Changes to

London Luton Airport Arrivals

CAP1616 Stage 7 Post-Implementation Review

Annex A1: Supplemental Traffic Dispersion Data

Photo © Graham Custance

Roles

Action	Role	Date
Produced	**Airspace Change Expert** NATS Operations Transformation	25/03/2025
Produced	**Airspace Change Lead** London Luton Airport	25/03/2025
Reviewed Approved	**Manager Airspace Change Compliance & Delivery** NATS Operations Transformation	25/03/2025
Reviewed Approved	**ATC Requirements & Acceptance Manager** NATS Swanwick	25/03/2025
Reviewed Approved	**Head of Flight Operations** London Luton Airport	25/03/2025

Drafting and Publication History

Issue	Month/Year	Changes this issue
Issue 1.0	March 2025	Published in response to CAA request for more data

References

Ref No	Description	Links
1	SAIP AD6 CAA web page – progress through the airspace change process, and the consultation website including responses	Link to CAA portal Link to consultation site
2	CAA Decision Document CAP2288	Link to document
3	CAA PIR Data Request Document	Link to document
3A	**CAA Clarification Questions and Sponsor Responses Document (including responses from NATS-LLA)**	Link to CAA portal
3B	**AD6 PIR Annex A1: Supplemental Traffic Dispersion Data (this document)**	Link to CAA portal
3C	**AD6 PIR Annex A Issue 2.0 Appendix Noise Technical Report (updated from Issue 1.0 with new Sections 6 and 7, updated conclusion Section 8)**	Link to CAA portal
4	Airspace Change Consultation material (selection of documents)	Executive summary Link to abridged document Link to full document
5	Consultation virtual exhibition	Link to website
6	Stage 4 Step 4A(ii) The Final Airspace Design (technical map for use on computers, unsuitable for smartphones and tablets, open using the free Adobe Reader DC app to make use of switchable layers)	Link to downloadable map
7	Airspace change: Guidance on the regulatory process for changing the notified airspace design (Edition 4 in force for this review) CAP1616	Link to document (Edition 4, March 2021)
8	CAA Definition of Overflight CAP1498	Link to document Link to short animation
9	UK Government Department for Transport's 2017 Guidance to the CAA on its environmental objectives when carrying out its air navigation functions (abbreviated to ANG2017)	Link to website Link to document

Contents

1. About this document

1.1 Introduction

1.1.1 This supplement is part of the NATS-London Luton Airport (LLA) co-sponsored airspace change proposal post-implementation review (ACP PIR).

1.1.2 Its purpose is to provide additional traffic dispersion data, as requested by the CAA (see separate Clarification Questions and Sponsor Responses document, ref. item CAA08). It also summarises the conclusion to the separately published AD6 PIR Annex A Noise Technical Report, which has been updated to Issue 2.0.

1.1.3 It should be read in conjunction with the following documents:

- PIR Main Document (published July 2024) which provides the structure, the majority of the evidence, and details the regulatory requirements
- PIR Annex A (published July 2024) that provides the original two weeks of traffic dispersion data for this review (one week of easterly operations, one week of westerly), alongside other environmental data and the original conclusion from the separately-published noise technical report.
- Reference 3 from the table on p.2, the CAA's originally-published Data Request document (as published March 2022), that sets out the CAA's requirements for this review
- Reference 3A from the table on p.2, the CAA's subsequent Clarification Questions and Sponsor Responses document (as published in March 2025), that lists additional CAA queries following their study of the PIR material as originally published in July 2024. That document includes our responses to their clarifications.
- Reference 3C from the table on p.2, which is Issue 2.0 of our specialist noise consultants' Noise Technical Report.

1.1.4 This document provides an additional two weeks of traffic dispersion data, detailed in Section 2 below. It further illustrates how air traffic patterns have changed and provides evidence that the change is operating as anticipated, within acceptable tolerances.

1.1.5 It is important to remember that air traffic is three-dimensional and cannot "stop", unlike railway or road traffic. In both the latter types of transport, variation comes from the amount of traffic and the direction in which it is flowing along the linear infrastructure, fixed to the ground. It is completely normal for aircraft to be in different places and at different altitudes while using the same airspace infrastructure arrangements, weekly, daily and hourly, depending entirely on the traffic situation and weather at the time. Variation should be expected within the system, however the main flows and common minor flows would also expect to be consistent.

1.1.6 The PIR Items references are 34a (density plots) and 34b (lateral and vertical analysis). In the CAA's PIR clarification reference table, this document covers items CAA08, CAA09 and CAA16. In addition to their already-completed item CAA07 (removal of bold arrows from flow diagrams) we have also published the original diagrams with the arrows made more transparent/fainter, so that the dispersion data can be discerned more easily (the arrows themselves have not changed size/shape/direction).

2. Density plots and analysis

2.1 Method –Summarised from original Annex A, with supplemental data samples.

2.1.1 This section provides maps of the region overlaid with processed radar data of actual flights. We show images of the pre-ACP (2019) flightpaths next to equivalent images of the post-implementation (2022-23) flightpaths so that the reader can see how flightpaths have changed.

2.1.2 Our data samples for 2019 (pre-ACP) are the same as the data we used in the original consultation material: 7 days to illustrate Runway 07 easterly arrivals (10/11/22/23/26/27/28 June 2019, 1,535 flights) and a different 7 days to illustrate Runway 25 westerly arrivals (1/2/3/5/13/14/17 June 2019, 1,524 flights). This totals 14 days of radar data, processed for this document, approximately 3,000 flights.

2.1.3 Our original data samples for post-implementation were: 7 days to illustrate Runway 07 easterly arrivals (5/6/7/8/9/10/11 June 2023, 1,353 flights) and a different 7 days to illustrate Runway 25 westerly arrivals (23/24/25/26/27/28/29 June 2023, 1,400 flights). These were chosen because they are considered by our air traffic control experts to be representative of typical traffic flows, before and after the airspace change, for both easterly and westerly operations. This is 14 days of radar data, processed for this document, approximately 2,800 flights.

2.1.4 The CAA requested supplemental data via their request reference CAA08, we agreed to provide two more 7 day samples (easterly and westerly):
7 days to illustrate Runway 07 easterly arrivals (1/2/3/4/5/6/7 September 2023, 1,385 flights)
7 days to illustrate Runway 25 westerly arrivals (13/14/15/16/17/18/19 March 2023, 1,146 flights)
These dates are also considered by our air traffic control experts as being representative of typical traffic flows after the airspace change. This is an additional 14 days of radar data, approximately 2,500 flights.

2.1.5 The primary information shows radar data processed into density plots. Each colour is associated with the number of times a specific place is overflown per day (as per the key on each map). The density plots show arrivals for each runway. The outer (grey) density indicates up to two overflights per day and is not considered a significant impact, but is included to illustrate the overall situation.

2.1.6 The CAA asked for clarification CAA09 as follows:

- Please provide a summary of how the concentration of tracks been calculated. There are areas of 'grey' that appear to overlap, yet this colour is meant to indicate fewer than 2 aircraft a day. *[Note that the grey in the key actually indicates up to, and including, 2 per day]*

2.1.7 As described in paragraph 2.1.5 above, the tool used to create the density plot considers the number of times a place is overflown, and changes the plot colour in accordance with the key. For all colour calculations, including the outer (grey), this is averaged over the 7-day data sample period.

2.1.8 The reason grey areas can overlap and still be grey is that a single flight over a specific place in the 7-day period would show on the plot as "up to 2 flights per day" even though mathematically it would be 1 flight/7 days=0.14 flights per day. Seven flights in a week's data sample would be 1 flight per day, also shown in grey. Up to and including 14 flights over the same place within the 7-day period would show as a grey plot. This is consistent with all such density plots, and an average of up to 2 per day is not considered a significant impact. Thus, a place where two flights cross another two flights would each show as grey tracks crossing grey tracks, and the intersection will be grey. This applies across all colour bands, where the total per day averaged over any place for the 7-day period, including where tracks or flows cross over or join, until the average reaches the next colour band.

2.1.9 Each map also has coloured shapes (and associated key) indicating typical altitude bands of arrivals, along with the main flow in black. For the pre-ACP 2019 maps, they are the same as the winter 2020/2021 consultation. For the PIR period of 2022-23 those shapes show the predicted extents and altitudes from the consultation, so the reader can assess how our predictions compared with the actual flow of arrivals using the radar density plots.

2.1.10 The tool we used to create the density plots is not always able to filter out departures or some processing display errors from its output. Throughout this proposal we have been clear that only arrivals would change. Please disregard unwanted radar tracks in these pictures, we did not wish to edit the diagrams to remove them.

3. High-level arrival flow diagrams and holding data

3.1 General information about these diagrams – summarised from original PIR Annex A

3.1.1 The flightplan routes and holding patterns (thin blue lines) illustrate arrivals from c.15,000ft to 8,000ft. Typical flightplanned and tactical flows (both major and minor) are also shown in blue. A tactical flow is where a controller manually directs the aircraft to follow a different path than the full flightplanned route (thin blue lines), creating regularly used common flows (solid thick blue arrows) and minor flows (dashed thick blue arrows). Controllers always try to be as efficient as possible with their flights; they will minimise flying time and distance wherever they can. Aircraft remain on their flightplanned route if the controller has no opportunity, or sees no advantage, to shorten the path to the runway in a safe, orderly and efficient manner.

3.1.2 Radar data is shown from c.12,000ft to 8,000ft; a density key illustrates frequency of overflight, and background maps show towns, cities and roads. The diagrams also contain the same coloured polygons from the consultation material, that illustrate the typical altitudes and dispersion from 8,000ft to the runway. These are included to provide additional context for later diagrams that show 8,000ft and below, i.e. showing how arrivals got from high levels to 8,000ft.

3.2 Important notes regarding high-level arrivals data and community noise impacts

3.2.1 All the radar data and flow information on the descent diagrams in Section 3 stops on reaching 8,000ft; see Section 4 from p.16 below for complementary diagrams descending from 8,000ft to the runway.

3.2.2 Government guidance on aviation environmental objectives (ANG2017, Ref 9) is that, in the airspace at or above 7,000ft, the priority should be flight efficiency; the minimising of community noise impacts is not a priority at high levels (paraphrased from ANG2017 p.18 paragraph 3.3.d, and p.21 paragraph 3.27).

3.3 LLA arrivals dispersion plots Runway 07: pre and post implementation, high level, and supplemental data

3.3.1 Figure 1 on p.7 shows the pre-implementation high-level arrivals for the easterly Runway 07. This is for context as the original PIR Annex A provides a full description, including a comparison with the original post-change diagram.

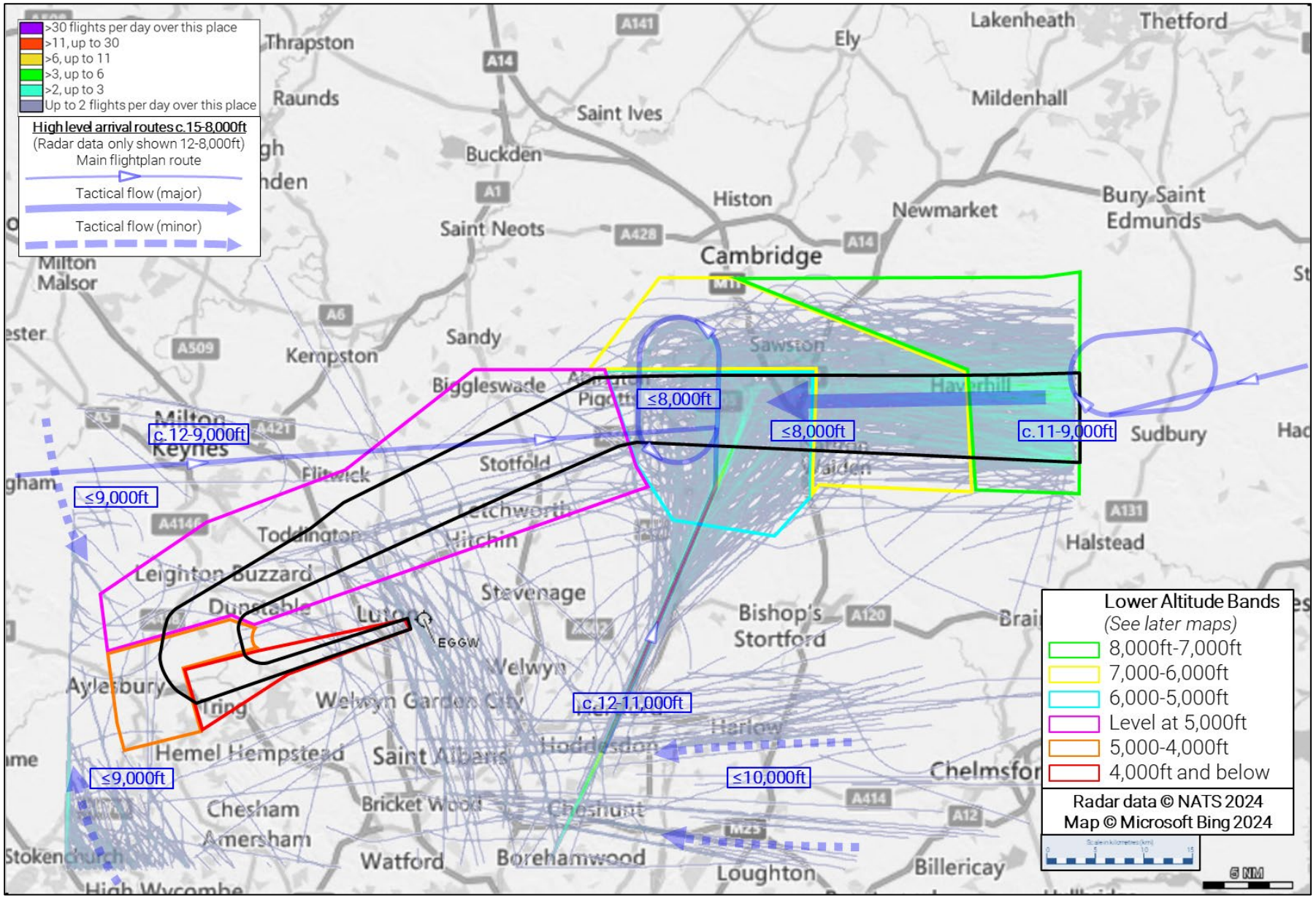

Figure 1 LLA Arrivals to Runway 07 descending from 12,000ft-8,000ft via shared holds ABBOT (east) and LOREL (west), 7 days in June 2019 pre-airspace change

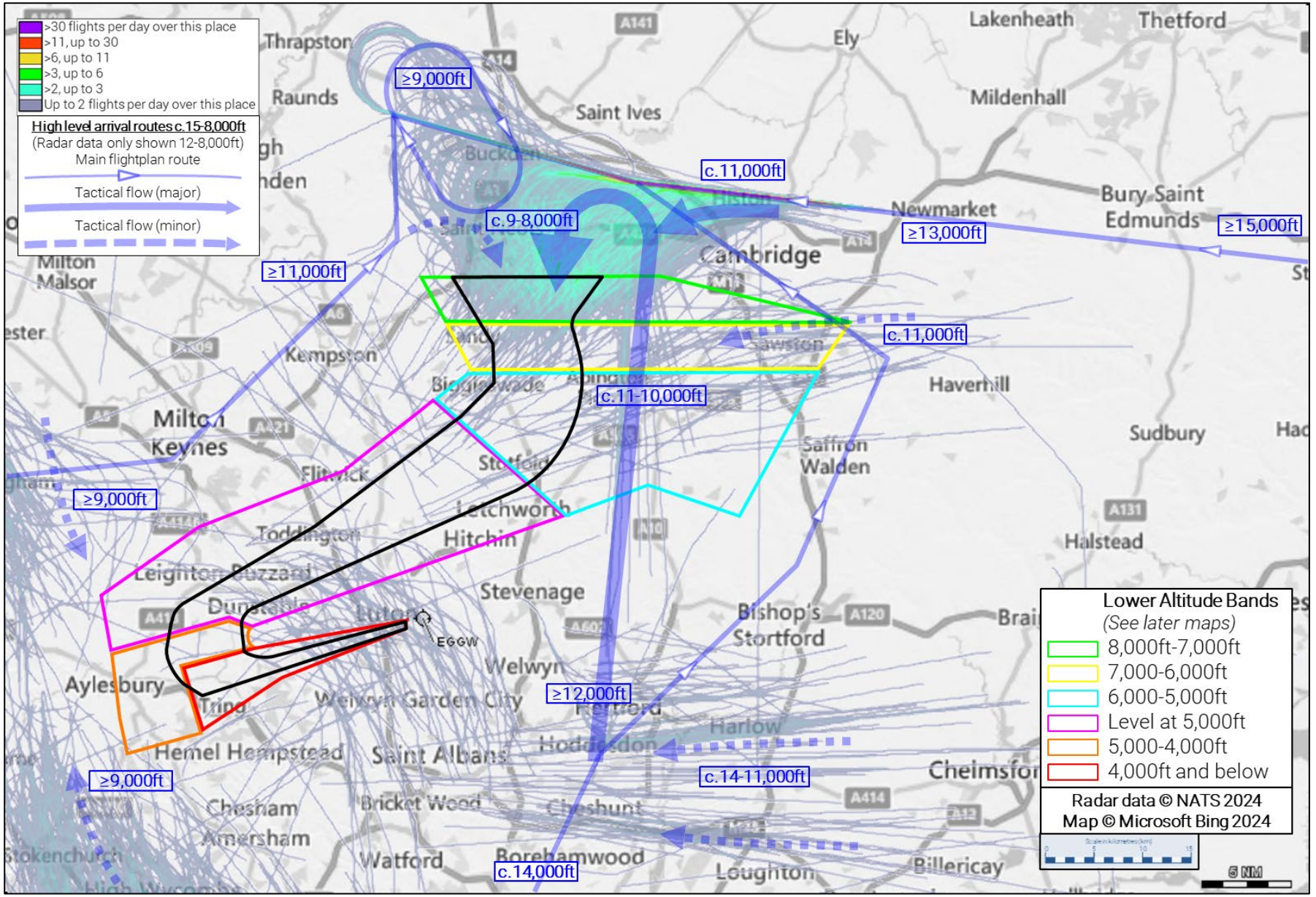

Figure 2 LLA Arrivals to Runway 07 descending from 12,000ft-8,000ft showing ZAGZO hold (north), 7 days in June 2023 post-airspace change

