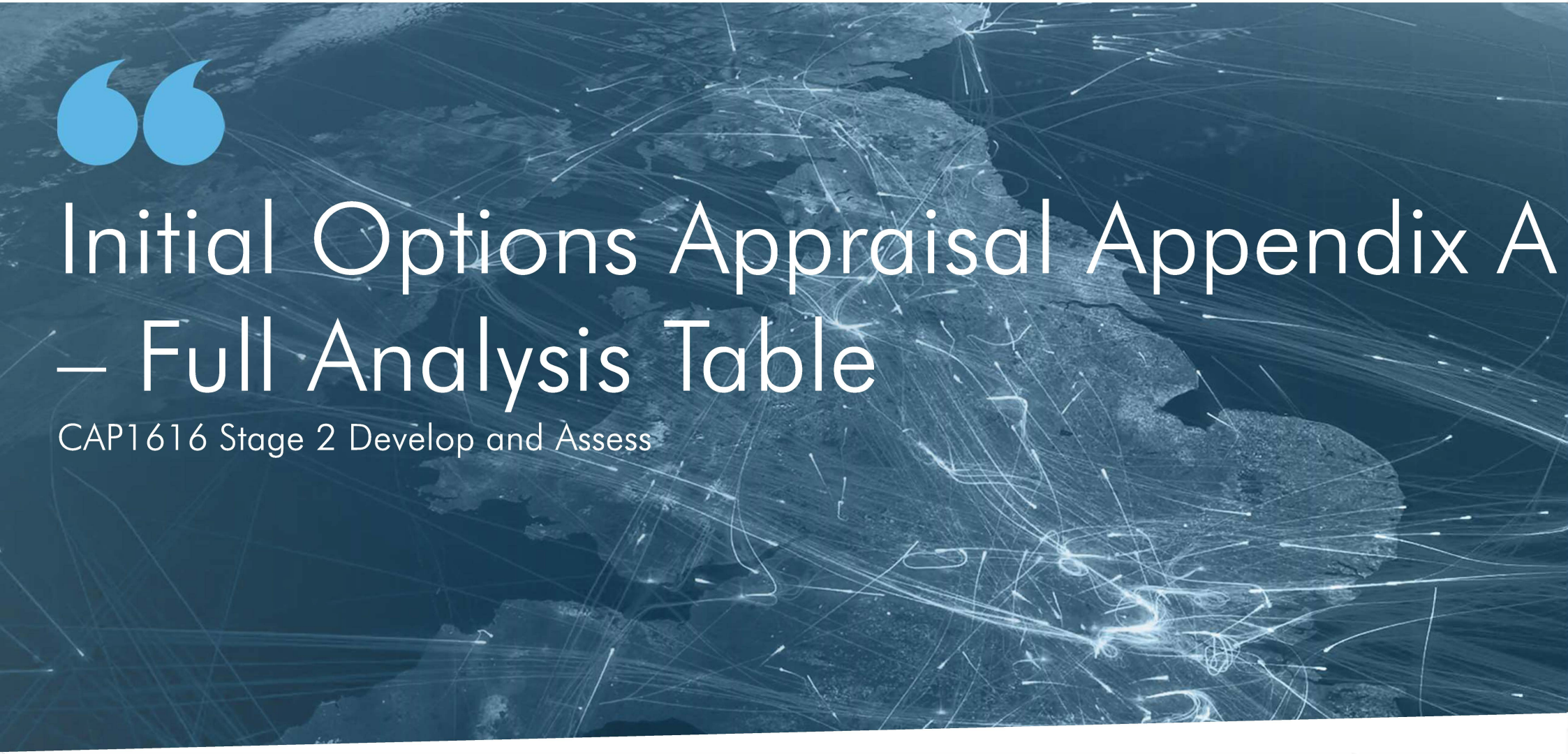

Initial Options Appraisal Appendix A – Full Analysis Table

CAP1616 Stage 2 Develop and Assess

MAG Manchester Airport

Departures

MAG Manchester Airport

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Departure Envelope: SID Runway 05 North

			'DO NOTHING' BASELINE		OPTION 1		OPTION 4	
			For the north design envelope, the 'do nothing' scenario for departures in terms of today's operation is based around the existing conventional POL SID. The 'do nothing' scenario for departures consists of a modal track that has been derived to provide an accurate representation of what occurs today. In addition to the modal track, a polygon has also been created that represents an area where current operations are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this SID was based on the modal track created using Noise and Track Keeping data at altitudes of 4,000ft and 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Departure End of Runway and the end of the modal track.		Option 1 is an RNAV1 replication of the current departure to POL and uses fly-by waypoints to create a replication of the existing conventional POL 4S/1Z departure. As a replicated route it follows a similar track over the ground as the current published departure. The routes combine shortly after departure and fly straight ahead overflying Stockport where they commence a left turn to the north. This takes the routes west of Ashton-under-Lyne and close to Oldham and they terminate at 7,000ft to the east of Rochdale. The design speed will permit a large number of aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise. There would be no speed restrictions applied to the procedure; therefore, the maximum speed of 250 KIAS below FL100 would apply. Due to the track-to-fix coding and simplicity of the route, dispersion is likely to be low even with maximum speeds.		This is an RNAV1 option that has a turn mid-way between options 1 and 3. It has been created in line with the Design Principle Noise N1 by following the course of the M60 motorway which already generates a level of ambient noise. This option has a direct routing to the north following the initial turn, which due to the track-to-fix coding and a fly-by waypoint, would result in repeatable ground tracks and a low level of dispersal. The design speed will permit a large number of aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise. The route has been designed using fly-by waypoints. •05L: After departure this route combines with the option for 05R and flies straight ahead and commences a left turn just to the east of Stockport. It continues north, broadly following the route of the M60 motorway which takes it over Audenshaw reservoir and west of Ashton-under-Lyne. It passes overhead Oldham and terminates at 7,000ft just to the east of Rochdale. •05R: After departure this route combines with the option for 05L and flies straight ahead overflying Heald Green and commences a left turn just to the east of Stockport. It continues north, broadly following the route of the M60 motorway which takes it over Audenshaw reservoir and west of Ashton-under-Lyne. It passes overhead Oldham and terminates at 7,000ft just to the east of Rochdale There would be no speed restrictions applied to the procedure; therefore, the maximum speed of 250 KIAS below FL100 would apply. Due to the track-to-fix coding however, and simplicity of the route, dispersion is likely to be low even with maximum speeds.	
Group	**Impact**	**Level of Analysis**	**Runway 05L**	**Runway 05R**	**Runway 05L**	**Runway 05R**	**Runway 05L**	**Runway 05R**
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing POL SID. In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this 'do nothing' scenario overflies approximately 46,700 people and approximately 22,850 residential buildings. - Up to 7,000ft, this 'do nothing' scenario overflies approximately 192,900 people and approximately 87,550 residential buildings.	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing POL SID. In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this 'do nothing' scenario overflies approximately 51,700 people and approximately 25,350 residential buildings. - Up to 7,000ft, this 'do nothing' scenario overflies approximately 219,800 people and approximately 99,350 residential buildings.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 79,900 people and approximately 40,300 residential buildings. - Up to 7,000ft, this option overflies approximately 206,600 people and approximately 94,600 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 80,700 people and approximately 40,900 residential buildings. - Up to 7,000ft, this option overflies approximately 216,300 people and approximately 99,250 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 55,200 people and approximately 26,650 residential buildings. - Up to 7,000ft, this option overflies approximately 208,100 people and approximately 91,750 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 61,200 people and approximately 29,850 residential buildings. - Up to 7,000ft, this option overflies approximately 218,000 people and approximately 96,500 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 05L POL SID overflies four AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 05R POL SID overflies four AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	Option 1 L overflies five AQMAs; however, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of dis-benefit as it overflies more AQMAs.	Option 1 R overflies five AQMAs; however, as per CAP1616 para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of dis-benefit as it overflies more AQMAs.	Option 4 L overflies five AQMAs; however, as per CAP1616 para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of dis-benefit as it overflies more AQMAs.	Option 4 R overflies five AQMAs; however, as per CAP1616 para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of dis-benefit as it overflies more AQMAs.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing 'do nothing' scenario, the track length is 22.90km (12.37nm).	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing 'do nothing' scenario, the track length is 27.85km (15.04nm).	Option 1 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1 L is 40.10km (21.65nm). When compared to the 'do nothing' scenario, Option 1 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 1 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1 R is 41.81km (22.57nm). When compared to the 'do nothing' scenario, Option 1 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 4 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 4L is 39.31km (21.22nm). When compared to the 'do nothing' scenario, Option 4 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 4 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 4 R is 35.92km (19.39nm). When compared to the 'do nothing' scenario, Option 4 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario does not overfly any AONBs or National Parks.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario does not overfly any AONBs or National Parks.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as equal/neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as equal/neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as equal/neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as equal/neutral.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.

			'DO NOTHING' BASELINE		OPTION 1		OPTION 4	
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing 'do nothing' scenario, the track length is 22.90km (12.37nm).	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing 'do nothing' scenario, the track length is 27.85km (15.04nm).	Option 1 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.10km (21.65nm) long. When compared to the 'do nothing' scenario, Option 1 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 1 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 41.81km (22.57nm) long. When compared to the 'do nothing' scenario, Option 1 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 4 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 39.31km (21.22nm) long. When compared to the 'do nothing' scenario, Option 4 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 4 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 35.92km (19.39nm) long. When compared to the 'do nothing' scenario, Option 4 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the extant procedures.	No change to operational costs is attributable to maintaining the extant procedures.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative	No deployment costs applicable to extant procedures.	No deployment costs applicable to extant procedures.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, it was identified that the options within this envelope may conflict with Leeds Bradford IFPs and potentially with aircraft operating on the L975 Lower ATS route, both of which can be mitigated through the design process. Furthermore, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Again, this can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, it was identified that the options within this envelope may conflict with Leeds Bradford IFPs and potentially with aircraft operating on the L975 Lower ATS route, both of which can be mitigated through the design process. Furthermore, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Again, this can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, it was identified that the options within this envelope may conflict with Leeds Bradford IFPs and potentially with aircraft operating on the L975 Lower ATS route, both of which can be mitigated through the design process. Furthermore, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Again, this can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, it was identified that the options within this envelope may conflict with Leeds Bradford IFPs and potentially with aircraft operating on the L975 Lower ATS route, both of which can be mitigated through the design process. Furthermore, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Again, this can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
		Summary of Analysis	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	When compared to the 'do nothing scenario', Option 1 L performs: - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - worse in terms of Noise impact, Air Quality, Greenhouse gas emissions and Fuel burn. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1 L has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing scenario', Option 1 R performs: - worse in terms of Air Quality, Greenhouse gas emissions and Fuel burn. - better in terms of Noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1 R has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing scenario', Option 4 L performs: - worse in terms of Noise impact, Air Quality, Greenhouse gas emissions and Fuel burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 4 L has been deemed as Favourable, as it overflies the second fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing scenario', Option 4 R performs: - worse in terms of Air Quality, Greenhouse gas emissions and Fuel burn. - better in terms of Noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 4 R has been deemed as Favourable, as it overflies the second fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Departure Envelope: SID Runway 05 East

'DO NOTHING' BASELINE

For the east design envelope, the 'do nothing' scenario for departures in terms of today's operation is based around the existing conventional DESIG SID. The 'do nothing' scenario for departures consists of a modal track that has been derived to provide an accurate representation of what occurs today. In addition to the modal track, a polygon has also been created that represents an area where current operations are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this SID was based on the modal track created using Noise and Track Keeping data at altitudes of 4,000ft and 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Departure End of Runway and the end of the modal track.

Group	Impact	Level of Analysis	Runway 05L	Runway 05R
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing DESIG SID. In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this 'do nothing' scenario overflies approximately 61,000 people and approximately 29,600 residential buildings. - Up to 7,000ft, this do nothing' scenario overflies approximately 104,500 people and approximately 51,500 residential buildings.	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing DESIG SID. In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this do nothing' scenario overflies approximately 59,900 people and approximately 28,750 residential buildings. - Up to 7,000ft, this do nothing' scenario overflies approximately 145,600 people and approximately 71,250 residential buildings.
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 05L DESIG SID overflies three AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 05R DESIG SID overflies three AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing 'do nothing' scenario the track length is 26.66km (14.39nm).	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing 'do nothing' scenario, the track length is 27.19km (14.68nm).
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario does not overfly any AONBs but does overfly one National Park.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario does not overfly any AONBs but does overfly one National Park.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing 'do nothing' scenario the track length is 26.66km (14.39nm).	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing 'do nothing' scenario, the track length is 27.19km (14.68nm).
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the extant procedures.	No change to operational costs is attributable to maintaining the extant procedures.
Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative	No deployment costs applicable to extant procedures.	No deployment costs applicable to extant procedures.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.
		Summary of Analysis	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.

OPTION 1

Option 1 is an RNAV1 replication of the current DESIG 1S/1Z SID and uses fly-over waypoints.
As a replicated route it follows a similar track over the ground as the current published route. After departure this takes it straight ahead on a runway heading in a straight line to 7,000ft. This takes it overhead Stockport and Hyde, and to the north of Glossop and it terminates south-west of Holmfirth.
There would be no speed restrictions applied to the procedure; therefore, the maximum speed of 250 KIAS below FL100 would apply. This design speed will permit many aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
Due to the track-to-fix coding and simplicity of the route, dispersion is likely to be low even with maximum speeds.

Group	Impact	Runway 05L	Runway 05R
Communities	Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 58,200 people and approximately 27,950 residential buildings. - Up to 7,000ft, this option overflies approximately 58,600 people and approximately 28,150 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 65,000 people and approximately 31,800 residential buildings. - Up to 7,000ft, this option overflies approximately 65,700 people and approximately 32,100 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Communities	Air Quality	Option 1 L overflies three AQMAs; however, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.	Option 1 R overflies three AQMAs; however, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.
Wider Society	Greenhouse Gas impact	Option 1 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1 L is 42.58km (22.99nm). When compared to the 'do nothing' scenario, Option 1 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 1 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1 R is 44.29km (23.91nm). When compared to the 'do nothing' scenario, Option 1 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Option 1 L overflies no AONBs and one National Park. When compared to the 'do nothing' scenario, Option 1 L is considered to be equal/neutral as it overflies the same number of Tranquillity receptors.	Option 1 R overflies no AONBs and one National Park. When compared to the 'do nothing' scenario, Option 1 R is considered to be equal/neutral as it overflies the same number of Tranquillity receptors.
Wider Society	Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Option 1 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 42.58km (22.99nm) long. When compared to the 'do nothing' scenario, Option 1 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 1 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 44.29km (23.91nm) long. When compared to the 'do nothing' scenario, Option 1 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, it was identified that the options within this envelope may conflict with on the L975 Lower ATS route and there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Both of which can be mitigated through the design process or procedurally if required. Furthermore, there is the potential for aircraft to 'drop out' of CAS. The mitigation is to design the procedure to remain within CAS. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, it was identified that the options within this envelope may conflict with on the L975 Lower ATS route and there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Both of which can be mitigated through the design process or procedurally if required. Furthermore, there is the potential for aircraft to 'drop out' of CAS. The mitigation is to design the procedure to remain within CAS. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
	Summary of Analysis	When compared to the 'do nothing' scenario, Option 1 L performs: - worse in terms of Greenhouse gas emissions and Fuel burn. - better in terms of noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1 L has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 1 R performs: - worse in terms of Greenhouse gas emissions and Fuel burn. - better in terms of noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1 R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.

OPTION 4

This is an RNAV1 option to provide an initial route identical to the existing DESIG SID, but with an earlier turn towards the network joining point to the east. This has been done to align with current operational practice and routes it to the southern edge of route L975 in line with the NATS network traffic flow.
The design speed will permit many aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
The route has been designed using fly-by waypoints.
05L: After departure this route combines with the option for 05R and flies straight ahead overflying Stockport and the southern edge of Hyde. It routes to the north-west of Glossop at which point it makes a right turn to route north of Glossop and terminates at 7,000ft just to the north and east of the Woodhead reservoir.
05R: After departure this route combines with the option for 05L and flies straight ahead overflying Stockport and the southern edge of Hyde. It routes to the north-west of Glossop at which point it makes a right turn to route north of Glossop and terminates at 7,000ft just to the north and east of the Woodhead reservoir.
There would be no speed restrictions applied to the procedure; therefore, the maximum speed of 250 KIAS below FL100 would apply.

Group	Impact	Runway 05L	Runway 05R
Communities	Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 58,200 people and approximately 27,950 residential buildings. - Up to 7,000ft, this option overflies approximately 58,200 people and approximately 28,000 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 65,000 people and approximately 31,800 residential buildings. - Up to 7,000ft, this option overflies approximately 65,400 people and approximately 31,900 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Communities	Air Quality	Option 4 L overflies three AQMAs; however, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.	Option 4 R overflies three AQMAs; however, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.
Wider Society	Greenhouse Gas impact	Option 4 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 4 L is 39.61km (21.39nm). When compared to the 'do nothing' scenario, Option 4 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 4 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 4 R is 41.32km (22.31nm). When compared to the 'do nothing' scenario, Option 4 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Option 4 L overflies no AONBs and one National Park. When compared to the 'do nothing' scenario, Option 4 L is considered to be equal/neutral as it overflies the same number of Tranquillity receptors.	Option 4 R overflies no AONBs and one National Park. When compared to the 'do nothing' scenario, Option 4 R is considered to be equal/neutral as it overflies the same number of Tranquillity receptors.
Wider Society	Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Option 4 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 39.61km (21.39nm) long. When compared to the 'do nothing' scenario, Option 4 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 4 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 41.32km (22.31nm) long. When compared to the 'do nothing' scenario, Option 4 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, it was identified that the options within this envelope may conflict with on the L975 Lower ATS route and there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Both of which can be mitigated through the design process or procedurally if required. Furthermore, there is the potential for aircraft to 'drop out' of CAS. The mitigation is to design the procedure to remain within CAS. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, it was identified that the options within this envelope may conflict with on the L975 Lower ATS route and there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Both of which can be mitigated through the design process or procedurally if required. Furthermore, there is the potential for aircraft to 'drop out' of CAS. The mitigation is to design the procedure to remain within CAS. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
	Summary of Analysis	When compared to the 'do nothing' scenario, Option 4 L performs: - worse in terms of Greenhouse gas emissions and Fuel burn. - better in terms of noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 4 L has been deemed as Acceptable, as it overflies the third fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 4 R performs: - worse in terms of Greenhouse gas emissions and Fuel burn. - better in terms of noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 4 R has been deemed as Acceptable, as it overflies the third fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.

OPTION 5

This is an RNAV1 option which provides an initial 15° track adjustment from the runway heading before correcting back to the runway heading (parallel to the existing SID) before turning east north-east of Glossop and Hadfield. This track adjustment is intended to reduce the impact of noise for communities on the extended runway centreline that are also impacted by Runway 23 arrivals.
This 15° initial track adjustment from the extended centreline is to a width of 2.25nm parallel to the centreline. It extends to 9nm from the DER on Runway 05L and 8.5nm for Runway 05R.
The design speed will permit a large number of aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise, and the option has been designed using track to fix coding.
05L: After passing the DER this route has a 15° track adjustment to the right which routes it south of Stockport. This track continues until just to the south-west of Glossop where it combines with the option for 05R returns to a runway heading. After overflying Glossop it makes a right turn to the east and terminates at 7,000ft just east of the Woodhead reservoir.
05R: After passing the DER this route has a 15° track adjustment to the right which routes it south of Stockport. This track continues until just to the south-west of Glossop where it combines with the option for 05L and returns to a runway heading. After overflying Glossop it makes a right turn to the east and terminates at 7,000ft just east of the Woodhead reservoir.
There would be no speed restrictions applied to the procedure; therefore, the maximum speed of 250 KIAS below FL100 would apply. Due to the track-to-fix coding and simplicity of the route, dispersion is likely to be low even with maximum speeds.

Group	Impact	Runway 05L	Runway 05R
Communities	Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 34,900 people and approximately 16,200 residential buildings. - Up to 7,000ft, this option overflies approximately 49,500 people and approximately 22,950 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 37,700 people and approximately 16,750 residential buildings. - Up to 7,000ft, this option overflies approximately 55,600 people and approximately 24,850 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Communities	Air Quality	Option 5 L overflies one AQMA; however, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies less AQMAs.	Option 5 R overflies one AQMA; however, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies less AQMAs.
Wider Society	Greenhouse Gas impact	Option 5 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 5 L is 38.38km (20.72nm). When compared to the 'do nothing' scenario, Option 5 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 5 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 5 R is 40.07km (21.63nm). When compared to the 'do nothing' scenario, Option 5 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Option 5 L overflies no AONBs and one National Park. When compared to the 'do nothing' scenario, Option 5 L is considered to be equal/neutral as it overflies the same number of Tranquillity receptors.	Option 5 R overflies no AONBs and one National Park. When compared to the 'do nothing' scenario, Option 5 R is considered to be equal/neutral as it overflies the same number of Tranquillity receptors.
Wider Society	Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Option 5 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 38.38km (20.72nm) long. When compared to the 'do nothing' scenario, Option 5 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 5 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.07km (21.63nm) long. When compared to the 'do nothing' scenario, Option 5 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, it was identified that the options within this envelope may conflict with on the L975 Lower ATS route and there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Both of which can be mitigated through the design process or procedurally if required. Furthermore, there is the potential for aircraft to 'drop out' of CAS. The mitigation is to design the procedure to remain within CAS. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, it was identified that the options within this envelope may conflict with on the L975 Lower ATS route and there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Both of which can be mitigated through the design process or procedurally if required. Furthermore, there is the potential for aircraft to 'drop out' of CAS. The mitigation is to design the procedure to remain within CAS. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
	Summary of Analysis	When compared to the 'do nothing' scenario, Option 5 L performs: - worse in terms of Greenhouse gas emissions and Fuel burn. - better in terms of air quality, noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 5 L has been deemed as Favourable, as it overflies the second fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 5 R performs: - worse in terms of Greenhouse gas emissions and Fuel burn. - better in terms of air quality, noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 5 R has been deemed as Favourable, as it overflies the second fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.

OPTION 6

This is an RNAV1 option to provide an initial route identical to the existing DESIG SID, but with an earlier turn towards the network joining point to the east. This has been done to align with current operational practice and routes it to the southern edge of route L975 in line with the NATS network traffic flow.
This option has a similar profile to option 4 but the right turn takes place approximately 2.5nm earlier.
The design speed will permit many aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
The route has been designed using fly-by waypoints.
05L: After departure, this route combines with the option for 05R and flies straight ahead overflying Stockport and the southern edge of Hyde. It routes to the west of Glossop at which point it makes a right turn to the east to the north of Glossop and terminates at 7,000ft overhead the Woodhead reservoir.
05R: After departure, this route combines with the option for 05L and flies straight ahead overflying Stockport and the southern edge of Hyde. It routes to the west of Glossop at which point it makes a right turn to the east to the north of Glossop and terminates at 7,000ft overhead the Woodhead reservoir.
There would be no speed restrictions applied to the procedure; therefore, the maximum speed of 250 KIAS below FL100 would apply.

Group	Impact	Runway 05L	Runway 05R
Communities	Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 58,200 people and approximately 28,000 residential buildings. - Up to 7,000ft, this option overflies approximately 60,900 people and approximately 29,500 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 65,000 people and approximately 31,750 residential buildings. - Up to 7,000ft, this option overflies approximately 68,000 people and approximately 33,550 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Communities	Air Quality	Option 6 L overflies three AQMAs; however, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.	Option 6 R overflies three AQMAs; however, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.
Wider Society	Greenhouse Gas impact	Option 6 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 6 L is 38.84km (20.97nm). When compared to the 'do nothing' scenario, Option 6 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 6 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 6 R is 40.54km (21.89nm). When compared to the 'do nothing' scenario, Option 6 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Option 6 L overflies no AONBs and one National Park. When compared to the 'do nothing' scenario, Option 6 L is considered to be equal/neutral as it overflies the same number of Tranquillity receptors.	Option 6 R overflies no AONBs and one National Park. When compared to the 'do nothing' scenario, Option 6 R is considered to be equal/neutral as it overflies the same number of Tranquillity receptors.
Wider Society	Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Option 6 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 38.84km (20.97nm) long. When compared to the 'do nothing' scenario, Option 6 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 6 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.54km (21.89nm) long. When compared to the 'do nothing' scenario, Option 6 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, it was identified that the options within this envelope may conflict with on the L975 Lower ATS route and there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Both of which can be mitigated through the design process or procedurally if required. Furthermore, there is the potential for aircraft to 'drop out' of CAS. The mitigation is to design the procedure to remain within CAS. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, it was identified that the options within this envelope may conflict with on the L975 Lower ATS route and there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Both of which can be mitigated through the design process or procedurally if required. Furthermore, there is the potential for aircraft to 'drop out' of CAS. The mitigation is to design the procedure to remain within CAS. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
	Summary of Analysis	When compared to the 'do nothing' scenario, Option 6 L performs: - worse in terms of Greenhouse gas emissions and Fuel burn. - better in terms of noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 6 L has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 6 R performs: - worse in terms of Greenhouse gas emissions and Fuel burn. - better in terms of noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 6 R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.

OPTION 7

This is an RNAV1 option that seeks to provide the shortest (most fuel efficient) route to the network joining point by using the earliest turn to the east, taking account of the constraints created by the base of controlled airspace.
It has a similar profile to options 4 and 6 except aircraft make the first right turn just north of Stockport to route to the network joining point. The position of this first turn is dictated by the dimensions of the controlled airspace to the east of Glossop which do not permit a turn and a direct route from an earlier point.
The design speed will permit many aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
The route has been designed using fly-by waypoints.
05L: After departure, this route combines with the option for 05R and flies straight ahead overflying Stockport. Upon reaching Bredbury the route turns right to route south of Hyde and routes direct to the east to terminates at 7,000ft to the east of the Woodhead reservoir.
05R: After departure, this route combines with the option for 05L and flies straight ahead overflying Stockport. Upon reaching Bredbury the route turns right to route south of Hyde and routes direct to the east to terminates at 7,000ft to the east of the Woodhead reservoir.
There would be no speed restrictions applied to the procedure; therefore, the maximum speed of 250 KIAS below FL100 would apply.

Group	Impact	Runway 05L	Runway 05R
Communities	Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 51,300 people and approximately 26,650 residential buildings. - Up to 7,000ft, this option overflies approximately 63,900 people and approximately 32,850 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 57,400 people and approximately 29,700 residential buildings. - Up to 7,000ft, this option overflies approximately 71,000 people and approximately 36,450 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Communities	Air Quality	Option 7 L overflies three AQMAs; however, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.	Option 7 R overflies three AQMAs; however, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.
Wider Society	Greenhouse Gas impact	Option 7 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 7 L is 38.80km (20.95nm). When compared to the 'do nothing' scenario, Option 7 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 7 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 7 R is 40.51km (21.87nm). When compared to the 'do nothing' scenario, Option 7 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Option 7 L overflies no AONBs and one National Park. When compared to the 'do nothing' scenario, Option 7 L is considered to be equal/neutral as it overflies the same number of Tranquillity receptors.	Option 7 R overflies no AONBs and one National Park. When compared to the 'do nothing' scenario, Option 7 R is considered to be equal/neutral as it overflies the same number of Tranquillity receptors.
Wider Society	Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Option 7 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 38.80km (20.95nm) long. When compared to the 'do nothing' scenario, Option 7 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 7 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.51km (21.87nm) long. When compared to the 'do nothing' scenario, Option 7 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, it was identified that the options within this envelope may conflict with on the L975 Lower ATS route and there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Both of which can be mitigated through the design process or procedurally if required. Furthermore, there is the potential for aircraft to 'drop out' of CAS. The mitigation is to design the procedure to remain within CAS. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, it was identified that the options within this envelope may conflict with on the L975 Lower ATS route and there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Both of which can be mitigated through the design process or procedurally if required. Furthermore, there is the potential for aircraft to 'drop out' of CAS. The mitigation is to design the procedure to remain within CAS. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
	Summary of Analysis	When compared to the 'do nothing' scenario, Option 7 L performs: - worse in terms of Greenhouse gas emissions and Fuel burn. - better in terms of noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 7 L has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 7 R performs: - worse in terms of Greenhouse gas emissions and Fuel burn. - better in terms of noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 7 R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.

OPTION 8

This is an RNAV1 option created to provide a 45° track divergence from northbound departures and enable a one-minute departure separation to align with the Design Principle Capacity. This one-minute separation between north and eastbound departures is not possible on other options within this design envelope all of which will all require two minutes separation.
In line with CAP493 Manual of Air Traffic Services Pt1, the minimum departure separation can be reduced to one minute provided that the aircraft fly on tracks diverging by 45° or more immediately after take-off.
This right turn also has a benefit in reducing the impact of noise for communities on the extended runway centreline that are impacted by Runway 23 arrivals and Runway 05 north departures. The design speed aligns to the CAP778 recommendation and may permit some aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
This option has a right turn no earlier than 1nm from DER, which is in accordance with CAP778.
The route has been designed as an RNAV1 route using fly-over and fly-by waypoints.
05L: After departure, this route makes a 45° turn to the right at 1nm from the DER and combines with the option for 05R. This routes it overhead Hazel Grove after which it makes a second turn to the left to route in a north-easterly direction. It overflies Glossop before making a final right turn to the east and terminates at 7,000ft to the Woodhead reservoir.
05R After departure this route makes a 45° turn to the right at approximately 2.1nm from the DER and combines with the option for 05L. This routes it overhead Hazel Grove after which it makes a second turn to the left to route in a north-easterly direction. It overflies Glossop before making a final right turn to the east and terminates at 7,000ft to the Woodhead reservoir.
A speed restriction of 210 KIAS is applied to the first turn which is the CAP778 recommended speed.

