TECHNICAL NOTE (v2):
Glasgow Prestwick Airport – New Routes ACP Noise Assessment

Introduction

This technical note summarises the noise modelling work undertaken by ERCD on behalf of NATS for the Glasgow Prestwick Airspace Change Proposal (ACP), to meet the requirements of CAP 725. The ACP proposes new RNAV SIDs and arrival routes for the main runway, 12/30.

Methodology

The following noise contours have been calculated using the ANCON noise model (v2.3):

- 51-72 dBA Leq contours (plotted at 3 dB intervals) assuming the current SIDs and arrival routes in 2018;
- 51-72 dBA Leq contours (plotted at 3 dB intervals) with the airspace change implemented in 2018;
- 51-72 dBA Leq contours (plotted at 3 dB intervals) for the forecast year 2023 with the airspace change implemented; and
- 80 and 90 dBA SEL footprints for the most frequent and noisiest aircraft types currently operating at night, for the existing and proposed routes.

Leq contours

The Leq contours were based on forecast traffic data for the 92-day summer period (16 June – 15 September, 0700-2300 local time), which were supplied by NATS for the forecast years 2018 and 2023. Total departure and arrival movement numbers by ANCON aircraft type were determined. SID distribution statistics for each runway direction by ANCON type were calculated for 2018 for the current and proposed routes, and for 2023 for the proposed routes, based on data provided by NATS. These distributions were applied to the total summer period daytime departure traffic. This enabled the modelling of an average '100% westerly' and '100% easterly' summer day, i.e. what would have occurred had all the traffic operated in a single runway direction. The single mode results could then be combined with the long-term runway split to produce average mode contours. Based on Prestwick runway usage data for the 10-year period 2007-2016, the long-term average summer day modal split was calculated to be 68% west / 32% east for the main runway (12/30). This runway modal split was assumed for all the Leq contours produced.

Only fixed-wing movements have been considered by this assessment. The secondary cross-runway (03/21) has not been included in the modelling as average daily fixed-wing movements on it will be very low (approximately 5 in 2018 and 7 in 2023) and the majority will be single-piston engine aircraft. Thus, the cross-runway noise contribution will be negligible.

The flight track coordinates of the current nominal SIDs at Glasgow Prestwick Airport were supplied by NATS (**Figure 1**). Representative lateral spread was applied to the current nominal departure tracks in the modelling. NATS also provided flight track coordinates for each of the proposed SIDs (**Figure 2**). Spreads reflecting RNAV procedures were modelled for all the new SIDs.

For the Leq contours, simplified 'straight-in' arrival tracks along the Runway 12/30 extended centreline were assumed.

All flight profiles of height, speed and thrust were based on proxy 2015 data from Gatwick as they would be representative of operations at Glasgow Prestwick Airport. The steeper 3.5 degree glideslope for Runway 30 arrivals was taken into account in the modelling.

The effects of the surrounding topography were modelled using *Meridian 2 Gridded Heights* terrain data obtained from Ordnance Survey. Extensive areas of higher ground are found especially to the south-east of the airport, which results in increased noise levels as the aircraft noise source is brought closer to the receiver.

SEL footprints

SEL footprints were produced for the most frequent and noisiest aircraft types that operate at night (2300-0700 local time) over the 2016 summer period at Glasgow Prestwick Airport, for each of the current and proposed routes. The footprints are plotted at 80 and 90 dBA SEL. The most frequent type at night was the Boeing 737-800 (ANCON type 'B738'), whilst the noisiest type was the Boeing 747-8F (ANCON type 'B748').

Because of the size of the B748 80 dBA SEL footprints, extended arrival routes (as shown in **Figure 3**) were modelled for the B748 instead of simple 'straight-in' arrival tracks. For the current situation, these were estimated from radar track 'heat maps' supplied by NATS. NATS provided coordinates for all the proposed arrival routes.

As with the Leq contours the effects of the surrounding topography were modelled using *Meridian 2 Gridded Heights* terrain data.

Results

Leq contours

The 2018 Leq noise contours modelled with the current SIDs are shown in **Figure 4**. The estimated areas, populations and households within the contours are summarised in **Table 1**. The population database used was a 2016 update of the 2011 Census supplied by CACI Ltd.

The contour results for the 2018 Leq contours with the airspace change implemented are shown in **Figure 5**. Estimated areas, populations and households within the contours are given in **Table 2**.

The contour results for the 5-year forecast 2023 Leq contours with the airspace change are shown in **Figure 6.** Estimated areas, populations and households within the contours are given in **Table 3**.

SEL footprints

SEL footprints have been generated for each of the current and proposed departure and arrival routes on Runways 12 and 30. Separate diagrams are provided for each aircraft type and runway direction as follows:

- Boeing 737-800 (B738) on RWY 12 current SIDs – **Figure 7**
- Boeing 737-800 (B738) on RWY 30 current SIDs – **Figure 8**
- Boeing 737-800 (B738) on RWY 12 current arrival routes – **Figure 9**
- Boeing 737-800 (B738) on RWY 30 current arrival routes – **Figure 10**

- Boeing 737-800 (B738) on RWY 12 proposed SIDs – **Figure 11**
- Boeing 737-800 (B738) on RWY 30 proposed SIDs – **Figure 12**
- Boeing 737-800 (B738) on RWY 12 proposed arrival routes – **Figure 13**
- Boeing 737-800 (B738) on RWY 30 proposed arrival routes – **Figure 14**

- Boeing 747-8F (B748) on RWY 12 current SIDs – **Figure 15**
- Boeing 747-8F (B748) on RWY 30 current SIDs – **Figure 16**
- Boeing 747-8F (B748) on RWY 12 current arrival routes – **Figure 17**
- Boeing 747-8F (B748) on RWY 30 current arrival routes – **Figure 18**

- Boeing 747-8F (B748) on RWY 12 proposed SIDs – **Figure 19**
- Boeing 747-8F (B748) on RWY 30 proposed SIDs – **Figure 20**
- Boeing 747-8F (B748) on RWY 12 proposed arrival routes – **Figure 21**
- Boeing 747-8F (B748) on RWY 30 proposed arrival routes – **Figure 22**

The estimated areas, populations and households within the SEL footprints are summarised in **Table 4** for the Boeing 737-800 (most frequent type) and **Table 5** for the Boeing 747-8F (noisiest type). The population database used was a 2016 update of the 2011 Census supplied by CACI Ltd.

ERCD
8 June 2017

Table 1 Glasgow Prestwick 2018 Leq contours with current routes - area, population and household estimates

Leq (dBA)	Area (km^2)	Population	Households
> 51	13.9	2,100	900
> 54	7.7	400	200
> 57	4.3	100	< 100
> 60	2.5	100	< 100
> 63	1.4	0	0
> 66	0.9	0	0
> 69	0.6	0	0
> 72	0.4	0	0

Table 2 Glasgow Prestwick 2018 Leq contours with ACP new routes - area, population and household estimates

Leq (dBA)	Area (km^2)	Population	Households
> 51	14.1	2,100	900
> 54	7.7	400	200
> 57	4.3	100	< 100
> 60	2.5	100	< 100
> 63	1.5	0	0
> 66	0.9	0	0
> 69	0.6	0	0
> 72	0.4	0	0

Table 3 Glasgow Prestwick 2023 Leq contours with ACP new routes - area, population and household estimates

Leq (dBA)	Area (km^2)	Population	Households
> 51	19.1	3,000	1,300
> 54	10.6	1,100	500
> 57	5.9	100	100
> 60	3.4	100	< 100
> 63	1.9	< 100	< 100
> 66	1.2	0	0
> 69	0.7	0	0
> 72	0.5	0	0

Note: Populations and households are given to the nearest 100. The population database used is a 2016 update of the 2011 Census supplied by CACI Ltd.

Table 4 Boeing 737-800 (B738) SEL footprints – area, population and household estimates

Route	Runway	SEL (dBA)	Area (km^2)	Population	Households
Existing routes					
NGY 1L	12	> 80	27.2	5,500	2,600
NGY 1L	12	> 90	4.6	100	< 100
TRN 1L	12	> 80	27.4	5,500	2,600
TRN 1L	12	> 90	4.6	100	< 100
ARRIVAL 12	12	> 80	11.0	1,000	500
ARRIVAL 12	12	> 90	0.7	0	0
NGY 1K	30	> 80	25.4	3,300	1,600
NGY 1K	30	> 90	4.5	100	100
TRN 1K	30	> 80	25.4	3,300	1,600
TRN 1K	30	> 90	4.5	100	100
ARRIVAL 30	30	> 80	11.9	1,500	700
ARRIVAL 30	30	> 90	0.9	< 100	< 100
Proposed routes					
HAVEN 1L	12	> 80	27.3	5,500	2,600
HAVEN 1L	12	> 90	4.6	100	< 100
HERON 1L	12	> 80	26.9	5,500	2,600
HERON 1L	12	> 90	4.6	100	< 100
OSMEG 1L	12	> 80	27.3	5,500	2,600
OSMEG 1L	12	> 90	4.6	100	< 100
TRN 2L	12	> 80	26.9	5,500	2,600
TRN 2L	12	> 90	4.6	100	< 100
ARRIVAL 12 via TRN	12	> 80	11.0	1,000	500
ARRIVAL 12 via TRN	12	> 90	0.7	0	0
HAVEN 1K	30	> 80	25.6	3,600	1,800
HAVEN 1K	30	> 90	4.4	100	100
HERON 1K	30	> 80	25.5	3,600	1,800
HERON 1K	30	> 90	4.4	100	100
OSMEG 1K	30	> 80	25.6	3,600	1,800
OSMEG 1K	30	> 90	4.4	100	100
TRN 2K	30	> 80	25.6	3,600	1,800
TRN 2K	30	> 90	4.4	100	100
ARR 30 via SUMIN	30	> 80	11.9	1,500	700
ARR 30 via SUMIN	30	> 90	0.9	< 100	< 100
ARRIVAL 30 via TRN	30	> 80	11.9	1,500	700
ARRIVAL 30 via TRN	30	> 90	0.9	< 100	< 100

Note: Populations and households are given to the nearest 100. The population database used is a 2016 update of the 2011 Census supplied by CACI Ltd.