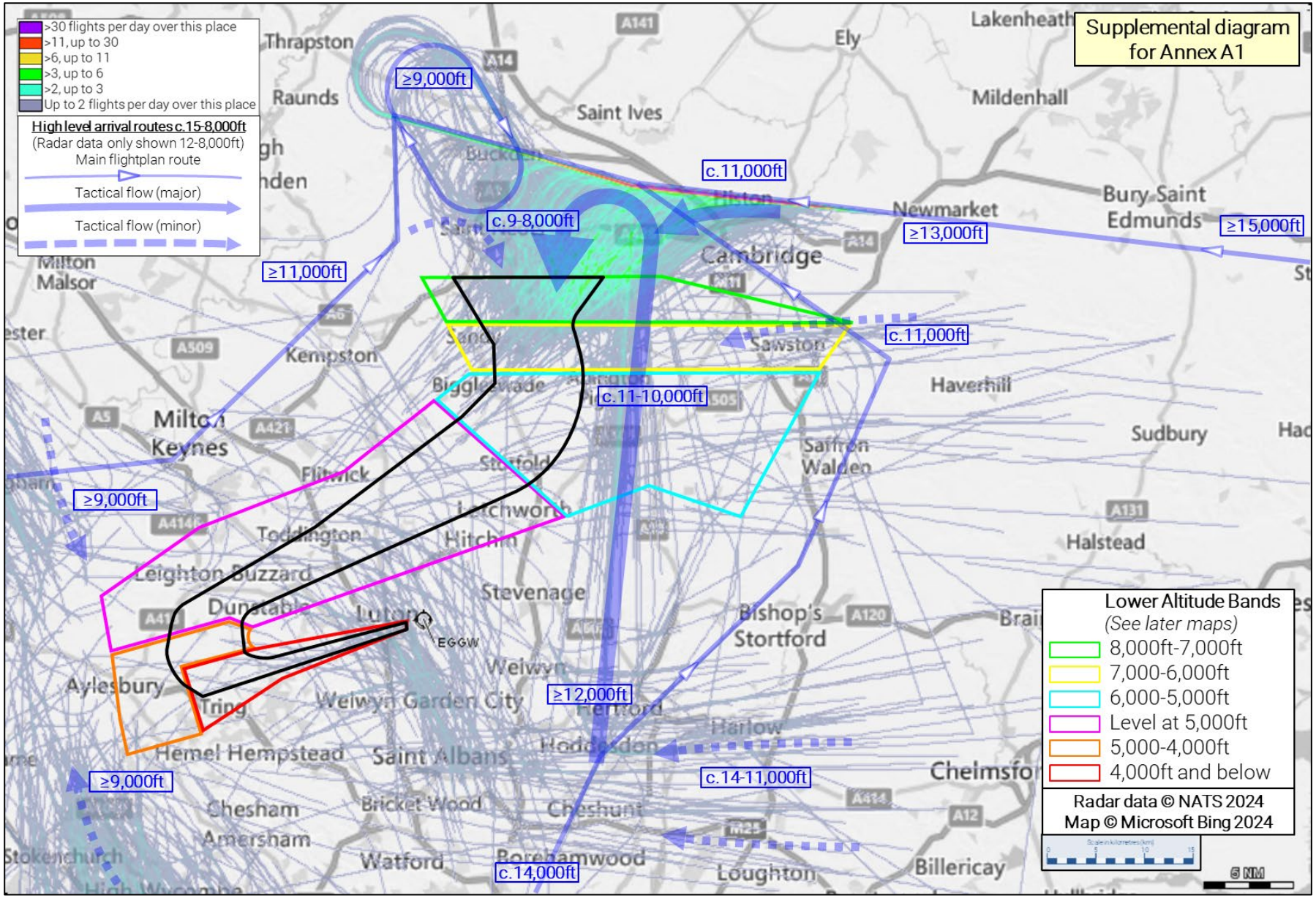

Figure 3 LLA Arrivals to Runway 07 descending from 12,000ft-8,000ft showing ZAGZO hold (north), 7 days in September 2023 post-airspace change

Comparison of the original post-change high-level arrivals to Runway 07 with the supplemental diagram

3.3.2 This subsection compares Figure 2 on p.8 (original 7 day PIR sample from June 2023) with Figure 3 on p.9 (supplemental 7 day PIR sample in September 2023). This comparison is between different 7-day periods of high-level arrivals to Runway 07. It does not duplicate the comparison of pre and post implementation traffic from the original Annex A Traffic Dispersion document.

3.3.3 The traffic dispersion and flows shown in Figure 3 on p.9 (supplemental) are consistent with those in Figure 2 on p.8 (original PIR). There are a similar number of flights (1,353 in the original 7-day period, 1,385 in the supplemental 7-day period).

3.3.4 In the supplemental diagram, the arrival flows from the east follow similar flow patterns to the original PIR diagram. The spread of the left turn north of Cambridge is similar, and there is a similar minor flow shortcutting north of Sawston c.11,000ft.

3.3.5 Other minor flows from the east/southeast (Harlow/Loughton) are similar, c.14-11,000ft.

3.3.6 Likewise, the arrival flows from the south are consistent, between the supplemental diagram and the original. The flow mainly follows the shortcut northwards from Hoddesdon ≥ c.12,000ft, avoiding the dogleg flightplan route, and is then integrated into the flow from the east and turned south as indicated by the thick blue arrow. Some variation is shown by traffic in the northward flow which is slightly lower in the supplemental diagram, and there is also a slight eastward spread as some northward flights stay closer to the dogleg flightplan route.

3.3.7 In the supplemental diagram, some arrivals from the south are taken off their flightplan very early and descend over High Wycombe / Stokenchurch at or above 9,000ft, this is consistent with the original diagram.

3.3.8 Likewise in the supplemental diagram, arrivals from the west, northwest and north flightplan to head east then northeast over Milton Keynes at high levels towards the new hold. As per the original diagram, many in the supplemental diagram are redirected off the flightplan early, onto a southbound tactical flow several km west of Milton Keynes at or above 9,000ft.

3.3.9 In both the original and supplemental diagram, some flights reach the holding area between Buckden and Thrapston.

3.3.10 Conclusion: there is some variation, as expected and explained in paragraph 1.1.5 on p.4 above, but the major and minor flows are consistent both laterally and vertically.

3.3.11 Later sections of this document illustrate how overflight has changed at altitudes below 8,000ft.

3.4 LLA arrivals dispersion plots Runway 25: pre and post implementation, high level, and supplemental data

3.4.1 Figure 4 on p.11 shows the pre-implementation high-level arrivals for the westerly Runway 25. This is for context as the original PIR Annex A provides a full description, including a comparison with the original post-change diagram.

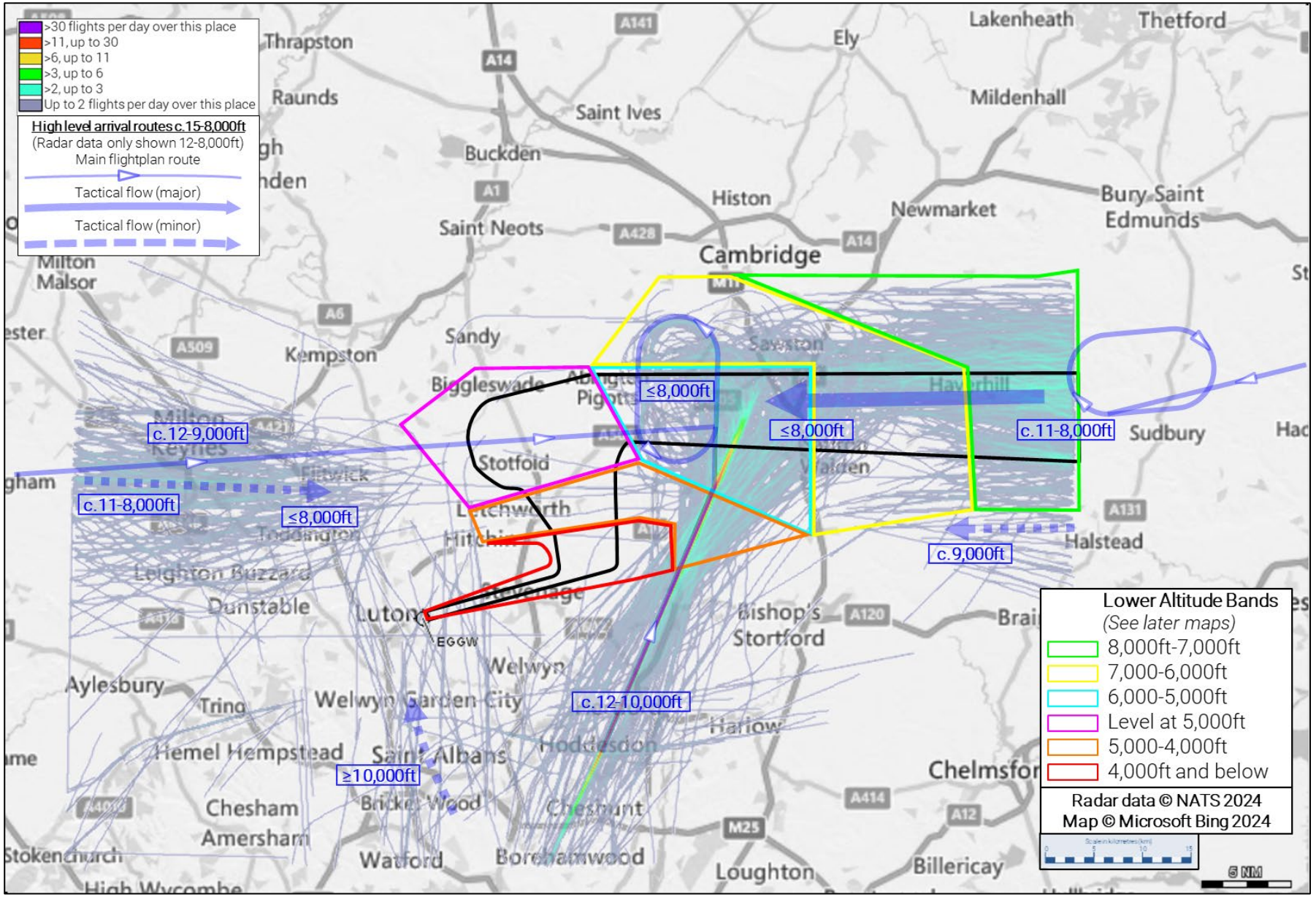

Figure 4 LLA Arrivals to Runway 25 descending from 12,000ft-8,000ft via shared holds ABBOT (east) and LOREL (west), 7 days in June 2019 pre-airspace change

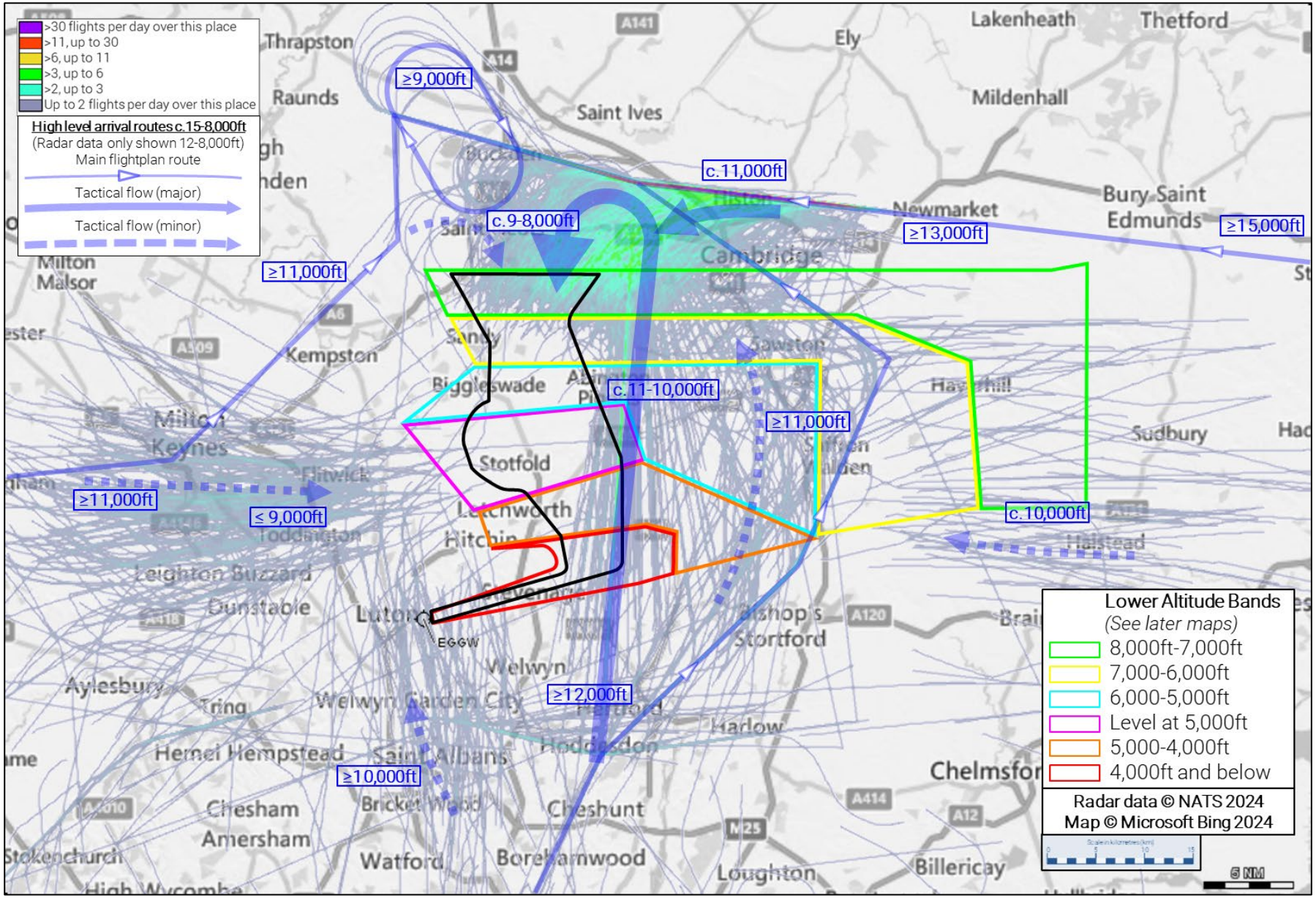

Figure 5 LLA Arrivals to Runway 25 descending from 12,000ft-8,000ft showing ZAGZO hold (north), 7 days in June 2023 post-airspace change

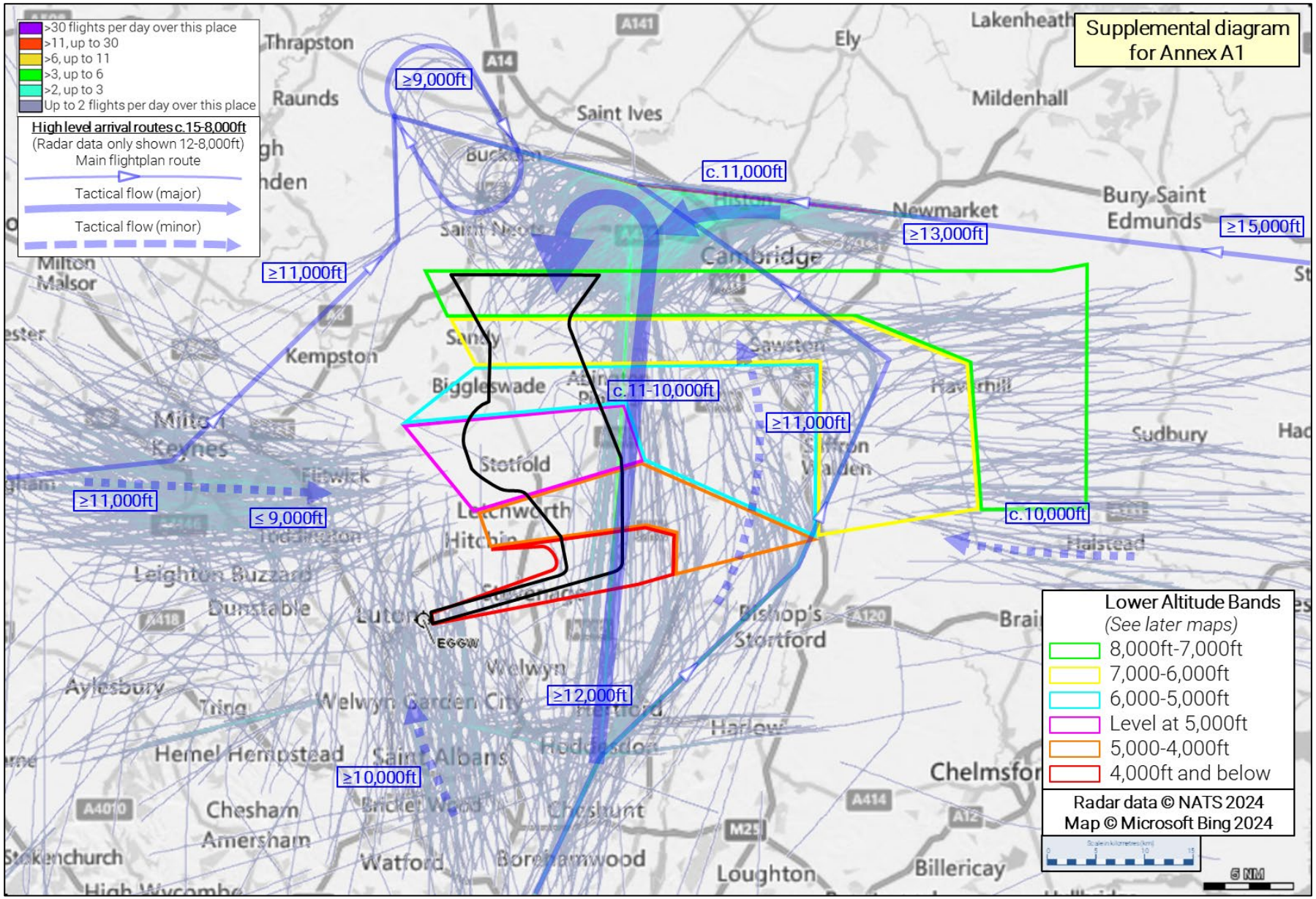

Figure 6 LLA Arrivals to Runway 25 descending from 12,000ft-8,000ft showing ZAGZO hold (north), 7 days in March 2023 post-airspace change

Comparison of the original post-change high-level arrivals to Runway 25 with the supplemental diagram

3.4.2 This subsection compares Figure 5 on p.12 (original 7 day PIR sample from June 2023) with Figure 6 on p.13 (supplemental 7 day PIR sample from March 2023). This comparison is between different 7-day periods of high-level arrivals to Runway 25. It does not duplicate the comparison of pre and post implementation traffic from the original Annex A Traffic Dispersion document.

