AIRSPACE MODERNISATION AIRSPACE CHANGE PROPOSAL

STEP 2B
INITIAL OPTIONS APPRAISAL

APPENDIX A

PERFORMANCE BASED NAVIGATION (PBN) STANDARD INSTRUMENT DEPARTURES (SIDs) PART 4

Heathrow

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All airspace design options in this document are subject to change throughout the airspace change process, as options are matured in detail and refined in accordance with safety requirements, design principles, appraisals and stakeholder engagement and consultation.

Initial Options Appraisal

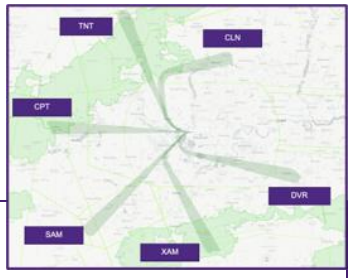
PBN Standard Instrument Departures (SIDs)

Runway 27R

All airspace design options in this document are subject to change throughout the airspace change process, as options are matured in detail and refined in accordance with safety requirements, design principles, appraisals and stakeholder engagement and consultation.

Version 1.0 (July 2023)

PBN SIDs – RWY 27R Option C



Option Description

This option was developed to address DP4.

Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA_{eq}, 16h)	227,200	+67,500
Population above Partial LOAEL (night-time, LA_{eq}, 8h)	70,500	+34,800
Population experiencing at least one event of N65 (daytime)	867,900	+255,100
Population experiencing at least one event of N60 (night-time)	423,900	+131,000

Communities - Air Quality

Introduction of PBN SIDs at Heathrow could affect track distribution below 1000ft within an AQMA. This may or may not have an effect on Air Quality. This is the same for all departure options and is not a differentiating factor at this stage. Any Air Quality impacts will be investigated at Full Options Appraisal (FOA).

Wider Society – Greenhouse Gas Impact

Metric	Option Value	Difference to Baseline
Overall Track Miles of the option (nm)	432	-23

Wider Society – Tranquillity & Biodiversity

Metric	Option Value	Difference to Baseline
Total Area of AONBs/National Parks (NPs) overflown between 0-7000ft once a day on average (daytime)	131km^2	-164km^2
Total Area of AONBs/NPs overflown experiencing at least one event of N65 on average (daytime)	52km^2	+8km^2
Total Area of Richmond Park overflown between 0-7000ft at least once a day on average (daytime)	0km^2	No change
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown between 0-1640ft which observe a potential change in location overflown	4	+4
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown between 0-3000ft which observe a potential change in location overflown	16	+16

Wider Society – Capacity/Resilience

Expected to perform better than the 'Do Nothing' scenario owing to anticipated improved departure separations.

Heathrow's capacity for this ACP is limited by the existing 480,000 movement cap.

General Aviation – Access

No additional CAS envisaged.

Systemised SIDs requiring less tactical intervention and with improved CCO could facilitate release of portions of CAS.

SIDs could impact helicopter route H10.

General Aviation / Commercial Airlines – Economic impact from increased effective capacity

If this option did enable sponsors to release some portions of CAS there could be a small, positive economic effect on GA operations outside CAS but this is not quantifiable at this stage.

The economic impact on commercial airlines from a reduction in ground delay is expected to provide an overall benefit in comparison to the Baseline.

General Aviation / Commercial Airlines – Fuel Burn

Change in Fuel Burn (compared to the Baseline - annual - tonnes)	-4,010

Commercial Airlines – Other costs

None identified.

Commercial Airlines – Training costs

None identified.

Airport/ANSP – Operational costs

This option is not anticipated to change airport or ANSP operational costs. The implementation of PBN SIDs removes Heathrow's dependency on conventional ground-based navigation equipment (VORs), which contributes to a reduction in Heathrow and NERL's operational costs as it enables VOR rationalisation.

Option may lead to a change in the number of properties eligible for the noise insulation scheme which could lead to a change in operational costs for the airport.

Airport/ANSP – Infrastructure costs

Option may require re-location and/or addition of Noise Monitoring Terminals.

Airport/ANSP – Deployment costs

There will be significant costs associated with deployment in terms of operational training and system upgrades which will be quantified in Stage 3. However, no differences are expected in these costs between the different options.

Safety

Designing first turn within PANS OPS may be challenging**.**

Although new or revised safety assurances may be needed, an acceptable safety argument is envisaged to be achievable.

