Edinburgh Airport Airspace Change Programme 2022

Stage 2 Develop and Assess

Initial Options Appraisal

Document control

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Edinburgh Airport: Airspace Change Programme
Stage 2: Develop and Assess
ACP-2019-32

Initial Options Appraisal

Initial Options Appraisal

Edinburgh Airport began their Airspace Change Proposal (ACP) in June 2019 and passed through Stage 1 of CAP1616 in July 2020. At this time, the project was paused due to the COVID-19 pandemic while the UK aviation industry and wider UK managed the pandemic, and its recovery from it. In May 2020 the project was remobilised, allowing Edinburgh Airport to recommence the ACP with work on Stage 2A Options Development commencing in August 2020. Initial airspace design options were shared with stakeholders from November 2020 and then through continual engagement.

This Initial Options Appraisal (IOA) forms part of Edinburgh Airports Stage 2 submission to the CAA and covers the following.

- Sets out the options that have progressed from Stage 2A;
- Describes the methodology used to assess each option;
- The outcomes of the IOA

The initial options appraisal provides a qualitative assessment of the potential impacts of aircraft operations within the departure and approach swathes for the 06 and 24 runways. At this stage, the swathes are broad to encompass a range of potential flight path options, including the existing baseline flight paths. The appraisal is based on a qualitative assessment of the relative benefits and disbenefits of potential flight path options within each swathe based on nominal tracks along the inner and outer edges of each swathe plus a central track. Detailed quantitative analysis and comparisons of the preferred SID options against the existing and RNAV-overlaid baselines will be provided in Stage 3, once the SIDs have been defined.

Each swathe has been overlaid on a population density map with a radius of 15 miles from the runway centre point. The swathe mapping extends to a nominal altitude of 10,000ft in indicative altitude bands of 0 – 4,000ft, 4,000 – 7,000ft and 7,000 – 10,000ft. The altitudes are based on the slowest climbing aircraft type likely to use Edinburgh Airport and therefore represent a conservative, worst-case, altitude at any given point on the ground. It is expected that the vertical climb profile of the majority of aircraft using Edinburgh Airport will out-perform the current slowest climbing aircraft and they will therefore track above the altitudes displayed in the swathes, resulting in an improvement to those impacts identified for the worst-case, conservative approach adopted for this appraisal.

CAP1616 requires consideration of noise impacts up to an altitude of 7,000ft, at which point aircraft will be transferred to NERL's en-route system and are no longer the responsibility of Edinburgh Airport. It should be noted that the swathe mapping displays an upper altitude band between 7,000ft and 10,000ft because there are no current fixed end points, and aircraft may be routed through any part of this upper altitude band. However, the initial options appraisal (other than the indicative track miles measurement for greenhouse gas and fuel burn assessment) is based only on consideration of the swathe up to an altitude of 7,000ft. Topic-specific considerations are detailed below.

Human Health

CAA guidance CAP1616 (page 42) states that "*The appraisal must use WebTAG, the Department for Transport's appraisal guidance, for health impacts associated with noise and potentially for other impacts where possible"*. WebTAG is the Department for Transport's suite of guidance on how to assess the expected impacts of transport policy proposals and projects. WebTAG can be used to monetise certain aspects of noise impacts from transport projects, given the correct inputs are available. At Stage 2B, qualitative assessments of noise and air quality impacts are required and, consequently, there are no quantitative noise or air quality data yet available to permit a WebTAG assessment of health impacts to be undertaken at Stage 2B. The quantitative data required to inform the WebTAG assessments will be available at Stage 3. The WebTAG assessment and health appraisal will therefore be incorporated into the Stage 3 Full Options Appraisal.

Noise

The 51 dB LAeq,16hr (daytime noise) and 45 dB LAeq, 8 hr (night-time noise) contours form a key input into WebTAG. Determination of the forecast contours based on the new airspace design options requires noise modelling at a system level. This requires a complete system design of arrivals and departures plus noise modelling with a forecast schedule and fleet mix, which is very detailed and time-consuming work. At this stage in the airspace change process, given the number of arrival and departure options and the subsequent permutations when combining these, it is not proportionate to quantify the LAeq metrics. Full quantitative analysis will be undertaken in the Stage 3 Full Options Appraisal for the shortlisted options based on defined SIDs. These SIDS will incorporate noise preferential routes.

The Stage 2B initial options appraisals detailed below provide a qualitative assessment of communities that may be potentially affected by aircraft using each swathe. The swathes have been overlaid on a population density map with a radius of 15 miles, which has been used to identify key communities located under the swathe in the altitude bands of 0 – 4,000ft and 4,000 – 7,000ft. The total population located beneath each swathe has not been calculated as the eventual flight paths / SIDS will not overfly the whole of each swathe and this metric would therefore provide a significant over-estimate of the population likely to be affected by the new flight paths. RNAV flight paths will provide greater track concentration than the existing flight paths; in conjunction with each swathe providing an opportunity to design a flight path / SID that will, as far as possible, minimise the overflown population, we anticipate a reduction in the overall impacts from the existing flight paths. These flight paths will be designed and assessed in Stage 3.

Air Quality

CAP1616 states that '*Due to the effects of mixing and dispersion, emissions from aircraft above 1,000 feet (amsl) are unlikely to have a significant impact on local air quality. Therefore, the impact of airspace design on local air quality is generally negligible compared with other factors such as changes in the volume of air traffic, and local transport infrastructures feeding the airport*.'

The initial options appraisal provides an estimate of the number of properties located under the footprint of the swathe below an aircraft altitude of 1,000ft. This has been generated by overlaying a 1,000ft buffer against the swathe and calculating the number of properties within the buffer using the Ordnance Survey AddressBase dataset. As an indicative aircraft increases in altitude, the 1,000ft buffer moves closer to the swathe until, at an aircraft altitude of 1,000ft the buffer and swathe merge. The number of properties located underneath the footprint is provided as a semi-quantitative assessment of the potential impacts of the options on local air quality. Quantitative assessment of local air quality, including modelling, will be undertaken in Stage 3.

Greenhouse Gas Impacts

Nominal flight path track lengths for the inner and outer edges of each swathe option have been estimated from GIS map measurements. A central flight path track length has been taken as the mid-point distance between the inner and outer track lengths. Based on professional judgement, it has been assumed that track length is a reasonable proxy for greenhouse gas emissions and that, assuming all other factors remain constant, a shorter track length will result in a lower volume of greenhouse gas emissions than a relatively longer track length.

At this stage of the project, it is not possible to take into consideration potential factors that may influence the relationship between track miles and greenhouse gas emissions, including the vertical flight profile and the aircraft type. These factors will be better defined in Stage 3, when a quantitative assessment will be developed based on the preferred flight path options, vertical flight profiles and aircraft fleet mix.

The Stage 2B appraisal therefore provides a comparative evaluation of the inner, central and outer flight path track miles including the percentage increase in track miles for the central and outer flight track compared to the inner flight track.

Tranquillity

CAA guidance CAP1616 (page 172) states that "*For the purposes of airspace change proposals, the impact upon tranquillity need only be considered with specific reference to Areas of Outstanding Natural Beauty (AONB) and National Parks unless other areas for consideration are identified through community engagement*".

There are no AONBs or National Parks that are likely to be affected by the ACP. However, a baseline tranquillity study has been undertaken to assess relative tranquillity across a study area around Edinburgh Airport. This followed a methodology that draws on established approaches to tranquillity mapping. Areas with no negative intrusion were identified, and these represent the areas with highest tranquillity within the study area. Full details are provided in the Tranquillity Assessment Baseline Report (September 2019).

The mapping indicates that tranquillity is a relatively limited resource across the study area, with a high level of influence of 'visual intrusion' indicators. This can be attributed to the dense pattern of settlement and transport links that characterise much of the study area.

The principal area of higher tranquillity is in the south of the study area, including the Pentland Hills and Moorfoot Hills, and the less settled areas surrounding them. An area of higher tranquillity occurs around Cramond and Dalmeny Park, extending across the Firth of Forth, where the effects of onshore intrusion are reduced. Smaller but significant concentrations of relative tranquillity are associated with other less settled areas, including the Bathgate Hills in West Lothian, and the inner Firth of Forth between Limekilns and Blackness.

Fuel Burn

The assessment of fuel burn has been based on the method used to assess relative greenhouse gas impacts for nominal inner, central and outer flight tracks within each swathe. This has been based on an assumption that track length is a reasonable proxy for fuel use and is subject to the same limitations regarding the potential influence of vertical flight profiles and aircraft types. These factors will be better defined in Stage 3, when a quantitative assessment will be developed.

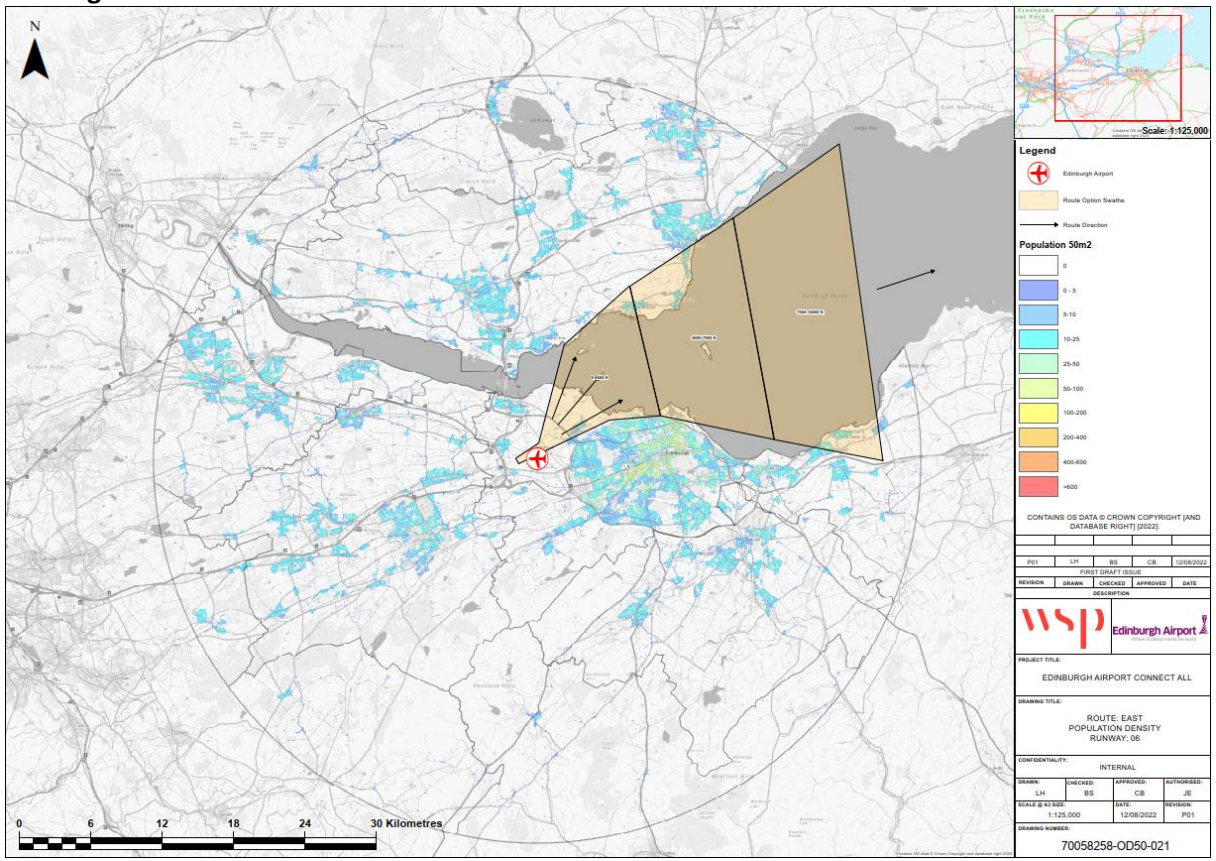
The Stage 2B appraisal therefore provides a comparative evaluation of the inner, central and outer track miles including the percentage increase in track miles for the central and outer track compared to the inner track.

Biodiversity

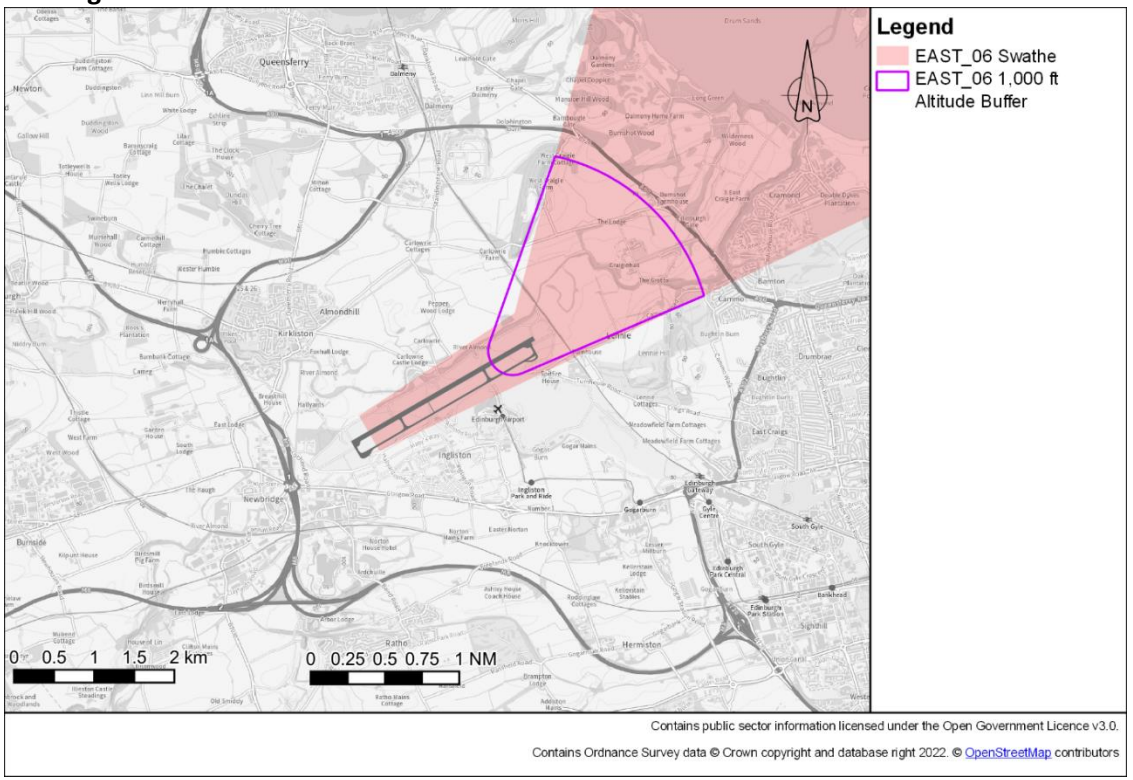
CAP1616 states '*In general, airspace change proposals are unlikely to have an impact upon biodiversity because they do not involve ground-based infrastructure. As such they are unlikely to have a direct impact that would engage the Birds or Habitats legislation.*'

The biodiversity assessment prepared in 2019 for Stage 1B of the airspace change programme reviewed the potential biodiversity impacts within a search area up to an altitude of 7,000ft (taken to be a nominal radius of 15 miles). The assessment concluded that were no Likely Significant Effects on Habitats sites (Special Areas of Conservation, Special Protected Areas and Ramsar sites) in the search area compared to the baseline.

The potential impact of the swathes on biodiversity has therefore been scoped out of the Stage 2B initial options appraisal and subsequent assessment stages of the project.

Option	Group	Impact	Qualitative Assessment
EAST-06	Communities	Noise Impact on Health and Quality of Life	**Overflight**  Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The swathe supports a continuous climb profile to minimise noise impacts to overflown communities.

			The swathe mostly overflies the Firth of Forth and avoids Edinburgh city centre, Granton and densely populated areas of Leith. The straight-ahead alignment directly overflies Cramond below 2,000ft, where there is a primary school, healthcare facility and two public open space/nature reserves and the popular Cramond coastal path. Retention of the Cramond Offset would avoid direct overflight of the village. At the edges of the swathe, below 4,000ft, there are several education facilities, two healthcare facilities and several recreational facilities (parks and leisure/recreational areas). Between 4,000ft and 7,000ft, the communities of Burntisland, Kinghorn and parts of Kirkaldy may be overflown. The swathe provides the opportunity to design a flight path that will provide track concentration to minimise the frequency of overflights of coastal communities in southern Fife and the Lothians. **NPR** The changes to SIDs will result in a requirement to adjustment the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as '*planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time*.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** This swathe passes over Cramond and Dalmeny Park, broadening across the Firth of Forth. Aircraft currently overfly this area, which includes relatively tranquil areas around Dalmeny Park and across the Firth of Forth islands. Use of this swathe is not anticipated to result in a change in tranquillity. If aircraft were routed along the most northerly part of the swathe, relatively tranquil areas close to the Fife coast could be overflown by aircraft approaching 7,000 ft.

	Communities	Air Quality	**Overflight**  The indicative swathe footprint up to an altitude of 1,000 ft is detailed above. **Receptors** The number of residential properties located under the indicative footprint is 104. As the footprint is unlikely to be significantly larger than the existing footprint, any effects on local air quality up to an altitude of 1,000ft will be primarily driven by changes in the volume of air traffic and changes to ground operations including potential reductions in hold times.

<table>
<tr><td></td><td>Wider Society</td><td>Greenhouse Gas Impact</td><td>
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<tr><th>Flight Path</th><th>Indicative Track Length (km)</th><th>Difference in Track Length (%)</th></tr>
<tr><td>Inner</td><td>32km</td><td>N/A</td></tr>
<tr><td>Central</td><td>36km</td><td>+12.5%</td></tr>
<tr><td>Outer</td><td>40km</td><td>+25%</td></tr>
</table>