3.4.3 The traffic dispersion and flows shown in Figure 6 on p.13 (supplemental) are consistent with those in Figure 5 on p.12 (original PIR). However, the supplemental period in early spring clearly has fewer flights than the original June 7-day sample period (1,146 vs 1,400, approximately 36 fewer per day).

3.4.4 In the supplemental diagram, the arrival flows from the east follow similar flow patterns to the original PIR diagram. The spread of the left turn north of Cambridge is similar, however the density is less pronounced due to fewer flights in the pre-summer period.

3.4.5 Other minor flows from the east (Halstead/Sudbury) are similar, c.10,000ft.

3.4.6 Likewise, the arrival flows from the south are consistent, between the supplemental diagram and the original, again with fewer flights overall. The flow mainly follows the shortcut northwards from Hoddesdon ≥ c.12,000ft, mainly avoiding the dogleg flightplan route, and is then integrated into the flow from the east and turned south as indicated by the thick blue arrow. In the westerly arrangement, a minor flow tends to be further east, towards the dogleg flightplan route. In the northward flow this is similar between data samples, but we attribute the difference to the lower number of flights pre-summer (see also next paragraph).

3.4.7 In both diagrams, some arrivals from the south are taken off their flightplan very early and descend over St Albans/Welwyn Garden City at or above 10,000ft. In the supplemental diagram, this shortcut appears to have been used more frequently, most likely due to the lower number of total flights pre-summer. This is also consistent with the reduction in northward flights, in the supplemental diagram.

3.4.8 Likewise in the supplemental diagram, arrivals from the west, northwest and north flightplan to head east then northeast over Milton Keynes at high levels towards the new hold. As per the original diagram, many in the supplemental diagram are redirected off the flightplan early, onto a southbound tactical flow several km west of Milton Keynes at or above 9,000ft.

3.4.9 In both the original and supplemental diagram, some flights reach the holding area between Buckden and Thrapston.

3.4.10 Conclusion: there is some variation, as expected and explained in paragraph 1.1.5 on p.4, but the major and minor flows are consistent both laterally and vertically.

3.4.11 Later sections of this document illustrate how overflight has changed at altitudes below 8,000ft.

3.5 Comparison of predicted high-level network flightpaths vs. actual flightpaths (above 8,000ft)

3.5.1 In the consultation we made a prediction that high-level arrivals to LLA would follow the blue arrows in Figure 7 below (adapted from Figure 9 on p.27 of the 2020 full consultation document).

3.5.2 In the original PIR Annex A we used the traffic dispersion data to summarise the high-level differences by adding pink arrows.

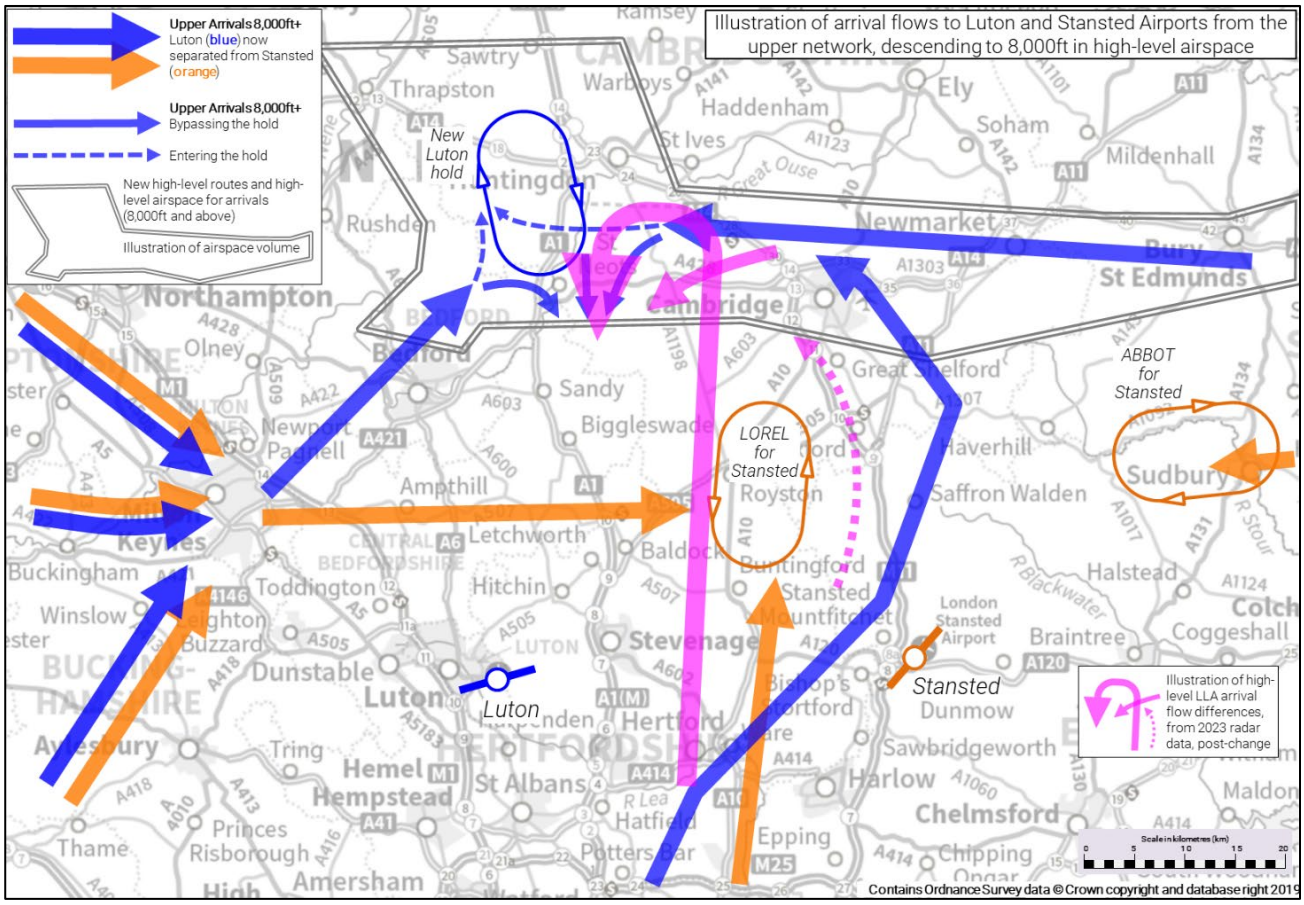

Figure 7 Extract from original PIR Annex A illustrating predicted routes 8,000ft and above, modified to show additional flows (pink arrows)

3.5.3 Given that the high-level flows in the supplemental diagrams (Figure 3 and Figure 6) are consistent with the flows in the original PIR diagrams (Figure 5 and Figure 2), we conclude that the pink arrows above continue to be reasonable illustrations.

3.5.4 From a community noise impact point of view, paragraph 3.2.2 above remains relevant; the difference in noise produced by flightpaths at and above 7,000ft is not considered a priority, in accordance with Government guidance. Flight efficiency is the priority, and the pink arrows are examples of additional high-level efficiency, with the supplemental data supporting that.

3.5.5 The next sections of this document illustrate how overflight has changed at altitudes below 8,000ft. As per the previous paragraph, Government guidance is that noise impacts are considered a priority below 7,000ft (see paragraph 4.2.2 below).

4. Arrival flow diagrams from 8,000ft to the runway

4.1 General information about these diagrams

4.1.1 The radar density diagrams illustrate arrivals from 8,000ft to each runway, pre-change and post-change using the same data samples detailed in Section 2 on p.5. There are now two post-change diagrams; one as per the original PIR Annex A, and a second supplemental diagram.

4.1.2 The supplemental diagrams are consistent with the style and content of those previously published.

4.1.3 As noted in the previous (high-level) section, the narrative in this section mainly compares the original PIR diagrams with the supplemental PIR diagrams, there being no need to duplicate the already-published comparison of the pre and post implementation traffic from the original PIR Annex A Traffic Dispersion document.

4.1.4 Also please note that the original easterly 7-day data sample has a similar number of flights as the supplemental easterly sample (1,353 vs. 1,385 flights), but the original westerly sample has more flights than the supplemental westerly sample (1,400 vs. 1,146). The westerly supplemental sample was taken from early spring when air traffic volumes are naturally lower than in summer.

4.2 Important notes regarding arrivals data from 8,000ft, and community noise impacts

4.2.1 The following subsection is unchanged from the original PIR Annex A:
All the radar data and flow information on these descent diagrams starts at 8,000ft; see Section 3 above for complementary diagrams descending from the high-level network c.12,000ft-8,000ft.

4.2.2 Government guidance on aviation environmental objectives (ANG2017, Ref 9) is that, in the airspace at or above 7,000ft the priority should be flight efficiency; the minimising of community noise impacts is not a priority at high levels (paraphrased from ANG2017 p.18 paragraph 3.3.d, and p.21 paragraph 3.27).

4.2.3 For these diagrams, flights within the green polygon (8,000ft-7,000ft) are shown using radar data, but the primary noise impacts are mainly considered as they leave the green polygon and cross the green-yellow boundary into the yellow polygon (7,000ft-6,000ft) and continue descent through the light blue, pink, orange and red polygons as per the altitude band key.

4.2.4 All arrivals are vectored; they are manually directed by the controller to turn and descend in sequence.

4.3 LLA arrivals dispersion plots: pre and post implementation and supplemental data, descending from 8,000ft to easterly Runway 07

4.3.1 Figure 8 on p.17 shows the pre-implementation high-level arrivals for the easterly Runway 07. This is for context as the original PIR Annex A provides a full description, including a comparison with the original post-change diagram.

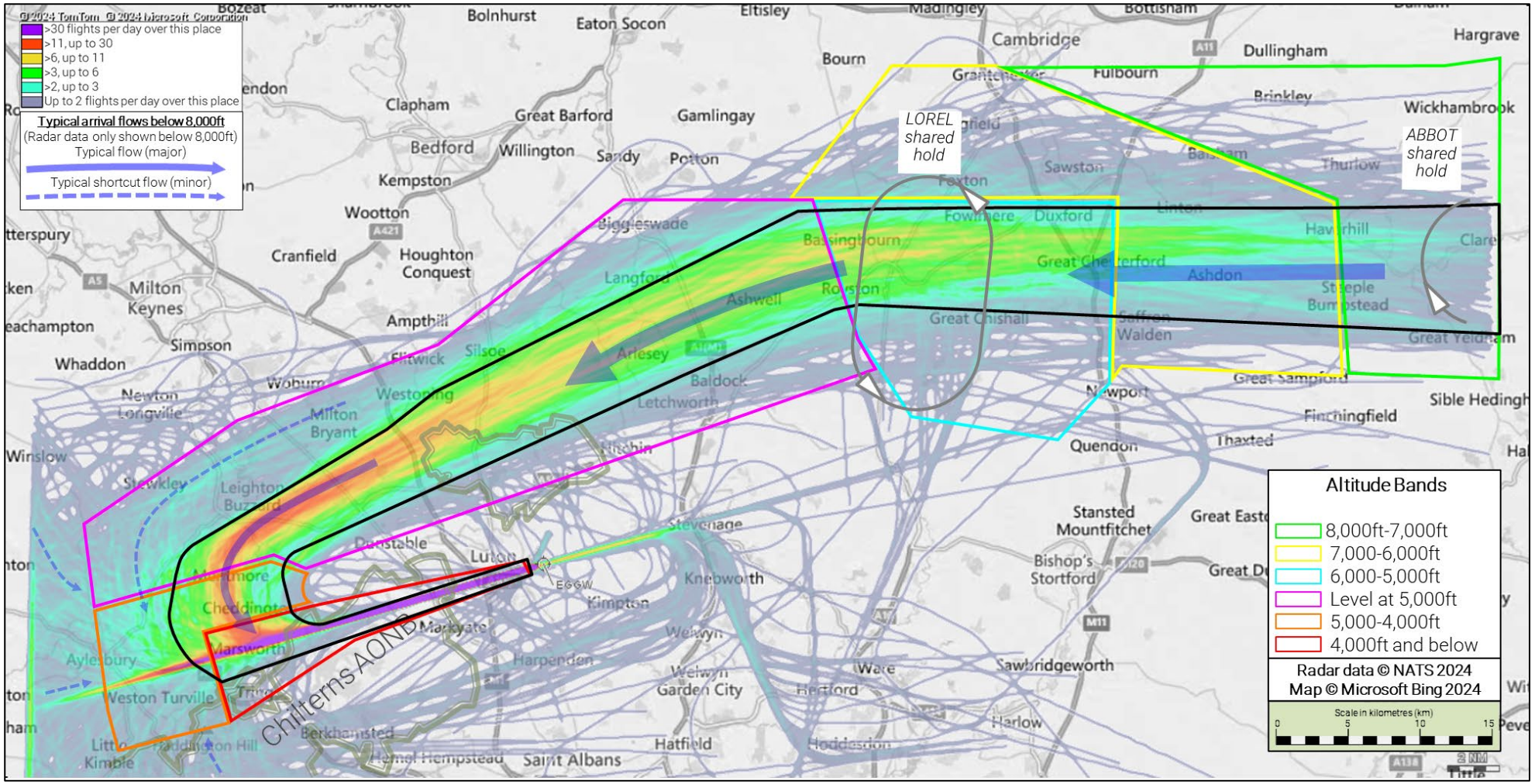

Figure 8 LLA Arrivals to Runway 07 descending from 8,000ft (7 days in June 2019 pre-airspace change)