Adherence to AMS

Supports the AMS through increased systemisation and meeting the Government's key environmental objectives by utilising PBN. Used in combination with suitable arrival options, the option supports CCO/CDA operations enabling quicker & cleaner journeys. PBN Departures provide opportunity to potentially reduce CAS & enable integration of UAM in the future. Efficiency benefits to the LTMA are not yet known.

Interdependencies, Conflicts & Trade-Offs

Option is expected to result in conflicts/interdependencies with RAF Northolt, Luton, Biggin Hill, Stansted, London City, Farnborough and Gatwick.

Outcome of PBN SID RWY27R Option C

Option C reduces the number of track miles, indicates a better performance than the Baseline regarding airport resilience and decreases the area of AONBs and NPs overflown.

There is a significant number of biodiversity sites between 0-3000ft that may experience a change in location overflown and it performs poorly against all the noise metrics. Critically, the option failed Test 1 of the shortlisting process as it increases the population above the partial LOAEL (night) to twice the size of the Baseline.

OPTION DISCONTINUED

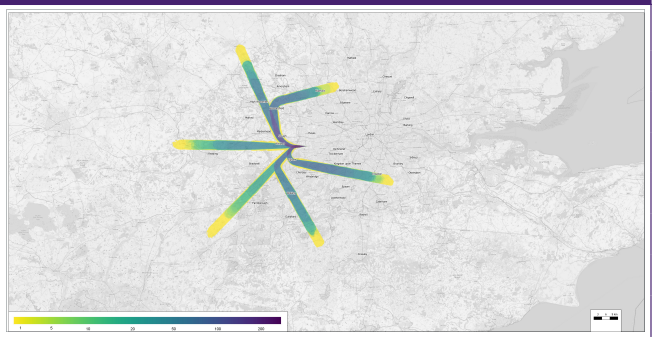
PBN Departures – RWY 27R Option C (Day)

07:00 - 23:00

Overflight

Rate	Population Overflown	
	Baseline	Option C
≥ 1	1,492,600	1,064,200
≥ 5	671,500	972,000
≥ 10	444,700	849,700
≥ 20	285,200	684,200
≥ 50	108,900	225,700
≥ 100	25,100	47,900
≥ 200	1,000	900

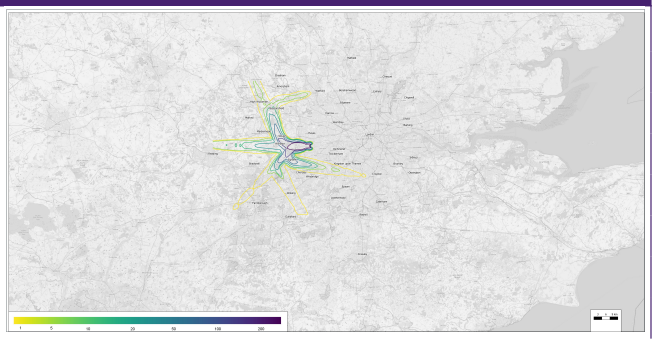
Overflight (0-7000 ft) contour map



Aircraft Noise Events

Rate	Population experiencing noise events above N65 each day	
	Baseline	Option C
≥ 1	612,800	867,900
≥ 5	288,800	424,400
≥ 10	209,700	299,600
≥ 20	155,700	221,900
≥ 50	66,800	113,900
≥ 100	22,300	29,700
≥ 200	11,800	10,300

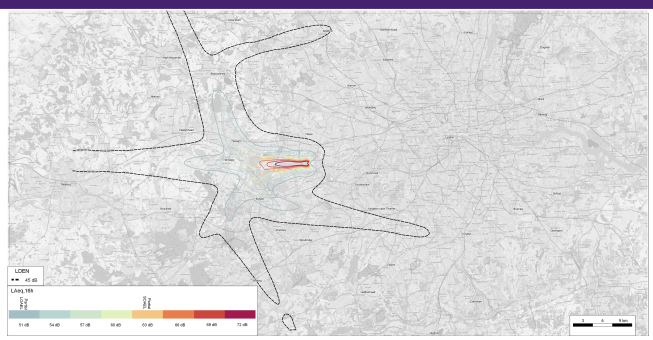
N65 events contour map



Noise Exposures

Population count	Baseline	Option C
Estimated total population above WHO Threshold (>45 dB L_{den})	597,500	814,900
Total population within Partial LOAEL (>51 dB $L_{Aeq,16h}$)	159,700	227,200