Group	Impact	Runway 05L	Runway 05R
Communities	Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 21,000 people and approximately 9,300 residential buildings. - Up to 7,000ft, this option overflies approximately 39.300 people and approximately 18,050 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 25,900 people and approximately 11,500 residential buildings. - Up to 7,000ft, this option overflies approximately 44,100 people and approximately 20,300 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Communities	Air Quality	Option 8 L overflies two AQMAs; however, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies less AQMAs.	Option 8 R overflies two AQMAs; however, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies less AQMAs.
Wider Society	Greenhouse Gas impact	Option 8 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 8 L is 40.65km (21.95nm). When compared to the 'do nothing' scenario, Option 8 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 8 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 8 R is 42.22km (22.80nm). When compared to the 'do nothing' scenario, Option 8 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Option 8 L overflies no AONBs and one National Park. When compared to the 'do nothing' scenario, Option 8 L is considered to be equal/neutral as it overflies the same number of Tranquillity receptors.	Option 8 R overflies no AONBs and one National Park. When compared to the 'do nothing' scenario, Option 8 R is considered to be equal/neutral as it overflies the same number of Tranquillity receptors.
Wider Society	Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Option 8 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.65km (21.95nm) long. When compared to the 'do nothing' scenario, Option 8 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 8 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 42.22km (22.80nm) long. When compared to the 'do nothing' scenario, Option 8 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, it was identified that the options within this envelope may conflict with on the L975 Lower ATS route and there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Both of which can be mitigated through the design process or procedurally if required. Furthermore, there is the potential for aircraft to 'drop out' of CAS. The mitigation is to design the procedure to remain within CAS. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, it was identified that the options within this envelope may conflict with on the L975 Lower ATS route and there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Both of which can be mitigated through the design process or procedurally if required. Furthermore, there is the potential for aircraft to 'drop out' of CAS. The mitigation is to design the procedure to remain within CAS. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
	Summary of Analysis	When compared to the 'do nothing' scenario, Option 8 L performs: - worse in terms of Greenhouse gas emissions and Fuel burn. - better in terms of Air Quality, Noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 8 L has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope	When compared to the 'do nothing' scenario, Option 8 R performs: - worse in terms of Greenhouse gas emissions and Fuel burn. - better in terms of Air Quality, Noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 8 R has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Departure Envelope: SID Runway 05 West

'DO NOTHING' BASELINE	OPTION 1	OPTION 4B	OPTION 6A	OPTION 7
For the west design envelope, the 'do nothing' scenario for departures in terms of today's operation is based around the existing conventional ASMIM SID. The 'do nothing' scenario for departures consists of a modal track that has been derived to provide an accurate representation of what occurs today. In addition to the modal track, a polygon has also been created that represents an area where current operations are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this SID was based on the modal track created using Noise and Track Keeping data at altitudes of 4,000ft and 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Departure End of Runway and the end of the modal track.	This option is included to provide a RNAV1 replication of the existing conventional ASMIM 1S/1Z SID. It uses a fly-over waypoint with Course-to-Fix (CF) path terminator coding and an element of dispersion would be apparent in the turn due to this coding As a replicated route it follows a similar track over the ground as the current route. After departure this involves a right turn to pass overhead Cheadle at which point the routes combine. They then pass just to the west of Didsbury and overfly Stretford and Urmston. The routes make a left turn just north of Irlam and route west to terminate at 7,000ft to the north of Warrington at Earlestown. A speed restriction of 185 KIAS is used for the first turn to replicate the existing 298° course to XOBRO, although this can be increased if it proves flyability issues. A higher speed would result in greater track dispersal in the first turn. This flyability will be conducted as part of the procedure validation process within Stage 4 of CAP1616.	This is an RNP1 that uses RF coding to provide a single initial turn to create a fuel-efficient route to the network joining point to the west. It differs from option 4A in that the turn is at the earliest PANS-OPS compliant position from 05L to create the shortest route possible at this design speed. Because of the turn positions used, the routes are separate for their duration and do not combine until the 7,000ft which creates a small element of dispersal. 05L: After departure this route turns left at the earliest PANS-OPS compliant position (1nm from DER). This is a single left turn that takes it overhead Cheadle and West Didsbury before completing the left turn heading in a westerly direction to the south of Chorlton. It continues west to route just north of Sale and terminates at 7,000ft north of Warrington where the two routes combine. 05R: After departure this route turns left at a point that is perpendicular with the turn point for the 05L option. This is a single left turn that takes it overhead Cheadle and West Didsbury before completing the left turn heading in a westerly direction to the south of Chorlton. It continues west to route just north of Sale and terminates at 7,000ft north of Warrington where the two routes combine. A speed restriction of 190 KIAS is used for the first turn which allows the smallest radius. Although PANS-OPS compliant it should be assessed for flyability as part of the procedure validation process within Stage 4 of CAP1616. Option 4B for Runway 05L was rejected at the DPE stage and has therefore not been assessed.	This is an RNP1 that uses RF coding to provide a single initial turn based on the position of the current turn to create a fuel-efficient route to the network joining point to the west. It is similar to option 5A but is designed with a higher speed of 220kts speed intended to allow aircraft to use the route in a more aerodynamic configuration. The greater speed results in a wider track, which may aid vertical separation from MAN arriving traffic from the north. It will also permit a larger number of aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise. 05L: After departure this route makes a single left turn just after Cheadle which takes it east of Burnage and overhead Fallowfield. The left turn is completed heading in a westerly direction overhead Old Trafford where the routes combine and continue west to route north of Stretford, Urmston and Irlam. It terminates at 7,000ft north of Warrington to the east of Earlestown. 05R: After departure this route makes a single left turn just after Cheadle which takes it east of Burnage and overhead Rusholme. The left turn is completed heading in a westerly direction overhead Old Trafford where the routes combine and continue west to route north of Stretford, Urmston and Irlam. It terminates at 7,000ft north of Warrington to the east of Earlestown. A speed restriction of 220 KIAS is used for the first turn which allows most aircraft to fly in a clean configuration.	This is an RNP1 option that uses RF coding to provide a similar route to that of option 4B, but it uses an initial 15° track adjustment to the left from the DER for Runway 05L, and a 5° adjustment for Runway 05R. This is to provide noise relief for the Cheadle area, which lies underneath the approach path for Runways 23L/23R arrivals. After this track adjustment it has a single initial turn at the earliest PANS-OPS compliant position to create a fuel-efficient route to the network joining point to the west. 05L: After passing the DER aircraft make a 15° track adjustment to the left (north) and then turn left at the earliest PANS-OPS compliant position (1nm from DER). This is a single left turn that takes it to the west side of Cheadle and then overhead West Didsbury before completing the left turn heading in a westerly direction to the south of Chorlton where the two routes combine. It continues west to route just north of Sale and terminates at 7,000ft north-west of Warrington. 05R: After passing the DER aircraft make a 5° track adjustment to the left (north) and then turn left at a point that is abeam the turn point for 05L. This is a single left turn that takes it to the west side of Cheadle and then overhead Didsbury before completing the left turn heading in a westerly direction to the south of Chorlton where the two routes combine. It continues west to route just north of Sale and terminates at 7,000ft north-west of Warrington. A speed restriction of 190 KIAS is used for the first turn which allows the smallest radius. Although PANS-OPS compliant it should be assessed for flyability as part of the procedure validation process within Stage 4 of CAP1616.

Group	Impact	Level of Analysis	'Do nothing' Runway 05L	'Do nothing' Runway 05R	Option 1 Runway 05L	Option 1 Runway 05R
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing ASMIM SID. In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this baseline overflies approximately 72,000 people and approximately 33,900 residential buildings. - Up to 7,000ft, this 'do nothing' scenario overflies approximately 241,200 people and approximately 108,900 residential buildings.	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing ASMIM SID. In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this baseline overflies approximately 63,000 people and approximately 30,150 residential buildings. - Up to 7,000ft, this 'do nothing' scenario overflies approximately 316,500 people and approximately 142,250 residential buildings.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 57,300 people and approximately 26,400 residential buildings. - Up to 7,000ft, this option overflies approximately 86,100 people and approximately 39,800 residential buildings. Assessed up to 7,000ft,+F8:M8 this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 63,000 people and approximately 29,050 residential buildings. - Up to 7,000ft, this option overflies approximately 93,300 people and approximately 43,150 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 05L ASMIM SID overflies five AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 05R ASMIM SID overflies five AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	Option 1 L overflies eight AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of dis-benefit as it overflies more AQMAs.	Option 1 R overflies eight AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of dis-benefit as it overflies more AQMAs.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring, although aircraft do all follow the extant procedures in a broader sense. The existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative emissions analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 05L ASMIM SID modal track, the track length is 25.40km (13.72nm).	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring, although aircraft do all follow the extant procedures in a broader sense. The existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 05R ASMIM SID modal track, the track length is 27.19km (14.68nm).	Option 1 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1 L is 39.23km (21.18nm). When compared to the 'do nothing' scenario, Option 1 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 1 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1 R is 41.37km (22.34nm). When compared to the 'do nothing' scenario, Option 1 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario does not overfly any AONBs or National Parks.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario does not overfly any AONBs or National Parks.	Option 1 L overflies no AONBs and no National Parks. When compared to the 'do nothing' scenario, Option 1 L is considered to be equally beneficial as it overflies no Tranquillity receptors.	Option 1 R overflies no AONBs and National Parks. When compared to the 'do nothing' scenario, Option 1 R is considered to be equally beneficial as it overflies no Tranquillity receptors.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 05L ASMIM SID modal track, the track length is 25.40km (13.72nm).	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. n the case of the existing Runway 05R ASMIM SID modal track, the track length is 27.19km (14.68nm).	Option 1 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 39.23km (21.18nm) long. When compared to the 'do nothing' scenario, Option 1 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 1 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 41.37km (22.34nm) long. When compared to the 'do nothing' scenario, Option 1 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.

Group	Impact	Option 4B Runway 05L NOT ASSESSED	Option 4B Runway 05R	Option 6A Runway 05L	Option 6A Runway 05R	Option 7 Runway 05L	Option 7 Runway 05R
Communities	Noise impact on health and quality of life		In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 67,800 people and approximately 31,550 residential buildings. - Up to 7,000ft, this option overflies approximately 140,200 people and approximately 64,750 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 121,100 people and approximately 57,850 residential buildings. - Up to 7,000ft, this option overflies approximately 168,800 people and approximately 78,700 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 130,100 people and approximately 62,500 residential buildings. - Up to 7,000ft, this option overflies approximately 187,000 people and approximately 87,400 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 52,900 people and approximately 24,700 residential buildings. - Up to 7,000ft, this option overflies approximately 121,800 people and approximately 56,150 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 60,600 people and approximately 28,700 residential buildings. - Up to 7,000ft, this option overflies approximately 138,500 people and approximately 64,450 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Communities	Air Quality		Option 4B R overflies six AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of dis-benefit as it overflies more AQMAs.	Option 6A L overflies five AQMA(s); however, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.	Option 6A R overflies five AQMA(s); h however, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.	Option 7 L overflies six AQMA(s); h however, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of dis-benefit as it overflies more AQMAs.	Option 7 R overflies six AQMA(s); h however, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of dis-benefit as it overflies more AQMAs.
Wider Society	Greenhouse Gas impact		Option 4B R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 4B R is 40.34km (21.78nm). When compared to the 'do nothing' scenario, Option 4B R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 6A L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 6A L is 42.63km (23.02nm). When compared to the do nothing' scenario, Option 6A L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 6A R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 6A R is 44.87km (24.23nm). When compared to the do nothing' scenario, Option 6A R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 7 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 7 L is 36.37km (19.64nm). When compared to the do nothing' scenario, Option 7 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 7 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 7 R is 39.57km (21.36nm). When compared to the do nothing' scenario, Option 7 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience		The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity		Option 4B R overflies no AONBs and National Parks. When compared to the 'do nothing' scenario, Option 1 R is considered to be equally beneficial as it overflies no Tranquillity receptors.	Option 6A L overflies no AONBs and no National Parks. When compared to the 'do nothing' scenario, Option 1 L is considered to be equally beneficial as it overflies no Tranquillity receptors.	Option 6A R overflies no AONBs and no National Parks. When compared to the 'do nothing' scenario, Option 1 R is considered to be equally beneficial as it overflies no Tranquillity receptors.	Option 7 L overflies no AONBs and no National Parks. When compared to the 'do nothing' scenario, Option 1 L is considered to be equally beneficial as it overflies no Tranquillity receptors.	Option 7 R overflies no AONBs and no National Parks. When compared to the 'do nothing' scenario, Option 1 R is considered to be equally beneficial as it overflies no Tranquillity receptors.
Wider Society	Biodiversity		The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access		No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity		The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn		Option 4B R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.34km (21.78nm) long. When compared to the 'do nothing' scenario, Option 4B R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 6A L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 42.63km (23.02nm) long. When compared to the 'do nothing' scenario, Option 6A L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 6A R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 44.87km (24.23nm) long. When compared to the 'do nothing' scenario, Option 6A R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 7 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 36.37km (19.64nm) long. When compared to the 'do nothing' scenario, Option 7 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 7 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 39.57km (21.36nm) long. When compared to the 'do nothing' scenario, Option 7 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs		It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs		Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.

Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.		There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the extant procedures.	No change to operational costs is attributable to maintaining the extant procedures.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative	No deployment costs applicable to extant procedures.	No deployment costs applicable to extant procedures.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process will reduce the need for ATC intervention in the future. Additionally, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation, which can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process will reduce the need for ATC intervention in the future. Additionally, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation, which can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.		Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process will reduce the need for ATC intervention in the future. Additionally, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation, which can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process will reduce the need for ATC intervention in the future. Additionally, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation, which can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process will reduce the need for ATC intervention in the future. Additionally, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation, which can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process will reduce the need for ATC intervention in the future. Additionally, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation, which can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process will reduce the need for ATC intervention in the future. Additionally, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation, which can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
		Summary of Analysis	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	When compared to the 'do nothing' scenario, Option 1 L performs: - worse in terms of Air Quality, Greenhouse gas emissions and Fuel burn. - better in terms of Noise impact. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1 L has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 1 R performs: - worse in terms of Air Quality, Greenhouse gas emissions and Fuel burn. - better in terms of Noise impact. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1 R has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.		When compared to the 'do nothing' scenario, Option 4B R performs: - worse in terms of Air Quality, Greenhouse gas emissions and Fuel burn. - better in terms of Noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 4B L has been deemed as Acceptable, as it overflies the third fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 6A L performs: - worse in terms of Air Quality, Greenhouse gas emissions and Fuel burn. - better in terms of Noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 6A L has been deemed as Acceptable, as it overflies the third fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 6A R performs: - worse in terms of Air Quality, Greenhouse gas emissions and Fuel burn. - better in terms of Noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 6A R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 7 L performs: - worse in terms of Air Quality, Greenhouse gas emissions and Fuel burn. - better in terms of Noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 7 L has been deemed as Favourable, as it overflies the second fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 7 R performs: - worse in terms of Air Quality, Greenhouse gas emissions and Fuel burn. - better in terms of Noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 7 R has been deemed as Favourable, as it overflies the second fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Departure Envelope: SID Runway 05 South

'DO NOTHING' BASELINE

For the south design envelope, the 'do nothing' scenario for departures in terms of today's operation is based around the existing conventional LISTO SID. The 'do nothing' scenario for departures consists of a modal track that has been derived to provide an accurate representation of what occurs today. In addition to the modal track, a polygon has also been created that represents an area where current operations are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this SID was based on the modal track created using Noise and Track Keeping data at altitudes of 4,000ft and 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Departure End of Runway and the end of the modal track.

SOUTH RIGHT TURN OPTIONS

OPTION 1

Option 1 is included to provide an RNAV1 replication of the existing conventional LISTO 2S/2Z SID. As a replicated route it follows a similar track over the ground as the current route to connect to the NATS network.
The fly-over waypoints for the right turn to the south are positioned at the position of the existing markers. For Runway 05L this is at the MCT D1.2 point which less than 1nm from DER but as this replicates the turn of the current procedure it aligns to the Design Principle Safety.
After departure the routes turn right to pass overhead Cheadle Hulme at which point they combine. They then pass just to the west of Woodford and Macclesfield and overfly Congleton and terminate at 7,000ft just west of Biddulph.
An element of dispersion will be present in the right turn to the south due to the fly-over coding and the variables that affect this. This is seen currently with the conventional procedure.
A speed restriction of 185 KIAS is used for the first turn.

OPTION 3

This is an RNP1 option with RF coding to provide a tight right turn then routing south-west to align with current operational practice.
The track following the right turn is often used by ATC to resolve interactions between flights on the LISTO departure and MAN arrivals from the south. This option therefore re-creates common operational practice above 4,000ft.
In the case of 05L, the turn point is at a minimum distance of 1nm from the DER, in accordance with PANS-OPS and CAP778. The turn point for 05R is located at a point roughly perpendicular to 05L, to create a similar ground track in the turn and subsequent leg.
05L: After departure this route turns right shortly after Heald Green in a tight radius turn that routes it inside of Poynton. This turn is continued onto a south-west heading to take it south of Wilmslow and Alderley Edge. It makes a left turn to head south to the north of Holmes Chapel and terminates at 7,000ft east of Middlewich.
05R After departure this route turns right shortly after Heald Green in a tight radius turn that routes it inside of Poynton. This turn is continued onto a south west heading to take it south of Wilmslow and Alderley Edge. It makes a left turn to head south to the north of Holmes Chapel and terminates at 7,000ft east of Middlewich.
A speed restriction of 190 KIAS is applied to the first turn which allows the smallest radius. Although PANS-OPS compliant it should be tested for flyability as part of the procedure validation process within Stage 4 of CAP1616.

OPTION 6A

This is an RNP1 option with RF coding to provide a tight right turn to route south-west to align with current operational practice. It is similar to option 3 initially but uses a higher speed in the initial turn which allow aircraft to climb more quickly, and it then turns south earlier.
This design speed aligns to the CAP778 recommendation and may permit some aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
The track following the right turn is often used by ATC to resolve interactions between flights on the LISTO departure and MAN arrivals from the south. This option therefore re-creates common operational practice above 4,000ft.
In the case of 05L, the turn point is at a minimum distance of 1nm from the DER, in accordance with PANS-OPS and CAP778. The turn point for Runway 05R is located at a point roughly perpendicular to Runway 05L, to create a similar ground track in the turn and subsequent leg.
05L: After departure, this route turns right shortly after Heald Green to route overhead Poynton. This turn is continued onto a south-west heading to take it south of Wilmslow and Alderley Edge and west of Macclesfield. It makes a left turn to head south at Chelford and terminates at 7,000ft east of Holmes Chapel.
05R: After departure, this route turns right shortly after Heald Green to route overhead Poynton. This turn is continued onto a south-west heading to take it south of Wilmslow and Alderley Edge and west of Macclesfield. It makes a left turn to head south at Chelford and terminates at 7,000ft east of Holmes Chapel.
A speed restriction of 210 KIAS is applied to the first turn which is the CAP778 recommended speed.

LEFT TURN OPTIONS

OPTION 7A

This is an RNP1 option with RF coding that turns left after departure to route north of Sale and then head south-west before heading south.
The design speed will permit many aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
Although this option creates more track miles to route to the south, because of the large number of southbound departures it has potential to aid departure flow and achieving one minute splits for southbound SIDs to align to the Design Principle Capacity.
05L: After departure this route turns left shortly after Heald Green to route overhead Cheadle. This turn is continued in a wide arc to the north of Chorlton and Sale and overhead Stretford where it combines with the option for 05R. It then heads south-west for a short straight segment and passes north of Altrincham where it makes a left turn to head south and terminates at 7,000ft west of Tatton Park.
05R: After departure this route turns left shortly after Heald Green to route overhead Cheadle. This turn is continued in a wide arc to the north of Chorlton and Sale and overhead Stretford where it combines with the option for 05L. It then heads south-west for a short straight segment and passes north of Altrincham where it makes a left turn to head south and terminates at 7,000ft west of Tatton Park.
A speed restriction of 220 KIAS has been applied to the first turn which allows most aircraft to fly in a clean configuration.

OPTION 8

This is an RNP1 option with RF coding that turns left after departure with the tightest radius possible to reduce track miles. This requires a speed restriction to allow the smaller turn radius.
In the case of 05L, the turn point is at a minimum distance of 1nm from the DER, in accordance with PANS-OPS and CAP778 recommendation. The turn point for Runway 05R is located at a point roughly perpendicular to Runway 05L, to create a similar ground track in the turn and subsequent leg.
Although this option creates more track miles to route to the south, it is the shortest of the left turn options. In addition, because of the large number of southbound departures it has potential to aid departure flow and achieving 1-minute splits for southbound SIDs to align to the Design Principle Capacity.
05L: After departure this route turns left shortly after Heald Green to route overhead Cheadle, West Didsbury and Sale. It then heads south-west for a straight segment and passes just north of Altrincham where it turns slightly south-east and combines with the route for 05R to pass east of Knutsford and terminate at 7,000ft.
05R: After departure this route turns left shortly after Heald Green to route overhead Cheadle, West Didsbury and Sale. It then heads south-west for a straight segment and passes just north of Altrincham where it turns slightly south-east and combines with the route for 05L to pass east of Knutsford and terminates at 7,000ft.
A speed restriction of 190 KIAS has been applied to the first turn which allows the smallest radius. Although PANS-OPS compliant it should be assessed for flyability as part of the procedure validation process within Stage 4 of CAP1616.

OPTION 9

This is an RNP1 option with RF coding that turns left after departure with the tightest radius possible to reduce track miles. It is similar to option 8 but terminates slightly further west.
In the case of 05L, the turn point is at a minimum distance of 1nm from the DER, in accordance with PANS-OPS and CAP778. The turn point for Runway 05R is located at a point roughly perpendicular to Runway 05L, to create a similar ground track in the turn and subsequent leg.
Although this option creates more track miles to route to the south, it is only slightly more track miles than option 8 which is shortest. Because of the large number of southbound departures it has potential to aid departure flow and achieving one minute splits for southbound SIDs.
05L: After departure this route turns left shortly after Heald Green to route overhead Cheadle, West Didsbury and Sale. It then heads south-west for a straight segment and passes just north of Altrincham where it turns south and combines with the route for 05R to pass west of Knutsford and terminates at 7,000ft.
05R: After departure this route turns left shortly after Heald Green to route overhead Cheadle, West Didsbury and Sale. It then heads south-west for a straight segment and passes just north of Altrincham where it turns south and combines with the route for 05L to pass west of Knutsford and terminates at 7,000ft.
A speed restriction of 190 KIAS applied to the first turn which allows the smallest radius. Although PANS-OPS compliant it should be assessed for flyability as part of the procedure validation process within Stage 4 of CAP1616.

OPTION 10

This is an RNP1 option with RF coding that turns left after departure. It routes mid-way between the other options in this envelope.
Although this option creates more track miles to route to the south, because of the large number of southbound departures it has potential to aid departure flow and achieving one minute splits for southbound SIDs.
The design speed aligns to the CAP778 recommendation and may permit some aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
In the case of 05L, the turn point is at a minimum distance of 1nm from the DER, in accordance with PANS-OPS and CAP778. The turn point for Runway 05R is located at a point roughly perpendicular to Runway 05L, to create a similar ground track in the turn and subsequent leg.
05L: After departure this route turns left shortly after Heald Green to route overhead Cheadle, Chorlton and Sale. It then heads south-west for a straight segment and passes just north of Altrincham where it turns south and combines with the route for 05R to pass west of Knutsford and terminates at 7,000ft.
05R: After departure this route turns left shortly after Heald Green to route overhead Cheadle, Chorlton and Sale. It then heads south-west for a straight segment and passes just north of Altrincham where it turns south and combines with the route for 05L to pass west of Knutsford and terminates at 7,000ft.
A speed restriction of 210 KIAS is applied to the first turn which is the CAP778 recommended speed.

'Do nothing' baseline

Group	Impact	Level of Analysis	'Do nothing' Runway 05L	'Do nothing' Runway 05R
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing LISTO SID. In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this 'do nothing' scenario overflies approximately 14,900 people and approximately 6,300 residential buildings. - Up to 7,000ft, this 'do nothing' scenario overflies 65,800 people and approximately 31,500 residential buildings.	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing LISTO SID. In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this 'do nothing' scenario overflies approximately 22,500 people and approximately 10,150 residential buildings. - Up to 7,000ft, this 'do nothing' scenario overflies 30,200 people and approximately 13,450 residential buildings.
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 05L LISTO SID overflies six AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 05R LISTO SID overflies three AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring, although aircraft do all follow the extant procedures in a broader sense. The existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative emissions analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 05L LISTO SID modal track, the track length is 28.57km (15.43nm).	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring, although aircraft do all follow the extant procedures in a broader sense. The existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 05R LISTO SID modal track, the track length is 25.41km (13.72nm).
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario does not overfly any AONBs or National Parks.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario does not overfly any AONBs or National Parks.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 05L LISTO SID modal track, the track length is 28.57km (15.43nm).	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 05R LISTO SID modal track, the track length is 25.41km (13.72nm).
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the extant procedures.	No change to operational costs is attributable to maintaining the extant procedures.
Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative	No deployment costs applicable to extant procedures.	No deployment costs applicable to extant procedures.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.
		Summary of Analysis	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.

South right turn options: Option 1 and Option 3

Group	Impact	Option 1 Runway 05L	Option 1 Runway 05R	Option 3 Runway 05L	Option 3 Runway 05R
Communities	Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 13,700 people and approximately 6,400 residential buildings. - Up to 7,000ft, this option overflies approximately 40,800 people and approximately 20,400 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 19,400 people and approximately 8,450 residential buildings. - Up to 7,000ft, this option overflies approximately 46,600 people and approximately 22,500 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 11,900 people and approximately 5,300 residential buildings. - Up to 7,000ft, this option overflies approximately 16,200 people and approximately 7,550 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 16,800 people and approximately 7,550 residential buildings. - Up to 7,000ft, this option overflies approximately 21,200 people and approximately 9,850 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Communities	Air Quality	Option 1 L overflies four AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 1 R overflies four AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.	Option 3 L overflies two AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 3 R overflies two AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.
Wider Society	Greenhouse Gas impact	Option 1 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1 L is 38.38km (20.73nm). When compared to the 'do nothing' scenario, Option 1 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 1 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1 R is 39.55km (21.35nm). When compared to the 'do nothing' scenario, Option 1 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 3 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 3 L is 53.92km (29.11nm). When compared to the 'do nothing' scenario, Option 3 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 3 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 3 R is 55.03km (29.71nm). When compared to the 'do nothing' scenario, Option 3 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Wider Society	Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Option 1 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 38.38km (20.73nm) long. When compared to the 'do nothing' scenario, Option 1 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 1 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 39.55km (21.35nm) long. When compared to the 'do nothing' scenario, Option 1 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 3 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 53.92km (29.11nm) long. When compared to the 'do nothing' scenario, Option 3 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 3 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 55.03km (29.71nm) long. When compared to the 'do nothing' scenario, Option 3 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with MAN arrivals/transitions. Both of which can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with MAN arrivals/transitions. Both of which can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with MAN arrivals/transitions. Both of which can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with MAN arrivals/transitions. Both of which can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
	Summary of Analysis	When compared to the 'do nothing' scenario, Option 1 L performs: - worse in terms of Greenhouse gas emissions and Fuel burn. - better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - neutral / equal in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1 L has been deemed as Acceptable, as it overflies the third fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 1 R performs: - worse in terms of Noise impact, Air Quality, Greenhouse gas emissions and Fuel burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - neutral / equal in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1 R has been deemed as Acceptable, as it overflies the third fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 3 L performs: - worse in terms of Greenhouse gas emissions and Fuel burn. - better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - neutral / equal in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 3L has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope	When compared to the 'do nothing' scenario, Option 3 R performs: - worse in terms of Greenhouse gas emissions and Fuel burn. - better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - neutral / equal in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 3R has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope

South right turn options: Option 6A; Left turn options: Option 7A

Group	Impact	Option 6A Runway 05L	Option 6A Runway 05R	Option 7A Runway 05L	Option 7A Runway 05R
Communities	Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 20,800 people and approximately 9,400 residential buildings. - Up to 7,000ft, this option overflies approximately 24,100 people and approximately 11,200 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 22,800 people and approximately 10,300 residential buildings. - Up to 7,000ft, this option overflies approximately 26,100 people and approximately 12,150 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 115,300 people and approximately 53,200 residential buildings. - Up to 7,000ft, this option overflies approximately 130,700 people and approximately 60,300 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 106,100 people and approximately 46,700 residential buildings. - Up to 7,000ft, this option overflies approximately 121,500 people and approximately 53,900 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.
Communities	Air Quality	Option 6A L overflies two AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 6A R overflies two AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 7A L overflies three AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 7A R overflies two AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.
Wider Society	Greenhouse Gas impact	Option 6A L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 6A L is 48.79km (26.35nm). When compared to the 'do nothing' scenario, Option 6 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 6A R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 6A R is 49.80km (26.89nm). When compared to the 'do nothing' scenario, Option 6 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 7A L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 7A L is 44.59km (24.08nm). When compared to the 'do nothing' scenario, Option 7A L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 7A R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 7A R is 44.77km (24.18nm). When compared to the 'do nothing' scenario, Option 7A R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Wider Society	Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Option 6A L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 48.79km (26.35nm) long. When compared to the 'do nothing' scenario, Option 6A L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 6A R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 49.80km (26.89nm) long. When compared to the 'do nothing' scenario, Option 6A R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 7A L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 44.59km (24.08nm) long. When compared to the 'do nothing' scenario, Option 7A L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 7A R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 44.77km (24.18nm) long. When compared to the 'do nothing' scenario, Option 7A R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with MAN arrivals/transitions. Both of which can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with MAN arrivals/transitions. Both of which can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process (reducing the need for ATC intervention in the future) or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process (reducing the need for ATC intervention in the future) or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
	Summary of Analysis	When compared to the 'do nothing' scenario, Option 6A L performs: - worse in terms of Greenhouse gas emissions and Fuel burn. - better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - neutral / equal in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 6A L has been deemed as Favourable, as it overflies the second fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 6A R performs: - worse in terms of Greenhouse gas emissions and Fuel burn. - better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - neutral / equal in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 6A R has been deemed as Favourable, as it overflies the second fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 7A L performs: - worse in terms of Noise impact, Greenhouse Gas emissions and Fuel burn. - better in terms of Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 7A L has been deemed as Acceptable, as it overflies the third fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 7A R performs: - worse in terms of Noise impact, Greenhouse Gas emissions and Fuel burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 7A R has been deemed as Acceptable, as it overflies the third fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.

