3.5%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
09L_ARR	96.1%	95.8%	54.4%	92.4%	33.0%
09R_ARR	3.9%	4.2%	45.6%	7.6%	67.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27L_ARR	49.9%	50.9%	48.9%	50.0%	54.2%
27R_ARR	50.1%	49.1%	51.1%	50.0%	45.8%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table C9-e Heathrow 2012 route distributions (single mode operations)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09LBPK	0.0%	0.0%	1.3%	0.07%	3.2%
09LBUZ	0.0%	0.0%	0.3%	0.01%	2.6%
09LCPT	0.0%	0.0%	0.2%	0.01%	1.0%
09LDVR	0.0%	0.0%	1.9%	0.09%	7.4%
09LMID	0.0%	0.0%	0.9%	0.04%	4.4%
09LSAM	0.0%	0.0%	0.4%	0.02%	2.6%
09RBPK	23.3%	30.0%	22.2%	24.74%	29.2%
09RBUZ	14.6%	11.6%	6.7%	13.67%	7.7%
09RCPT	19.3%	7.6%	3.9%	16.21%	5.0%
09RDVR	21.6%	26.8%	33.6%	23.13%	19.7%
09RMID	16.2%	18.6%	16.4%	16.70%	15.5%
09RSAM	5.0%	5.4%	12.1%	5.30%	1.8%
Total	**100%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27LBPK	9.7%	13.1%	9.2%	10.5%	10.9%
27LCPT	8.1%	3.6%	2.1%	6.9%	2.9%
27LDVR	11.7%	14.5%	18.3%	12.5%	19.4%
27LMID	7.7%	8.8%	8.2%	8.0%	9.7%
27LSAM	2.5%	2.6%	5.8%	2.6%	4.1%
27LWOB	7.9%	5.4%	3.4%	7.2%	4.8%
27RBPK	10.6%	14.1%	11.0%	11.4%	13.6%
27RCPT	9.1%	3.8%	2.4%	7.8%	1.9%
27RDVR	12.9%	15.4%	21.4%	13.7%	17.1%
27RMID	8.4%	9.7%	8.6%	8.7%	9.4%
27RSAM	2.6%	2.8%	6.1%	2.8%	4.0%
27RWOB	8.7%	6.0%	3.7%	8.0%	2.3%
Total	**100%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
09L_ARR	95.6%	94.5%	55.0%	91.9%	60.5%
09R_ARR	4.4%	5.5%	45.0%	8.1%	39.5%
Total	**100%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27L_ARR	50.6%	51.9%	49.9%	50.8%	47.3%
27R_ARR	49.4%	48.1%	50.1%	49.2%	52.7%
Total	**100%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table C9-f Heathrow 2013 route distributions (single mode operations)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09L_BPK	0.1%	1.0%	7.8%	0.6%	17.5%
09L_BUZ	0.2%	0.1%	1.0%	0.2%	6.4%
09L_CPT	0.0%	0.2%	0.5%	0.1%	2.3%
09L_DVR	0.0%	1.6%	15.2%	0.9%	21.4%
09L_MID	0.0%	0.4%	5.4%	0.3%	16.8%
09L_SAM	0.0%	0.4%	2.2%	0.2%	3.4%
09R_BPK	23.2%	28.6%	13.3%	24.0%	7.3%
09R_BUZ	15.2%	11.6%	4.5%	14.0%	1.7%
09R_CPT	19.1%	8.6%	3.3%	16.3%	1.2%
09R_DVR	21.3%	23.5%	25.5%	21.9%	11.4%
09R_MID	16.1%	18.8%	10.9%	16.5%	7.1%
09R_SAM	4.8%	5.3%	10.4%	5.1%	3.4%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27L_BPK	10.4%	13.1%	6.8%	10.8%	7.7%
27L_CPT	8.0%	3.9%	1.6%	6.9%	1.0%
27L_DVR	11.6%	12.8%	13.1%	11.9%	12.1%
27L_MID	7.5%	8.7%	7.3%	7.7%	5.8%
27L_SAM	2.5%	2.7%	3.3%	2.6%	1.9%
27L_WOB	8.8%	6.0%	3.5%	8.0%	3.4%
27R_BPK	10.8%	14.3%	12.3%	11.6%	12.9%
27R_CPT	8.4%	4.2%	2.4%	7.3%	3.2%
27R_DVR	12.6%	14.8%	28.5%	13.6%	12.8%
27R_MID	7.8%	9.8%	11.5%	8.4%	34.9%
27R_SAM	2.5%	3.1%	6.3%	2.7%	4.4%
27R_WOB	9.2%	6.6%	3.3%	8.4%	0.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
09L_ARR	95.4%	95.6%	65.6%	92.8%	69.9%
09R_ARR	4.6%	4.4%	34.4%	7.2%	30.1%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27L_ARR	51.2%	50.0%	46.2%	50.5%	34.5%
