What is an airspace change?

Our airspace is regulated by the Civil Aviation Authority (CAA) who keep it safe, efficient and cost-effective. Airspace is broken down into two categories:

Uncontrolled – where aircraft are free to fly without constraint, of which there are considerable areas across Scotland.

Controlled – a network of corridors and areas with fixed navigation aids acting as markers to ensure safe distances between aircraft.

The changeover from analogue to digital infrastructure is part of a five-year national programme that started in 2014. The navigation aids that assist aircraft to fly in and out of Glasgow Prestwick Airport are due to be taken out of service in 2018.

For Glasgow Prestwick Airport, this means the removal of navigation aids at Turnberry and New Galloway. They will be replaced by procedures that use technology on the aircraft and in space to navigate.

The Airspace Change Process is a series of steps required by the CAA. The steps are there to ensure all airports follow the same process, and many involve a consultation with the public. The results from this consultation are then included to inform the final design that will be considered by the CAA for approval.

The CAA's decision is based on whether the change is efficient, environmentally-friendly and safe.

At low level (below 4,000ft) this means minimising noise impact on communities, while at higher levels minimising CO_2 emissions is the priority.

We are working with NATS (the UK's air traffic control company) and their airspace design experts as we change our existing flight procedures ahead of the introduction of the new technology. We are using this opportunity to see if there are any improvements we can make to how we use our airspace to make it as efficient and environmentally-friendly as possible.

Our proposed designs have placed the new flight paths either as close as possible to those being used currently, or away from more-populated areas where we can.

Because the new designs are largely unchanged, it is likely that most people won't notice any significant change. In fact, one of the main aims for the design team is to limit the number of people being overflown, wherever possible.

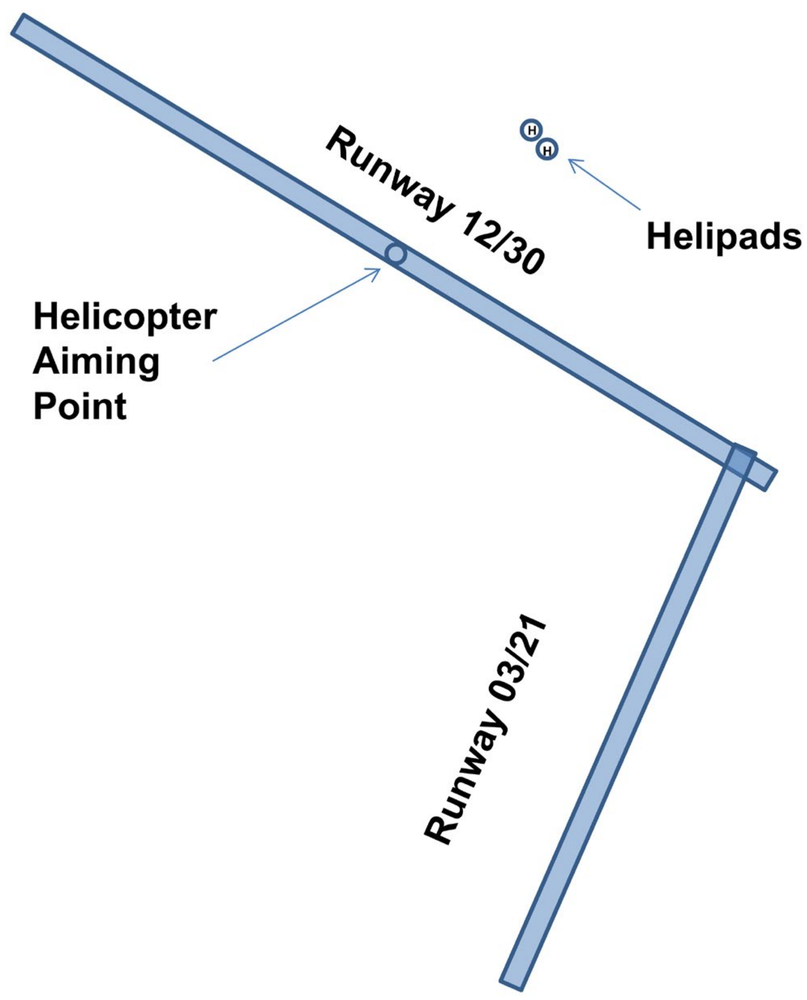
If you live directly underneath, or close to, an existing flight path, it's possible you could notice some changes. If you do, we expect these to be very small.

Glasgow Prestwick Airport offers the widest range of aviation services of all the Scottish airports. We handle passenger, cargo, military, helicopters and light aircraft. Aircraft that come through Prestwick arrive from and depart to destinations all over the world. We need to ensure that our airspace is still able to accommodate these activities.

Location of navigation aids

Example of navigation aid to be decommissioned

Airport runways layout



Glasgow Prestwick Airport

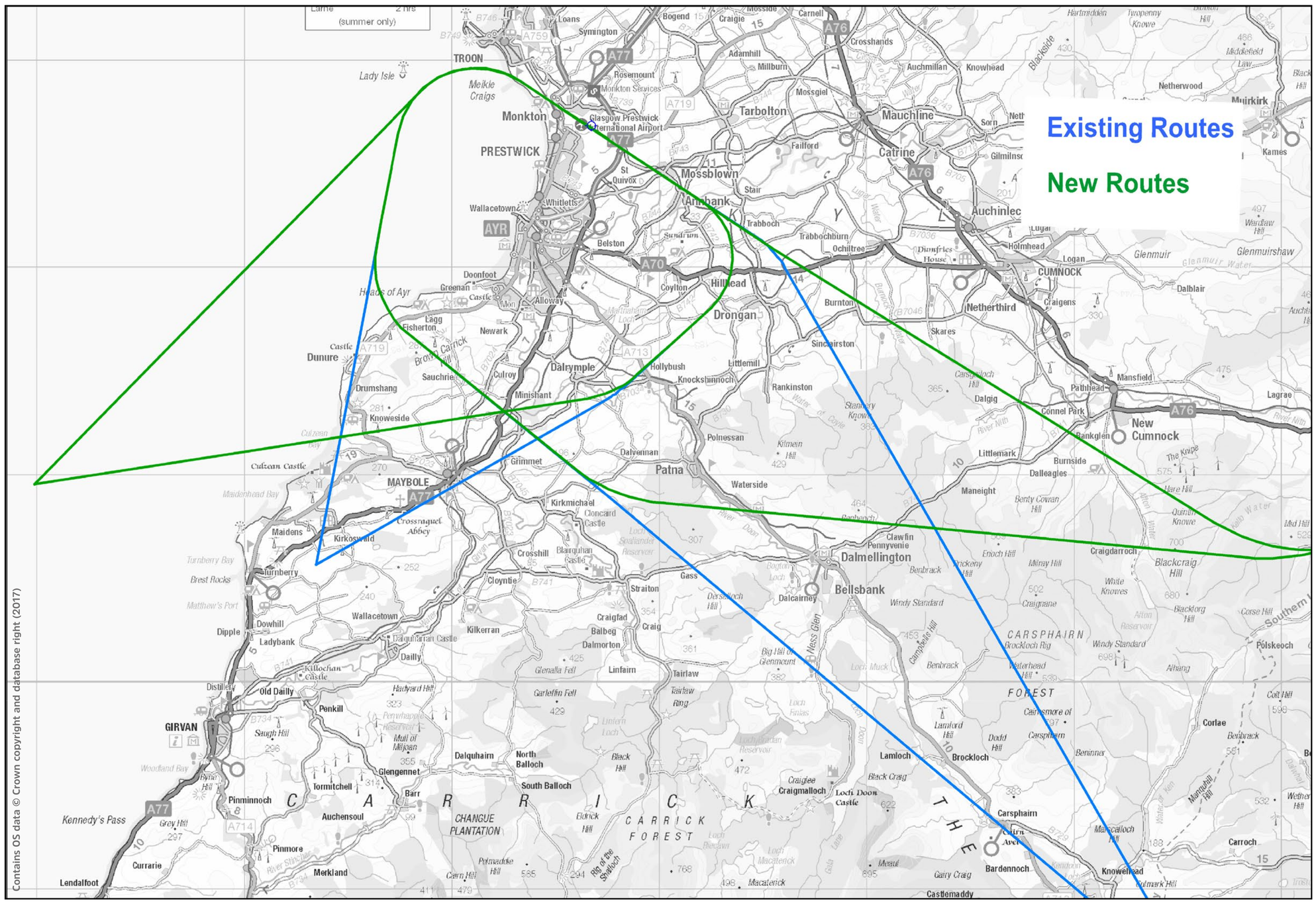
Departures

Our current departure routes take aircraft to the Southeast and Southwest, which works well for aircraft bound for destinations such as the UK and central/southern Europe.

Because aircraft travelling to North America, Northern Europe and the Far East have to fly away from their destination before turning back to the east or west, we have proposed two new departure routes from the airport, one taking aircraft east towards Northumberland and the other taking aircraft west towards Kintyre.

For the departures from runway 30 the current conventional procedures turn to the south at a point approximately 1,500 metres from the end of the runway. The current design criteria prohibit the turn point from being defined any closer than 1,950 metres from the end of the runway. We have therefore placed the new turn point at this location. The result of this change is that aircraft travel further over the water and are therefore slightly higher when they cross the shore resulting in less noise impact on the ground, albeit slightly higher CO_2 emissions.

For the departures from runway 12 the current conventional procedures to the southwest directly overfly Drongan. We are proposing a new route for departures to the west and southwest that turns slightly earlier and passes between Drongan and Hillhead. This route is approximately 5km shorter than the current route and is aimed at reducing the total number of people exposed to noise on the ground by avoiding the main built-up areas.



Proposed departure routes

Glasgow Prestwick Airport

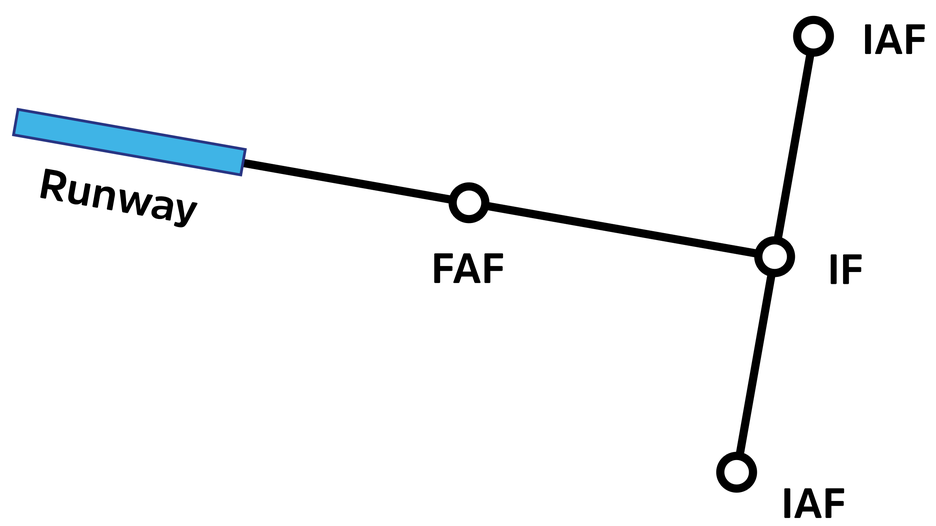
Arrivals

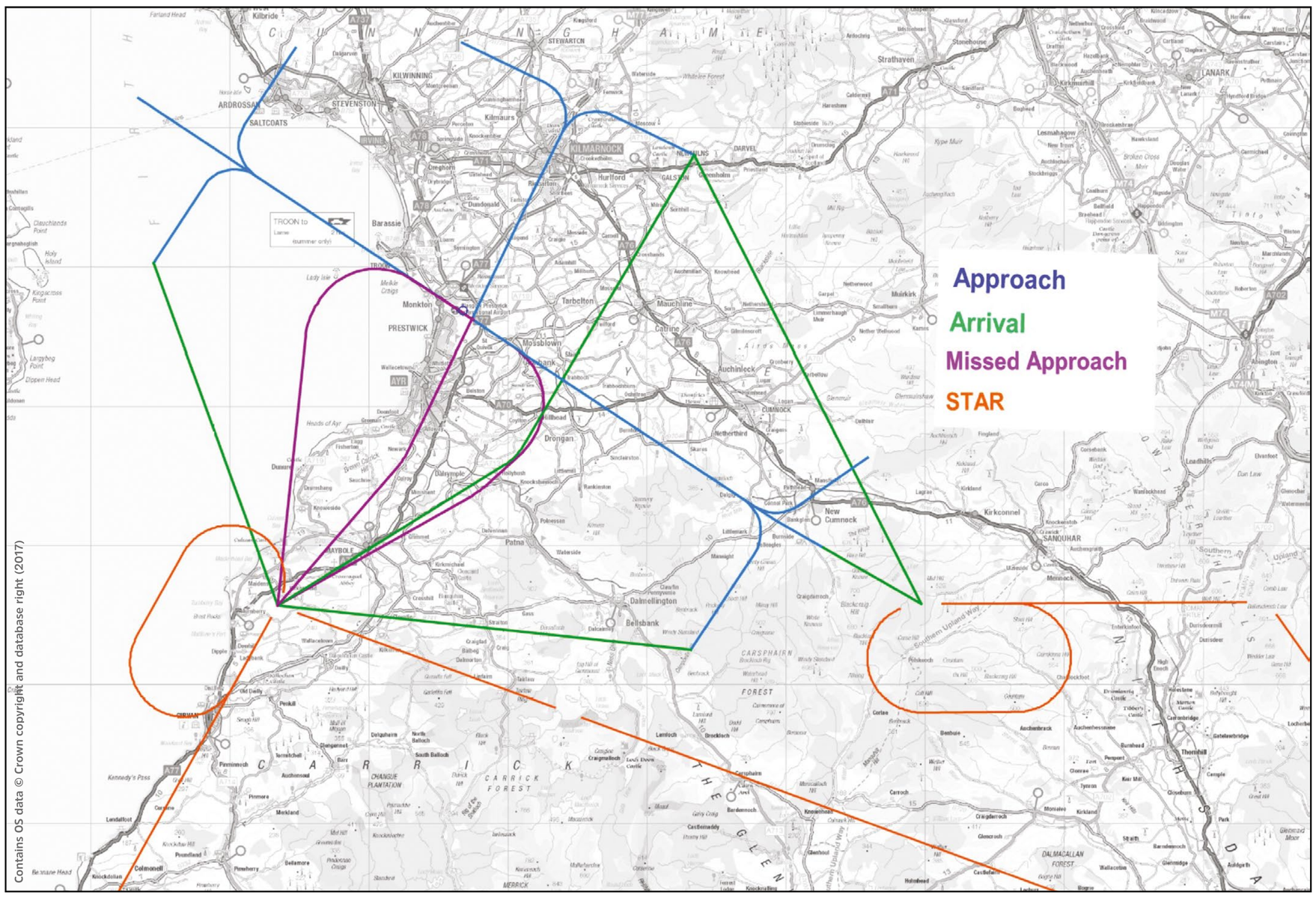
The new arrival flightpaths we have designed replicate the existing routes as closely as possible with the addition of modern “T-Bar” tracks.