Left turn options: Option 8, Option 9 and Option 10

Group	Impact	Option 8 Runway 05L	Option 8 Runway 05R	Option 9 Runway 05L	Option 9 Runway 05R	Option 10 Runway 05L	Option 10 Runway 05R
Communities	Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 99,500 people and approximately 44,650 residential buildings. - Up to 7,000ft, this option overflies approximately 115,000 people and approximately 51,900 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 98,200 people and approximately 44,700 residential buildings. - Up to 7,000ft, this option overflies approximately 116,900 people and approximately 53,500 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 99,600 people and approximately 44,650 residential buildings. - Up to 7,000ft, this option overflies approximately 115,700 people and approximately 52,600 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 98,500 people and approximately 44,750 residential buildings. - Up to 7,000ft, this option overflies approximately 117,500 people and approximately 54,150 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 108,400 people and approximately 47,200 residential buildings. - Up to 7,000ft, this option overflies approximately 130,800 people and approximately 57,350 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 101,200 people and approximately 45,100 residential buildings. - Up to 7,000ft, this option overflies approximately 128,600 people and approximately 57,200 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.
Communities	Air Quality	Option 8 L overflies four AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 8 R overflies four AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.	Option 9 L overflies four AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 9 R overflies four AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.	Option 10 L overflies four AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 10 R overflies four AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.
Wider Society	Greenhouse Gas impact	Option 8 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 8 L is 38.38km (20.72nm). When compared to the 'do nothing' scenario, Option 8 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of a dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 8 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 8 R is 39.25km (21.19nm). When compared to the 'do nothing' scenario, Option 8 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of a dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 9 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 9 L is 39.50km (21.33nm). When compared to the 'do nothing' scenario, Option 9 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of a dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 9 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 9 R is 40.41km (21.82nm). When compared to the 'do nothing' scenario, Option 9 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of a dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 10 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 10 L is 41.67km (22.50nm). When compared to the 'do nothing' scenario, Option 10 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of a dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 10 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 10 R is 42.57km (22.99nm). When compared to the 'do nothing' scenario, Option 10 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of a dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Wider Society	Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Option 8 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 38.38km (20.72nm) long. When compared to the 'do nothing' scenario, Option 8 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 8 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 39.25km (21.19nm) long. When compared to the 'do nothing' scenario, Option 8 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 9 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 39.50km (21.33nm) long. When compared to the 'do nothing' scenario, Option 9 L R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 9 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.41km (21.82nm) long. When compared to the 'do nothing' scenario, Option 9 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 10 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 41.67km (22.50nm) long. When compared to the 'do nothing' scenario, Option 10 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 10 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 42.57km (22.99nm) long. When compared to the 'do nothing' scenario, Option 10 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process (reducing the need for ATC intervention in the future) or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process (reducing the need for ATC intervention in the future) or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process (reducing the need for ATC intervention in the future) or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process (reducing the need for ATC intervention in the future) or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process (reducing the need for ATC intervention in the future) or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process (reducing the need for ATC intervention in the future) or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
	Summary of Analysis	When compared to the 'do nothing' scenario, Option 8 L performs: - worse in terms of Noise impact, Greenhouse Gas emissions and Fuel burn. - better in terms of Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 8 L has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope	When compared to the 'do nothing' scenario, Option 8 R performs: - worse in terms of Noise impact, Air Quality, Greenhouse Gas emissions and Fuel burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 8 R has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope	When compared to the 'do nothing' scenario, Option 9 L performs: - worse in terms of Noise impact, Greenhouse Gas emissions and Fuel burn. - better in terms of Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 9 L has been deemed as Favourable, as it overflies the second fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 9 R performs: - worse in terms of Noise impact, Air Quality, Greenhouse Gas emissions and Fuel burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 9 R has been deemed as Favourable, as it overflies the second fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 10 L performs: - worse in terms of Noise impact, Greenhouse Gas emissions and Fuel burn. - better in terms of Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 10 L has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 10 R performs: - worse in terms of Noise impact, Air Quality, Greenhouse Gas emissions and Fuel burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 10 R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Departure Envelope: SID Runway 05 South West

Group	Impact	Level of Analysis	'DO NOTHING' BASELINE	
			For the south-west design envelope, the 'do nothing' scenario for departures in terms of today's operation is based around the existing conventional ASMIM SID. The 'do nothing' scenario for departures consists of a modal track that has been derived to provide an accurate representation of what occurs today. In addition to the modal track, a polygon has also been created that represents an area where current operations are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this SID was based on the modal track created using Noise and Track Keeping data at altitudes of 4,000ft and 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Departure End of Runway and the end of the modal track.	
			Runway 05L	Runway 05R
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing ASMIM SID. In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 72,000 people and approximately 33,900 residential buildings. - Up to 7,000ft, this option overflies approximately 241,200 people and approximately 108,900 residential buildings.	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing ASMIM SID. In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 63,000 people and approximately 30,150 residential buildings. - Up to 7,000ft, this option overflies approximately 316,500 people and approximately 142,250 residential buildings.
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 05L ASMIM SID overflies five AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 05L ASMIM SID overflies five AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring, although aircraft do all follow the extant procedures in a broader sense. The existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative emissions analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 05L ASMIM SID modal track, the track length is 25.40km (13.72nm).	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring, although aircraft do all follow the extant procedures in a broader sense. The existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative emissions analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 05R ASMIM SID modal track, the track length is 27.19km (14.68nm).
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario does not overfly any AONBs or National Parks.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario does not overfly any AONBs or National Parks.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 05L ASMIM SID modal track, the track length is 25.40km (13.72nm).	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 05R ASMIM SID modal track, the track length is 27.19km (14.68nm).
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the extant procedures.	No change to operational costs is attributable to maintaining the extant procedures.
Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative	No deployment costs applicable to extant procedures.	No deployment costs applicable to extant procedures.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.
		Summary of Analysis	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.

Group	Impact	Level of Analysis	OPTION 1		OPTION 2A	
			This is an RNAV1 option that provides two left turns and then a track to join the NATS network to the south-west. The initial course is similar to the current ASMIM 1S/1Z SID, but it turns off this to the north of MAN. It has an initial turn at 1nm DER (05L) followed by a 117° left turn to head south-west. The design speed aligns to the CAP778 recommendation and may permit some aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise. The procedure uses fly-by waypoints. 05L: After departure this route turns left at the earliest PANS-OPS compliant position (1nm from DER). This takes it overhead Cheadle and West Didsbury where it combines with the option for 05R. There is then a short straight segment before a second turn is made over Stretford and it heads in a south-westerly direction over sparsely populated areas to terminate at 7,000ft south of the Lymm interchange between the M56 and the M6. 05R: After departure this route turns left at a point that is perpendicular with the turn point for the 05L option. This takes it overhead Cheadle and West Didsbury where it combines with the option for 05L. There is then a short straight segment before a second turn is made over Stretford and it heads in a south westerly direction over sparsely populated areas to terminate at 7,000ft south of the Lymm interchange between the M56 and the M6. A speed restriction of 210 KIAS is used for the first turn and second turn, which is the CAP778 recommended speed. Option 1 for Runway 05L was rejected at the DPE stage and has therefore not been assessed.		This is an RNP1 option that uses RF coding to provide a single left turn starting at the position of the current turn to create a fuel-efficient route. The design speed results in a tight radius turn to create a short track length to join the NATS network to the south-west. 05L: After departure this route makes a single left turn just after Cheadle which takes it overhead Burnage and Withington where it combines with the option for 05R. The left turn is completed heading in a south-westerly direction in the vicinity of Chorlton and it continues in this direction to terminate at 7,000ft south of the Lymm interchange between the M56 and the M6. 05R: After departure this route makes a single left turn just after Cheadle which takes it overhead Burnage and Withington where it combines with the option for 05L. The left turn is completed heading in a south-westerly direction in the vicinity of Sale and it continues in this direction to terminate at 7,000ft south of the Lymm interchange between the M56 and the M6. A speed restriction of 190 KIAS is used for the first turn which allows the smallest radius. Although PANS-OPS compliant it should be assessed for flyability as part of the procedure validation process within Stage 4 of CAP1616. Option 2A for Runway 05L was rejected at the DPE stage and has therefore not been assessed.	
			Runway 05L (NOT ASSESSED)	Runway 05R	Runway 05L (NOT ASSESSED)	Runway 05R
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative		In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 90,100 people and approximately 42,950 residential buildings. - Up to 7,000ft, this option overflies approximately 96,100 people and approximately 45,550 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.		In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 118,500 people and approximately 50,300 residential buildings. - Up to 7,000ft, this option overflies approximately 145,600 people and approximately 61,900 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Communities	Air Quality	Initial Options Appraisal: Qualitative		Option 1 R overflies three AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.		Option 2A R overflies four AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative		Option 1 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1 R is 42.66km (23.03nm). When compared to the 'do nothing' scenario, Option 1 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.		Option 2A R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 2A R is 42.71km (23.63nm). When compared to the 'do nothing' scenario, Option 2A R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative		The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.		The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative		This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral / equal.		This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral / equal.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative		The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.		The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative		No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.		No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative		The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.		The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative		Option 1 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 42.66km (23.03nm) long. When compared to the 'do nothing' scenario, Option 1 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.		Option 2A R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 42.71km (23.06nm) long. When compared to the 'do nothing' scenario, Option 2A R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative		It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.		It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative		Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.		Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative		There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.		There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative		Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process will reduce the need for ATC intervention in the future. Additionally, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation, which can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.		Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process will reduce the need for ATC intervention in the future. Additionally, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation, which can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
		Summary of Analysis		When compared to the 'do nothing' scenario, Option 1 R performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. - better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1 R has been deemed as Favourable, as it overflies the second fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.		When compared to the 'do nothing' scenario, Option 2A R performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. -better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 2A R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.

Group	Impact	Level of Analysis	OPTION 2B		OPTION 3A	
			This is an RNP1 that uses RF coding to provide a single initial turn to create a fuel-efficient route to the network joining point to the west. It differs from option 2A in that the turn is at the earliest PANS-OPS compliant position from Runway 05L to create the shortest route possible at this design speed. 05L: After departure this route turns left at the earliest PANS-OPS compliant position (1nm from DER). This is a single left turn that takes it overhead Cheadle and West Didsbury before completing the left turn heading in a south-westerly direction to the south of Sale where it combines with the option for 05R. It continues south-west to route just north of Altrincham and terminates at 7,000ft south of Warrington. 05R: After departure this route turns left at a point that is perpendicular with the turn point for the 05L option. This is a single left turn that takes it overhead Cheadle and West Didsbury before completing the left turn heading in a south-westerly direction to the south of Sale where it combines with the option for 05L. It continues south-west to route just north of Altrincham and terminates at 7,000ft south of Warrington. A speed restriction of 190 KIAS is used for the first turn which allows the smallest radius. Although PANS-OPS compliant it should be assessed for flyability as part of the procedure validation process within Stage 4 of CAP1616. Option 2B for Runway 05L was rejected at the DPE stage and has therefore not been assessed.		This is an RNP1 option that uses RF coding to provide a single initial turn starting at the position of the current turn to create a fuel-efficient route to the south-west. It is similar to option 2A but is designed with a higher design speed of 210kts. The greater speed results in a wider track, which may aid vertical separation from MAN arriving traffic from the north. The design speed may also permit some aircraft to be in a clean configuration (without the use of flaps) which has potential benefits in terms of noise. 05L: After departure this route makes a single left turn just after Cheadle which takes it overhead Burnage and Fallowfield where it combines with the option for 05R. The left turn is completed heading in a south-westerly direction between Chorlton and Stretford and it continues in this direction to terminate at 7,000ft south of the Lymm interchange between the M56 and the M6. 05R: After departure this route makes a single left turn just after Cheadle which takes it overhead Burnage and Fallowfield where it combines with the option for 05L. The left turn is completed heading in a south-westerly direction between Chorlton and Stretford and it continues in this direction to terminate at 7,000ft south of the Lymm interchange between the M56 and the M6. A speed restriction of 210 KIAS is applied to the first turn which is the CAP778 recommended speed. Option 3A for Runway 05L was rejected at the DPE stage and has therefore not been assessed.	
			Runway 05L (NOT ASSESSED)	Runway 05R	Runway 05L (NOT ASSESSED)	Runway 05R
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative		In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 101,400 people and approximately 45,600 residential buildings. - Up to 7,000ft, this option overflies approximately 109,200 people and approximately 48,800 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.		In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 135,500 people and approximately 62,500 residential buildings. - Up to 7,000ft, this option overflies approximately 172,200 people and approximately 78,250 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Communities	Air Quality	Initial Options Appraisal: Qualitative		Option 2B R overflies four AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.		Option 3A R overflies four AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative		Option 2B R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 2B R is 40.71km (21.98nm). When compared to the 'do nothing' scenario, Option 2B R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.		Option 3A R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 3A R is 45.14km (24.37nm). When compared to the 'do nothing' scenario, Option 3A R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative		The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.		The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative		This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral / equal.		This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral / equal.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative		The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.		The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative		No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.		No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative		The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.		The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative		Option 2B R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.71km (21.98nm) long. When compared to the 'do nothing' scenario, Option 2B R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.		Option 3A R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 45.14km (24.37nm) long. When compared to the 'do nothing' scenario, Option 3A R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative		It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.		It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative		Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.		Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative		There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.		There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative		Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process will reduce the need for ATC intervention in the future. Additionally, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation, which can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.		Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process will reduce the need for ATC intervention in the future. Additionally, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation, which can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
		Summary of Analysis		When compared to the 'do nothing' scenario, Option 2B R performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. -better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 2B R has been deemed as Acceptable, as it overflies the third fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.		When compared to the 'do nothing' scenario, Option 3A R performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. -better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 3A R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.

Group	Impact	Level of Analysis	OPTION 3B		OPTION 4B	
			This is an RNP1 option that uses RF coding to provide a single initial turn to create a fuel-efficient route to the network joining point to the west. It differs from option 3A in that the turn is at the earliest PANS-OPS compliant position from 05L to create a shorter route for this design speed. It is similar to option 2B but is designed with a higher speed of 210kts. The greater speed results in a wider track, which may aid vertical separation from MAN arriving traffic from the north. It may also permit some aircraft to be in a clean configuration (without the use of flaps) which has potential benefits in terms of noise. 05L: After departure this route turns left at the earliest PANS-OPS compliant position (1nm from DER). This is a single left turn that takes it overhead Cheadle and Withington before completing the left turn heading in a south-westerly direction to the south of Stretford where it combines with the option for 05R. It continues south-west to route to avoid Altrincham and terminates at 7,000ft west of the Lymm interchange between the M56 and the M6. 05R: After departure this route turns left at a point that is perpendicular with the turn point for the 05L option. This is a single left turn that takes it overhead Cheadle and Withington before completing the left turn heading in a south-westerly direction to the south of Stretford where it combines with the option for 05L. It continues south-west to route to avoid Altrincham and terminates at 7,000ft west of the Lymm interchange between the M56 and the M6. A speed restriction of 210 KIAS is applied to the first turn which is the CAP778 recommended speed. Option 3B for Runway 05L was rejected at the DPE stage and has therefore not been assessed.		This is an RNP1 option that uses RF coding to provide a single initial turn at the earliest PANS-OPS compliant position to create a route to the south-west. It differs from option 4A in that the turn is at the earliest PANS-OPS compliant position from Runway 05L to create a shorter route for this design speed. It is similar to options 2B and 3B but is designed with a higher speed of 220kts. The design speed results in a wider track, which may aid vertical separation from MAN arriving traffic from the north. It will also permit a larger number of aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise. 05L: After departure this route turns left at the earliest PANS-OPS compliant position (1nm from DER). This is a single left turn that takes it overhead Cheadle, Burnage and Fallowfield before completing the left turn heading in a south-westerly direction at Stretford where it combines with the option for 05R. It continues in this direction to terminate at 7,000ft west of the Lymm interchange between the M56 and the M6. 05R: After departure this route turns left at a point that is perpendicular with the turn point for the 05L option. This single left turn takes it overhead Cheadle, Burnage and Fallowfield before completing the left turn heading in a south-westerly direction at Stretford where it combines with the option for 05L. It continues in this direction to terminate at 7,000ft west of the Lymm interchange between the M56 and the M6. A speed restriction of 220 KIAS is used for the first turn which allows most aircraft to fly in a clean configuration.	
			Runway 05L (NOT ASSESSED)	Runway 05R	Runway 05L	Runway 05R
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative		In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 112,500 people and approximately 49,200 residential buildings. - Up to 7,000ft, this option overflies approximately 128,500 people and approximately 55,850 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 114,300 people and approximately 50,550 residential buildings. - Up to 7,000ft, this option overflies approximately 129,000 people and approximately 57,150 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 126,300 people and approximately 56,900 residential buildings. - Up to 7,000ft, this option overflies approximately 147,900 people and approximately 66,450 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Communities	Air Quality	Initial Options Appraisal: Qualitative		Option 3B R overflies four AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 4B L overflies four AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 4B R overflies four AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative		Option 3B R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 3B R is 43.11km (23.28nm). When compared to the 'do nothing' scenario, Option 3B R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 4B L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 4B L is 42.44km (22.92nm). When compared to the 'do nothing' scenario, Option 4B L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 4B R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 4B R is 44.77km (24.17nm). When compared to the 'do nothing' scenario, Option 4B R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative		The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative		This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral / equal.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral / equal.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral / equal.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative		The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative		No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative		The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative		Option 3B R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 43.11km (23.28nm) long. When compared to the 'do nothing' scenario, Option 3B R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 4B L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 42.44km (22.92nm) long. When compared to the 'do nothing' scenario, Option 4B L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 4B R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 44.77km (24.17nm) long. When compared to the 'do nothing' scenario, Option 4B R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative		It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative		Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative		There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative		Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process will reduce the need for ATC intervention in the future. Additionally, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation, which can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process will reduce the need for ATC intervention in the future. Additionally, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation, which can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process will reduce the need for ATC intervention in the future. Additionally, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation, which can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
		Summary of Analysis		When compared to the 'do nothing' scenario, Option 3B R performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. -better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 3B R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 4B L performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. -better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 4B L has been deemed as Favourable, as it overflies the second fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 4B R performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. -better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 4B R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.

Group	Impact	Level of Analysis	OPTION 5	
			This is an RNAV1 option that provides two turns to the left to route south-west similar option 1 but uses an initial 15° track adjustment to the left from the DER for Runway 05L, and a 5° adjustment for Runway 05R. This is to provide noise relief for the Cheadle area, which lies underneath the approach path for Runways 23L/23R arrivals. The design speed aligns to the CAP778 recommendation and may permit some aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise. The procedure uses fly-by waypoints. 05L: After passing the DER aircraft make a 15° track adjustment to the left (north) followed by a left turn that routes aircraft to the west of Cheadle. There is then a short straight segment where the routes combine before a second turn is made over Stretford and it heads in a south-westerly direction over sparsely populated areas to terminate at 7,000ft to the south-west of the junction between the M56 and M6. 05R: After passing the DER aircraft make a 5° track adjustment to the left (north) followed by a left turn that routes aircraft to the west of Cheadle. There is then a short straight segment where the routes combine before a second turn is made over Stretford and it heads in a south-westerly direction over sparsely populated areas to terminate at 7,000ft to the south-west of the junction between the M56 and M6. A speed restriction of 210 KIAS is used for the first turn which is the CAP778 recommended speed.	
			Runway 05L	Runway 05R
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 73,700 people and approximately 35,600 residential buildings. - Up to 7,000ft, this option overflies approximately 79,000 people and approximately 37,900 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 86,500 people and approximately 41,200 residential buildings. - Up to 7,000ft, this option overflies approximately 92,100 people and approximately 43,600 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Communities	Air Quality	Initial Options Appraisal: Qualitative	Option 5 L overflies three AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 5 R overflies three AQMA(s); however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Option 5 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 5 L is 39.47km (21.31nm). When compared to the 'do nothing' scenario, Option 5 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 5 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 5 R is 42.06km (22.71nm). When compared to the 'do nothing' scenario, Option 5 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral / equal.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral / equal.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	Option 5 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 39.47km (21.31nm) long. When compared to the 'do nothing' scenario, Option 5 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 5 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 42.06km (22.71nm) long. When compared to the 'do nothing' scenario, Option 5 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process will reduce the need for ATC intervention in the future. Additionally, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation, which can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with MAN arrivals/transitions and aircraft inbound to Liverpool. In some cases, ATC intervention is required to mitigate this, but it is expected that the introduction of PBN IFPs and the application of the design process will reduce the need for ATC intervention in the future. Additionally, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation, which can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
		Summary of Analysis	When compared to the 'do nothing' scenario, Option 5L performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. -better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 5 L has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope	When compared to the 'do nothing' scenario, Option 5R performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. -better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 5 R has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope..

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Departure Envelope: SID Runway 23 North

'DO NOTHING' BASELINE

For the north design envelope, the 'do nothing' scenario for departures in terms of today's operation is based around the existing conventional POL SID. The 'do nothing' scenario for departures consists of a modal track that has been derived to provide an accurate representation of what occurs today. In addition to the modal track, a polygon has also been created that represents an area where current operations are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this SID was based on the modal track created using Noise and Track Keeping data at altitudes of 4,000ft and 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Departure End of Runway and the end of the modal track.

OPTION 1A

Option 1A is an RNAV 1 replication of the current departure to POL and uses fly-over waypoints with CF path terminator coding to create an approximate replication of the existing conventional POL 5R 1Y SID. An element of dispersion would be apparent in the turns due to the fly-over waypoint and CF coding.
The fly-over waypoints are positioned at the existing markers.
•For Runway 23R this first turn is at MCT D3.
•For Runway 23L, this is at D3.2 which is less than 1nm from DER but replicates the current procedure.
As a replicated route it follows a similar track over the ground as the current published route. This takes both routes to the north of Knutsford at which point the tracks of the SIDs converge. The route heads north until turning right to the north-west of Irlam to head in a north-east direction and terminates at 7,000ft just east of Farnworth.
A speed restriction of 200 KIAS is used for the first turn.

OPTION 1B

Option 1B is an RNAV1 option, similar to option 1A, using fly-over waypoints with CF path terminator coding. However, aircraft make a second right turn earlier to provide a more direct and fuel-efficient route.
The fly-over waypoints are positioned at the existing markers:
•For Runway 23R this first turn is at MCT D3.
•For Runway 23L, this is at D3.2 which is less than 1nm from DER, but this replicates the turn of the current procedure and therefore aligns to the Design Principle Safety.
23L: This route commences the RF turn to the north of Knutsford. This turn continues until Mere where it combines with the option for 23R and continues north until west of Partington at which point the route heads north-east following the line of the M62 initially and terminates at 7,000ft north of Prestwich.
23R: This route commences the RF turn to the north of Knutsford. This turn continues until Mere where it combines with the option for 23L and continues north until west of Partington at which point the route heads north-east following the line of the M62 initially and terminates at 7,000ft north of Prestwich.
An element of dispersion would be apparent in the turn due to the fly-over waypoint and CF coding. To create replication with the existing procedure, a speed restriction of 200 KIAS is used for the first turn.

Option 1B for Runway 23L was rejected at the DPE stage and has therefore not been assessed.

OPTION 2B

This is an RNP1option with RF coding that is similar to option 1B but the use of RF coding results in a track slightly further west initially before heading north-east initially following the course of the M62 to provide a more direct and fuel-efficient route.
The option has been created to use the more modern technology and maximise fuel efficiency by making a second right turn earlier to head on a north-east trajectory where it terminates south of the existing POL SID.
The design speed aligns to the CAP778 recommendation and may permit some aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
23L: This route commences the RF turn to the north of Knutsford. This turn continues via Over Tabley and routes north to the east of Lymm until west of Partington at which point the route heads north-east. It initially follows the route of the M62 and terminates at 7,000ft north of Prestwich.
23R: This route commences the RF turn to the north of Knutsford. This turn continues via Over Tabley and routes north to the east of Lymm until west of Partington at which point the route heads north-east. It initially follows the route of the M62 and terminates at 7,000ft north of Prestwich.
A speed restriction of 210 KIAS is applied to the first turn which is the CAP778 recommended speed.

OPTION 3

This provides an RNP1 option with RF coding using fly-by waypoints.
It has been created using fly-by waypoints with a tighter radius first turn than option 2B to reduce noise impact for Knutsford. It also aims to improve fuel efficiency by making a second right turn earlier than the current POL SID.
The design speed aligns to the CAP778 recommendation and may permit some aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
23L: This route commences the RF turn to the north of Knutsford. The radius of this turn takes it further north of Knutsford than option 2B to route between High Legh and Bucklow Hill. The route heads north and combine near Broomedge and continue until just west of Partington. At this point the route turns right to follow the course of the M62 in a north-easterly direction and terminates at 7,000ft west of Prestwich.
23R: This route commences the RF turn earlier than 23L, to route further to the north of Knutsford. This routes it between High Legh and Bucklow Hill and it converges with the option for 23L in the vicinity of Broomedge. The route heads north until just west of Partington. At this point the route turns right to follow the course of the M62 in a north-easterly direction and terminates at 7,000ft west of Prestwich.
A speed restriction of 210 KIAS is applied to the first turn which is the CAP778 recommended speed.

OPTION 4A

This is an RNP1 option with RF coding included to replicate the existing conventional POL SID but using an RF turn. This results in a slightly wider initial turn than the conventional route and the RNAV1 replication options.
It has been created with the slightly tighter radius first turn similar to option 3 to reduce noise impact for Knutsford but does not have the second turn at the earlier point of that option because it replicates the current SID.
The design aims to have aircraft make the first right turn no closer than 1nm from DER after which both routes head in a northerly direction and converge just north of Cadishead.
23L: This route commences the RF turn to the north of Knutsford. The radius of this turn takes it further north of Knutsford than option 2B to route between High Legh and Bucklow Hill. The route heads north until turning right via a fly-by turn at XUMAT (north of Cadishead) to head in a north-east direction and terminates just east of Farnworth.
23R: This route commences the RF turn earlier than 23L, to route further to the north of Knutsford. This routes it between High Legh and Bucklow Hill and it converges with the option for 23L in the vicinity of Cadishead. At this point the route turns right to head in a north-east direction and terminates just east of Farnworth.
A speed restriction of 190 KIAS is used for the first turn which allows the smallest radius. Although PANS-OPS compliant it may need to be assessed for flyability as part of the procedure validation process within Stage 4 of CAP1616.

OPTION 4B

This is an RNP1 option with RF coding included to replicate the existing conventional POL SID but using an RF turn. It has the same slightly tighter turn radius as option 4A to reduce noise impact for Knutsford but makes a second right turn earlier to head north-east to provide a more direct and fuel-efficient route.
The design aims to have aircraft make the first right turn no closer than 1nm from DER.
23L: This route commences the RF turn to the north of Knutsford. The radius of this turn takes it further north of Knutsford than option 2B to route between High Legh and Bucklow Hill. The route heads north until just west of Partington where it combines with the option for 23R. At this point the route turns right to follow the course of the M62 in a north-easterly direction and terminates at 7,000ft west of Prestwich.
23R: This route commences the RF turn earlier than 23L, prior to Parkgate Industrial Area to route further to the north of Knutsford. This routes between High Legh and Bucklow Hill and it converges with the option for 23L in the vicinity of Partington. At this point the route turns right to follow the course of the M62 in a north-easterly direction and terminates at 7,000ft west of Prestwich.
A speed restriction of 190 KIAS is used for the first turn which allows the smallest radius. Although PANS-OPS compliant it should be assessed for flyability as part of the procedure validation process within Stage 4 of CAP1616.

OPTION 6A

This is an RNP1 option with RF coding that maximises fuel efficiency by removing the northbound leg between the first and second turns and replacing it with a single turn to the north-east. This provides the most direct route to POL.
The design aims to have aircraft make the first right turn no closer than 1nm from DER, and the speed applied to this option results in this option forming the westerly edge of the envelope in the initial turn along with option 6B. This speed will also permit a larger number of aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
23L: This route commences the single RF turn to the north of Knutsford. The turn continues north via Over Tabley before heading in a north easterly direction in the vicinity of Broomedge. The route then continues to the west of the Sale and Urmston before terminating at 7,000ft in the vicinity of Eccles.
23R: This route commences the single RF turn earlier than 23L, prior to route further to the north of Knutsford. The turn continues to route east of Over Tabley before converging with the option for 23L in the vicinity of Broomedge. The route then continues to the west of the Sale and Urmston before terminating at 7,000ft in the vicinity of Eccles.
A speed restriction of 220 KIAS is used for the first turn.

OPTION 6B

This is an RNP1option with RF coding that is similar to option 2B but the use of a higher speed results in a track slightly further west before making the second turn to the north.
The design aims to have aircraft make the first right turn no closer than 1nm from DER, and the speed applied to this option results in this option forming the westerly edge of the envelope in the initial turn along with option 6A. This speed will also permit a larger number of aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
23L: This route commences the RF turn to the north of Knutsford. The radius of this turn takes it on the same track as option 6a via Over Tabley and east of Lymm, until west of Partington. At this point it combines with the option for 23R and heads north-east. They initially follow the route of the M62 and terminate at 7,000ft north of Prestwich.
23R: This route commences the RF turn earlier than 23L, to route further to the north of Knutsford. The radius of this turn takes it on the same track as option 6a via Over Tabley and east of Lymm, until west of Partington. At this point it combines with the option for 23L and heads north-east. They initially follow the route of the M62 and terminate at 7,000ft north of Prestwich.
A speed restriction of 220 KIAS is used for the first turn which allows most aircraft to fly in a clean configuration; however, this results in a wider turn radius than the replicated route.

OPTION 7

This is an RNP1 option that uses RF coding and an initial 15° track adjustment to the right from the DER for Runway 23L and a 5° adjustment for Runway 23R. This track adjustment is aimed to reduce noise impact on Knutsford. Thereafter this option has a similar route to that of option 4B.
An RNP+RF turn follows the initial track adjustment, and this commences at 1nm from DER for Runway 23L.
The design speed aligns to the CAP778 recommendation and may permit some aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
23L: After passing DER this route has a 15° track adjustment to the north which continues until 1nm from DER. An RNP+RF turn is then commenced to the north of Knutsford. This is continued until heading in north in the vicinity of High Legh at which point the route heads north until just west of Partington. It then turns right to follow the course of the M62 in a north-easterly direction and terminates at 7,000ft north of Prestwich.
23R: After passing DER this route has a 5° track adjustment to the north. An RNP+RF turn is then commenced to the north of Knutsford. This is continued until the vicinity of High Legh where the route converges with the option for 23L. After this point the route heads north until just west of Cadishead where it turns right to follow the course of the M62 in a north-easterly direction and terminates at 7,000ft north of Prestwich.
A speed restriction of 210 KIAS is applied to the first turn which is the CAP778 recommended speed.