27R_ARR	48.8%	50.0%	53.8%	49.5%	65.5%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table C9-g Heathrow 2014 route distributions (single mode operations)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09L_BPK	0.1%	0.4%	1.1%	0.2%	1.0%
09L_BUZ	0.1%	0.1%	0.1%	0.1%	0.0%
09L_CPT	0.0%	0.1%	0.1%	0.0%	0.0%
09L_DVR	0.0%	0.6%	1.6%	0.2%	2.7%
09L_MID	0.0%	0.1%	1.0%	0.1%	5.2%
09L_SAM	0.0%	0.1%	0.3%	0.0%	1.7%
09R_BPK	22.4%	28.4%	18.8%	23.6%	15.9%
09R_BUZ	16.5%	11.7%	5.5%	15.1%	6.8%
09R_CPT	18.6%	8.1%	3.0%	15.8%	5.9%
09R_DVR	22.6%	26.8%	37.6%	24.0%	39.4%
09R_MID	14.7%	16.7%	17.7%	15.3%	13.1%
09R_SAM	5.0%	6.8%	13.2%	5.6%	8.3%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27L_BPK	10.5%	13.6%	10.2%	11.1%	10.5%
27L_CPT	7.7%	3.9%	1.5%	6.7%	3.8%
27L_DVR	11.8%	14.0%	22.2%	12.6%	27.6%
27L_MID	7.5%	8.3%	11.2%	7.8%	15.9%
27L_SAM	2.7%	3.2%	6.4%	2.9%	5.0%
27L_WOB	9.1%	6.0%	3.0%	8.3%	4.5%
27R_BPK	10.7%	14.1%	9.4%	11.4%	4.2%
27R_CPT	8.1%	4.1%	1.6%	7.0%	1.7%
27R_DVR	12.3%	14.5%	17.2%	12.9%	15.4%
27R_MID	7.6%	8.9%	8.7%	7.9%	5.8%
27R_SAM	2.5%	3.3%	5.7%	2.7%	2.9%
27R_WOB	9.6%	6.2%	2.8%	8.6%	2.7%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
09L_ARR	96.1%	94.0%	50.8%	91.7%	37.0%
09R_ARR	3.9%	6.0%	49.2%	8.3%	63.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27L_ARR	50.6%	51.7%	53.9%	51.1%	63.8%
27R_ARR	49.4%	48.3%	46.1%	48.9%	36.2%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table C9-h Heathrow 2015 route distributions (single mode operations)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09L_BPK	0.0%	0.2%	4.5%	0.2%	11.0%
09L_BUZ	0.0%	0.0%	0.3%	0.0%	1.0%
09L_CPT	0.0%	0.0%	0.8%	0.0%	4.0%
09L_DET	0.0%	0.4%	5.0%	0.2%	11.0%
09L_MID	0.0%	0.1%	1.9%	0.1%	6.0%
09L_SAM/GAS	0.0%	0.0%	0.9%	0.0%	7.0%
09R_BPK	20.0%	25.0%	20.4%	21.1%	16.3%
09R_BUZ	14.6%	10.4%	4.4%	13.4%	4.1%
09R_CPT	20.6%	8.2%	2.8%	17.4%	2.0%
09R_DET	25.5%	33.0%	32.7%	27.3%	26.5%
09R_MID	14.3%	16.7%	14.4%	14.8%	8.1%
09R_SAM/GAS	5.0%	5.7%	11.9%	5.4%	3.1%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27L_BPK	10.3%	12.9%	10.9%	10.9%	12.8%
27L_CPT	8.9%	3.7%	1.8%	7.6%	3.6%
27L_DET	12.5%	15.8%	18.7%	13.4%	22.8%
27L_MID	7.4%	8.5%	9.5%	7.7%	10.0%
27L_SAM/GOG	2.5%	2.8%	5.7%	2.6%	5.2%
27L_WOB	8.4%	5.3%	2.9%	7.6%	4.8%
27R_BPK	10.1%	13.5%	12.2%	10.9%	11.3%
27R_CPT	8.9%	4.0%	1.9%	7.6%	1.4%
27R_DET	12.6%	16.1%	18.7%	13.5%	15.8%
27R_MID	7.5%	9.0%	9.5%	7.9%	7.7%
27R_SAM/GOG	2.5%	2.9%	5.5%	2.7%	2.1%
27R_WOB	8.5%	5.6%	2.8%	7.7%	2.5%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
09L_ARR	96.1%	96.1%	59.3%	92.8%	60.4%
09R_ARR	3.9%	3.9%	40.7%	7.2%	39.6%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27L_ARR	50.0%	51.0%	51.2%	50.3%	52.7%
27R_ARR	50.0%	49.0%	48.8%	49.7%	47.3%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table C9-i Heathrow 2016 route distributions (single mode operations)