These allow aircraft arriving from any direction to fly a stable approach path without having to make any extreme turns.

We are also proposing new arrival routes that take aircraft from the arrival points to the start of an appropriate “T-Bar” track. These routes are designed to keep aircraft over the water or open countryside as much as possible.

The main points on a T-bar approach





Proposed arrival routes

Glasgow Prestwick Airport

Departures

General factors influencing design

For each departure route, we have indicated the preferred route and the alternative routes evaluated. All the routes are designed and evaluated according to the design principles listed in the consultation document, section 6.1.1.

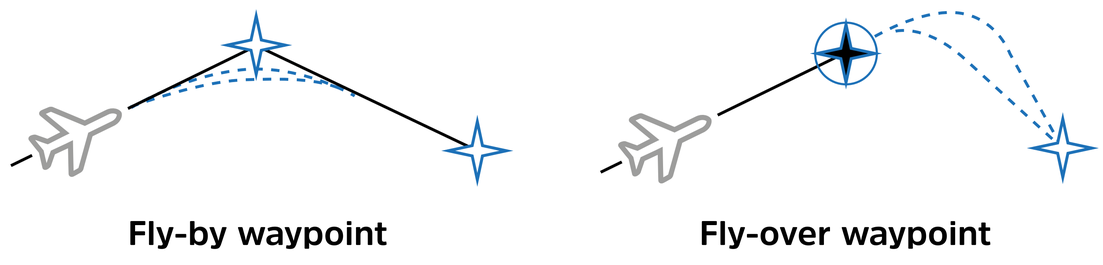
Noise analysis is based on the Boeing 737 (the commonest aircraft type operating from Glasgow Prestwick) and the Boeing 747 (the loudest aircraft type typically operating from the airport). While the Boeing 747 footprints are larger, this aircraft type only makes up approximately 2% of the aircraft movements.

Concentration vs. dispersal

Moving to more accurate modern forms of navigation usually has the effect of concentrating flights along a small area each side of the route centreline, reducing the total number of people affected. Certain methods can be used to disperse traffic over a wider area, such as requiring aircraft to turn when they reach a certain altitude. This results in a much larger area being subject to aircraft noise, but on a less frequent basis. This may be preferable if a concentrated route would overfly a particular community as a dispersed route can spread the noise impact over a swathe of countryside. The differences in the speed, altitude, and bank angle of each individual aircraft mean there will always be a certain amount of dispersal.

"Fly-by" vs "fly-over"

Each route has a number of turn points. The type of turn specified in relation to these points will influence dispersal. "Fly-by" turns are where the aircraft will calculate where it needs to start turning in order to smoothly intercept the next segment of the route, and will "fly-by" the navigation point. For these turns there will be a limited amount of dispersal around the inside of the turn. "Fly-over" turns are where the aircraft fly all the way to the turn point before starting to turn. These turns result in a larger amount of dispersal around the outside of the turn.



Runway 30 – departures

The current departure routes from runway 30 fly straight ahead for approximately 1,500 metres before turning to the southwest over the Firth of Clyde. The current design criteria prohibit the turn point from being defined any closer than 1,950 metres from the end of the runway.

This table shows anticipated aircraft departures from runway 30

Anticipated aircraft flying this route per week	2018	2019	2020	2021	2022	2023
Southwest	18	22	24	25	25	26
West	5	7	7	7	7	8
Southeast	52	65	70	72	74	76
East	3	4	4	4	5	5

Note: Further information on runway 30 departures is provided in the consultation document, sections 6.2 to 6.5

Runway 12 – departures

The current departure routes from runway 12 fly over or close to several villages. As part of the redesign project, we explored options to minimise the noise impact on these communities.

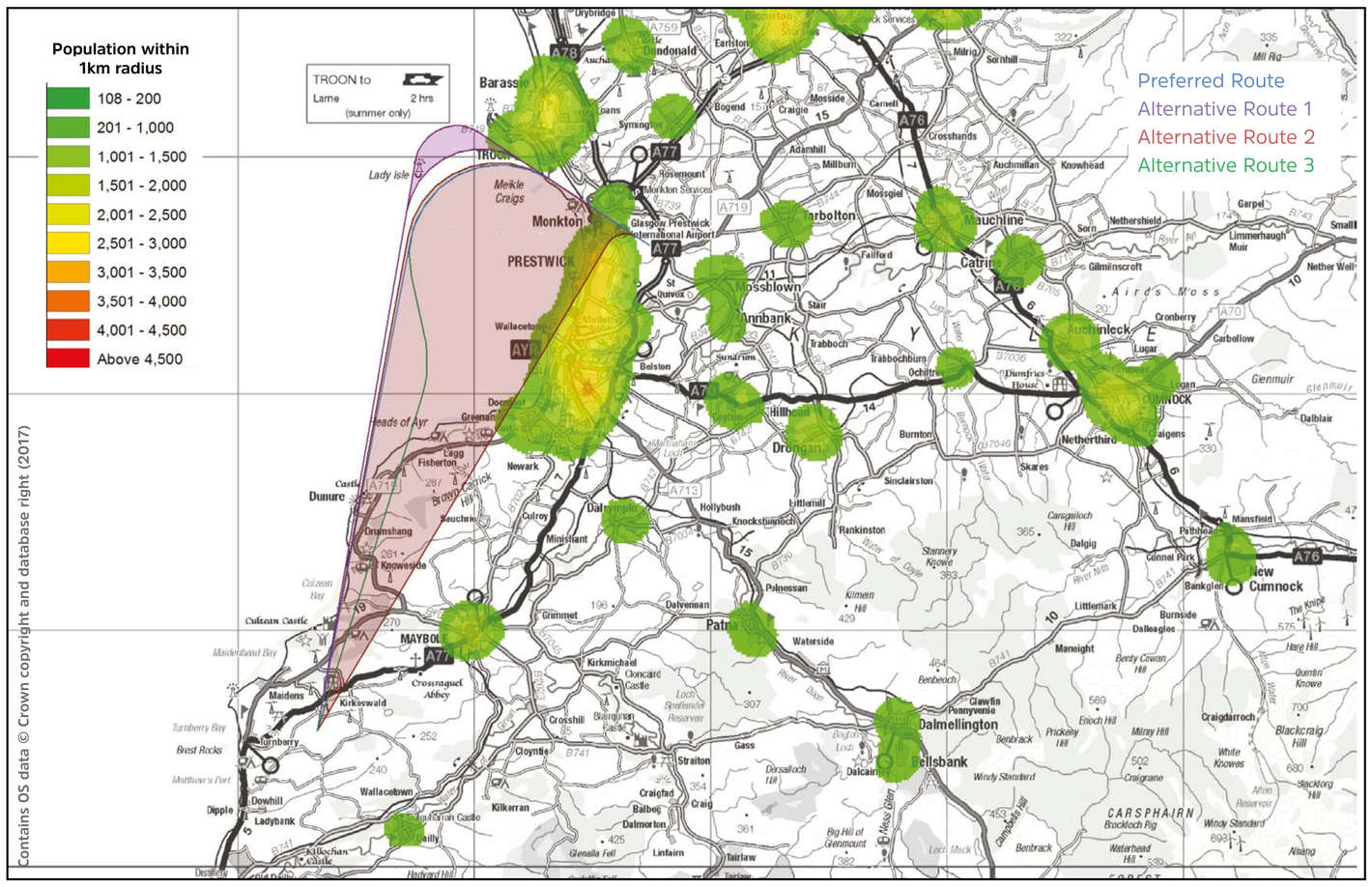
This table shows anticipated aircraft departures from runway 12

Anticipated aircraft flying this route per week	2018	2019	2020	2021	2022	2023
Southwest	10	13	14	14	14	15
West	3	3	3	3	3	4
Southeast	21	27	29	30	31	32
East	2	2	2	2	2	2

Note: Further information on runway 30 departures is provided in the consultation document, sections 6.6 to 6.9

Runway 30 – departures to the southwest

This is a replacement for the existing “TRN 1K” departure route



Runway 30 departures to the southwest – preferred and alternative routes over population density map

Preferred – Departures from runway 30 currently fly straight ahead for approximately 1,500 metres before turning to the southwest over the Firth of Clyde. The current design criteria prohibit the turn point from being defined any closer than 1,950 metres from the end of the runway. This slight extension to the straight flight has a small noise impact on the town of Troon. The preferred route then turns to the south and climbs over the Firth before crossing the shore again at Dunure and continuing toward a point overhead the old Turnberry (TRN) navigation aid.

Alternative 1 – We considered designing the route using a “fly-by” turn rather than a “fly-over” turn. The preferred route uses a “fly-over” turn to ensure that all aircraft start their turn at the defined point.

Fly-by turns are the standard turn type for the routes as they allow aircraft to turn from one track onto another smoothly using the most appropriate turn radius for the aircraft.

However, the turn point has to be placed at a sufficient distance to ensure the fastest aircraft doesn’t start turning before 1,950 metres from the end of the runway. This will result in more aircraft continuing to fly straight next to Troon before starting their turn to the southwest.

Alternative 2 – We considered specifying the initial turn to the south based on a specified altitude above the ground. This has the environmental advantage of ensuring aircraft turn as soon as they reach a safe altitude.

However, it also causes significant dispersion of the traffic as lighter aircraft that climb well will turn much earlier while heavier aircraft will take a lot longer (and travel further) to reach the same altitude and will therefore turn later.

This dispersion makes it very difficult for air traffic control to integrate the traffic together and ensure airspace containment.

Alternative 3 – We considered designing a route that complies with the design criteria for the initial turn then brings aircraft back onto the current conventional route.

This would have the same impact on Troon as the preferred route and would result in slightly increased track mileage / slightly increased CO_2 emissions.

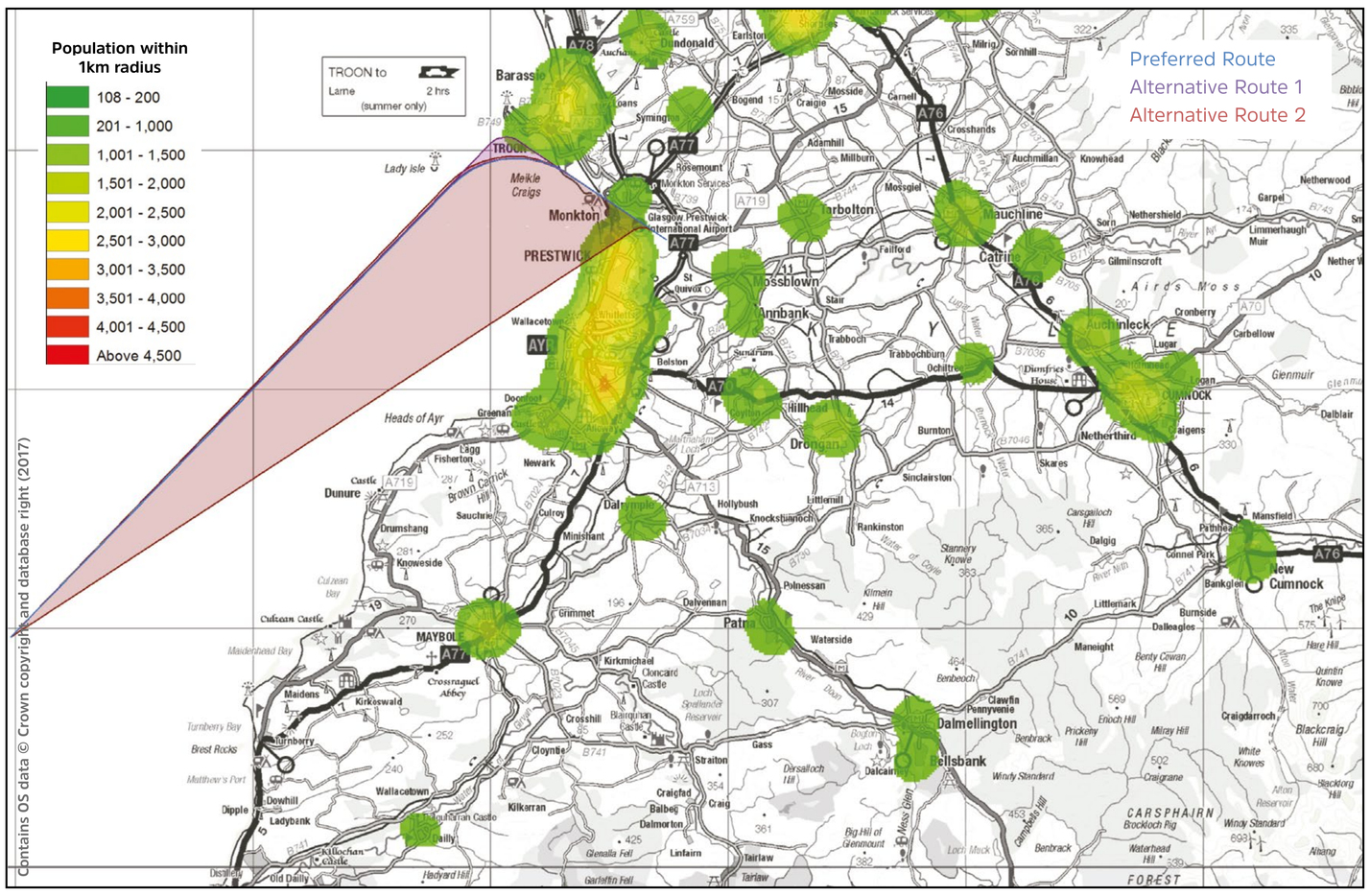
This table compares the impact of each route

	Preferred	Alt. 1	Alt. 2	Alt. 3
CO_2 emissions	More	More	Variable	More
Noise – Population Overflown	550	968	11,548	572
Noise – New Population	0	0	10,655	0
Concentration / Dispersal	Concentration	Concentration	Dispersal	Concentration
Technical Feasibility	Good	Good	Difficult	Good
Community	Impact (compared to current day)			
Troon	Closer	Closer	Closer	Closer
Dunure	Similar	Similar	Similar	Same
Ayr	Same	Same	Partially Overflown	Same

Glasgow Prestwick Airport

Runway 30 – departures to the west

This is a new route intended to provide a more efficient route for aircraft departing to destinations such as Iceland, North America, or South America.



Runway 30 departures to the west – preferred and alternative routes over population density map

Preferred – Departures from runway 30 currently fly straight ahead for approximately 1,500 metres before turning to the southwest over the Firth of Clyde. The current design criteria prohibit the turn point from being defined any closer than 1,950 metres from the end of the runway. This slight extension to the straight flight has a small noise impact on the town of Troon. The preferred route then turns to the southwest and climbs over the Firth to connect to a point called HERON on the airway leading to the Atlantic.