The inner track length of 32km will, all other factors remaining constant, generate the least greenhouse gas emissions, with the central and outer tracks generating approximately 13% and 25% more emissions than the inner track.
</td></tr>
<tr><td></td><td>Wider Society</td><td>Capacity / Resilience</td><td>Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction</td></tr>
<tr><td></td><td>General Aviation</td><td>Access</td><td>The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected
One flight paths are designed we may give CAS back.
VFR traffic pass underneath East.</td></tr>
<tr><td></td><td>General Aviation / Commercial airlines</td><td>Economic impact from increased effective capacity</td><td>There will be no economic impact on GA
With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.</td></tr>
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The inner track length of 32km will, all other factors remaining constant, generate the lowest fuel burn, with the central and outer tracks generating approximately 13% and 25% higher fuel burn than the inner track.
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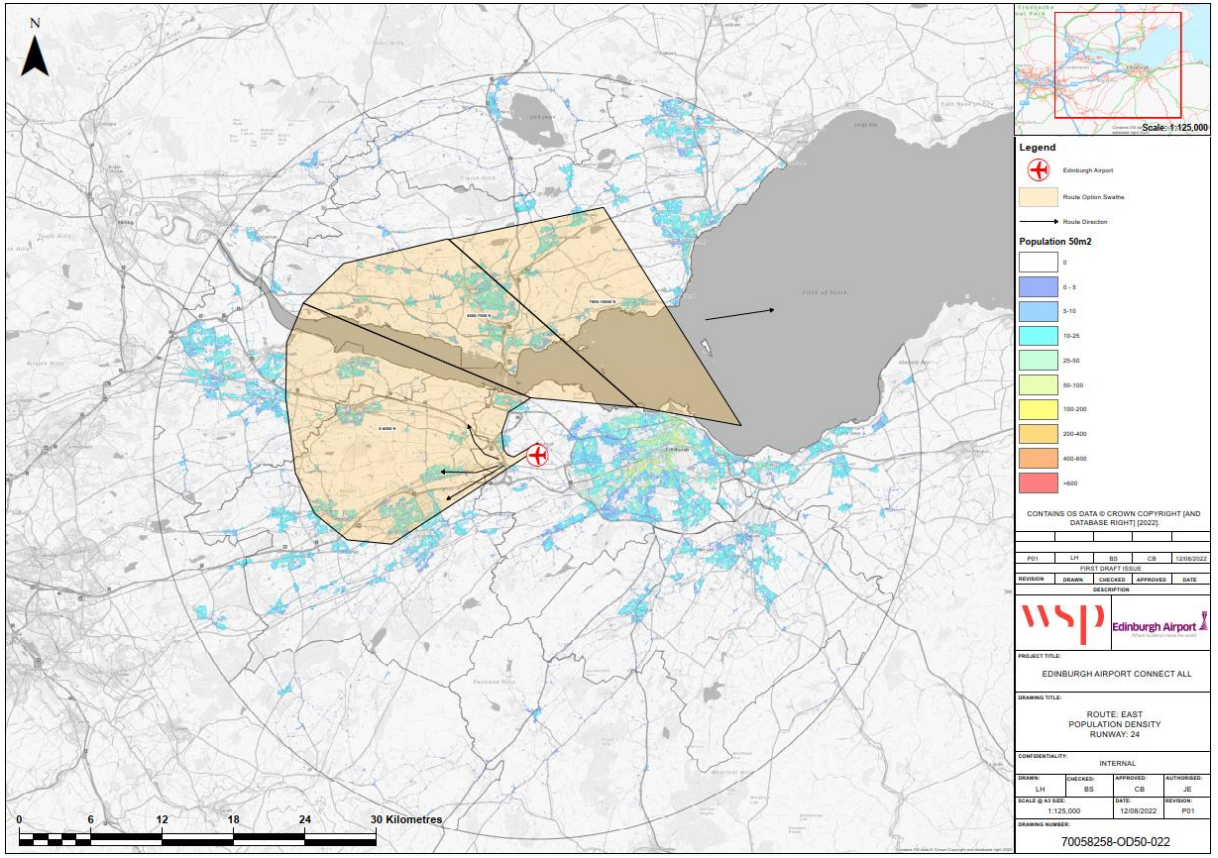
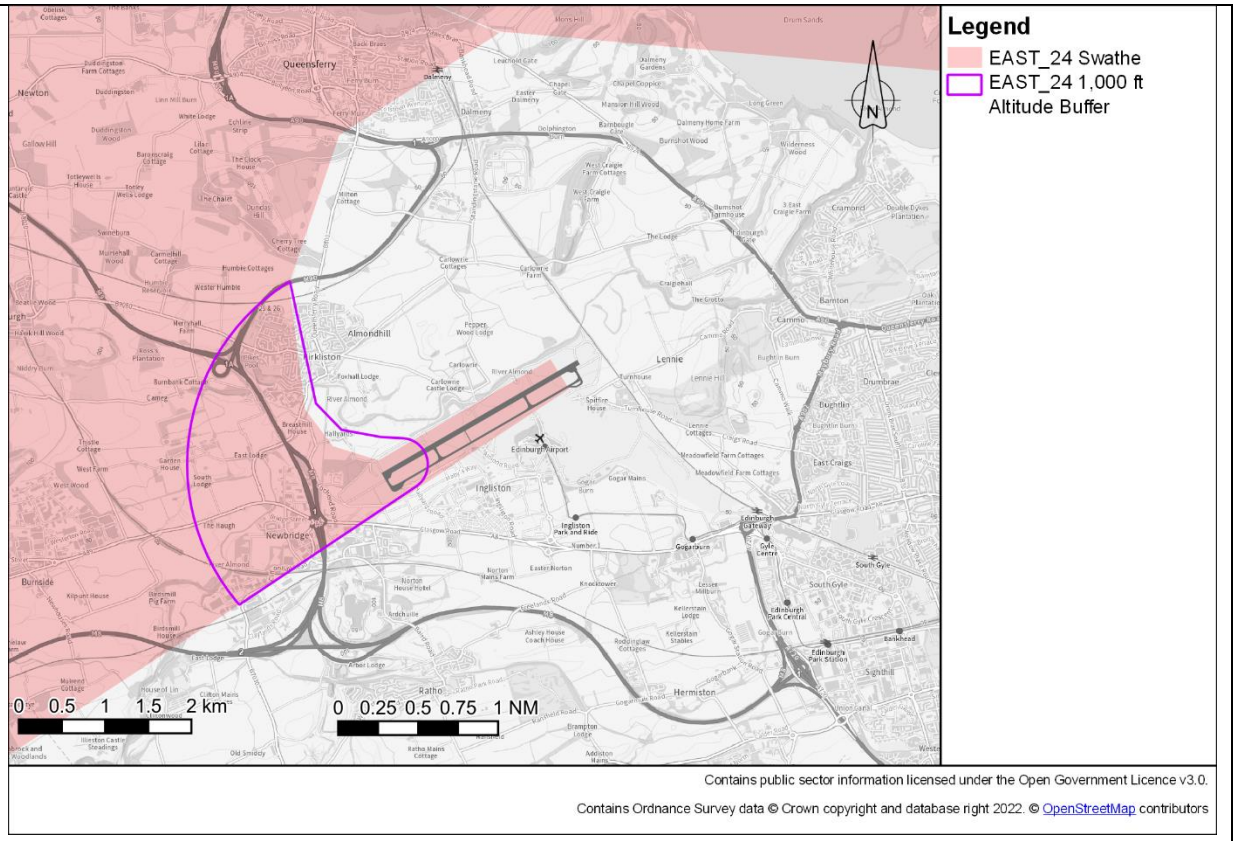
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

EAST-24	Communities	Noise impact on Health and Quality of Life	**Overflight**  Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The swathe supports a continuous climb profile to minimise noise impacts to overflown communities.

			This swathe overflies the densely populated areas of Kirkliston, Winchburgh, Broxburn, Livingston, Bathgate, Linlithgow, Bo'ness and South Queensferry below 4,000ft. Several of these communities would be newly overflown. Between 4,000-7,000 ft the swathe may overfly communities north of the River Forth including North Queensferry, Inverkeithing, Rosyth, Limekilns, Valleyfield, Cairneyhill, Crossford, Oakley, Carnock and Dunfermline. The swathe provides the opportunity to design a flight path that will provide track concentration and may minimise the frequency of overflights of communities in West Lothian and southern Fife. **NPR** The changes to SIDs will result in a requirement to adjustment the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as '*planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time*.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** This swathe takes in a broadening sweep over Livingston, Grangemouth and Queensferry, turning to the east over the Firth of Forth and Dunfermline. Current flight paths indicate some overflying of this area, which includes tranquil areas in the Bathgate Hills. Use of this swathe could result in an increase in overflying across relatively tranquil areas in the Bathgate Hills and in the inner Forth between Blackness and Limekilns. Further north, areas of highest tranquillity in the West Fife Hills may be overflown but only if aircraft are routed at the outer edge of the swathe, and only when approaching 7,000 ft.
	Communities	Air Quality	**Overflight**



The indicative swathe footprint up to an altitude of 1,000 ft is detailed above.

Receptors

The number of residential properties located under the indicative footprint is 1,487.

Any effects on local air quality from EAST-24 up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic, the potential overflight of new receptors in Kirkliston and changes to ground operations including potential reductions in hold times.

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<tr><td>Outer</td><td>68</td><td>+152</td></tr>
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The inner track length of 27km will, all other factors remaining constant, generate the least greenhouse gas emissions, with the central and outer tracks generating approximately 78% and 152% more emissions than the inner track.

The central and outer track lengths and associated greenhouse gas emissions are slightly greater (23% each) than those for the EASTS-24 option.
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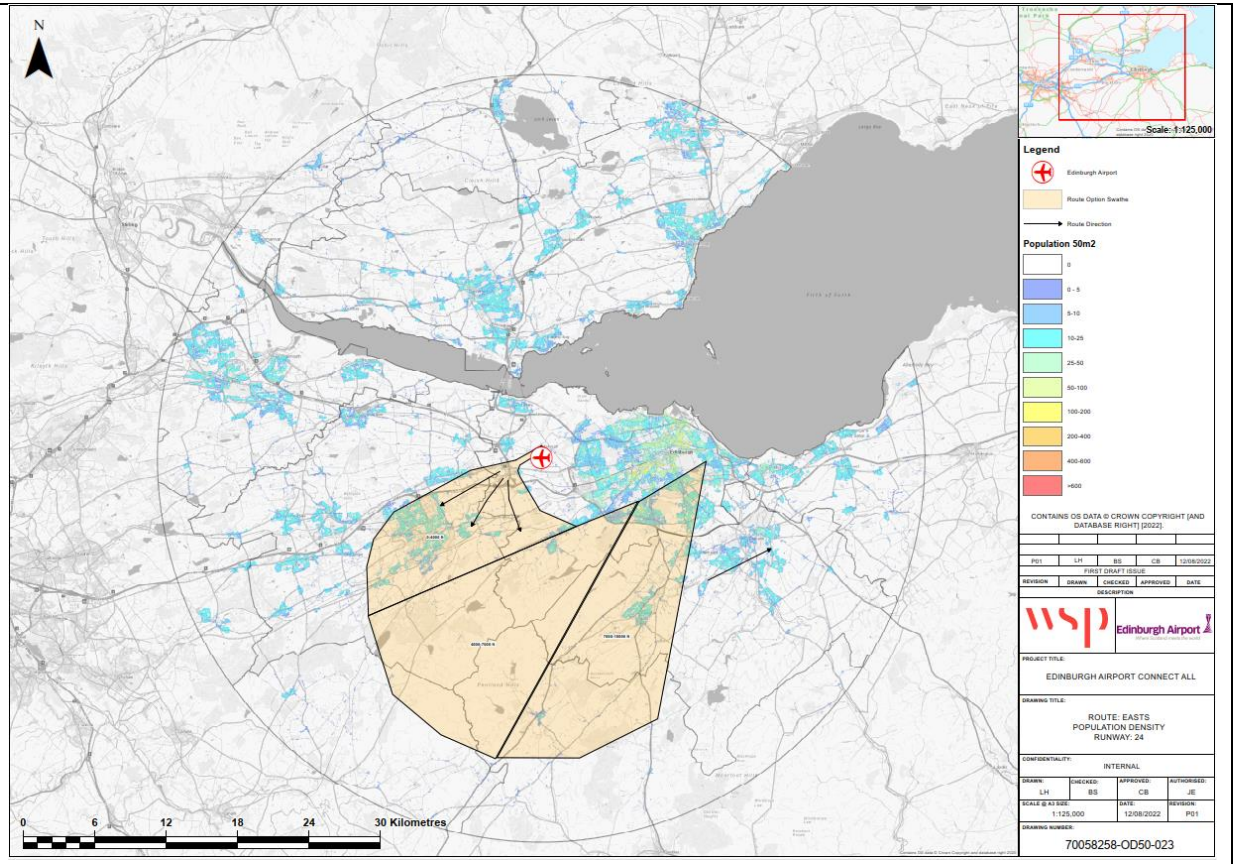
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

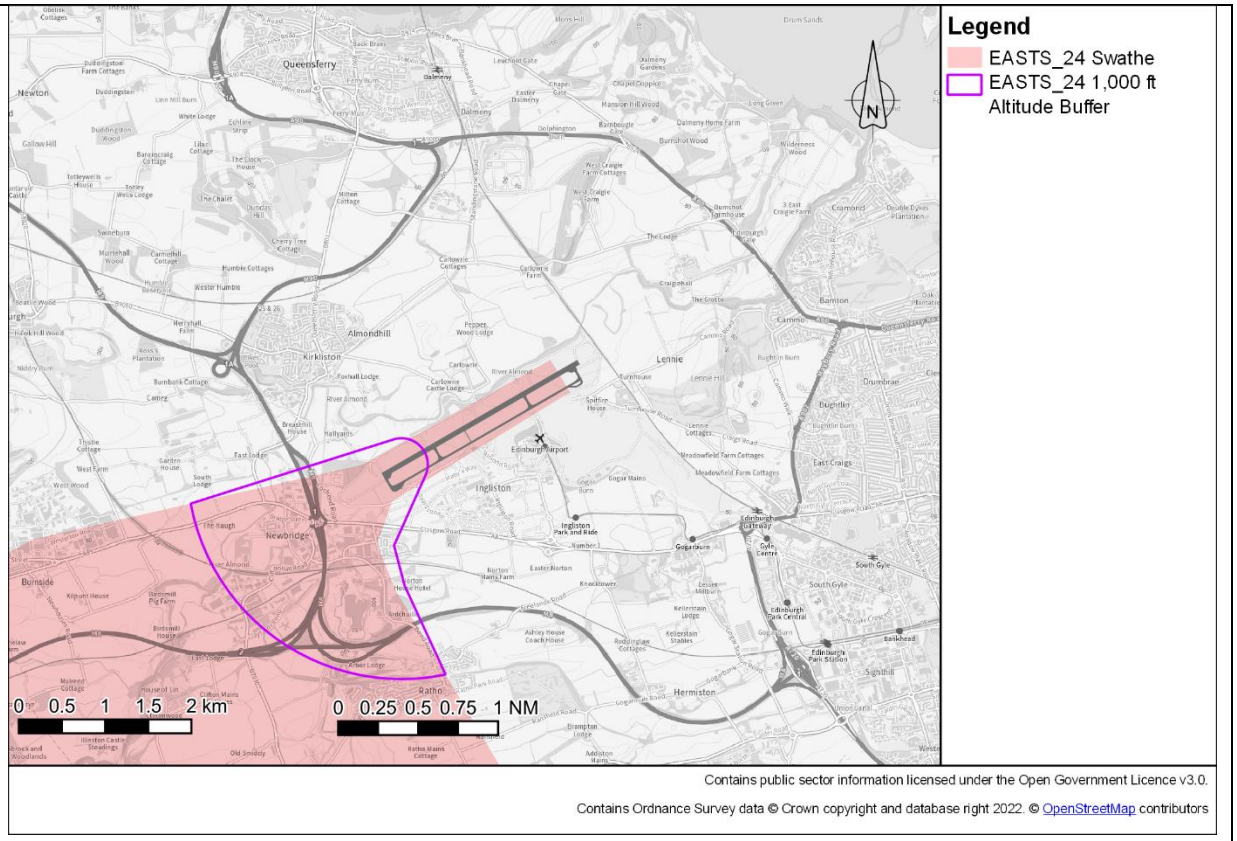
EASTS-24	Communities	Noise impact on Health and Quality of Life	**Overflight**



Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The swathe supports a continuous climb profile to minimise noise impacts to overflown communities.

This swathe may overfly Newbridge, Ratho, East Calder, Livingston and Kirknewton below 4,000ft.

			Between 4,000ft and 7,000ft, very few densely populated areas are within the swathe, with the northern edge of the swathe bordering Balerno, Currie and Colinton on the south-west fringe of Edinburgh. The swathe provides the opportunity to design a flight path that will provide track concentration to minimise the frequency of new overflights of rural communities in West Lothian. **NPR** The changes to SIDs will result in a requirement to adjustment the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as '*planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time*.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** This swathe turns south then east, broadening across the Pentland Hills to the south of Edinburgh. The Pentland Hills include the largest areas of highest tranquillity within the study area, although the south-western hills are currently overflown. Aircraft routed across the central and northern parts of the swathe would pass over areas that are not currently overflown. If routed further south, use of this swathe could intensify overflying in the south-west Pentlands. Aircraft would be between 4,000ft and 7,000 ft across the Pentland Hills.
	Communities	Air Quality	**Overflight**



The indicative swathe footprint up to an altitude of 1,000 ft is detailed above.

Receptors

The number of residential properties located under the indicative footprint is 463.

Any effects on local air quality from EASTS-24 up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic, the potential overflight of new receptors and changes to ground operations including potential reductions in hold times. There are new residential and recreational developments planned within the swathe that may be affected by overflight.

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The inner track length of 23km will, all other factors remaining constant, generate the least greenhouse gas emissions, with the central and outer tracks generating approximately 70% and 139% more emissions than the inner track.

The central and outer track lengths and associated greenhouse gas emissions are slightly lower (19% each) than those for the EAST-24 option.
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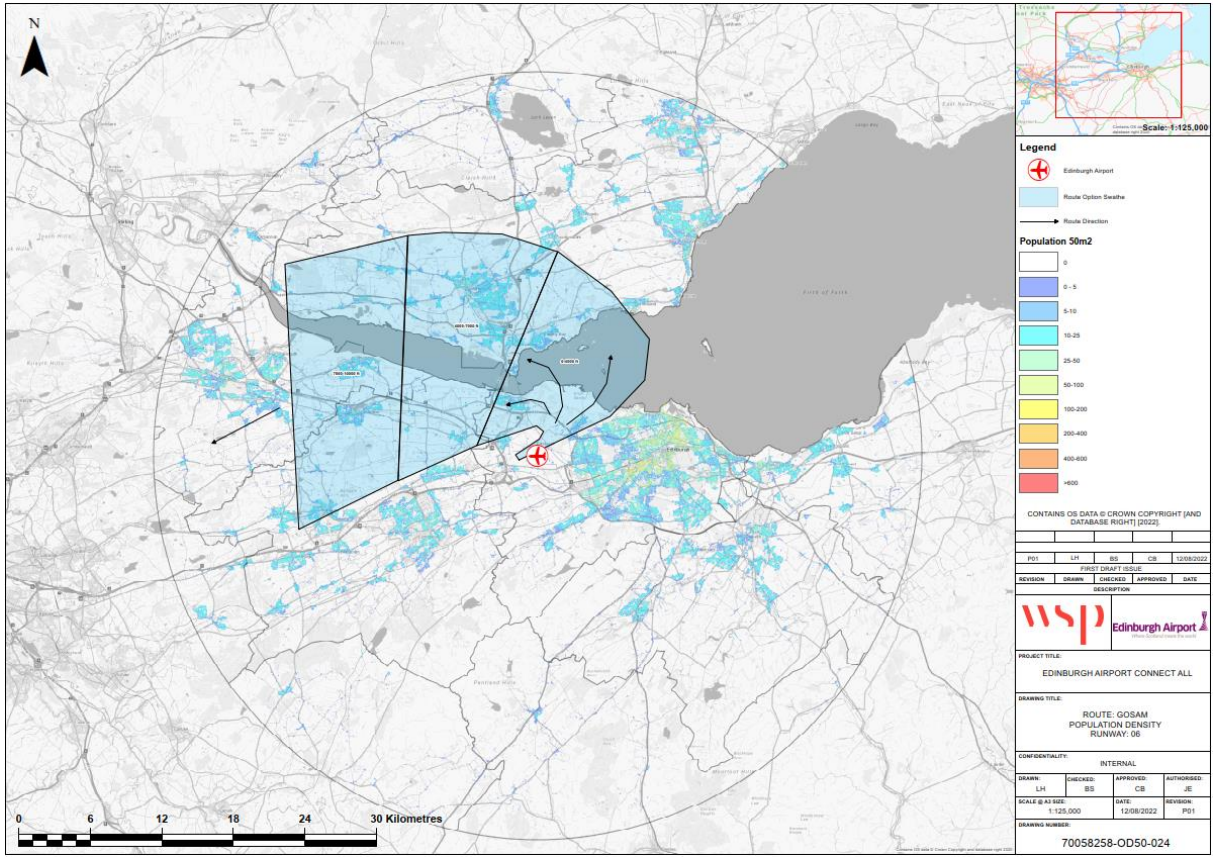
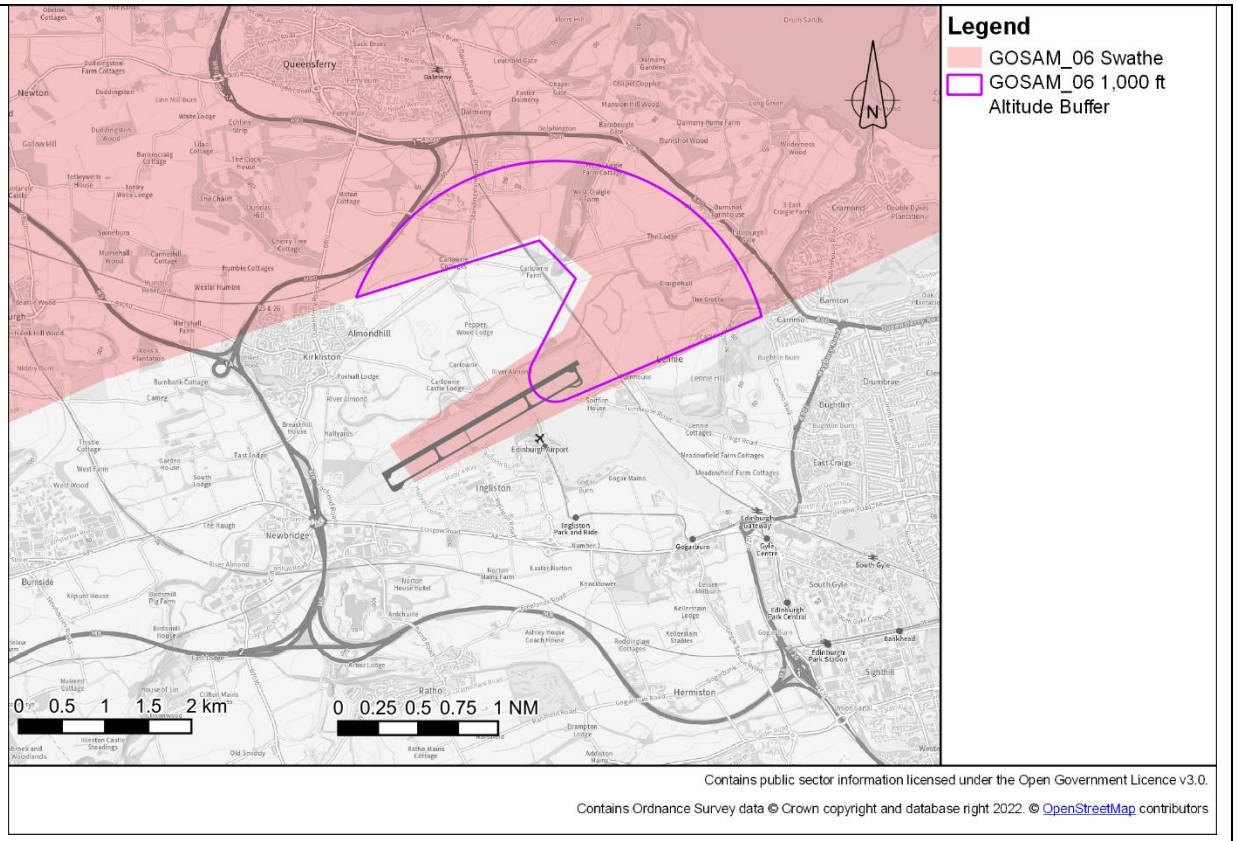
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

GOSAM-06	Communities	Noise impact on Health and Quality of Life	**Overflight**  Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The swathe supports a continuous climb profile to minimise noise impacts to overflown communities.