Route	L_{day}	$L_{evening}$	L_{night}	L_{den}	$L_{eq,6.5hr\ night}$
09L_BPK	0.0%	0.0%	1.0%	0.0%	8.2%
09L_BUZ	0.0%	0.0%	0.0%	0.0%	1.9%
09L_CPT	0.0%	0.0%	0.2%	0.0%	0.0%
09L_DET	0.0%	0.0%	1.4%	0.0%	16.7%
09L_MID	0.0%	0.0%	0.6%	0.0%	5.8%
09L_SAM (GAS)	0.0%	0.0%	0.4%	0.0%	3.0%
09R_BPK	21.6%	26.1%	22.5%	22.6%	19.6%
09R_BUZ	14.1%	8.6%	5.7%	12.6%	7.1%
09R_CPT	20.4%	7.4%	5.2%	17.0%	3.0%
09R_DET	24.3%	34.6%	34.9%	26.9%	18.9%
09R_MID	14.9%	17.2%	16.9%	15.4%	13.5%
09R_SAM (GAS)	4.8%	6.1%	11.2%	5.3%	2.2%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27L_BPK	11.1%	13.0%	13.6%	11.6%	14.4%
27L_CPT	9.4%	3.7%	2.8%	7.9%	3.0%
27L_DET	11.6%	16.2%	19.2%	12.9%	28.9%
27L_MID	8.0%	8.8%	10.1%	8.3%	10.9%
27L_SAM (GOG)	2.5%	3.0%	5.7%	2.7%	3.9%
27L_WOB	7.8%	4.3%	3.0%	6.9%	4.7%
27R_BPK	10.8%	13.3%	11.8%	11.4%	6.8%
27R_CPT	9.4%	3.7%	1.8%	7.9%	0.5%
27R_DET	11.6%	17.1%	16.0%	12.9%	14.6%
27R_MID	7.6%	9.2%	8.7%	8.0%	6.8%
27R_SAM (GOG)	2.5%	3.1%	5.0%	2.7%	2.9%
27R_WOB	7.7%	4.5%	2.4%	6.8%	2.7%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
09L_ARR	96.3%	96.6%	59.0%	93.0%	50.4%
09R_ARR	3.7%	3.4%	41.0%	7.0%	49.6%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
27L_ARR	49.7%	50.6%	50.7%	49.9%	51.2%
27R_ARR	50.3%	49.4%	49.3%	50.1%	48.8%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table C10-a Heathrow L_{day} W-E runway modal splits by year