Table 5 Boeing 747-8F (B748) SEL footprints – area, population and household estimates

Route	Runway	SEL (dBA)	Area (km^2)	Population	Households
Existing routes					
NGY 1L	12	> 80	55.9	7,100	3,100
NGY 1L	12	> 90	6.3	1,400	600
TRN 1L	12	> 80	52.1	8,400	3,700
TRN 1L	12	> 90	6.3	1,400	600
ARR 12 (straight-in)	12	> 80	39.8	5,500	2,800
ARR 12 (straight-in)	12	> 90	5.3	500	200
ARR 12 (vectored)	12	> 80	40.0	5,500	2,800
ARR 12 (vectored)	12	> 90	5.3	500	200
NGY 1K	30	> 80	51.9	2,300	1,000
NGY 1K	30	> 90	5.9	100	< 100
TRN 1K	30	> 80	50.7	2,400	1,000
TRN 1K	30	> 90	5.9	100	< 100
ARR 30 (straight-in)	30	> 80	45.4	4,200	1,900
ARR 30 (straight-in)	30	> 90	6.1	600	300
ARR 30 (vectored)	30	> 80	48.6	4,200	1,900
ARR 30 (vectored)	30	> 90	6.1	600	300
Proposed routes					
HAVEN 1L	12	> 80	54.9	5,300	2,300
HAVEN 1L	12	> 90	6.3	1,400	600
HERON 1L	12	> 80	51.0	6,700	2,900
HERON 1L	12	> 90	6.4	1,400	600
OSMEG 1L	12	> 80	55.6	5,300	2,300
OSMEG 1L	12	> 90	6.3	1,400	600
TRN 2L	12	> 80	50.9	6,700	2,900
TRN 2L	12	> 90	6.4	1,400	600
ARRIVAL 12 via TRN	12	> 80	40.0	5,500	2,800
ARRIVAL 12 via TRN	12	> 90	5.3	500	200
HAVEN 1K	30	> 80	48.9	4,200	1,900
HAVEN 1K	30	> 90	5.8	100	< 100
HERON 1K	30	> 80	48.3	4,200	1,900
HERON 1K	30	> 90	5.8	100	< 100
OSMEG 1K	30	> 80	48.9	4,200	1,900
OSMEG 1K	30	> 90	5.8	100	< 100
TRN 2K	30	> 80	48.4	4,200	1,900
TRN 2K	30	> 90	5.8	100	< 100
ARR 30 via SUMIN	30	> 80	45.5	4,200	1,900
ARR 30 via SUMIN	30	> 90	6.1	600	300
ARRIVAL 30 via TRN	30	> 80	46.0	4,200	1,900
ARRIVAL 30 via TRN	30	> 90	6.1	600	300

Note: Populations and households are given to the nearest 100. The population database used is a 2016 update of the 2011 Census supplied by CACI Ltd.

Figure 1 Glasgow Prestwick Airport current SIDs

Figure 2 Glasgow Prestwick Airport proposed SIDs

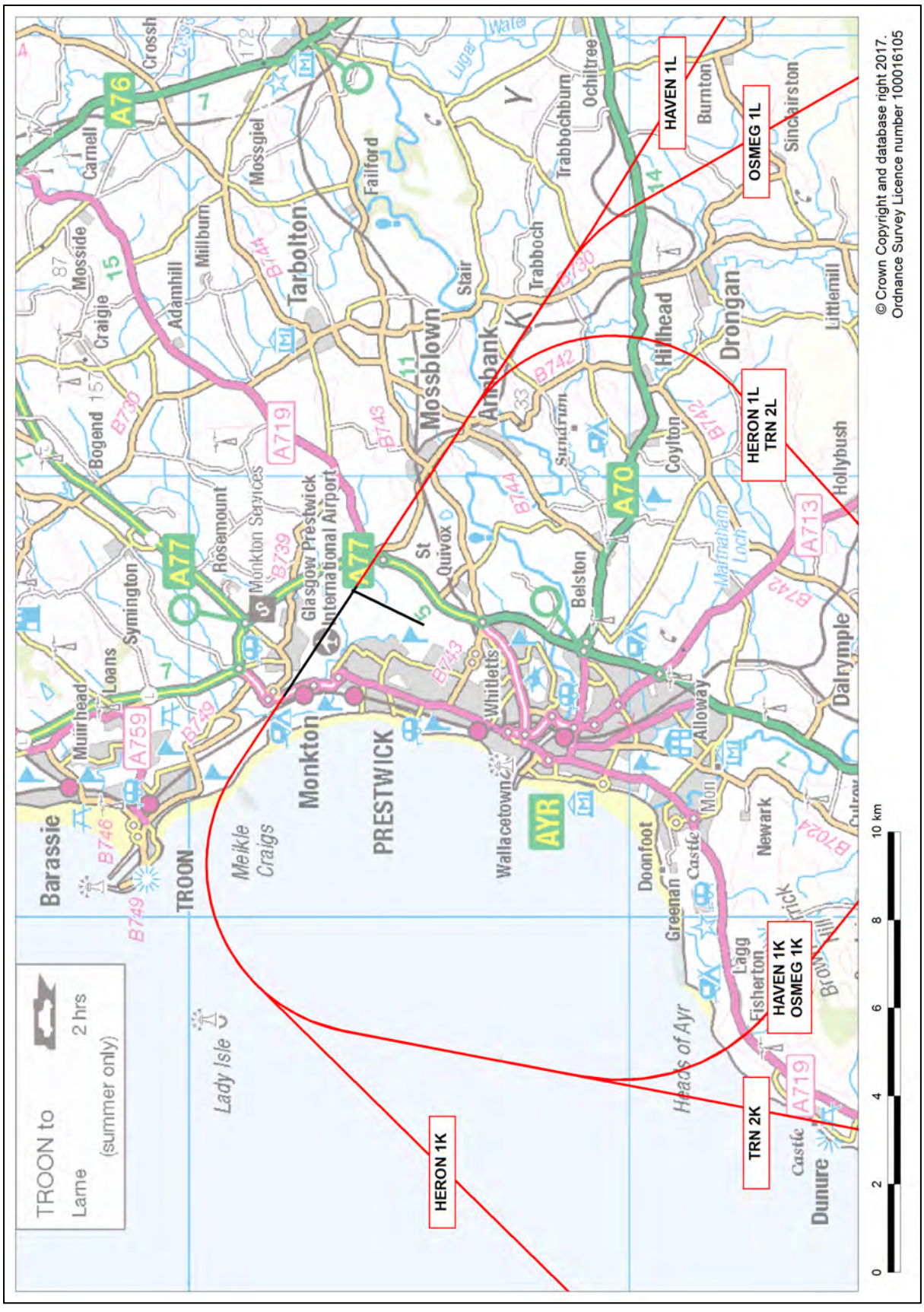

Figure 3 Glasgow Prestwick Airport current **(blue)** and proposed **(red)** arrival routes

Figure 4 Glasgow Prestwick 2018 average summer day (68% W / 32% E) 51-72 dBA Leq noise contours – with current routes

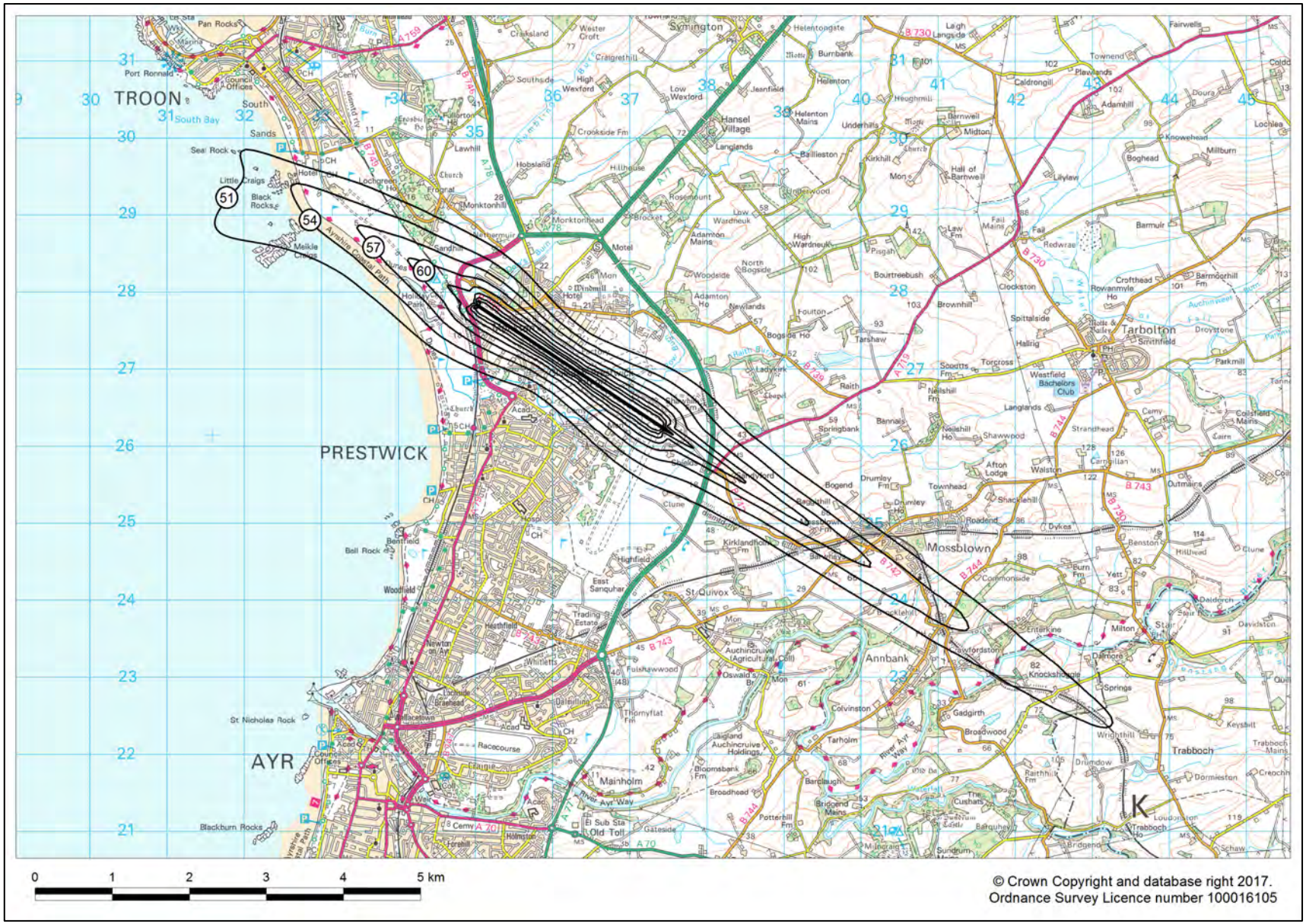

Figure 5 Glasgow Prestwick 2018 average summer day (68% W / 32% E) 51-72 dBA Leq noise contours – with ACP