			This straight-ahead track would overfly Cramond at an altitude of less than 2,000ft. The inside track would newly overfly communities at Dalmeny, Kirkliston and South Queensferry, plus the already overflown communities of Dalgety Bay and Inverkeithing at an altitude below 4,000ft. Between 4,000 – 7,000ft, the populated areas of Rosyth, Dunfermline, Crossgates, Cowdenbeath and communities west of Dunfermline such as Crossford, Cairneyhill and Limekilns may be overflown. The swathe provides the opportunity to design a flight path that will provide track concentration and may minimise the frequency of overflights of communities in the City of Edinburgh, southern Fife and West Lothian. **NPR** The changes to SIDs will result in a requirement to adjustment the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as '*planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time*.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** This swathe passes over Cramond and Dalmeny Park, turning to the west and broadening across Queensferry and Dunfermline. Aircraft currently make this westward turn over the Firth of Forth, flying westward over Dalgety Bay and Inverkeithing. Areas of local tranquillity around Blackness and Limekilns are therefore unlikely to experience change. If aircraft were routed along the northern edge of the swathe, they would pass over areas of highest tranquillity in the West Fife Hills which are not currently overflown, though aircraft would be approaching 7,000 ft by this point. Aircraft routed along the southern edge of the swathe would overfly areas of relative tranquillity in the Bathgate Hills, although again they would be approaching 7,000 ft.
	Communities	Air Quality	**Overflight**



The indicative swathe footprint up to an altitude of 1,000 ft is detailed above.

Receptors

The number of residential properties located under the indicative footprint is 115.

Any effects on local air quality from GOSAM-06 up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic, the potential overflight of new receptors and changes to ground operations including potential reductions in hold times.

<table>
<tr><td></td><td>Wider Society</td><td>Greenhouse Gas Impact</td><td>
<table>
<tr><th>Flight Path</th><th>Indicative Track Length (km)</th><th>Difference in Track Length (%)</th></tr>
<tr><td>Inner</td><td>26</td><td>N/A</td></tr>
<tr><td>Central</td><td>39</td><td>+50</td></tr>
<tr><td>Outer</td><td>51</td><td>+96</td></tr>
</table>

The inner track length of 26km will, all other factors remaining constant, generate the least greenhouse gas emissions, with the central and outer tracks generating approximately 50% and 96% more emissions than the inner track.
</td></tr>
<tr><td></td><td>Wider Society</td><td>Capacity / Resilience</td><td>Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction</td></tr>
<tr><td></td><td>General Aviation</td><td>Access</td><td>The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected
One flight paths are designed we may give CAS back.
VFR traffic pass underneath East.</td></tr>
<tr><td></td><td>General Aviation / Commercial airlines</td><td>Economic impact from increased effective capacity</td><td>There will be no economic impact on GA
With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.</td></tr>
<tr><td></td><td>General Aviation/Commercial airlines</td><td>Fuel Burn</td><td>
<table>
<tr><th>Flight Path</th><th>Indicative Track Length (km)</th><th>Difference in Track Length (%)</th></tr>
<tr><td>Inner</td><td>26</td><td>N/A</td></tr>
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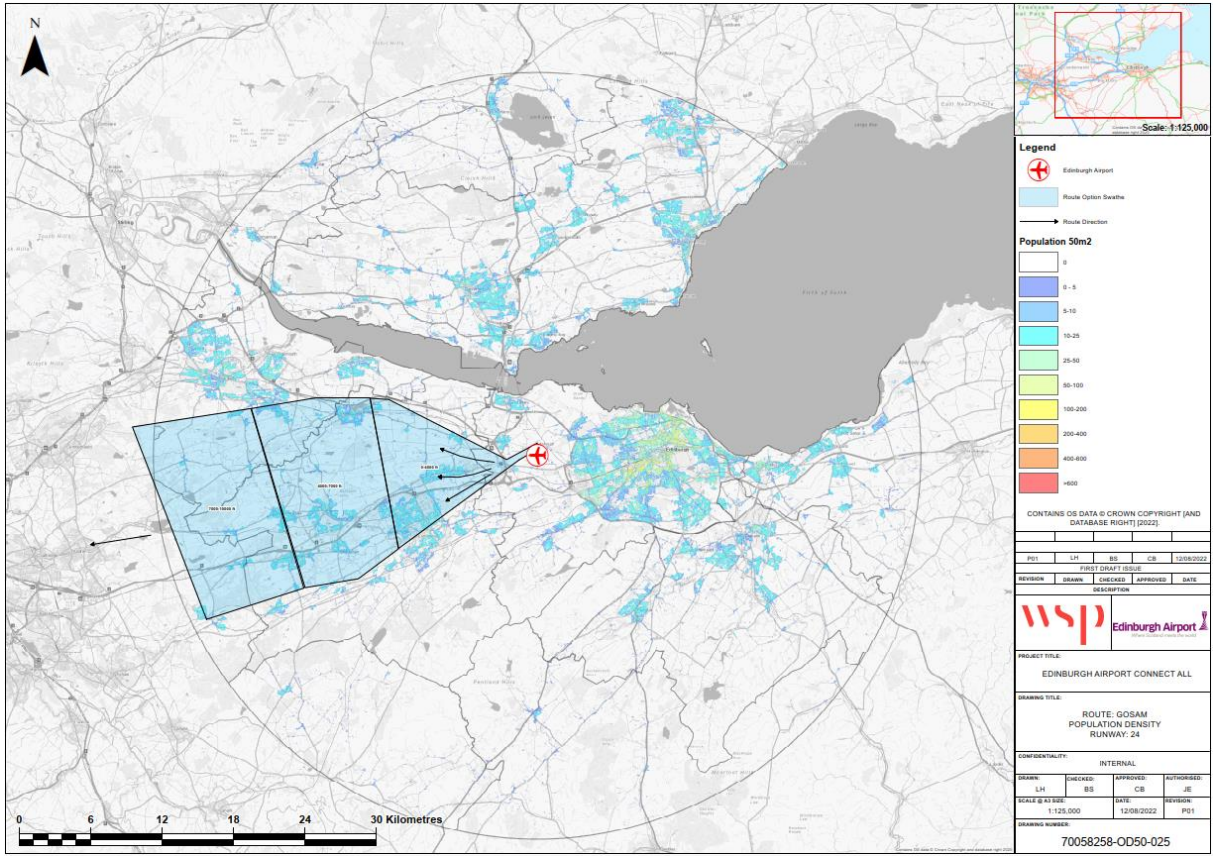
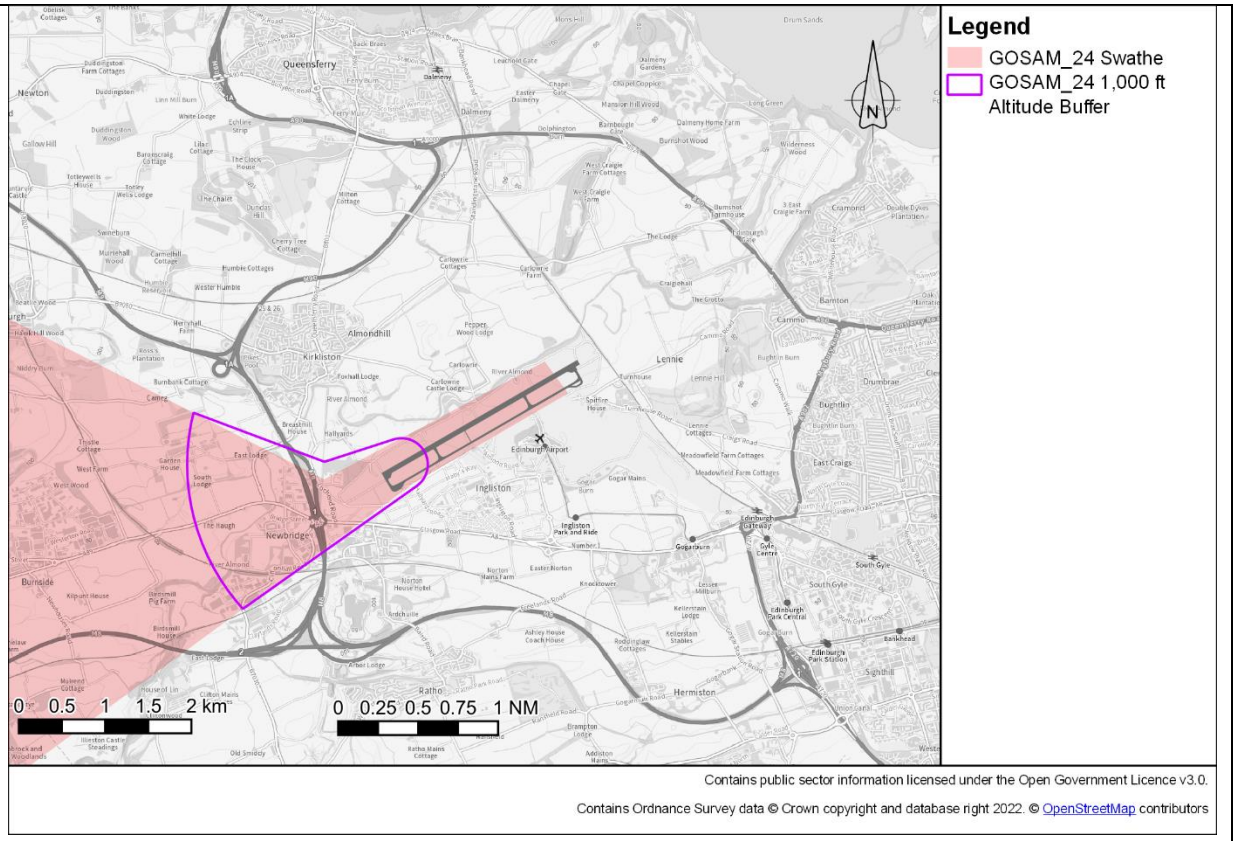
</table>

The inner track length of 26km will, all other factors remaining constant, generate the lowest fuel burn, with the central and outer tracks generating approximately 50% and 96% higher fuel burn than the inner track.
</td></tr>
</table>

	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

GOSAM-24	Communities	Noise impact on Health and Quality of Life	**Overflight**  Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The swathe supports a continuous climb profile to minimise noise impacts to overflown communities. The swathe provides an opportunity to route aircraft along the M8 motorway corridor, to minimise noise exposure.

			Below 4,000ft the swathe may overfly Winchburgh, Broxburn, Uphall, Livingston and the eastern edge of Linlithgow. Between 4,000ft and 7,000ft the communities of Bathgate, Blackburn, Armdale, Whitburn and Maddiston, which border the M8 motorway, may be overflown. The swathe provides the opportunity to design a flight path that will provide track concentration and may minimise the frequency of overflights of communities in West Lothian and North Lanarkshire. **NPR** The changes to SIDs will result in a requirement to adjustment the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as '*planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time*.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** This swathe heads west from the runway, broadening northwards as far as Linlithgow. The settled area in the south of the swathe including Livingston and Bathgate is currently overflown. To the north of this area is the Bathgate Hills, which is an area of relative tranquillity, and is currently overflown to a lesser extent. Should aircraft be routed further north than currently, then this area of tranquillity would be overflown by aircraft at around 4,000 ft.
	Communities	Air Quality	**Overflight**



The indicative swathe footprint up to an altitude of 1,000 ft is detailed above.

Receptors

The number of residential properties located under the indicative footprint is 185.

Any effects on local air quality from GOSAM-24 up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic, the potential overflight of new receptors and changes to ground operations including potential reductions in hold times.

<table>
<tr><td></td><td>Wider Society</td><td>Greenhouse Gas Impact</td><td>
<table>
<tr><th>Flight Path</th><th>Indicative Track Length (km)</th><th>Difference in Track Length (%)</th></tr>
<tr><td>Inner</td><td>32</td><td>N/A</td></tr>
<tr><td>Central</td><td>34</td><td>+6</td></tr>
<tr><td>Outer</td><td>36</td><td>+13</td></tr>
</table>

The inner track length of 32km will, all other factors remaining constant, generate the least greenhouse gas emissions, with the central and outer tracks generating approximately 6% and 13% more emissions than the inner track.
</td></tr>
<tr><td></td><td>Wider Society</td><td>Capacity / Resilience</td><td>Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction</td></tr>
<tr><td></td><td>General Aviation</td><td>Access</td><td>The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected
One flight paths are designed we may give CAS back.
VFR traffic pass underneath East.</td></tr>
<tr><td></td><td>General Aviation / Commercial airlines</td><td>Economic impact from increased effective capacity</td><td>There will be no economic impact on GA
With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.</td></tr>
<tr><td></td><td>General Aviation/Commercial airlines</td><td>Fuel Burn</td><td>
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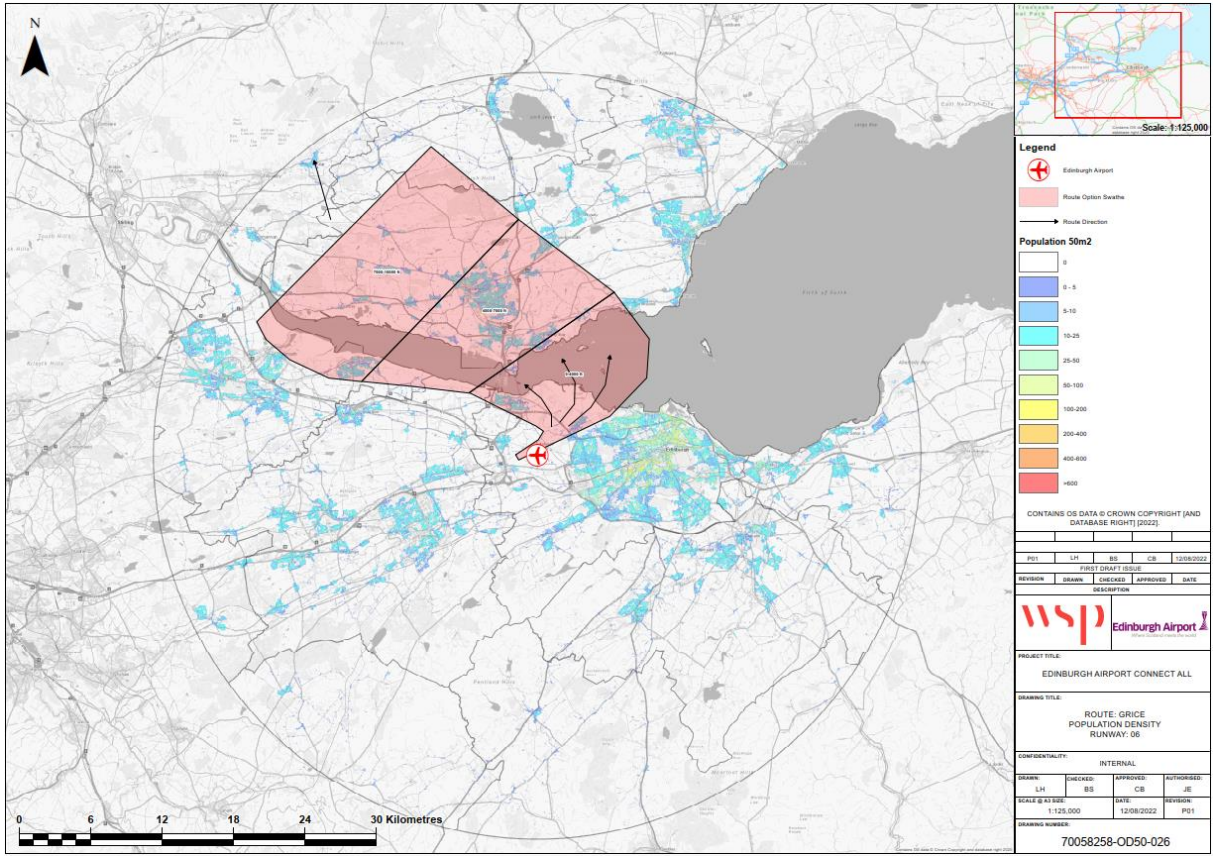
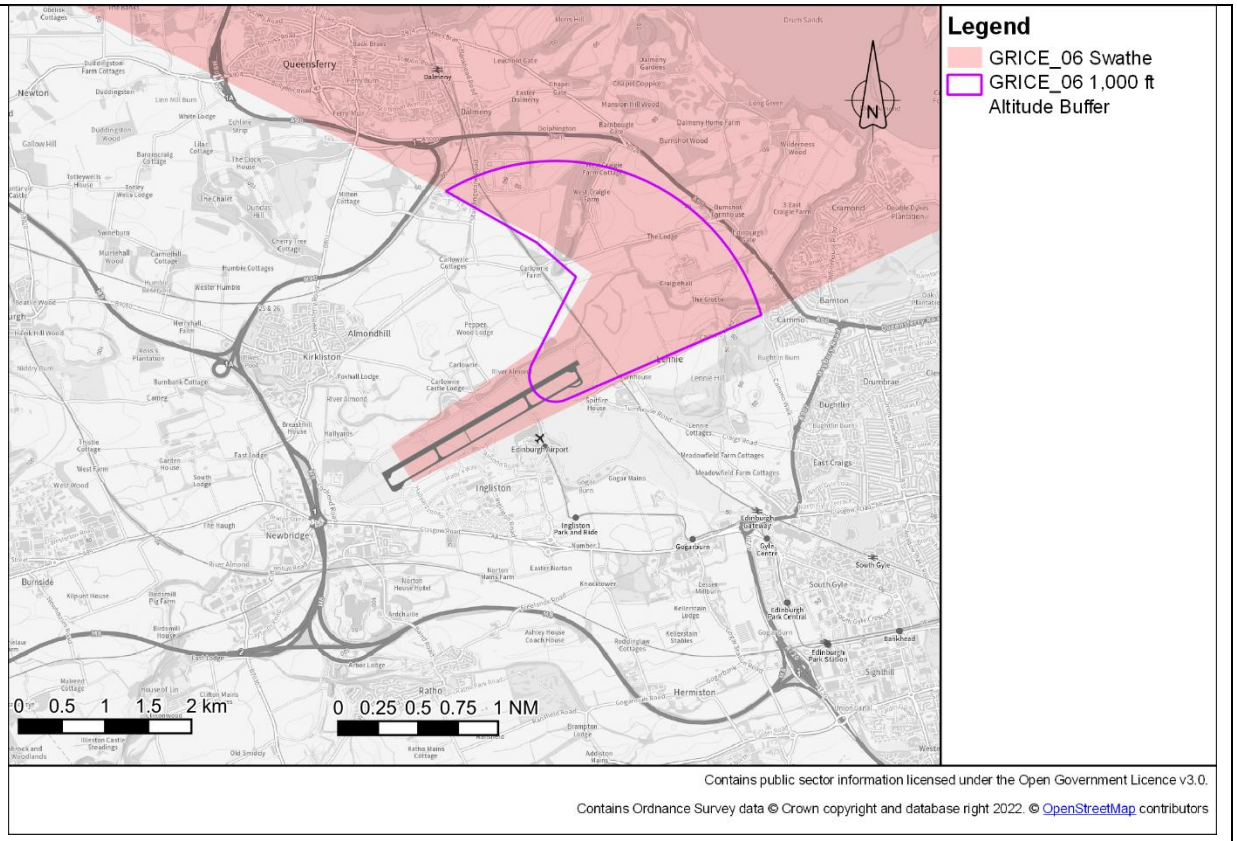
</table>

The inner track length of 32km will, all other factors remaining constant, generate the lowest fuel burn, with the central and outer tracks generating approximately 6% and 13% higher fuel burn than the inner track.
</td></tr>
</table>

	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

GRICE-06	Communities	Noise impact on Health and Quality of Life	**Overflight**  Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The swathe supports a continuous climb profile to minimise noise impacts to overflown communities, with aircraft likely turning over the Firth of Forth.