Alternative 1 – We considered designing the route using a "fly-by" turn rather than a "fly-over" turn. The preferred route uses a "fly-over" turn to ensure that all aircraft start their turn at the defined point.

Fly-by turns are the standard turn type for the routes as they allow aircraft to turn from one track onto another smoothly using the most appropriate turn radius for the aircraft.

However, the turn point has to be placed at a sufficient distance to ensure the fastest aircraft doesn't start turning before 1,950 metres from the end of the runway. This will result in more aircraft continuing to fly over the water next to Troon before starting their turn to the southwest.

Alternative 2 – We considered specifying the initial turn to the south based on a specified altitude above the ground. This has the environmental advantage of ensuring aircraft turn as soon as they reach a safe altitude.

However, it also causes significant dispersion of the traffic as lighter aircraft that climb well will turn much earlier while heavier aircraft will take a lot longer (and travel further) to reach the same altitude and will therefore turn later.

This dispersion makes it very difficult for air traffic control to integrate the traffic together and ensure airspace containment.

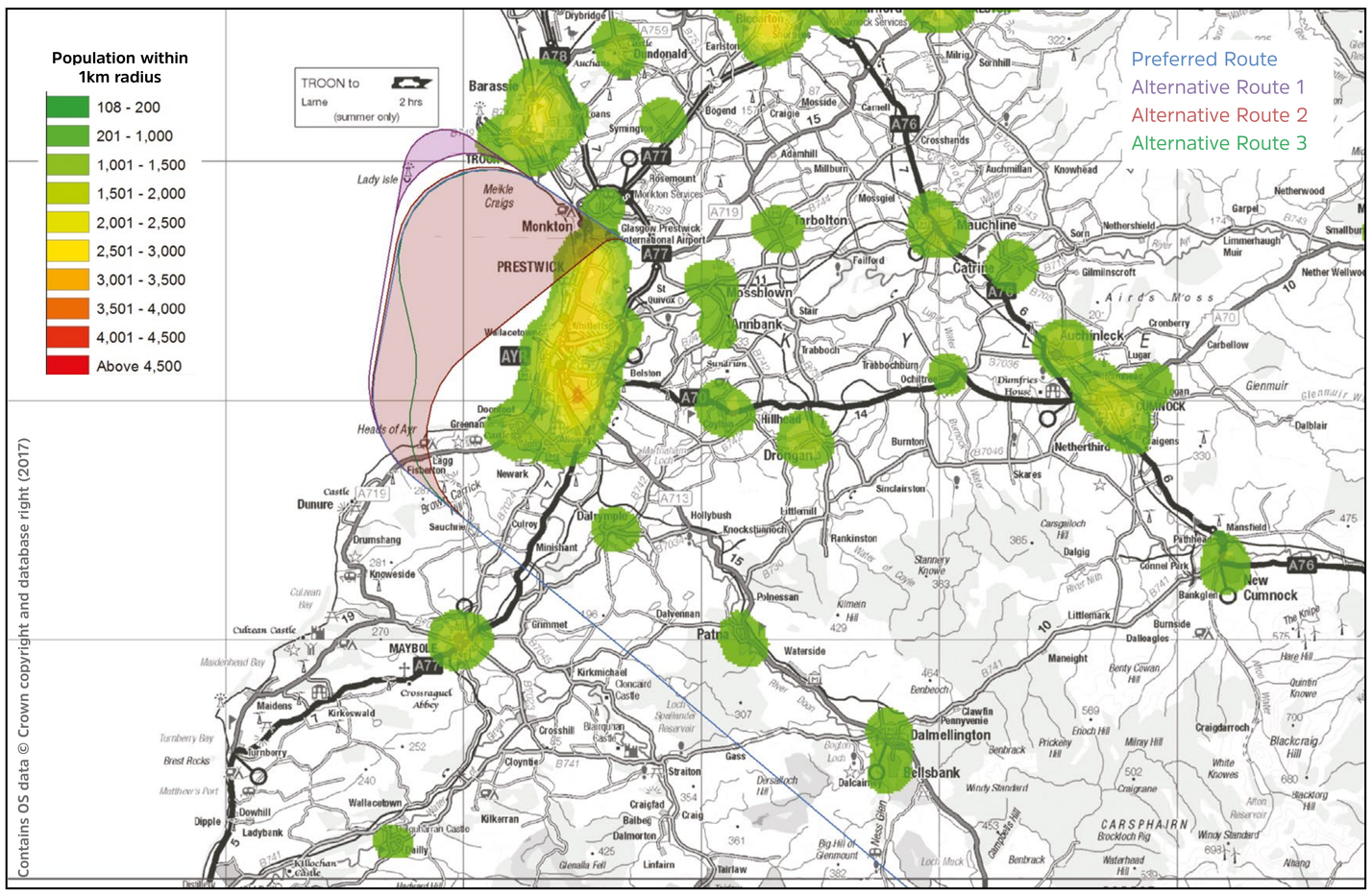
This table compares the impact of each route

	Preferred	Alt. 1	Alt. 2
CO_2 emissions	Less	Less	Variable
Noise – Population Overflown	105	141	3,283
Noise – New Population	0	0	1,296
Concentration / Dispersal	Concentration	Concentration	Dispersal
Technical Feasibility	Good	Good	Difficult
Community	Impact (compared to current day)		
Troon	Closer	Closer	Closer
Dunure	Further	Further	Further
Ayr	Same	Same	Partially Overflown

Glasgow Prestwick Airport

Runway 30 – departures to the southeast

This is a replacement for the existing “NGY 1K” departure route.



Runway 30 departures to the southeast – preferred and alternative routes over population density map

Preferred – Departures from runway 30 currently fly straight ahead for approximately 1,500 metres before turning to the southwest over the Firth of Clyde. The current design criteria prohibit the turn point from being defined any closer than 1,950 metres from the end of the runway. This slight extension to the straight flight has a small noise impact on the town of Troon. The preferred route then turns to the south and climbs over the Firth before turning to the southeast and crossing the shore at Fisherton. To improve on the integration of these aircraft into the airways network this departure route will now end at a point called OSMEG which is approximately 6,000 metres southeast of the old New Galloway (NGY) navigation aid.

Alternative 1 – We considered designing the route using a “fly-by” turn rather than a “fly-over” turn. The preferred route uses a fly-over turn to ensure that all aircraft start their turn at the defined point.

Fly-by turns are the standard turn type for the routes as they allow aircraft to turn from one track onto another smoothly using the most appropriate turn radius for the aircraft.

However, the turn point has to be placed at a sufficient distance to ensure the fastest aircraft doesn’t start turning before 1,950 metres from the end of the runway. This will result in more aircraft continuing to fly straight next to Troon before starting their turn to the south.

Alternative 2 – We considered specifying the initial turn to the south based on a specified altitude above the ground. This has the environmental advantage of ensuring aircraft turn as soon as they reach a safe altitude.

However, it also causes significant dispersion of the traffic as lighter aircraft that climb well will turn much earlier while heavier aircraft will take a lot longer (and travel further) to reach the same altitude and will therefore turn later.

This dispersion makes it very difficult for air traffic control to integrate the traffic together and ensure airspace containment.

Alternative 3 – We considered designing a route that complies with the design criteria for the initial turn then brings aircraft back onto the current conventional route.

This would have the same impact on Troon as the preferred route and would result in problems with aircraft flying the route due to the number of turns in close proximity.

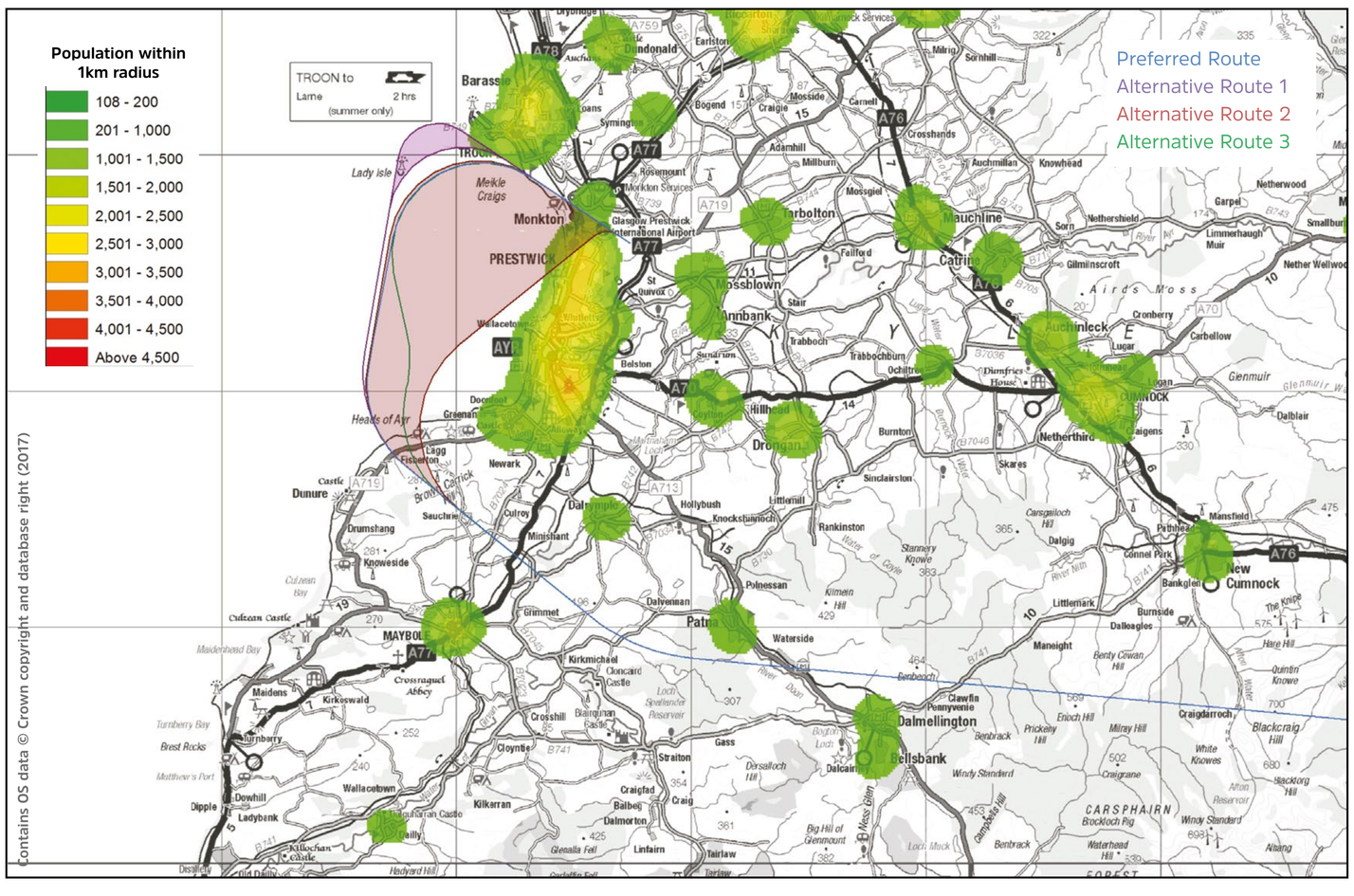
This table compares the impact of each route

	Preferred	Alt. 1	Alt. 2	Alt. 3
CO_2 emissions	More	More	Variable	More
Noise – Population Overflown	324	181	2,934	326
Noise – New Population	0	0	1,608	0
Concentration / Dispersal	Concentration	Concentration	Dispersal	Concentration
Technical Feasibility	Good	Good	Difficult	Good
Community	Impact (compared to current day)			
Troon	Closer	Closer	Closer	Closer
Ayr	Same	Same	Partially Overflown	Same

Glasgow Prestwick Airport

Runway 30 – departures to the east

This is a new route intended to provide a more environmentally efficient route for aircraft departing to destinations such as Northern Europe, Russia, or the Far East.



Runway 30 departures to the east – preferred and alternative routes over population density map

Preferred – Departures from runway 30 currently fly straight ahead for approximately 1,500 metres before turning to the southwest over the Firth of Clyde. The current design criteria prohibit the turn point from being defined any closer than 1,950 metres from the end of the runway. This slight extension to the straight flight has a small noise impact on the town of Troon. The preferred route then turns to the south and climbs over the Firth before turning to the southeast and crossing the shore at Fisherton. At a point close to Patna the route turns east to a point called SUMIN where it turns to the northeast to a point called HAVEN which is on the airway leading to the East.

Alternative 1 – We considered designing the route using a "fly-by" turn rather than a "fly-over" turn. The preferred route uses a fly-over turn to ensure that all aircraft start their turn at the defined point.

Fly-by turns are the standard turn type for the routes as they allow aircraft to turn from one track onto another smoothly using the most appropriate turn radius for the aircraft.

However, the turn point has to be placed at a sufficient distance to ensure the fastest aircraft doesn't start turning before 1,950 metres from the end of the runway. This will result in more aircraft continuing to fly straight next to Troon before starting their turn to the south.

Alternative 2 – We considered specifying the initial turn to the south based on a specified altitude above the ground. This has the environmental advantage of ensuring aircraft turn as soon as they reach a safe altitude.

However, it also causes significant dispersion of the traffic as lighter aircraft that climb well will turn much earlier while heavier aircraft will take a lot longer (and travel further) to reach the same altitude and will therefore turn later.

This dispersion makes it very difficult for air traffic control to integrate the traffic together and ensure airspace containment.

Alternative 3 – We considered designing a route that complies with the design criteria for the initial turn then brings aircraft back onto the current conventional route.

This would have the same impact on Troon as the preferred route and would result in problems with aircraft flying the route due to the number of turns in close proximity.