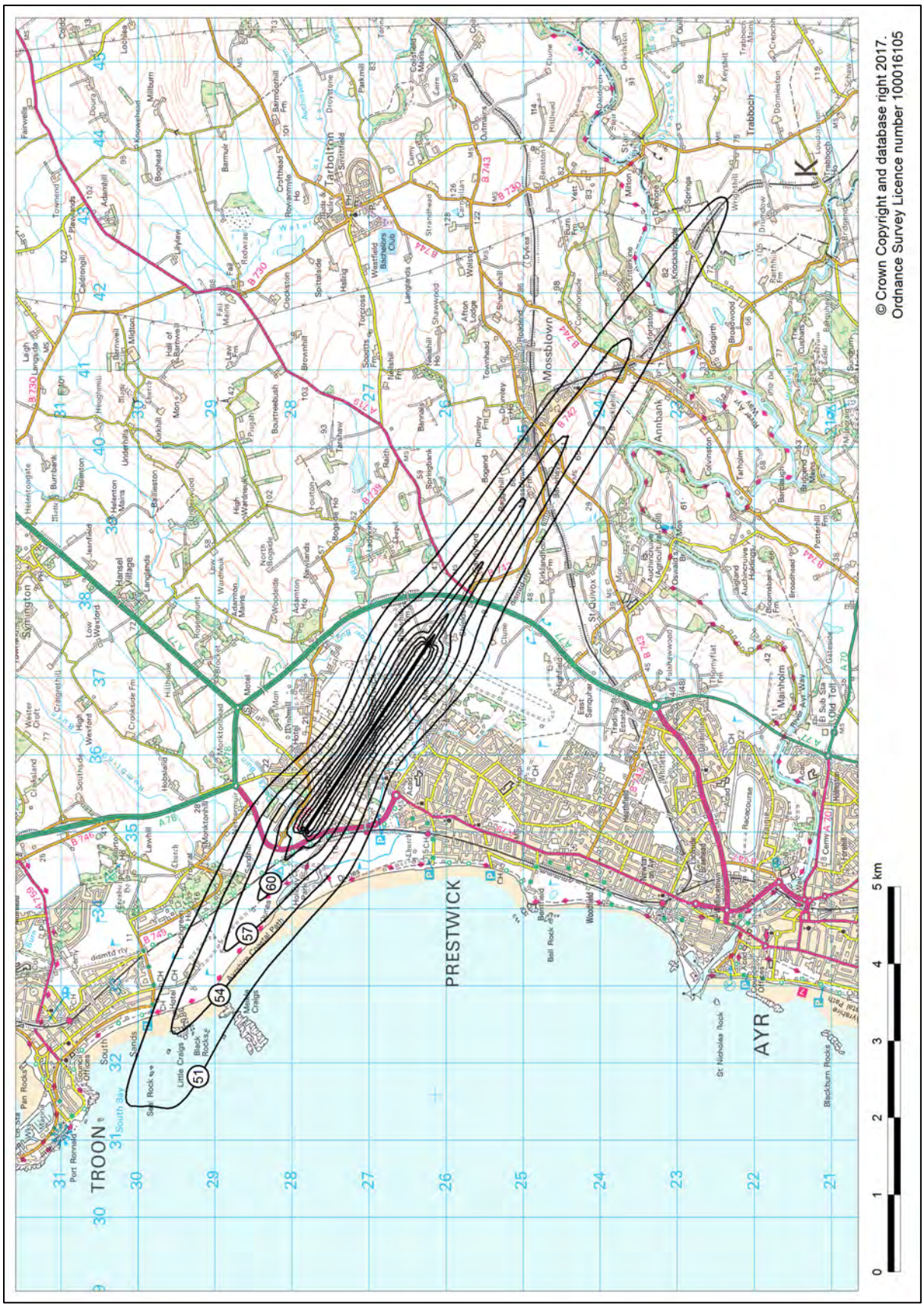

Figure 6 Glasgow Prestwick 2023 average summer day (68% W / 32% E) 51-72 dBA Leq noise contours – with ACP