			The straight-ahead track would overfly Cramond at an altitude of less than 2,000ft, but retention of the Cramond Offset would avoid direct overflight of the village. The inside track would newly overfly Dalmeny and South Queensferry, plus the already overflown communities of North Queensferry, Dalgety Bay and Inverkeithing at an altitude below 4,000ft. Between 4,000 – 7,000ft, the populated areas of Rosyth, Dunfermline, Crossgates, Cowdenbeath and communities west of Dumfermline such as Crossford, Cairneyhill and Limekilns may be overflown. The swathe provides the opportunity to design a flight path that will provide track concentration and may minimise the frequency of overflights of communities in City of Edinburgh, West Lothian and southern Fife. **NPR** The changes to SIDs will result in a requirement to adjustment the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as '*planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time*.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** This swathe passes over Cramond and Dalmeny Park, turning to the north-west over the Firth of Forth to broaden across Queensferry, Dunfermline and part of Cowdenbeath. Aircraft currently turn over the Forth and overfly relatively tranquil areas around Aberdour and Fordell, and no change would be expected for these areas. Aircraft routed along the southern edge of the swathe would overfly areas of relative tranquillity around Hopetoun and the inner Firth of Forth. Aircraft routed to the north-east edge of the swathe would overfly small pockets of relatively tranquillity that are not currently overflown.
	Communities	Air Quality	**Overflight**



The indicative swathe footprint up to an altitude of 1,000 ft is detailed above.

Receptors

The number of residential properties located under the indicative footprint is 105.

Any effects on local air quality from GRICE-06 up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic, the potential overflight of new receptors and changes to ground operations including potential reductions in hold times.

<table>
<tr><td></td><td>Wider Society</td><td>Greenhouse Gas Impact</td><td>
<table>
<tr><th>Flight Path</th><th>Indicative Track Length (km)</th><th>Difference in Track Length (%)</th></tr>
<tr><td>Inner</td><td>30</td><td>N/A</td></tr>
<tr><td>Central</td><td>36</td><td>+20</td></tr>
<tr><td>Outer</td><td>41</td><td>+37</td></tr>
</table>

The inner track length of 30km will, all other factors remaining constant, generate the least greenhouse gas emissions, with the central and outer tracks generating approximately 20% and 37% more emissions than the inner track.
</td></tr>
<tr><td></td><td>Wider Society</td><td>Capacity / Resilience</td><td>Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction</td></tr>
<tr><td></td><td>General Aviation</td><td>Access</td><td>The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected
One flight paths are designed we may give CAS back.
VFR traffic pass underneath East.</td></tr>
<tr><td></td><td>General Aviation / Commercial airlines</td><td>Economic impact from increased effective capacity</td><td>There will be no economic impact on GA
With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.</td></tr>
<tr><td></td><td>General Aviation/Commercial airlines</td><td>Fuel Burn</td><td>
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<tr><th>Flight Path</th><th>Indicative Track Length (km)</th><th>Difference in Track Length (%)</th></tr>
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The inner track length of 30km will, all other factors remaining constant, generate the lowest fuel burn, with the central and outer tracks generating approximately 20% and 37% higher fuel burn than the inner track.
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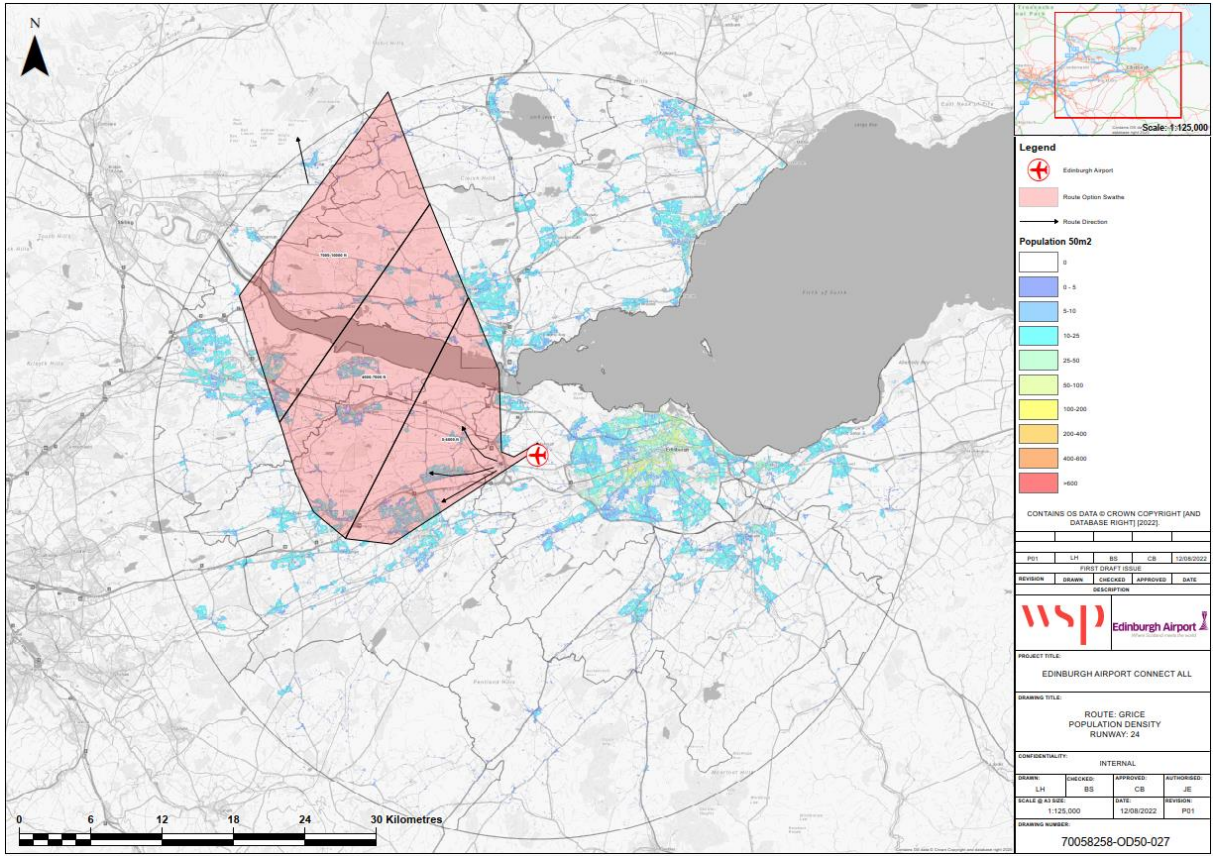
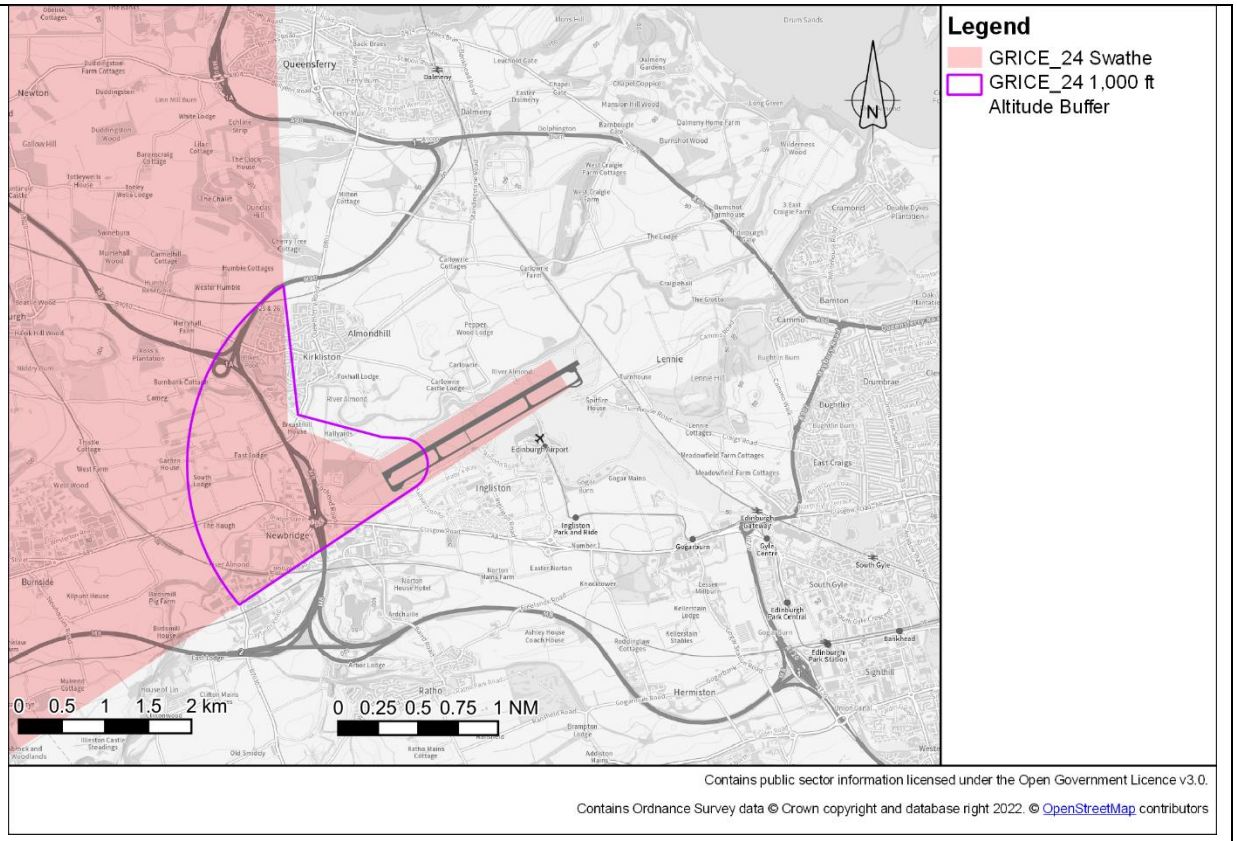
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

GRICE-24	Communities	Noise impact on Health and Quality of Life	**Overflight**  Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The swathe supports a continuous climb profile to minimise noise impacts to overflown communities.

			The early turn (inner) track may newly overfly communities at Kirkliston, Winchburgh, Broxburn and South Queensferry below 4,000ft, while the remainder of the track may overfly the already overflown community of Livingston at an altitude below 4,000ft. Between 4,000ft and 7,000ft the swathe may overfly the communities of Bathgate, Linlithgow, Bo'ness, the edge of Maddiston and small communities to the west of Dunfermline. The swathe provides the opportunity to design a flight path that will provide track concentration and may minimise the frequency of overflights of communities in West Lothian, Falkirk and Fife. **NPR** The changes to SIDs will result in a requirement to adjustment the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as '*planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time*.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** This swathe turns to the north-west, taking in a very broad area from Bathgate in the south-west to Dunfermline in the north-east. Aircraft heading north currently overfly the central part of this swathe and, to a lesser extent, the area in the west. Areas of relative tranquillity within the swathe occur at the Bathgate Hills and within the inner Forth near Blackness and Limekilns. Both of these areas are overflown to some extent. Routeing aircraft across either area could result in an intensification of overflights, likely to be at around 4,000 ft.
	Communities	Air Quality	**Overflight**



The indicative swathe footprint up to an altitude of 1,000 ft is detailed above.

Receptors

The number of residential properties located under the indicative footprint is 1,148.

Any effects on local air quality from GRICE-24 up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic, the potential overflight of new receptors and changes to ground operations including potential reductions in hold times.

<table>
<tr>
<td></td>
<td>Wider Society</td>
<td>Greenhouse Gas Impact</td>
<td>
<table>
<tr><th>Flight Path</th><th>Indicative Track Length (km)</th><th>Difference in Track Length (%)</th></tr>
<tr><td>Inner</td><td>36</td><td>N/A</td></tr>
<tr><td>Central</td><td>39</td><td>+8</td></tr>
<tr><td>Outer</td><td>42</td><td>+17</td></tr>
</table>

The inner track length of 36km will, all other factors remaining constant, generate the least greenhouse gas emissions, with the central and outer tracks generating approximately 8% and 17% more emissions than the inner track.
</td>
</tr>
<tr>
<td></td>
<td>Wider Society</td>
<td>Capacity / Resilience</td>
<td>Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction</td>
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<td>Access</td>
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One flight paths are designed we may give CAS back.
VFR traffic pass underneath East.</td>
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The inner track length of 36km will, all other factors remaining constant, generate the lowest fuel burn, with the central and outer tracks generating approximately 8% and 17% higher fuel burn than the inner track.
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</tr>
</table>

	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
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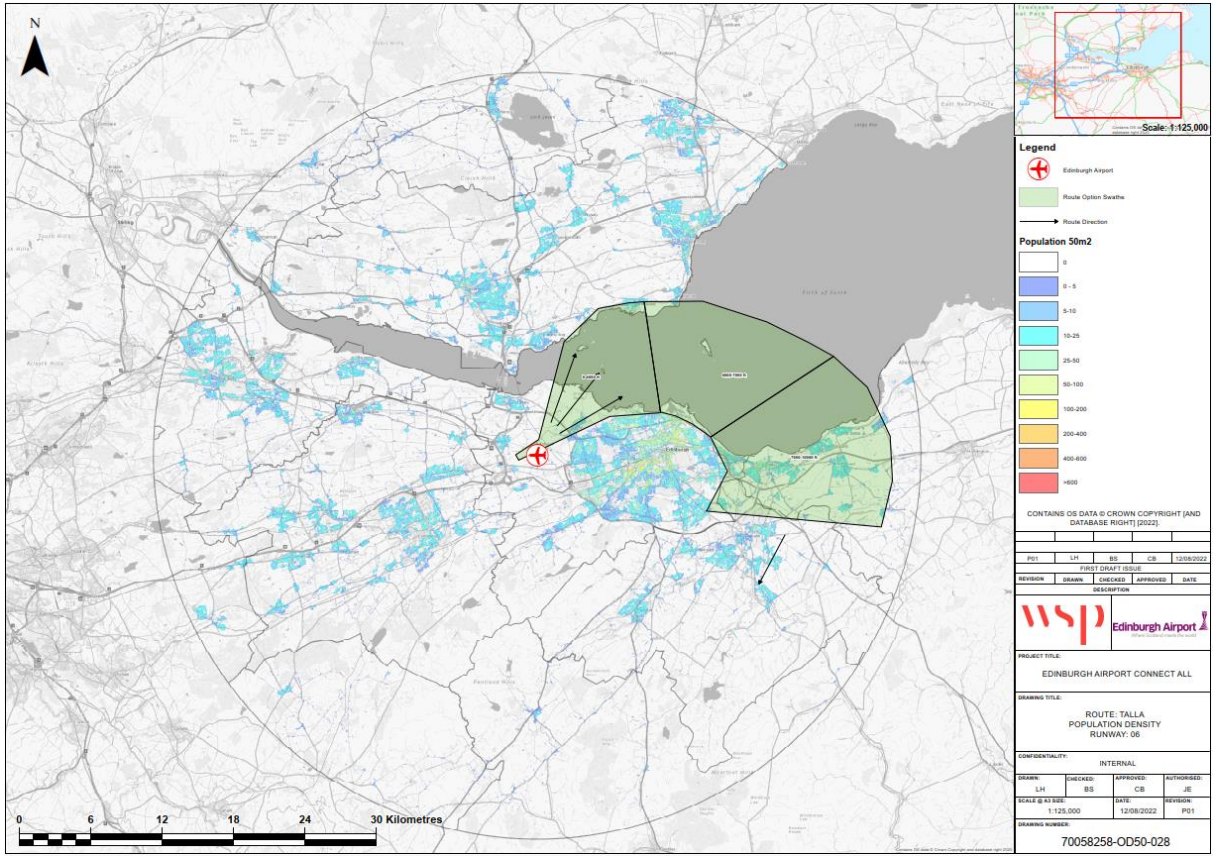
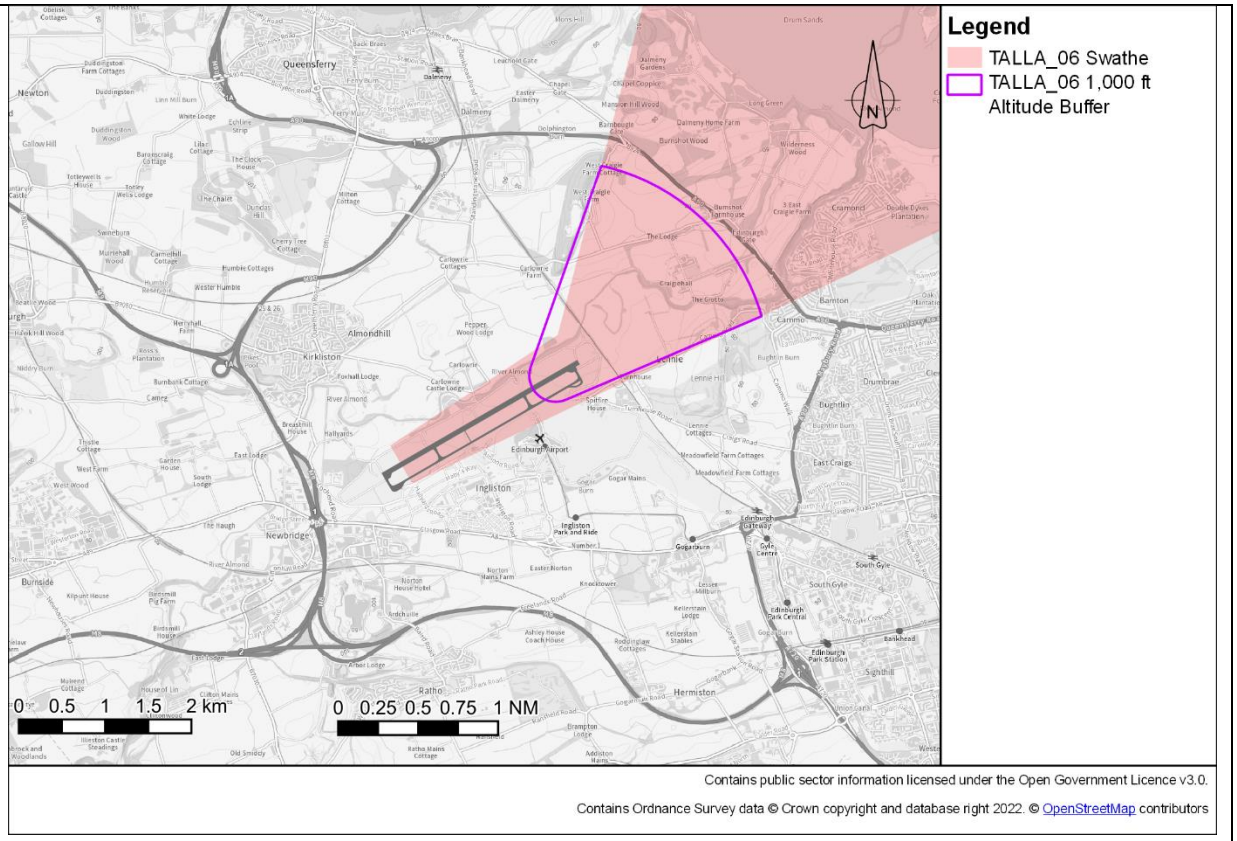
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

TALLA-06	Communities	Noise impact on Health and Quality of Life	**Overflight**  Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The swathe supports a continuous climb profile to minimise noise impacts to overflown communities. The straight-ahead alignment would directly overfly Cramond at an altitude of less than 2,000ft. Retention of the Cramond Offset would avoid direct overflight of the village.