Year	West departures	East departures	Total	West arrivals	East arrivals	Total
2006	70%	30%	100%	70%	30%	100%
2009	74%	26%	100%	73%	27%	100%
2010	66%	34%	100%	66%	34%	100%
2011	71%	29%	100%	71%	29%	100%
2012	74%	26%	100%	74%	26%	100%
2013	67%	33%	100%	67%	33%	100%
2014	69%	31%	100%	70%	30%	100%
2015	72%	28%	100%	72%	28%	100%
2016	70%	30%	100%	70%	30%	100%

Table C10-b Heathrow $L_{evening}$ W-E runway modal splits by year

Year	West departures	East departures	Total	West arrivals	East arrivals	Total
2006	71%	29%	100%	72%	28%	100%
2009	72%	28%	100%	73%	27%	100%
2010	64%	36%	100%	64%	36%	100%
2011	72%	28%	100%	72%	28%	100%
2012	76%	24%	100%	76%	24%	100%
2013	64%	36%	100%	64%	36%	100%
2014	70%	30%	100%	70%	30%	100%
2015	72%	28%	100%	73%	27%	100%
2016	72%	28%	100%	72%	28%	100%

Table C10-c Heathrow L_{night} W-E runway modal splits by year

Year	West departures	East departures	Total	West arrivals	East arrivals	Total
2006	74%	26%	100%	71%	29%	100%
2009	72%	28%	100%	74%	26%	100%
2010	67%	33%	100%	68%	32%	100%
2011	73%	27%	100%	71%	29%	100%
2012	75%	25%	100%	75%	25%	100%
2013	66%	34%	100%	69%	31%	100%
2014	69%	31%	100%	69%	31%	100%
2015	72%	28%	100%	73%	27%	100%
2016	72%	28%	100%	69%	31%	100%

Table C10-d Heathrow L_{den} W-E runway modal splits by year

Year	West departures	East departures	Total	West arrivals	East arrivals	Total
2006	70%	30%	100%	71%	29%	100%
2009	73%	27%	100%	73%	27%	100%
2010	66%	34%	100%	66%	34%	100%
2011	71%	29%	100%	71%	29%	100%
2012	75%	25%	100%	74%	26%	100%
2013	66%	34%	100%	67%	33%	100%
2014	70%	30%	100%	70%	30%	100%
2015	72%	28%	100%	72%	28%	100%
2016	71%	29%	100%	70%	30%	100%

Table C10-e Heathrow $L_{eq,6.5hr\ night}$ W-E runway modal splits by year

Year	West departures	East departures	Total	West arrivals	East arrivals	Total
2006	77%	23%	100%	72%	28%	100%
2009	62%	38%	100%	75%	25%	100%
2010	57%	43%	100%	67%	33%	100%
2011	67%	33%	100%	74%	26%	100%
2012	67%	33%	100%	68%	32%	100%
2013	65%	35%	100%	77%	23%	100%
2014	70%	30%	100%	67%	33%	100%
2015	74%	26%	100%	72%	28%	100%
2016	83%	17%	100%	69%	31%	100%

Table C11 Heathrow 2016 & 2015 L_{day} cumulative contour area, population and household estimates

L_{day} (dBA)	2016 area	2015 area	Change in area	2016 pop	2015 pop	Change in pop	2016 house	2015 house	Change in house
> 55	148.9	152.9	-3%	420.8	434.5	-3%	167.3	173.7	-4%
> 60	54.7	56.5	-3%	118.3	122.6	-4%	42.8	46.8	-9%
> 65	22.1	23.2	-5%	18.1	20.1	-10%	6.2	7.6	-18%
> 70	7.0	7.4	-5%	1.3	1.8	-28%	0.5	0.7	-29%
> 75	2.7	2.8	-4%	< 0.1	< 0.1	(n/a)	< 0.1	< 0.1	(n/a)

Table C12 Heathrow 2016 & 2015 $L_{evening}$ cumulative contour area, population and household estimates

$L_{evening}$ (dBA)	2016 area	2015 area	Change in area	2016 pop	2015 pop	Change in pop	2016 house	2015 house	Change in house
> 55	129.9	135.0	-4%	348.1	356.1	-2%	136.0	141.0	-4%
> 60	48.1	49.7	-3%	91.4	95.2	-4%	32.5	36.2	-10%
> 65	19.8	20.6	-4%	11.2	12.8	-13%	4.0	4.9	-18%
> 70	6.4	6.7	-4%	0.8	0.8	0%	0.3	0.3	0%
> 75	2.6	2.6	0%	0.0	0.0	(-)	0.0	0.0	(-)

Table C13 Heathrow 2016 & 2015 L_{night} cumulative contour area, population and household estimates

L_{night} (dBA)	2016 area	2015 area	Change in area	2016 pop	2015 pop	Change in pop	2016 house	2015 house	Change in house
> 50	74.0	74.1	0%	221.2	223.4	-1%	86.3	88.0	-2%
> 55	26.5	26.4	0%	62.4	67.6	-8%	21.6	25.4	-15%
> 60	8.6	8.6	0%	10.9	12.6	-13%	3.4	4.6	-26%
> 65	3.0	3.0	0%	1.1	1.3	-15%	0.3	0.5	-40%
> 70	1.4	1.4	0%	0.0	0.0	(-)	0.0	0.0	(-)