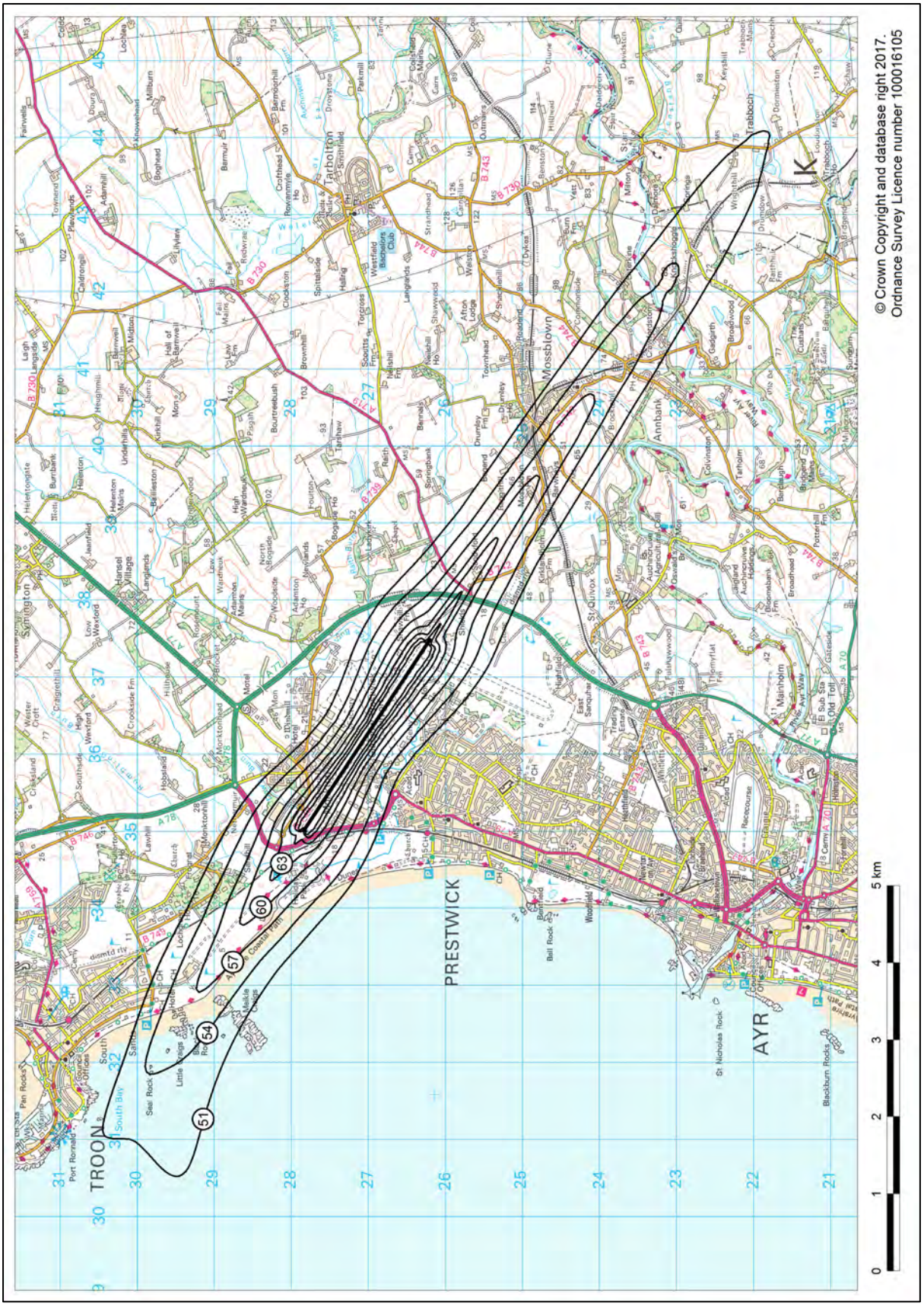

Figure 7 Boeing 737-800 SEL footprints for Runway 12 – current SIDs

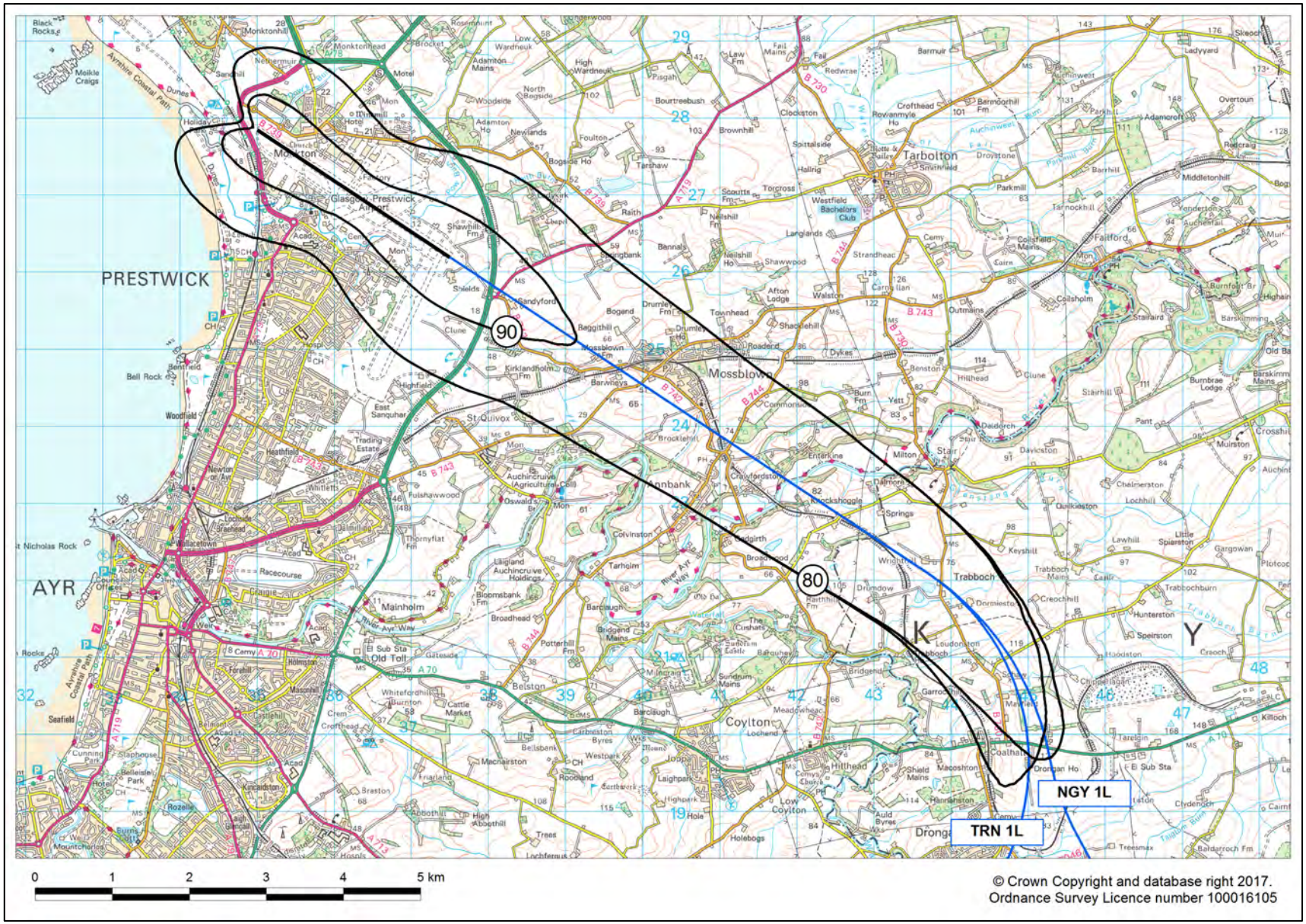

Figure 8 Boeing 737-800 SEL footprints for Runway 30 – current SIDs

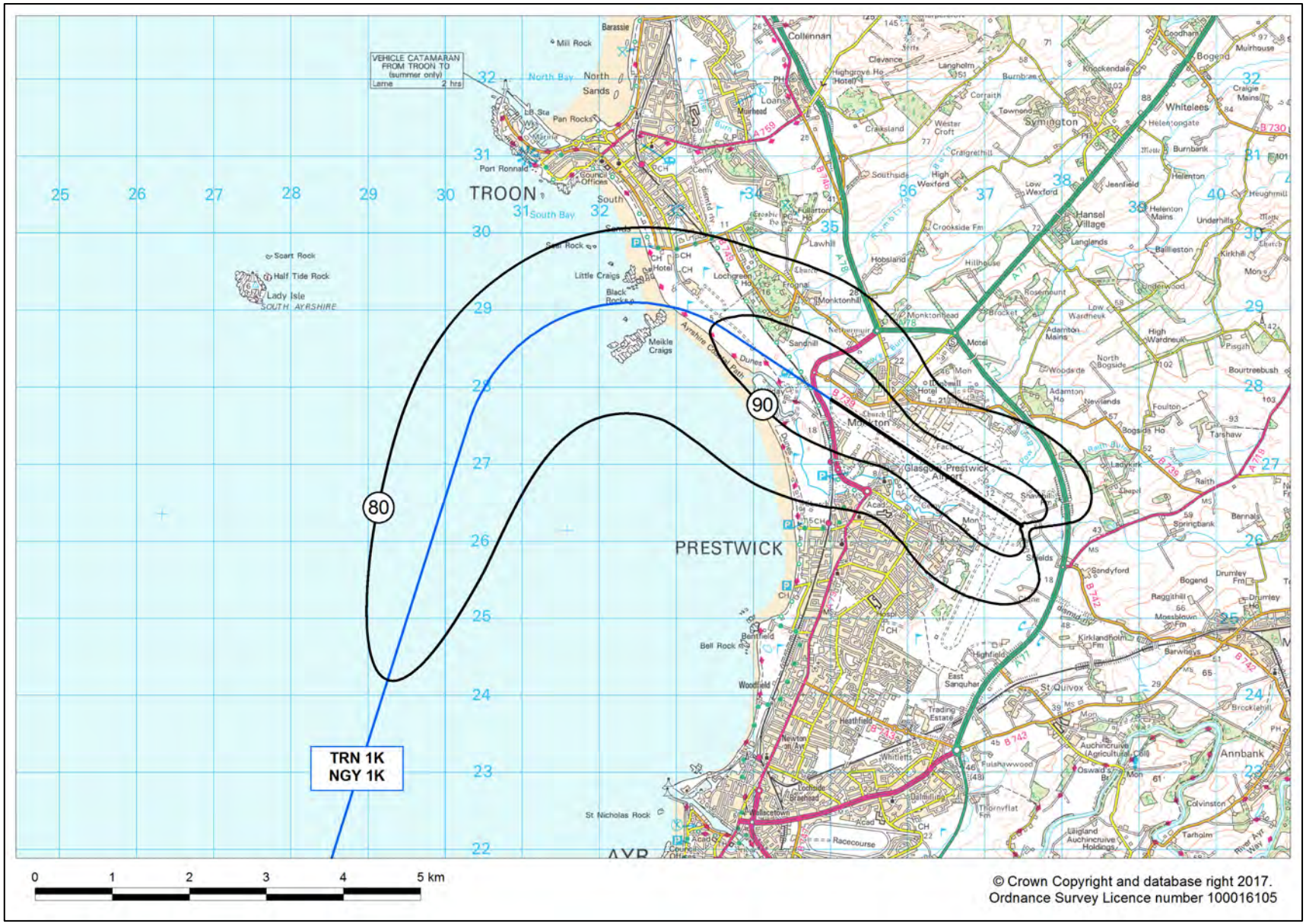

Figure 9 Boeing 737-800 SEL footprints for Runway 12 – current arrival routes