			The majority of the swathe is over the Firth of Forth, avoiding impacts on communities. However, the outer edge of the swathe may skirt Burntisland, while the inner edge may skirt the densely populated community of Granton, both below 4,000ft. Between 4,000ft and 7,000ft, the outer edges of the swathe may skirt Kinghorn to the north and Leith and Portobello to the south. The swathe provides the opportunity to design a flight path that will provide track concentration and may minimise the frequency of overflights of communities in the City of Edinburgh and coastal communities in southern Fife. **NPR** The changes to SIDs will result in a requirement to adjustment the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as '*planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time*.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** This swathe passes over Cramond and Dalmeny Park, broadening across the Firth of Forth and turning southwards. Aircraft currently overfly this area, which includes relatively tranquil areas around Dalmeny Park and across the Firth of Forth islands. Use of this swathe is not anticipated to result in a change in tranquillity to these areas. There are no areas of tranquillity within the swathe that are not currently overflown.
	Communities	Air Quality	**Overflight**



The indicative swathe footprint up to an altitude of 1,000 ft is detailed above.

Receptors

The number of residential properties located under the indicative footprint is 104.

Any effects on local air quality from TALLA-06 up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic, the potential overflight of new receptors and changes to ground operations including potential reductions in hold times.

<table>
<tr>
<td></td>
<td>Wider Society</td>
<td>Greenhouse Gas Impact</td>
<td>
<table>
<tr><th>Flight Path</th><th>Indicative Track Length (km)</th><th>Difference in Track Length (%)</th></tr>
<tr><td>Inner</td><td>25</td><td>N/A</td></tr>
<tr><td>Central</td><td>39</td><td>+56</td></tr>
<tr><td>Outer</td><td>52</td><td>+108</td></tr>
</table>

The inner track length of 25km will, all other factors remaining constant, generate the least greenhouse gas emissions, with the central and outer tracks generating approximately 56% and 108% more emissions than the inner track.
</td>
</tr>
<tr>
<td></td>
<td>Wider Society</td>
<td>Capacity / Resilience</td>
<td>Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction</td>
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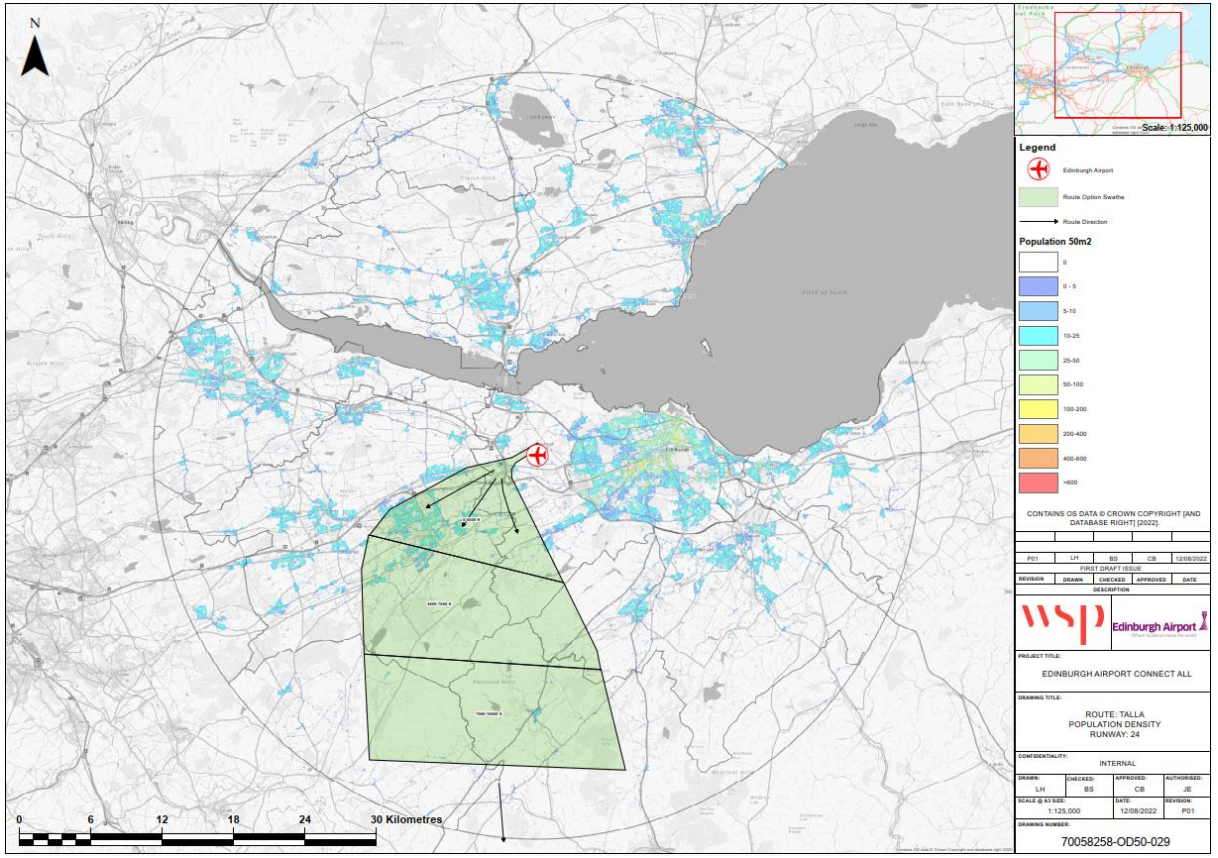
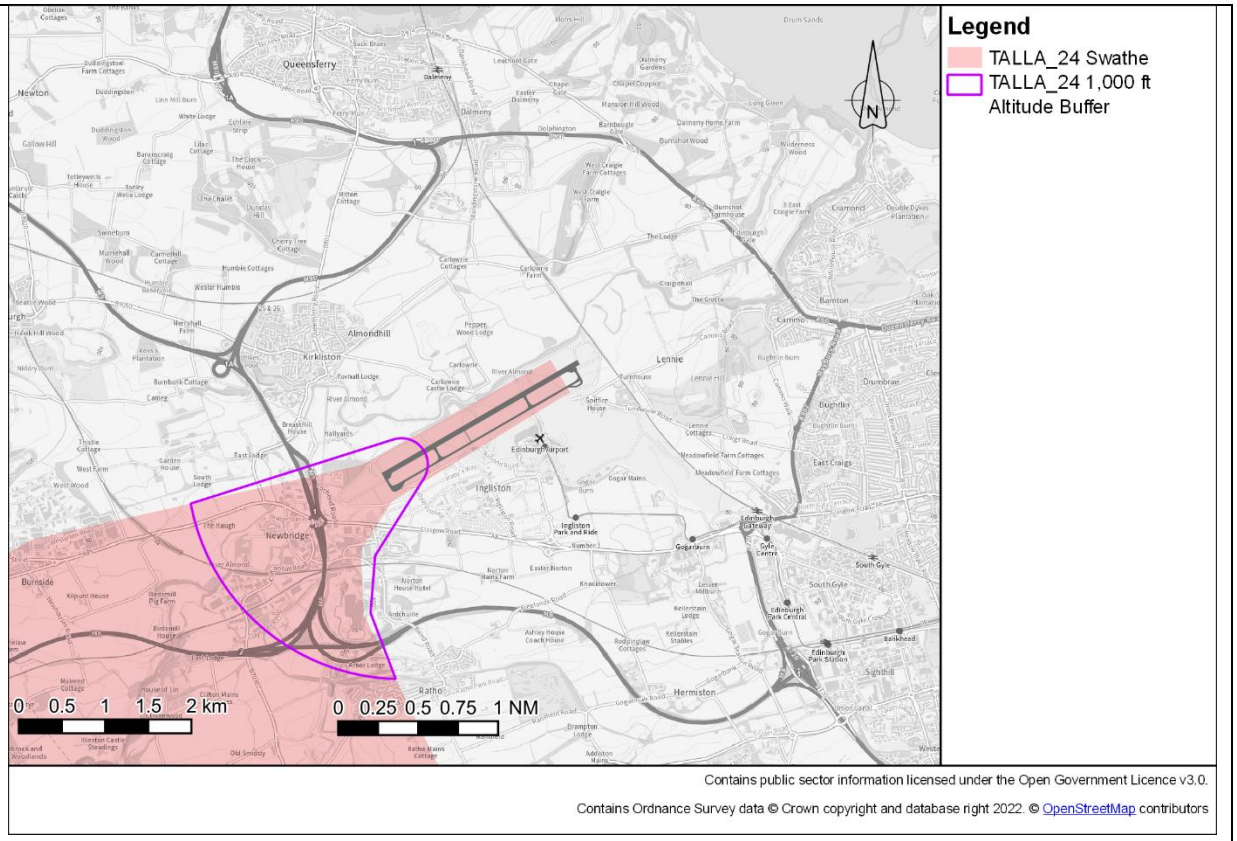
<td>Economic impact from increased effective capacity</td>
<td>There will be no economic impact on GA
With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.</td>
</tr>
<tr>
<td></td>
<td>General Aviation/Commercial airlines</td>
<td>Fuel Burn</td>
<td>
<table>
<tr><th>Flight Path</th><th>Indicative Track Length (km)</th><th>Difference in Track Length (%)</th></tr>
<tr><td>Inner</td><td>25</td><td>N/A</td></tr>
<tr><td>Central</td><td>39</td><td>+56</td></tr>
<tr><td>Outer</td><td>52</td><td>+108</td></tr>
</table>

The inner track length of 25km will, all other factors remaining constant, generate the lowest fuel burn, with the central and outer tracks generating approximately 56% and 108% higher fuel burn than the inner track.
</td>
</tr>
</table>

	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

TALLA-24	Communities	Noise impact on Health and Quality of Life	**Overflight**  Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The swathe supports a continuous climb profile to minimise noise impacts to overflown communities.

			The swathe would overfly Newbridge and may overfly other communities in West Lothian such as Livingston, East Calder and Kirknewton (newly overflown) below 4,000ft. The inner track may skirt Balerno at close to 4,000ft. Between 4,000ft and 7,000ft, very few densely populated areas would be overflown, with the outer track potentially overflying Polbeth, West Calder and Addiewell. The swathe provides the opportunity to design a flight path that will provide track concentration and may minimise the frequency of overflights of communities in West Lothian, South Lanarkshire and the Scottish Borders. **NPR** The changes to SIDs will result in a requirement to adjustment the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as '*planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time*.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** This swathe turns to the south to include a large section of the Pentland Hills. The Pentland Hills include the largest areas of highest tranquillity within the study area, although the south-western hills are currently overflown. Routeing in the eastern part of this swathe may see an increase in aircraft over the central Pentlands, which currently has few overflights, at between 4,000ft and 7,000ft. Routeing further west could see intensification of the existing pattern of overflights, and would allow aircraft to climb higher, approaching 7,000 ft before reaching the Pentlands.
	Communities	Air Quality	**Overflight**



The indicative swathe footprint up to an altitude of 1,000 ft is detailed above.

Receptors

The number of residential properties located under the indicative footprint is 299.

Any effects on local air quality from TALLA-24 up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic, the potential overflight of new receptors and changes to ground operations including potential reductions in hold times.

<table>
<tr><td></td><td></td><td></td><td>There are new residential and recreational developments planned within the flight swathe that will be affected by potential overflight.</td></tr>
<tr><td></td><td>Wider Society</td><td>Greenhouse Gas Impact</td><td>
<table>
<tr><th>Flight Path</th><th>Indicative Track Length (km)</th><th>Difference in Track Length (%)</th></tr>
<tr><td>Inner</td><td>31</td><td>N/A</td></tr>
<tr><td>Central</td><td>34</td><td>+10</td></tr>
<tr><td>Outer</td><td>36</td><td>+16</td></tr>
</table>

The inner track length of 31km will, all other factors remaining constant, generate the least greenhouse gas emissions, with the central and outer tracks generating approximately 10% and 16% more emissions than the inner track.
</td></tr>
<tr><td></td><td>Wider Society</td><td>Capacity / Resilience</td><td>Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction</td></tr>
<tr><td></td><td>General Aviation</td><td>Access</td><td>The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected
One flight paths are designed we may give CAS back.
VFR traffic pass underneath East.</td></tr>
<tr><td></td><td>General Aviation / Commercial airlines</td><td>Economic impact from increased effective capacity</td><td>There will be no economic impact on GA
With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.</td></tr>
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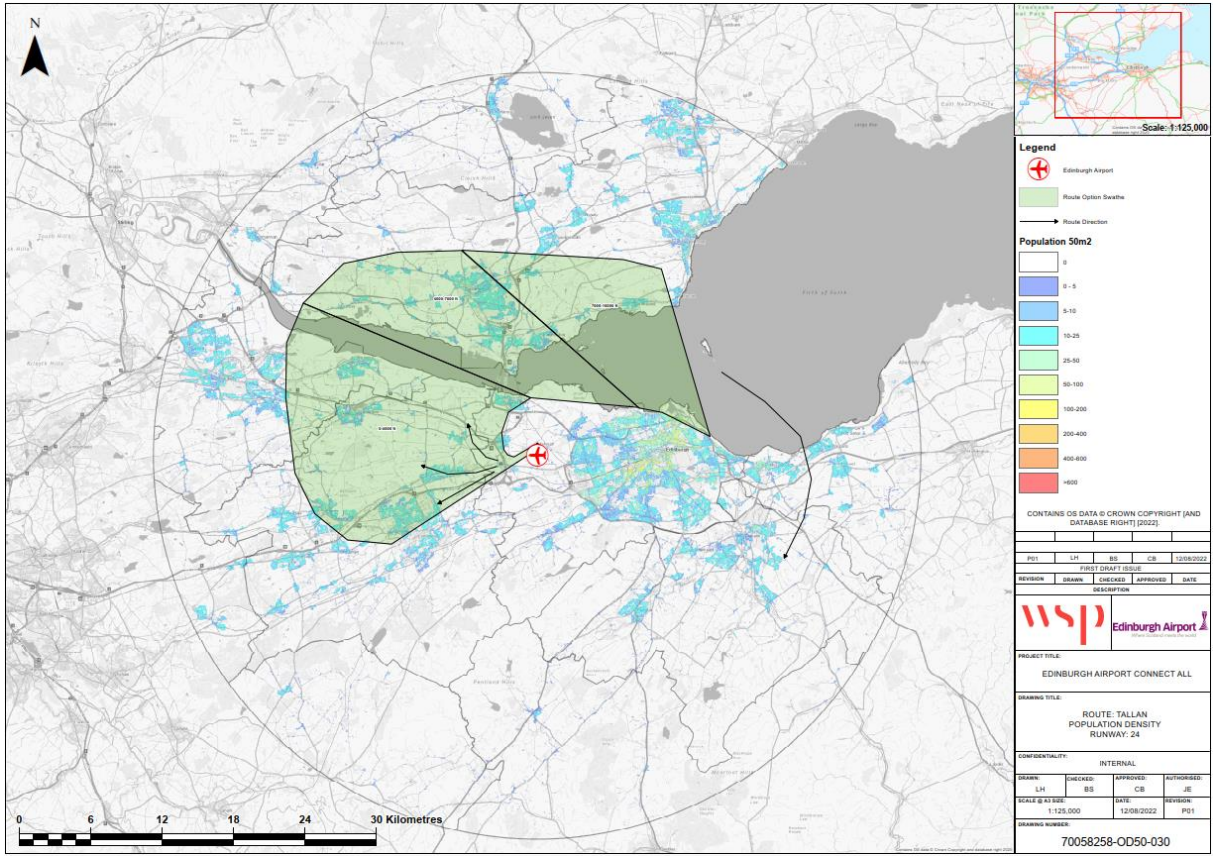
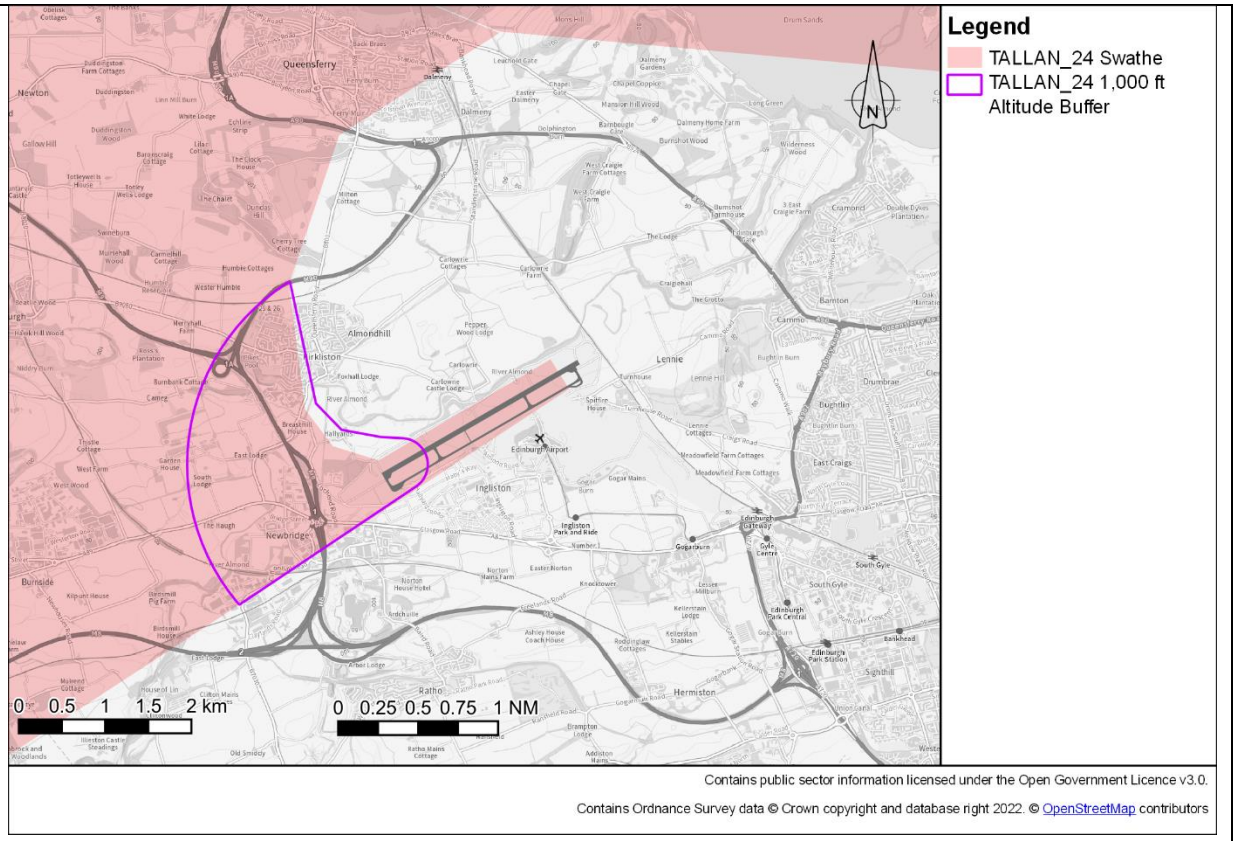
</table>
</td></tr>
</table>

			The inner track length of 31km will, all other factors remaining constant, generate the lowest fuel burn, with the central and outer tracks generating approximately 10% and 16% higher fuel burn than the inner track.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

TALLAN-24	Communities	Noise impact on Health and Quality of Life	**Overflight**  Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The swathe supports a continuous climb profile to minimise noise impacts to overflown communities.

			This swathe option covers a similar area to EAST-24 and would overfly the densely populated areas of Winchburgh, Broxburm, Livingston, Bathgate, Linlithgow and Bo'ness. The inner track may also overfly newly affected communities of Kirkliston and South Queensferry below 4,000ft. Communities which may be overflown north of the River Forth at altitudes between 4,000 – 7,000ft may include Valleyfield, Oakley, Carnock, Cairneyhill, Crossford, Limekilns, Dunfermline, Rosyth, North Queensferry and Inverkeithing. The swathe provides the opportunity to design a flight path that will provide track concentration and may minimise the frequency of overflights of communities in West Lothian and southern Fife. **NPR** The changes to SIDs will result in a requirement to adjustment the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as '*planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time*.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** This swathe is almost identical to EAST-24. In a broadening sweep it takes in Livingston, Grangemouth and Queensferry, turning around to the east over the Firth of Forth and Dunfermline. Current flight paths indicate some overflying of this area, which includes tranquil areas in the Bathgate Hills. Use of this swathe could result in an increase in overflying across relatively tranquil areas in the Bathgate Hills and in the inner Forth between Blackness and Limekilns. Further north, areas of highest tranquillity in the West Fife Hills may be overflown but only if aircraft are routed at the outer edge of the swathe, and only when approaching 7,000 ft.
	Communities	Air Quality	**Overflight**



The indicative swathe footprint up to an altitude of 1,000 ft is detailed above.

Receptors

The number of residential properties located under the indicative footprint is 1,487.