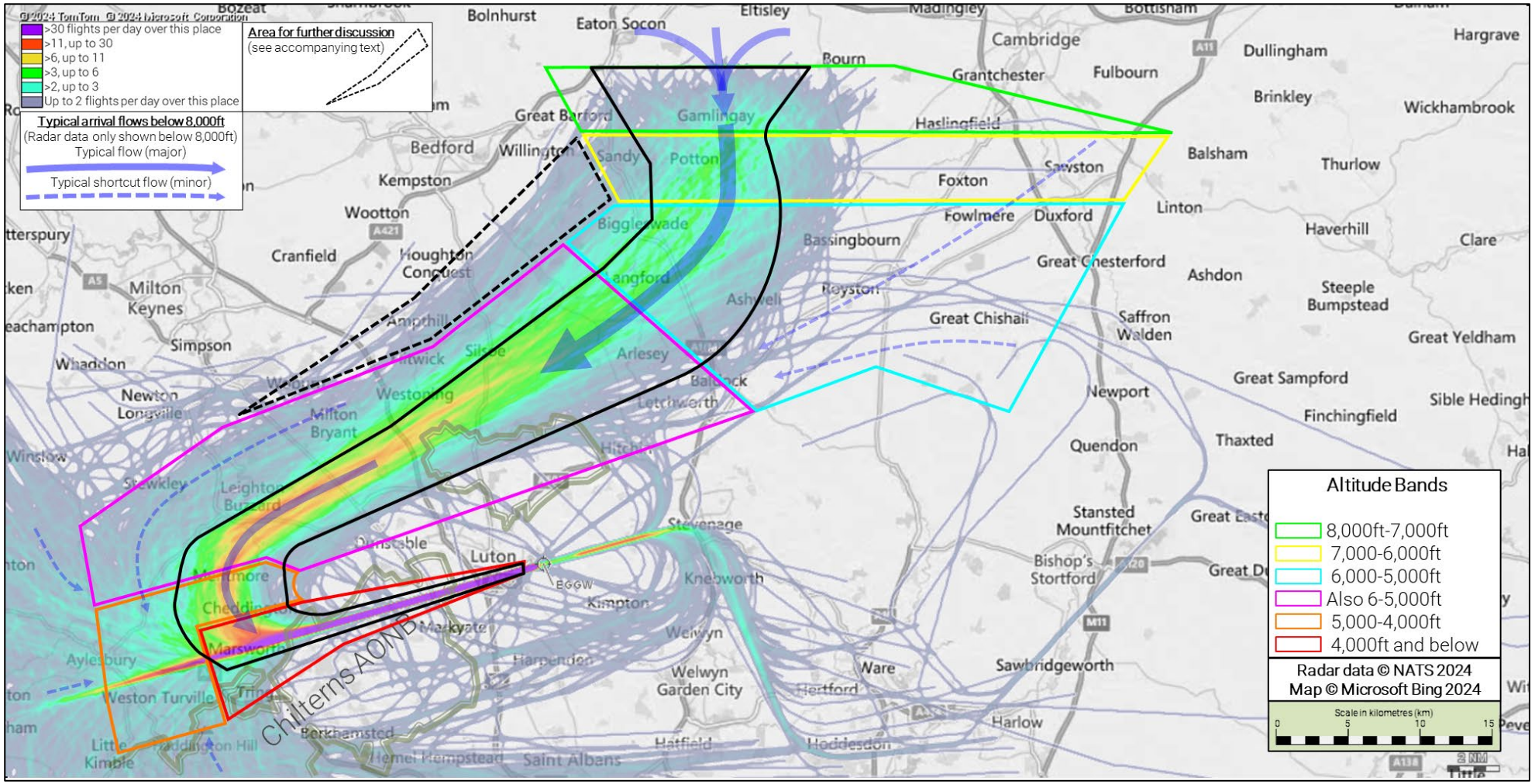

Figure 9 LLA Arrivals to Runway 07 descending from 8,000ft (7 days in June 2023 post-airspace change)

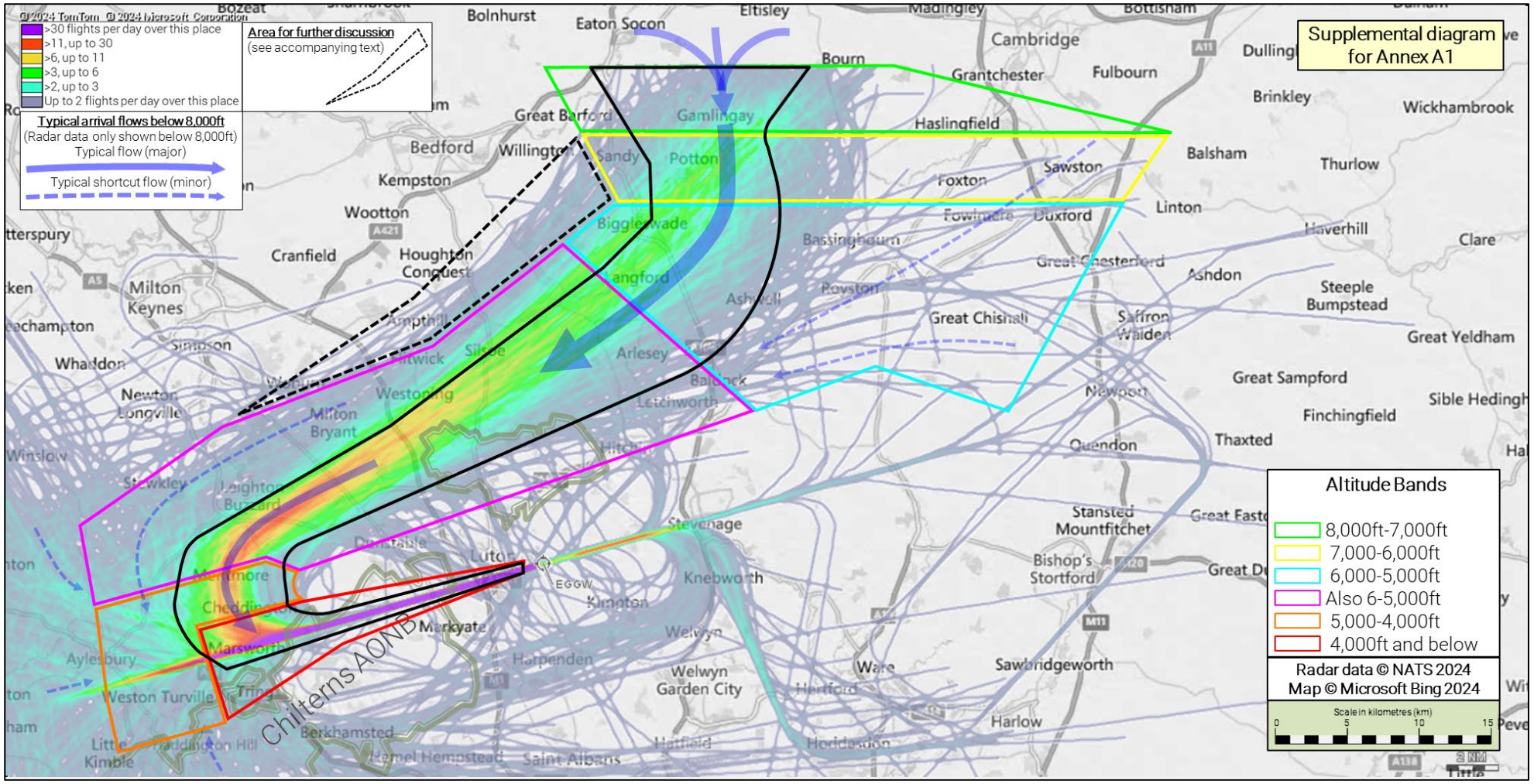

Figure 10 LLA Arrivals to Runway 07 descending from 8,000ft (7 days in September 2023 post-airspace change)

4.3.2 This subsection compares Figure 9 on p.18 (original 7 day PIR sample from June 2023) with Figure 10 on p.19 (supplemental 7 day PIR sample in September 2023). This comparison is between different 7-day periods of arrivals to Runway 07. It does not duplicate the comparison of pre and post implementation traffic from the original Annex A Traffic Dispersion document.

4.3.3 The traffic dispersion and flows shown in Figure 10 on p.19 (supplemental) are consistent with those in Figure 9 on p.18 (original PIR). There are a similar number of flights (1,353 in the original 7-day period, 1,385 in the supplemental 7-day period).

4.3.4 In the supplemental diagram, the primary flow from the north follows a similar flow pattern to the original PIR diagram. The spread of the density pattern is slightly different but are consistent with the original areas of consultation.

4.3.5 The minor southwestbound flow, positioned north of Leighton Buzzard, is present in both PIR diagrams.

4.3.6 The minor flows are similar between the supplemental diagram and the original PIR diagram.

- The minor westbound shortcut flow to the south of the airport (St Albans, Hemel Hempstead, Tring) is present and consistent in both diagrams.
- The minor shortcut flows from the northwest, west and southwest (Winslow, Aylesbury, Little Kimble) are also present and consistent in both diagrams.

4.3.7 In both diagrams there are some flights heading southwest in an area we did not expect to be overflown (Sandy-Ampthill), highlighted by the black dashed area and previously explained in the original Annex A Traffic Dispersion document, from paragraphs 4.3.21-4.3.28 on p.20-21 of that document.

4.3.8 The same explanation applies here and is not duplicated. Please see the next page for comparisons between the two PIR data samples regarding these flights over areas we did not originally expect.

(Intentionally blank for pagination)

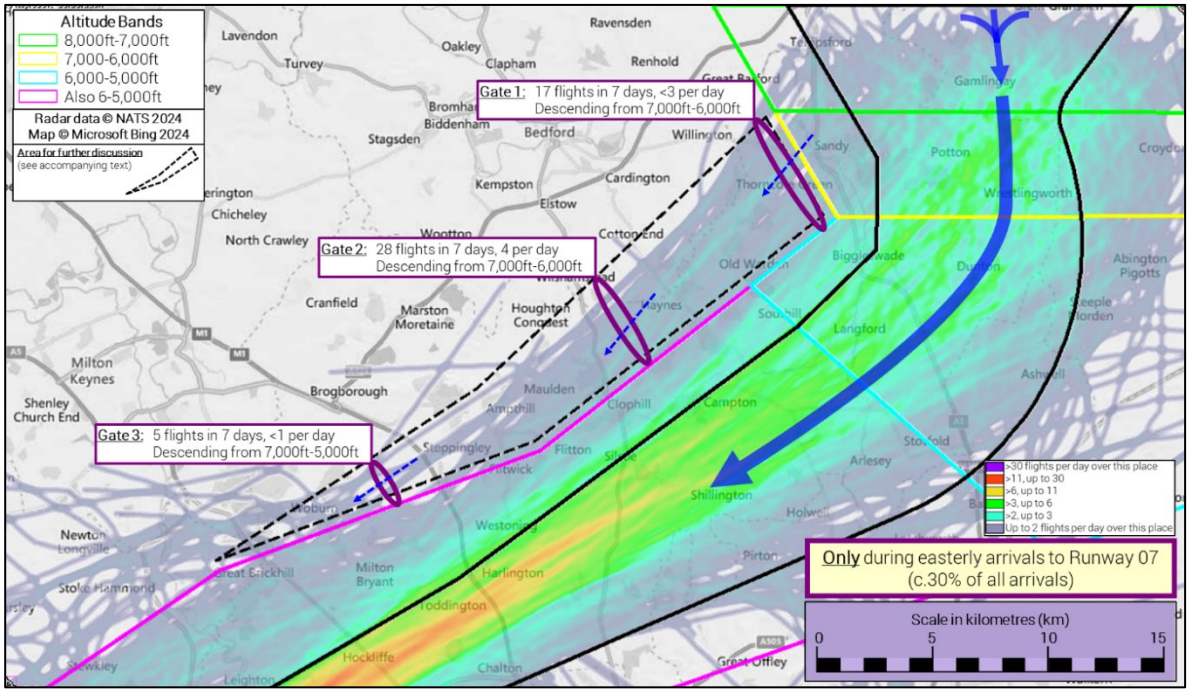

Figure 11 Arrivals outside main predicted overflight areas (7 days in June 2023 post-airspace change)

4.3.9 Both diagrams on this page analyse the number of flights in the black dashed triangle using the same analysis method as the original PIR Annex A.

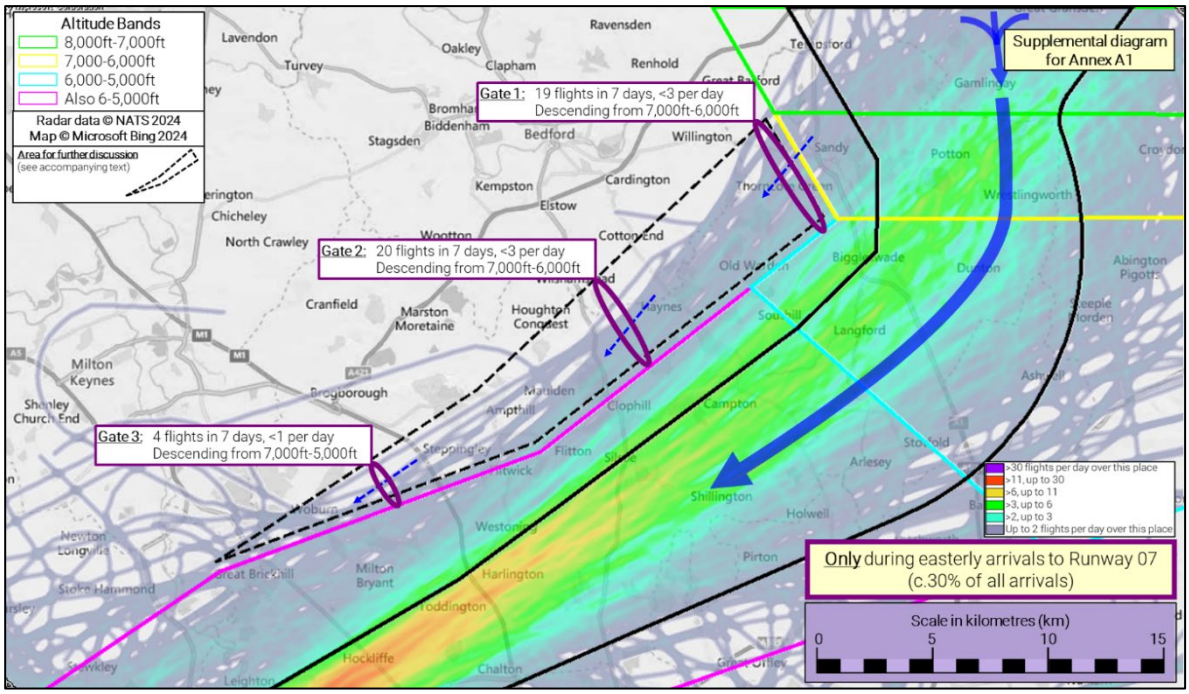

Figure 12 Arrivals outside main predicted overflight areas (7 days in Sept 2023 post-airspace change)

4.3.10 In the supplemental September data sample (top), the general arrangement was consistent with the original June sample (above), however there were slightly fewer arrivals in the black dashed area.

4.3.11 With these two diagrams we provide evidence that this consistency with the original PIR diagram demonstrates that the impacts are not significant (3-4 overflights per day between 7,000ft-5,000ft).

Arrivals to Runway 07: Illustrating the 5,000ft-4,000ft band

4.3.12 The diagrams on the next pages show flights within the 1,000ft band from 5,000ft-4,000ft, and illustrate the differences pre and post-change with the addition of a supplemental data period.

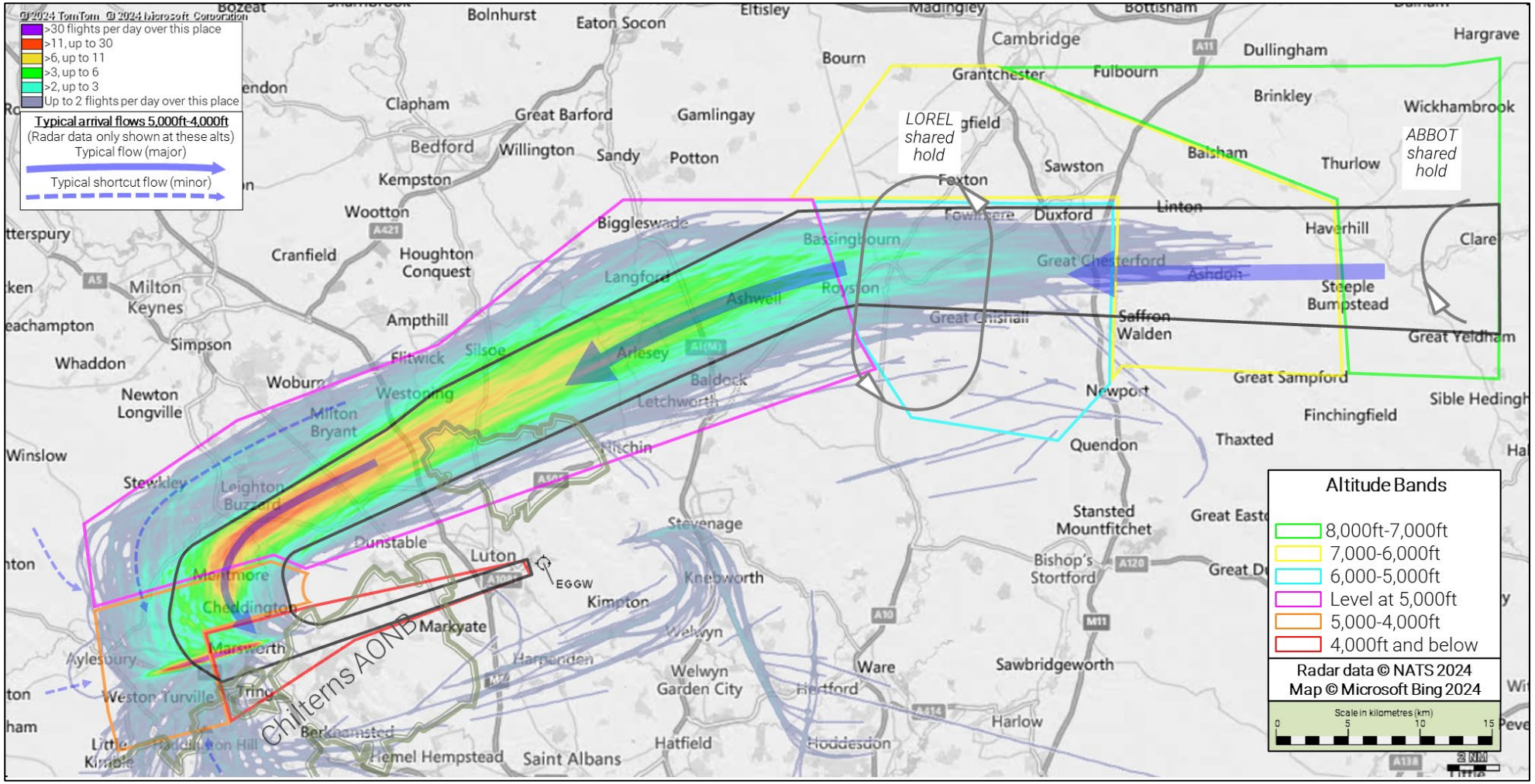

Figure 13 LLA Arrivals to Runway 07 only showing radar data from 5,000ft-4,000ft (7 days in June 2019 pre-airspace change)

4.3.13 Pre-change, as described in the original PIR Annex A, all easterly arrivals were level at 5,000ft for c.50km. This is from the vicinity of Great Chesterford/ Royston to south of the Leighton Buzzard area, where they were descended to 4,000ft and below, out of this diagram and into the subsequent set of diagrams.