Figure 10 Boeing 737-800 SEL footprints for Runway 30 – current arrival routes

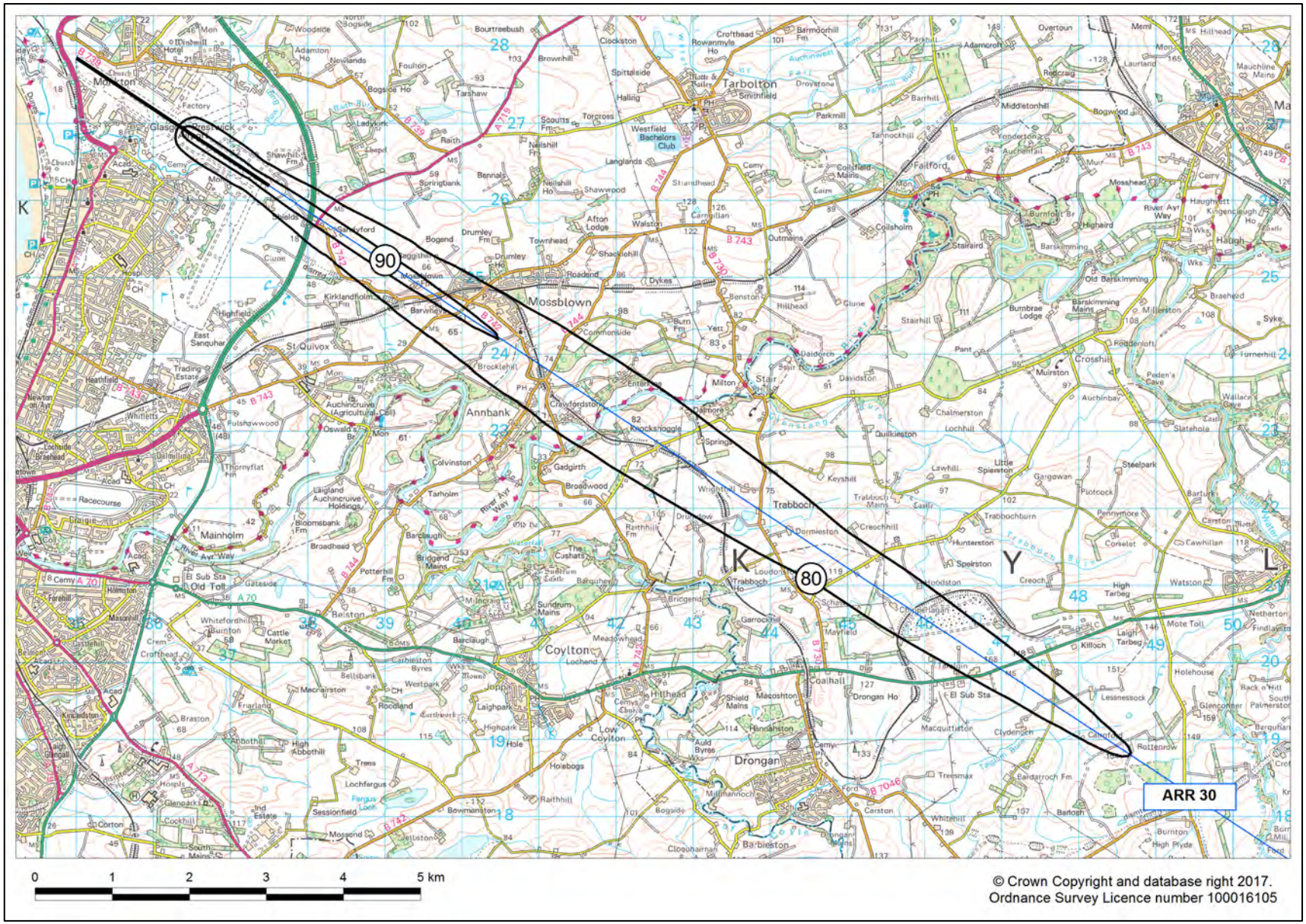

Figure 11 Boeing 737-800 SEL footprints for Runway 12 – proposed SIDs

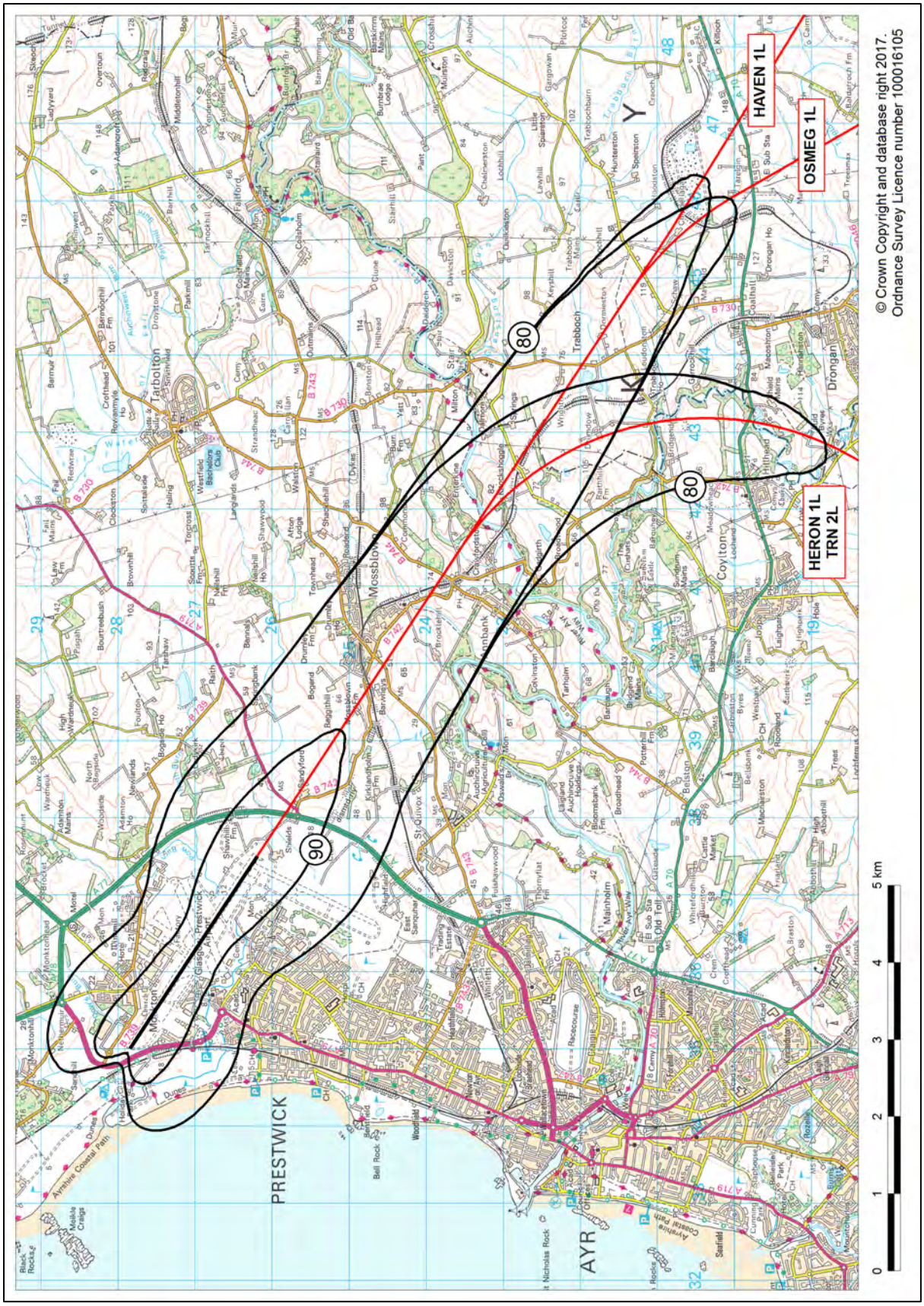

Figure 12 Boeing 737-800 SEL footprints for Runway 30 – proposed SIDs

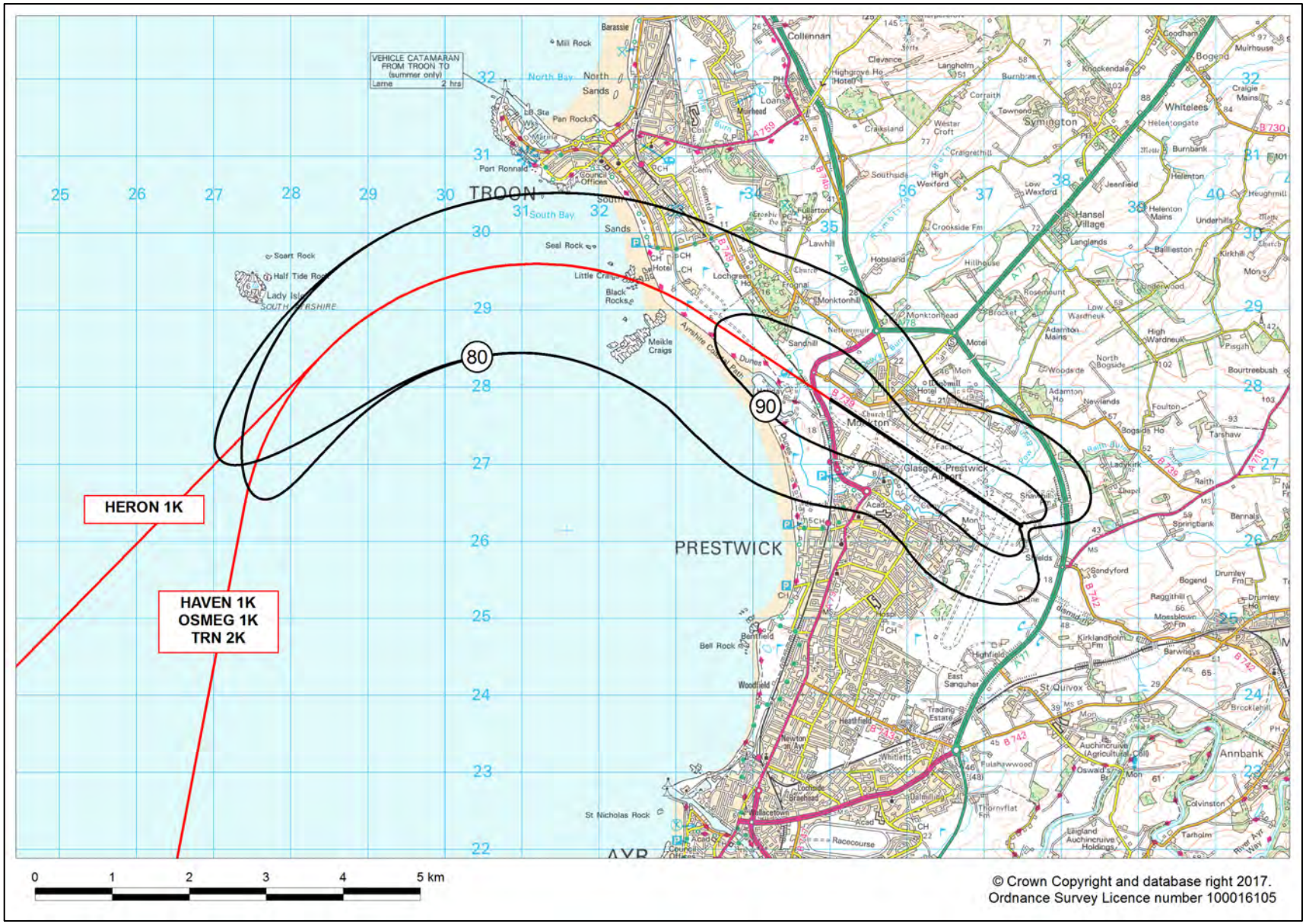