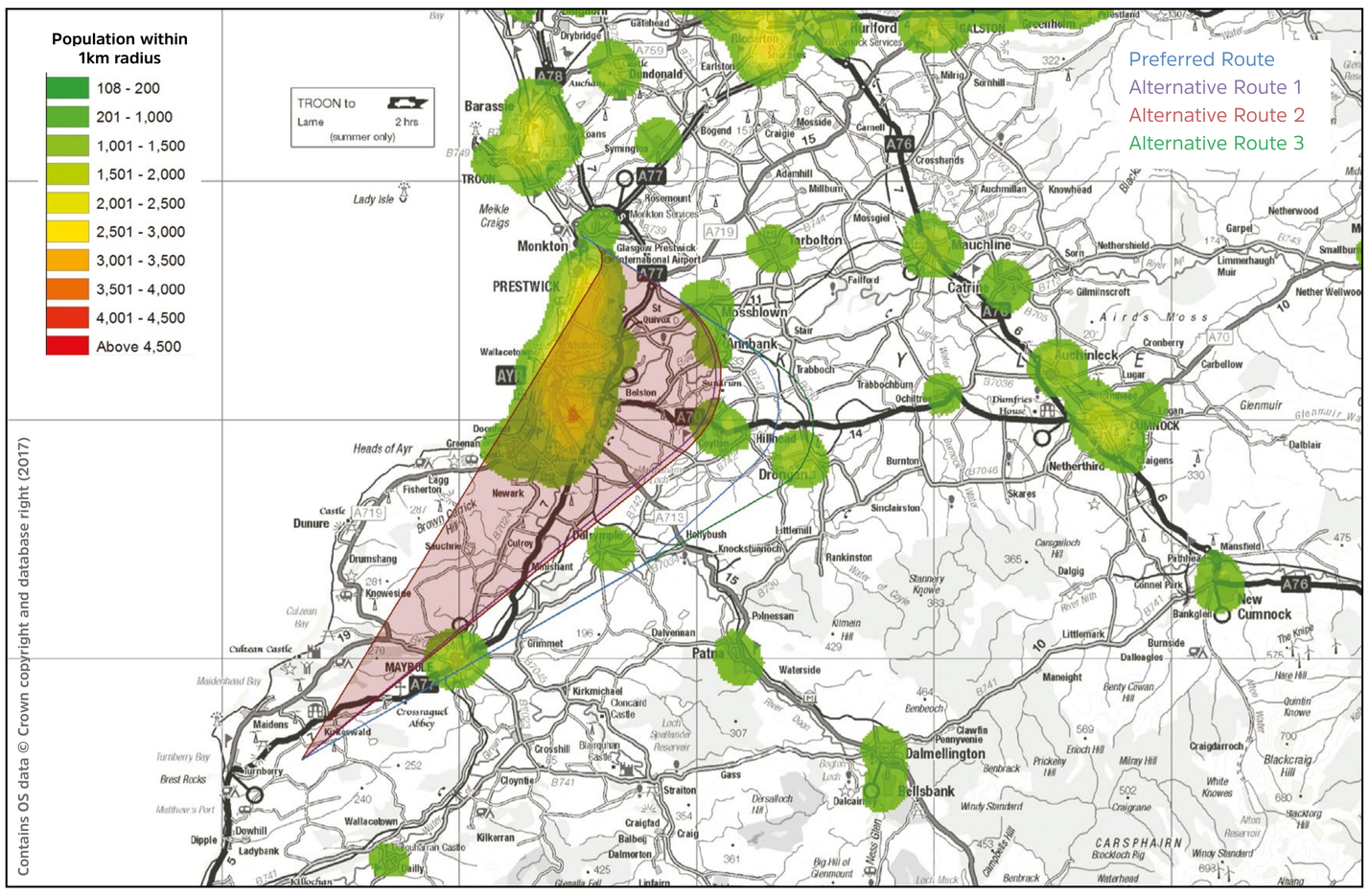
This table compares the impact of each route

	Preferred	Alt. 1	Alt. 2	Alt. 3
CO_2 emissions	Less	Less	Variable	Less
Noise – Population Overflown	324	181	2,934	326
Noise – New Population	0	0	1,608	0
Concentration / Dispersal	Concentration	Concentration	Dispersal	Concentration
Technical Feasibility	Good	Good	Difficult	Good
Community	Impact (compared to current day)			
Troon	Closer	Closer	Closer	Closer
Ayr	Same	Same	Partially Overflown	Same

Glasgow Prestwick Airport

Runway 12 – departures to the southwest

This is a replacement for the existing “TRN 1L” departure route.



Runway 12 departures to the southwest – preferred and alternative routes over population density map

Preferred – In order to minimise the noise impact for the greatest number of people, we have maintained the current track between Mossblown and Annbank rather than making an earlier turn to the south. However, we have moved the turn point slightly closer to the airport in order to reduce the noise impact on Drongan. This puts the centreline of the prefererred route slightly closer to Hillhead and Coylton but the centre of the noise footprint is in the countryside between Hillhead and Drongan. The new route then re-joins the current route in the vicinity of Hollybush and turns toward a point overhead the old Turnberry (TRN) navigation aid.

Alternative 1 – We considered specifying the turn to the south as soon as possible from the end of the runway. However, this route would directly overfly Annbank as well as Coylton.

While the reduced track mileage would result in lower CO_2 emissions, CAA guidance states that minimising noise impact should be the priority below 4,000ft; therefore this isn’t our preferred route.

Alternative 2 – We considered specifying the initial turn to the south based on a specified altitude above the ground. This has the environmental advantage of ensuring aircraft turn as soon as they reach a safe altitude.

However, it also causes significant dispersion of the traffic as lighter aircraft that climb well will turn much earlier while heavier aircraft will take a lot longer (and travel further) to reach the same altitude and will therefore turn later.

This results in a much larger area being subject to overflight albeit on less frequent but unpredictable basis.

Alternative 3 – We considered replicating the current departure route as closely as possible. This does not introduce any new problems but it doesn’t provide any improvement for the people in Drongan and doesn’t provide any environmental benefit.

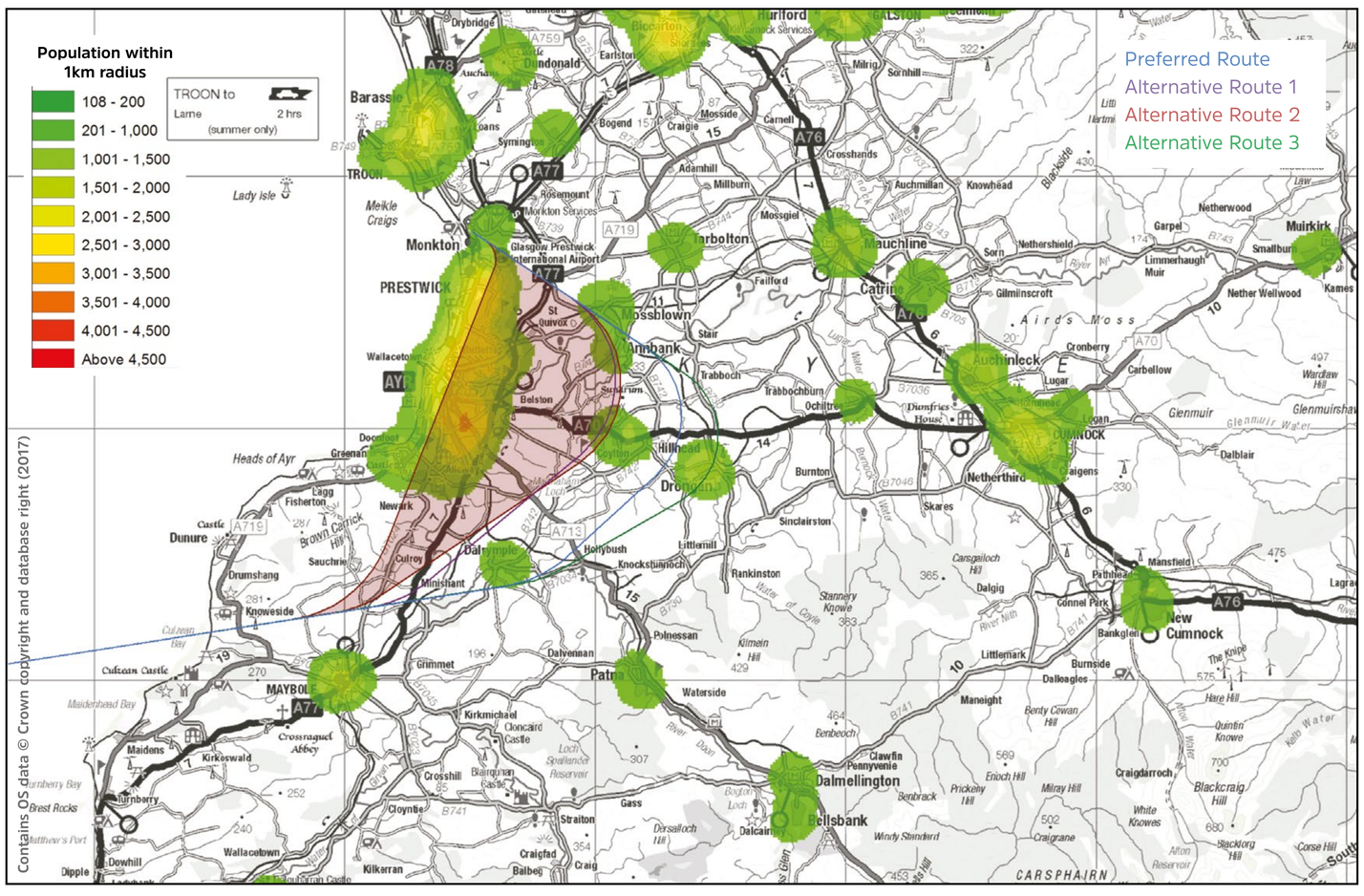
This table compares the impact of each route

	Preferred	Alt. 1	Alt. 2	Alt. 3
CO_2 emissions	Less	Less	Variable	Same
Noise – Population Overflown	7,598	10,060	14,896	6,570
Noise – New Population	6,515	8,441	14,102	2,430
Concentration / Dispersal	Concentration	Concentration	Dispersal	Concentration
Technical Feasibility	Good	Good	Difficult	Good
Community	Impact (compared to current day)			
Mossblown	Same	Similar	Similar	Same
Annbank	Same	More Overflown	More Overflown	Same
Drongan	Further	Further	Overflown	Same
Hillhead	Partially Overflown	Similar	Overflown	Same
Coylton	Closer	Overflown	Overflown	Same
Hollybush	Similar	Further	Overflown	Same
Dalrymple	Similar	Similar	Overflown	Same
Rankinston	Further	Further	Further	Same
Ayr	Same	Closer	Partially Overflown	Same

Glasgow Prestwick Airport

Runway 12 – departures to the west

This is a new route intended to provide a more environmentally efficient route for aircraft departing to destinations such as Iceland, North America, or South America.



Runway 12 departures to the west – preferred and alternative routes over population density map

Preferred – In order to minimise the noise impact for the greatest number of people, we have maintained the current track between Mossblown and Annbank rather than making an earlier turn to the south. However, we have moved the turn point slightly closer to the airport in order to reduce the noise impact on Drongan. This puts the centreline of the prefererred route slightly closer to Hillhead and Coylton but the centre of the noise footprint is in the countryside between Hillhead and Drongan. The new route then turns to the west and continues to a point called HERON on the airway leading to the Atlantic.

Alternative 1 – We considered specifying the turn to the south as soon as possible from the end of the runway. However, this route would directly overfly Annbank as well as Coylton.

While the reduced track mileage would result in lower CO2 emissions, CAA guidance states that minimising noise impact should be the priority below 4,000ft; therefore this isn't our preferred route.

Alternative 2 – We considered specifying the initial turn to the south based on a specified altitude above the ground. This has the environmental advantage of ensuring aircraft turn as soon as they reach a safe altitude.

However, it also causes significant dispersion of the traffic as lighter aircraft that climb well will turn much earlier while heavier aircraft will take a lot longer (and travel further) to reach the same altitude and will therefore turn later.

This results in a much larger area being subject to overflight albeit on a less frequent but unpredictable basis.

Alternative 3 – We considered replicating the initial turn of the current departure route as closely as possible. This does not introduce any new problems but it doesn't provide any improvement for the people in Drongan and doesn't provide any environmental benefit.

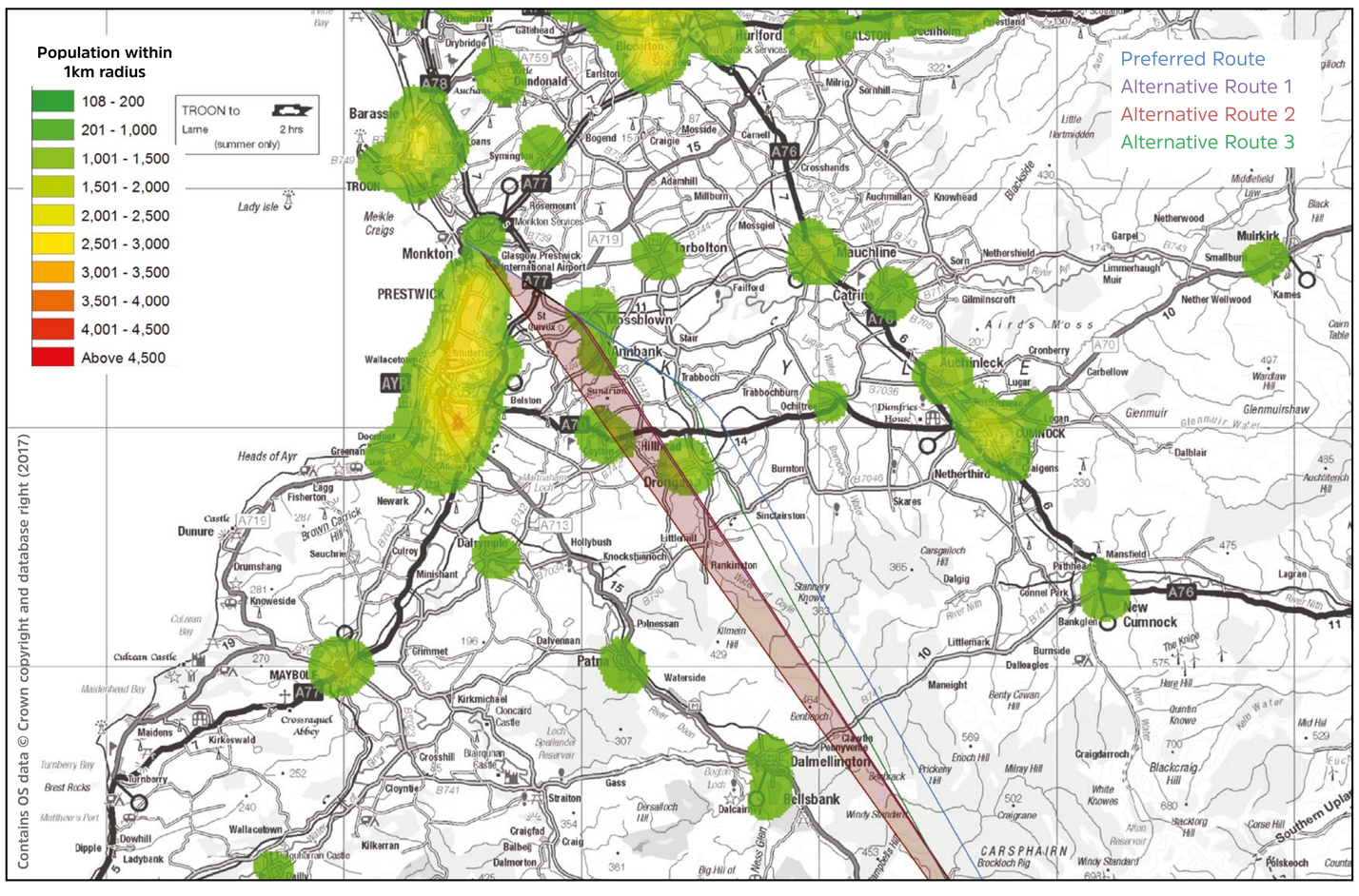
This table compares the impact of each route

	Preferred	Alt. 1	Alt. 2	Alt. 3
CO_2 emissions	Less	Less	Variable	Less
Noise – Population Overflown	3,201	19,118	4,222	6,540
Noise – New Population	2,153	18,664	3,063	2,415
Concentration / Dispersal	Concentration	Concentration	Dispersal	Concentration
Technical Feasibility	Good	Good	Difficult	Good
Community	Impact (compared to current day)			
Mossblown	Same	Similar	Similar	Same
Annbank	Same	More Overflown	More Overflown	Same
Drongan	Partially Overflown	Further	Further	Same
Hillhead	Partially Overflown	Similar	Overflown	Same
Coylton	Closer	Overflown	Overflown	Same
Hollybush	Similar	Further	Similar	Same
Dalrymple	Same	Similar	Overflown	Same
Ayr	Same	Closer	Partially Overflown	Same

Glasgow Prestwick Airport

Runway 12 – departures to the southeast

This is a replacement for the existing “NGY 1L” departure route



Runway 12 departures to the southeast – preferred and alternative routes over population density map

Preferred – In order to minimise the noise impact for the greatest number of people, we have maintained the current track between Mossblown and Annbank rather than making an earlier turn to the southeast. We have then used the same turning point as the routes to the southwest and west for the turn to the southeast. This puts the centreline of the proposed route slightly further to the east and reduces the noise impact on Drongan. To improve the integration of these aircraft into the airways network this departure route will now end at a point called OSMEG which is approximately 6,000 metres southeast of the old New Galloway (NGY) navigation aid.