'Do nothing' baseline

Group	Impact	Level of Analysis	'Do nothing' Runway 23L	'Do nothing' Runway 23R
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing POL SID. In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this baseline overflies approximately 6,400 people and approximately 2,750 residential buildings. - Up to 7,000ft, this baseline overflies approximately 109,400 people and approximately 48,100 residential buildings.	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing POL SID. In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this baseline overflies approximately 3,600 people and approximately 1,450 residential buildings. - Up to 7,000ft, this baseline overflies approximately 217,400 people and approximately 96,550 residential buildings.
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 23L POL SID overflies four AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 23R POL SID overflies four AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring, although aircraft do all follow the extant procedures in a broader sense. The existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative emissions analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23L POL SID modal track, the track length is 22.16km (11.96nm).	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring, although aircraft do all follow the extant procedures in a broader sense. The existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative emissions analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23R POL SID modal track, the track length is 23.26km (12.56nm).
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario does not overfly any AONBs or National Parks.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario does not overfly any AONBs or National Parks.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23L POL SID modal track, the track length is 22.16km (11.96nm).	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23R POL SID modal track, the track length is 23.26km (12.56nm).
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the extant procedures.	No change to operational costs is attributable to maintaining the extant procedures.
Airport / Air navigation service provider	deployment costs	Initial Options Appraisal: Qualitative	No deployment costs applicable to extant procedures.	No deployment costs applicable to extant procedures.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.
		Summary of Analysis	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.

Options 1A and 1B

Impact	Option 1A Runway 23L	Option 1A Runway 23R	Option 1B Runway 23L (NOT ASSESSED)	Option 1B Runway 23R
Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 10,800 people and approximately 4,550 residential buildings. - Up to 7,000ft, this option overflies approximately 89,300 people and approximately 42,400 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 11,300 people and approximately 4,800 residential buildings. - Up to 7,000ft, this option overflies approximately 90,100 people and approximately 42,800 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.		In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 13,000 people and approximately 5,700 residential buildings. - Up to 7,000ft, this option overflies approximately 119,200 people and approximately 54,750 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Air Quality	Option 1A L overflies five AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of dis-benefit as it overflies more AQMAs.	Option 1A R overflies five AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of dis-benefit as it overflies more AQMAs.		Option 1B R overflies two AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.
Greenhouse Gas impact	Option 1A L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1A L is 39.60km (21.38nm). When compared to the 'do nothing' scenario, Option 1A L is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 1A R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1A R is 40.86km (22.06nm). When compared to the 'do nothing' scenario, Option 1A R is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.		Option 1B R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1B R is 39.95km (21.57nm). When compared to the 'do nothing' scenario, Option 1B R is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.
Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in the air and on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in the air and on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.		The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in the air and on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.
Tranquillity	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.		This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.		The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.		No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.		The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
Fuel burn	Option 1A L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 39.60km (21.38nm) long. When compared to the 'do nothing' scenario, Option 1A L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 1A R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.86km (22.06nm) long. When compared to the 'do nothing' scenario, Option 1A R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.		Option 1B R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 39.95km (21.57nm) long. When compared to the 'do nothing' scenario, Option 1B R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.		It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.		Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.		There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
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Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with the L975 Lower ATS route, MAN arrivals/transitions, aircraft inbound to Liverpool and some GA aircraft operating at low level. Furthermore, there is the potential for 'drop out' of CAS. These hazards can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with the L975 Lower ATS route, MAN arrivals/transitions, aircraft inbound to Liverpool and some GA aircraft operating at low level. Furthermore, there is the potential for 'drop out' of CAS. These hazards can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.		Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with the L975 Lower ATS route, MAN arrivals/transitions, aircraft inbound to Liverpool and some GA aircraft operating at low level. Furthermore, there is the potential for 'drop out' of CAS. These hazards can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
Summary of Analysis	When compared to the 'do nothing' scenario, Option 1A L this option performs: - worse in terms of Noise impact, Air Quality, Greenhouse Gas emissions and Fuel burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1A L has been deemed as Favourable, as it overflies the second fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 1A R performs: - worse in terms of Noise impact, Air Quality, Greenhouse Gas emissions and Fuel burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1A R has been deemed as Favourable, as it overflies the second fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.		When compared to the 'do nothing' scenario, Option 1B R performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. - better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1B R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.

Options 2B and 3

Impact	Option 2B Runway 23L	Option 2B Runway 23R	Option 3 Runway 23L	Option 3 Runway 23R
Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 11,200 people and approximately 4,850 residential buildings. - Up to 7,000ft, this option overflies approximately 92,000 people and approximately 42,050 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 9,700 people and approximately 4,150 residential buildings. - Up to 7,000ft, this option overflies approximately 91,700 people and approximately 42,150 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 10,900 people and approximately 4,750 residential buildings. - Up to 7,000ft, this option overflies approximately 99,000 people and approximately 45,900 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 11,100 people and approximately 4,750 residential buildings. - Up to 7,000ft, this option overflies approximately 98,800 people and approximately 45,850 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Air Quality	Option 2B L overflies three AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 2B R overflies two AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 3 L overflies two AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 3 R overflies two AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.
Greenhouse Gas impact	Option 2B L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 2B L is 41.06km (22.17nm). When compared to the 'do nothing' scenario, Option 2B L is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 2B R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 2B R is 41.36km (22.33nm). When compared to the 'do nothing' scenario, Option 2B R is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 3 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 3 L is 39.99km (21.59nm). When compared to the 'do nothing' scenario, Option 3 L is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 3 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 3 R is 39.77km (21.48nm). When compared to the 'do nothing' scenario, Option 3 R is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.
Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in the air and on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in the air and on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in the air and on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in the air and on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.
Tranquillity	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
Fuel burn	Option 2B L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 41.06km (22.17nm) long. When compared to the 'do nothing' scenario, Option 2B L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 2B R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 41.36km (22.33nm) long. When compared to the 'do nothing' scenario, Option 2B R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 3 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 39.99km (21.59nm) long. When compared to the 'do nothing' scenario, Option 3 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 3 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 39.77km (21.48nm) long. When compared to the 'do nothing' scenario, Option 3 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
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Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with the L975 Lower ATS route, MAN arrivals/transitions, aircraft inbound to Liverpool and some GA aircraft operating at low level. Furthermore, there is the potential for 'drop out' of CAS. These hazards can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with the L975 Lower ATS route, MAN arrivals/transitions, aircraft inbound to Liverpool and some GA aircraft operating at low level. Furthermore, there is the potential for 'drop out' of CAS. These hazards can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with the L975 Lower ATS route, MAN arrivals/transitions, aircraft inbound to Liverpool and some GA aircraft operating at low level. Furthermore, there is the potential for 'drop out' of CAS. These hazards can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with the L975 Lower ATS route, MAN arrivals/transitions, aircraft inbound to Liverpool and some GA aircraft operating at low level. Furthermore, there is the potential for 'drop out' of CAS. These hazards can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
Summary of Analysis	When compared to the 'do nothing' scenario, Option 2B L performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. - better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 2B L has been deemed as Acceptable, as it overflies the third fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 2B R performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. - better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 2B R has been deemed as Acceptable, as it overflies the third fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 3 L performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. - better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 3 L has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 3 R performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. - better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 3 R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.

Options 4A and 4B

Impact	Option 4A Runway 23L	Option 4A Runway 23R	Option 4B Runway 23L	Option 4B Runway 23R
Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 8,300 people and approximately 3,500 residential buildings. - Up to 7,000ft, this option overflies approximately 86,500 people and approximately 41,250 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 10,100 people and approximately 4,300 residential buildings. - Up to 7,000ft, this option overflies approximately 88,400 people and approximately 42,100 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 11,400 people and approximately 4,950 residential buildings. - Up to 7,000ft, this option overflies approximately 97,900 people and approximately 45,100 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 11,500 people and approximately 5,100 residential buildings. - Up to 7,000ft, this option overflies approximately 99,000 people and approximately 45,550 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Air Quality	Option 4A L overflies five AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of dis-benefit as it overflies more AQMAs.	Option 4A R overflies five AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of dis-benefit as it overflies more AQMAs.	Option 4B L overflies two AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 4B R overflies two AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.
Greenhouse Gas impact	Option 4A L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 4A L is 42.07km (22.72nm). When compared to the 'do nothing' scenario, Option 4A L is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 4A R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 4A R is 42.45km (22.92nm). When compared to the 'do nothing' scenario, Option 4A R is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 4B L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 4B L is 40.05km (21.63nm). When compared to the 'do nothing' scenario, Option 4B L is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 4B R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 4B R is 40.39km (21.81nm). When compared to the 'do nothing' scenario, Option 4B R is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.
Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in the air and on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in the air and on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in the air and on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in the air and on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.
Tranquillity	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
Fuel burn	Option 4A L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 42.07km (22.72nm) long. When compared to the 'do nothing' scenario, Option 4A L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 4A R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 42.45km (22.92nm) long. When compared to the 'do nothing' scenario, Option 4A R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 4B L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.05km (21.63nm) long. When compared to the 'do nothing' scenario, Option 4B L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 4B R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.39km (21.81nm) long. When compared to the 'do nothing' scenario, Option 4B R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
deployment costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with the L975 Lower ATS route, MAN arrivals/transitions, aircraft inbound to Liverpool and some GA aircraft operating at low level. Furthermore, there is the potential for 'drop out' of CAS. These hazards can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with the L975 Lower ATS route, MAN arrivals/transitions, aircraft inbound to Liverpool and some GA aircraft operating at low level. Furthermore, there is the potential for 'drop out' of CAS. These hazards can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with the L975 Lower ATS route, MAN arrivals/transitions, aircraft inbound to Liverpool and some GA aircraft operating at low level. Furthermore, there is the potential for 'drop out' of CAS. These hazards can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with the L975 Lower ATS route, MAN arrivals/transitions, aircraft inbound to Liverpool and some GA aircraft operating at low level. Furthermore, there is the potential for 'drop out' of CAS. These hazards can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
Summary of Analysis	When compared to the 'do nothing' scenario, Option 4A L performs: - worse in terms of Air Quality, Greenhouse Gas emissions and Fuel burn. - better in terms of Noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 4A L has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 4A R performs: - worse in terms of Air Quality, Greenhouse Gas emissions and Fuel burn. - better in terms of Noise impact, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 4A R has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 4B L performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. - better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 4B L has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 4B R performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. - better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 4B R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.

Options 6A and 6B

Impact	Option 6A Runway 23L	Option 6A Runway 23R	Option 6B Runway 23L	Option 6B Runway 23R
Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 5,000 people and approximately 2,300 residential buildings. - Up to 7,000ft, this option overflies approximately 129,800 people and approximately 61,750 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be of dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 4,500 people and approximately 1,800 residential buildings. - Up to 7,000ft, this option overflies approximately 129,500 people and approximately 61,600 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 9,700 people and approximately 4,300 residential buildings. - Up to 7,000ft, this option overflies approximately 93,900 people and approximately 43,350 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 8,300 people and approximately 3,550 residential buildings. - Up to 7,000ft, this option overflies approximately 93,500 people and approximately 43,000 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Air Quality	Option 6A L overflies three AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 6A R overflies three AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 6B L overflies three AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 6B R overflies three AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.
Greenhouse Gas impact	Option 6A L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 6A L is 40.50km (21.87nm). When compared to the 'do nothing' scenario, Option 6A L is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 6A R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 6A R is 40.70km (21.98nm). When compared to the 'do nothing' scenario, Option 6A R is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 6B L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 6B L is 41.80km (22.57nm). When compared to the 'do nothing' scenario, Option 6B L is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 6B R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 6B R is 42.07km (22.72nm). When compared to the 'do nothing' scenario, Option 6B R is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.
Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in the air and on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in the air and on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in the air and on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in the air and on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.
Tranquillity	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
Fuel burn	Option 6A L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.50km (21.87nm) long. When compared to the 'do nothing' scenario, Option 6A L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 6A R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.70km (21.98nm) long. When compared to the 'do nothing' scenario, Option 6A R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 6B L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 41.80km (22.57nm) long. When compared to the 'do nothing' scenario, Option 6B L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 6B R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 42.07km (22.72nm) long. When compared to the 'do nothing' scenario, Option 6B R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
deployment costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with the L975 Lower ATS route, MAN arrivals/transitions, aircraft inbound to Liverpool and some GA aircraft operating at low level. Furthermore, there is the potential for 'drop out' of CAS. These hazards can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with the L975 Lower ATS route, MAN arrivals/transitions, aircraft inbound to Liverpool and some GA aircraft operating at low level. Furthermore, there is the potential for 'drop out' of CAS. These hazards can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with the L975 Lower ATS route, MAN arrivals/transitions, aircraft inbound to Liverpool and some GA aircraft operating at low level. Furthermore, there is the potential for 'drop out' of CAS. These hazards can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with the L975 Lower ATS route, MAN arrivals/transitions, aircraft inbound to Liverpool and some GA aircraft operating at low level. Furthermore, there is the potential for 'drop out' of CAS. These hazards can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
Summary of Analysis	When compared to the 'do nothing' scenario, Option 6A L performs: - worse in terms of Noise impact, Greenhouse Gas emissions and Fuel burn. - better in terms of Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 6A L has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 6A R performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. - better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 6A R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 6B L performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. - better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 6B L has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 6B R performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. - better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 6B R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.

Option 7

Impact	Option 7 Runway 23L	Option 7 Runway 23R
Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 10,800 people and approximately 4,700 residential buildings. - Up to 7,000ft, this option overflies approximately 110,100 people and approximately 51,100 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be of dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 11,400 people and approximately 4,900 residential buildings. - Up to 7,000ft, this option overflies approximately 112,000 people and approximately 51,950 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Air Quality	Option 7 L overflies two AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.	Option 7 R overflies two AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.
Greenhouse Gas impact	Option 7 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 7 L is 38.95km (21.03nm). When compared to the 'do nothing' scenario, Option 7 L is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 7 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 7 R is 40.60km (21.92nm). When compared to the 'do nothing' scenario, Option 7 R is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.
Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in the air and on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in the air and on the ground). The reduction of the reliance on outdated ground based navigational aids will significantly increase operational resilience through the introduction of PBN.
Tranquillity	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
Fuel burn	Option 7 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 38.95km (21.03nm) long. When compared to the 'do nothing' scenario, Option 7 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 7 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.60km (21.92nm) long. When compared to the 'do nothing' scenario, Option 7 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
deployment costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with the L975 Lower ATS route, MAN arrivals/transitions, aircraft inbound to Liverpool and some GA aircraft operating at low level. Furthermore, there is the potential for 'drop out' of CAS. These hazards can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, options within this envelope may conflict with the L975 Lower ATS route, MAN arrivals/transitions, aircraft inbound to Liverpool and some GA aircraft operating at low level. Furthermore, there is the potential for 'drop out' of CAS. These hazards can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
Summary of Analysis	When compared to the 'do nothing' scenario, Option 7 L performs: - worse in terms of Noise impact, Greenhouse Gas emissions and Fuel burn. - better in terms of Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 7 L has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 7 R performs: - worse in terms of Greenhouse Gas emissions and Fuel burn. - better in terms of Noise impact, Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 7 R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Departure Envelope: SID Runway 23 East

'DO NOTHING' BASELINE

For the east design envelope, the 'do nothing' scenario for departures in terms of today's operation is based around the existing conventional SONEX SID. The 'do nothing' scenario for departures consists of a modal track that has been derived to provide an accurate representation of what occurs today. In addition to the modal track, a polygon has also been created that represents an area where current operations are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this SID was based on the modal track created using Noise and Track Keeping data at altitudes of 4,000ft and 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Departure End of Runway and the end of the modal track.

RIGHT TURN OPTIONS

OPTION 1A

Option 1A is an RNAV 1 replication of the current SONEX 1R/1Y SID and uses a fly-over waypoint with CF path terminator coding.
The fly-over waypoints are positioned at the existing markers.
23R this first turn is at MCT D3.
23L this is at MCT D3.2 which less than 1nm from DER but as this replicates the turn of the current procedure it therefore aligns to the Design Principle Safety.
As a replicated route it follows a similar track over the ground as the current published route. The first turn commences to the north and east of Knutsford which takes both routes north of Knutsford at which point the tracks of the SIDs converge close to Mere. The routes head north until turning right to the north of Irlam, and then heads in an easterly direction south of Eccles and terminates at 7,000ft just east of Salford.
An element of dispersion would be apparent in the turns due to the fly-over waypoint and CF coding. A speed restriction of 200 KIAS is used for the first turn to create replication of the current route.

OPTION 1C

This option provides a similar initial RNAV1 route to options 1A and 1B which are based on the existing conventional SID. However, aircraft will make the second right turn at an earlier point to route via an area of low population density to reduce noise impact.
This is aimed at recreating current ATC operational practice whereby aircraft are vectored to the east after passing 4,000ft.
An element of dispersion would be apparent in the turn due to the fly-over waypoint. These fly-over waypoints are positioned at the existing markers:
•For Runway 23R this first turn is at MCT D3.
•For Runway 23L, this is at D3.2 which is less than 1nm from DER, but this replicates the turn of the current procedure and therefore aligns to the Design Principle Safety.
23L: This follows an initial track over the ground that seeks to replicate the current route in the first right turn. This turn commences to the north of Knutsford and takes the route north where it converges with the option for 23R close to Mere. The routes continue north until turning right to the south of Partington through an area of low population density until Stretford and Urmston, where they turn right to head in an easterly direction routing south of Manchester city centre and terminating at 7,000ft overhead Gorton.
23R: This follows an initial track over the ground that seeks to replicate the current route in the first right turn. This turn commences to the north of Knutsford which takes the route north where it converges with the option for 23L close to Mere. The routes continue north until turning right to the south of Partington through an area of low population density until Stretford and Urmston, where they turn right to head in an easterly direction routing south of Manchester city centre and terminating at 7,000ft overhead Gorton.
A speed restriction of 200 KIAS is used for the first turn to create track replication of the current route.

Option 1C for Runway 23R was rejected at the DPE stage and has therefore not been assessed.

OPTION 4A

This is an RNP1 option using RF coding that provides a more direct route to the east using a single right turn.
It is similar to option 2A but at the CAP778 recommended speed of 210kts in the turn which results in a slightly wider track to the west and north. This speed may also permit some aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise. The design aims to have aircraft make the first right turn no closer than 1nm from DER.
23L: The first RF right turn starts to the north of Knutsford. This routes aircraft further west of Mere than option 2 but via Over Tabley before heading in a north-easterly direction to avoid Bowdon and Altrincham. The route continues in this direction before making a second right turn to the east to route to the south of Sale before terminating at 7,000ft near Heaton Chapel.
23R: This route commences the single RF turn earlier than 23L, prior to route further to the north of Knutsford. This results in a turn just west of Mere before heading in a north-easterly direction to avoid Bowdon and Altrincham. It converges with the option for 23L south of Sale where it heads east before terminating at 7,000ft near Heaton Chapel.
A speed restriction of 210 KIAS is applied to the first turn which is the CAP778 recommended speed.

Option 4A for Runway 23L was rejected at the DPE stage and has therefore not been assessed.

OPTION 4B

Option 4B is and RNP1 option using RF coding included to increase the distance of routes from Knutsford through the use of a track adjustment to the north commencing at the DER. A 5° adjustment is used for Runway 23R and 15° for Runway 23L.
An RNP+RF turn follows the initial track adjustment (1nm from DER for 23L), and it then follows a similar track to option 4A.
The design speed aligns to the CAP778 recommendation and may permit some aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
23L: After passing DER this route has a 15° track adjustment to the north which continues until 1nm from DER. An RNP+RF turn is then commenced which results in the route passing north of Knutsford. This RF turn takes aircraft over Mere where it combines with the option for 23R before heading in a north-easterly direction to avoid Bowdon and Altrincham. The route continues in this direction before making a second right turn to the east to route to the south of Sale before terminating at 7,000ft near Heaton Chapel.
23R: After passing DER this route has a 5° track adjustment to the north. An RNP+RF turn is then commenced which results in the route passing north of Knutsford. This is continued until the vicinity of Mere where the route converges with the option for 23L. The combined routes head in a north-easterly direction to avoid Bowdon and Altrincham and continue in this direction before making a second right turn to the east to route to the south of Sale before terminating at 7,000ft near Heaton Chapel.
A speed restriction of 210 KIAS is applied to the first turn which is the CAP778 recommended speed.

OPTION 5

This is an RNP1 option using RF coding that provides a direct route to the east using a single right turn.
It is similar to option 4A but with an increased speed in the turn which results in this option forming the westerly edge of the envelope in the initial turn
The greater speed will also permit a larger number of aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise. The design aims to have aircraft make the first right turn no closer than 1nm from DER.
23L: This route commences the single RF turn to the north of Knutsford. The turn continues north via Over Tabley before heading in an easterly direction north of Altrincham. The route continues easterly heading and terminates at 7,000ft at Burnage.
23R: This route commences the single RF turn earlier than 23L, prior to Parkgate Industrial Area to route further to the north of Knutsford. The turn continues to route between Over Tabley and Mere before heading in an easterly direction north of Altrincham. It then continues easterly heading and terminates at 7,000ft at Burnage.
A speed restriction of 220 KIAS is used for the first turn which is 10kts higher than option 4A.

Option 5 for Runway 23L was rejected at the DPE stage and has therefore not been assessed.

LEFT TURN OPTIONS

OPTION 6A

This is an RNP1 left turn option using RF coding. It is included to provide a direct route to the east following an initial left turn and is intended to provide an alternative to the existing right turn departures.
This route is already used tactically by ATC in adverse weather conditions and therefore formalises these routes. The speed of the initial left turn has been applied to create the smallest radius and reduce the noise impact on Knutsford.
These routes do not converge until reaching 7,000ft.
23L: This route commences the single RF left turn close to Mobberley and routes aircraft to the south of Knutsford. The turn continues before heading in an easterly direction to the south of Alderley Edge and continues south of Poynton on an easterly heading to terminate at 7,000ft to the west of New Mills.
23R: This route commences the single RF turn slightly earlier than 23L, which results in a track slightly further south of Knutsford. The turn continues before heading in an easterly direction to the south of Alderley Edge and continues south of Poynton on an easterly heading to terminate and converge with the option for 23L at 7,000ft to the west of New Mills.
A speed restriction of 190 KIAS is used for the first turn which allows the smallest radius. Although PANS-OPS compliant it should be assessed for flyability as part of the procedure validation process within Stage 4 of CAP1616.

Option 6A for Runway 23R was rejected at the DPE stage and has therefore not been assessed.

OPTION 6B

This is an RNP1 left turn option using RF coding that is identical to option 6A in the initial turn but terminates at 7,000ft further to the north. As with option 6A it is included to provide a direct route to the east following the initial left turn and to provide an alternative to the existing right turn departures. The speed of the initial left turn has been applied to create the smallest radius and reduce the noise impact on Knutsford.
23L: This route commences the single RF left turn close to Mobberley and routes aircraft to the south of Knutsford. The turn continues before heading in an easterly direction over Chelford to the south of Alderley Edge and continues via Woodford and Poynton to terminate at 7,000ft south of Marple.
23R: This route commences the single RF turn slightly earlier than 23L, which results in a track slightly further south of Knutsford. The turn continues before heading in an easterly direction over Chelford to the south of Alderley Edge and continues via Woodford and Poynton to terminate at 7,000ft south of Marple.
A speed restriction of 190 KIAS is used for the first turn which allows the smallest radius. Although PANS-OPS compliant it should be assessed for flyability as part of the procedure validation process within Stage 4 of CAP1616.

OPTION 6C

This is an RNP1 left turn option using RF coding that has been created with an earlier turn point when compared to option 6A and 6B to increase the distance of routes from Knutsford. This turn point used is less than 1nm from the DER but is identical to that used by existing Runway 23 departures.
After the initial turn it routes in a similar direction to option 6B and is included to provide a direct route to the east following the initial turn and provide an alternative to the existing right turn departures. The speed of the initial left turn has been applied to create the smallest radius and reduce the noise impact on Knutsford.
The waypoints for the first turn are positioned at the existing markers:
•For Runway 23R this first turn is at MCT D3.
•For Runway 23L, this is at D3.2 which is less than 1nm from DER, but this replicates the turn of the current procedure and therefore aligns to the Design Principle Safety.
23L: This route commences the single RF left turn close to Mobberley and routes aircraft further to the south of Knutsford when compared to option 6B. The turn continues before heading in an easterly direction over Chelford to the south of Alderley Edge and continues via Woodford and Poynton to terminate at 7,000ft at Marple.
23R: This route commences the single RF turn slightly earlier than 23L, which results in a track slightly further south of Knutsford when compared to option 6B. The turn continues before heading in an easterly direction over Chelford to the south of Alderley Edge and continues via Woodford and Poynton to terminate at 7,000ft at Marple.
A speed restriction of 190 KIAS is used for the first turn which allows the smallest radius. Although PANS-OPS compliant it should be assessed for flyability as part of the procedure validation process within Stage 4 of CAP1616.

OPTION 8A

This is an RNP1 left turn option using RF coding that uses a higher speed in the initial turn but terminates in a similar area to option 6A. As with option 6A it is included to provide a direct route to the east following the initial left turn and to provide an alternative to the existing right turn departures.
The speed of the initial left turn is the CAP778 recommended but this results in a track closer to Knutsford. The design speed may also permit some aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
23L: This route commences the single RF left turn close to Mobberley and routes aircraft close to the centre of Knutsford. The turn continues before heading in an easterly direction over Chelford to the south of Alderley Edge and continues to the north of Prestbury to terminate at 7,000ft close to Disley.
23R: This route commences the single RF turn slightly earlier than 23L, which results in a track to the southern edge of Knutsford. The turn continues before heading in an easterly direction over Chelford to the south of Alderley Edge and continues to the north of Prestbury to terminate and converge with the route for 23L at 7,000ft close to Disley.
A speed restriction of 210 KIAS is applied to the first turn which is the CAP778 recommended speed.

Option 8A for Runway 23R was rejected at the DPE stage and has therefore not been assessed.

OPTION 8C

This is an RNP1 left turn option using RF coding that has the higher CAP778 turn speed as options 8A and 8B but with an earlier turn point that aims to reduce the impact of noise on Knutsford. This turn point used is less than 1nm from the DER but is identical to that used by existing Runway 23 departures.
After the initial turn it routes in a similar direction to option 8B and is included to provide a direct route to the east following the initial turn and provide an alternative to the existing right turn departures.
The design speed may permit some aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
The waypoints for the first turn are positioned at the existing markers:
•For Runway 23R this first turn is at MCT D3.
•For Runway 23L, this is at D3.2 which is less than 1nm from DER, but this replicates the turn of the current procedure and therefore aligns with the Design Principle Safety.
23L: This route commences the single RF left turn close to Mobberley and routes aircraft just to the south of Knutsford. The turn continues before heading in an easterly direction to the south of Chelford and Alderley Edge and continues via Woodford and Poynton to terminate south of Marple.
23R: This route commences the single RF turn slightly earlier than 23L, which results in a track slightly further south of Knutsford than 23L. The turn continues before heading in an easterly direction to the south of Chelford and Alderley Edge and continues via Woodford and Poynton to terminate south of Marple.
A speed restriction of 210 KIAS is applied to the first turn which is the CAP778 recommended speed.

Option 8C for Runway 23R was rejected at the DPE stage and has therefore not been assessed.

Group	Impact	Level of Analysis	'Do nothing' Baseline – Runway 23L	'Do nothing' Baseline – Runway 23R
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing SONEX SID. In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this baseline overflies approximately 1,800 people and approximately 800 residential buildings. - Up to 7,000ft, this baseline overflies 115,700 people and approximately 50,700 residential buildings.	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing SONEX SID. In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this baseline overflies approximately 7,000 people and approximately 2,950 residential buildings. - Up to 7,000ft, this baseline overflies 202,600 people and approximately 90,300 residential buildings.
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 23L SONEX SID overflies four AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 23R SONEX SID overflies four AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring, although aircraft do all follow the extant procedures in a broader sense. The existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative emissions analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23L SONEX SID modal track, the track length is 20.11km (10.86nm).	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring, although aircraft do all follow the extant procedures in a broader sense. The existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative emissions analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23R SONEX SID modal track, the track length is 22.34km (12.06nm).
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario does not overfly any AONBs or National Parks.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario does not overfly any AONBs or National Parks.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23L SONEX SID modal track, the track length is 20.11km (10.86nm).	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23R SONEX SID modal track, the track length is 22.34km (12.06nm).
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the extant procedures.	No change to operational costs is attributable to maintaining the extant procedures.
Airport / Air navigation service provider	deployment costs	Initial Options Appraisal: Qualitative	No deployment costs applicable to extant procedures.	No deployment costs applicable to extant procedures.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.
		Summary of Analysis	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.

Option	Runway	Communities – Noise impact on health and quality of life
Option 1A	Runway 23L	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 11,200 people and approximately 4,750 residential buildings. - Up to 7,000ft, this option overflies approximately 154,600 people and approximately 100,150 residential buildings. Assessed up to 7,000ft, this option overflies a greater number of people and residential buildings than the 'do nothing' scenario and is therefore considered to be a dis-benefit.
Option 1A	Runway 23R	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 11,700 people and approximately 4,950 residential buildings. - Up to 7,000ft, this option overflies approximately 155,700 people and approximately 100,550 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Option 1C	Runway 23L	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 2,700 people and approximately 1,450 residential buildings. - Up to 7,000ft, this option overflies approximately 276,800 people and approximately 148,550 residential buildings. Assessed up to 7,000ft, this option overflies a greater number of people and residential buildings than the 'do nothing' scenario and is therefore considered to be of dis-benefit.
Option 1C	Runway 23R (NOT ASSESSED)	
Option 4A	Runway 23L (NOT ASSESSED)	
Option 4A	Runway 23R	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 2,600 people and approximately 1,100 residential buildings. - Up to 7,000ft, this option overflies approximately 234,600 people and approximately 106,150 residential buildings. Assessed up to 7,000ft, this option overflies a greater number of people and residential buildings than the 'do nothing' scenario and is therefore considered to be of dis-benefit.
Option 4B	Runway 23L	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 16,800 people and approximately 6,900 residential buildings. - Up to 7,000ft, this option overflies approximately 235,000 people and approximately 107,250 residential buildings. Assessed up to 7,000ft, this option overflies a greater number of people and residential buildings than the 'do nothing' scenario and is therefore considered to be of dis-benefit.
Option 4B	Runway 23R	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 10,800 people and approximately 4,450 residential buildings. - Up to 7,000ft, this option overflies approximately 238,500 people and approximately 108,500 residential buildings. Assessed up to 7,000ft, this option overflies a greater number of people and residential buildings than the 'do nothing' scenario and is therefore considered to be of dis-benefit.
Option 5	Runway 23L (NOT ASSESSED)	
Option 5	Runway 23R	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 5,800 people and approximately 2,400 residential buildings. - Up to 7,000ft, this option overflies approximately 204,400 people and approximately 92,500 residential buildings. Assessed up to 7,000ft, this option overflies a greater number of people and residential buildings than the 'do nothing' scenario and is therefore considered to be of dis-benefit.
Option 6A	Runway 23L	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 3,700 people and approximately 1,900 residential buildings. - Up to 7,000ft, this option overflies approximately 23,200 people and approximately 11,300 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Option 6A	Runway 23R (NOT ASSESSED)	
Option 6B	Runway 23L	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 3,700 people and approximately 1,900 residential buildings. - Up to 7,000ft, this option overflies approximately 42,800 people and approximately 20,050 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Option 6B	Runway 23R	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 3,300 people and approximately 1,700 residential buildings. - Up to 7,000ft, this option overflies approximately 43,300 people and approximately 20,350 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Option 6C	Runway 23L	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 2,400 people and approximately 1,150 residential buildings. - Up to 7,000ft, this option overflies approximately 44,800 people and approximately 20,850 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Option 6C	Runway 23R	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 4,000 people and approximately 2,100 residential buildings. - Up to 7,000ft, this option overflies approximately 47,100 people and approximately 22,100 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Option 8A	Runway 23L	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 3,500 people and approximately 1,700 residential buildings. - Up to 7,000ft, this option overflies approximately 14,600 people and approximately 7,200 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Option 8A	Runway 23R (NOT ASSESSED)	
Option 8C	Runway 23L	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 2,700 people and approximately 1,350 residential buildings. - Up to 7,000ft, this option overflies approximately 39,200 people and approximately 18,150 residential buildings. Assessed up to 7,000ft, this option overflies fewer people and residential buildings than the 'do nothing' scenario and is therefore considered to be beneficial.
Option 8C	Runway 23R (NOT ASSESSED)	

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Departure Envelope: SID Runway 23 South

'DO NOTHING' BASELINE

For the south design envelope, the 'do nothing' scenario for departures in terms of today's operation is based around the existing conventional SANBA and LISTO SIDs. The 'do nothing' scenario for departures consists of a modal track that has been derived to provide an accurate representation of what occurs today. In addition to the modal track, a polygon has also been created that represents an area where current operations are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this SID was based on the modal track created using Noise and Track Keeping data at altitudes of 4,000ft and 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Departure End of Runway and the end of the modal track.