Figure 13 Boeing 737-800 SEL footprints for Runway 12 – proposed arrival routes

Figure 14 Boeing 737-800 SEL footprints for Runway 30 – proposed arrival routes

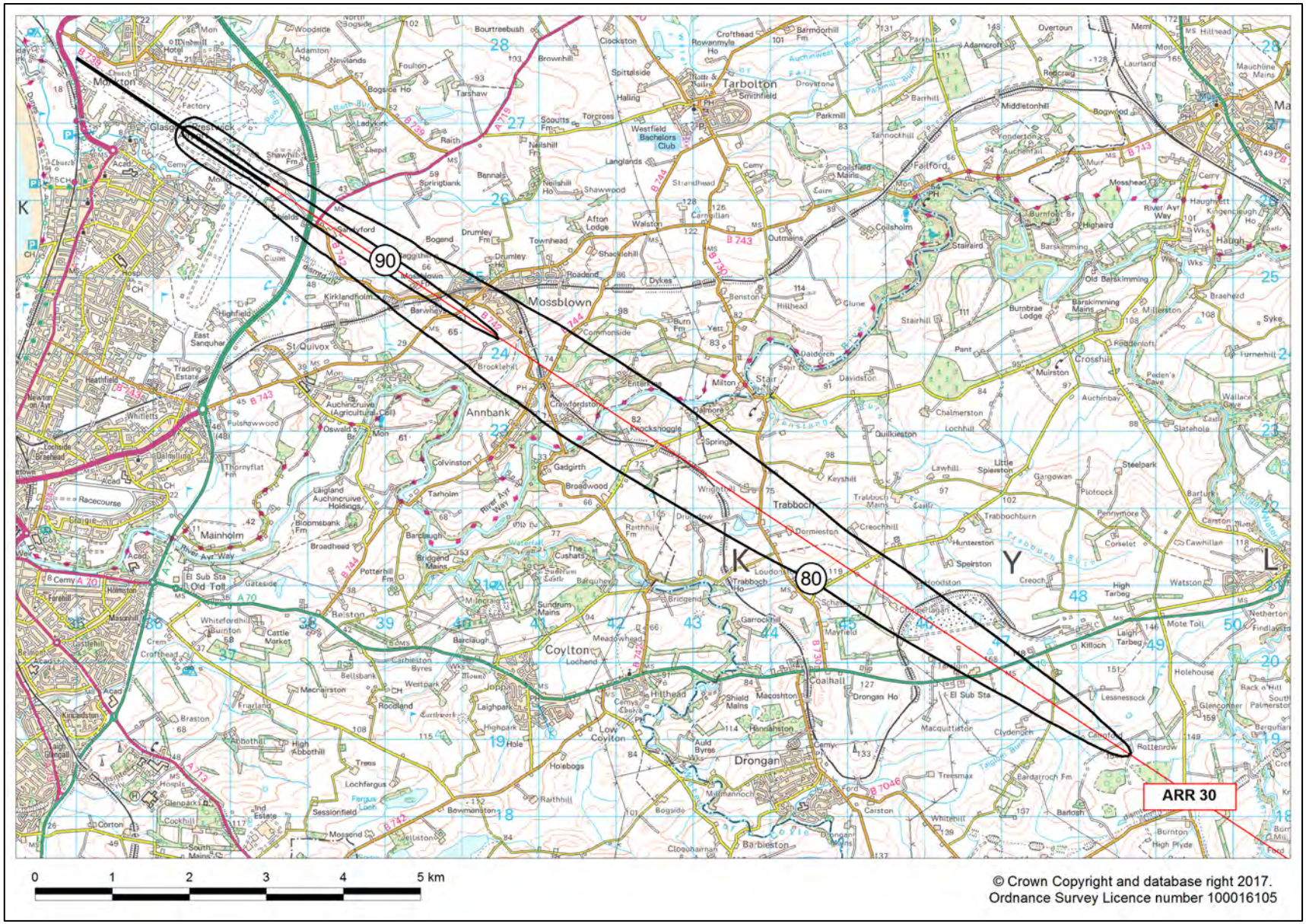

Figure 15 Boeing 747-8F SEL footprints for Runway 12 – current SIDs

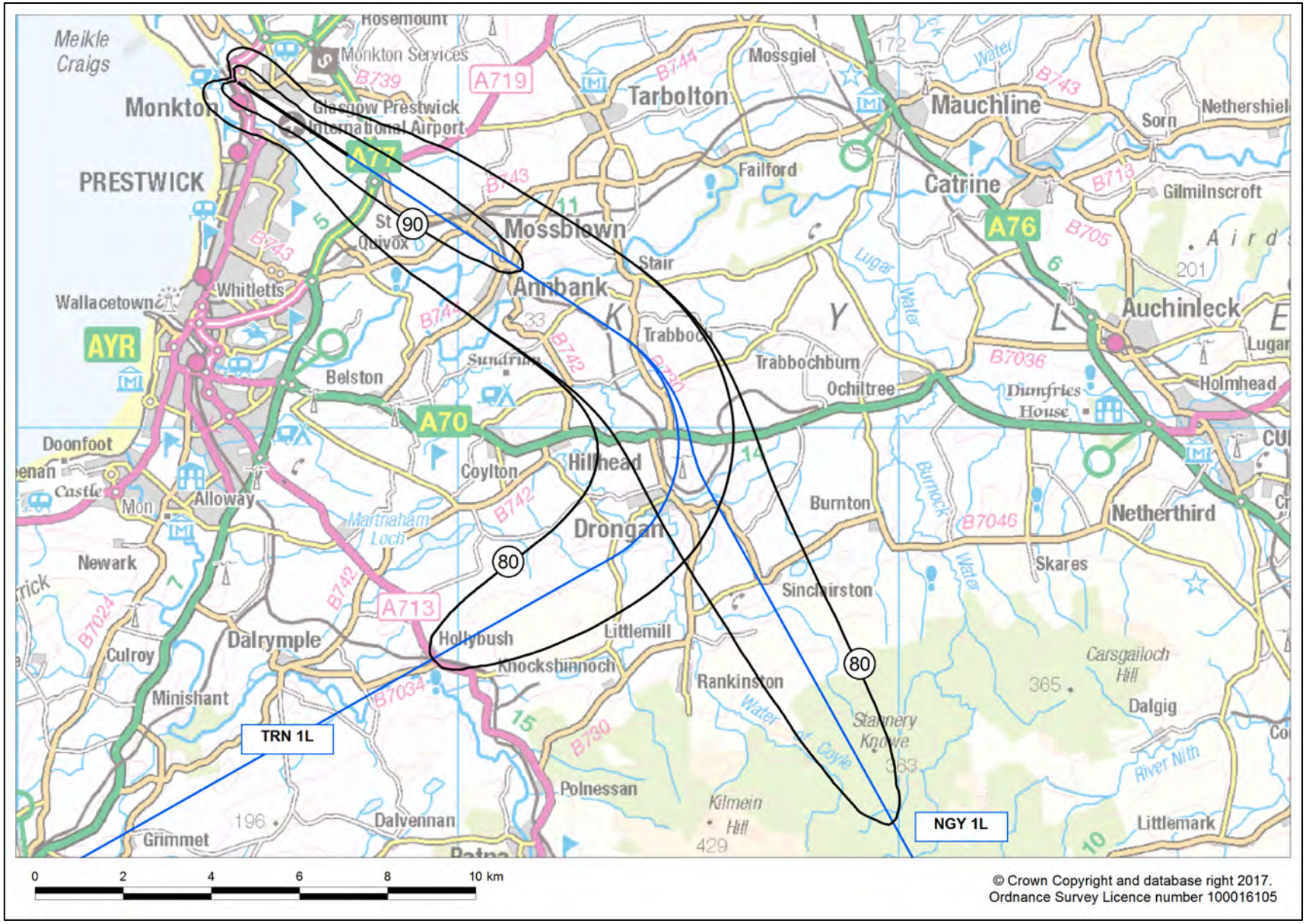

Figure 16 Boeing 747-8F SEL footprints for Runway 30 – current SIDs