Any effects on local air quality from TALLAN-24 up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic, the potential overflight of new receptors and changes to ground operations including potential reductions in hold times.

<table>
<tr>
<td></td>
<td>Wider Society</td>
<td>Greenhouse Gas Impact</td>
<td>
<table>
<tr><th>Flight Path</th><th>Indicative Track Length (km)</th><th>Difference in Track Length (%)</th></tr>
<tr><td>Inner</td><td>25</td><td>N/A</td></tr>
<tr><td>Central</td><td>49</td><td>+96</td></tr>
<tr><td>Outer</td><td>73</td><td>+192</td></tr>
</table>

The inner track length of 25km will, all other factors remaining constant, generate the least greenhouse gas emissions, with the central and outer tracks generating approximately 36% and 192% more emissions than the inner track.

The central and outer track lengths and associated greenhouse gas emissions will be significantly greater (44% and 203%, respectively) than those for the most direct option, TALLA-24. The additional track miles to TALLA from the termination of the 7,000 – 10,000ft swathe will be even greater.
</td>
</tr>
<tr>
<td></td>
<td>Wider Society</td>
<td>Capacity / Resilience</td>
<td>Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction</td>
</tr>
<tr>
<td></td>
<td>General Aviation</td>
<td>Access</td>
<td>The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected
One flight paths are designed we may give CAS back.
VFR traffic pass underneath East.</td>
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<td></td>
<td>General Aviation / Commercial airlines</td>
<td>Economic impact from increased effective capacity</td>
<td>There will be no economic impact on GA
With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.</td>
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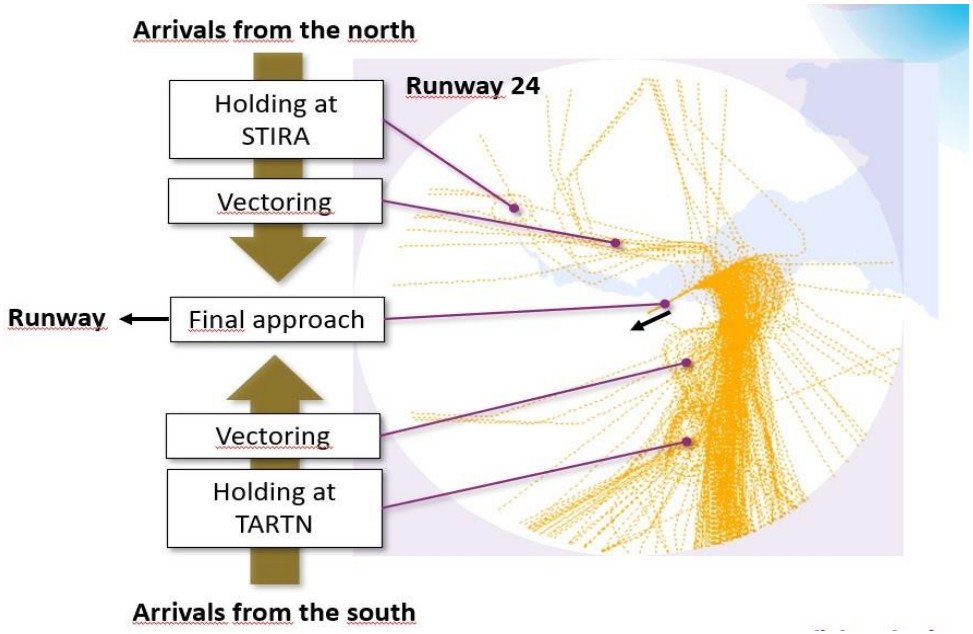
			The inner track length of 25km will, all other factors remaining constant, generate the lowest fuel burn, with the central and outer tracks generating approximately 36% and 192% higher fuel burn than the inner track. The central and outer track lengths and associated fuel burn will be significantly greater (44% and 203%, respectively) than those for the most direct option, TALLA-24. The additional track miles to TALLA from the termination of the 7,000 – 10,000ft swathe will be even greater.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

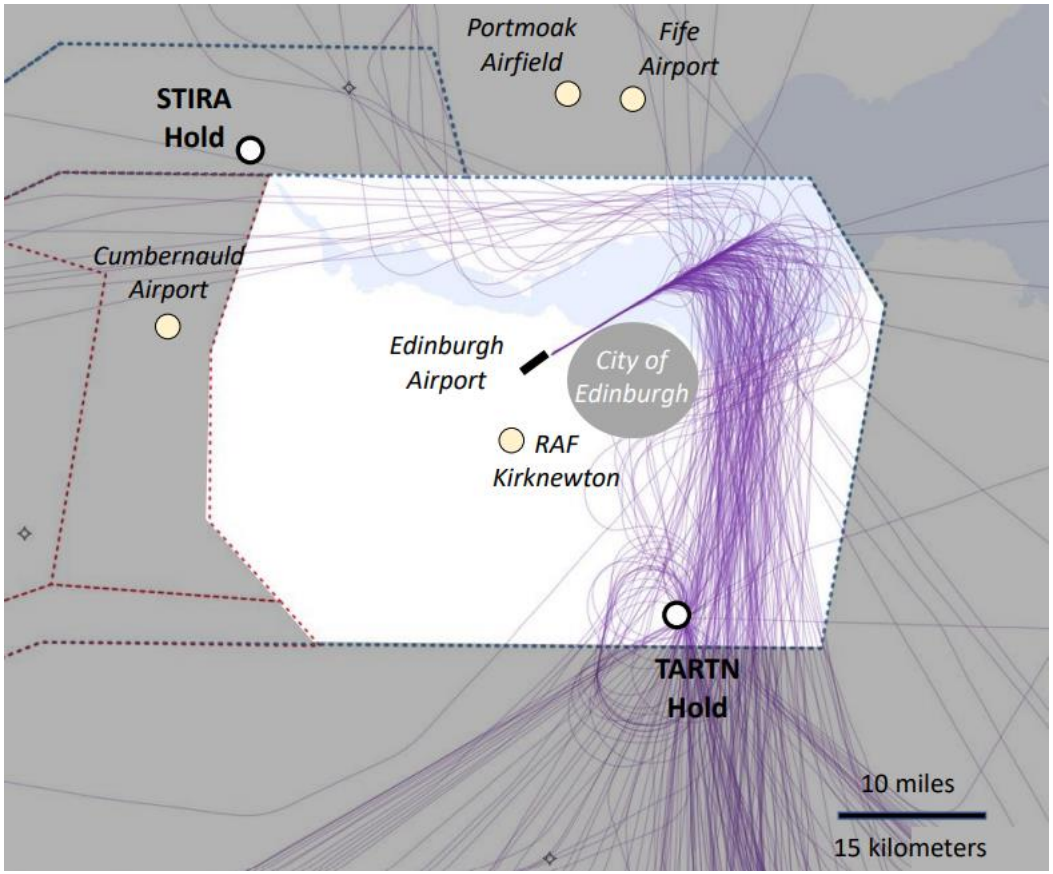
Stage 2B: Initial Options Appraisal - Arrivals

Air Quality

CAP1616 states that '*Due to the effects of mixing and dispersion, emissions from aircraft above 1,000 feet (amsl) are unlikely to have a significant impact on local air quality. Therefore, the impact of airspace design on local air quality is generally negligible compared with other factors such as changes in the volume of air traffic, and local transport infrastructures feeding the airport*.'

As the final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules, there will be no air quality difference between the various arrival options and so no assessment has been undertaken as part of Stage 2B. Any change in air quality is likely to be primarily because of changes in the volume of air traffic, local transport movements feeding the airport and ground movements, and will be assessed quantitatively at Stage 3.

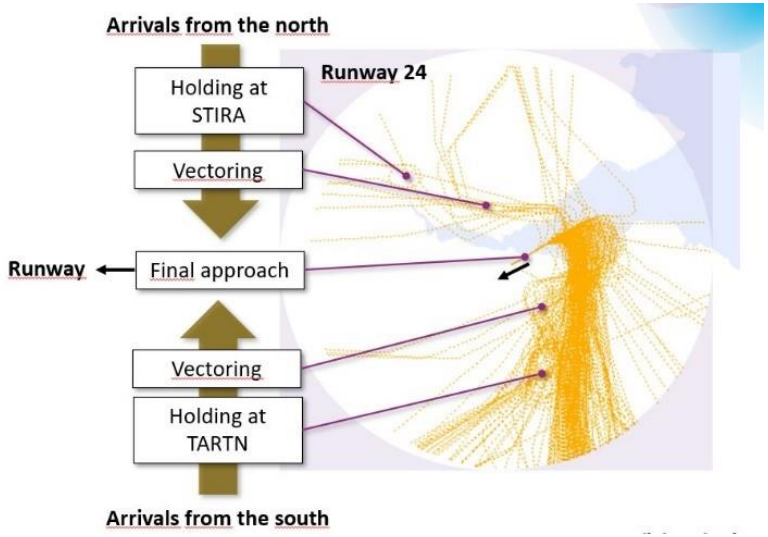
Option	Group	Impact	Qualitative Assessment
24 Baseline	Communities	Noise Impact on Health and Quality of Life	

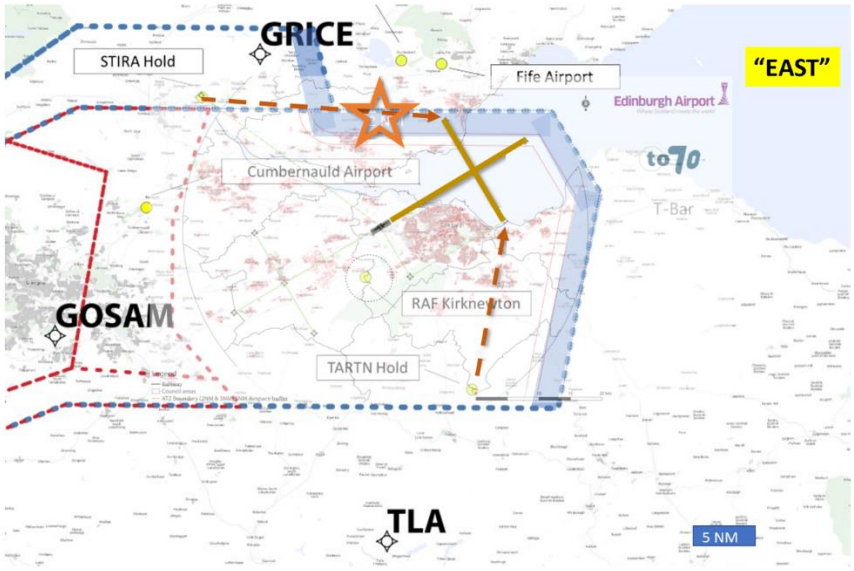
			 *All* descending aircraft, either routed directly from 7,000ft or released from the STIRA (north) or TARTN (south) holds at approximately 8,000ft, are vectored to the final approach and overfly small to large communities and population centres in the Scottish Borders, Midlothian, East Lothian and the City of Edinburgh.

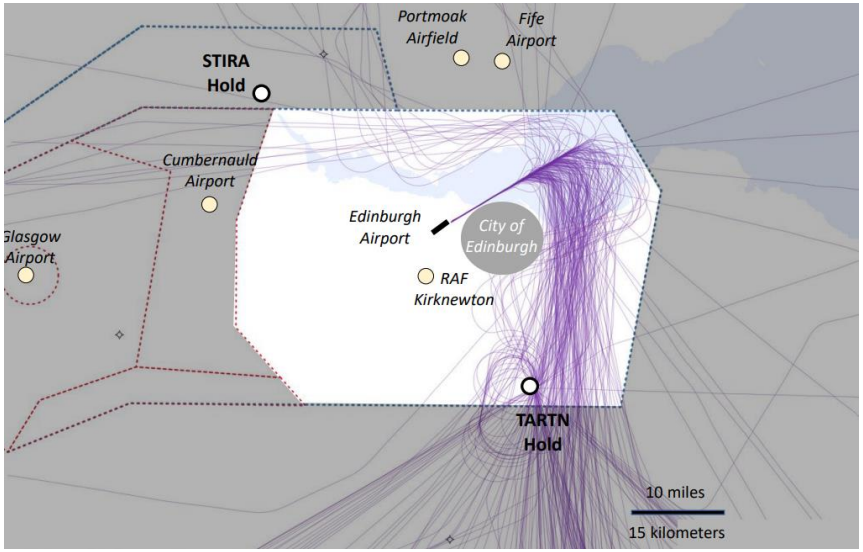
			From the south, aircraft cross the coast between Leith at approximately 3,000ft altitude to Longniddry at approximately 6,000ft altitude. From the north, aircraft are routed across Stirling, Clackmannanshire, Fife and the City of Edinburgh, crossing the Fife coast approximately between Kinghorn and Kirkcaldy at an altitude of around 3,000ft. Aircraft join the final approach at approximately 8 miles distance from the airport, over the Firth of Forth, and all arrivals overfly Cramond at an altitude of less than 1,000ft; this is unavoidable given the orientation of the 24 runway and aircraft operating rules. While the arriving aircraft will be operating at a lower (and hence quieter) engine power than departing aircraft, the concentration of aircraft on the final approach provides no opportunity to minimise impacts to the affected community in Cramond. Vectoring of *all* descending aircraft between approximately 8,000ft to 3,000ft provides a high degree of track dispersion that reduces the frequency of impacts to individual affected receptors, but the dispersal results in a wider area and larger population being overflown. **Tranquillity** This option represents the current arrangement. Aircraft from the south descend over the tranquil areas to the south of Edinburgh, including the Pentland Hills and Moorfoot Hills. Vectoring of *all* aircraft reduces the frequency of overflights over any one area. For the most part, aircraft will be above or just below 7,000 ft when crossing these areas, making most of their descent across the built-up area around Edinburgh. Aircraft approaching from the north descend across less tranquil areas of Fife. All runway 24 approaches unavoidably overfly the relatively tranquil areas around Cramond and across the Firth of Forth.
	Communities	Air Quality	The final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules. Changes in the volume of air traffic, ground movements and local transport infrastructure feeding the airport, will be assessed quantitatively at Stage 3.
	Wider Society	Greenhouse Gas Impact	The final approach is fixed and provides the most efficient flight path to the runway.

			Vectoring of *all* descending aircraft between approximately 8,000ft to 3,000ft is used to deliver efficient route management that minimises track miles and resulting greenhouse gas emissions. While the unavoidable use of the STIRA and TARTN holds during busy periods increases track miles and associated emissions for some flights, overall, the flexibility provided by vectoring *all* aircraft delivers the most efficient operation.
	Wider Society	Capacity / Resilience	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
	General Aviation	Access	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected One flight paths are designed we may give CAS back. VFR traffic pass underneath East.
	General Aviation / Commercial airlines	Economic impact from increased effective capacity	There will be no economic impact on GA With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
	General Aviation / Commercial airlines	Fuel Burn	The final approach is fixed and provides the most efficient flight path to the runway. Vectoring of *all* descending aircraft between approximately 8,000ft to 3,000ft is used to deliver efficient route management that minimises track miles and fuel burn. While the unavoidable use of the STIRA and TARTN holds during busy periods increases track miles and fuel burn for some flights, overall, the flexibility provided by vectoring *all* aircraft delivers the most efficient operation.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.

	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

Option	**Group**	**Impact**	**Qualitative Assessment**
24 Baseline and RNAV	Communities	Noise Impact on Health and Quality of Life	

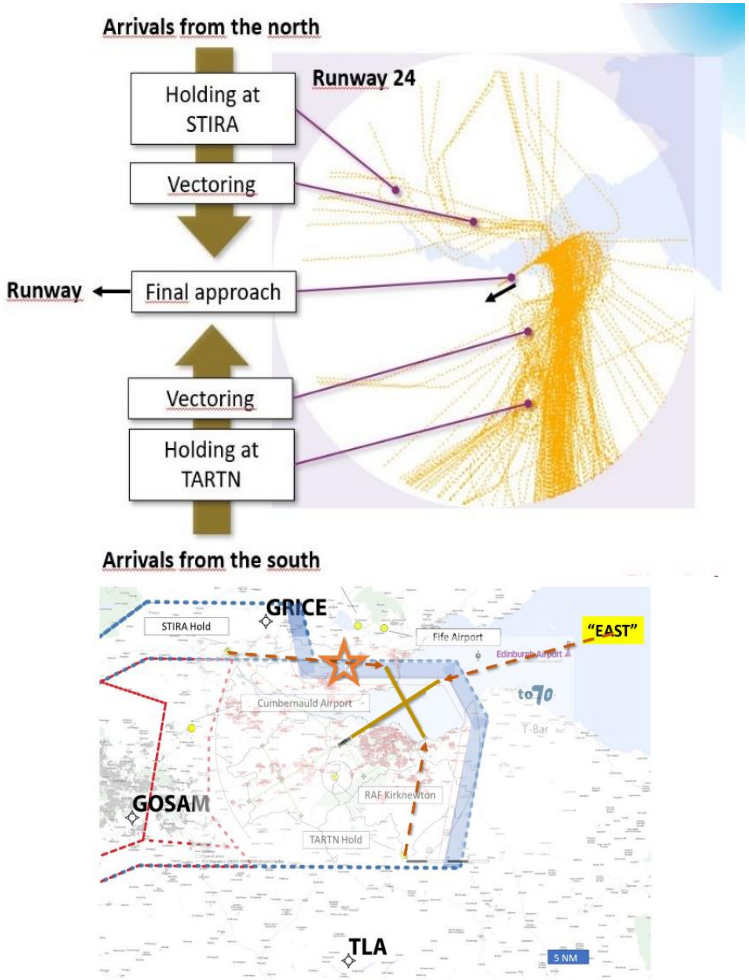

GRICE
STIRA Hold
Fife Airport
"EAST"
Edinburgh Airport
to70
Cumbernauld Airport
T-Bar
RAF Kirknewton
GOSAM
TARTN Hold
TLA
5 NM

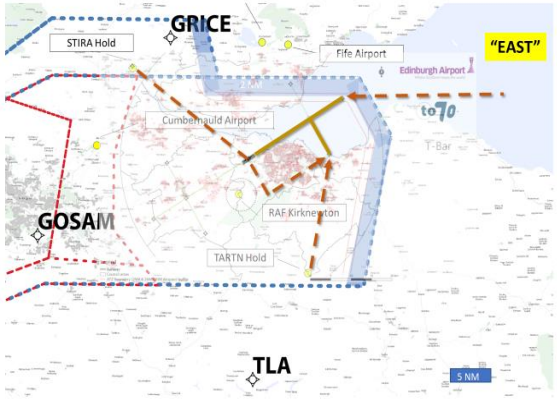

Portmoak Airfield
Fife Airport
STIRA Hold
Cumbernauld Airport
Edinburgh Airport
City of Edinburgh
Glasgow Airport
RAF Kirknewton
TARTN Hold
10 miles
15 kilometers

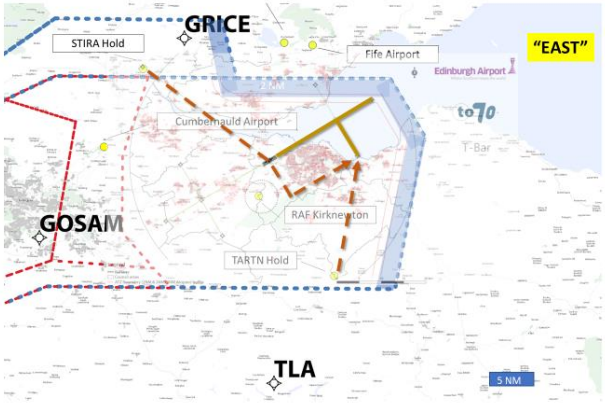
			Descending aircraft will continue to overfly small to large communities and population centres in the Scottish Borders, Midlothian, West Lothian, East Lothian, Stirling, Clackmannanshire, Fife and the City of Edinburgh. All aircraft on the final approach will overfly Cramond at an altitude of less than 1,000ft. This is unavoidable given the orientation of the 24 runway and aircraft operating rules, which provide no opportunity to minimise impacts to the affected community in Cramond. This option overlays RNAV on the baseline option. During busy periods, vectoring of *most* aircraft between 8,000ft and 3,000ft will provide a high degree of track dispersion that reduces the frequency of impacts to individual affected receptors, but the dispersal will result in a wider area and larger population being overflown. The introduction and use of an RNAV overlay may generate slightly greater track concentration when aircraft are not vectored (during quieter periods of the day / night). **Tranquillity** This option is similar to the current arrangement, but with a slightly greater level of concentration of flight tracks (during quiet periods) before joining the final approach. Vectoring will still be used during busier periods for most flights. As the tranquil areas are located at the start of the descent, no change to overflights of tranquil areas is anticipated relative to the baseline.
	Communities	Air Quality	The final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules. Changes in the volume of air traffic, ground movements and local transport infrastructure feeding the airport, will be assessed quantitatively at Stage 3.
	Wider Society	Greenhouse Gas Impact	The final approach is fixed and provides the most efficient flight path to the runway. Vectoring of *most* descending aircraft between approximately 8,000ft to 3,000ft will be used to deliver efficient route management that minimises track miles and resulting greenhouse gas emissions. The introduction and use of an RNAV overlay will deliver efficient route management when aircraft are not vectored (during quieter periods of the day / night).