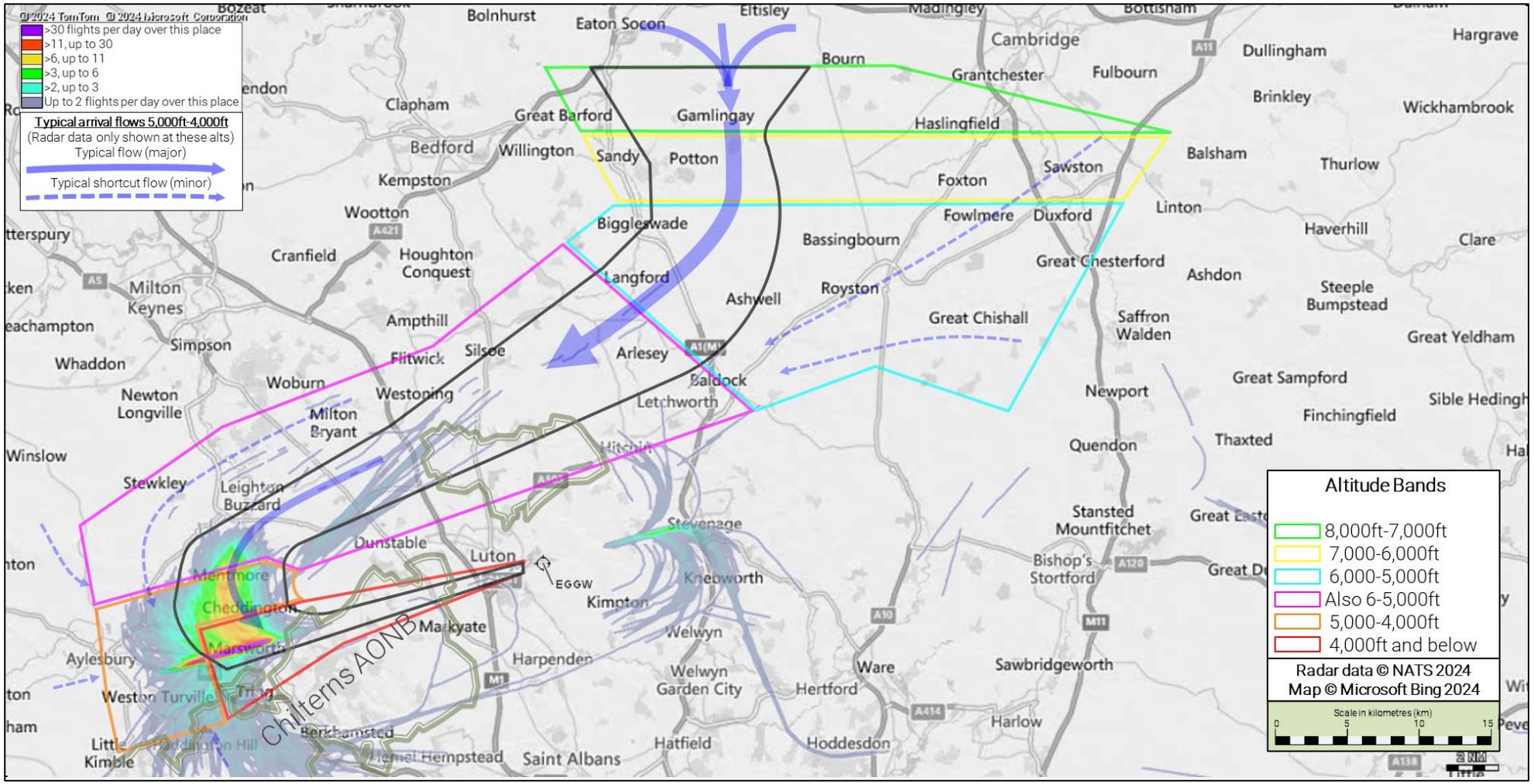

Figure 14 LLA Arrivals to Runway 07 only showing radar data from 5,000ft-4,000ft (7 days in June 2023 post-airspace change)

4.3.14 Post-change, as described in the original PIR Annex A, easterly arrivals stay higher for longer than we predicted in our consultation material. This is a positive change from our prediction because aircraft at higher altitudes produce less overall noise impact and are more fuel-efficient.

4.3.15 South of the Leighton Buzzard area they are descended to 4,000ft and below. There was a significant reduction in overflight of the northern part of the Chilterns AONB at 5,000ft.

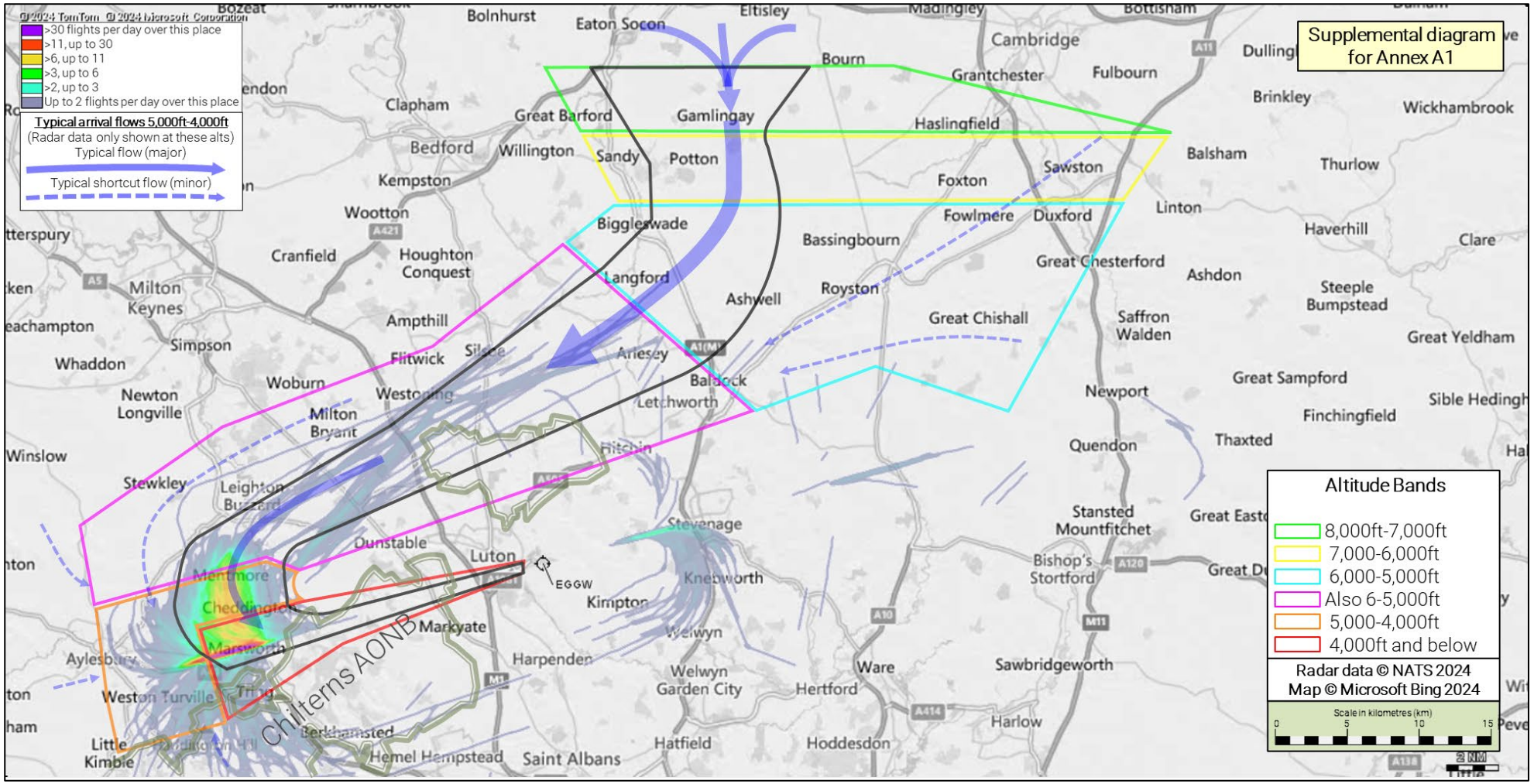

Figure 15 LLA Arrivals to Runway 07 only showing radar data from 5,000ft-4,000ft (7 days in September 2023 post-airspace change)

4.3.16 This post-change supplemental diagram is consistent with the previous diagram. In both diagrams, some flights descend from the vicinity of Westoning, and in both diagrams the main descent below 5,000ft occurs south of Leighton Buzzard, consistent with the base of controlled airspace.

4.3.17 South of the Leighton Buzzard area they are descended to 4,000ft and below.

4.3.18 The following set of diagrams show the pre and post-change flightpaths descending from 4,000ft to the easterly Runway 07.

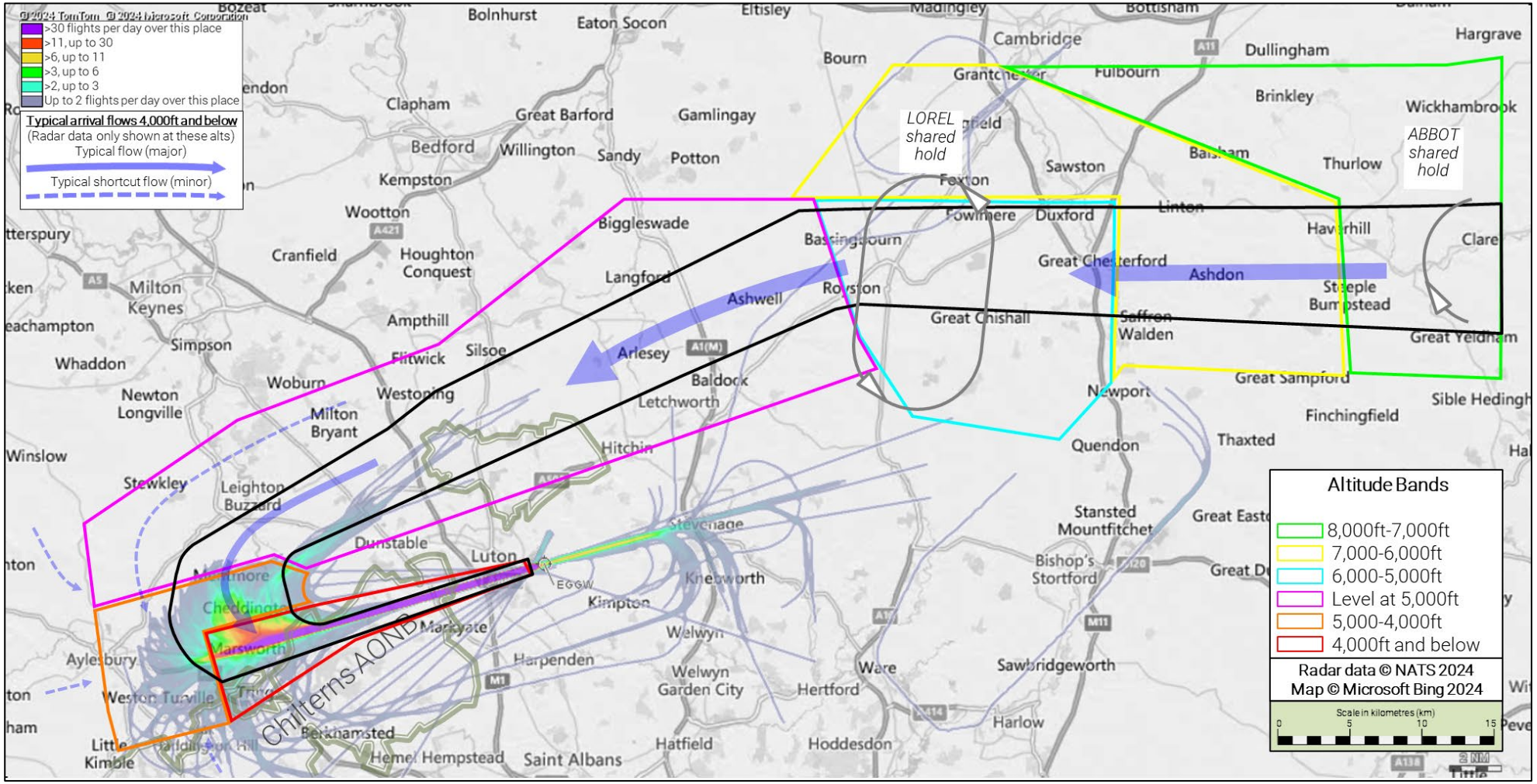

Figure 16 LLA Arrivals to Runway 07 only showing radar data from 4,000ft to land (7 days in June 2019 pre-airspace change)

4.3.19 Pre-change, as described in the original PIR Annex A, south of the Leighton Buzzard area the main arrival flow descended below 4,000ft in the Mentmore to Cheddington vicinity. Arrivals were also shortcut from the northwest, west and southwest, converging around Marsworth as they aligned with the runway on the final approach track from 3,000ft. The greatest concentration occurred on final approach from 3,000ft and below. Overflight of the southern part of the Chilterns AONB could not be avoided because it was directly under the final approach path to land on the easterly Runway 07.

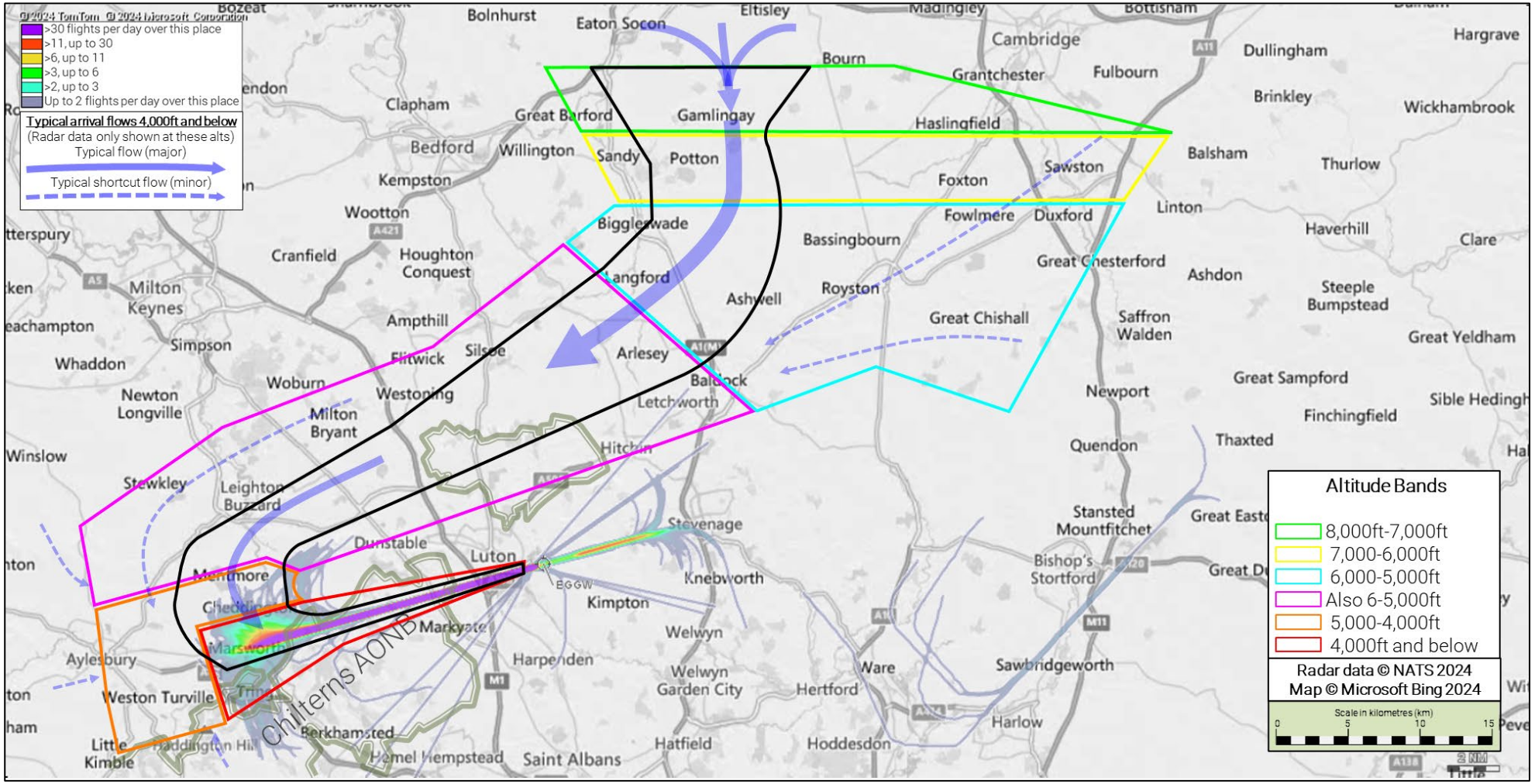

Figure 17 LLA Arrivals to Runway 07 only showing radar data from 4,000ft to land (7 days in June 2023 post-airspace change)

4.3.20 Post-change, as described in the original PIR Annex A, south of the Leighton Buzzard area the main arrival flow descends below 4,000ft in the Cheddington vicinity; this is evidence that flights remain higher for longer than the pre-change flightpath. Arrivals continue to be shortcut from the northwest, west and southwest, converging around Marsworth as they aligned with the runway on the final approach track from 3,000ft. However, the shortcut flights also tend to be higher than pre-change, not descending below 4,000ft until closer to Marsworth. The greatest concentration remains on final approach from 3,000ft and below. Overflight of the southern part of the Chilterns AONB cannot be avoided because it remains directly under the final approach path to land on the easterly Runway 07.