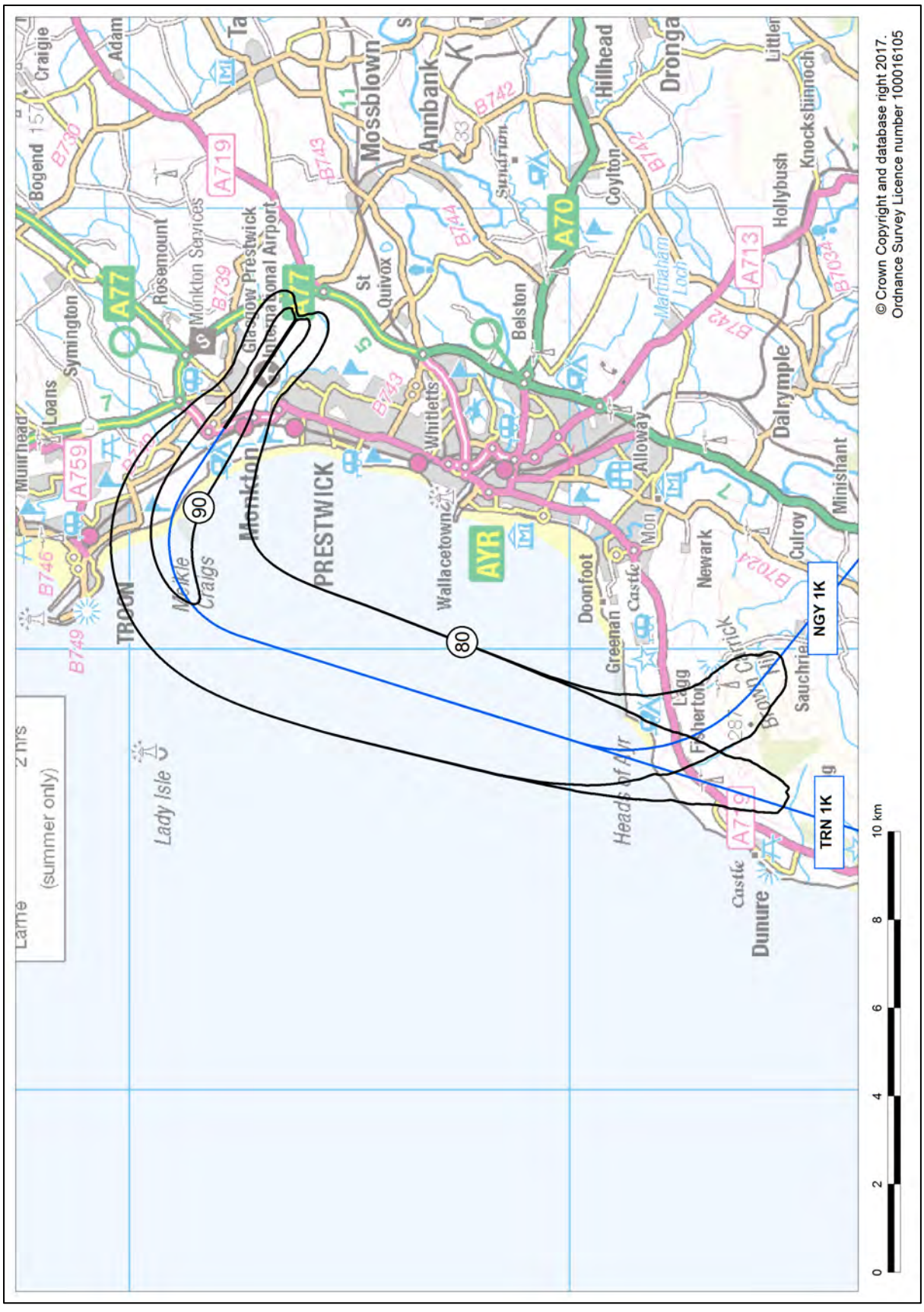

Figure 17 Boeing 747-8F SEL footprints for Runway 12 – current arrival routes

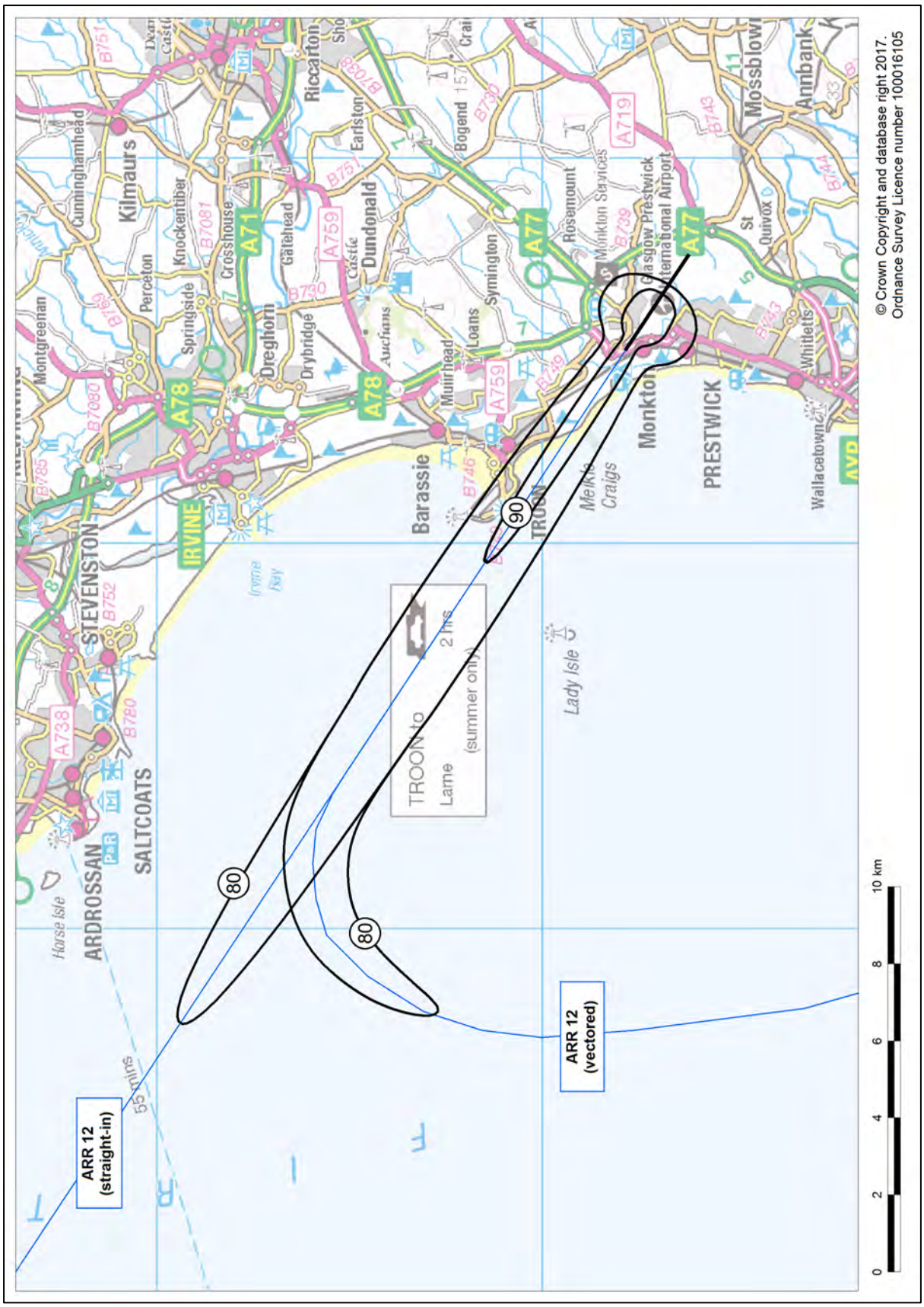

Figure 18 Boeing 747-8F SEL footprints for Runway 30 – current arrival routes

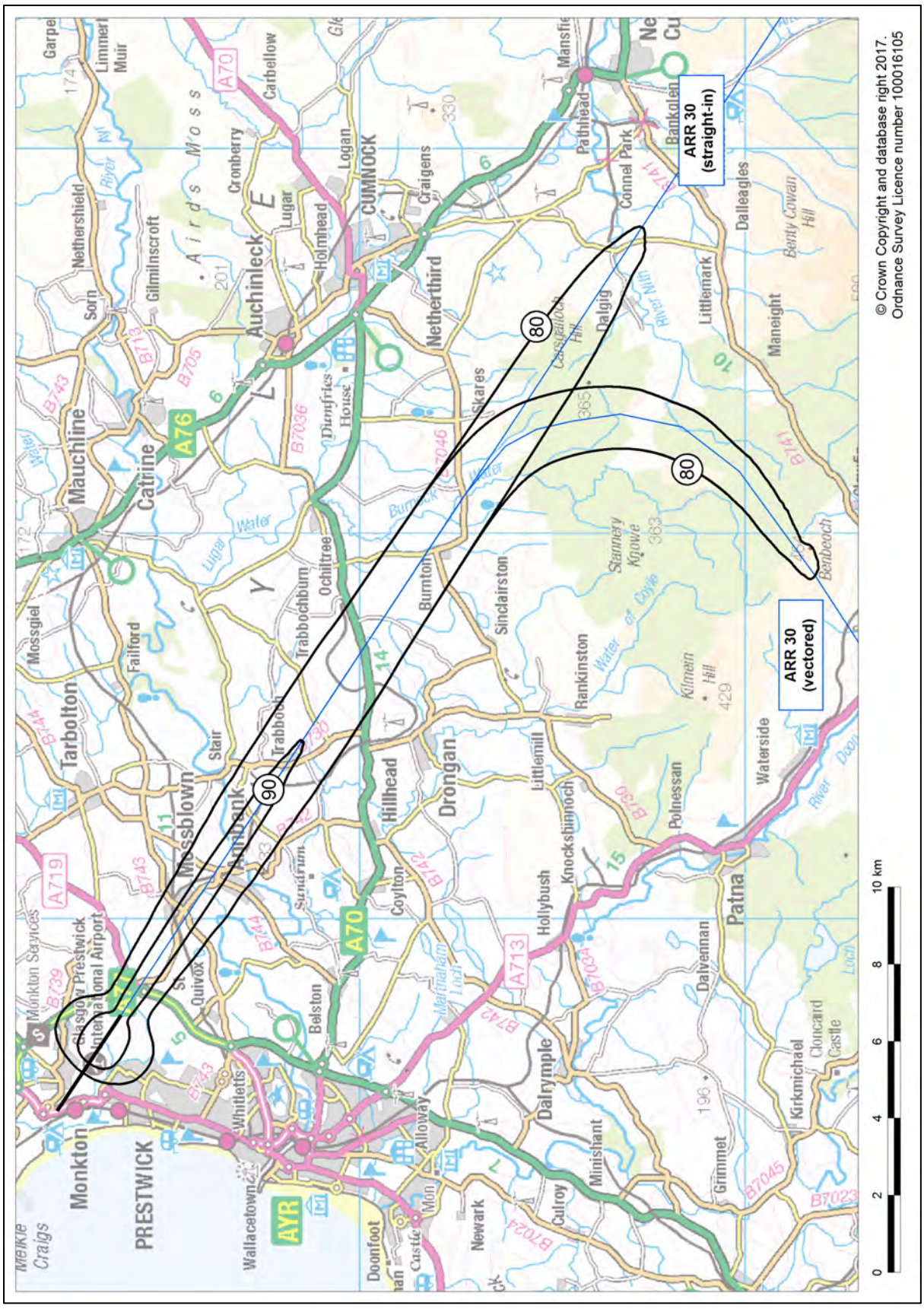

Figure 19 Boeing 747-8F SEL footprints for Runway 12 – proposed SIDs

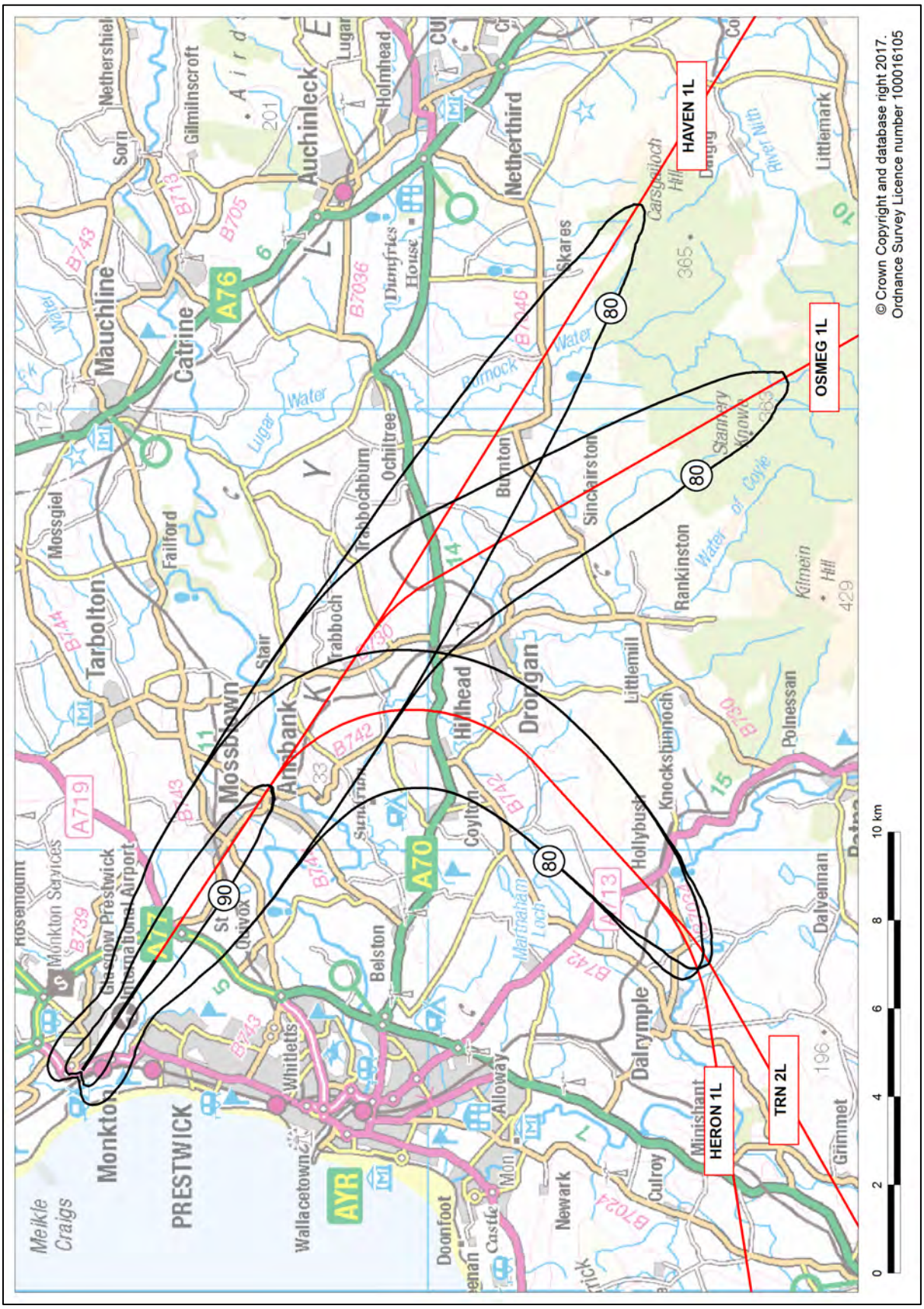