Note: Areas are given in km^2, and populations and households in thousands. The 2016 and 2015 population/household counts are based on 2016 and 2015 CACI updates of the 2011 Census respectively. **The 2016 population counts differ from the 'official' END Round 3 noise mapping figures published by Defra, which are derived from a different population database.**

Table C14 Heathrow 2016 & 2015 L_{den} cumulative contour area, population and household estimates

L_{den} (dBA)	2016 area	2015 area	Change in area	2016 pop	2015 pop	Change in pop	2016 house	2015 house	Change in house
> 55	198.0	200.0	-1%	689.4	695.4	-1%	286.1	285.9	0%
> 60	74.5	76.5	-3%	195.6	202.7	-4%	74.5	79.0	-6%
> 65	28.9	29.8	-3%	44.5	47.7	-7%	15.4	18.1	-15%
> 70	9.5	9.8	-3%	4.8	5.3	-9%	1.7	2.0	-15%
> 75	3.4	3.5	-3%	< 0.1	0.1	(n/a)	< 0.1	< 0.1	(n/a)

Table C15 Heathrow 2016 & 2015 $L_{eq,6.5hr\ night}$ cumulative contour area, population and household estimates

$L_{eq,6.5hr\ night}$ (dBA)	2016 area	2015 area	Change in area	2016 pop	2015 pop	Change in pop	2016 house	2015 house	Change in house
> 48	33.9	33.0	+3%	95.4	105.5	-10%	34.2	40.3	-15%

Notes: Areas are given in km^2, and populations and households in thousands. The 2016 and 2015 population/household counts are based on 2016 and 2015 CACI updates of the 2011 Census respectively. **The 2016 population counts differ from the 'official' END Round 3 noise mapping figures published by Defra, which are derived from a different population database.**

Table C16 Heathrow 2016 & 2006 L_{day} cumulative contour area, population and household estimates

L_{day} (dBA)	2016 area	2006 area	Change in area	2016 pop	2006 pop	Change in pop	2016 house	2006 house	Change in house
> 55	148.9	177.7	-16%	420.8 (357.3)	485.6	-13% (-26%)	167.3 (152.8)	210.5	-21% (-27%)
> 60	54.7	64.0	-15%	118.3 (91.1)	111.0	+7% (-18%)	42.8 (36.5)	44.9	-5% (-19%)
> 65	22.1	27.2	-19%	18.1 (14.9)	24.1	-25% (-38%)	6.2 (5.7)	9.2	-33% (-38%)
> 70	7.0	9.3	-25%	1.3 (1.2)	2.8	-54% (-57%)	0.5 (0.5)	1.0	-50% (-50%)
> 75	2.7	3.5	-23%	< 0.1 (0.0)	< 0.1	(n/a)	< 0.1 (0.0)	< 0.1	(n/a)

Table C17 Heathrow 2016 & 2006 $L_{evening}$ cumulative contour area, population and household estimates

$L_{evening}$ (dBA)	2016 area	2006 area	Change in area	2016 pop	2006 pop	Change in pop	2016 house	2006 house	Change in house
> 55	129.9	185.6	-30%	348.1 (290.6)	450.5	-23% (-35%)	136.0 (122.5)	192.6	-29% (-36%)
> 60	48.1	66.1	-27%	91.4 (71.2)	106.3	-14% (-33%)	32.5 (28.2)	42.4	-23% (-33%)
> 65	19.8	28.1	-30%	11.2 (9.5)	20.5	-45% (-54%)	4.0 (3.7)	7.9	-49% (-53%)
> 70	6.4	10.0	-36%	0.8 (0.5)	2.4	-67% (-79%)	0.3 (0.2)	1.0	-70% (-80%)
> 75	2.6	3.8	-32%	0.0 (0.0)	< 0.1	(n/a)	0.0 (0.0)	< 0.1	(n/a)

Notes:

- Areas are given in km^2, and populations and households in thousands.
- The 2016 population/household counts are based on a 2016 CACI update of the 2011 Census.
- The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census.
- Estimates for 2016 using the 2006 population database are shown in blue.
- **The 2016 population counts differ from the 'official' END Round 3 noise mapping figures published by Defra, which are derived from a different population database.**

Table C18 Heathrow 2016 & 2006 L_{night} cumulative contour area, population and household estimates