Alternative 1 – We considered specifying the turn to the southeast as soon as possible from the end of the runway. However, this route would directly overfly Annbank as well as Drongan.

While the reduced track mileage would result in lower CO_2 emissions, CAA guidance states that minimising noise impact should be the priority below 4,000ft; therefore this isn’t our preferred route.

Alternative 2 – We considered specifying the initial turn to the southeast based on a specified altitude above the ground. This has the environmental advantage of ensuring aircraft turn as soon as they reach a safe altitude.

However it also causes significant dispersion of the traffic as lighter aircraft that climb well will turn much earlier while heavier aircraft will take a lot longer (and travel further) to reach the same altitude and will therefore turn later.

Alternative 3 – We considered replicating the current departure route as closely as possible. This does not introduce any new problems but it doesn’t provide any improvement for the people in Drongan.

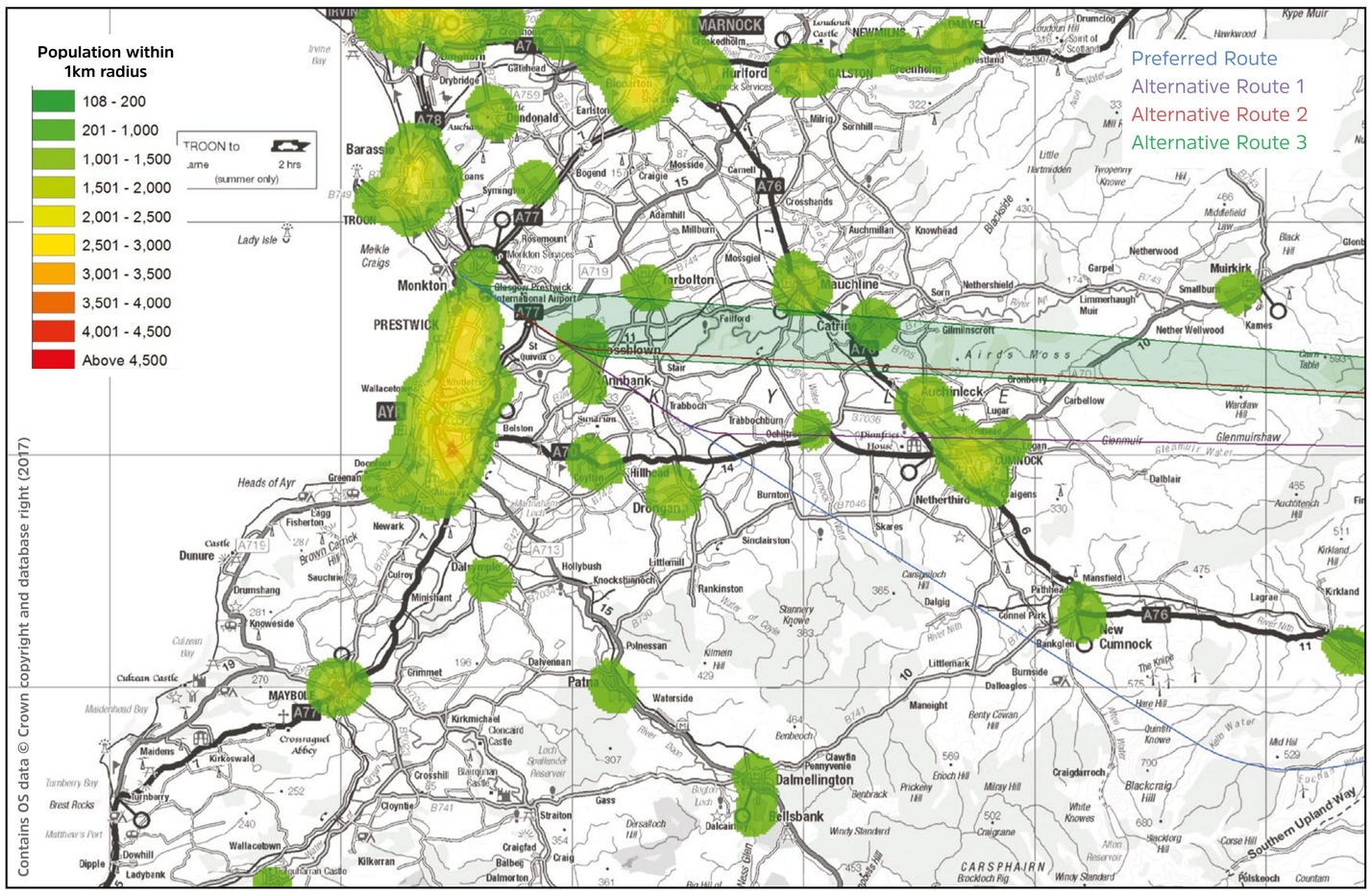
This table compares the impact of each route

	Preferred	Alt. 1	Alt. 2	Alt. 3
CO_2 emissions	Similar	Less	Variable	Same
Noise – Population Overflown	2,037	4,445	3,076	4,737
Noise – New Population	0	578	3,024	751
Concentration / Dispersal	Concentration	Concentration	Dispersal	Concentration
Technical Feasibility	Good	Good	Moderate	Good
Community	Impact (compared to current day)			
Mossblown	Same	Similar	Similar	Same
Annbank	Same	More Overflown	More Overflown	Same
Drongan	Similar	Overflown	Overflown	Same
Hillhead	Similar	Overflown	Overflown	Same
Coylton	Similar	Closer	Overflown	Same
Rankinston	Further	Overflown	Overflown	Same
Ayr	Same	Same	Closer	Same

Glasgow Prestwick Airport

Runway 12 – departures to the east

This is a new route intended to provide a more environmentally efficient route for aircraft departing to destinations such as Northern Europe, Russia, or the Far East.



Runway 12 departures to the east – preferred and alternative routes over population density map

Preferred – In order to minimise the noise impact for the greatest number of people, we have maintained the current track between Mossblown and Annbank rather than making an earlier turn to the east. We have then used the same turning point as the routes to the southwest and west for the turn to a point called SUMIN. This keeps aircraft away from all other significant population areas until they are above 7,000ft at which point the Civil Aviation Authority (CAA) guidance states that minimising emissions should be the priority.

Alternative 1 – We considered using the same turning point as the routes to the southwest and west but turning directly to HAVEN. However, this route would pass very close to Ochiltree and overfly Cumnock.

While the reduced track mileage would result in lower CO_2 emissions, CAA guidance states that minimising noise impact should be the priority below 4,000ft; therefore this isn't our preferred route.

This option would also present significant air traffic control challenges due to the increased interactions with Glasgow and Edinburgh traffic.

Alternative 2 – We considered specifying the turn toward HAVEN as soon as possible from the end of the runway. However, this route would directly overfly Mossblown. As noise impact is the priority below 4,000ft this has been prioritised vs. reduced track mileage / reduced CO_2 emissions.

This option would also present significant air traffic control challenges due to the increased interactions with Glasgow and Edinburgh traffic.

Alternative 3 – We considered specifying the initial turn toward HAVEN based on a specified altitude above the ground. This has the environmental advantage of ensuring aircraft turn as soon as they reach a safe altitude.

However, it also causes significant dispersion of the traffic as lighter aircraft that climb well will turn much earlier while heavier aircraft will take a lot longer (and travel further) to reach the same altitude and will therefore turn later.

This option would also present significant air traffic control challenges due to the increased interactions with Glasgow and Edinburgh traffic.

This table compares the impact of each route

	Preferred	Alt. 1	Alt. 2	Alt. 3
CO_2 emissions	Less	Less	Less	Variable
Noise – Population Overflown	11,376	4,026	4,491	6,958
Noise – New Population	10,660	2,577	2,969	6,950
Concentration / Dispersal	Concentration	Concentration	Concentration	Dispersal
Technical Feasibility	Good	Difficult	Difficult	Difficult
Community	Impact (compared to current day)			
Mossblown	Same	Same	More Overflown	More Overflown
Annbank	Same	Same	Similar	Similar
Ochiltree	Closer	Overflown	Closer	Closer
Catrine	Similar	Similar	Closer	Overflown
Auchinleck	Similar	Overflown	Partially Overflown	Overflown
Cumnock	Closer	Overflown	Closer	Closer
Mauchline	Same	Same	Closer	Overflown
Tarbolton	Same	Same	Closer	Overflown
Drongan	Same	Same	Further	Further
Hillhead	Similar	Similar	Further	Further

Glasgow Prestwick Airport

Runway 30 arrivals

General factors influencing design

Runway 30 will be used by aircraft arriving at the airport via one of the Standard Instrument Arrivals (STARs). Aircraft required to hold will enter from the south. Aircraft that continue directly without holding arrive from the east.

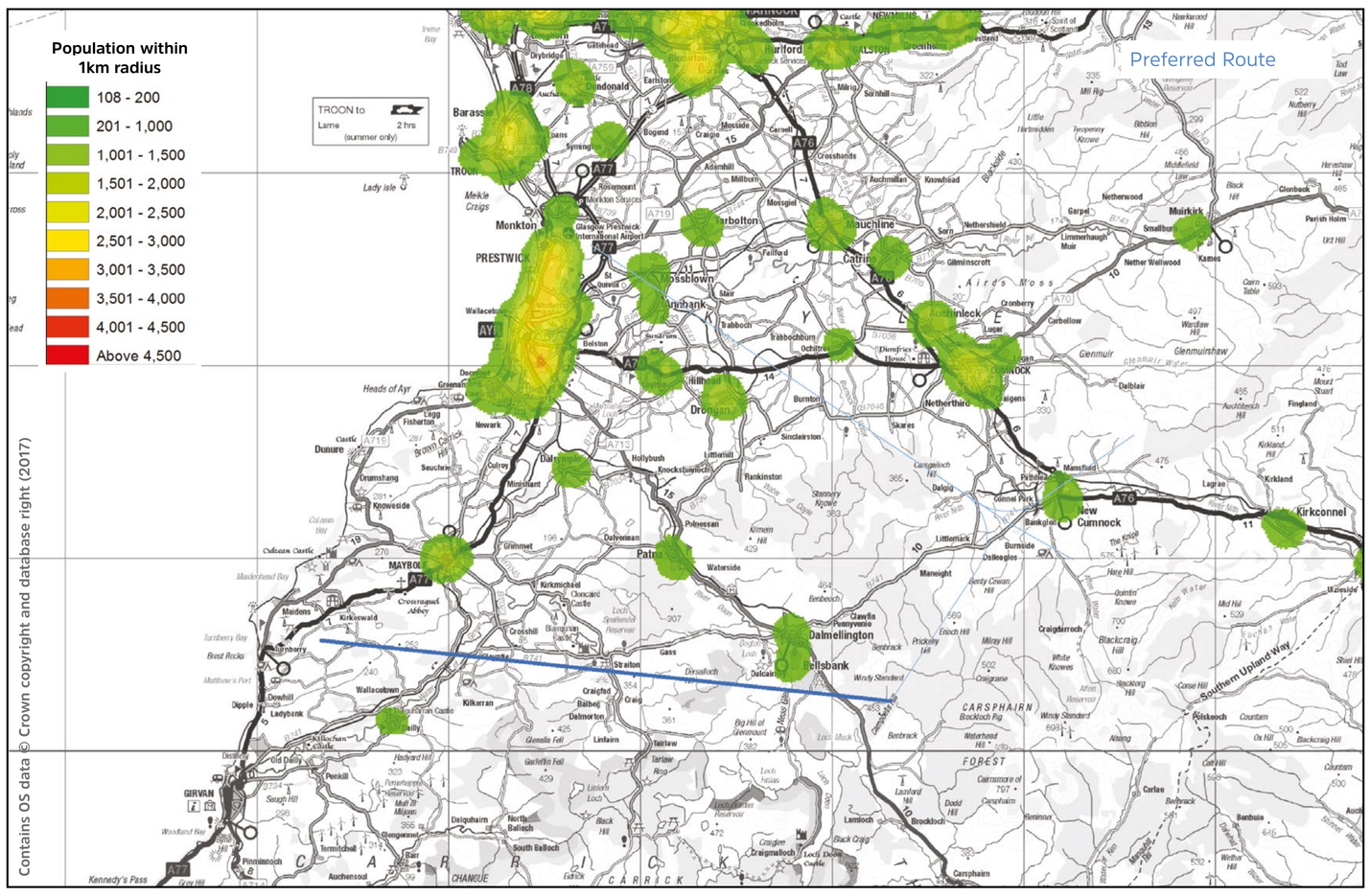
When several aircraft arrive at the airport in close succession Air Traffic Control may decide to give each aircraft individual instructions rather than having them follow the published arrival route. This may be to improve operational efficiency, minimise delays to subsequent aircraft, or to ensure the correct separation between aircraft is applied. In such instances the aircraft are likely to fly within the same swathe as is currently seen.

This table shows anticipated aircraft arrivals at runway 30

Anticipated aircraft flying this route per week	2018	2019	2020	2021	2022	2023
South	78	97	105	108	110	113
East	78	97	105	108	110	113

Note: Further information on runway 30 arrivals is provided in the consultation document, sections 6.10 and 6.11

For these arrivals, we have only indicated a preferred route. These routes have been designed and evaluated according to the design principles listed in the consultation document, section 6.1.1.