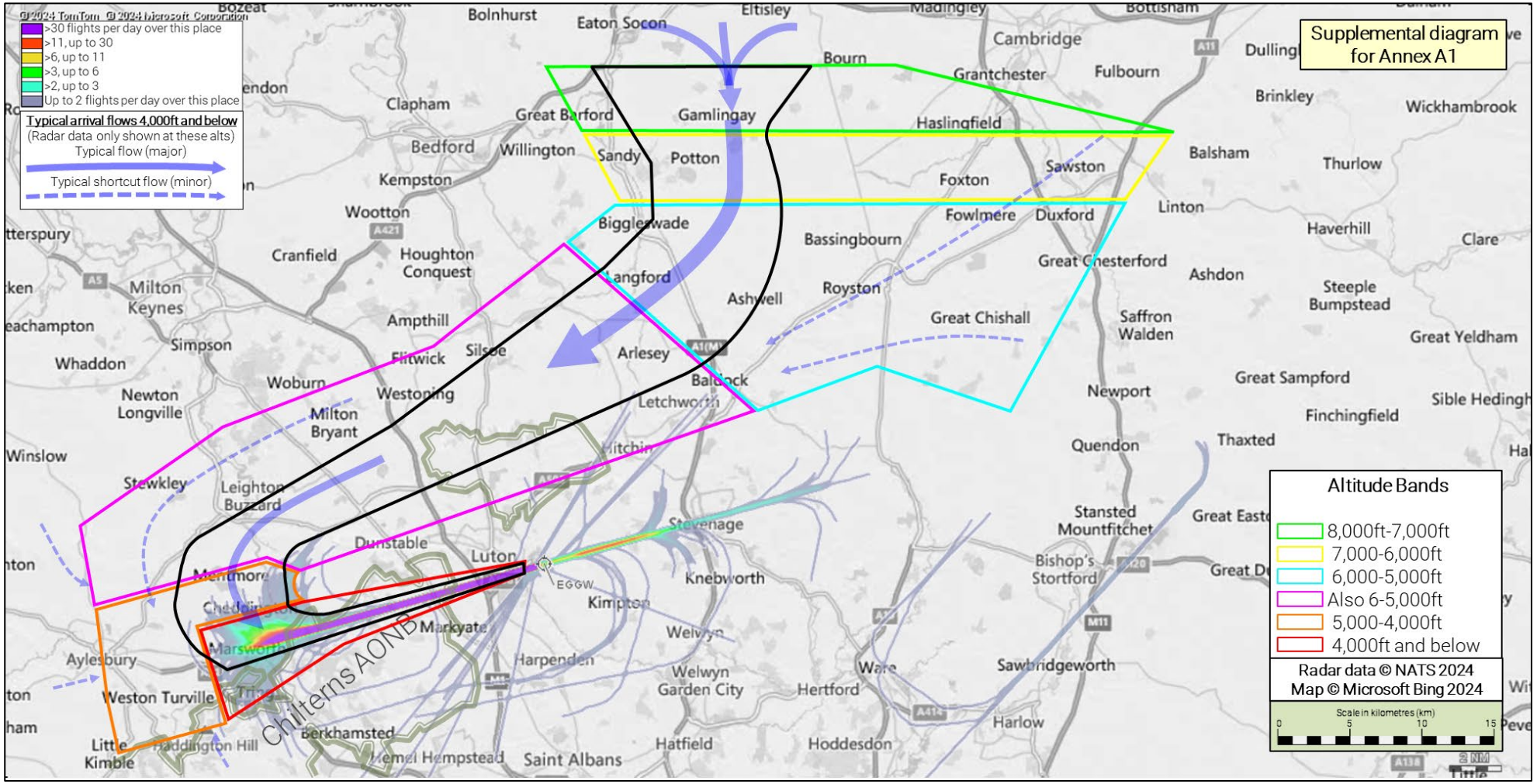

Figure 18 LLA Arrivals to Runway 07 only showing radar data from 4,000ft to land (7 days in September 2023 post-airspace change)

4.3.21 This post-change supplemental diagram is consistent with the previous diagram. In both diagrams, flight at and below 4,000ft mainly occurs as arrivals join final approach to the runway. Consistent with the previous original PIR diagram, arrivals tend to be higher than the pre-change diagram.

4.4 LLA arrivals dispersion plots: pre and post implementation and supplemental data, 8,000ft to westerly Runway 25

4.4.1 The diagrams on the following pages illustrate arrival traffic flows for westerly Runway 25. Each is followed by a narrative comparison, and includes the outline of the Chilterns AONB.

- The first set compares the entire radar data from 8,000ft to the runway
- The second set compares radar data in the 1,000ft band between 5,000ft and 4,000ft
- The third set compares radar data for the final 4,000ft to the runway

(Intentionally blank for pagination)

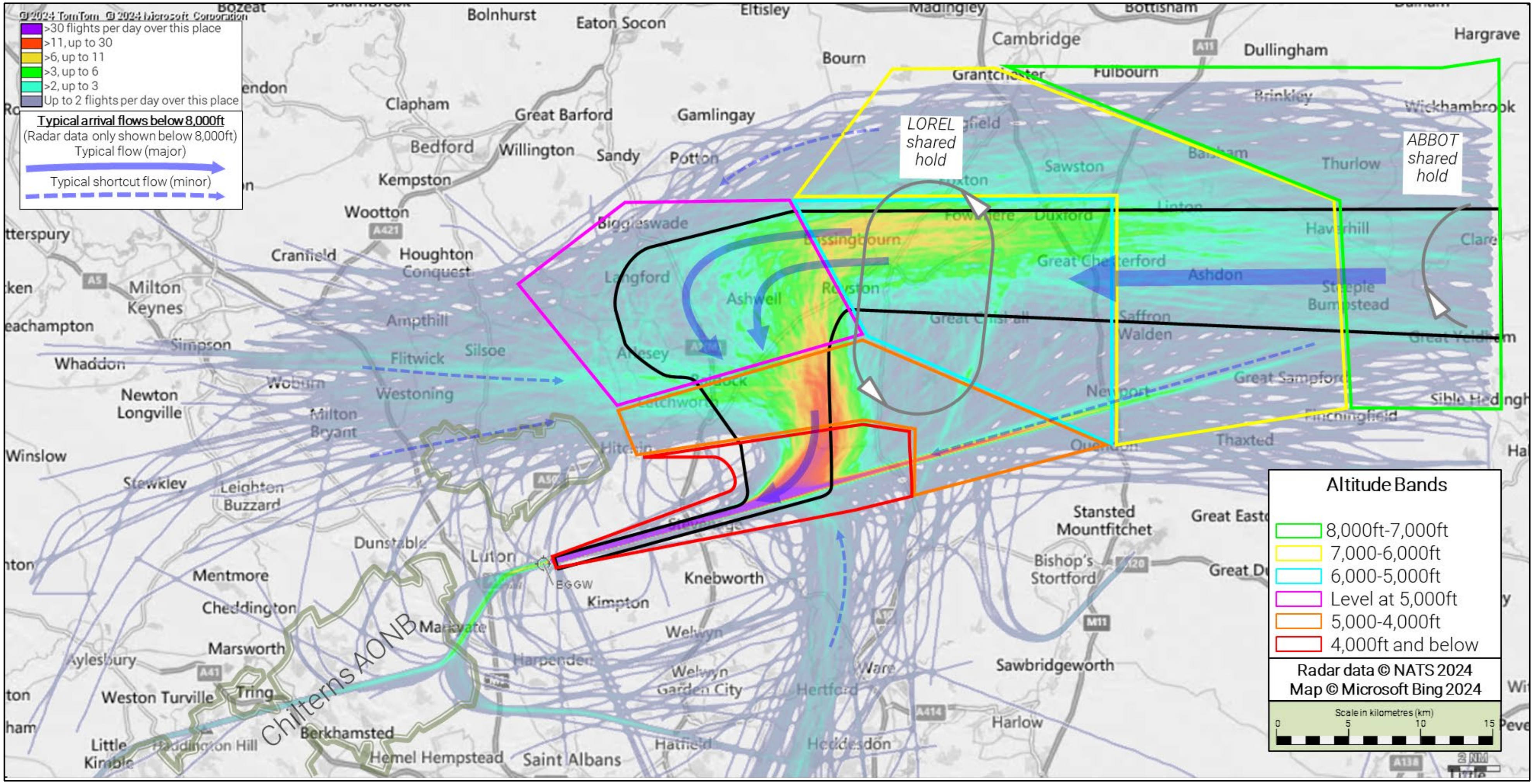

Figure 19 LLA Arrivals to Runway 25 descending from 8,000ft (7 days in June 2019 pre-airspace change)

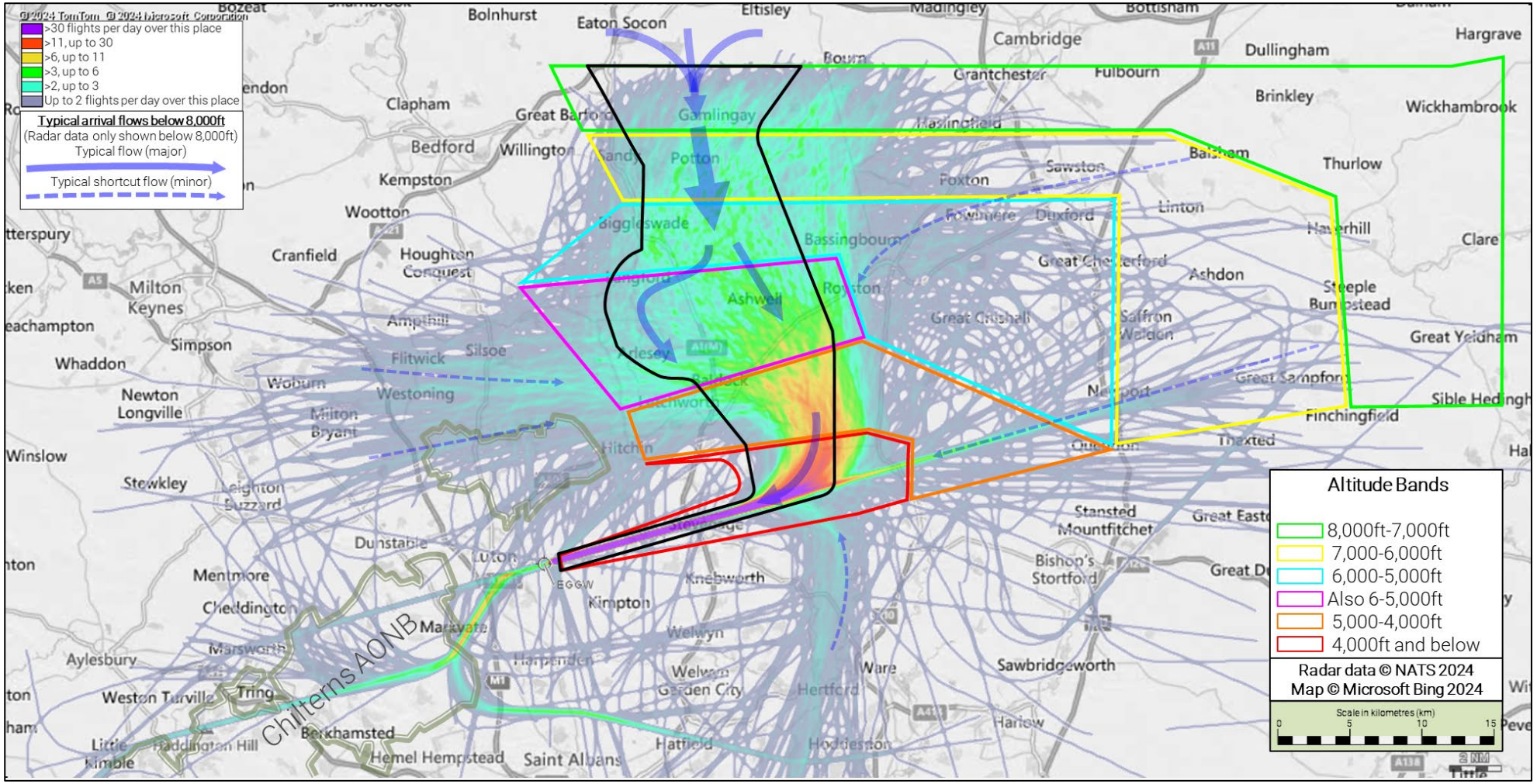

Figure 20 LLA Arrivals to Runway 25 descending from 8,000ft (7 days in June 2023 post-airspace change)

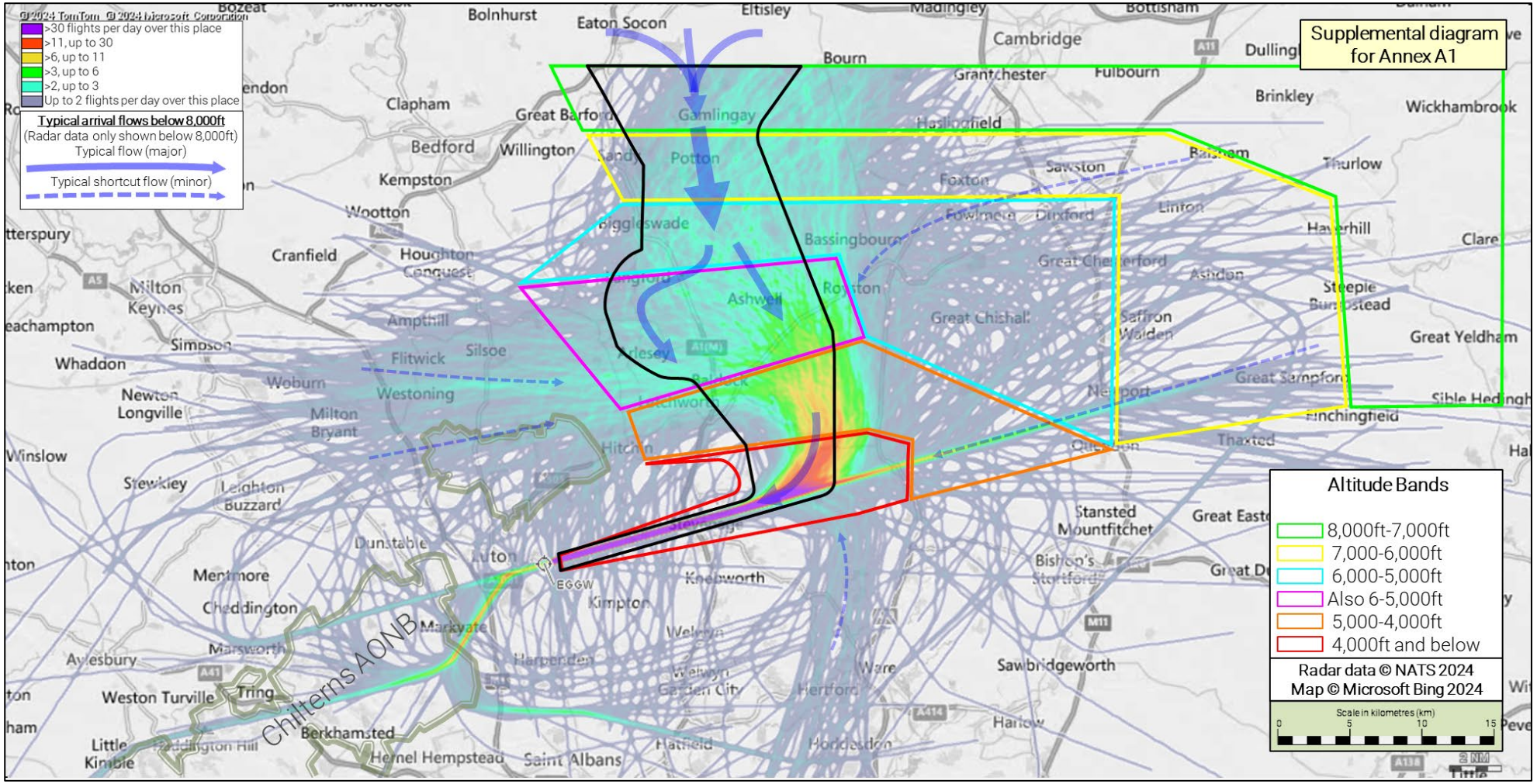

Figure 21 LLA Arrivals to Runway 25 descending from 8,000ft (7 days in September 2023 post-airspace change)

4.4.2 There are fewer flights in this spring data sample than the original PIR summer data sample (see paragraph 4.4.4 on p.32).

4.4.3 This subsection compares Figure 20 on p.30 (original 7 day PIR sample from June 2023) with Figure 21 on p.31 (supplemental 7 day PIR sample in September 2023). This comparison is between different 7-day periods of arrivals to Runway 25. It does not duplicate the comparison of pre and post implementation traffic from the original Annex A Traffic Dispersion document.