L_{night} (dBA)	2016 area	2006 area	Change in area	2016 pop	2006 pop	Change in pop	2016 house	2006 house	Change in house
> 50	74.0	84.4	-12%	221.2 (180.6)	207.2	+7% (-13%)	86.3 (76.9)	88.9	-3% (-13%)
> 55	26.5	34.2	-23%	62.4 (47.5)	62.0	+1% (-23%)	21.6 (18.5)	24.1	-10% (-23%)
> 60	8.6	11.9	-28%	10.9 (9.0)	16.3	-33% (-45%)	3.4 (3.1)	6.0	-43% (-48%)
> 65	3.0	4.5	-33%	1.1 (0.8)	1.7	-35% (-53%)	0.3 (0.3)	0.6	-50% (-50%)
> 70	1.4	1.8	-22%	0.0 (0.0)	< 0.1	(n/a)	0.0 (0.0)	< 0.1	(n/a)

Notes:

- Areas are given in km^2, and populations and households in thousands.
- The 2016 population/household counts are based on a 2016 CACI update of the 2011 Census.
- The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census.
- Estimates for 2016 using the 2006 population database are shown in blue.
- **The 2016 population counts differ from the 'official' END Round 3 noise mapping figures published by Defra, which are derived from a different population database.**

Table C19 Heathrow 2016 & 2006 L_{den} cumulative contour area, population and household estimates

L_{den} (dBA)	2016 area	2006 area	Change in area	2016 pop	2006 pop	Change in pop	2016 house	2006 house	Change in house
> 55	198.0	244.7	-19%	689.4 (599.8) (683.7)	756.1	-9% (-21%)	286.1 (268.0) (288.05)	338.5	-15% (-21%)
> 60	74.5	92.7	-20%	195.6 (154.3) (193.7)	194.6	1% (-21%)	74.5 (64.6) (72.05)	81.6	-9% (-21%)
> 65	28.9	37.1	-22%	44.5 (34.1) (45.6)	54.3	-18% (-37%)	15.4 (13.3) (15.05)	21.4	-28% (-38%)
> 70	9.5	13.7	-31%	4.8 (3.7) (4.5)	9.6	-50% (-61%)	1.7 (1.3) (1.45)	3.5	-51% (-63%)
> 75	3.4	5.0	-32%	< 0.1 (< 0.1) (< 0.1)	0.7	(n/a)	< 0.1 (< 0.1) (< 0.05)	0.3	(n/a)

Notes:

- Areas are given in km^2, and populations and households in thousands.
- The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census.
- The 2016 population/household counts are based on a 2016 CACI update of the 2011 Census.
- Estimates for 2016 using the 2006 population database are shown in blue.
- **The 2016 population counts differ from the 'official' END Round 3 noise mapping figures published by Defra which are derived from a different population database. These are shown in red for L_{den}.**

Table C20 Heathrow 2016 & 2006 $L_{eq,6.5hr\ night}$ cumulative contour area, population and household estimates

$L_{eq,6.5hr\ night}$ (dBA)	2016 area	2006 area	Change in area	2016 pop	2006 pop	Change in pop	2016 house	2006 house	Change in house
> 48	33.9	56.4	-40%	95.4 (72.6)	137.4	-31% (-47%)	34.2 (28.8)	57.5	-41% (-50%)

Notes:

- Areas are given in km^2, and populations and households in thousands.
- The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census.
- The 2016 population/household counts are based on a 2016 CACI update of the 2011 Census.
- Estimates for 2016 using the 2006 population database are shown in blue.
- **The 2016 population counts differ from the 'official' END Round 3 noise mapping figures published by Defra which are derived from a different population database.**
- The 2006 results were based on data recorded over the 2006 calendar year. The 2016 results were based on data recorded from 27 March 2016 to 26 March 2017.

Table C21 Heathrow 2016 & 2006 L_{den} cumulative contour area, population and household estimates – assuming 2006 W/E runway modal split and 2006 N/S runway usage

L_{den} (dBA)	2016 area	2006 area	Change in area	2016 pop	2006 pop	Change in pop	2016 house	2006 house	Change in house
> 55	198.3	244.7	-19%	692.7	756.1	-8%	288.1	338.5	-15%
> 60	74.4	92.7	-20%	194.7	194.6	0%	74.1	81.6	-9%
> 65	28.7	37.1	-23%	44.0	54.3	-19%	15.3	21.4	-29%
> 70	9.4	13.7	-31%	4.6	9.6	-52%	1.6	3.5	-54%
> 75	3.4	5.0	-32%	< 0.1	0.7	(n/a)	< 0.1	0.3	(n/a)

Notes:

- Areas are given in km^2, and populations and households in thousands.
- The 2016 population/household counts are based on a 2016 CACI update of the 2011 Census.
- The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census.