Partial LOAEL contour map



Noise Exposure Change

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL
Partial LOAEL	68,900 (of which 46,200 brought out of Partial LOAEL by Option)	38,700	165,800 (of which 113,700 brought into Partial LOAEL by Option)

Change in noise exposure map

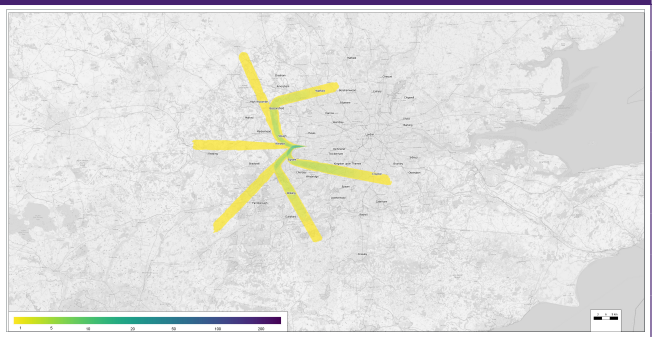
PBN Departures – RWY 27R Option C (Night)

23:00 - 07:00

Overflight

Rate	Population Overflown	
	Baseline	Option C
≥ 1	190,500	703,300
≥ 5	2,000	2,300
≥ 10	1,000	700
≥ 20	0	0
≥ 50	0	0
≥ 100	0	0
≥ 200	0	0

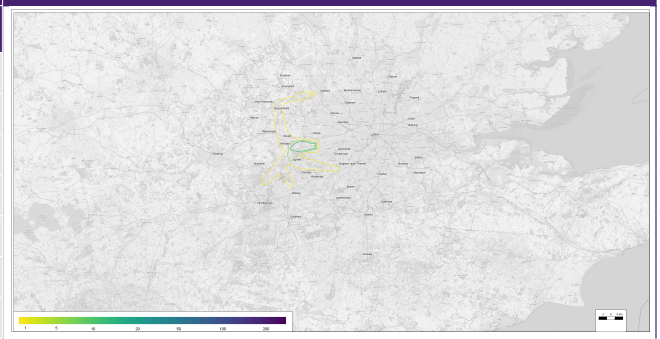
Overflight (0-7000 ft) contour map



Aircraft Noise Events

Rate	Population experiencing noise events above N60 each day	
	Baseline	Option C
≥ 1	292,900	423,900
≥ 5	42,800	34,400
≥ 10	19,700	15,300
≥ 20	0	0
≥ 50	0	0
≥ 100	0	0
≥ 200	0	0

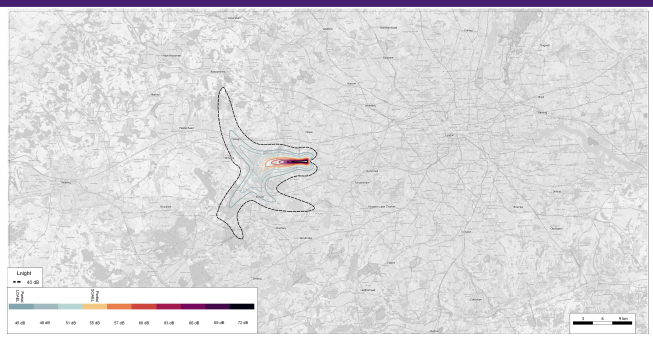
N60 events contour map



Noise Exposures

Population count	Baseline	Option C
Estimated total population above WHO Threshold (>40 dB L_{night})	166,600	208,800
Total population within Partial LOAEL (>45 dB $L_{Aeq,8h}$)	35,700	70,500

Partial LOAEL contour map

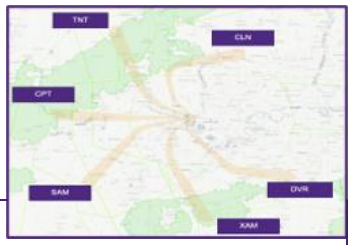


Noise Exposure Change

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL
Partial LOAEL	12,300 (of which 8,200 brought out of Partial LOAEL by Option)	19,300	47,200 (of which 43,000 brought into Partial LOAEL by Option)

Change in noise exposure map

PBN SIDs – RWY 27R Option D



Option Description

This option was developed to address DP5.

Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA_{eq}, 16h)	219,700	+60,000
Population above Partial LOAEL (night-time, LA_{eq}, 8h)	79,600	+43,900
Population experiencing at least one event of N65 (daytime)	753,300	+140,500
Population experiencing at least one event of N60 (night-time)	408,400	+115,500

Communities - Air Quality

Introduction of PBN SIDs at Heathrow could affect track distribution below 1000ft within an AQMA. This may or may not have an effect on Air Quality. This is the same for all departure options and is not a differentiating factor at this stage. Any Air Quality impacts will be investigated at Full Options Appraisal (FOA).

Wider Society – Greenhouse Gas Impact

Metric	Option Value	Difference to Baseline
Overall Track Miles of the option (nm)	439	-16

Wider Society – Tranquillity & Biodiversity

Metric	Option Value	Difference to Baseline
Total Area of AONBs/National Parks (NPs) overflown between 0-7000ft once a day on average (daytime)	114km^2	-182km^2
Total Area of AONBs/NPs overflown experiencing at least one event of N65 on average (daytime)	59km^2	+15km^2
Total Area of Richmond Park overflown between 0-7000ft at least once a day on average (daytime)	0km^2	No change
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown between 0-1640ft which observe a potential change in location overflown	0	No change
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown between 0-3000ft which observe a potential change in location overflown	4	+4

Wider Society – Capacity/Resilience

Expected to perform better than the 'Do Nothing' scenario owing to anticipated improved departure separations.

Heathrow's capacity for this ACP is limited by the existing 480,000 movement cap.

General Aviation – Access

No additional CAS envisaged.

Systemised SIDs requiring less tactical intervention and with improved CCO could facilitate release of portions of CAS.

SIDs could impact helicopter route H10.

General Aviation / Commercial Airlines – Economic impact from increased effective capacity

If this option did enable sponsors to release some portions of CAS there could be a small, positive economic effect on GA operations outside CAS but this is not quantifiable at this stage.

The economic impact on commercial airlines from a reduction in ground delay is expected to provide an overall benefit in comparison to the Baseline.

General Aviation / Commercial Airlines – Fuel Burn

Change in Fuel Burn (compared to the Baseline - annual - tonnes)	-2,800

Commercial Airlines – Other costs

None identified.

Commercial Airlines – Training costs

None identified.

Airport/ANSP – Infrastructure costs

Option may require re-location and/or addition of Noise Monitoring Terminals.

Airport/ANSP – Operational costs

This option is not anticipated to change airport or ANSP operational costs. The implementation of PBN SIDs removes Heathrow's dependency on conventional ground-based navigation equipment (VORs), which contributes to a reduction in Heathrow and NERL's operational costs as it enables VOR rationalisation.

Option may lead to a change in the number of properties eligible for the noise insulation scheme which could lead to a change in operational costs for the airport.

Airport/ANSP – Deployment costs

There will be significant costs associated with deployment in terms of operational training and system upgrades which will be quantified in Stage 3. However, no differences are expected in these costs between the different options.

Safety

Designing first turn within PANS OPS may be challenging**.**

Although new or revised safety assurances may be needed, an acceptable safety argument is envisaged to be achievable.

Adherence to AMS

Supports the AMS through increased systemisation and meeting the Government's key environmental objectives by utilising PBN. Used in combination with suitable arrival options, the option supports CCO/CDA operations enabling quicker & cleaner journeys. PBN Departures provide opportunity to potentially reduce CAS & enable integration of UAM in the future. Efficiency benefits to the LTMA are not yet known.

Interdependencies, Conflicts & Trade-Offs

Option is expected to result in conflicts/interdependencies with RAF Northolt, Luton, Biggin Hill, Stansted, London City, Farnborough and Gatwick.

Outcome of PBN SID RWY27R Option D

Option D reduces the number of track miles, indicates better airport resilience performance than the Baseline, and decreases the area of AONBs and NPs overflown.

There is a significant number of biodiversity sites between 0-3000ft that may experience a change in location overflown and it performs poorly against all the noise metrics. Critically, the option failed Test 1 of the shortlisting process as it increases the population above the partial LOAEL (night) to more than twice the size of the Baseline.