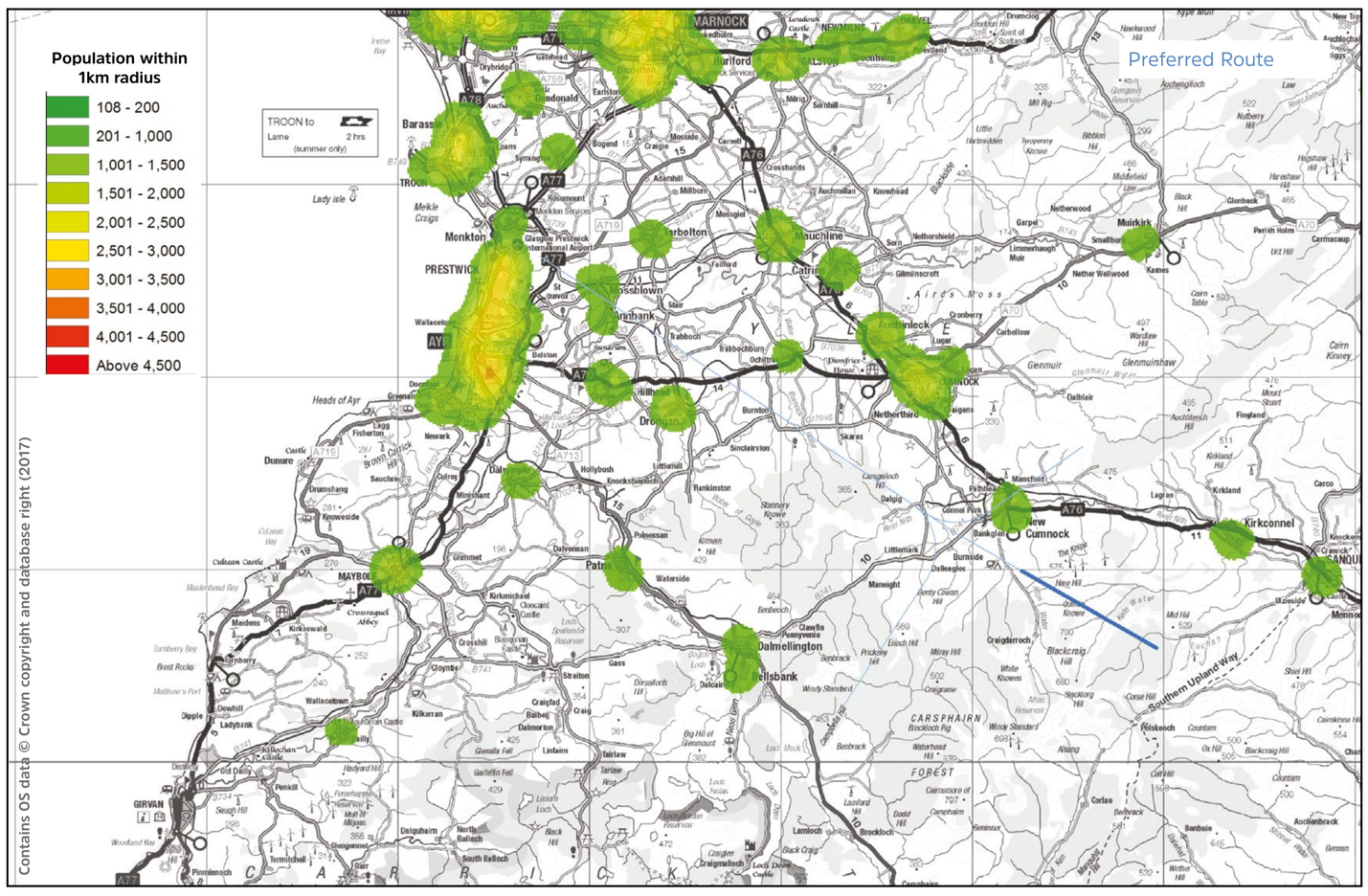


Runway 30 arrivals from the south – preferred route over population density map

Preferred –

This route will be used by aircraft arriving at the airport via one of the Standard Instrument Arrivals (STARs) that end at a point overhead the old Turnberry (TRN) navigation aid. Aircraft will hold at TRN until instructed by Air Traffic Control to leave the hold. This procedure will then deliver them to the start of the approach procedure for runway 30.

As the majority of this route remains above 7,000ft the main priority has been to minimise emissions. This route is therefore a straight line from TRN to the southern entry to the runway 30 approach procedure.



Runway 30 arrivals from the east – preferred route over population density map

Preferred –

This route will be used by aircraft arriving at the airport via one of the Standard Instrument Arrivals (STARs) that ends at the point called SUMIN. Aircraft are only sent to SUMIN when the traffic situation allows them to continue directly to an approach without holding. This procedure will then deliver them to the start of the approach procedure for runway 30.

As this the majority of this route remains above 7,000ft the main priority has been to minimise emissions. This route is therefore a straight line from SUMIN to the eastern enrty to the runway 30 approach procedure.

Glasgow Prestwick Airport

Runway 12 arrivals

General factors influencing design

Runway 12 will be used by aircraft arriving at the airport via one of the Standard Instrument Arrivals (STARs). All aircraft will enter from the south and may be instructed to hold, depending on the traffic situation.

When several aircraft arrive at the airport in close succession Air Traffic Control may decide to give each aircraft individual instructions rather than having them follow the published arrival route. This may be to improve operational efficiency, minimise delays to subsequent aircraft, or to ensure the correct separation between aircraft is applied. In such instances, the aircraft are likely to fly within the same swathe as is currently seen.

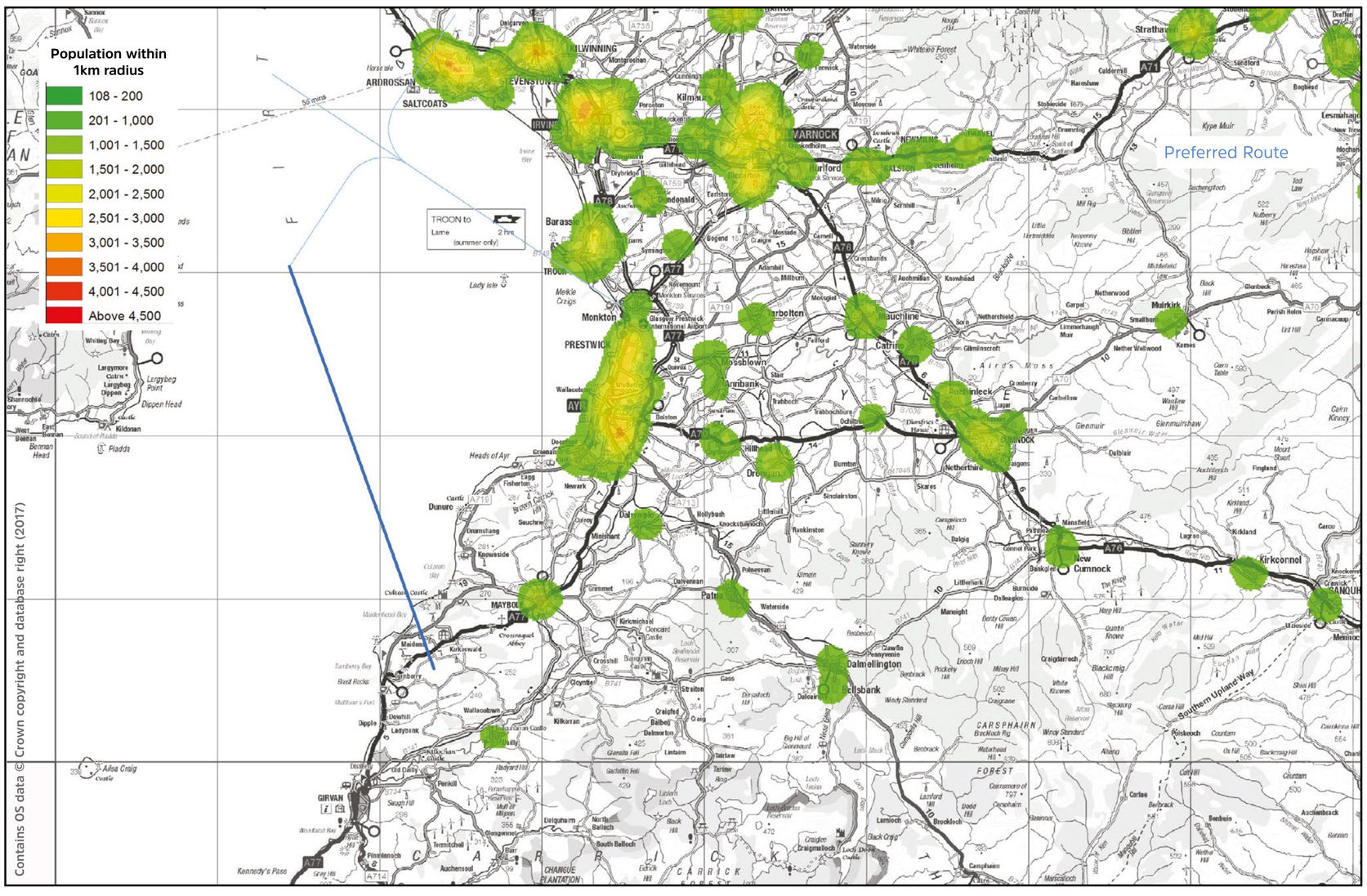
This table shows anticipated aircraft arriving at runway 12

Anticipated aircraft flying this route per week	2018	2019	2020	2021	2022	2023
South	39	49	53	54	56	57

Note: Further information on runway 12 arrivals is provided in the consultation document, section 6.12

For this arrival, we have only indicated a preferred route. This route has been designed and evaluated according to the design principles listed in the consultation document, section 6.1.1.

Runway 12 arrivals from the south



Runway 12 arrivals from the south – preferred route over population density map

Preferred – This route will be used by aircraft arriving at the airport via one of the Standard Instrument Arrivals (STARs) that end at point overhead the old Turnberry (TRN) navigation aid. Aircraft will hold at TRN until instructed by Air Traffic Control to leave the hold. This procedure will then deliver them to the start of the approach procedure for runway 12.

As the majority of this route remains above 7,000ft the main priority has been to minimise emissions. This route is therefore a straight line from TRN to the southern entry to the runway 12 approach procedure.

Glasgow Prestwick Airport

Runway 21 arrivals

General factors influencing design

For these arrivals, we have only indicated a preferred route. These routes have been designed and evaluated according to the design principles listed in the consultation document, section 6.1.1.

When several aircraft arrive at the airport in close succession Air Traffic Control may decide to give each aircraft individual instructions rather than having them follow the published arrival route. This may be to improve operational efficiency, minimise delays to subsequent aircraft, or to ensure the correct separation between aircraft is applied. In such instances, the aircraft are likely to fly within the same swathe as is currently seen.

This table shows anticipated aircraft arrivals at runway 21

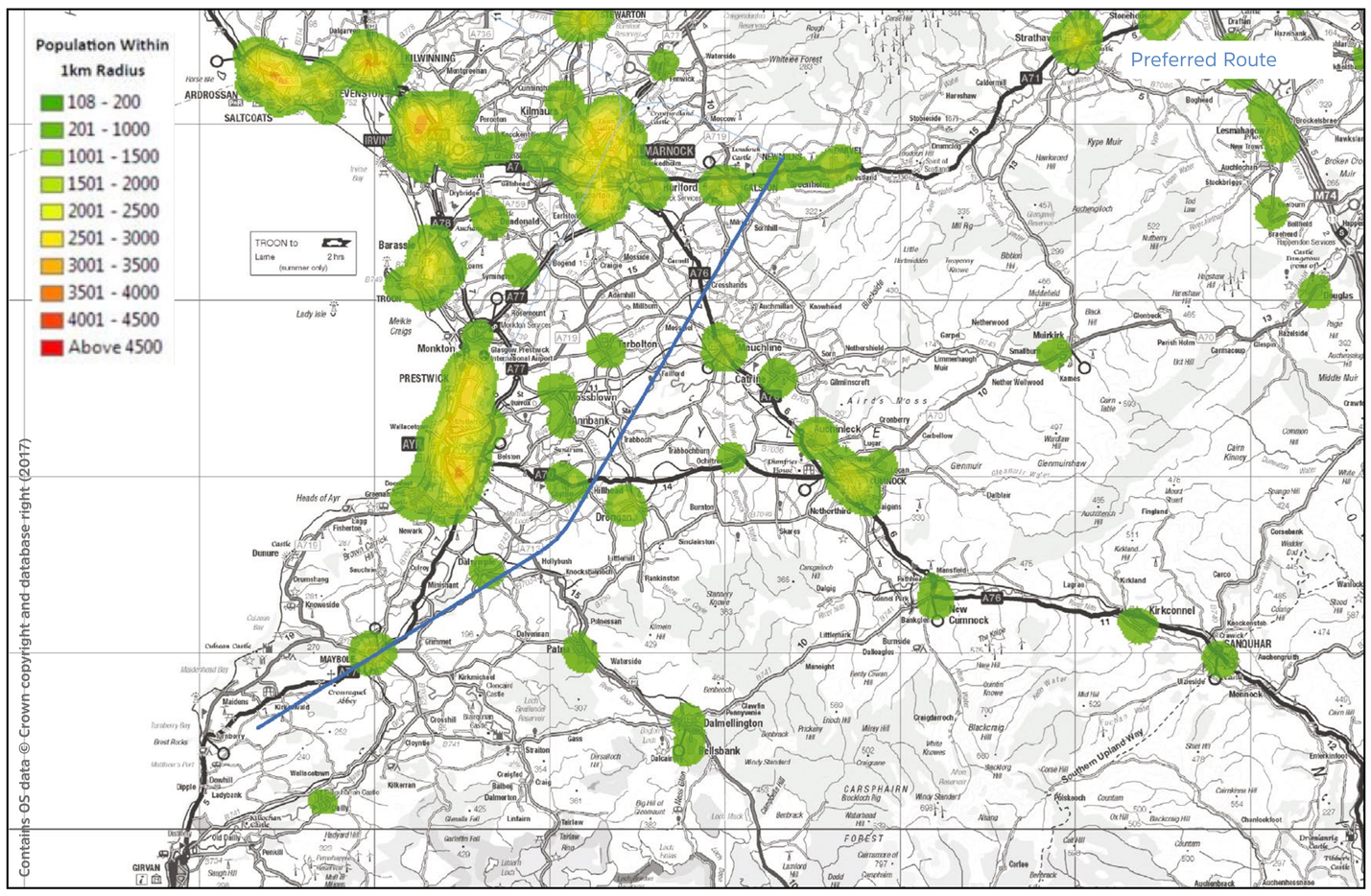
Anticipated aircraft flying this route per week	2018	2019	2020	2021	2022	2023
South	1	1	1	1	1	1
East	1	1	1	1	1	1

*As runway 21 is only used in extreme weather conditions or when the main runway is closed, it is difficult to predict how many aircraft are likely to fly this route. On historic evidence, it is unlikely to average more than one aircraft per week.