APPENDIX D

ANCON type descriptions

Table D1 ANCON type descriptions

ANCON type	Description
B717	Boeing 717
B727	Boeing 727 (Chapter 2&3)
B732	Boeing 737-200 (Chapter 2&3)
B733	Boeing 737-300/400/500
B736	Boeing 737-600/700
B738	Boeing 737-800/900
B747	Boeing 747-100 & 200/300 series (certificated to Chapter 3)
B744G	Boeing 747-400 with General Electric CF6-80F engines
B744P	Boeing 747-400 with Pratt & Whitney PW4000 engines
B744R	Boeing 747-400 with Rolls-Royce RB211 engines
B747SP	Boeing 747SP
B748	Boeing 747-8
B753	Boeing 757-300
B757C	Boeing 757-200 with Rolls-Royce RB211-535C engines
B757E	Boeing 757-200 with Rolls-Royce RB211-535E4/E4B engines
B757P	Boeing 757-200 with Pratt & Whitney PW2037/2040 engines
B762	Boeing 767-200
B763G	Boeing 767-300 with General Electric CF6-80 engines
B763P	Boeing 767-300 with Pratt & Whitney PW4000 engines
B763R	Boeing 767-300 with Rolls-Royce RB211 engines
B764	Boeing 767-400
B772G	Boeing 777-200 with General Electric GE90 engines
B772P	Boeing 777-200 with Pratt & Whitney PW4000 engines
B772R	Boeing 777-200 with Rolls-Royce Trent 800 engines
B773G	Boeing 777-200LR/300ER with General Electric GE90 engines
B773P	Boeing 777-300 with Pratt & Whitney PW4000 engines
B773R	Boeing 777-300 with Rolls-Royce Trent 800 engines
B788	Boeing 787-8
B789	Boeing 787-9
BA46	BAe 146/Avro RJ series
CRJ	Bombardier CRJ100/200 series
CRJ700	Bombardier CRJ700 series
CRJ900	Bombardier CRJ900 series

ANCON type	Description
CS100	Bombardier C Series CS100
DC10	McDonnell Douglas DC-10
EA30	Airbus A300
EA31	Airbus A310
EA318	Airbus A318
EA319C	Airbus A319 with CFM56 engines
EA319V	Airbus A319 with IAE V2500 engines
EA320C	Airbus A320 with CFM56 engines
EA320NEO	Airbus A320neo
EA320V	Airbus A320 with IAE V2500 engines
EA321C	Airbus A321 with CFM56 engines
EA321V	Airbus A321 with IAE V2500 engines
EA33	Airbus A330
EA34	Airbus A340-200/300
EA346	Airbus A340-500/600
EA359	Airbus A350-900
EA38GP	Airbus A380 with Engine Alliance GP7000 engines
EA38R	Airbus A380 with Rolls-Royce Trent 900 engines
ERJ	Embraer ERJ 135/145
ERJ170	Embraer E-170/175
ERJ190	Embraer E-190/195
EXE2	Chapter 2 executive jets
EXE3	Chapter 3 executive jets
FK10	Fokker 70/100
L101	Lockheed L-1011 TriStar
L4P	Large four-engine propeller
LTT	Large twin-turboprop
MD11	McDonnell Douglas MD-11
MD80	McDonnell Douglas MD-80 series
SP	Single piston
STP	Small twin-piston
STT	Small twin-turboprop
TU54	Tupolev Tu-154

Glossary

Glossary	
ANCON	The UK civil aircraft noise contour model, developed and maintained by ERCD.
CAA	Civil Aviation Authority
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
ICAO	International Civil Aviation Organization
L_{day}	Equivalent sound level of aircraft noise in dBA for the annual average 12-hour day period (0700-1900 local time).
L_{den}	Equivalent sound level of aircraft noise in dBA for the annual average 24-hour 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 annual average 4-hour evening period (1900-2300 local time).
L_{max}	Maximum sound level of a noise event.
L_{night}	Equivalent sound level of aircraft noise in dBA for the annual average 8-hour night period (2300-0700 local time).
N70/N65/N60	Number of aircraft noise events exceeding a maximum sound level of 70/65/60 dBA.
NTK	Noise and Track Keeping monitoring system.
SEL	Sound Exposure Level
SoNA	Survey of Noise Attitudes