SANBA – OPTION 1

Option 1 is an RNAV 1 replication of the current SANBA 1R/1Y SID and uses a fly-by to fly-over waypoint sequence with CF path terminator coding to create an approximate replication.
As a replication of the SANBA, this option routes to the west side of the envelope.
The fly-by waypoints are positioned to replicate the turn at the existing markers:
•23R this first turn is at MCT D3.
•23L this is at MCT D3.2 which less than 1nm from DER but as this replicates the turn of the current procedure it therefore aligns to the Design Principle Safety. This earlier turn is to avoid Knutsford.
As a replicated route it follows a similar track over the ground as the current published route. The first turn commences in the vicinity of Parkgate Industrial Area and the route kinks to the north of Knutsford before turning left to head south. The routes converge in the vicinity of Lostock Gralam and it then routes in a south easterly direction to pass west of Holmes Chapel and east of Sandbach and terminates at 7,000ft just west of Kidsgrove.
An element of dispersion would be apparent in the turns due to the fly-over waypoint and CF coding. A speed restriction of 200 KIAS, then 210 KIAS is used for the first and second turn to create replication of the current route.

SANBA – OPTION 4A

This RNAV1 option provides an initial turn over the southern edge of Knutsford and heads in a south-west direction. It serves a similar purpose as the SANBA 1R/1Y SID and terminates on the west side of the envelope.
The procedure uses a fly-over waypoint and can be coded as either course-to-fix, track-to-fix, or direct-to-fix. The climb gradient has been set at 6%.
An element of dispersion would be apparent in the turn due to the path terminator coding.
23L: After departure this route continues straight ahead before making a left turn to the south-west over Knutsford. It continues in this direction to the west of Holmes Chapel and Sandbach. It passes over the eastern edge of Crewe and converges with the option for 23R at the 7,000ft termination point just south of Crewe.
23R: After departure this route makes a left turn to the south-west to route between Knutsford and Mobberley and continues in this direction just to the west of Holmes Chapel and Sandbach. It passes over the eastern edge of Crewe and both routes converge at the 7,000ft termination point just south of Crewe.
A speed restriction of 190 KIAS is applied to the first turn.

SANBA – OPTION 4C

[illegible]

SANBA – OPTION 5C

[illegible]

SANBA – OPTION 6

[illegible]

LISTO – OPTION 2A

[illegible]

LISTO – OPTION 2B

[illegible]

LISTO – OPTION 5A

[illegible]

LISTO – OPTION 5B

[illegible]

Group	Impact	Level of Analysis	'Do Nothing' Baseline – Runway 23L	'Do Nothing' Baseline – Runway 23R	Option 1 – Runway 23L	Option 1 – Runway 23R
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing SANBA and LISTO SIDs. In terms of potential noise impact, initial quantitative analysis has identified that for the Runway 23L SANBA SID: - Up to 4,000ft, this baseline overflies approximately 1,800 people and approximately 800 residential buildings. - Up to 7,000ft, this baseline overflies 7,200 people and approximately 3,400 residential buildings. Initial quantitative analysis has identified that the existing Runway 23L LISTO SID - Up to 4,000ft, this baseline overflies approximately 1,600 people and approximately 850 residential buildings. - Up to 7,000ft, this baseline overflies 27,700 people and approximately 14,550 residential buildings.	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing SANBA and LISTO SIDs. In terms of potential noise impact, initial quantitative analysis has identified that for the Runway 23L SANBA SID: - Up to 4,000ft, this baseline overflies approximately 3,400 people and approximately 1,450 residential buildings. - Up to 7,000ft, this baseline overflies 14,300 people and approximately 7,550 residential buildings. Initial quantitative analysis has identified that the existing Runway 23R LISTO SID - Up to 4,000ft, this baseline overflies approximately 2,300 people and approximately 1,250 residential buildings. - Up to 7,000ft, this baseline overflies 27,900 people and approximately 14,800 residential buildings.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 1,200 people and approximately 600 residential buildings. - Up to 7,000ft, this option overflies approximately 25,900 people and approximately 13,600 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 2,700 people and approximately 1,300 residential buildings. - Up to 7,000ft, this option overflies approximately 27,900 people and approximately 14,550 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of dis-benefit.
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 23L SANBA SID does not overfly any AQMAs. The existing Runway 23L LISTO SID overflies three AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs,the existing Runway 23R SANBA SID overflies one AQMA. The existing Runway 23L LISTO SID overflies three AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	Option 1 L overflies one AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.	Option 1 R overflies one AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring, although aircraft do all follow the extant procedures in a broader sense. The existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative emissions analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23L SANBA SID modal track, the track length is 25.75km (13.90nm). In the case of the existing Runway 23L LISTO SID modal track, the track length is 23.23km (12.54nm).	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring, although aircraft do all follow the extant procedures in a broader sense. The existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative emissions analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23R SANBA SID modal track, the track length is 29.63km (16.00nm). In the case of the existing Runway 23R LISTO SID modal track, the track length is 24.52km (13.24nm).	Option 1 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1 L is 46.78km (25.26nm). When compared to the 'do nothing' scenario, Option 1 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 1 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1 R is 49.59km (26.78nm). When compared to the 'do nothing' scenario, Option 1 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenarios for SANBA and LISTO SIDs do not overfly any AONBs or National Parks.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenarios for SANBA and LISTO SIDs do not overfly any AONBs or National Parks.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23L SANBA SID modal track, the track length is 25.75km (13.90nm). In the case of the existing Runway 23L LISTO SID modal track, the track length is 23.23km (12.54nm).	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23R SANBA SID modal track, the track length is 29.63km (16.00nm). In the case of the existing Runway 23R LISTO SID modal track, the track length is 24.52km (13.24nm).	Option 1 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 46.78km (25.26nm) long. When compared to the 'do nothing' scenario, Option 1 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 1 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 49.59km (26.78nm) long. When compared to the 'do nothing' scenario, Option 1 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the extant procedures.	No change to operational costs is attributable to maintaining the extant procedures.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	deployment costs	Initial Options Appraisal: Qualitative	No deployment costs applicable to extant procedures.	No deployment costs applicable to extant procedures.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
		Summary of Analysis	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	When compared to the 'do nothing' scenario, Option 1 L performs: - worse in terms of Noise impact, Air Quality, Greenhouse Gas emissions and Fuel burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1 L has been deemed as Acceptable, as it overflies the third fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 1 R performs: - worse in terms of Noise impact, Greenhouse Gas emissions and Fuel burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1 R has been deemed as Acceptable, as it overflies the third fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.

Group	Impact	Option 4A – Runway 23L	Option 4A – Runway 23R
Communities	Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 5,400 people and approximately 2,700 residential buildings. - Up to 7,000ft, this option overflies approximately 42,100 people and approximately 22,200 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 3,400 people and approximately 1,500 residential buildings. - Up to 7,000ft, this option overflies approximately 39,800 people and approximately 20,800 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of dis-benefit.
Communities	Air Quality	Option 4A L overflies one AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.	Option 4A R overflies no AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be beneficial as it overflies fewer AQMAs.
Wider Society	Greenhouse Gas impact	Option 4A L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 4A L is 44.45km (24.00nm). When compared to the 'do nothing' scenario, Option 4A L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 4A R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 4A R is 46.27km (24.98nm). When compared to the 'do nothing' scenario, Option 4A R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Wider Society	Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Option 4A L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 44.45km (24.00nm) long. When compared to the 'do nothing' scenario, Option 4A L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 4A R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 46.27km (24.98nm) long. When compared to the 'do nothing' scenario, Option 4A R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	deployment costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
	Summary of Analysis	When compared to the 'do nothing' scenario, Option 4A L performs: - worse in terms of Noise impact, Air Quality, Greenhouse Gas emissions and Fuel burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 4A L has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 4A R performs: - worse in terms of Noise impact, Greenhouse Gas emissions and Fuel burn. - better in terms of Air Quality, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 4A R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.

Group	Impact	Option 4C – Runway 23L	Option 4C – Runway 23R	Option 5C – Runway 23L	Option 5C – Runway 23R	Option 6 – Runway 23L	Option 6 – Runway 23R	Option 2A – Runway 23L	Option 2A – Runway 23R	Option 2B – Runway 23L	Option 2B – Runway 23R	Option 5A – Runway 23L	Option 5A – Runway 23R	Option 5B – Runway 23L	Option 5B – Runway 23R
Communities	Noise impact on health and quality of life	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Communities	Air Quality	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Wider Society	Greenhouse Gas impact	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Wider Society	Capacity and resilience	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Wider Society	Tranquillity	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Wider Society	Biodiversity	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
General Aviation	Access	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
General Aviation / commercial airlines	Economic impact from increased effective capacity	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
General Aviation / commercial airlines	Fuel burn	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Commercial airlines	Training costs	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Commercial airlines	Other costs	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Airport / Air navigation service provider	Infrastructure costs	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Airport / Air navigation service provider	Operational costs	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Airport / Air navigation service provider	deployment costs	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Safety Assessment	Safety Assessment	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Summary of Analysis	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Departure Envelope: SID Runway 23 West

'DO NOTHING' BASELINE

For the west design envelope, the 'do nothing' scenario for departures in terms of today's operation is based around current operations where aircraft routing to the west via an EKLAD SID are vectored off the SID once they are above 3,000ft. The 'do nothing' scenario for departures consists of a modal track that has been derived to provide an accurate representation of what occurs today. In addition to the modal track, a polygon has also been created that represents an area where current operations are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this SID was based on the modal track created using Noise and Track Keeping data at altitudes of 4,000ft and 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Departure End of Runway and the end of the modal track.

OPTION 7

This is an RNAV1 option that modifies option 2 to minimise the interactions with LPL airspace following stakeholder feedback.
It provides an initial climb out to a fly-over waypoint and then a right turn to route north of Knutsford and direct towards Wallasey to align with current operational practice. It follows the same lateral track as option 2 but following stakeholder feedback to eliminate interactions with LPL inbound traffic to Runway 27, it has an increased climb gradient up to the point the LPL delegated airspace is overflown. Thereafter the gradient is reduced to one that will result in the route terminating in the same location as option 2, which has been designed to a constant 6% gradient.
The initial climb gradient in this option is greater than the 6% to 7,000ft that has been adopted for other routes and which was identified as flyable by all aircraft within the fleet equipage survey at section 5.6. This survey identified that some aircraft could exceed this 6% gradient, and because this initial climb gradient is only required to 3,500ft it will be assessed with the airlines to confirm viability should it be taken forward.
The initial climb gradient has been set at 11.64% for 23L / 9.81% for 23R for the portion of the SID prior to where the route meets the 3nm buffer of the LPL delegated airspace. Thereafter a maximum climb gradient of 4.2% is applied to terminate at 7,000ft at the same end position as option 2. Waypoints will be placed at the location of the 3nm boundary to specify that an altitude of 'at or above 3,500ft' is required to ensure safe separation.
The design speed may allow aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
23L: After departure, the route makes a turn to the right 1nm from DER which takes it just to the north of Knutsford through Mere. It then heads in a north-westerly direction routing to the south of Warrington and terminates at 7,000ft to the south-east of Liverpool.
23R: Similar to option for 23L, this route makes a right turn following take-off to the north of Knutsford through Mere. It then heads in a north-westerly direction routing to the south of Warrington and terminates at 7,000ft to the south-east of Liverpool.
An element of dispersion would be apparent in the turn due to the fly-over waypoint and either CF or DF coding.
A speed restriction of 210 KIAS is applied to the first turn.

OPTION 8

This is an RNAV1 option that modifies option 3B to minimise the interactions with LPL airspace following stakeholder feedback.
It follows the same lateral track as option 3B but following stakeholder feedback to eliminate interactions with LPL inbound traffic to Runway 27, it has an increased climb gradient up to the point the LPL delegated airspace is overflown. Thereafter the gradient is reduced to one that will result in the route terminating in the same location as option 3B.
The initial climb gradient in this option is greater than the 6% to 7,000ft that has been adopted for other routes and which was identified as flyable by all aircraft within the fleet equipage survey at section 5.6. This survey identified that some aircraft could exceed this 6% gradient, and because this initial climb gradient is only required to 3,500ft it will be assessed with the airlines to confirm viability should it be taken forward.
The initial climb gradient has been set at 12.1% for 23L / 10.3% for 23R for the portion of the SID prior to where the route meets the 3nm buffer of the LPL delegated airspace. Thereafter a maximum climb gradient of 3.7% is applied to terminate at 7,000ft at the same end position as option 3B. As the option is within a turn segment at the location of the airspace boundary, a waypoint cannot be placed on the intersection of the nominal track and the boundary. A restriction greater than 3,500 ft would need to be placed upon the second waypoint to follow the profile of the required climb to ensure that the correct altitude is met at the boundary.
23L: After departure, the route makes a turn to the right at 0.7nm from DER which replicates the turn of the current EKLAD procedure and therefore aligns to the Design Principle Safety. It continues to replicate the EKLAD SID to the north of Knutsford through Mere and passes north of Northwich at which point it turns right onto a westerly heading which takes it overhead Widnes where it terminates at 7,000ft.
23R: After departure, the route makes a turn to the right and replicates the track of the current EKLAD SID to the north of Knutsford through Mere where it combines with the route for 23L. It then routes north of Northwich at which point it turns right onto a westerly heading which takes it overhead Widnes where it terminates at 7,000ft
An element of dispersion would be apparent in the turn due to the fly-over waypoint and either CF or DF coding.
A speed restriction of 200 KIAS then 250 KIAS is used for the first turn and second turn.

OPTION 9

This is an RNP1 option that modifies option 4 to minimise the interactions with LPL airspace following stakeholder feedback.
It follows the same lateral track as option 4 but following stakeholder feedback to eliminate interactions with LPL inbound traffic to Runway 27, it has an increased climb gradient up to the point the LPL delegated airspace is overflown. Thereafter the gradient is reduced to one that will result in the route terminating in the same location as option 4.
It has an almost identical track across the ground as option 2 but to a higher navigation standard to provide more accurate track keeping.
The initial climb gradient in this option is greater than the 6% to 7,000ft that has been adopted for other routes and which was identified as flyable by all aircraft within the fleet equipage survey at section 5.6. This survey identified that some aircraft could exceed this 6% gradient, and because this initial climb gradient is only required to 3,500ft it will be assessed with the airlines to confirm viability should it be taken forward.
The initial climb gradient has been set at 11.7% for 23L / 9.9% for 23R for the portion of the SID prior to where the route meets the 3nm buffer of the LPL delegated airspace. Thereafter a maximum climb gradient of 4.2% is applied to terminate at 7,000ft at the same end position as option 4. Waypoints will be placed at the location of the 3nm boundary to specify that an altitude of 'at or above 3,500ft' is required to ensure safe separation.
23L: After departure, the route makes a turn to the right 1nm from DER which takes it just to the north of Knutsford through Mere. It then heads in a north-westerly direction routing to the south of Warrington and terminates at 7,000ft to the south-east of Liverpool.
23R: Similar to option for 23L, this route makes a turn to the right which takes it just to the north of Knutsford through Mere. It then heads in a north-westerly direction routing to the south of Warrington and terminates at 7,000ft to the south-east of Liverpool.
A speed restriction of 190 KIAS is used for the first turn, thereafter 250 KIAS would apply. Although PANS-OPS compliant it should be assessed for flyability as part of the procedure validation process within Stage 4 of CAP1616.

OPTION 10

This is an RNP1 option that modifies option 5A to minimise the interactions with LPL airspace following stakeholder feedback.
It follows the same lateral track as option 5A with an RF right turn that routes north of Knutsford and then direct towards Wallasey to align with current operational practice. However, to eliminate interactions with LPL inbound traffic to Runway 27, it has an increased climb gradient up to the point the LPL delegated airspace is overflown. Thereafter the gradient is reduced to one that will result in the route terminating in the same position as option 5A, which has been designed to a constant 6% gradient.
The initial climb gradient in this option is greater than the 6% to 7,000ft that has been adopted for other routes and which was identified as flyable by all aircraft within the fleet equipage survey at section 5.6. This survey identified that some aircraft could exceed this 6% gradient, and because this initial climb gradient is only required to 3,500ft it will be assessed with the airlines to confirm viability should it be taken forward.
The initial climb gradient has been set at 11.3% for 23L / 9.7% for 23R for the portion of the SID prior to where the route meets the 3nm buffer of the LPL delegated airspace. Thereafter a maximum climb gradient of 4.2% is applied to terminate at 7,000ft at the same end position as option 5A.
Waypoints will be placed at the location of the 3nm boundary to specify that an altitude of 'at or above 3,500ft' is required to ensure safe separation. For 23L, placing a waypoint on this boundary may result in a segment length that is too short between the RF turn and the 3nm boundary (in accordance with PANS-OPS requirements). This could either be assessed in flight validation for FMS anomalies, or the waypoint can be located at the necessary distance from the RF turn and specified with a higher altitude than 3,500ft to follow the profile of the required climb to ensure that the correct altitude is met at the boundary.
The route followed by the options is as follows:
23L: After departure, the route makes a turn to the right at 1nm from DER which takes it just to the north of Knutsford through Mere. It then heads in a north-westerly direction routing to the south of Warrington and terminates at 7,000ft just west of Widnes.
23R: After departure, the route makes a turn to the right which takes it over the northern edge of Knutsford through Mere. It then heads in a north-westerly direction routing to the south of Warrington and terminates at 7,000ft just west of Widnes.
A speed restriction of 220 KIAS is used for the first turn, thereafter 250 KIAS would apply.

OPTION 11

This is an RNP1 option that modifies option 5B to minimise the interactions with LPL airspace following stakeholder feedback.
It follows the same lateral track as option 5B with an RF right turn that routes north of Knutsford and then direct towards Wallasey to align with current operational practice. However, to eliminate interactions with LPL inbound traffic to Runway 27, it has an increased climb gradient up to the point the LPL delegated airspace is overflown. Thereafter the gradient is reduced to one that will result in the route terminating in the same position as option 5B.
The initial climb gradient in this option is greater than the 6% to 7,000ft that has been adopted for other routes and which was identified as flyable by all aircraft within the fleet equipage survey at section 5.6. This survey identified that some aircraft could exceed this 6% gradient, and because this initial climb gradient is only required to 3,500ft it will be assessed with the airlines to confirm viability should it be taken forward.
The initial climb gradient has been set at 11.5% for 23L / 9.7% for 23R for the portion of the SID prior to where the route meets the 3nm buffer of the LPL delegated airspace; thereafter a maximum climb gradient of 4.2% would be required to terminate at 7,000ft at the same end position as option 5B. Waypoints will be placed at the location of the 3nm boundary to specify that an altitude of 'at or above 3,500ft' is required to ensure safe separation.
The design speed will permit a larger number of aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
23L: After departure, the route makes a turn to the right at 1nm from DER which takes it to the north of Knutsford through Mere. It then heads in a north-westerly direction routing to the south of Warrington and terminates at 7,000ft just west of Widnes.
23R: After departure, the route makes a turn to the right which takes it just to the north of Knutsford through Mere. It then heads in a north-westerly direction routing to the south of Warrington and terminates at 7,000ft just west of Widnes.
A speed restriction of 220 KIAS is used for the first turn, thereafter 250 KIAS would apply.

OPTION 12

This is an RNP1 option that modifies option 6 to minimise the interactions with LPL airspace following stakeholder feedback.
It follows the same lateral track as option 6 with an RF right turn that routes north before turning towards Wallasey. However, to eliminate interactions with LPL inbound traffic to Runway 27, it has an increased climb gradient up to the point the LPL delegated airspace is overflown. Thereafter the gradient is reduced to one that will result in the route terminating in the same position as option 6.
The initial climb gradient in this option is greater than the 6% to 7,000ft that has been adopted for other routes and which was identified as flyable by all aircraft within the fleet equipage survey at section 5.6. This survey identified that some aircraft could exceed this 6% gradient, and because this initial climb gradient is only required to 3,500ft it will be assessed with the airlines to confirm viability should it be taken forward.
The initial climb gradient has been set at 11.0% for 23L/8.9% for 23R for the portion of the SID prior to where the route meets the 3nm buffer of the LPL delegated airspace. Thereafter a maximum climb gradient of 4.4% is applied to terminate at 7,000ft at the same end position as option 6. As the option is within a turn segment at the location of the airspace boundary, a waypoint cannot be placed on the intersection of the nominal track and the boundary. A restriction greater than 3500ft would need to be placed upon the waypoints at the end of the RF turns to follow the profile of the required climb to ensure that the correct altitude is met at the boundary.
The design speed aligns to the CAP778 recommendation and may permit some aircraft to fly this route in a clean configuration (without the use of flaps) which has potential benefits in terms of noise.
23L: After departure, the route makes a turn to the right at 1nm from DER which takes it to the north of Knutsford through Mere. It then heads north on a short straight segment before making a left turn to the west, just to the north of Lymm where it combines with the option from 23R. The combined routes continue in a westerly direction routing overhead Warrington and terminate at 7,000ft just north of Widnes.
23R: After departure, the route makes a turn to the right which takes it to the north of Knutsford through Mere. It then heads north on a short straight segment before making a left turn to the west, just to the north of Lymm where it combines with the option from 23L. The combined routes continue in a westerly direction routing overhead Warrington and terminate at 7,000ft just north of Widnes.
A speed restriction of 210 KIAS is applied to the first turn which is the CAP778 recommended speed.

Group	Impact	Level of Analysis	'DO NOTHING' BASELINE Runway 23L	'DO NOTHING' BASELINE Runway 23R
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing EKLAD SID. In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 800 people and approximately 350 residential buildings. - Up to 7,000ft, this option overflies approximately 6,300 people and approximately 2,900 residential buildings.	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing EKLAD SID. In terms of potential noise impact, initial quantitative analysis has identified that:- Up to 4,000ft, this option overflies approximately 800 people and approximately 350 residential buildings. - Up to 7,000ft, this option overflies approximately 10,100 people and approximately 4,900 residential buildings.
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 23L EKLAD SID overflies one AQMA. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 23L EKLAD SID overflies one AQMA. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring, although aircraft do all follow the extant procedures in a broader sense. The existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative emissions analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23L EKLAD SID modal track, the track length is 27.41km (14.80nm).	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring, although aircraft do all follow the extant procedures in a broader sense. The existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative emissions analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23R EKLAD SID modal track, the track length is 26.63km (14.38nm).
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario does not overfly any AONBs or National Parks.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario does not overfly any AONBs or National Parks.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23L EKLAD SID modal track, the track length is 27.41km (14.80nm).	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23R EKLAD SID modal track, the track length is 26.63km (14.38nm).
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the extant procedures.	No change to operational costs is attributable to maintaining the extant procedures.
Airport / Air navigation service provider	deployment costs	Initial Options Appraisal: Qualitative	No deployment costs applicable to extant procedures.	No deployment costs applicable to extant procedures.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.

Group	Impact	OPTION 7 Runway 23L	OPTION 7 Runway 23R	OPTION 8 Runway 23L	OPTION 8 Runway 23R
Communities	Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 1,300 people and approximately 700 residential buildings. - Up to 7,000ft, this option overflies approximately 55,900 people and approximately 27,500 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 2,800 people and approximately 1,350 residential buildings. - Up to 7,000ft, this option overflies approximately 55,500 people and approximately 27,129 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 1,000 people and approximately 500 residential buildings. - Up to 7,000ft, this option overflies approximately 60,500 people and approximately 27,750 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 1,000 people and approximately 500 residential buildings. - Up to 7,000ft, this option overflies approximately 60,900 people and approximately 28,000 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit..
Communities	Air Quality	Option 7 L overflies three AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.	Option 7 R overflies three AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.	Option 8 L overflies three AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.	Option 8 R overflies three AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.
Wider Society	Greenhouse Gas impact	Option 7 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 7 L is 38.73km (20.91nm). When compared to the 'do nothing' scenario, Option 7 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 7 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 7 R is 40.17km (21.69nm). When compared to the 'do nothing' scenario, Option 7 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 8 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 8 L is 40.19km (21.70nm). When compared to the 'do nothing' scenario, Option 8 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 8 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 8 R is 41.85km (22.59nm). When compared to the 'do nothing' scenario, Option 8 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Wider Society	Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Option 7 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 38.73km (20.91nm) long. When compared to the 'do nothing' scenario, Option 7 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 7 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.17km (21.69nm) long. When compared to the 'do nothing' scenario, Option 7 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 8 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.19km (21.70nm) long. When compared to the 'do nothing' scenario, Option 8 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 8 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 41.85km (22.59nm) long. When compared to the 'do nothing' scenario, Option 8 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	deployment costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic, MAN arrivals/transitions and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic, MAN arrivals/transitions and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic, MAN arrivals/transitions and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic, MAN arrivals/transitions and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.

Group	Impact	OPTION 9 Runway 23L	OPTION 9 Runway 23R	OPTION 10 Runway 23L	OPTION 10 Runway 23R
Communities	Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 1,800 people and approximately 850 residential buildings. - Up to 7,000ft, this option overflies approximately 55,500 people and approximately 27,100 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 3,800 people and approximately 1,500 residential buildings. - Up to 7,000ft, this option overflies approximately 56,200 people and approximately 27,050 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 7,200 people and approximately 3,350 residential buildings. - Up to 7,000ft, this option overflies approximately 67,100 people and approximately 30,400 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 7,500 people and approximately 3,450 residential buildings. - Up to 7,000ft, this option overflies approximately 66,400 people and approximately 29,900 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.
Communities	Air Quality	Option 9 L overflies three AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.	Option 9 R overflies four AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.	Option 10 L overflies four AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.	Option 10 R overflies four AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.
Wider Society	Greenhouse Gas impact	Option 9 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 9 L is 38.70km (20.90nm). When compared to the 'do nothing' scenario, Option 9 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 9 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 9 R is 40.12km (21.66nm). When compared to the 'do nothing' scenario, Option 9 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 10 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 10 L is 39.05km (21.09nm). When compared to the 'do nothing' scenario, Option 10 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 10 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 10 R is 40.06km (21.63nm). When compared to the 'do nothing' scenario, Option 10 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Wider Society	Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Option 9 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 38.70km (20.90nm) long. When compared to the 'do nothing' scenario, Option 9 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 9 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.12km (21.66nm) long. When compared to the 'do nothing' scenario, Option 9 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 10 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 39.05km (21.09nm) long. When compared to the 'do nothing' scenario, Option 10 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 10 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.06km (21.63nm) long. When compared to the 'do nothing' scenario, Option 10 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	deployment costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic, MAN arrivals/transitions and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic, MAN arrivals/transitions and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic, MAN arrivals/transitions and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic, MAN arrivals/transitions and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.

Group	Impact	OPTION 11 Runway 23L	OPTION 11 Runway 23R	OPTION 12 Runway 23L	OPTION 12 Runway 23R
Communities	Noise impact on health and quality of life	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 6, 200 people and approximately 2,900 residential buildings. - Up to 7,000ft, this option overflies approximately 67,600 people and approximately 30,400 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 7,500 people and approximately 3,450 residential buildings. - Up to 7,000ft, this option overflies approximately 68,500 people and approximately 30,700 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 14,900 people and approximately 6,600 residential buildings. - Up to 7,000ft, this option overflies approximately 129,400 people and approximately 60,350 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 12,400 people and approximately 5,600 residential buildings. - Up to 7,000ft, this option overflies approximately 129,500 people and approximately 60,350 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.
Communities	Air Quality	Option 11 L overflies four AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.	Option 11 R overflies three AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.	Option 12 L overflies three AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.	Option 12 R overflies three AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of a dis-benefit as it overflies more AQMAs.
Wider Society	Greenhouse Gas impact	Option 11 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 11 L is 38.32km (20.69nm). When compared to the 'do nothing' scenario, Option 11 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 11 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 11 R is 39.70km (21.43nm). When compared to the 'do nothing' scenario, Option 11 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 12 L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 12 L is 42.48km (22.94nm). When compared to the 'do nothing' scenario, Option 12 L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 12 R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 12 R is 43.20km (23.32nm). When compared to the 'do nothing' scenario, Option 12 R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Wider Society	Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Option 11 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 38.32km (20.69nm) long. When compared to the 'do nothing' scenario, Option 11 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 11 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 39.70km (21.43nm) long. When compared to the 'do nothing' scenario, Option 11 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 12 L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 42.48km (22.94nm) long. When compared to the 'do nothing' scenario, Option 12 L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 12 R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 43.20km (23.32nm) long. When compared to the 'do nothing' scenario, Option 12 R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	deployment costs	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic, MAN arrivals/transitions and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic, MAN arrivals/transitions and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic, MAN arrivals/transitions and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic, MAN arrivals/transitions and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.