Note: Further information on runway 30 arrivals is provided in the consultation document, sections 6.13 and 6.14

For these arrivals, we have only indicated a preferred route. These routes have been designed and evaluated according to the design principles listed in the consultation document, section 6.1.1.

Runway 21 Arrivals from the South



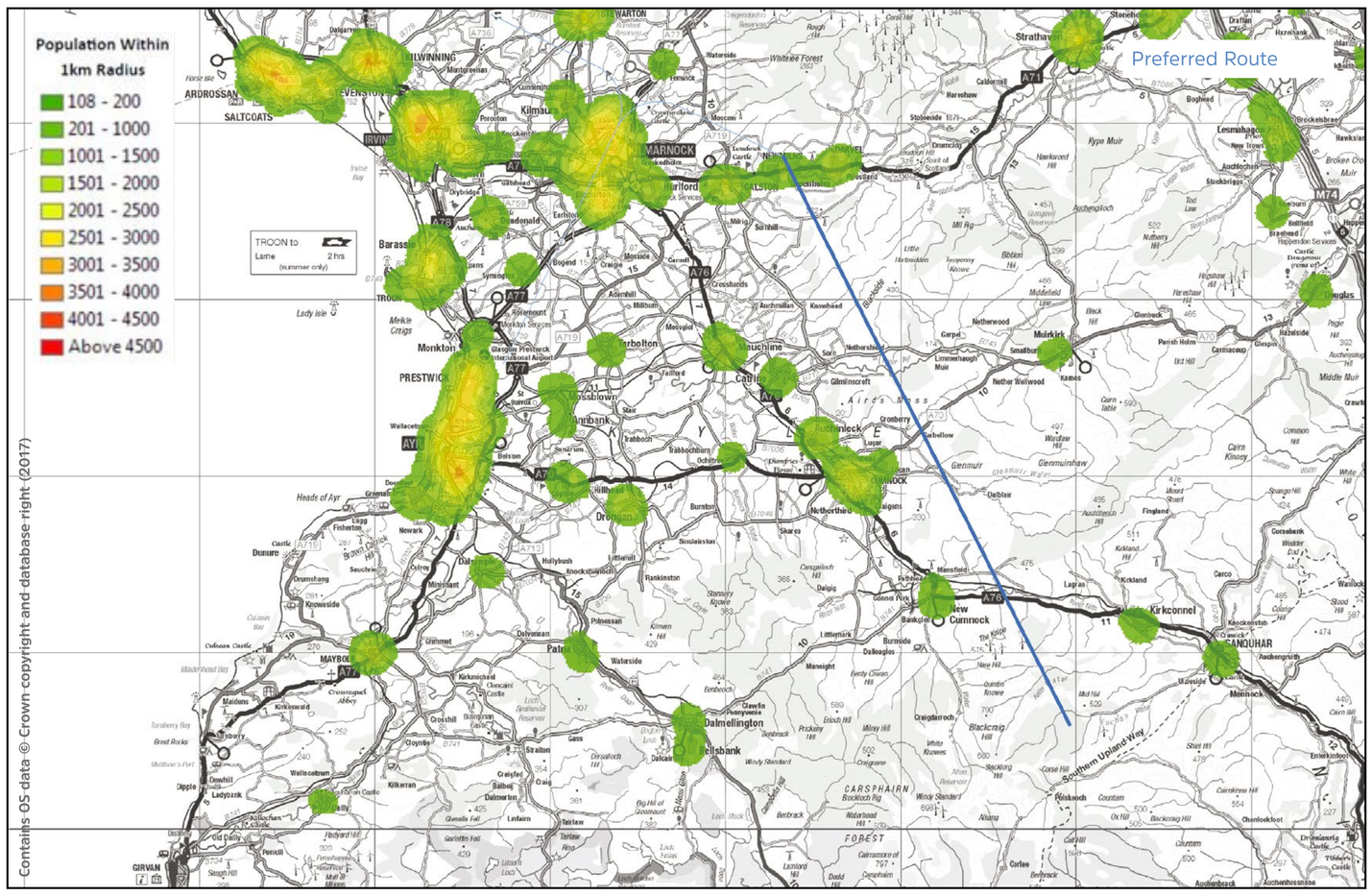
Runway 21 arrivals from the south – preferred route over population density map

Preferred –

This route will be used by aircraft arriving at the airport via one of the Standard Instrument Arrivals (STARs) that end at a point overhead the old Turnberry (TRN) navigation aid.

Aircraft will hold at TRN until instructed by Air Traffic Control to leave the hold. This procedure will then deliver them to the start of the approach procedure for runway 21.

As the majority of this route remains above 7,000ft the main priority has been to minimise emissions. This route takes the aircraft to the northeast initially until they are approximtely 10,000 metres east of the runway centreline. The route then turns north to go parallel to the runway in a straight line to the eastern entry to the runway 21 approach procedure.



Runway 21 arrivals from the east – preferred route over population density map

Preferred –

This route will be used by aircraft arriving at the airport via one of the Standard Instrument Arrivals (STARs) that ends at the point called SUMIN. Aircraft are only sent to SUMIN when the traffic situation allows them to continue directly to an approach without holding. This procedure will then deliver them to the start of the approach procedure for runway 21.

As this the majority of this route remains above 7,000ft the main priority has been to minimise emissions. This route is therefore a straight line from SUMIN to the eastern enrty to the runway 21 approach procedure.

Glasgow Prestwick Airport

Approaches

General factors influencing design

For each approach, we have indicated the preferred route and the alternative routes evaluated.

We have also designed new missed approach precedures for each runway to cater for situations where an aircraft is unable to land – e.g. problem with aircraft, low cloud preventing the pilots from being able to see the runway in time, or an obstruction on the runway. The missed approach must end at a location where the aircraft can hold in case there are technical issues to be resolved and where the aircraft can either commence another approach or divert to an alternative airport.

All the routes are designed and evaluated according to the design principles listed in the consultation document, section 6.1.1.

Noise analysis is based on the Boeing 737 (the commonest aircraft type operating from Glasgow Prestwick) and the Boeing 747 (the loudest aircraft type typically operating from the airport). While the Boeing 747 footprints are larger, this aircraft type only makes up approximately 2% of the aircraft movements.

This table shows anticipated aircraft approaches on runways 30, 12 & 21

Anticipated aircraft flying this route per week	2018	2019	2020	2021	2022	2023
Runway 30	78	97	105	108	110	113
Runway 12	39	49	53	54	56	57
Runway 21	1	1	1	1	1	1

*As runway 21 is only used in extreme weather conditions or when the main runway is closed, it is difficult to predict how many aircraft are likely to fly this route. On historic evidence, it is unlikely to average more than one aircraft per week.

Note: Further information on approaches is provided in the consultation document, sections 6.15 to 6.17

What are “T-Bars”?

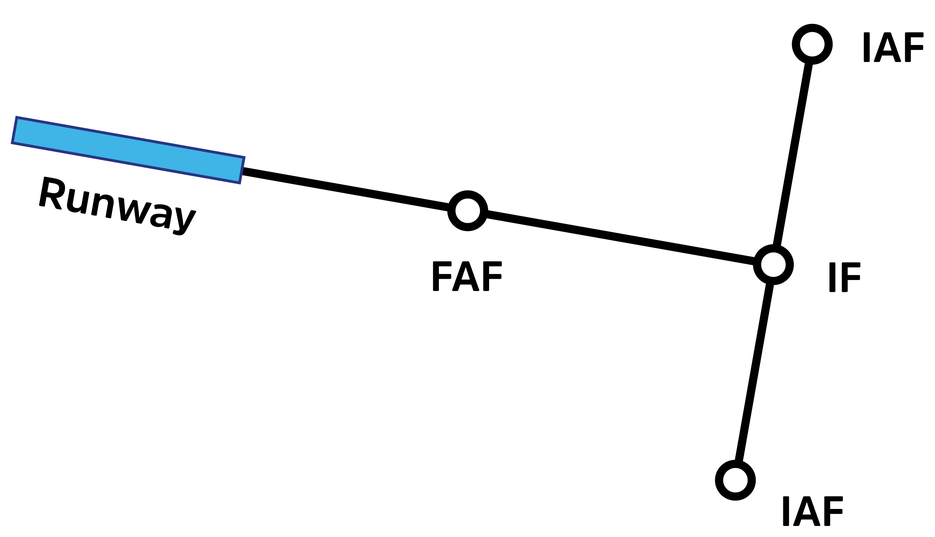
We have added modern “T-Bar” tracks to our arrival procedures. These allow aircraft arriving from any direction to avoid making extreme turns.

An approach procedure involves setting in sequence the:

- **Initial Approach Fix (IAF) – A point at the start of an approach procedure that aircraft are directed to by Air Traffic Control (ATC) when it is safe to commence an approach**
- **Intermediate Fix (IF) - The point on an approach procedure where aircraft turn onto the extended runway centreline**
- **Final Approach Fix (FAF) - The point on an approach procedure where aircraft commence their final stabilised descent toward the runway.**

For a “T-Bar” approach the IAFs are located so that the turn at the Intermediate Fix is 90°.

The main points on a T-bar approach

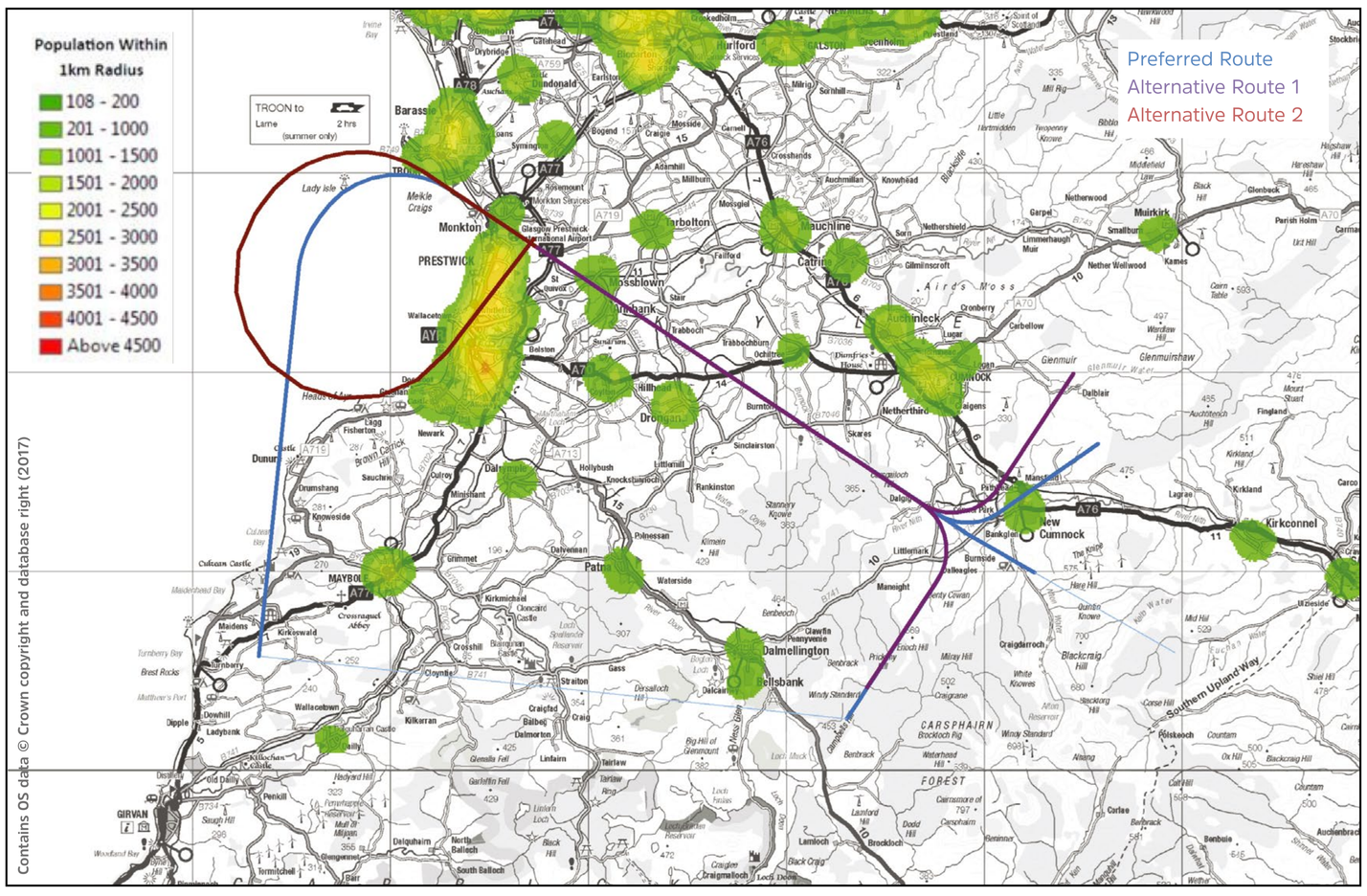


In this example, aircraft arriving from the:

- **north - fly to the top IAF to join the procedure**
- **south - fly to the bottom IAF to join the procedure**
- **east - fly directly to the IF to join the procedure**
- **west - fly to the most appropriate IAF based on their location relative to the airport.**

Runway 30 – approaches

This is a replication of the existing conventional approach procedure to Runway 30. The new route adds two "T-Bar" legs which facilitate arrivals from the north and south without the need for Air Traffic Control (ATC) intervention. This procedure will primarily be flown by training aircraft practicing the new procedure type. However, it is also likely to become the preferred backup approach procedure for use when the conventional navigation aids for Runway 30 are unavailable for any reason.



Runway 30 approaches - preferred and alternative routes over population density map

Preferred –

The design is primarily driven by the dimensions of the controlled airspace to the east of the airport. (This is the airspace within which Air Traffic Control direct aircraft to get them into and out of the airport in the most efficient way.) The route requires the

final approach to the runway to commence at an altitude of 3,500 ft and has been designed with a descent angle of 3.5° to exactly match with the current route which places the Final Approach Fix 16,854 metres away from the end of the runway (at an altitude of 3,500 ft).

We have been able to increase the length of the southern segment to 11,112 metres which will maximise the distance available for aircraft to descend. However, due to the dimensions of the controlled airspace around the Intermediate Fix, we have had to rotate the northern segment to provide the maximum distance available. This is still shorter than the standard and has resulted in the nominal track overflying communities in the vicinity of New Cumnock. However, the northern segment is unlikely to be used very often as the majority of traffic arrives from the south.

Alternative 1 –

We looked at designing the route with a standard "T-Bar" configuration. However, this would have caused problems for both the northern and southern segments.

The start of the northern segment would have been in an area of controlled airspace where aircraft are required to be at least 6,000ft. This would have meant that aircraft have to stay at 6,000ft until reaching the Intermediate Fix and would then have insufficient distance to descend to 3,500ft by the Final Approach Fix.