			While the unavoidable use of the STIRA and TARTN holds during busy periods will increase track miles and associated emissions for some flights, overall, the flexibility provided by vectoring *most* aircraft will deliver a highly efficient operation.
	Wider Society	Capacity / Resilience	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
	General Aviation	Access	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected One flight paths are designed we may give CAS back. VFR traffic pass underneath East.
	General Aviation / Commercial airlines	Economic impact from increased effective capacity	There will be no economic impact on GA With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
	General Aviation / Commercial airlines	Fuel Burn	The final approach is fixed and provides the most efficient flight path to the runway. Vectoring of *most* descending aircraft between approximately 8,000ft to 7,000ft will be used to deliver efficient route management that minimises track miles and fuel burn. The introduction and use of an RNAV overlay will deliver efficient route management when aircraft are not vectored (during quieter periods of the day / night). While the unavoidable use of the STIRA and TARTN holds during busy periods will increase track miles and fuel burn for some flights, overall, the flexibility provided by vectoring *most* aircraft will deliver a highly efficient operation.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)

	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

Option	Group	Impact	Qualitative Assessment
24 Vectoring and Approach Transitions	Communities	Noise Impact on Health and Quality of Life	



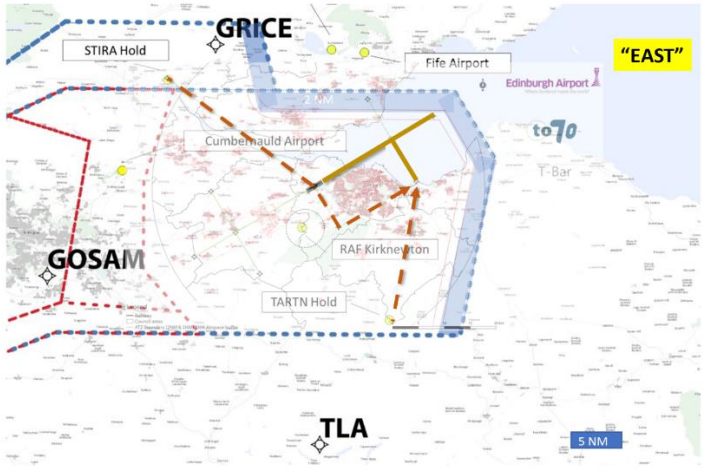


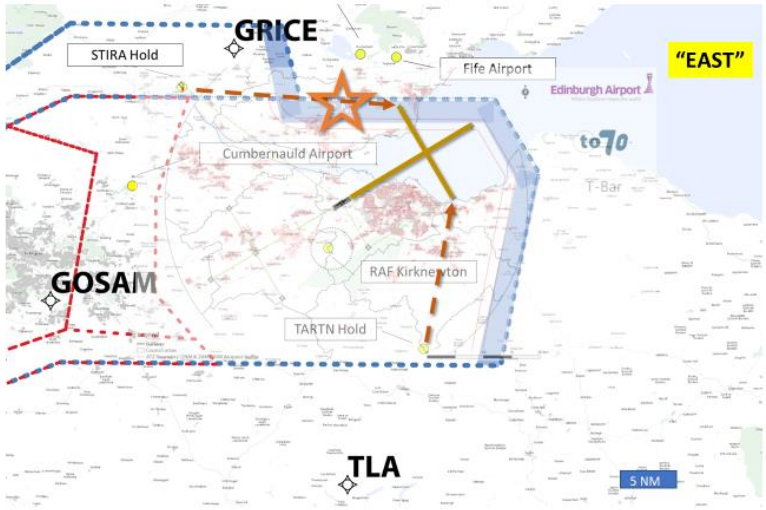
Descending aircraft will continue to overfly small to large communities and population centres in the Scottish Borders, Midlothian, West Lothian, East Lothian, Stirling, Clackmannanshire, Fife and the City of Edinburgh.

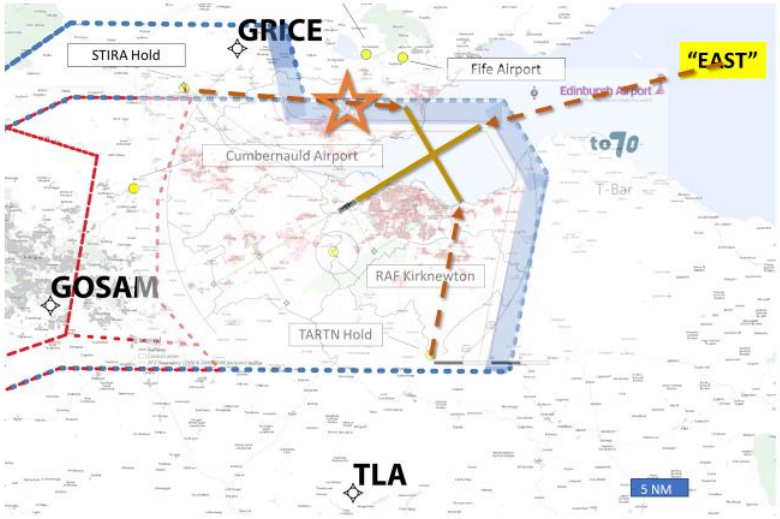
			All aircraft on the final approach will overfly Cramond at an altitude of less than 1,000ft. This is unavoidable given the orientation of the 24 runway and aircraft operating rules, which provide no opportunity to minimise impacts to the affected community in Cramond. This option provides increased systemisation of the airspace through the introduction and use of approach transitions to the t-bars. These will be used during the majority of the day. This will generate greater track concentration along the defined flightpaths. This will reduce the area and number of people overflown but increase the frequency of overflights to those affected. Vectoring of *some* aircraft will be required during busy periods, providing a small degree of track dispersion that will slightly reduce the frequency of impacts to individual affected receptors, but the dispersal will result in a wider area and larger population being overflown. **Tranquillity** This option is more systemised than the baseline, with aircraft likely to be more concentrated on particular tracks, though with *some* vectoring during busier periods. While this may increase the frequency of overflights of tranquil areas, no additional tranquil areas will be affected. As with the baseline, aircraft will be above or just below 7,000 ft when crossing these tranquil areas.
	Communities	Air Quality	The final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules. Changes in the volume of air traffic, ground movements and local transport infrastructure feeding the airport, will be assessed quantitatively at Stage 3.
	Wider Society	Greenhouse Gas Impact	The final approach is fixed and provides the most efficient flight path to the runway. Increased systemisation through the introduction and use of approach transitions to the t-bars will deliver relatively efficient route management during most of the day. *Some* vectoring will be used during busy periods to deliver efficient route management that will minimise track miles and resulting greenhouse house emissions. The increased systemisation may increase the use of the STIRA and TARTN hold, which would increase track miles and greenhouse house emissions for some flights. Overall, the systemisation of

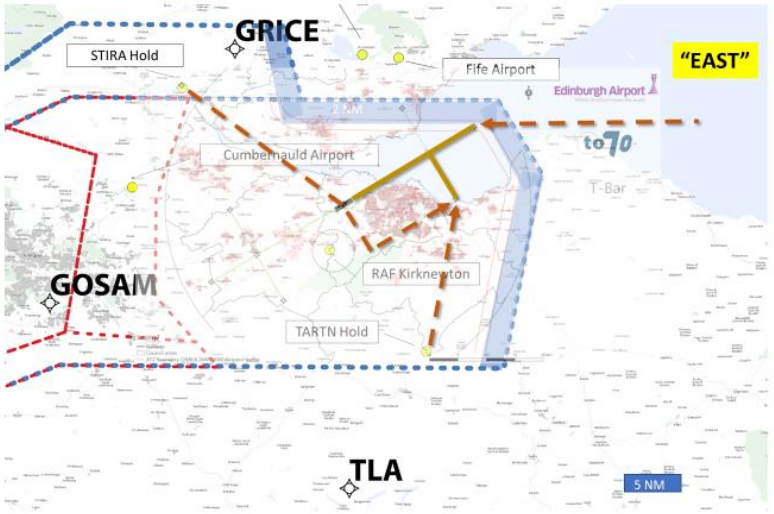
			most flights is likely to deliver a slightly less efficient operation than an approach with more vectoring.
	Wider Society	Capacity / Resilience	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
	General Aviation	Access	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected One flight paths are designed we may give CAS back. VFR traffic pass underneath East.
	General Aviation / Commercial airlines	Economic impact from increased effective capacity	There will be no economic impact on GA With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
	General Aviation / Commercial airlines	Fuel Burn	The final approach is fixed and provides the most efficient flight path to the runway. Increased systemisation through the introduction and use of approach transitions to the t-bars will deliver relatively efficient route management during most of the day. *Some* vectoring will be used during busy periods to deliver efficient route management that will minimise track miles and fuel burn. The increased systemisation may increase the use of the STIRA and TARTN hold, which would increase track miles and fuel burn for some flights. Overall, the systemisation of most flights is likely to deliver a slightly less efficient operation than an approach with more vectoring.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)

	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

Option	**Group**	**Impact**	**Qualitative Assessment**
24 Approach transition and Holds	Communities	Noise Impact on Health and Quality of Life	

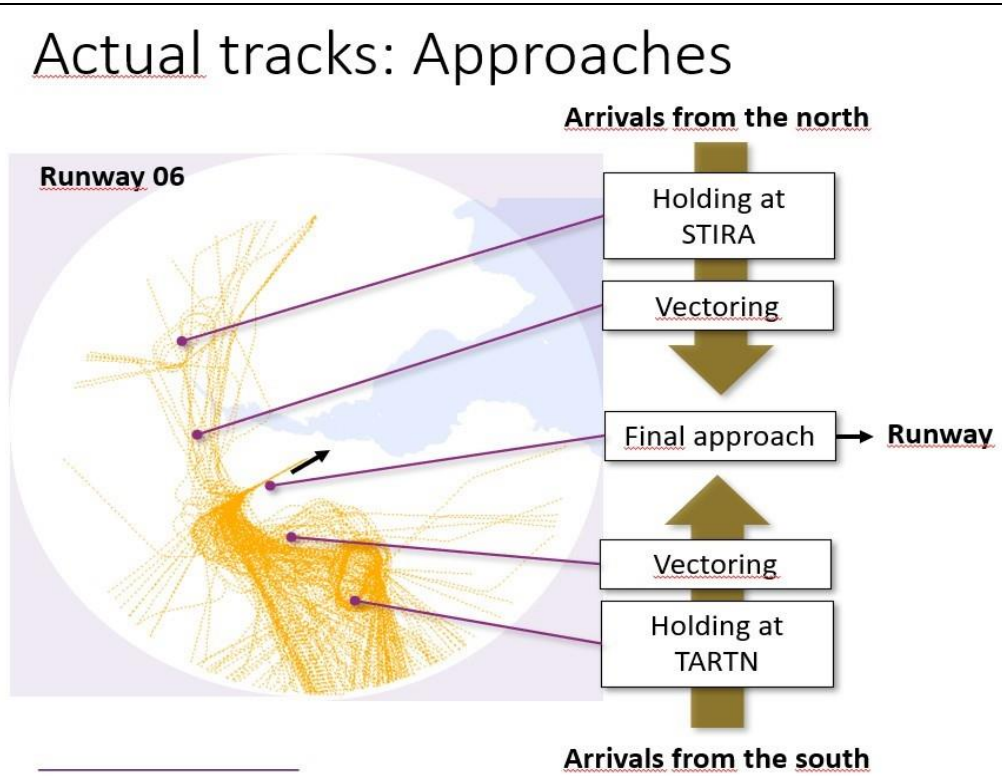

GRICE
STIRA Hold
Fife Airport
"EAST"
Edinburgh Airport
Cumbernauld Airport
T-Bar
RAF Kirknewton
GOSAM
TARTN Hold
TLA
5 NM

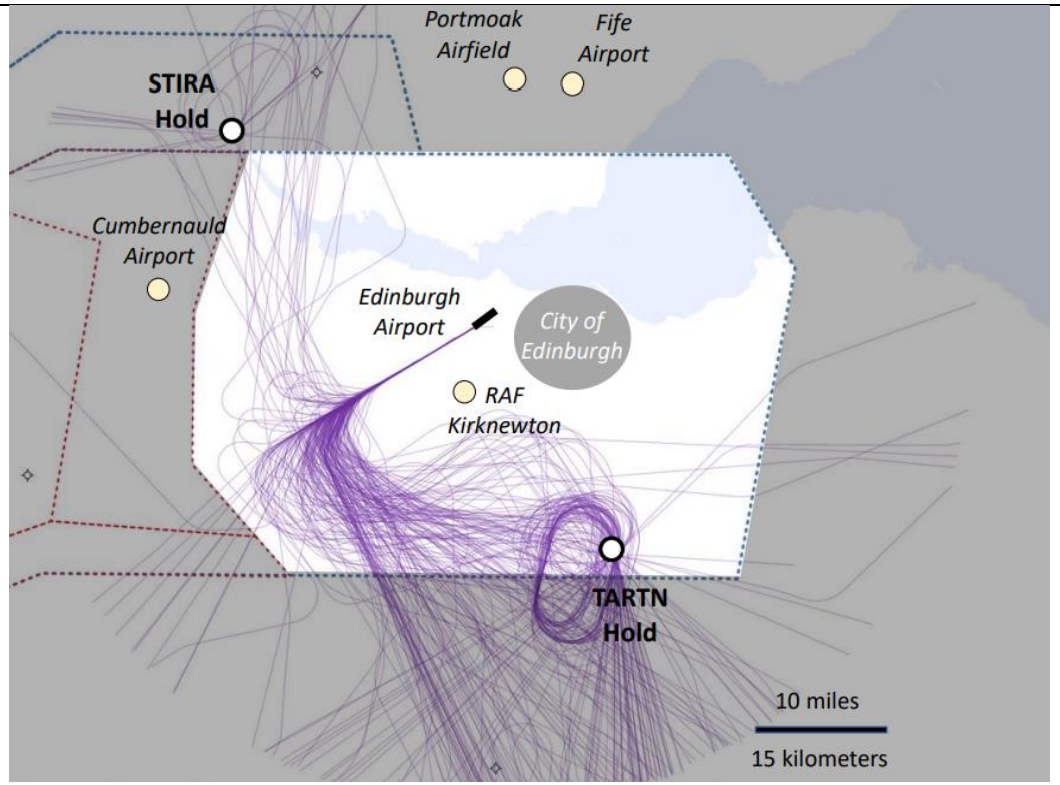

GRICE
STIRA Hold
Fife Airport
"EAST"
Cumbernauld Airport
T-Bar
RAF Kirknewton
GOSAM
TARTN Hold
TLA
5 NM

			 Descending aircraft will continue to overfly small to large communities and population centres in the Scottish Borders, Midlothian, West Lothian, East Lothian, Stirling, Clackmannanshire, Fife and the City of Edinburgh. All aircraft on the final approach will overfly Cramond at an altitude of less than 1,000ft. This is unavoidable given the orientation of the 24 runway and aircraft operating rules, which provide no opportunity to minimise impacts to the affected community in Cramond. This option provides full systemisation of the airspace through the introduction and use of approach transitions to the t-bars for all aircraft. This will generate significantly greater track concentration along the defined flightpaths. This will reduce the area and number of people overflown but increase the frequency of overflights to those affected. Vectoring, which would generate a degree of track dispersal, will only be used in exceptional circumstances.

			Tranquillity This option is fully systemised, with all aircraft concentrated on particular tracks, and with minimal use of vectoring and dispersal. While this may increase the frequency of overflights of tranquil areas, no additional tranquil areas will be affected. As with the baseline, aircraft will be above or just below 7,000 ft when crossing these tranquil areas.
	Communities	Air Quality	The final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules. Changes in the volume of air traffic, and local transport infrastructure feeding the airport, will be assessed quantitatively at Stage 3.
	Wider Society	Greenhouse Gas Impact	The final approach is fixed and provides the most efficient flight path to the runway. Full systemisation through the introduction and use of approach transitions to the t-bars will deliver relatively efficient route management during most of the day. Vectoring will only be used by exception. Full systemisation may result in potential capacity constraints during busy periods, which may result in more aircraft being held in the STIRA or TARTN holds, increasing track miles and associated emissions for many flights. Overall, full systemisation is likely to deliver a moderately less efficient operation than an approach including vectoring.
	Wider Society	Capacity / Resilience	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
	General Aviation	Access	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected One flight paths are designed we may give CAS back. VFR traffic pass underneath East.

	General Aviation / Commercial airlines	Economic impact from increased effective capacity	There will be no economic impact on GA With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
	General Aviation / Commercial airlines	Fuel Burn	The final approach is fixed and provides the most efficient flight path to the runway. Full systemisation through the introduction and use of approach transitions to the t-bars will deliver relatively efficient route management during most of the day. Vectoring will only be used by exception. Full systemisation may result in potential capacity constraints during busy periods, which may result in more aircraft being held in the STIRA or TARTN holds, increasing track miles and fuel burn for many flights. Overall, full systemisation is likely to deliver a moderately less efficient operation than an approach including vectoring.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

Option	Group	Impact	Qualitative Assessment
06 Baseline	Communities	Noise Impact on Health and Quality of Life	



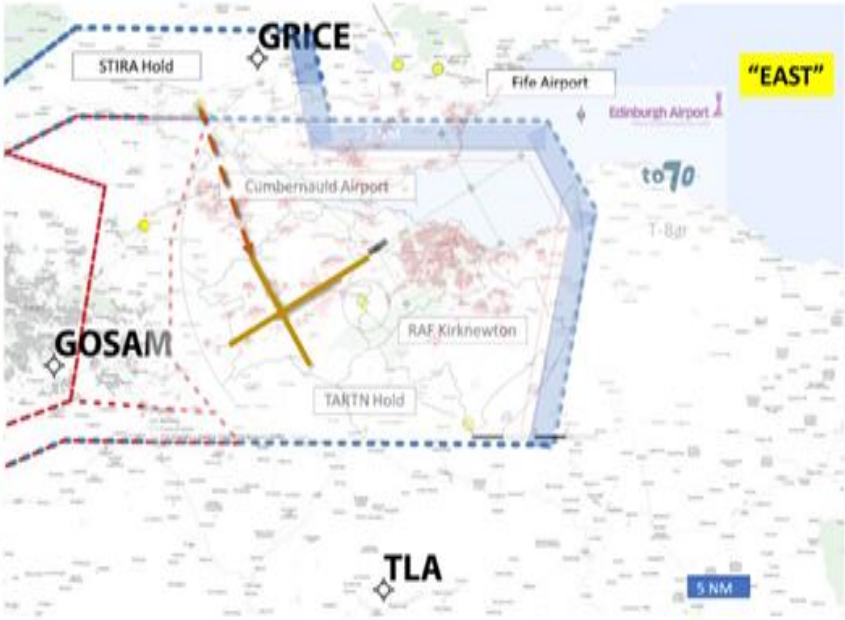
All descending aircraft, either routed directly from 7,000ft or released from the STIRA or TARTN hold at approximately 8,000ft, are vectored to the final approach and overfly small to medium communities and population centres in the Scottish Borders, South Lanarkshire and West Lothian (from the south / TARTN) and Stirling, Clackmannanshire, Falkirk and West Lothian (from the north / STIRA) at altitudes between approximately 8,000ft to 3,000ft.