Summary of Analysis	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	When compared to the 'do nothing' scenario, Option 7 L performs: - worse in terms of Air Quality, Noise impact, Greenhouse Gas emissions and Fuel Burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 7 L has been deemed as Favourable, as it overflies the second fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 7 R performs: - worse in terms of Air Quality, Noise impact, Greenhouse Gas emissions and Fuel Burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 7 R has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 8 L performs: - worse in terms of Air Quality, Noise impact, Greenhouse Gas emissions and Fuel Burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 8 L has been deemed as Acceptable, as it overflies the third fewest population when compared to other routes (originating from the same runway direction) within the same design envelope	When compared to the 'do nothing' scenario, Option 8 R performs: - worse in terms of Air Quality, Noise impact, Greenhouse Gas emissions and Fuel Burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 8 R has been deemed as Acceptable, as it overflies the third fewest population when compared to other routes (originating from the same runway direction) within the same design envelope	When compared to the 'do nothing' scenario, Option 9 L performs: - worse in terms of Air Quality, Noise impact, Greenhouse Gas emissions and Fuel Burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 9 L has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 9 R performs: - worse in terms of Air Quality, Noise impact, Greenhouse Gas emissions and Fuel Burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 9 R has been deemed as Favourable, as it overflies the second fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 10 L performs: - worse in terms of Air Quality, Noise impact, Greenhouse Gas emissions and Fuel Burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 10 L has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 10 R performs: - worse in terms of Air Quality, Noise impact, Greenhouse Gas emissions and Fuel Burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 10 R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 11 L performs: - worse in terms of Air Quality, Noise impact, Greenhouse Gas emissions and Fuel Burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 11 L has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 11 R performs: - worse in terms of Air Quality, Noise impact, Greenhouse Gas emissions and Fuel Burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 11 R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 12 L performs: - worse in terms of Air Quality, Noise impact, Greenhouse Gas emissions and Fuel Burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 12 L has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 12 R performs: - worse in terms of Air Quality, Noise impact, Greenhouse Gas emissions and Fuel Burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 12 R has been rejected as it overflies a greater population when compared to other options (originating from the same runway direction) within the same design envelope.

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Departure Envelope: SID Runway 23 Southwest

	'DO NOTHING' BASELINE	EKLAD – OPTION 1D
	For the south-west design envelope, the 'do nothing' scenario for departures in terms of today's operation is based around current operations where aircraft routing to the west via the EKLAD, KUXEM and MONTY SIDs. The 'do nothing' scenario for departures consists of a modal track that has been derived to provide an accurate representation of what occurs today. In addition to the modal track, a polygon has also been created that represents an area where current operations are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this SID was based on the modal track created using Noise and Track Keeping data at altitudes of 4,000ft and 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Departure End of Runway and the end of the modal track. **Note: There has been no overflight analysis conducted with regards to define a baseline for the MONTY SID due to its current lack of regular use and the route usually being utilised for traffic leaving CAS. A replication of this SID has been provided at Option 1A and for assessment purposes, this option has been compared against data relating to the EKLAD 'do nothing' scenario.**	This option is included to provide a RNAV1 replication of the EKLAD 1R/1Y SIDs. The procedure uses fly-by waypoints, positioned to replicate the turn at the existing markers: •23R this first turn is at MCT D3. •23L this is at MCT D3.2 which less than 1nm from DER but as this replicates the turn of the current procedure it therefore aligns to the Design Principle Safety. This earlier turn is to avoid Knutsford. As a replicated route it follows a similar track over the ground as the current route. This routes aircraft to the north of Knutsford, before making a left turn to the west to route north of Northwich. The route continues in this direction until reaching 7,000ft to the north-east of Chester. A speed restriction of 200 KIAS is used for the first turn, thereafter 250 KIAS would apply.

Group	Impact	Level of Analysis	Baseline – Runway 23L	Baseline – Runway 23R	Option 1D – Runway 23L	Option 1D – Runway 23R
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing EKLAD and KUXEM SIDs. In terms of potential noise impact, initial quantitative analysis has identified for the EKLAD baseline that: - Up to 4,000ft, this baseline overflies approximately 800 people and approximately 350 residential buildings. - Up to 7,000ft, this baseline overflies 6,300 people and approximately 2,900 residential buildings. Initial quantitative analysis has identified for the KUXEM baseline that: - Up to 4,000ft, this baseline overflies approximately 700 people and approximately 300 residential buildings. - Up to 7,000ft, this baseline overflies 15,800 people and approximately 7,700 residential buildings.	For comparison purposes within the IOA, the 'do nothing' scenario was based upon the existing EKLAD and KUXEM SIDs. In terms of potential noise impact, initial quantitative analysis has identified for the EKLAD baseline that: - Up to 4,000ft, this baseline overflies approximately 800 people and approximately 350 residential buildings. - Up to 7,000ft, this baseline overflies 10,100 people and approximately 4,900 residential buildings. Initial quantitative analysis has identified for the KUXEM baseline that: - Up to 4,000ft, this baseline overflies approximately 500 people and approximately 200 residential buildings. - Up to 7,000ft, this baseline overflies 15,500 people and approximately 7,500 residential buildings.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 800 people and approximately 450 residential buildings. - Up to 7,000ft, this option overflies approximately 11,800 people and approximately 5,900 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.	In terms of potential noise impact, initial quantitative analysis has identified that: - Up to 4,000ft, this option overflies approximately 900 people and approximately 450 residential buildings. - Up to 7,000ft, this option overflies approximately 12,100 people and approximately 6,100 residential buildings. Assessed up to 7,000ft, this option overflies more people and residential buildings than the 'do nothing' scenario and is therefore considered to be of a dis-benefit.
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 23L EKLAD SID overflies one AQMA while the Runway 23L KUXEM SID does not directly overfly any AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions. The majority of the extant procedure involves overflight above 1,000ft, other than the areas in the immediate vicinity of the Departure End of Runway. In terms of AQMAs, the existing Runway 23R EKLAD SID overflies one AQMA while the Runway 23L KUXEM SID does not directly overfly any AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	Option 1D L overflies one AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.	Option 1D R overflies one AQMAs; however, as per CAP1616 , para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate vicinity of the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring, although aircraft do all follow the extant procedures in a broader sense. The existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative emissions analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23L EKLAD SID modal track, the track length is 27.41km (14.80nm). In the case of the existing Runway 23L KUXEM SID modal track, the track length is 24.83km (13.41nm).	Current routes do not enable continuous climb operations. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring, although aircraft do all follow the extant procedures in a broader sense. The existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative emissions analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23R EKLAD SID modal track, the track length is 26.63km (14.38nm). In the case of the existing Runway 23R KUXEM SID modal track, the track length is 24.63km (13.30nm).	Option 1D L has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1D L is 40.76km (22.01nm). When compared to the 'do nothing' scenario, Option 1D L is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.	Option 1D R has been designed to support continuous climb operations. An element of radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1D R is 42.38km (22.89nm). When compared to the 'do nothing' scenario, Option 1D R is longer and is therefore expected to emit more greenhouse gases this option is deemed to be of dis-benefit. More in-depth analysis will take place at Stage 3, to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario for the EKLAD and KUXEM SIDs do not overfly any AONBs or National Parks.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The 'do nothing' scenario for the EKLAD and KUXEM SIDs do not overfly any AONBs or National Parks.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for GA/airlines.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23L EKLAD SID modal track, the track length is 27.41km (14.80nm). In the case of the existing Runway 23L KUXEM SID modal track, the track length is 24.83km (13.41nm).	The existing MAN procedures for departures do not enable continuous climb operations. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn analysis. This will be covered in Stage 3. In order to make a comparison in Stage 2, track mileage is used, based on the theory that the shorter the track mileage, the less greenhouse gases are emitted. In the case of the existing Runway 23R EKLAD SID modal track, the track length is 26.63km (14.38nm). In the case of the existing Runway 23R KUXEM SID modal track, the track length is 24.63km (13.30nm).	Option 1D L supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 40.76km (22.01nm) long. When compared to the 'do nothing' scenario, Option 1D L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 1D R supports continuous climb operations, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 42.38km (22.89nm) long. When compared to the 'do nothing' scenario, Option 1D R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra pilot/crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the extant procedures.	No change to operational costs is attributable to maintaining the extant procedures.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	deployment costs	Initial Options Appraisal: Qualitative	No deployment costs applicable to extant procedures.	No deployment costs applicable to extant procedures.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft departing MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a possible increase in ATCO workload.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	Possible hazards have been identified, some of which are extant. Firstly, aircraft executing a MAP may conflict with aircraft on the SID. This is an extant hazard. In addition, there is the potential for faster aircraft to catch up with slower aircraft due to dispersion in the turn, which may lead to a loss of separation. Furthermore, options within this envelope may conflict with Liverpool traffic and some GA aircraft operating at low level. These hazards can be mitigated through the design process or procedurally if required. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
		Summary of Analysis	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and Economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing SIDs do not enable continuous climb operations to 7,000ft, which leads to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and economic impact, the 'do nothing' baseline provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	When compared to the 'do nothing' scenario, Option 1D L performs: - worse in terms of Noise impact, Greenhouse Gases and Fuel burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1D L has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope.	When compared to the 'do nothing' scenario, Option 1D R performs: - worse in terms of Noise impact, Greenhouse Gases and Fuel burn. - better in terms of Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. Possible conflicts with some routes operated by other routes/nearby airports have been identified, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed as in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis is required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1D R has been deemed the Preferred option (within this design envelope), as it overflies the fewest population when compared to other routes (originating from the same runway direction) within the same design envelope..

[illegible]

Arrivals

MAG Manchester Airport

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Arrival Envelope: Runway 05 North 3,000ft (Baseline ROSUN)

			'DO NOTHING' BASELINE		IAF Steak - OPTION 1A		IAF 3 - OPTION 8A		IAF 4 - OPTION 9A	
			For arrivals from the north, the 'do nothing' scenario in terms of today's operation is based around the existing ROSUN and MIRSI Holds. A modal track has been derived to provide an accurate representation of what occurs today. The 'do nothing' scenario for arrivals consists of modal tracks that have been generated based upon current operations where most arrivals are radar vectored from the Hold. In addition to the modal tracks, a polygon has also been created that represents an area where current operations and approaches to MAN are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this transition was based on the modal track created using Noise and Track Keeping data from an altitude of 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Arrival End of Runway and the start of the modal track. For the purpose of the IOA, the change sponsor has elected to use the data aligned to the ROSUN 'do nothing' scenario as it most closely aligns to current operations and the positions of the IAFs that are being assessed.		Option 1A has an IAF at 7,000ft to the north-west of the airport in the vicinity of Atherton and is equidistant to easterly or westerly operations. It is designed to facilitate an equal CDA profile to all runways. From this location the route splits and turns south-west, west of Urmston, Irlam, Partington, Cadishead and then east of Warrington before turning on to the final approach to the west of Northwich at 3,000ft for either Runway 05L or Runway 05R. The descent gradient to the FAF is 3.5%/2.01° for Runway 05L and 3.28%/1.88° for Runway 05R. These gradients are within the optimum range for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance. Option 1A for Runway 05R was rejected at the DPE stage and has therefore not been assessed.		Option 8A has an IAF at 7,000ft to the north-west of the airport in the vicinity of the Middlebrook Retail Park (marked on VFR charts as Middlebrook Stadium). It has been designed to reduce potential interactions with departures and to facilitate a CDA profile to all runways. It also provides a broadly equal CDA for both runway directions. From this location the route splits, and heads south-west in the vicinity of Atherton and routes just to the east of central Warrington. Both routes then turn left to establish aircraft on final approach to the west of Northwich at 3,000ft for either Runway 05L or 05R. The descent gradient to the FAF is 3.06%/1.75° for Runway 05L and 2.9%/1.66° for Runway 05R. These gradients are at the lower end of the optimum for low noise approach but still within the acceptable range for CDAs defined within ICAO guidance.		Option 9A has an IAF at 7,000ft to the north of the airport just to the east of Bolton and is designed to facilitate a CDA profile to all runways. This position results in this being the longest transition for Runway 05 and therefore the least optimal CDA profile. From this location the route splits, heads initially south to avoid Bolton and then turns south-west to and tracks to the east of Warrington. Both routes then turn left to establish aircraft on final approach at 3,000ft for either Runway 05L or 05R. The descent gradient to the FAF is 2.72%/1.56° for Runway 05L and 2.58%/1.48° for Runway 05R. These gradients are below the optimum for low noise approaches but just within the acceptable range for CDAs defined within ICAO guidance.	
Group	**Impact**	**Level of Analysis**	**Runway 05L**	**Runway 05R**	**Runway 05L**	**Runway 05R NOT ASSESSED**	**Runway 05L**	**Runway 05R**	**Runway 05L**	**Runway 05R**
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	In terms of potential noise impact, the ROSUN 'do nothing' scenario overflies approximately 943,000 people and approximately 439,300 residential buildings.	In terms of potential noise impact, the ROSUN 'do nothing' scenario overflies approximately 952,300 people and approximately 445,400 residential buildings.	In terms of potential noise impact, Option 1A L overflies approximately 90,400 people and approximately 43,300 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.		In terms of potential noise impact, Option 8A L overflies approximately 172,200 people and approximately 82,700 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 8A R overflies approximately 180,300 people and approximately 86,600 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	**In terms of potential noise impact, Option 9A L overflies approximately 149,900 people and approximately 71,350 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.**	**In terms of potential noise impact, Option 9A R overflies approximately 156,700 people and approximately 74,600 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.**
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions, the majority of the extant procedures involves overflight above 1,000ft, other than the areas in the immediate vicinity or final approach to MAN. For safety reasons, aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. In terms of AQMAs, the ROSUN 'do nothing' scenario overflies 13 AQMAs and overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions, the majority of the extant procedures involves overflight above 1,000ft, other than the areas in the immediate vicinity or final approach to MAN. For safety reasons, aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. In terms of AQMAs, the ROSUN 'do nothing' scenario overflies 12 AQMAs and overflight of these AQMAs occurs when the aircraft is above 1,000ft.	Option 1A L overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.		Option 8A L overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.	Option 8A R overflies two AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.	**Option 9A L overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.**	**Option 9A R overflies two AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.**
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current arrival operations do not enable continuous descent approaches to all runways at MAN from 7,000ft. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be conducted in Stage 3. In order to make a comparison, track mileage is used as a proxy using the theory that the shorter the track mileage, the less greenhouse gases are emitted. With regards to the 'do nothing' scenario track lengths, the ROSUN 05L 'do nothing' scenario track is 75.97km (41.02nm) long.	Current arrival operations do not enable continuous descent approaches to all runways at MAN from 7,000ft. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be conducted in Stage 3. In order to make a comparison, track mileage is used as a proxy using the theory that the shorter the track mileage, the less greenhouse gases are emitted. With regards to the 'do nothing' scenario track lengths, the ROSUN 05R 'do nothing' scenario track is 79.37km (42.86nm) long.	Option 1A L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1A L is 58.40km (31.53nm). When compared to the 'do nothing' scenario, Option 1A L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.		Option 8A L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 8A L is 64.46km (34.81nm). When compared to the 'do nothing' scenario, Option 8A L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 8A R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 8A R is 66.85km (36.09nm). When compared to the 'do nothing' scenario, Option 8A R is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 9A L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 9A L is 69.38km (37.46nm). When compared to the 'do nothing' scenario, Option 9A L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 9A R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 9A R is 71.94km (38.84nm). When compared to the 'do nothing' scenario, Option 9A R is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.		The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The ROSUN 'do nothing' scenario does not overfly any AONBs or National Parks.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The ROSUN 'do nothing' scenario does not overfly any AONBs or National Parks.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.		This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.		The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.		No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.

General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for General Aviation/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for General Aviation/airlines.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.		The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for arrivals do not support continuous descent approaches. Fuel burn is expected to be greater due to tactical ATC intervention and periods of level flight in the approach phase. In the case of the ROSUN 05L 'do nothing' scenario the track length is 75.97km (41.02nm) long.	The existing MAN procedures for arrivals do not support continuous descent approaches. Fuel burn is expected to be greater due to tactical ATC intervention and periods of level flight in the approach phase. In the case of the ROSUN 05R 'do nothing' scenario the track length is 79.37km (42.86nm) long.	Option 1A L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 58.40km (31.53nm) long. When compared to the 'do nothing' scenario, Option 1A L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.		Option 8A L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 64.46km (34.81nm) long. When compared to the 'do nothing' scenario, Option 8A L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 8A R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 66.85km (36.09nm) long. When compared to the 'do nothing' scenario, Option 8A R is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 9A L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 69.38km (37.46nm) long. When compared to the 'do nothing' scenario, Option 9A L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 9A R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 71.94km (38.84nm) long. When compared to the 'do nothing' scenario, Option 9A R is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.		It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g., aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g., aircraft types, on-board system capability etc.) to consider these effectively.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.		Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.		There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the existing procedures.	No change to operational costs is attributable to maintaining the existing procedures.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative	No Deployment costs applicable to extant procedures	No Deployment costs applicable to extant procedures	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft arriving at MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a potential increase in ATCO workload.	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft arriving at MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a potential increase in ATCO workload.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Work has already commenced to understand and resolve the interactions with Liverpool. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.		The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Work has already commenced to understand and resolve the interactions with Liverpool. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Work has already commenced to understand and resolve the interactions with Liverpool. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Work has already commenced to understand and resolve the interactions with Liverpool. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Work has already commenced to understand and resolve the interactions with Liverpool. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
Summary of Analysis			The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing arrival arrangements do not enable continuous descent approaches from 7,000ft, which could lead to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and economic impact, the 'do nothing baseline' provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing arrival arrangements do not enable continuous descent approaches from 7,000ft, which could lead to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and economic impact, the 'do nothing baseline' provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	When compared to the 'do nothing' scenario, Option 1A L performs: - better in terms of Noise impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1A L has been deemed as the Preferred option, as it overflies the fewest population when compared to other design options (originating from the IAF).		When compared to the 'do nothing' scenario, Option 8A L performs: - better in terms of Noise impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 8A L has been deemed as the Acceptable option, as it overflies the third fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 8A R performs - better in terms of Noise impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 8A R has been deemed as the Favourable option, as it overflies the /second fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 9A L performs: - better in terms of Noise impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 9A L has been deemed as the Favourable option, as it overflies second fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 9A R performs - better in terms of Noise impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 9A R has been deemed as the Preferred option, as it overflies the fewest population when compared to other design options (originating from the IAF).

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Arrival Envelope: Runway 05 North 2,000ft (Baseline ROSUN)

			'DO NOTHING' BASELINE		IAF 12 - OPTION 13	
			For arrivals from the north, the 'do nothing' scenario in terms of today's operation is based around the existing ROSUN and MIRSI Holds. A modal track has been derived to provide an accurate representation of what occurs today. The 'do nothing' scenario for arrivals consists of modal tracks that have been generated based upon current operations where most arrivals are radar vectored from the Hold. In addition to the modal tracks, a polygon has also been created that represents an area where current operations and approaches to MAN are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this transition was based on the modal track created using Noise and Track Keeping data from an altitude of 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Arrival End of Runway and the start of the modal track. For the purpose of the IOA, the change sponsor has elected to use the data aligned to the ROSUN 'do nothing' scenario as it most closely aligns to current operations and the positions of the IAFs that are being assessed.		Option 13 has an IAF at 7,000ft to the north-north-west of the airport in the vicinity of Worsley, co-located with the IAF for option 23L/23R North 11A and has been designed to reduce potential interactions and increase the lateral separation from LPL Runway 27 arrivals. From the Worsley area, west of Prestwich, the route splits, and heads south-west just to the west of Irlam and overflying Cadishead and Lymm. Both routes then turn left to establish aircraft on final approach at 2,000ft for either Runway 05L or 05R. The descent gradient to the FAF is 4.37%/2.50° for Runway 05L and 4.09%/2.34° for Runway 05R. These gradients are optimum for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance.	
Group	**Impact**	**Level of Analysis**	**Runway 05L**	**Runway 05R**	**Runway 05L**	**Runway 05R**
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	In terms of potential noise impact, the ROSUN 'do nothing' scenario overflies approximately 943,000 people and approximately 439,300 residential buildings.	In terms of potential noise impact, the ROSUN 'do nothing' scenario overflies approximately 952,300 people and approximately 445,400 residential buildings.	In terms of potential noise impact, Option 13 L overflies approximately 118,700 people and approximately 55,200 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 13 R overflies approximately 131,200 people and approximately 60,750 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions, the majority of the extant procedures involves overflight above 1,000ft, other than the areas in the immediate vicinity or final approach to MAN. For safety reasons, aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. In terms of AQMAs, the ROSUN 'do nothing' scenario overflies 13 AQMAs and overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions, the majority of the extant procedures involves overflight above 1,000ft, other than the areas in the immediate vicinity or final approach to MAN. For safety reasons, aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. In terms of AQMAs, the ROSUN 'do nothing' scenario overflies 12 AQMAs and overflight of these AQMAs occurs when the aircraft is above 1,000ft.	Option 13 L overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.	Option 13 R overflies two AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current arrival operations do not enable continuous descent approaches to all runways at MAN from 7,000ft. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be conducted in Stage 3. In order to make a comparison, track mileage is used as a proxy using the theory that the shorter the track mileage, the less greenhouse gases are emitted. With regards to the 'do nothing' scenario track lengths, the ROSUN 05L 'do nothing' scenario track is 75.97km (41.02nm) long.	Current arrival operations do not enable continuous descent approaches to all runways at MAN from 7,000ft. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be conducted in Stage 3. In order to make a comparison, track mileage is used as a proxy using the theory that the shorter the track mileage, the less greenhouse gases are emitted. With regards to the 'do nothing' scenario track lengths, the ROSUN 05R 'do nothing' scenario track is 79.37km (42.86nm) long.	Option 13 L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 13 L is 52.21km (28.19nm). When compared to the 'do nothing' scenario, Option 13 L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of a benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 13 R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 13 R is 54.73km (29.55nm). When compared to the 'do nothing' scenario, Option 13 R is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of a benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.

Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The ROSUN 'do nothing' scenario does not overfly any AONBs or National Parks.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The ROSUN 'do nothing' scenario does not overfly any AONBs or National Parks.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for General Aviation/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for General Aviation/airlines.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for arrivals do not support continuous descent approaches. Fuel burn is expected to be greater due to tactical ATC intervention and periods of level flight in the approach phase. In the case of the ROSUN 05L 'do nothing' scenario the track length is 75.97km (41.02nm) long.	The existing MAN procedures for arrivals do not support continuous descent approaches. Fuel burn is expected to be greater due to tactical ATC intervention and periods of level flight in the approach phase. In the case of the ROSUN 05R 'do nothing' scenario the track length is 79.37km (42.86nm) long.	Option 13 L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 52.21km (28.19nm) long. When compared to the 'do nothing' scenario, Option 13 L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 13 R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 54.73km (29.55nm) long. When compared to the 'do nothing' scenario, Option 13 R is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.

Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g., aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g., aircraft types, on-board system capability etc.) to consider these effectively.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the existing procedures.	No change to operational costs is attributable to maintaining the existing procedures.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative	No deployment costs applicable to extant procedures	No deployment costs applicable to extant procedures	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft arriving at MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a potential increase in ATCO workload.	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft arriving at MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a potential increase in ATCO workload.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Work has already commenced to understand and resolve the interactions with Liverpool. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Work has already commenced to understand and resolve the interactions with Liverpool. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
		Summary of Analysis	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing arrival arrangements do not enable continuous descent approaches from 7,000ft, which could lead to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and economic impact, the 'do nothing baseline' provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing arrival arrangements do not enable continuous descent approaches from 7,000ft, which could lead to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and economic impact, the 'Do Nothing baseline' provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	When compared to the 'do nothing' scenario, Option 13 L performs: - better in terms of Noise impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 13 L has been deemed as the Preferred option, as it overflies the fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 13 R performs: - better in terms of Noise impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 13 R has been deemed as the Preferred option, as it overflies the fewest population when compared to other design options (originating from the IAF).

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Arrival Envelope: Runway 05 North 2,500ft (Baseline ROSUN)

			'DO NOTHING' BASELINE		IAF Steak - OPTION 1B		IAF 3 - OPTION 8B		IAF 4 - OPTION 9B	
			For arrivals from the north, the 'do nothing' scenario in terms of today's operation is based around the existing ROSUN and MIRSI Holds. A modal track has been derived to provide an accurate representation of what occurs today. The 'do nothing' scenario for arrivals consists of modal tracks that have been generated based upon current operations where most arrivals are radar vectored from the Hold. In addition to the modal tracks, a polygon has also been created that represents an area where current operations and approaches to MAN are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this transition was based on the modal track created using Noise and Track Keeping data from an altitude of 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Arrival End of Runway and the start of the modal track. For the purpose of the IOA, the change sponsor has elected to use the data aligned to the ROSUN 'do nothing' scenario as it most closely aligns to current operations and the positions of the IAFs that are being assessed.		Option 1B has an IAF at 7,000ft to the north-west of the airport in the vicinity of Atherton and is equidistant to easterly or westerly operations. It is designed to facilitate a CDA profile to all runways. From this location the route turns south-west and splits, heading west of Urmston, Irlam and east of Warrington towards base-leg positions. Both routes then turn left to establish aircraft on final approach at 2,500ft for either Runway 05L or 05R. The descent gradient to the FAF is 4.24%/2.43° for Runway 05L and 3.96%/2.27° Runway 05R. These gradients are within the optimum range for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance.		Option 8B has an IAF at 7,000ft to the north-west of the airport in the vicinity of the Middlebrook Retail Park (marked on VFR charts as Middlebrook Stadium). It has been designed to reduce potential interactions with departures and to facilitate a CDA profile to all runways. From this location the route splits, heads south-west and routes to the east of Warrington. Both routes then turn left to establish aircraft on final approach at 2,500ft for either Runway 05L or 05R. The descent gradient to the FAF is 3.65%/2.09° for Runway 05L and 3.45%/1.98° for Runway 05R. These gradients are within the optimum range for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance. Option 8B for Runway 05R was rejected at the DPE stage and has therefore not been assessed.		Option 9B has an IAF at 7,000ft to the north of the airport in the vicinity of Bolton and is designed to facilitate a CDA profile to all runways. From this location the route splits, heads south-west and tracks to the east of Warrington. Both routes then turn left to establish aircraft on final approach at 2,500ft for either Runway 05L or 05R. The descent gradient to the FAF is 3.24%/1.86° for Runway 05L and 3.07%/1.76° for Runway 05R. These gradients at the lower end of the optimum range for low noise approaches but within the acceptable range for CDAs defined within ICAO guidance. Option 9B for Runway 05R was rejected at the DPE stage and has therefore not been assessed.	
Group	**Impact**	**Level of Analysis**	**Runway 05L**	**Runway 05R**	**Runway 05L**	**Runway 05R**	**Runway 05L**	**Runway 05R NOT ASSESSED**	**Runway 05L**	**Runway 05R NOT ASSESSED**
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	In terms of potential noise impact, the ROSUN 'do nothing 'scenario overflies approximately 943,000 people and approximately 439,300 residential buildings.	In terms of potential noise impact, the ROSUN 'do nothing' scenario overflies approximately 952,300 people and approximately 445,400 residential buildings.	In terms of potential noise impact, Option 1B L overflies approximately 83,700 people and approximately 40,350 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 1B R overflies approximately 85,600 people and approximately 40,750 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 8B L overflies approximately 159,400 people and approximately 76,800 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.		In terms of potential noise impact, Option 9B L overflies approximately 150,000 people and approximately 71,850 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions, the majority of the extant procedures involves overflight above 1,000ft, other than the areas in the immediate vicinity or final approach to MAN. For safety reasons, aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. In terms of AQMAs, the ROSUN 'do nothing' scenario overflies 13 AQMAs and overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions, the majority of the extant procedures involves overflight above 1,000ft, other than the areas in the immediate vicinity or final approach to MAN. For safety reasons, aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. In terms of AQMAs, the ROSUN 'do nothing' scenario overflies 12 AQMAs and overflight of these AQMAs occurs when the aircraft is above 1,000ft.	Option 1B L overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.	Option 1B R overflies two AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.	Option 8B L overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.		Option 9B L overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.	
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current arrival operations do not enable continuous descent approaches to all runways at MAN from 7,000ft. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be conducted in Stage 3. In order to make a comparison, track mileage is used as a proxy using the theory that the shorter the track mileage, the less greenhouse gases are emitted. With regards to the 'do nothing' scenario track lengths, the ROSUN 05L 'do nothing' scenario track is 75.97km (41.02nm) long.	Current arrival operations do not enable continuous descent approaches to all runways at MAN from 7,000ft. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be conducted in Stage 3. In order to make a comparison, track mileage is used as a proxy using the theory that the shorter the track mileage, the less greenhouse gases are emitted. With regards to the 'do nothing' scenario track lengths, the ROSUN 05R 'do nothing' scenario track is 79.37km (42.86nm) long.	Option 1B L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1B L is 53.06km (28.65nm). When compared to the 'do nothing' scenario, Option 1B L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 1B R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1B R is 56.59km (30.56nm). When compared to the 'do nothing' scenario, Option 1B R is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 8B L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 8B L is 59.33km (32.04nm). When compared to the 'do nothing' scenario, Option 8B L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.		Option 9B L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 9B L is 63.94km (34.52nm). When compared to the 'do nothing' scenario, Option 9B L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.		The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The ROSUN 'do nothing' scenario does not overfly any AONBs or National Parks.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The ROSUN 'do nothing' scenario does not overfly any AONBs or National Parks.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.		This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore comparable to the 'do nothing' scenario and assessed as neutral.	
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.		The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.		No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for General Aviation/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for General Aviation/airlines.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.		The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	

General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for arrivals do not support continuous descent approaches. Fuel burn is expected to be greater due to tactical ATC intervention and periods of level flight in the approach phase. In the case of the ROSUN 05L 'do nothing' scenario the track length is 75.97km (41.02nm) long.	The existing MAN procedures for arrivals do not support continuous descent approaches. Fuel burn is expected to be greater due to tactical ATC intervention and periods of level flight in the approach phase. In the case of the ROSUN 05R 'do nothing' scenario the track length is 79.37km (42.86nm) long.	Option 1B L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 53.06km (28.65nm) long. When compared to the 'do nothing' scenario, Option 1B L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 1B R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 56.59km (30.56nm) long. When compared to the 'do nothing' scenario, Option 1B R is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 8B L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 59.33km (32.04nm) long. When compared to the 'do nothing' scenario, Option 8B L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.		Option 9B L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 63.94km (34.52nm) long. When compared to the 'do nothing' scenario, Option 9B L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.		It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g., aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g., aircraft types, on-board system capability etc.) to consider these effectively.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.		Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.		There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the existing procedures.	No change to operational costs is attributable to maintaining the existing procedures.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	
Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative	No deployment costs applicable to extant procedures	No deployment costs applicable to extant procedures	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft arriving at MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a potential increase in ATCO workload.	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft arriving at MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a potential increase in ATCO workload.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Work has already commenced to understand and resolve the interactions with Liverpool. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Work has already commenced to understand and resolve the interactions with Liverpool. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Work has already commenced to understand and resolve the interactions with Liverpool. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.		The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Work has already commenced to understand and resolve the interactions with Liverpool. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	
Summary of Analysis			The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing arrival arrangements do not enable continuous descent approaches from 7,000ft, which could lead to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and economic impact, the 'do nothing baseline' provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing arrival arrangements do not enable continuous descent approaches from 7,000ft, which could lead to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and economic impact, the 'do nothing baseline' provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	When compared to the 'do nothing' scenario, Option 1B L performs: - better in terms of Noise impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1B L has been deemed as the Preferred option, as it overflies the fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 1B R performs: - better in terms of Noise impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1B R has been deemed as the Preferred option, as it overflies the fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 8B L performs: - better in terms of Noise impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 8B L has been deemed as the Acceptable option, as it overflies the third fewest population when compared to other design options (originating from the IAF).		When compared to the 'do nothing' scenario, Option 9B L performs: - better in terms of Noise impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 9B L has been deemed as the Favourable option, as it overflies the second fewest population when compared to other design options (originating from the IAF).	