4.4.4 The traffic dispersion and flows shown in Figure 21 on p.31 (supplemental) are consistent with those in Figure 20 on p.30 (original PIR). There are fewer flights in the supplemental 7-day period (in March 2023) than the original PIR 7-day period (in June 2023)[1], however the major and minor flows are similar.

4.4.5 In the supplemental diagram, the primary flow from the north follows a similar flow pattern to the original PIR diagram. The spread and intensity of the density pattern is slightly different, most likely due to the lower traffic levels in spring rather than summer, but are consistent with the original areas of consultation.

4.4.6 The minor flows are similar between the supplemental diagram and the original PIR diagram.

- The minor eastbound flow from the west, in the Flitwick/Westoning area, is present in both PIR diagrams.
- The minor westbound shortcut flow to the south of the airport (St Albans, Hemel Hempstead, Tring) is present and consistent in both diagrams.
- The minor shortcut flows from the northwest, west and southwest (Winslow, Aylesbury, Little Kimble) are also present and consistent in both diagrams.

Arrivals to Runway 25: Illustrating the 5,000ft-4,000ft band

4.4.7 The diagrams on the next pages show flights within the 1,000ft band from 5,000ft-4,000ft, and illustrate the differences pre and post-change with the addition of a supplemental data period.

(Intentionally blank for pagination)

[1] See paragraph 4.1.4 on p.15.

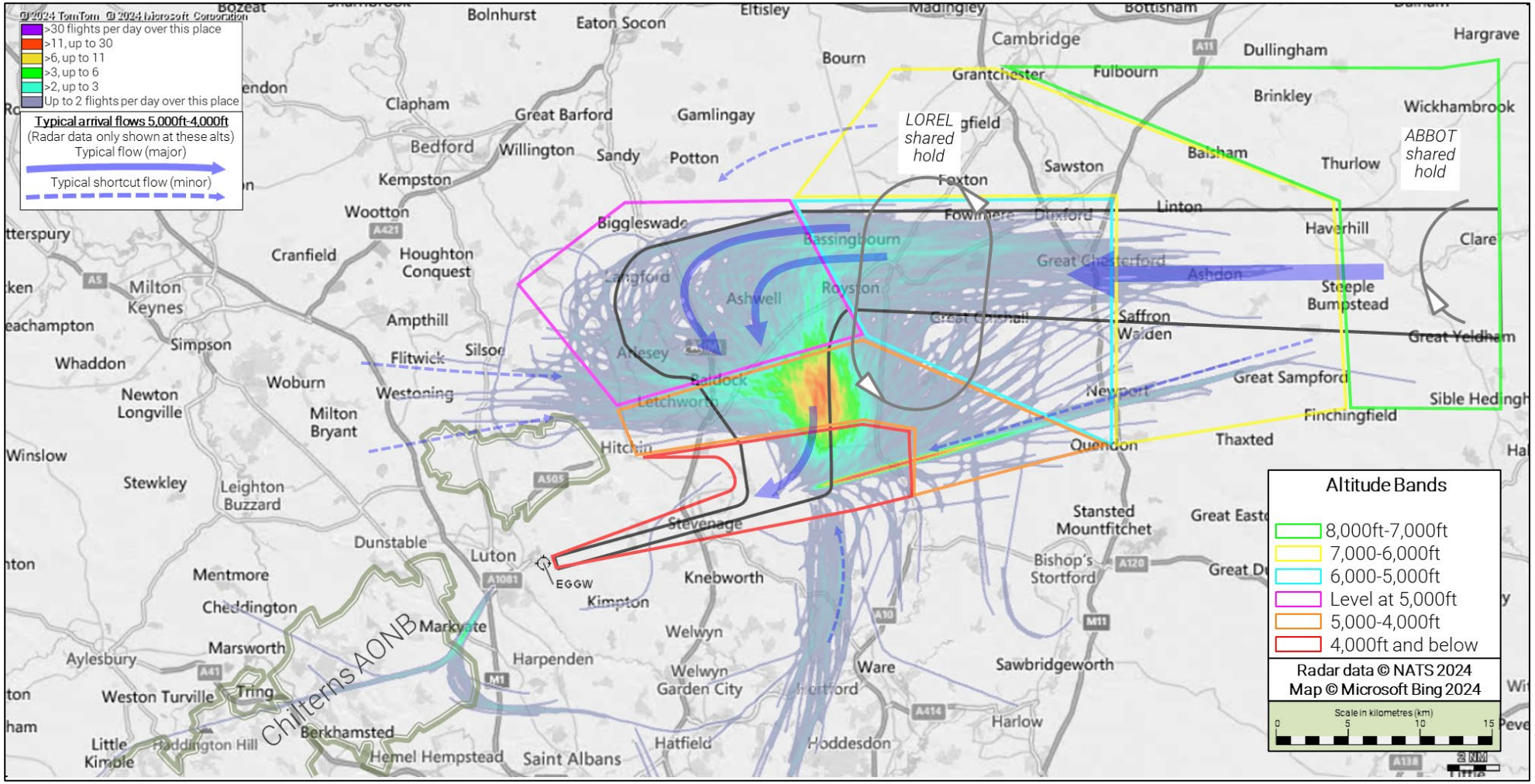

Figure 22 LLA Arrivals to Runway 25 only showing radar data from 5,000ft-4,000ft (7 days in June 2019 pre-airspace change)

4.4.8 Pre-change, all westerly arrivals were level at 5,000ft for c.15km. This is from east of Royston to the Baldock area (pink polygon), where they were descended to 4,000ft. On reaching the southern edge of the orange polygon they were descended below 4,000ft, out of this diagram and into the subsequent set of diagrams.

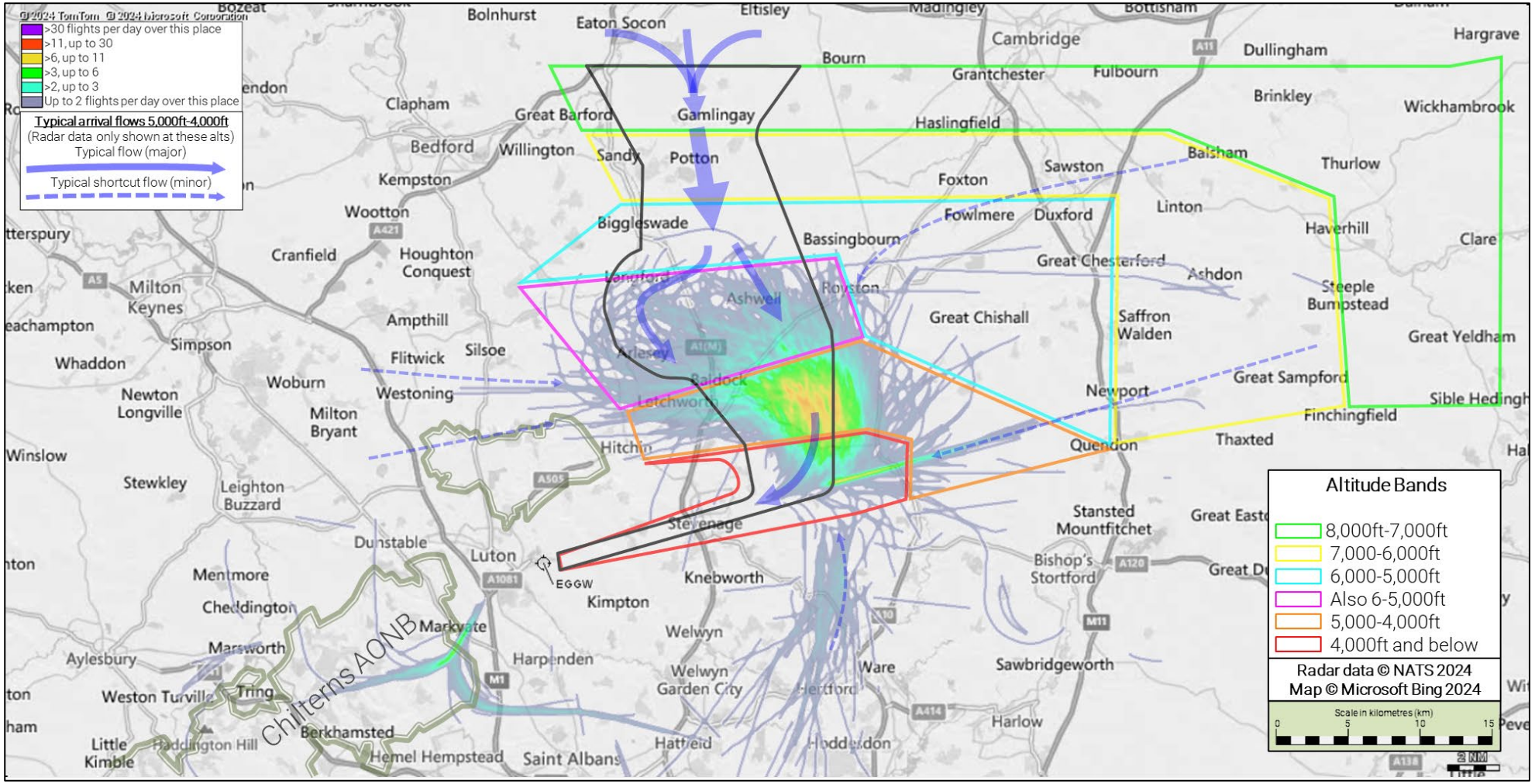

Figure 23 LLA Arrivals to Runway 25 only showing radar data from 5,000ft-4,000ft (7 days in June 2023 post-airspace change)

4.4.9 Post-change, westerly arrivals stay slightly higher for longer than we predicted in our consultation material. This is consistent with, or a positive change from, our prediction because aircraft at higher altitudes produce less overall noise impact and are more fuel-efficient.

4.4.10 On reaching the southern edge of the orange polygon they are descended below 4,000ft, out of this diagram and into the subsequent set of diagrams, which show the pre and post-change flightpaths descending from 4,000ft to the westerly Runway 25.

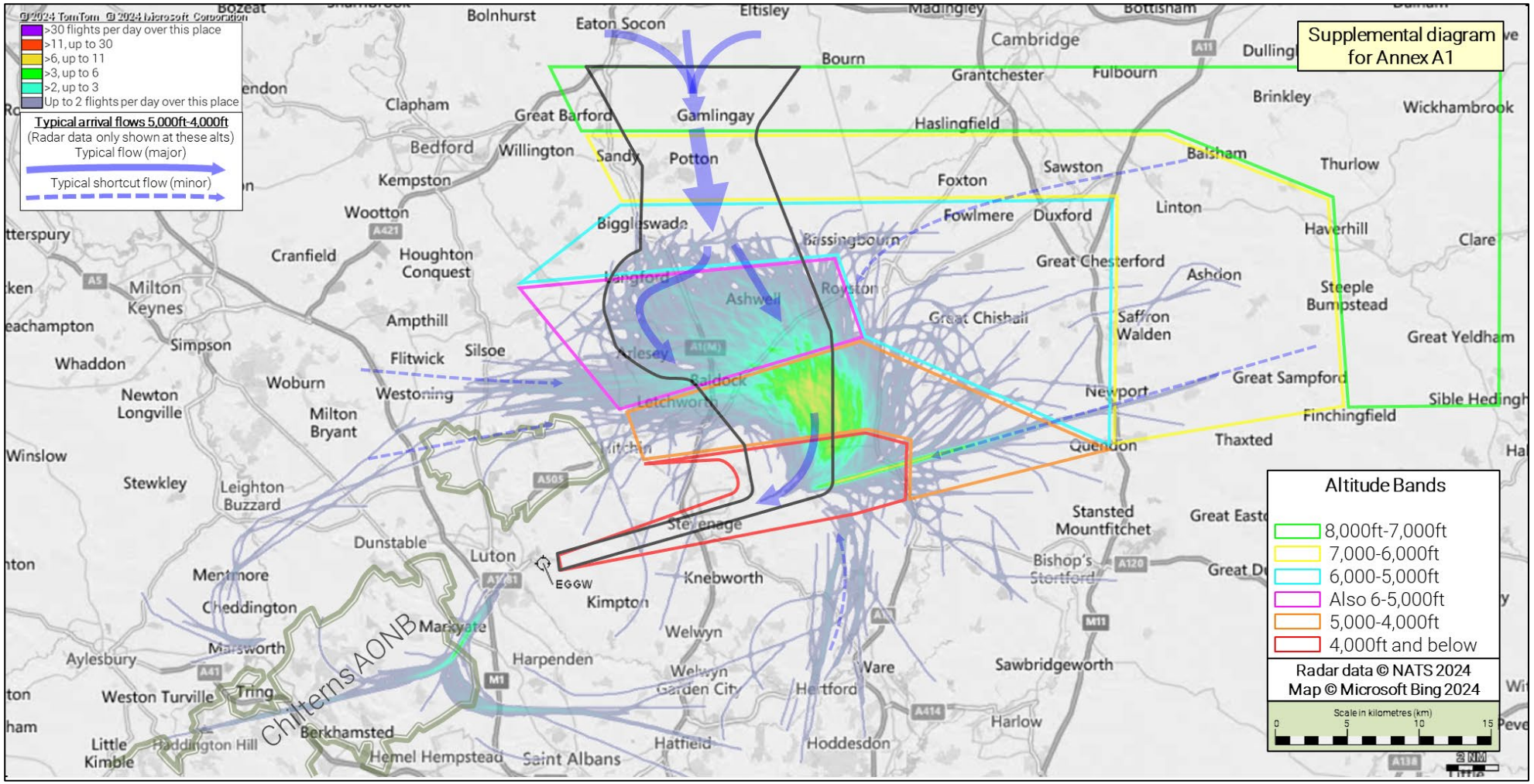

Figure 24 LLA Arrivals to Runway 25 only showing radar data from 5,000ft-4,000ft (7 days in September 2023 post-airspace change)

4.4.12 This post-change supplemental diagram is consistent with the previous diagram. In both diagrams, some flights arrive from the west and the south, with additional minor flows straight in from the east and some from the northeast. The main density patterns are consistent, with the intensity being lighter in the supplemental diagram. There are fewer flights in this spring data sample than the original PIR summer data sample (see paragraph 4.4.4 on p.32).

4.4.13 South of the orange area they are descended to 4,000ft and below.

4.4.14 The following set of diagrams show the pre and post-change flightpaths descending from 4,000ft to the westerly Runway 25.

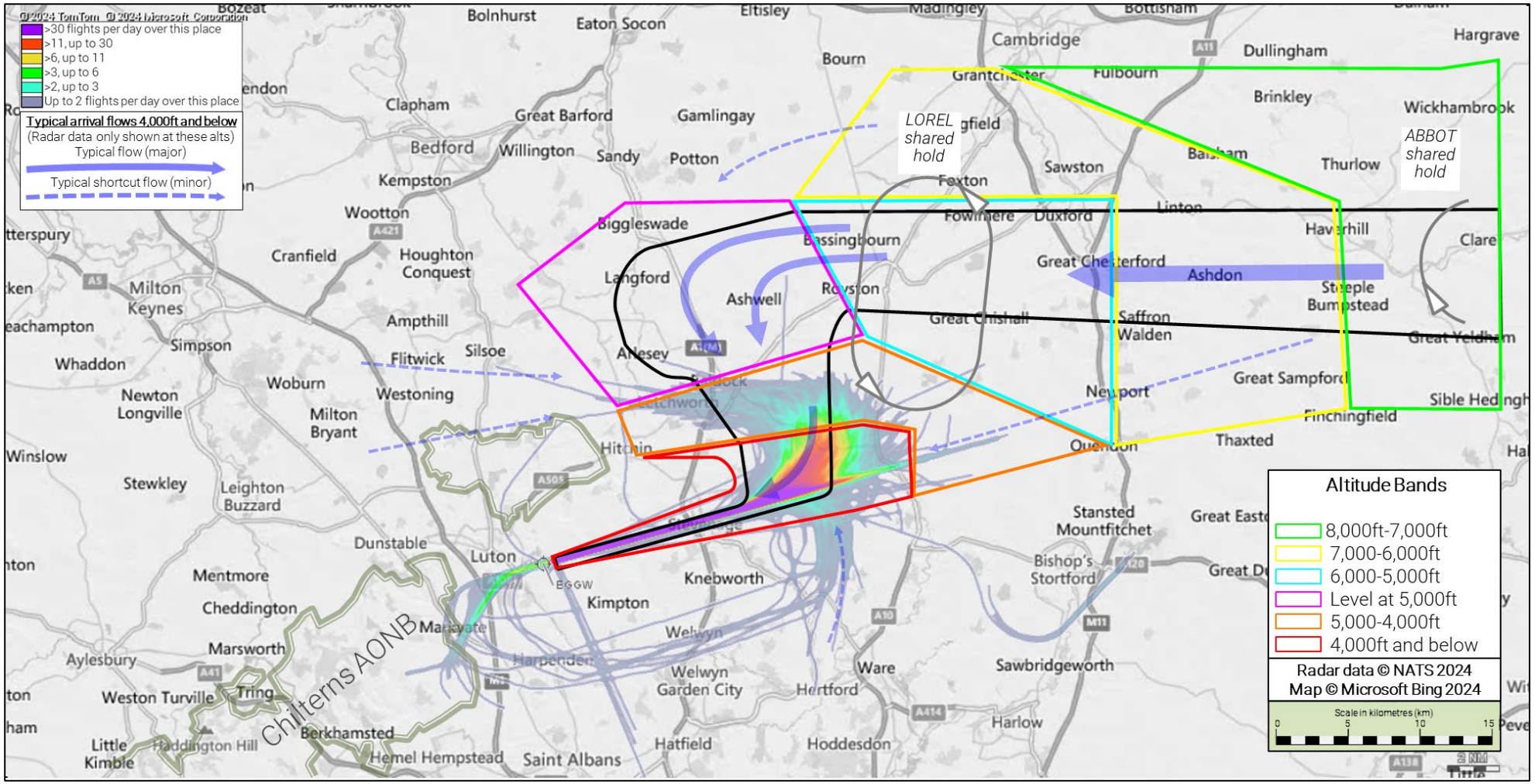

Figure 25 LLA Arrivals to Runway 25 only showing radar data from 4,000ft to land (7 days in June 2019 pre-airspace change)

4.4.15 Pre-change, as described in the original PIR Annex A, the main arrival flow descended below 4,000ft at the southern edge of the orange polygon [in the vicinity of Buntingford, Throcking, Cottered and Weston, not shown on this map]. Arrivals were also shortcut from the northwest and west, converging with that main flow east of the A1 past Letchworth. The main flow descended to 3,000ft and was turned to align with the runway on the final approach track from 3,000ft towards Stevenage. The greatest concentration occurred on final approach from 3,000ft and below. There were other shortcut flows from the east and southeast. There was minimal overflight of the Chilterns AONB below 4,000ft.