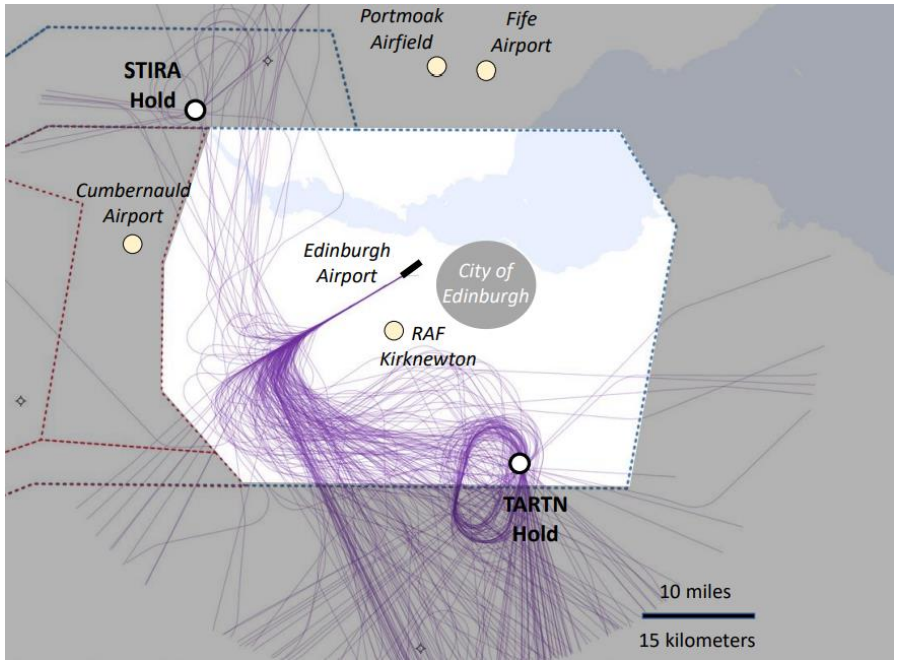
Aircraft join the final approach at approximately 8 miles distance from the airport and all overfly Livingston at an altitude of less than 3,000 feet and Newbridge at an altitude of less than 1,000 feet –

			this is unavoidable given the orientation of the 06 runway and aircraft operating rules. While the arriving aircraft will be operating at a lower (and hence quieter) engine power than departing aircraft, the concentration of aircraft on the final approach provides no opportunity to minimise impacts to affected communities. Vectoring of *all* descending aircraft between approximately 8,000ft to 3,000ft provides a high degree of track dispersion that reduces the frequency of impacts to individual affected receptors, but the dispersal results in a wider area and larger population being overflown. **Tranquillity** This option represents the current arrangement. Aircraft from the south descend over tranquil areas within the Pentland Hills. Descending aircraft cross the south-west Pentlands at between 7,000ft and 4,000 ft. Vectoring of *all* aircraft increases dispersal of aircraft, which reduces the frequency of overflights over this area: some flights are vectored around the most tranquil areas, while others overfly longer stretches of the hills. Aircraft approaching from the north descend across generally less tranquil areas of West Lothian and Falkirk, though with some vectoring across the relatively tranquil Bathgate Hills. The later part of the descent, from north and south, is made across the less tranquil areas around Livingston.
	Communities	Air Quality	The final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules. Changes in the volume of air traffic, ground movements and local transport infrastructure feeding the airport, will be assessed quantitatively at Stage 3.
	Wider Society	Greenhouse Gas Impact	The final approach is fixed and provides the most efficient flight path to the runway. Vectoring of *all* descending aircraft between approximately 8,000ft to 3,000ft is used to deliver efficient route management that minimises track miles and resulting greenhouse gas emissions. While the unavoidable use of the STIRA and TARTN holds during busy periods increases track miles and associated emissions for some flights, overall, the flexibility provided by vectoring *all* aircraft delivers the most efficient operation.

	Wider Society	Capacity / Resilience	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
	General Aviation	Access	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected One flight paths are designed we may give CAS back. VFR traffic pass underneath East.
	General Aviation / Commercial airlines	Economic impact from increased effective capacity	There will be no economic impact on GA With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
	General Aviation / Commercial airlines	Fuel Burn	The final approach is fixed and provides the most efficient flight path to the runway. Vectoring of *all* descending aircraft between approximately 8,000ft to 3,000ft is used to deliver efficient route management that minimises track miles and fuel burn. While the unavoidable use of the STIRA and TARTN holds during busy periods increases track miles and fuel burn for some flights, overall, the flexibility provided by vectoring *all* aircraft delivers the most efficient operation.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.

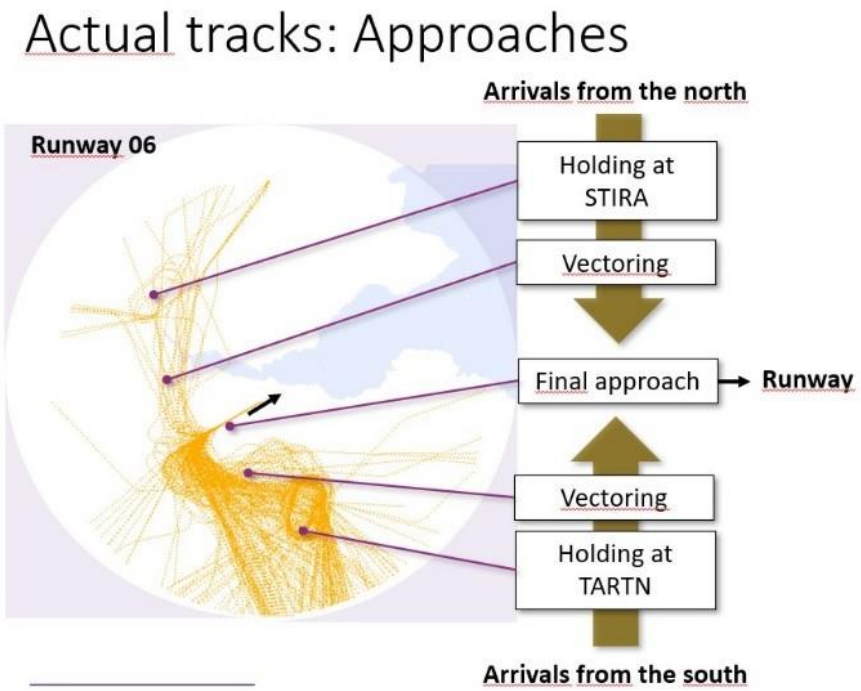
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

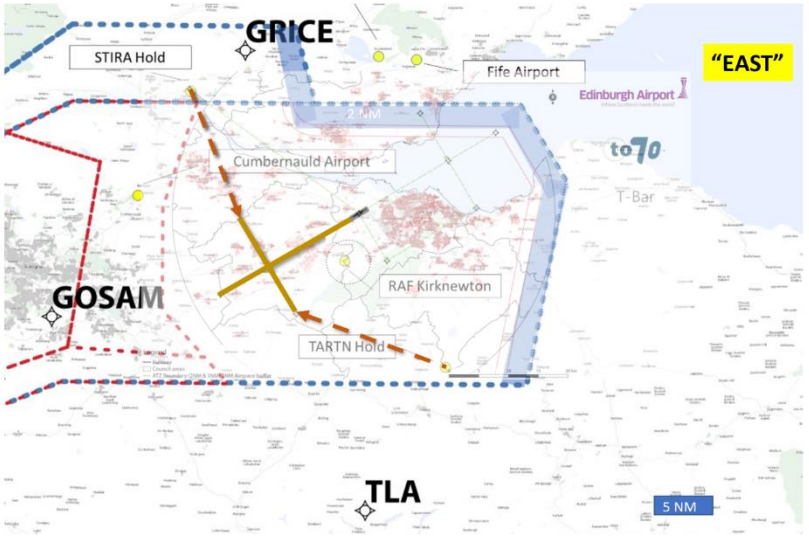
Option	Group	Impact	Qualitative Assessment
06 Baseline and RNAV	Communities	Noise Impact on Health and Quality of Life	

			 Descending aircraft will continue to overfly small to medium communities and population centres in the Scottish Borders, South Lanarkshire, West Lothian, Stirling, Clackmannanshire and Falkirk. All aircraft on the final approach will overfly Livingston at an altitude of less than 3,000 feet and Newbridge at an altitude of less than 1,000 feet. This is unavoidable given the orientation of the 06 runway and aircraft operating rules, which provide no opportunity to minimise impacts to these affected communities. This option overlays RNAV on the baseline option. During busy periods, vectoring of *most* aircraft between 8,000ft and 3,000ft will provide a high degree of track dispersion that reduces the frequency of impacts to individual affected receptors, but the dispersal will result in a wider area and larger population being overflown.

			The introduction and use of an RNAV overlay may generate slightly greater track concentration when aircraft are not vectored (during quieter periods of the day / night). **Tranquillity** This option is similar to the current arrangement, but with a greater level of concentration of flight tracks on the final approaches. Vectoring will still be used during busier periods for most flights. As the tranquil areas are located at the start of the descent, no change to overflights of tranquil areas is anticipated relative to the baseline.
	Communities	Air Quality	The final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules. Changes in the volume of air traffic, and local transport infrastructure feeding the airport, will be assessed quantitatively at Stage 3.
	Wider Society	Greenhouse Gas Impact	The final approach is fixed and provides the most efficient flight path to the runway. Vectoring of *most* descending aircraft between approximately 8,000ft to 3,000ft will be used to deliver efficient route management that minimises track miles and resulting greenhouse gas emissions. The introduction and use of an RNAV overlay will deliver efficient route management when aircraft are not vectored (during quieter periods of the day / night). While the unavoidable use of the STIRA and TARTN holds during busy periods will increase track miles and associated emissions for some flights, overall, the flexibility provided by vectoring *most* aircraft will deliver a highly efficient operation.
	Wider Society	Capacity / Resilience	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
	General Aviation	Access	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected One flight paths are designed we may give CAS back. VFR traffic pass underneath East.

	General Aviation / Commercial airlines	Economic impact from increased effective capacity	There will be no economic impact on GA With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
	General Aviation / Commercial airlines	Fuel Burn	The final approach is fixed and provides the most efficient flight path to the runway. Vectoring of *most* descending aircraft between approximately 8,000ft to 3,000ft will be used to deliver efficient route management that minimises track miles and resulting fuel burn. The introduction and use of an RNAV overlay will deliver efficient route management when aircraft are not vectored (during quieter periods of the day / night). While the unavoidable use of the STIRA and TARTN holds during busy periods will increase track miles and fuel burn for some flights, overall, the flexibility provided by vectoring *most* aircraft will deliver a highly efficient operation.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

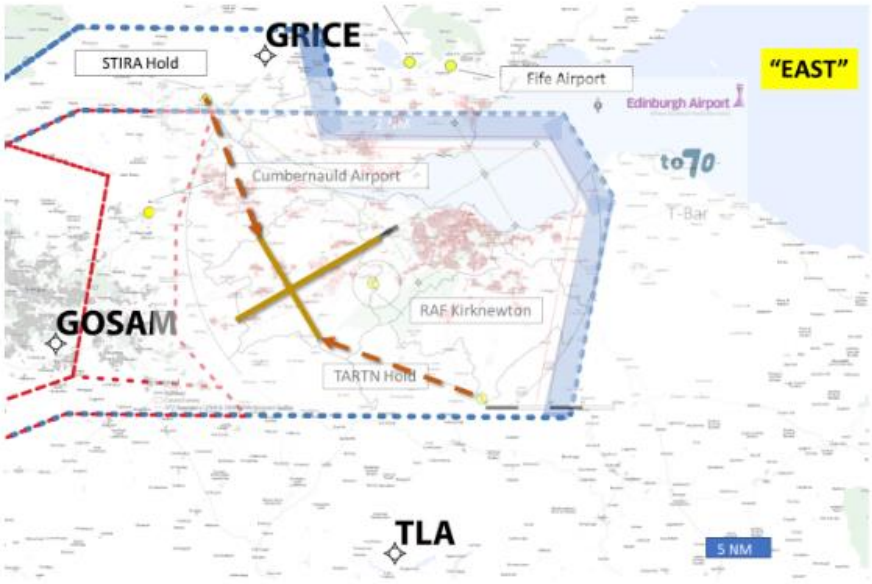
Option	Group	Impact	Qualitative Assessment
06 Vectoring and Approach transitions	Communities	Noise Impact on Health and Quality of Life	

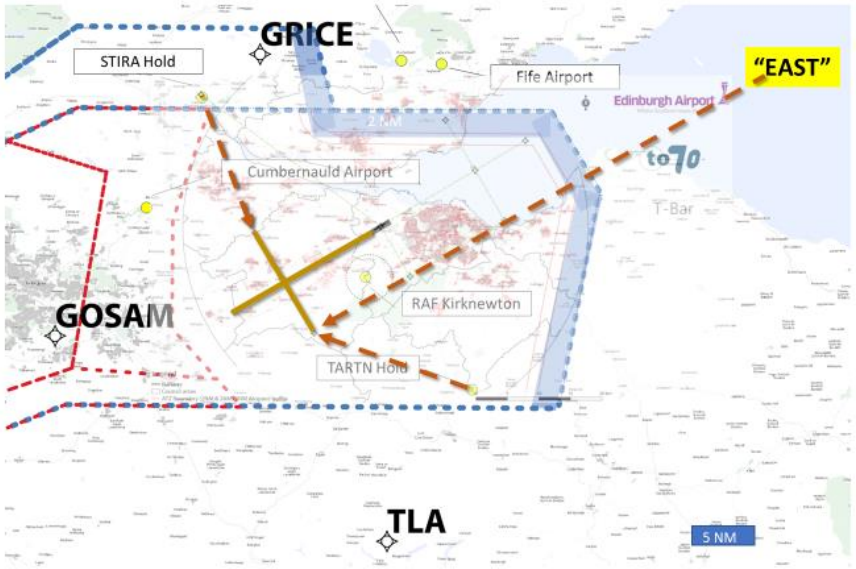
			 Descending aircraft will continue to overfly small to medium communities and population centres in the Scottish Borders, South Lanarkshire, West Lothian, Stirling, Clackmannanshire and Falkirk. All aircraft on the final approach will overfly Livingston at an altitude of less than 3,000 feet and Newbridge at an altitude of less than 1,000 feet. This is unavoidable given the orientation of the 06 runway and aircraft operating rules, which provide no opportunity to minimise impacts to these affected communities. This option provides increased systemisation of the airspace through the introduction and use of approach transitions to the t-bars. These will be used during the majority of the day. This will generate greater track concentration along the defined flightpaths. This will reduce the area and number of people overflown but increase the frequency of overflights to those affected. Vectoring of *some* aircraft will be required during busy periods, providing a small degree of track dispersion that will slightly reduce the frequency of impacts to individual affected receptors, but the dispersal will result in a wider area and larger population being overflown.

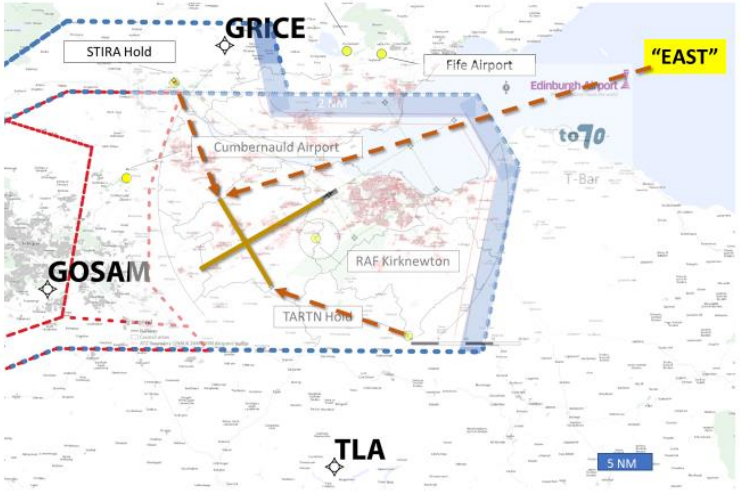
			Tranquillity This option is more systemised than the baseline, with aircraft likely to be more concentrated on particular tracks, though with *some* vectoring. As with the baseline, aircraft from the south will continue to overfly the Pentland Hills at between 7,000ft and 4,000 ft. The approach will increase the frequency of overflights along particular tracks across the tranquil areas but is likely to reduce the extent of tranquil areas overflown. No additional tranquil areas will be affected.
	Communities	Air Quality	The final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules. Changes in the volume of air traffic, and local transport infrastructure feeding the airport, will be assessed quantitatively at Stage 3.
	Wider Society	Greenhouse Gas Impact	The final approach is fixed and provides the most efficient flight path to the runway. Increased systemisation through the introduction and use of approach transitions to the t-bars will deliver relatively efficient route management during most of the day. *Some* vectoring will be used during busy periods to deliver efficient route management that will minimise track miles and resulting greenhouse house emissions. The increased systemisation may increase the use of the STIRA and TARTN hold, which would increase track miles and greenhouse house emissions for some flights. Overall, the systemisation of most flights is likely to deliver a slightly less efficient operation than an approach with more vectoring.
	Wider Society	Capacity / Resilience	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
	General Aviation	Access	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected One flight paths are designed we may give CAS back.

			VFR traffic pass underneath East.
	General Aviation / Commercial airlines	Economic impact from increased effective capacity	There will be no economic impact on GA With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
	General Aviation / Commercial airlines	Fuel Burn	The final approach is fixed and provides the most efficient flight path to the runway. Increased systemisation through the introduction and use of approach transitions to the t-bars will deliver relatively efficient route management during most of the day. *Some* vectoring will be used during busy periods to deliver efficient route management that will minimise track miles and fuel burn. The increased systemisation may increase the use of the STIRA and TARTN hold, which would increase track miles and fuel burn for some flights. Overall, the systemisation of most flights is likely to deliver a slightly less efficient operation than an approach with more vectoring.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.

	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

Option	Group	Impact	Qualitative Assessment
06 Holds approach transition and holds	Communities	Noise Impact on Health and Quality of Life	


GRICE
STIRA Hold
Fife Airport
"EAST"
Edinburgh Airport
2 NM
to 70
Cumbernauld Airport
T-Bar
RAF Kirknewton
GOSAM
TARTN Hold
TLA
5 NM


GRICE
STIRA Hold
Fife Airport
"EAST"
Edinburgh Airport
2 NM
to 70
Cumbernauld Airport
T-Bar
RAF Kirknewton
GOSAM
TARTN Hold
TLA
5 NM

			Descending aircraft will continue to overfly small to medium communities and population centres in the Scottish Borders, South Lanarkshire, West Lothian, Stirling, Clackmannanshire and Falkirk. All aircraft on the final approach will overfly Livingston at an altitude of less than 3,000 feet and Newbridge at an altitude of less than 1,000 feet. This is unavoidable given the orientation of the 06 runway and aircraft operating rules, which provide no opportunity to minimise impacts to these affected communities. This option provides full systemisation of the airspace through the introduction and use of approach transitions to the t-bars for all aircraft. This will generate significantly greater track concentration along the defined flightpaths. This will reduce the area and number of people overflown but increase the frequency of overflights to those affected. Vectoring, which would generate a degree of track dispersal, will only be used in exceptional circumstances. **Tranquillity** This option is fully systemised, with all aircraft concentrated on particular tracks, and with minimal use of vectoring and dispersal. As with the baseline, aircraft from the south will continue to overfly the Pentland Hills at between 7,000ft and 4000 ft. The approach will increase the frequency of overflights along particular tracks across the tranquil areas but is likely to reduce the extent of tranquil areas overflown. No additional tranquil areas will be affected.
	Communities	Air Quality	The final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules. Changes in the volume of air traffic, and local transport infrastructure feeding the airport, will be assessed quantitatively at Stage 3.

	Wider Society	Greenhouse Gas Impact	The final approach is fixed and provides the most efficient flight path to the runway. Full systemisation through the introduction and use of approach transitions to the t-bars will deliver relatively efficient route management during most of the day. Vectoring will only be used by exception. Full systemisation may result in potential capacity constraints during busy periods, which may result in more aircraft being held in the STIRA or TARTN holds, increasing track miles and associated emissions for many flights. Overall, full systemisation is likely to deliver a moderately less efficient operation than an approach including vectoring.
	Wider Society	Capacity / Resilience	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
	General Aviation	Access	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected One flight paths are designed we may give CAS back. VFR traffic pass underneath East.
	General Aviation / Commercial airlines	Economic impact from increased effective capacity	There will be no economic impact on GA With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
	General Aviation / Commercial airlines	Fuel Burn	The final approach is fixed and provides the most efficient flight path to the runway. Full systemisation through the introduction and use of approach transitions to the t-bars will deliver relatively efficient route management during most of the day. Vectoring will only be used by exception. Full systemisation may result in potential capacity constraints during busy periods, which may result in more aircraft being held in the STIRA or TARTN holds, increasing track miles and fuel burn for

			many flights. Overall, full systemisation is likely to deliver a moderately less efficient operation than an approach including vectoring.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

This IOA is the first stage of the appraisal of airspace change options and is primarily a qualitative assessment of the options determined to be compliant with the Design Principles in Stage 2A. Options will progress through two further evaluations in Stage 3 (Full Options Appraisal) and Stage 4 (Final Options Appraisal) where options will be quantitively assessed.