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Arrival Envelope: Runway 05 South 2,500ft (Baseline DAYNE)

Group	Impact	Level of Analysis	'DO NOTHING' BASELINE – Runway 05L	'DO NOTHING' BASELINE – Runway 05R
			For arrivals from the south, the 'do nothing' scenario in terms of today's operation is based around the existing DAYNE Hold. A modal track has been derived to provide an accurate representation of what occurs today. The 'do nothing' scenario for arrivals consists of modal tracks that have been generated based upon current operations where most arrivals are radar vectored from the Hold. In addition to the modal tracks, a polygon has also been created that represents an area where current operations and approaches to MAN are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this transition was based on the modal track created using Noise and Track Keeping data from an altitude of 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Arrival End of Runway and the start of the modal track.	
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	For comparison purposes within the IOA, for Runway 05L, Southerly arrivals are compared to the DAYNE 'do nothing' scenario. In terms of potential noise impact, the DAYNE 'do nothing' scenario overflies approximately 237,400 people and approximately 120,300 residential buildings.	For comparison purposes within the IOA, for Runway 05R, Southerly arrivals are compared to the DAYNE 'do nothing' scenario. In terms of potential noise impact, the DAYNE 'do nothing' scenario overflies approximately 152,200 people and approximately 79,550 residential buildings.
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions, the majority of the extant procedures involves overflight above 1,000ft, other than the areas in the immediate vicinity or final approach to MAN. For safety reasons, aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. In terms of AQMAs, the DAYNE 05L 'do nothing' scenario overflies 12 AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions, the majority of the extant procedures involves overflight above 1,000ft, other than the areas in the immediate vicinity or final approach to MAN. For safety reasons, aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. In terms of AQMAs, the DAYNE 05R 'do nothing' scenario overflies 8 AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current arrival operations do not enable continuous descent approaches to all runways at MAN from 7,000ft. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be conducted in Stage 3. In order to make a comparison, track mileage is used as a proxy using the theory that the shorter the track mileage, the less greenhouse gases are emitted. With regards to the 'do nothing' scenario track lengths, the DAYNE 05L 'do nothing' scenario track is 64.02km (34.57nm) long.	Current arrival operations do not enable continuous descent approaches to all runways at MAN from 7,000ft. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be conducted in Stage 3. In order to make a comparison, track mileage is used as a proxy using the theory that the shorter the track mileage, the less greenhouse gases are emitted. With regards to the 'do nothing' scenario track lengths, the DAYNE 05R 'do nothing' scenario track is 66.28km (35.79nm) long.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The DAYNE 'do nothing' scenario overflies no AONBs and one National Park.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The DAYNE 'do nothing' scenario overflies no AONBs and one National Park.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for General Aviation/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for General Aviation/airlines.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for arrivals do not support continuous descent approaches. Fuel burn is expected to be greater due to tactical ATC intervention and periods of level flight in the approach phase. In the case of the DAYNE 05L 'do nothing' scenario the track length is 64.02km (34.57nm) long.+D16:E16	The existing MAN procedures for arrivals do not support continuous descent approaches. Fuel burn is expected to be greater due to tactical ATC intervention and periods of level flight in the approach phase. In the case of the DAYNE 05R 'do nothing' scenario the track length is 66.28km (35.79nm) long.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g., aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g., aircraft types, on-board system capability etc.) to consider these effectively.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the existing procedures.	No change to operational costs is attributable to maintaining the existing procedures.

Group	Impact	Level of Analysis	IAF TURKY - OPTION 1B – Runway 05L	IAF TURKY - OPTION 1B – Runway 05R	IAF 7 - OPTION 6B – Runway 05L	IAF 7 - OPTION 6B – Runway 05R
			Option 1B has an IAF at 7,000ft to the south-east of the airport in the vicinity of Meerbrook and is equidistant to easterly or westerly operation. It is designed to facilitate a CDA profile to all runways. From this location the route splits and heads west, to the south of Macclesfield, north of Congleton and over Middlewich. Both routes then turn right to establish aircraft on final approach at 2,500ft for either Runway 05L or 05R. The descent gradient to the FAF is 4.17%/2.39° for Runway 05L and 3.95%/2.26° for Runway 05R. These gradients are within the optimum range for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance.		Option 6B has an IAF at 7,000ft to the south-east of the airport, just to the north of Leek. It is designed to facilitate a CDA profile to all runways. From this location the route splits and heads west, south of Holmes Chapel, north of Sandbach and over Middlewich. Both routes then turn right to establish aircraft on final approach at 2,500ft for either Runway 05L or 05R. This is the southernmost option and has been designed to maintain 3nm separation from the boundary of CAS in accordance with the CAA containment policy. The descent gradient to the FAF is 4.26%/2.44° for Runway 05L and 4.06%/2.33° Runway 05R. These gradients are within the optimum range for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance.	
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	In terms of potential noise impact, Option 1B L overflies approximately 27,700 people and approximately 13,600 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 1B R overflies approximately 29,300 people and approximately 14,600 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 6B L overflies approximately 30,400 people and approximately 15,500 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 6B R overflies approximately 41,900 people and approximately 21,350 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.
Communities	Air Quality	Initial Options Appraisal: Qualitative	Option 1B L overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.	Option 1B R overflies two AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.	Option 6B L overflies two AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.	Option 6B R overflies two AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Option 1B L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1B L is 54.62km (29.49nm). When compared to the 'do nothing' scenario, Option 1B L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 1B R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1B R is 56.64km (30.58nm). When compared to the 'do nothing' scenario, Option 1B R is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 6B L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 6B L is 53.97km (29.14nm). When compared to the 'do nothing' scenario, Option 6B L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 6B R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 6B R is 55.71km (30.08nm). When compared to the 'do nothing' scenario, Option 6B R is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	Option 1B L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 54.62km (29.49nm) long. When compared to the 'do nothing' scenario, Option 1B L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 1B R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 56.64km (30.58nm) long. When compared to the 'do nothing' scenario, Option 1B R is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 6B L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 53.97km (29.14nm) long. When compared to the 'do nothing' scenario, Option 6B L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 6B R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 55.71km (30.08nm) long. When compared to the 'do nothing' scenario, Option 6B R is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.

Group	Impact	Level of Analysis	IAF 8 - OPTION 7B – Runway 05L	IAF 8 - OPTION 7B – Runway 05R	IAF 10 - OPTION 9B – Runway 05L	IAF 10 - OPTION 9B – Runway 05R
			Option 7B has an IAF at 7,000ft co-located at the existing DAYNE hold. It is designed to facilitate a CDA profile to all runways. From this location the route splits and heads west, south of Macclesfield, north of Congleton and over Middlewich. Both routes then turn right to establish aircraft on final approach at 2,500ft for either Runway 05L or 05R. The descent gradient to the FAF is 3.82%/2.19° for Runway 05L and 3.62%/2.08° Runway 05R. These gradients are within the optimum range for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance.		Option 9B has an IAF at 7,000ft to the south-east of the airport in the vicinity of The Roaches. From this location the route splits and turns downwind, south-west to Congleton, then west just north of Sandbach and over Middlewich before turning on to the final approach at 2,500ft for either Runway 05L or 05R. The route has been designed to replicate the existing vectoring patterns used by ATC and is anticipated to reduce interactions with Runway 05 southbound departures. The descent gradient to the FAF is 3.82%/2.19° for Runway 05L and 3.67%/2.1° for Runway 05R. These gradients are within the optimum range for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance.	
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	In terms of potential noise impact, Option 7B L overflies approximately 28,600 people and approximately 14,250 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 7B R overflies approximately 34,000 people and approximately 16,550 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 9B L overflies approximately 43,300 people and approximately 22,700 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 9B R overflies approximately 46,900 people and approximately 24,450 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.
Communities	Air Quality	Initial Options Appraisal: Qualitative	Option 7B L overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.	Option 7B R overflies two AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.	Option 9B L overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.	Option 9B R overflies two AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Option 7B L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 7B L is 57.43km (31.01nm). When compared to the 'do nothing' scenario, Option 7B L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 7B R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 7B R is 59.52km (32.14nm). When compared to the 'do nothing' scenario, Option 7B R is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 9B L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 9B L is 56.96km (30.76nm). When compared to the 'do nothing' scenario, Option 9B L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 9B R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 9B R is 58.55km (31.62nm). When compared to the 'do nothing' scenario, Option 9B R is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	Option 7B L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 57.43km (31.01nm) long. When compared to the 'do nothing' scenario, Option 7B L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 7B R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 59.52km (32.14nm) long. When compared to the 'do nothing' scenario, Option 7B R is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 9B L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 56.96km (30.76nm) long. When compared to the 'do nothing' scenario, Option 9B L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 9B R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 58.55km (31.62nm) long. When compared to the 'do nothing' scenario, Option 9B R is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.

Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative	No deployment costs applicable to extant procedures	No deployment costs applicable to extant procedures	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft arriving at MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a potential increase in ATCO workload.	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft arriving at MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a potential increase in ATCO workload.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
Summary of Analysis			The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing arrival arrangements do not enable continuous descent approaches from 7,000ft, which could lead to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and economic impact, the 'do nothing baseline' provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing arrival arrangements do not enable continuous descent approaches from 7,000ft, which could lead to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and economic impact, the 'Do Nothing baseline' provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	When compared to the 'do nothing' scenario, Option 1B L performs: - better in terms of Noise Impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. MAN has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1B L has been deemed as the Preferred option, as it overflies the fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 1B R performs: - better in terms of Noise Impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1B R has been deemed as the Preferred option, as it overflies the fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 6B L performs: - better in terms of Noise Impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 6B L has been deemed as the Acceptable option, as it overflies the third fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 6B R performs: - better in terms of Noise Impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 6B R has been deemed as the Acceptable option, as it overflies the third fewest population when compared to other design options (originating	When compared to the 'do nothing' scenario, Option 7B L performs: - better in terms of Noise Impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 7B L has been deemed as the Favourable option, as it overflies the second fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 7B R performs: - better in terms of Noise Impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 7B R has been deemed as the Favourable option, as it overflies the second fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 9B L performs: - better in terms of Noise Impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 9B L has been deemed as the Rejected option, as it overflies the greater population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 9B R performs: - better in terms of Noise Impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 9B R has been deemed as the Rejected option, as it overflies the greater population when compared to other design options (originating from the IAF).

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Arrival Envelope: Runway 23 North 3,000ft (Baseline ROSUN/MIRSI)

			'DO NOTHING' BASELINE		IAF 4 - OPTION 7B (ROSUN)		IAF 12 - OPTION 11B (MIRSI)	
			For arrivals from the north, the 'do nothing' scenario in terms of today's operation is based around the existing ROSUN and MIRSI Holds. A modal track has been derived to provide an accurate representation of what occurs today. The 'do nothing' scenario for arrivals consists of modal tracks that have been generated based upon current operations where most arrivals are radar vectored from the Hold. In addition to the modal tracks, a polygon has also been created that represents an area where current operations and approaches to MAN are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this transition was based on the modal track created using Noise and Track Keeping data from an altitude of 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Arrival End of Runway and the start of the modal track.		Option 7B has an IAF at 7,000ft to the north-west of the airport in the vicinity of Harwood. It is designed to facilitate a CDA profile to all runways. From this location the route splits and heads south-east between Bolton and Bury but overhead Oldham. Both routes then turn right to establish aircraft on final approach at 3,000ft for either Runway 23L or 23R. The descent gradient to the FAF is 4.45%/2.55° for Runway 23L and 4.32%/2.48° for Runway 23R. These gradients are optimal for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance.		Option 11B has an IAF at 7,000ft to the north-west of the airport in the vicinity of Worsley, co-located with the IAF for option 05L/05R North 13. It is designed to facilitate a CDA profile to all runways. From this location the route splits and heads south-east overhead Farnworth, then heads east, just to the north of Prestwich overhead Oldham. Both routes then turn right to establish aircraft on final approach at 3,000ft for either Runway 23L or 23R. This option is included to provide a design option from an IAF created specifically for Runways 05L/05R (05L/05R 2,000ft FAF option 13), where design options were required that minimise the impact on LPL Runway 27 arrivals. The descent gradient to the FAF is 4.45%/2.55° for Runway 23L and 4.27%/2.45° for Runway 23R. These gradients are optimal for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance.	
Group	**Impact**	**Level of Analysis**	**Runway 23L**	**Runway 23R**	**Runway 23L**	**Runway 23R**	**Runway 23L**	**Runway 23R**
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	For comparison purposes within the IOA, for Runway 23L, Easterly arrivals are compared to the ROSUN 'do nothing' scenario. In terms of potential noise impact, the ROSUN 'do nothing' scenario overflies approximately 409,800 people and approximately 185,700 residential buildings. Westerly arrivals for Runway 23L are compared to a modal track, which is based on the MIRSI 'do nothing' scenario from the West and Southwest. In terms of potential noise impact, this scenario overflies approximately 753,900 people and approximately 342,550 residential buildings.	For comparison purposes within the IOA, for Runway 23R, Easterly arrivals are compared to the ROSUN 'do nothing' scenario. In terms of potential noise impact, the ROSUN 'do nothing' scenario overflies approximately 368,800 people and approximately 167,550 residential buildings. Westerly arrivals for Runway 23R are compared to a modal track, which is based on the MIRSI 'do nothing' scenario from the West and Southwest. In terms of potential noise impact, this scenario overflies approximately 717,300 people and approximately 325,900 residential buildings.	In terms of potential noise impact, Option 7B L overflies approximately 283,400 people and approximately 126,850 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 7B R overflies approximately 260,500 people and approximately 120,950 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 11B L overflies approximately 304,100 people and approximately 133,350 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 11B R overflies approximately 291,100 people and approximately 133,400 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions, the majority of the extant procedures involves overflight above 1,000ft, other than the areas in the immediate vicinity or final approach to MAN. For safety reasons, aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. In terms of AQMAs, the ROSUN 'do nothing' scenario overflies 7 AQMAs and the MIRSI 'do nothing' scenario overflies 9 AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions, the majority of the extant procedures involves overflight above 1,000ft, other than the areas in the immediate vicinity or final approach to MAN. For safety reasons, aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. In terms of AQMAs, the ROSUN 'do nothing' scenario overflies 6 AQMAs and the MIRSI 'do nothing' scenario overflies 9 AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	Option 7B L overflies seven AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be neutral as it overflies the same number of AQMAs.	Option 7B R overflies seven AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of dis-benefit as it overflies more AQMAs.	Option 11B L overflies eight AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.	Option 11B R overflies eight AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current arrival operations do not enable continuous descent approaches to all runways at MAN from 7,000ft. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be conducted in Stage 3. In order to make a comparison, track mileage is used as a proxy using the theory that the shorter the track mileage, the less greenhouse gases are emitted. With regards to the 'do nothing' scenario track lengths, the ROSUN 23L 'do nothing' scenario track is 54.13km (29.23nm) long. Meanwhile, the MIRSI 23L 'do nothing' scenario track is 86.15km (46.52nm) in length.	Current arrival operations do not enable continuous descent approaches to all runways at MAN from 7,000ft. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be conducted in Stage 3. In order to make a comparison, track mileage is used as a proxy using the theory that the shorter the track mileage, the less greenhouse gases are emitted. With regards to the 'do nothing' scenario track lengths, the ROSUN 23R 'do nothing' scenario track is 58.51km (31.59nm) long. Meanwhile, the MIRSI 23R 'do nothing' scenario track is 72.00km (38.88nm) in length.	Option 7B L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 7B L is 52.09km (28.13nm). When compared to the 'do nothing' scenario, Option 7B L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 7B R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 7B R is 52.73km (28.50nm). When compared to the 'do nothing' scenario, Option 7B R is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 11B L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 11B L is 51.97km (28.06nm). When compared to the 'do nothing' scenario, Option 11B L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 11B R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 11B R is 52.88km (28.55nm). When compared to the 'do nothing' scenario, Option 11B R is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The ROSUN 'do nothing' scenario overflies no AONBs and one National Park. The MIRSI 'do nothing' scenario overflies no AONBs and one National Park.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The ROSUN 'do nothing' scenario overflies no AONBs and one National Park. The MIRSI 'do nothing' scenario overflies no AONBs and one National Park.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore and is therefore deemed to be beneficial compared to the 'do nothing' scenario.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore and is therefore deemed to be beneficial compared to the 'do nothing' scenario.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore and is therefore deemed to be beneficial compared to the 'do nothing' scenario.	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore and is therefore deemed to be beneficial compared to the 'do nothing' scenario.

Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for General Aviation/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for General Aviation/airlines.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for arrivals do not support continuous descent approaches. Fuel burn is expected to be greater due to tactical ATC intervention and periods of level flight in the approach phase. In the case of the ROSUN 23L 'do nothing' scenario the track length is 54.13km (29.23nm) long. Meanwhile, the MIRSI 23L 'do nothing' track is 86.15km (46.52nm) in length.	The existing MAN procedures for arrivals do not support continuous descent approaches. Fuel burn is expected to be greater due to tactical ATC intervention and periods of level flight in the approach phase. In the case of the ROSUN 23R 'do nothing' scenario the track length is 58.51km (31.59nm) long. Meanwhile, the MIRSI 23R 'do nothing' track is 72.00km (38.88nm) in length.	Option 7B L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 52.09km (28.13nm) long. When compared to the ROSUN 'do nothing' scenario, Option 7B L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 7B R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 52.73km (28.50nm) long. When compared to the ROSUN 'do nothing' scenario, Option 7B R is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 11B L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 51.97km (28.06nm) long. When compared to the MIRSI 'do nothing' scenario, Option 11B L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 11B R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 52.88km (28.55nm) long. When compared to the MIRSI 'do nothing' scenario, Option 11B R is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g., aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g., aircraft types, on-board system capability etc.) to consider these effectively.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the existing procedures.	No change to operational costs is attributable to maintaining the existing procedures.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative	No deployment costs applicable to extant procedures	No deployment costs applicable to extant procedures	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft arriving at MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a potential increase in ATCO workload.	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft arriving at MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a potential increase in ATCO workload.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.

Summary of Analysis	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing arrival arrangements do not enable continuous descent approaches from 7,000ft, which could lead to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and economic impact, the 'do nothing baseline' provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing arrival arrangements do not enable continuous descent approaches from 7,000ft, which could lead to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and economic impact, the 'Do Nothing baseline' provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	When compared to the 'do nothing' scenario, Option 7B L performs: - better in terms of Noise Impact, Greenhouse Gases, Fuel Burn, Tranquillity, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 7B L has been deemed as the Preferred option, as it overflies the fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 7B R performs: - better in terms of Noise Impact, Greenhouse Gases, Fuel Burn, Tranquillity, Capacity and resilience, and Economic impact from increased effective capacity. - worse in terms of Air Quality. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 7B R has been deemed as the Preferred option, as it overflies the fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 11B L performs: - better in terms of Noise Impact, Greenhouse Gases, Fuel Burn, Tranquillity, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 11B L has been deemed as the Favourable option, as it overflies the second fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 11B R performs: - better in terms of Noise Impact, Greenhouse Gases, Fuel Burn, Tranquillity, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 11B R has been deemed as the Favourable option, as it overflies the second fewest population when compared to other design options (originating

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Arrival Envelope: Runway 23 North 3,500ft (Baseline ROSUN/MIRSI)

'DO NOTHING' BASELINE

For arrivals from the north, the 'do nothing' scenario in terms of today's operation is based around the existing ROSUN and MIRSI Holds. A modal track has been derived to provide an accurate representation of what occurs today. The 'do nothing' scenario for arrivals consists of modal tracks that have been generated based upon current operations where most arrivals are radar vectored from the Hold. In addition to the modal tracks, a polygon has also been created that represents an area where current operations and approaches to MAN are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this transition was based on the modal track created using Noise and Track Keeping data from an altitude of 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Arrival End of Runway and the start of the modal track.

Group	Impact	Level of Analysis	'Do nothing' Runway 23L	'Do nothing' Runway 23R
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	For comparison purposes within the IOA, for Runway 23L, Easterly arrivals are compared to the ROSUN 'do nothing' scenario. In terms of potential noise impact, the ROSUN 'do nothing' scenario overflies approximately 409,800 people and approximately 185,700 residential buildings. Westerly arrivals for Runway 23L are compared to a modal track, which is based on the MIRSI 'do nothing' scenario from the West and Southwest. In terms of potential noise impact, this scenario overflies approximately 753,900 people and approximately 342,550 residential buildings.	For comparison purposes within the IOA, for Runway 23R, Easterly arrivals are compared to the ROSUN 'do nothing' scenario. The ROSUN 'do nothing' scenario overflies approximately 368,800 people and approximately 167,550 residential buildings. Westerly arrivals for Runway 23R are compared to a modal track, which is based on the MIRSI 'do nothing' scenario from the West and Southwest. In terms of potential noise impact, this scenario overflies approximately 717,300 people and approximately 325,900 residential buildings.
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions, the majority of the extant procedures involves overflight above 1,000ft, other than the areas in the immediate vicinity or final approach to MAN. For safety reasons, aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. In terms of AQMAs, the ROSUN 'do nothing' scenario overflies 7 AQMAs and the MIRSI 'do nothing' scenario overflies 9 AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions, the majority of the extant procedures involves overflight above 1,000ft, other than the areas in the immediate vicinity or final approach to MAN. For safety reasons, aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. In terms of AQMAs, the ROSUN 'do nothing' scenario overflies 6 AQMAs and the MIRSI 'do nothing' scenario overflies 9 AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current arrival operations do not enable continuous descent approaches to all runways at MAN from 7,000ft. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be conducted in Stage 3. In order to make a comparison, track mileage is used as a proxy using the theory that the shorter the track mileage, the less greenhouse gases are emitted. With regards to the 'do nothing' scenario track lengths, the ROSUN 23L 'do nothing' scenario track is 54.13km (29.23nm) long. Meanwhile, the MIRSI 23L 'do nothing' scenario track is 86.15km (46.52nm) in length.	Current arrival operations do not enable continuous descent approaches to all runways at MAN from 7,000ft. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be conducted in Stage 3. In order to make a comparison, track mileage is used as a proxy using the theory that the shorter the track mileage, the less greenhouse gases are emitted. With regards to the 'do nothing' scenario track lengths, the ROSUN 23R 'do nothing' scenario track is 58.51km (31.59nm) long. Meanwhile, the MIRSI 23R 'do nothing' scenario track is 72.00km (38.88nm) in length.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The ROSUN 'do nothing' scenario overflies no AONBs and one National Park. The MIRSI 'do nothing' scenario overflies no AONBs and one National Park.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The ROSUN 'do nothing' scenario overflies no AONBs and one National Park. The MIRSI 'do nothing' scenario overflies no AONBs and one National Park.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for General Aviation/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for General Aviation/airlines.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for arrivals do not support continuous descent approaches. Fuel burn is expected to be greater due to tactical ATC intervention and periods of level flight in the approach phase. In the case of the ROSUN 23L 'do nothing' scenario the track length is 54.13km (29.23nm) long. Meanwhile, the MIRSI 23L 'do nothing' track is 86.15km (46.52nm) in length.	The existing MAN procedures for arrivals do not support continuous descent approaches. Fuel burn is expected to be greater due to tactical ATC intervention and periods of level flight in the approach phase. In the case of the ROSUN 23R 'do nothing' scenario the track length is 58.51km (31.59nm) long. Meanwhile, the MIRSI 23R 'do nothing' track is 72.00km (38.88nm) in length.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g., aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g., aircraft types, on-board system capability etc.) to consider these effectively.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.

IAF STEAK - OPTION 1A (MIRSI)

Option 1A has an IAF at 7,000ft to the north-west of the airport in the vicinity of Aspull. It is designed to facilitate a CDA profile to all runways. From this location the route splits and heads east, over Boothstown, Prestwich and Oldham but north of Manchester city centre. Both routes then turn right to establish aircraft on final approach at 3,500ft for either Runway 23L or 23R.
The descent gradient to the FAF is 2.99%/1.71° for Runway 23L and 2.89%/1.65° for Runway 23R. These gradients are just below the optimum for low noise approaches but within the acceptable range for CDAs defined within ICAO guidance.

Impact	Option 1A Runway 23L	Option 1A Runway 23R
Noise impact on health and quality of life	In terms of potential noise impact, Option 1A L overflies approximately 311,900 people and approximately 143,450 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 1A R overflies approximately 292,000 people and approximately 132,350 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.
Air Quality	Option 1A L overflies eight AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.	Option 1A R overflies eight AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.
Greenhouse Gas impact	Option 1A L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1A L is 62.79km (33.90nm). When compared to the 'do nothing' scenario, Option 1A L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 1A R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1A R is 63.92km (34.51nm). When compared to the 'do nothing' scenario, Option 1A R is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.
Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.
Tranquillity	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore deemed to be beneficial compared to the 'do nothing' scenario.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
Fuel burn	Option 1A L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 62.79km (33.90nm) long. When compared to the MIRSI 'do nothing' scenario, Option 1A L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 1A R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 63.92km (34.51nm) long. When compared to the MIRSI 'do nothing' scenario, Option 1A R is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Training costs	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.

IAF 4 - OPTION 7A (ROSUN)

Option 7A has an IAF at 7,000ft to the north-west of the airport in the vicinity of Harwood. It is designed to facilitate a CDA profile to all runways.
From this location the route splits and heads south-east between Bolton and Bury but overhead Oldham. Both routes then turn right to establish aircraft on final approach at 3,500ft for either Runway 23L or 23R.
The descent gradient to the FAF is 3.64%/2.09° for Runway 23L and 3.53%/2.02° for Runway 23R. These gradients are within the optimum range for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance.

Impact	Option 7A Runway 23L	Option 7A Runway 23R
Noise impact on health and quality of life	In terms of potential noise impact, Option 7A L overflies approximately 237,600 people and approximately 111,750 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 7A R overflies approximately 195,600 people and approximately 91,700 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.
Air Quality	Option 7A L overflies seven AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of equally beneficial as it overflies the same number of AQMAs.	Option 7A R overflies seven AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of dis-benefit as it overflies more AQMAs.
Greenhouse Gas impact	Option 7A L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 7A L is 56.85km (30.69nm). When compared to the 'do nothing' scenario, Option 7A L is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 7A R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 7A R is 57.61km (31.11nm). When compared to the 'do nothing' scenario, Option 7A R is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.
Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.
Tranquillity	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore deemed to be beneficial compared to the 'do nothing' scenario.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
Fuel burn	Option 7A L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 56.85km (30.69nm) long. When compared to the ROSUN 23L 'do nothing' scenario, Option 7A L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be a dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 7A R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 57.61km (31.11nm) long. When compared to the ROSUN 23R 'do nothing' scenario, Option 7A R is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Training costs	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.

IAF 3 - OPTION 8A (MIRSI)

Option 8A has an IAF at 7,000ft to the north-west of the airport in the vicinity of the Middlebrook Retail Park (marked on VFR charts as Middlebrook Stadium), co-located with the IAF for option 05L/05R North 8A. It is designed to facilitate a CDA profile to all runways.
From this location the route splits and heads east, to the south of Bury and Rochdale. Both routes then turn right to establish aircraft on final approach at 3,500ft for either Runway 23L or 23R.
The descent gradient to the FAF is 2.84%/1.63° for Runway 23L and 2.76%/1.58° for Runway 23R. These gradients are below the optimum for low noise approaches but within the acceptable range for CDAs defined within ICAO guidance.

Impact	Option 8A Runway 23L	Option 8A Runway 23R
Noise impact on health and quality of life	In terms of potential noise impact, Option 8A L overflies approximately 288,300 people and approximately 132,700 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 8A R overflies approximately 257,700 people and approximately 117,450 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.
Air Quality	Option 8A L overflies eight AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.	Option 8A R overflies eight AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.
Greenhouse Gas impact	Option 8A L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 8A L is 65.00km (35.10nm). When compared to the 'do nothing' scenario, Option 8A L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 8A R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 8A R is 65.92km (35.60nm). When compared to the 'do nothing' scenario, Option 8A R is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.
Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.
Tranquillity	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore and is therefore deemed to be beneficial compared to the 'do nothing' scenario.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
Fuel burn	Option 8A L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 65.00km (35.10nm) long. When compared to the MIRSI 'do nothing' scenario, Option 8A L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 8A R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 65.92km (35.60nm) long. When compared to the MIRSI 'do nothing' scenario, Option 8A R is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Training costs	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.

IAF 12 - OPTION 11A (MIRSI)

Option 11A has an IAF at 7,000ft to the north-west of the airport in the vicinity of Worsley, co-located with the IAF for option 05L/05R North 13. It is designed to facilitate a CDA profile to all runways.
From this location the route splits and heads south-east overhead Farnworth, then heads east, just to the north of Prestwich overhead Oldham. Both routes then turn right to establish aircraft on final approach at 3,500ft for either Runway 23L or 23R.
This option is included to provide a design option from an IAF created specifically for Runways 05L/05R (05L/05R 2,000ft FAF option 13), where design options were required that minimise the impact on LPL Runway 27 arrivals.
The descent gradient to the FAF is 3.59%/2.05° for Runway 23L and 3.44%/1.97° for Runway 23R. These gradients are within the optimum range for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance.