The start of the southern segment would have been safely inside an area of controlled airspace where aircraft are required to be at least 4,500ft. Aircraft could therefore have started their descent from 6,000ft at the beginning of the southern segment, however, the descent gradient would still have been slightly steep.

Alternative 2 –

We looked at replicating the current missed approach procedure for the new route. However, the current missed approach has aircraft turning back to the airport and holding overhead. This results in more track miles for aircraft and doesn't place them in a good location from which to commence another approach or divert.

For this reason aircraft conducting missed approaches using the current procedures are typically given alternative instructions by Air Traffic Control in order to maintain operational efficiency.

This table compares the impact of each route

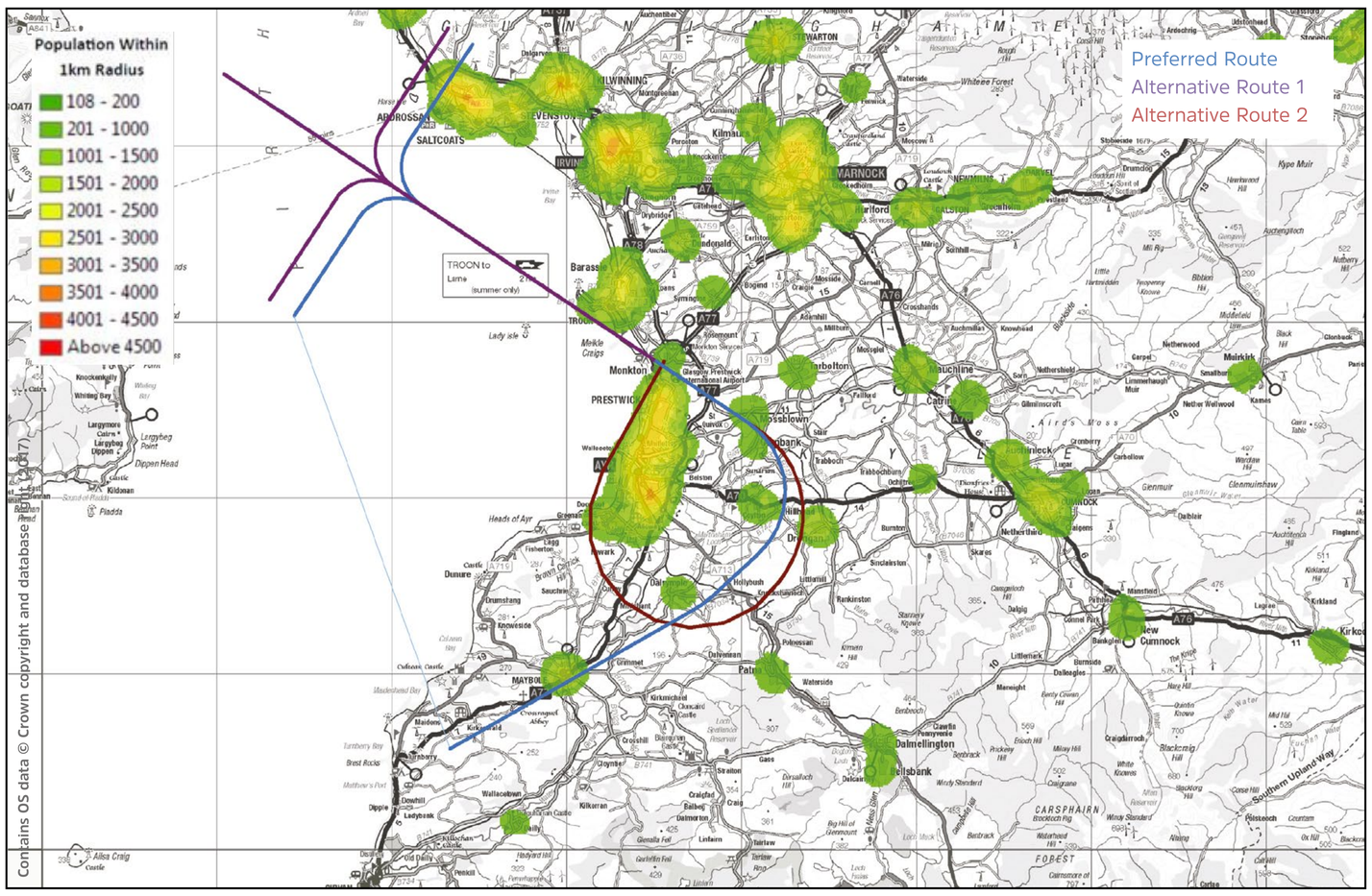
	Preferred	Alt. 1	Alt. 2
CO_2 emissions	More	More	Similar
Noise – Population Overflown	3,326	1,125	*
Noise – New Population	2,150	720	*
Concentration / Dispersal	Concentration	Concentration	Dispersal
Technical Feasibility	Good	Difficult	Difficult
Community	Impact (compared to current day)		
New Cumnock (only northern segment)	Infrequently Overflown	Closer	Same
Annbank	Same	Same	Same
Mossblown	Same	Same	Same
Troon (only missed approach)	Same	Same	Same
Ochiltree	Same	Same	Same
Drongan	Same	Same	Same
Hillhead	Same	Same	Same
Mansfield (only northern segment)	Infrequently Overflown	Closer	Same

* Population figures not calculated as missed approaches are infrequently flown.

Glasgow Prestwick Airport

Runway 12 – approaches

This is a replication of the existing conventional approach procedure to runway 12. The new route adds three “T-Bar” legs which facilitate arrivals from the north, south, and west without the need for Air Traffic Control intervention.



This procedure will primarily be flown by training aircraft practicing the new procedure type. However, it is also likely to become the preferred backup approach procedure for use when the conventional navigation aids for runway 12 are unavailable for any reason.

Runway 12 approaches - preferred and alternative routes over population density map

Preferred – The design is primarily driven by the dimensions of the controlled airspace to the west of the airport. (This is the airspace within which Air Traffic Control direct aircraft to get them into and out of the airport in the most efficient way.) The route should be contained within this controlled airspace which requires the final approach to the runway to commence at an altitude of 2,000 ft. This procedure has been designed with a descent angle of 3.0° to exactly match with the current procedure which places the Final Approach Fix 11,103 metres away from the end of the runway (at an altitude of 2,000 ft). Due to the limited amount of controlled airspace available. the Intermediate Fix has been placed slightly closer than normal at only 7,593 metres before the Final Approach Fix. There is then adequate controlled airspace to include the standard northern and southern segments. The design criteria also provides the option for a straight segment prior to the Intermediate Fix and this has been included for this runway although the segment is only 7,408 metres long. However, the northern segment is unlikely to be used very often as the majority of traffic arrives from the south or west.

Alternative 1 – We looked at designing the route with the Intermediate Fix 9,260 metres before the Final Approach Fix. However this would have put the northern and southern segments very close to the edge of controlled airspace.

This increases the risk of conflicts with aircraft flying on their own outside controlled airspace.

Alternative 2 – We looked at replicating the current missed approach procedure for the new route. However, the current missed approach has aircraft turning back to the airport and holding overhead. This results in more track miles for aircraft and doesn’t place them in a good location from which to commence another approach or divert.

For this reason aircraft conducting missed approaches using the current procedures are typically given alternative instructions by Air Traffic Control in order to maintain operational efficiency.

This table compares the impact of each route

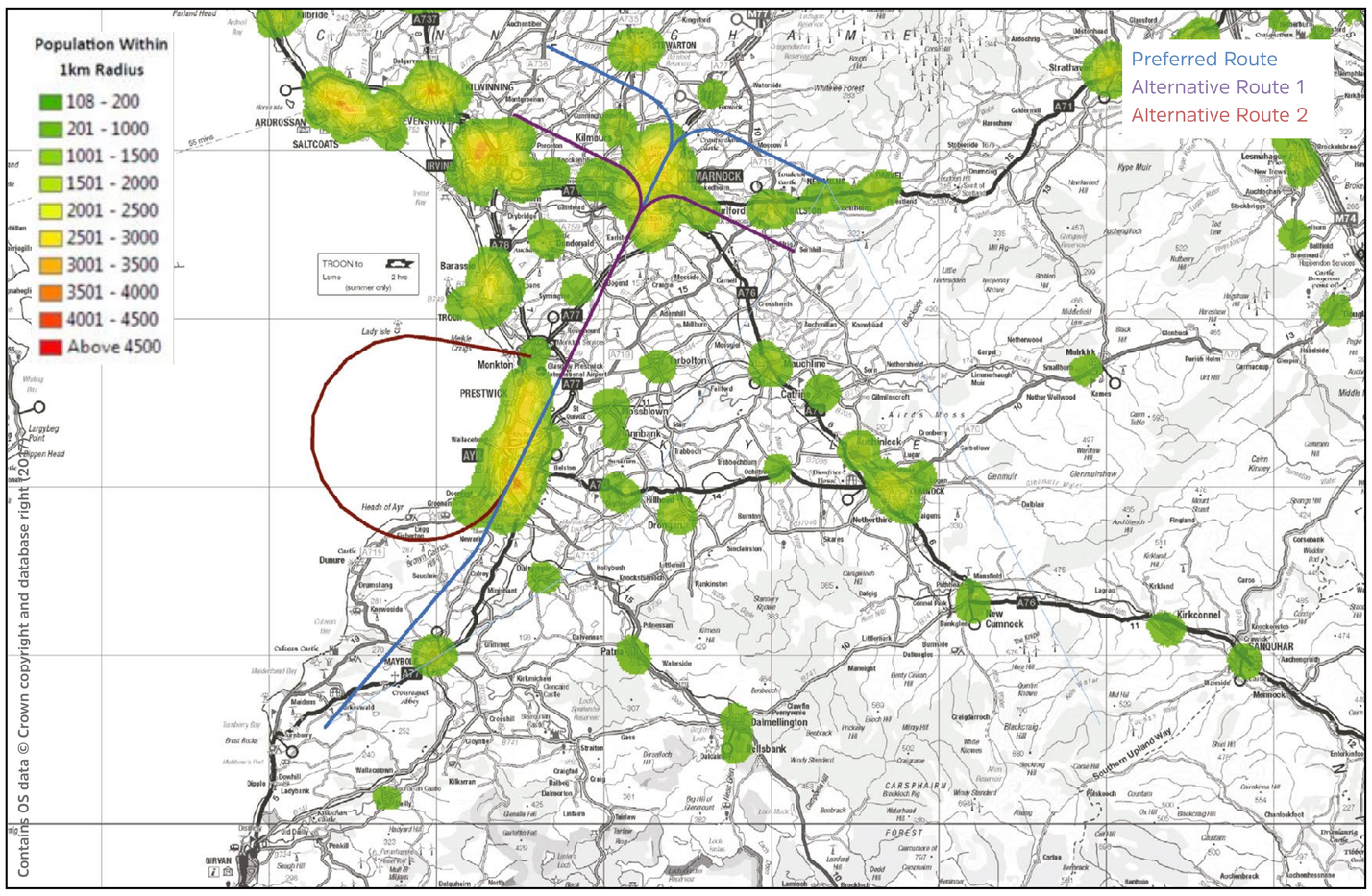
	Preferred	Alt. 1	Alt. 2
CO_2 emissions	Similar	More	Similar
Noise – Population Overflown	10,292	131	*
Noise – New Population	10,292	131	*
Concentration / Dispersal	Concentration	Concentration	Dispersal
Technical Feasibility	Good	Difficult	Difficult
Community	Impact (compared to current day)		
Saltcoats (only northern segment)	Infrequently Overflown	Closer	Same
Troon	Same	Same	Same
Annbank (only missed approach)	Same	Same	Same
Mossblown (only missed approach)	Same	Same	Same
Patna (only missed approach)	Further	Same	Same
Drongan (only missed approach)	Same	Same	Same
Hillhead (only missed approach)	Same	Same	Same
Coylton (only missed approach)	Same	Same	Same
Dalrymple (only missed approach)	Same	Same	Same

* Population figures not calculated as missed approaches are infrequently flown.

Glasgow Prestwick Airport

Runway 21 – approaches

This is a replacement for the existing conventional approach procedure to runway 21. The new route adds two “T-Bar” legs which facilitate arrivals from the east and west without the need for Air Traffic Control intervention..



This procedure is likely to become the preferred approach procedure to runway 21.

Runway 21 approaches - preferred and alternative routes over population density map

Preferred – The current conventional approach procedure is offset to the east of the runway centreline by approximately 2°. To comply with current design criteria the procedure has to be aligned with the runway and the nominal track is, therefore, approximately 460 metres to the west of the current route as aircraft pass over Kilmarnock. This procedure has been designed with a descent angle of 3.5° which is the maximum permitted by the design criteria for this type of approach. The current procedure has a descent angle of approximately 3.6°. The intermediate altitude has been set at 2,100 ft to match with the current procedure which places the Final Approach Fix 10,027 metres away from the end of the runway (at an altitude of 2,100 ft). This places aircraft outside controlled airspace which is not ideal, but is the same as the current procedure.

Due to the proximity of Glasgow International Airport, the Intermediate Fix has been placed slightly closer than normal at only 7,567 metres before the Final Approach Fix. We have then included the standard eastern and western segments. However, the western segment is unlikely to be used very often as the majority of traffic arrives from the east.

Alternative 1 – We looked at designing the route with a Final Approach Fix at 1,600ft in order to keep the route closer to Glasgow Prestwick Airport and reduce the potential interaction with Glasgow International Airport.

However this would have the effect of putting aircraft over Kilmarnock 500ft lower than they are currently and did not provide the required obstacle clearance.

Alternative 2 – We looked at replicating the current missed approach procedure for the new route. However, the current missed approach has aircraft turning back to the airport and holding overhead. This results in more track miles for aircraft and doesn’t place them in a good location from which to commence another approach or divert.

For this reason aircraft conducting missed approaches using the current procedures are typically given alternative instructions by Air Traffic Control in order to maintain operational efficiency.

This table compares the impact of each route

	Preferred	Alt. 1	Alt. 2
CO_2 emissions	Similar	Less	Similar
Noise – Population Overflown	16,788	15,200	*
Noise – New Population	10,561	15,200	*
Concentration / Dispersal	Concentration	Concentration	Dispersal
Technical Feasibility	Good	Difficult	Difficult
Community	Impact (compared to current day)		
Galston	Similar	Overflown	Similar
Newmilns	Similar	Further	Similar
Darvel	Similar	Further	Similar
Fenwick	Similar	Further	Similar
Kilmarnock	Similar	Similar but 500ft Lower	Similar
Kilmaurs (only western segment)	Similar	Similar	Similar
Symington	Same	Same	Same
Ayr (only missed approach)	Same	Same	Same
Stewarton	Similar	Further	Similar
Crookedholm	Similar	Overflown	Same

* Population figures not calculated as missed approaches are infrequently flown.

Glasgow Prestwick Airport