Figure 20 Boeing 747-8F SEL footprints for Runway 30 – proposed SIDs

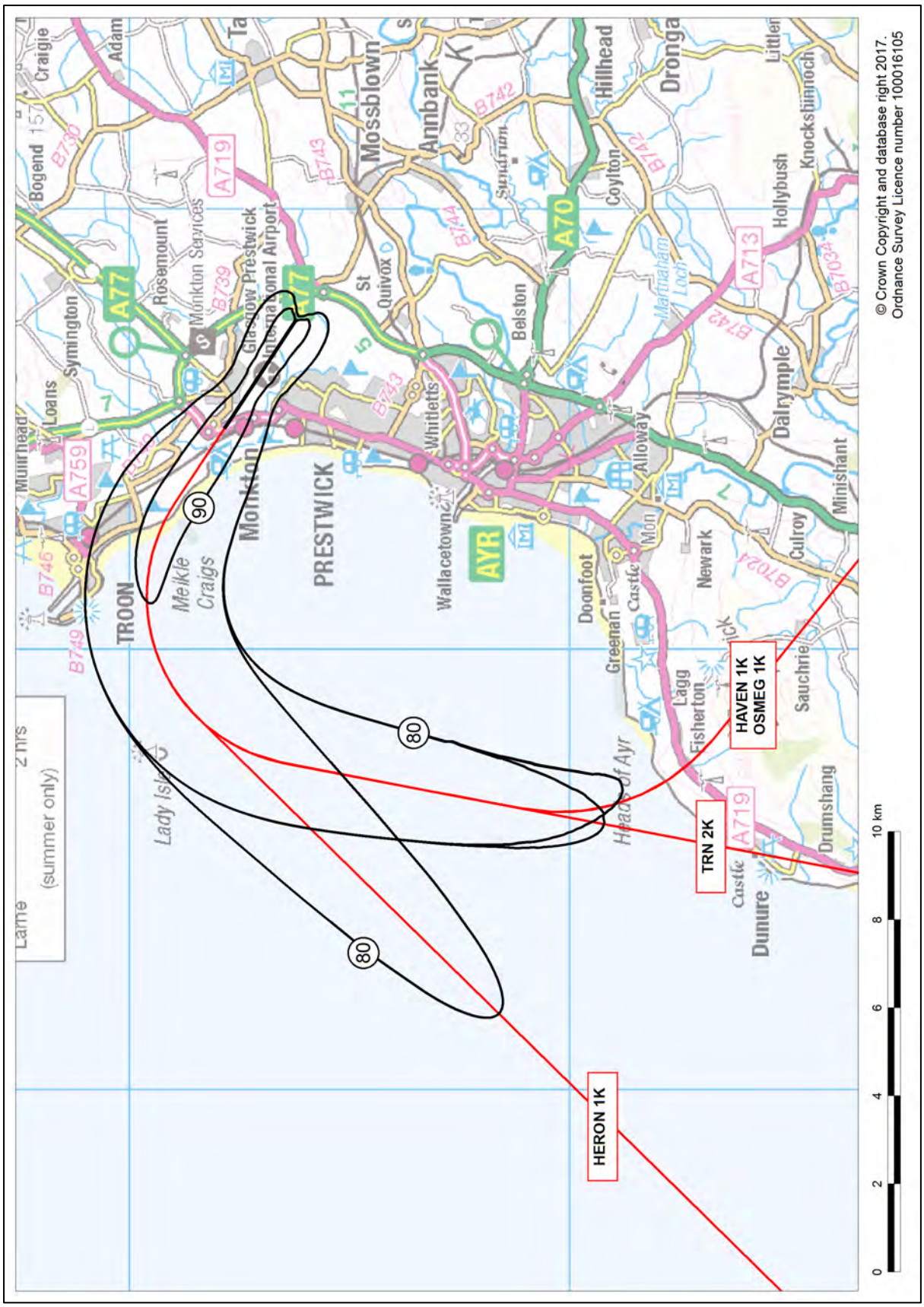

Figure 21 Boeing 747-8F SEL footprints for Runway 12 – proposed arrival routes

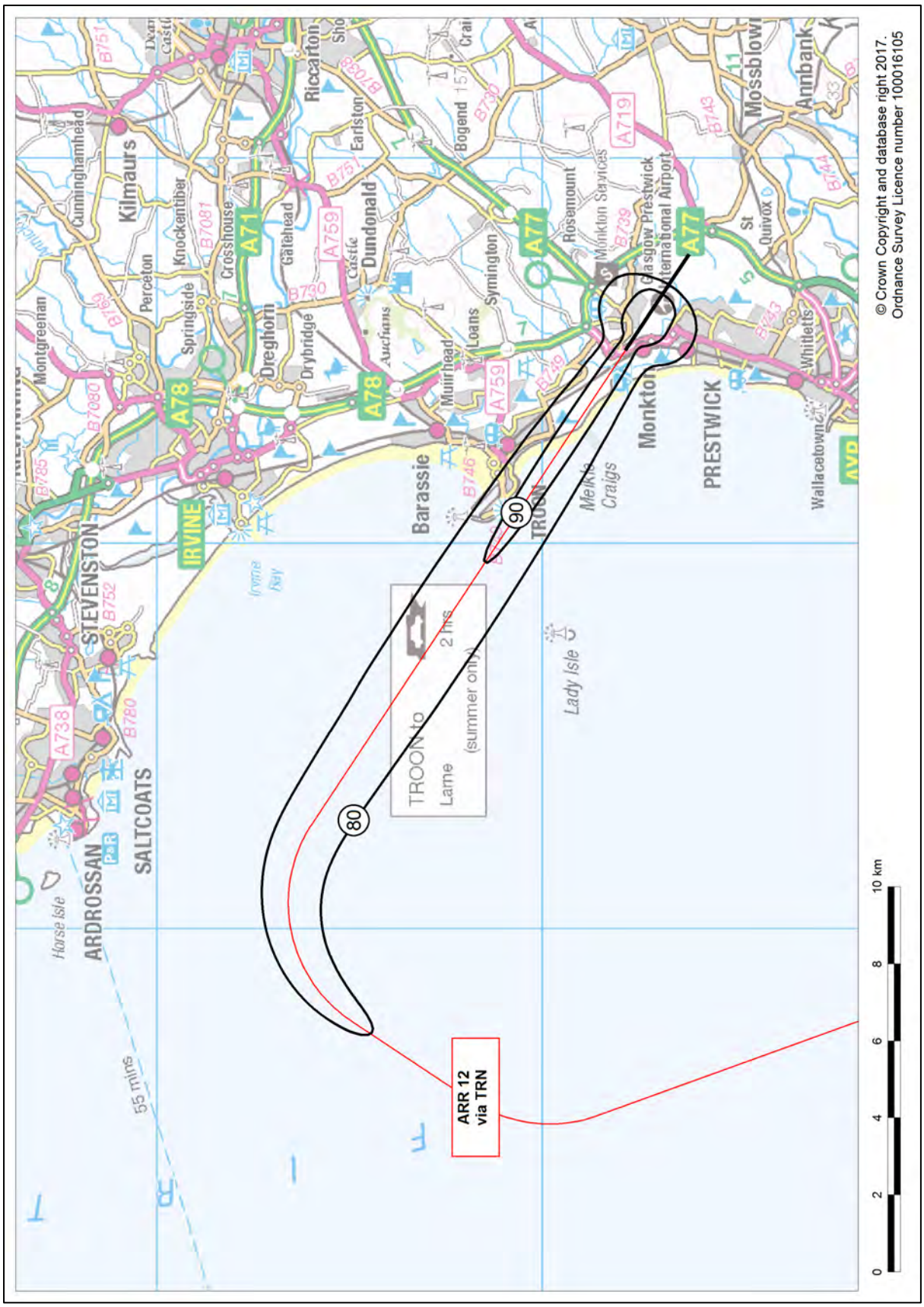
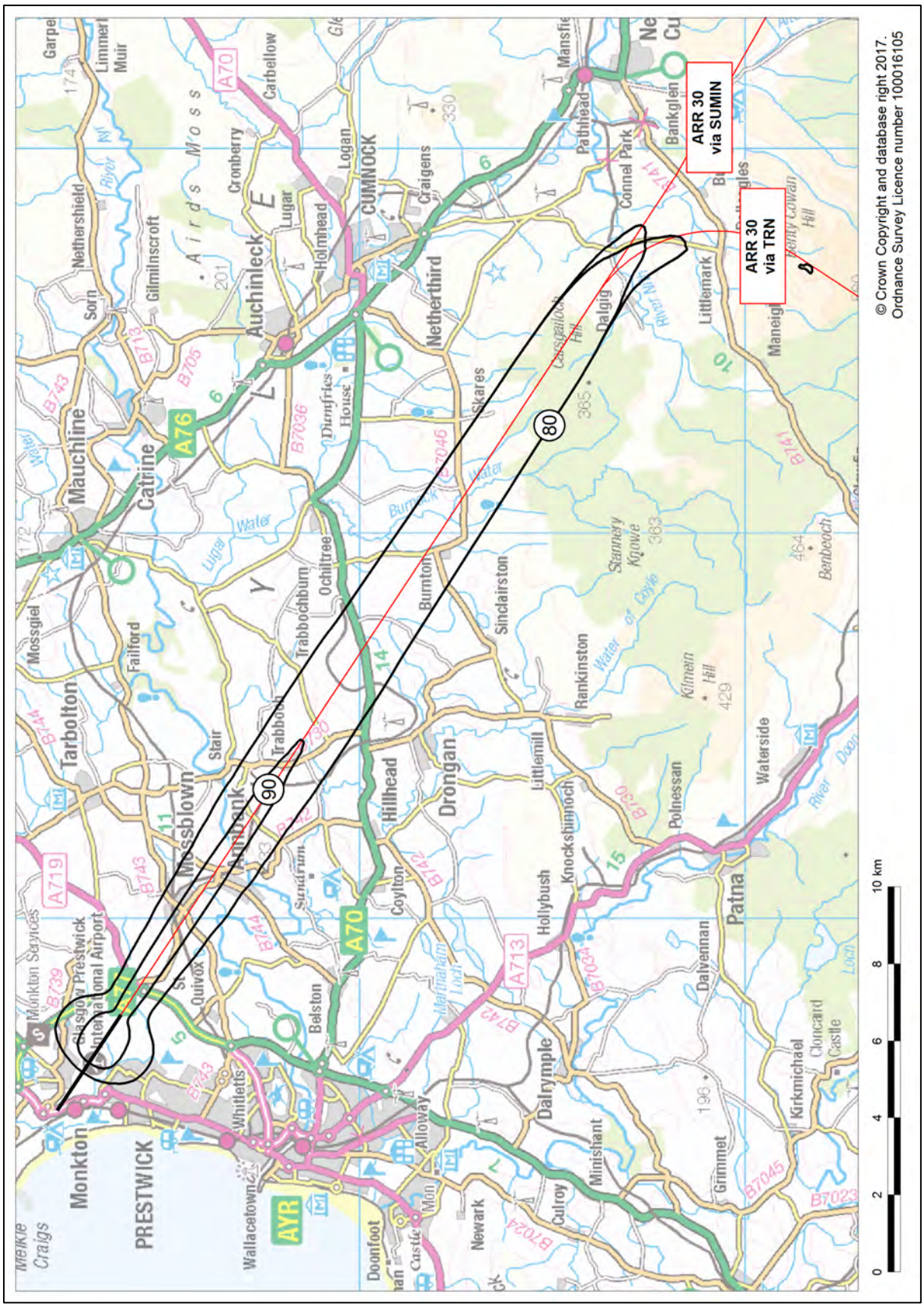
Figure 22 Boeing 747-8F SEL footprints for Runway 30 – proposed arrival routes