Impact	Option 11A Runway 23L	Option 11A Runway 23R
Noise impact on health and quality of life	In terms of potential noise impact, Option 11A L overflies approximately 280,300 people and approximately 129,250 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 11A R overflies approximately 257,200 people and approximately 118,300 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.
Air Quality	Option 11A L overflies eight AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.	Option 11A R overflies eight AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be of benefit as it overflies fewer AQMAs.
Greenhouse Gas impact	Option 11A L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 11A L is 57.16km (30.87nm). When compared to the 'do nothing' scenario, Option 11A L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 11A R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 11A R is 58.18km (31.42nm). When compared to the 'do nothing' scenario, Option 11A R is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.
Capacity and resilience	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.
Tranquillity	This option overflies no statutorily identified tranquillity receptors (AONBs or National Parks), nor any identified through community engagement and is therefore and is therefore deemed to be beneficial compared to the 'do nothing' scenario.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Biodiversity	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
Access	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
Economic impact from increased effective capacity	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
Fuel burn	Option 11A L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 57.16km (30.87nm) long. When compared to the MIRSI 'do nothing' scenario, Option 11A L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 11A R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 58.18km (31.42nm) long. When compared to the MIRSI 'do nothing' scenario, Option 11A R is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Training costs	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Other costs	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Infrastructure costs	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.

Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the existing procedures.	No change to operational costs is attributable to maintaining the existing procedures.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative	No deployment costs applicable to extant procedures	No deployment costs applicable to extant procedures	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft arriving at MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a potential increase in ATCO workload.	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft arriving at MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a potential increase in ATCO workload.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
		Summary of Analysis	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing arrival arrangements do not enable continuous descent approaches from 7,000ft, which could lead to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and economic impact, the 'do nothing baseline' provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing arrival arrangements do not enable continuous descent approaches from 7,000ft, which could lead to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and economic impact, the 'Do Nothing baseline' provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	When compared to the 'do nothing' scenario, Option 1A L performs: - better in terms of Noise impact, Air Quality, Greenhouse Gases, Fuel Burn, Tranquillity, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1A L has been deemed as the Rejected, as it overflies the greater population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 1A R performs: - better in terms of Noise impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1A R has been deemed as the Rejected, as it overflies the greater population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 7A L performs: - better in terms of Noise impact, Greenhouse Gases and Fuel Burn, Tranquillity, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 7A L has been deemed as the Preferred option, as it overflies the fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 7A R performs: - worse in terms of Air Quality. - better in terms of Noise impact, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 7A R has been deemed as the Preferred option, as it overflies the fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 8A L performs: - better in terms of Noise impact, Air Quality, Greenhouse Gases, Fuel Burn, Tranquillity, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 8A L has been deemed as the Acceptable option, as it overflies the third fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 8A R performs: - better in terms of Noise impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 8A R has been deemed as the Acceptable option, as it overflies the third fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 11A L performs: - better in terms of Noise impact, Air Quality, Greenhouse Gases, Tranquility, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 11A L has been deemed as the Favourable option, as it overflies the second fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 11A R performs: - better in terms of Noise impact, Air Quality, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 11A R has been deemed as the Favourable option, as it overflies the second fewest population when compared to other design options (originating from the IAF).

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Arrival Envelope: Runway 23 South 3,000ft (Baseline DAYNE)

			'DO NOTHING' BASELINE		IAF TURKY - OPTION 1B		IAF 8 - OPTION 6B		IAF 10 - OPTION 8B		IAF 7 - OPTION 9B	
			For arrivals from the south, the 'do nothing' scenario in terms of today's operation is based around the existing DAYNE Hold. A modal track has been derived to provide an accurate representation of what occurs today. The 'do nothing' scenario for arrivals consists of modal tracks that have been generated based upon current operations where most arrivals are radar vectored from the Hold. In addition to the modal tracks, a polygon has also been created that represents an area where current operations and approaches to MAN are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this transition was based on the modal track created using Noise and Track Keeping data from an altitude of 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Arrival End of Runway and the start of the modal track.		Option 1B has an IAF at 7,000ft to the south-east of the airport in the vicinity of Danebridge. It is designed to facilitate a CDA profile to all runways. From this location the route splits and heads north-east, just to the west of Whaley Bridge and then overhead Glossop. Both routes then turn left to establish aircraft on final approach at 3,000ft for either Runway 23L or 23R. The descent gradient to the FAF is 3.78%/2.17° for Runway 23L and 3.63%/2.08° for Runway 23R. These gradients are within the optimum range for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance. Option 1B for Runway 23L was rejected at the DPE stage and has therefore not been assessed.		Option 6B has an IAF at 7,000ft to the south-east of the airport co-located with the DAYNE hold. It is designed to facilitate a CDA profile to all runways. From this location the route splits and heads north-east, to the west of Whaley Bridge and then overhead Glossop. Both routes then turn left to establish aircraft on final approach at 3,000ft for either Runway 23L or 23R. The descent gradient to the FAF is 4.12%/2.36° for Runway 23L and 3.94%/2.26° for Runway 23R. These gradients are within the optimum range for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance.		Option 8B has an IAF at 7,000ft to the south-east of the airport in the vicinity of the Roaches. It is co-located with the IAF for the 05L/05R option 9B and is designed to facilitate a CDA profile to all runways. From this location the route splits and heads north-east, just to the west of Whaley Bridge and then overhead Glossop. Both routes then turn left to establish aircraft on final approach at 3,000ft for either Runway 23L or 23R. The descent gradient to the FAF is 4.14%/2.37° for Runway 23L and 3.95%/2.26° for Runway 23R. These gradients are within the optimum range for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance.		Option 9B has an IAF at 7,000ft to the south-east of the airport, just to the north of Leek. It is co-located with the IAF for the 05L/05R option 6B and is designed to facilitate a CDA profile to all runways. From this location the route splits and heads north-east between Macclesfield and Buxton, overhead Whaley Bridge and Glossop. Both routes then turn left to establish aircraft on final approach at 3,000ft for either Runway 23L or 23R. The descent gradient to the FAF is 3.33%/1.91° for Runway 23L and 3.21%/1.84° for Runway 23R. These gradients are within the optimum range for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance. Option 9B for Runway 23L was rejected at the DPE stage and has therefore not been assessed.	
Group	**Impact**	**Level of Analysis**	**Runway 23L**	**Runway 23R**	**Runway 23L NOT ASSESSED**	**Runway 23R**	**Runway 23L**	**Runway 23R**	**Runway 23L**	**Runway 23R**	**Runway 23L NOT ASSESSED**	**Runway 23R**
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	For comparison purposes within the IOA, for Runway 23L, Southerly arrivals are compared to the DAYNE 'do nothing' scenario. In terms of potential noise impact, the DAYNE 'do nothing' scenario overflies approximately 147,700 people and approximately 71,650 residential buildings.	For comparison purposes within the IOA, for Runway 23R, Southerly arrivals are compared to the DAYNE 'do nothing' scenario. In terms of potential noise impact, the DAYNE 'do nothing' scenario overflies approximately 135,900 people and approximately 66,350 residential buildings.		In terms of potential noise impact, Option 1B R overflies approximately 66,000 people and approximately 31,750 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 6B L overflies approximately 78,800 people and approximately 38,150 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 6B R overflies approximately 70,800 people and approximately 34,150 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 8B L overflies approximately 73,900 people and approximately 35,700 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 8B R overflies approximately 68,700 people and approximately 33,100 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.		In terms of potential noise impact, Option 9B R overflies approximately 61,600 people and approximately 29,300 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions, the majority of the extant procedures involves overflight above 1,000ft, other than the areas in the immediate vicinity or final approach to MAN. For safety reasons, aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. In terms of AQMAs, the DAYNE 23L'do nothing' scenario overflies 3 AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions, the majority of the extant procedures involves overflight above 1,000ft, other than the areas in the immediate vicinity or final approach to MAN. For safety reasons, aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. In terms of AQMAs, the DAYNE 23R 'do nothing' scenario overflies 3 AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.		Option 1B R overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.	Option 6B L overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.	Option 6B R overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.	Option 8B L overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.	Option 8B R overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.		Option 9B R overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current arrival operations do not enable continuous descent approaches to all runways at MAN from 7,000ft. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be conducted in Stage 3. In order to make a comparison, track mileage is used as a proxy using the theory that the shorter the track mileage, the less greenhouse gases are emitted. With regards to the 'do nothing' scenario track lengths, the DAYNE 23L 'do nothing' scenario track is 62.74km (33.88nm) long.	Current arrival operations do not enable continuous descent approaches to all runways at MAN from 7,000ft. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be conducted in Stage 3. In order to make a comparison, track mileage is used as a proxy using the theory that the shorter the track mileage, the less greenhouse gases are emitted. With regards to the 'do nothing' scenario track lengths, the DAYNE 23R 'do nothing' scenario track is 41.04km (22.16nm) long.		Option 1B R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1B R is 57.80km (31.21nm). When compared to the 'do nothing' scenario, Option 1B R is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 6B L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 6B L is 50.08km (27.04nm). When compared to the 'do nothing' scenario, Option 6B L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 6B R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 6B R is 51.25km (27.67nm). When compared to the 'do nothing' scenario, Option 6B R is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 8B L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 8B L is 54.00km (29.15nm). When compared to the 'do nothing' scenario, Option 8B L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 8BR has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 8BR is 55.18km (29.80nm). When compared to the 'do nothing' scenario, Option 8BR is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.		Option 9B R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 9B R is 62.39km (33.69nm). When compared to the 'do nothing' scenario, Option 9B R is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.		The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.		The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The DAYNE 'do nothing' scenario overflies no AONBs and one National Park.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The DAYNE 'do nothing' scenario overflies no AONBs and one National Park.		This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.		This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.		The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.		The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.		No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.		No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for General Aviation/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for General Aviation/airlines.		The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.		The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for arrivals do not support continuous descent approaches. Fuel burn is expected to be greater due to tactical ATC intervention and periods of level flight in the approach phase. In the case of the DAYNE 23L 'do nothing' scenario the track length is 62.74km (33.88nm) long.	The existing MAN procedures for arrivals do not support continuous descent approaches. Fuel burn is expected to be greater due to tactical ATC intervention and periods of level flight in the approach phase. In the case of the DAYNE 23R 'do nothing' scenario the track length is 41.04km (22.16nm) long.		Option 1B R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 57.80km (31.21nm) long. When compared to the 'do nothing' scenario, Option1B R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of a dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 6B L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 50.08km (27.04nm) long. When compared to the 'do nothing' scenario, Option 6B L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 6B R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is Option 6B R is 51.25km (27.67nm). When compared to the 'do nothing' scenario, Option 6B R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 8B L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 54.00km (29.15nm) long. When compared to the 'do nothing' scenario, Option 8B L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 8B R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 55.18km (29.80nm) long. When compared to the 'do nothing' scenario, Option 8B R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.		Option 9B R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 62.39km (33.69nm) long. When compared to the 'do nothing' scenario, Option 9B R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.		It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.		It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g., aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g., aircraft types, on-board system capability etc.) to consider these effectively.		Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.		Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.		There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.		There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the existing procedures.	No change to operational costs is attributable to maintaining the existing procedures.		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.

Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative	No deployment costs applicable to extant procedures	No deployment costs applicable to extant procedures		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft arriving at MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft arriving at MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a		The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.		The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
Summary of Analysis			The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing arrival arrangements do not enable continuous descent approaches from 7,000ft, which could lead to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and economic impact, the 'do nothing baseline' provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing arrival arrangements do not enable continuous descent approaches from 7,000ft, which could lead to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and economic impact, the 'Do Nothing baseline' provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.		When compared to the 'do nothing' scenario, Option 1B R performs: - better in terms of Noise impact. - worse in terms of Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1B R has been deemed as the Favourable option, as it overflies second fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 6B L performs: - better in terms of Noise impact, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 6B L has been deemed as the Favourable option, as it overflies the second fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 6B R performs: - better in terms of Noise impact. - worse in terms of Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 6B R has been deemed as the Rejected, as it overflies the greater population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 8B L performs: - better in terms of Noise impact, Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 8B L has been deemed as the Preferred option, as it overflies the fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 8B R performs: - better in terms of Noise impact. - worse in terms of Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 8B R has been deemed as the Acceptable option, as it overflies the third fewest population when compared to other design options (originating from the IAF).		When compared to the 'do nothing' scenario, Option 9B R performs: - worse in terms of Greenhouse Gases, Fuel Burn, Capacity and resilience and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 9B R has been deemed as the Preferred option, as it overflies the fewest population when compared to other design options (originating from the IAF).

MAN ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Arrival Envelope: Runway 23 South 3,500ft (Baseline DAYNE)

			'DO NOTHING' BASELINE		IAF TURKY - OPTION 1A		IAF 8 - OPTION 6A		IAF 10 - OPTION 8A		IAF 7 - OPTION 9A	
			For arrivals from the south, the 'do nothing' scenario in terms of today's operation is based around the existing DAYNE Hold. A modal track has been derived to provide an accurate representation of what occurs today. The 'do nothing' scenario for arrivals consists of modal tracks that have been generated based upon current operations where most arrivals are radar vectored from the Hold. In addition to the modal tracks, a polygon has also been created that represents an area where current operations and approaches to MAN are dispersed due to radar vectoring and potentially may affect people on the ground. The overflight analysis conducted on this transition was based on the modal track created using Noise and Track Keeping data from an altitude of 7,000ft with the addition of a radar vectoring area where appropriate. All data is based on current aircraft performance data and is calculated based on the distance between the Arrival End of Runway and the start of the modal track.		Option 1A has an IAF at 7,000ft to the south-east of the airport in the vicinity of Sutton. It is designed to facilitate a CDA profile to all runways. From this location the route splits and heads north-east, just to the west of Whaley Bridge and then overhead Glossop. Both routes then turn left to establish aircraft on final approach at 3,500ft for either Runway 23L or 23R. The descent gradient to the FAF is 3.15%/1.80° for Runway 23L and 3.02%/1.73° for Runway 23R. These gradients are within the optimum range for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance.		Option 6A has an IAF at 7,000ft to the south-east of the airport co-located with the DAYNE hold. It is designed to facilitate a CDA profile to all runways. From this location the route splits and heads north-east, to the west of Whaley Bridge and then overhead Glossop. Both routes then turn left to establish aircraft on final approach at 3,500ft for either Runway 23L or 23R. The descent gradient to the FAF is 3.41%/1.96° for Runway 23L and 3.27%/1.87° for Runway 23R. These gradients are within the optimum range for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance.		Option 8A has an IAF at 7,000ft to the south-east of the airport in the vicinity of the Roaches. It is co-located with the IAF for the 05L/05R option 9A and is designed to facilitate a CDA profile to all runways. From this location the route splits and heads north-east, just to the west of Whaley Bridge and then overhead Glossop. Both routes then turn left to establish aircraft on final approach at 3,500ft for either Runway 23L or 23R. The descent gradient to the FAF is 3.42%/1.96° for Runway 23L and 3.28%/1.88° for Runway 23R. These gradients are within the optimum range for low noise approaches and within the acceptable range for CDAs defined within ICAO guidance. Option 8A for Runway 23L was rejected at the DPE stage and has therefore not been assessed.		Option 9A has an IAF at 7,000ft to the south-east of the airport, just to the north of Leek. It is co-located with the IAF for the 05L/05R option 6A and is designed to facilitate a CDA profile to all runways. From this location the route splits and heads north-east between Macclesfield and Buxton, overhead Whaley Bridge and Glossop. Both routes then turn left to establish aircraft on final approach at 3,500ft for either Runway 23L or 23R. The descent gradient to the FAF is 2.78%/1.59° for Runway 23L and 2.69%/1.54° for Runway 23R. These gradients are below the optimum range for low noise approaches but just within the acceptable range for CDAs defined within ICAO guidance.	
Group	**Impact**	**Level of Analysis**	**Runway 23L**	**Runway 23R**	**Runway 23L**	**Runway 23R**	**Runway 23L**	**Runway 23R**	**Runway 23L NOT ASSESSED**	**Runway 23R**	**Runway 23L**	**Runway 23R**
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	For comparison purposes within the IOA, for Runway 23L, Southerly arrivals are compared to the DAYNE 'do nothing' scenario. In terms of potential noise impact, the DAYNE 'do nothing' scenario overflies approximately 147,700 people and approximately 71,650 residential buildings.	For comparison purposes within the IOA, for Runway 23R, Southerly arrivals are compared to the DAYNE 'do nothing' scenario. In terms of potential noise impact, the DAYNE 'do nothing' scenario overflies approximately 135,900 people and approximately 66,350 residential buildings.	In terms of potential noise impact, Option 1A L overflies approximately 55,800 people and approximately 26,850 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 1A R overflies approximately 51,800 people and approximately 24,150 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 6A L overflies approximately 60,900 people and approximately 29,750 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 6A R overflies approximately 53,500 people and approximately 25,250 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.		In terms of potential noise impact, Option 8A R overflies approximately 54,400 people and approximately 25,750 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 9A L overflies approximately 48,800 people and approximately 24,150 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.	In terms of potential noise impact, Option 9A R overflies approximately 46,900 people and approximately 21,700 residential buildings. When compared to the 'do nothing' scenario, this option overflies fewer people and residential buildings and as such is seen as beneficial.
Communities	Air Quality	Initial Options Appraisal: Qualitative	No change to air quality is predicted in maintaining baseline conditions, the majority of the extant procedures involves overflight above 1,000ft, other than the areas in the immediate vicinity or final approach to MAN. For safety reasons, aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. In terms of AQMAs, the DAYNE 23L'do nothing' scenario overflies 3 AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	No change to air quality is predicted in maintaining baseline conditions, the majority of the extant procedures involves overflight above 1,000ft, other than the areas in the immediate vicinity or final approach to MAN. For safety reasons, aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. In terms of AQMAs, the DAYNE 23R 'do nothing' scenario overflies 3 AQMAs. Overflight of these AQMAs occurs when the aircraft is above 1,000ft.	Option 1A L overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.	Option 1A R overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.	Option 6A L overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.	Option 6A R overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.		Option 8A R overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.	Option 9A L overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.	Option 9A R overflies three AQMAs, having said that, as per CAP1616, para B74, due to mixing and dispersion, the impact on air quality above 1,000ft is not likely to be significant. There are areas within the immediate area surrounding the airport that may be overflown below 1,000ft; however, for safety reasons, this is unavoidable, as aircraft are required to establish a safe and stable flight profile during the final approach phases of flight. Therefore, overall, when compared to the 'do nothing' scenario, this option is deemed to be equally beneficial as it overflies the same number of AQMAs.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Current arrival operations do not enable continuous descent approaches to all runways at MAN from 7,000ft. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be conducted in Stage 3. In order to make a comparison, track mileage is used as a proxy using the theory that the shorter the track mileage, the less greenhouse gases are emitted. With regards to the 'do nothing' scenario track lengths, the DAYNE 23L 'do nothing' scenario track is 62.74km (33.88nm) long.	Current arrival operations do not enable continuous descent approaches to all runways at MAN from 7,000ft. It must be noted that the exact track length flown by aircraft may vary slightly due to the nature of radar vectoring. Existing procedures do not support optimal aircraft performance and therefore are predicted to have a greater environmental impact compared to proposed options. Within Stage 2 of the CAP1616 process, there is no requirement for a change sponsor to conduct quantitative fuel burn or emissions analysis; this will be conducted in Stage 3. In order to make a comparison, track mileage is used as a proxy using the theory that the shorter the track mileage, the less greenhouse gases are emitted. With regards to the 'do nothing' scenario track lengths, the DAYNE 23R 'do nothing' scenario track is 41.04km (22.16nm) long.	Option 1A L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1A L is 61.17km (33.03nm). When compared to the 'do nothing' scenario, Option 1A L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 1A R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 1A R is 62.38km (33.68nm). When compared to the 'do nothing' scenario, Option 1A R is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 6A L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 6A L is 54.62km (29.49nm). When compared to the 'do nothing' scenario, Option 6A L is shorter and is therefore expected to emit less greenhouse gases and this option is deemed to be of benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 6A R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 6A R is 55.83km (30.14nm). When compared to the 'do nothing' scenario, Option 6A R is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.		Option 8A R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 8A R is 59.78km (32.28nm). When compared to the 'do nothing' scenario, Option 8A R is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 9A L has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 9A L is 65.76km (35.51nm). When compared to the 'do nothing' scenario, Option 9A L is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.	Option 9A R has been designed to support continuous descent approach operations. An element of tactical radar vectoring may still be required to manage aircraft separation distances. The track mileage of Option 9A R is 66.97km (36.16nm). When compared to the 'do nothing' scenario, Option 9A R is longer and is therefore expected to emit more greenhouse gases and this option is deemed to be of dis-benefit. More in-depth analysis at Stage 3 is required to confirm the exact volumes of greenhouse gases released.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	Maintaining extant procedures would maintain current capacity; however, due to the reliance upon ground-based navigational aids, resilience could be significantly affected, following the removal of the DVOR in December 2022.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.		The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.	The introduction of PBN routes is expected to deliver benefits by increasing airspace capacity which subsequently leads to more predictable flight paths and fewer delays (both in air or on the ground). The reduction of the reliance on outdated ground-based navigational aid will significantly increase operational resilience through the introduction of PBN.
Wider Society	Tranquillity	Initial Options Appraisal: Qualitative	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The DAYNE 'do nothing' scenario overflies no AONBs and one National Park.	As per CAP1616, Appendix B, para B76, change sponsors are required to consider Tranquillity with specific reference to AONBs and National Parks only, unless other areas have been identified through community engagement. No additional specific areas were identified by community engagement. The DAYNE 'do nothing' scenario overflies no AONBs and one National Park.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.		This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.	This option overflies no AONBs and one National Park. It is therefore comparable to the 'do nothing' scenario and assessed as neutral.
Wider Society	Biodiversity	Initial Options Appraisal: Qualitative	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.		The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.	The change sponsor has mapped the designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSAR sites, as identified on the DEFRA MAGiC Map. CAP1616, Appendix B, para B74, states that because of dispersion and mixing, there is unlikely to be an impact on local air quality from aircraft above 1,000ft. Furthermore, CAP1616, Appendix B, para B80, states that in general, airspace change proposal will not have an impact on biodiversity as they do not involve ground-based infrastructure. However, the change sponsor acknowledges that any potential impact to the designated sites around MAN will be assessed in Stage 3 of the ACP process by Subject Matter Experts.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No change to existing airspace arrangements. Any General Aviation users of airspace in the vicinity of MAN will maintain their current level of access under extant operational arrangements.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.		No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.	No adverse impact to General Aviation access is anticipated as a consequence of this ACP. All Visual Reference Points and existing Letters of Agreement pertaining to General Aviation access will be reviewed and updated (where applicable) prior to implementation to ensure their continued validity. Airspace classification requirements will be reviewed as part of Stage 3 activities.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for General Aviation/airlines.	No increase to effective capacity anticipated for continued use of extant procedures, therefore no economic benefit for General Aviation/airlines.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.		The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.	The introduction of PBN is expected to deliver benefits by increasing airspace capacity which in turn will lead to more predictable flight paths and fewer delays (both in the air or on the ground). This is expected to facilitate economic benefit by potentially increasing the frequency of air transport movements, increasing passenger numbers and increasing cargo tonnage carried.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	The existing MAN procedures for arrivals do not support continuous descent approaches. Fuel burn is expected to be greater due to tactical ATC intervention and periods of level flight in the approach phase. In the case of the DAYNE 23L 'do nothing' scenario the track length is 62.74km (33.88nm) long.	The existing MAN procedures for arrivals do not support continuous descent approaches. Fuel burn is expected to be greater due to tactical ATC intervention and periods of level flight in the approach phase. In the case of the DAYNE 23R 'do nothing' scenario the track length is 41.04km (22.16nm) long.	Option 1A L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 61.17km (33.03nm) long. When compared to the 'do nothing' scenario, Option 1A L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 1A R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 62.38km (33.68nm) long. When compared to the 'do nothing' scenario, Option1A R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 6A L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 54.62km (29.49nm) long. When compared to the 'do nothing' scenario, Option 6A L is shorter and at this stage it is assumed that it will require a smaller amount of fuel burn, therefore, this option is deemed to be beneficial in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 6A R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 55.83km (30.14nm) long. When compared to the 'do nothing' scenario, Option 6A R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.		Option 8A R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 59.78km (32.28nm) long. When compared to the 'do nothing' scenario, Option 8A R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 9A L supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 65.76km (35.51nm) long. When compared to the 'do nothing' scenario, Option 9A L is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.	Option 9A R supports continuous descent approaches, reducing the overall amount of fuel burnt. There is no requirement within Stage 2 of the CAP1616 process to quantify fuel burn, this will be conducted in Stage 3. Therefore, to enable a comparison, the logic applied is that the shorter the track length, the less fuel is burnt. With regards to this option, it is 66.97km (36.16nm) long. When compared to the 'do nothing' scenario, Option 9A R is longer and at this stage it is assumed that it will require a larger amount of fuel burn, therefore, this option is deemed to be of dis-benefit in terms of fuel burn. More in-depth analysis will be carried out in Stage 3 to confirm.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	Standard training would be applicable for existing procedures which would be practised by crews through existing simulator exercises.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.		It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.	It is anticipated that no extra Pilot/Crew training will be required to enable pilots to fly the new PBN procedures as PBN has become a common navigation standard across the world.
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g., aircraft types, on-board system capability etc.) to consider these effectively.	It is not proportionate for MAN to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g., aircraft types, on-board system capability etc.) to consider these effectively.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.		Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for MAN to assess the 'other costs' to commercial airlines of flying PBN procedures.
Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	No additional infrastructure is required at MAN to maintain extant conventional procedures; however, maintaining accessibility to current ground-based equipment (operated by NERL) may become prohibitively expensive should a CAP1781 RNAV substitution not be implemented prior to the proposed removal date.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.		There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.	There are no expected additional infrastructure costs. All options relate to the implementation of PBN and no additional infrastructure is anticipated to be required as the introduction of PBN reduces the reliance on ground infrastructure, in particular ground-based navigation aids are no longer needed.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	No change to operational costs is attributable to maintaining the existing procedures.	No change to operational costs is attributable to maintaining the existing procedures.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some operational costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.

Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative	No deployment costs applicable to extant procedures	No deployment costs applicable to extant procedures	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.		ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.	ATC at MAN is contracted out to a third-party organisation. This existing commercial contract between MAN and their chosen ANSP is considered to be an ongoing cost. Some deployment costs are anticipated with respect to the implementation of new procedures and training of controllers; however, these cannot be identified at this stage of the ACP process.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft arriving at MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a potential increase in ATCO workload.	The 'do nothing' scenario assumes that current operations at MAN are safe including use of the extant conventional procedures. Following the removal of ground-based navigational aids supporting the existing SIDs, aircraft arriving at MAN would continuously require radar vectoring (should CAP1781 or a commercial agreement to maintain the existing navigational aid not be implemented), resulting in a potential increase in ATCO workload.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.		The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.	The only hazard that was identified was a potential conflict with MAN proposed SIDs that could cause a possible loss of horizontal/vertical separation, causing an increase in ATCO workload. This hazard can be mitigated through the design process. Further assessment will be conducted at Stage 3 and 4 of the CAP1616 process to confirm the exact nature of all hazards and mitigations.
Summary of Analysis			The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing arrival arrangements do not enable continuous descent approaches from 7,000ft, which could lead to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and economic impact, the 'do nothing baseline' provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	The 'do nothing' scenario in relation to this ACP is not a viable option as it does not provide a sustainable solution in terms of airspace modernisation and is unviable following the removal of the DVOR beacons in December 2022, which would have a significant impact on capacity and resilience. The existing arrival arrangements do not enable continuous descent approaches from 7,000ft, which could lead to a greater volume of fuel burn, emissions and noise at lower levels. In terms of Tranquillity, Biodiversity, General Aviation access and economic impact, the 'Do Nothing baseline' provides minimal/no change to today's operations. Furthermore, there are very limited costs incurred as a result of this scenario. From a safety perspective, it is assumed that current MAN operations are safe. Following the removal of the DVORs, it is acknowledged that ATCO workload may increase due to the enduring requirement for radar vectoring.	When compared to the 'do nothing' scenario, Option 1A L performs: - better in terms of Noise impact, Greenhouse Gases, Fuel Burn, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1A L has been deemed as the Favourable option, as it overflies the second fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 1A R performs: - better in terms of Noise impact. - worse in terms of Greenhouse Gases, Fuel Burn, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 1A R has been deemed as the Favourable option, as it overflies the second fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 6A L performs: - better in terms of Noise impact, Greenhouse Gases, Fuel Burn, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 6A L has been deemed as the Acceptable option, as it overflies the third fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 6A R performs: - better in terms of Noise impact. - worse in terms of Greenhouse Gases, Fuel Burn, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 6A R has been deemed as the Acceptable option, as it overflies the third fewest population when compared to other design options (originating from the IAF).		When compared to the 'do nothing' scenario, Option 8A R performs: - better in terms of Noise impact. - worse in terms of Greenhouse Gases, Fuel Burn, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 8A R has been deemed as the Rejected, as it overflies the greater population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 9A L performs: - better in terms of Noise impact. - worse in terms of Greenhouse Gases, Fuel Burn, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 9A L has been deemed as the Preferred option, as it overflies the fewest population when compared to other design options (originating from the IAF).	When compared to the 'do nothing' scenario, Option 9A R performs: - better in terms of Noise impact. - worse in terms of Greenhouse Gases, Fuel Burn, Capacity and resilience, and Economic impact from increased effective capacity. - equal/neutral in terms of the remaining criteria because there is no change when compared to today's operation. At this time, it is not possible to fully determine the safety implications of this specific option. The change sponsor has identified that there may be some possible conflicts with some routes operated by adjacent airports, but the exact nature of these conflicts is unclear at this stage. Further analysis and engagement is required in Stage 3 and 4 of the CAP1616 process to determine this. Furthermore, this option has been assessed in isolation rather than as a set of design options as part of a wider system/runway pair. Additional analysis will be required in Stage 3 to determine the cumulative impact of this option when compared to all the other options. Based on performance in the IOA, Option 9A R has been deemed as the Preferred option, as it overflies the fewest population when compared to other design options (originating from the IAF).