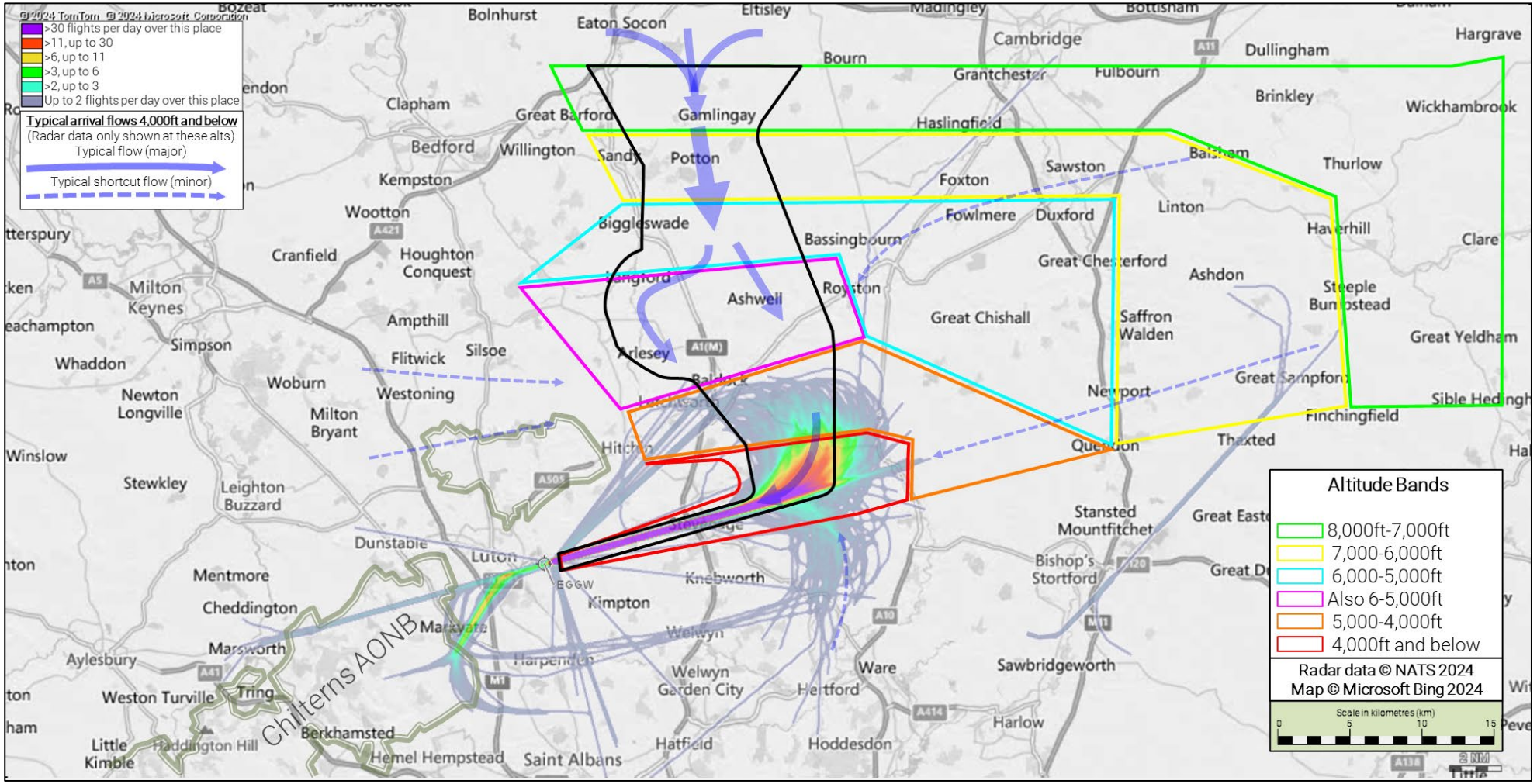

Figure 26 LLA Arrivals to Runway 25 only showing radar data from 4,000ft to land (7 days in June 2023 post-airspace change)

4.4.16 Post-change, as described in the original PIR Annex A, the main arrival flow is consistent with the pre-change flightpaths. It descends below 4,000ft at the southern edge of the orange polygon [in the vicinity of Buntingford, Throcking, Cottered and Weston, not shown on this map]. Arrivals are also shortcut from the northwest and west, converging with that main flow east of the A1 past Letchworth, staying slightly higher than the pre-change shortcut flow. The main flow descends to 3,000ft and is turned to align with the runway on the final approach track from 3,000ft towards Stevenage. The greatest concentration continues to occur on final approach from 3,000ft and below. There are other shortcut flows from the east and southeast, similar to the pre-change shortcuts. There was minimal overflight of the Chilterns AONB below 4,000ft. Note there are a small number of erroneous radial 'spikes' displayed emanating from LLA; these are data display errors of the tool used to create the image and are not actual flights.

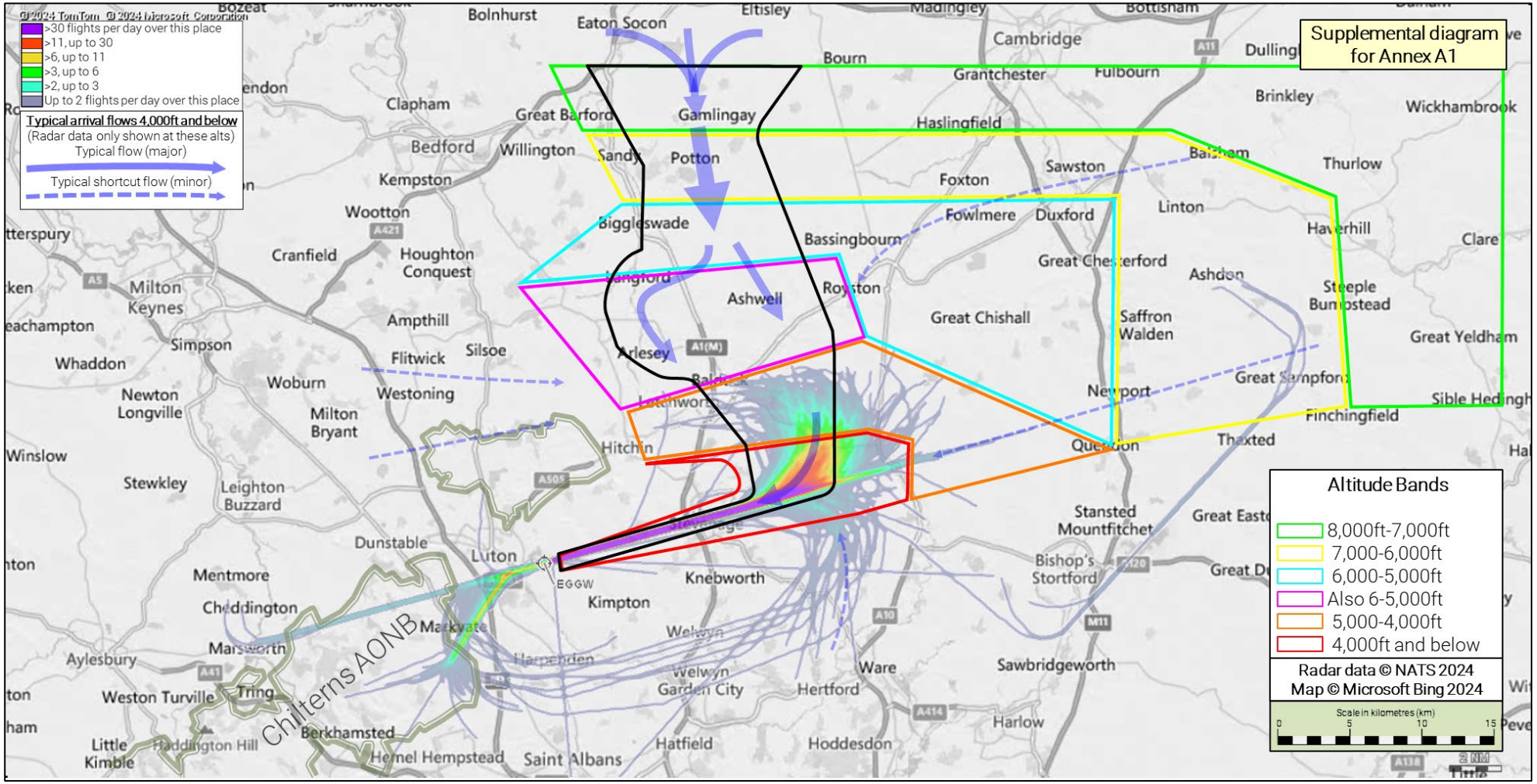

Figure 27 LLA Arrivals to Runway 25 only showing radar data from 4,000ft to land (7 days in September 2023 post-airspace change)

4.4.17 This post-change supplemental diagram is consistent with the previous diagram. In both diagrams, flight at and below 4,000ft mainly occurs as arrivals merge to join final approach to the runway.

4.4.18 There are fewer flights in this spring data sample than the original PIR summer data sample (see paragraph 4.4.4 on p.32).

5. Conclusions on traffic dispersion, with supplemental data

5.1 CAA additional PIR items satisfied

5.1.1 Up to this point in the document, the following supplemental CAA clarifications are covered:

CAA08	*Supplemental dispersion data plots (additional 2 periods of 7 days each)*
CAA09	*Summary of how the density concentration colours are calculated*
CAA16	*Place name visibility on background maps vs. reference within the narrative*

5.1.2 For details of high level arrivals see section 3 from p.6, and for arrival flightpaths below 8,000ft see section 4 from p.16. Each section is divided into easterly arrivals to Runway 07 and westerly arrivals to Runway 25.

5.2 Conclusion: Supplemental diagrams are consistent with original PIR diagrams

5.2.1 The supplemental diagrams show traffic flows and dispersion in these separate data samples are consistent with those in the original PIR Annex A.

5.2.2 Some natural variation was expected (see paragraph 1.1.5 on p.4) and can be seen in the diagrams, however the main flows and common minor flows are consistent.

5.2.3 This includes consistency regarding the overflight above 5,000ft of an area outside the main predicted overflight areas. When easterly Runway 07 is in service (c.30% of the year) a small number of aircraft overfly a small triangular region north of the predicted main pink polygon. In our original 7-day data sample, this averaged up to 4 per day between 7,000ft-6,000ft, and fewer than 1 per day on average between 7,000ft-5,000ft. Our supplemental 7-day data sample was consistent with those daily averages.

5.2.4 This consistency demonstrates that the actual traffic flows operate within acceptable tolerances of the original ACP predictions.

6. Noise Metrics, Contours and Diagrams

6.1 About the Noise Technical Report Issue 2.0 (Ref 3C)

6.1.1 We commissioned a technical report to meet the PIR specifications agreed with the CAA, covering PIR Items 49g-j, 49l-o. This was originally published as Issue 1.0.

6.1.2 The CAA requested additional technical information (see Ref 3A, CAA PIR Data Report Clarification Request Document, questions CAA13 and CAA17).

6.1.3 To address those questions, we recommissioned our noise consultants to produce Issue 2.0 of the noise technical report (Ref 3C, published on the CAA airspace change portal).

6.1.4 Issue 2.0 has a new Section 6 to provide additional overflight data, a new Section 7 to explain the differences between forecast results and actual results, and an updated conclusion in Section 8 (reproduced below).

6.1.5 The rest of the Issue 2.0 technical report remains the same as Issue 1.0, apart from some minor typo corrections.

6.1.6 Please read sections 3.2 on p.6 and 4.2 on p.16, both of which summarise the Government guidance regarding noise impacts at & above 7,000ft, and below 7,000ft, respectively.

6.2 Updated Conclusion (extract from noise technical report)

6.2.1 For the PIR, this report has considered three different comparisons between the pre and post AD6 scenarios to analyse the impacts of the implemented airspace:

- '2023 Actual' vs '2023 without AD6';
- 'Option 1A – Final Design in the implementation year' Vs 'Option 1A – with AD6 airspace configuration as occurred';
- 'Option 1A – with AD6 airspace configuration as occurred' vs 'Option 0 – Baseline do-nothing in the implementation Year'.

6.2.2 The first comparison has considered operations in 2023 adopting airspace assumptions that reflect the airspace before and after the implementation of the AD6 airspace change. This comparison utilises the same fleet mix and number of aircraft operations as actually occurred in 2023. The only difference between the two scenarios is about the routes which reflect the ground tracks and route utilisations before and after the implementation of AD6. Since the two models share a majority of the same modelling assumptions, this comparison is deemed to be the most reliable across the three to present the direct impacts of the AD6 airspace change. The analysis of this first comparison has shown no discernible differences in terms of population exposed to the various levels of LA_{eq16h} and LA_{eq8h} noise exposure and contour areas. Small differences are observed for the N60 metric specifically in locations influenced by easterly arrivals. This is due to the presence of the S3 route in which aircraft coming from the east join the final approach from the south. As the traffic is almost evenly split between the main vector and the S3 route, the N60 rate 5 and N60 rate 10 contours are more pronounced to the south, causing a difference of $2km^2$ compared to the pre AD6 scenario.

6.2.3 No significant differences have been found in the overflight comparison between the pre-AD6 and the post-AD6 airspace implementation up to either 1,000ft or 1,640ft which suggests that there are no impacts on both local air quality and biodiversity caused by the implementation of AD6 airspace.

6.2.4 For the other two comparisons, differences have been identified in the night-time period outcomes. Such differences are mainly attributable to:

- A lower utilisation of the vectoring routes during night-time and the consequential higher utilisation of the shortcuts occurred in 2023 compared to the assumptions of the 2021 forecast;
- A different utilisation of the shortcut routes compared to the advice for the design;
- A different dispersion pattern of the vectored arrivals compared to the one assumed in the Stage 3 design; and
- The combinative effect of the above on increasing modelled concentration along the final approach.

6.2.5 The differences between the actual and assumed dispersion pattern and in the shortcut route utilisation resulted in a higher concentration of modelled flights on the final approach for 'Scenario 4 with AD6 as occurred', compared to the 2021 forecast scenarios modelled for the Final Option Appraisal.

6.2.6 Whilst the differences to the east of the airport under westerly arrivals at night are primarily due to differences in the assumptions used for the FOA with observed route usage at night, the other differences identified are due to the consequence of different modelled dispersion patterns.

6.2.7 When modelling aircraft noise, a decision is required as to where the dispersion pattern is modelled for each route. When the dispersion pattern is broad or generally even, this can have the effect of reducing the size of noise contours. This effect is observed in the comparisons presented in this PIR.

6.2.8 At the time of the FOA in 2020, there was no guidance on aircraft noise modelling beyond the general provision provided in the noise calculation methodology. CAA guidance followed in 2021 with the publication of CAA's CAP 2091 'Minimum Standard for Noise Modelling' which states that for the most sophisticated noise models, track-keeping data is to be used to calculate the dispersion of aircraft either side of the mean track. However CAP2091 does not provide any guidance as to how this should be calculated. Moreover, if dispersion around the nominal track is based on ECAC Doc. 29 guidance, they could differ from the actual dispersion patterns of an airport.

6.2.9 In the context of the WebTAG outcomes the main differences are driven by differences in night-time route use assumptions in combination with different modelled dispersion patterns. These factors result in the population exposed to levels of LOAEL and above to the east of the airport being increased.

6.2.10 It should be noted that LA_{eq} analysis of the '2023 Actual' Vs '2023 Without AD6' where assumptions are consistent show either no or minimal differences between the pre and post AD6 implementation scenarios. This is a strong indicator of the importance of dispersion and route usage assumptions on outcomes and that comparisons of forecasts compared to actuals are challenging.

6.2.11 Based on the environmental analysis that has been carried out for the PIR, it is therefore concluded that there is no significant difference between the pre and post implementation of AD6 for the metrics and thresholds indicated in policy (i.e. 51dB LA_{eq16h} and 45dB LA_{eq8h}) and no impacts on both local air quality and biodiversity which are caused by the implementation of AD6 airspace.

End of Annex A1: Supplemental Traffic Dispersion Data