OPTION DISCONTINUED

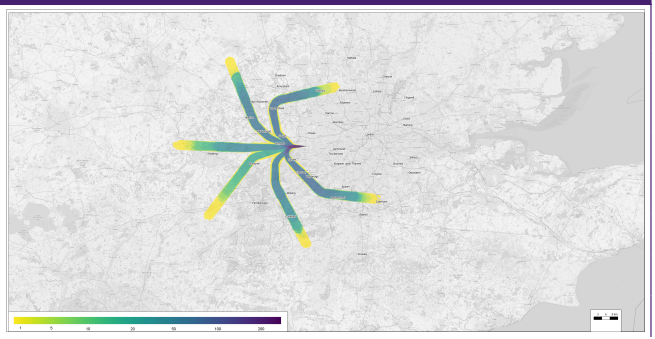
PBN Departures – RWY 27R Option D (Day)

07:00 - 23:00

Overflight

Rate	Population Overflown	
	Baseline	Option D
≥ 1	1,492,600	790,000
≥ 5	671,500	702,600
≥ 10	444,700	651,500
≥ 20	285,200	536,500
≥ 50	108,900	143,400
≥ 100	25,100	2,900
≥ 200	1,000	1,200

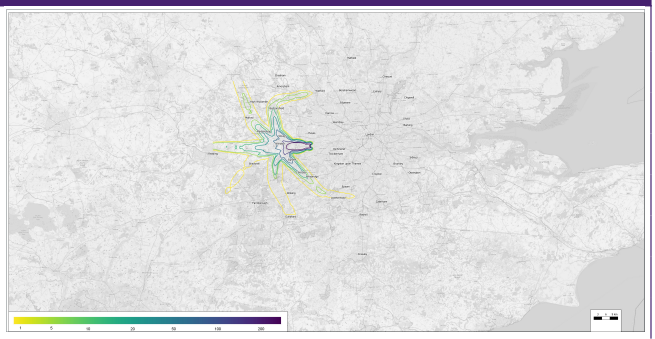
Overflight (0-7000 ft) contour map



Aircraft Noise Events

Rate	Population experiencing noise events above N65 each day	
	Baseline	Option D
≥ 1	612,800	753,300
≥ 5	288,800	420,600
≥ 10	209,700	285,200
≥ 20	155,700	216,900
≥ 50	66,800	111,900
≥ 100	22,300	22,300
≥ 200	11,800	11,000

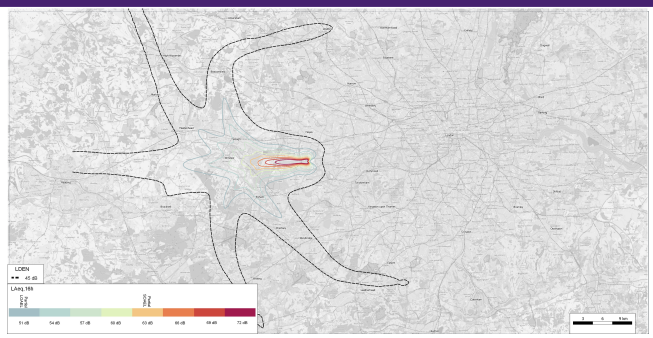
N65 events contour map



Noise Exposures

Population count	Baseline	Option D
Estimated total population above WHO Threshold (>45 dB L_{den})	597,500	728,600
Total population within Partial LOAEL (>51 dB $L_{Aeq,16h}$)	159,700	219,700

Partial LOAEL contour map



Noise Exposure Change

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL
Partial LOAEL	53,400 (of which 20,200 brought out of Partial LOAEL by Option)	61,900	124,600 (of which 80,100 brought into Partial LOAEL by Option)

Change in noise exposure map

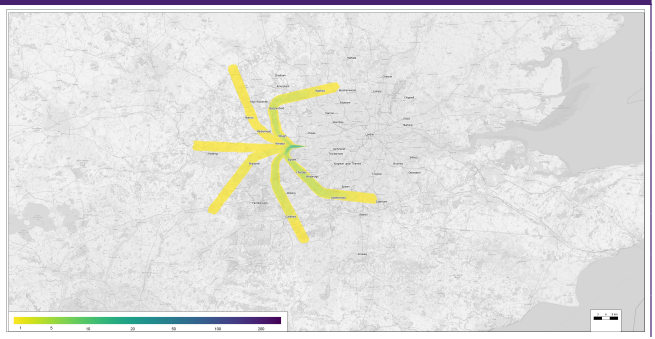
PBN Departures – RWY 27R Option D (Night)

23:00 - 07:00

Overflight

Rate	Population Overflown	
	Baseline	Option D
≥ 1	190,500	455,900
≥ 5	2,000	3,700
≥ 10	1,000	1,000
≥ 20	0	0
≥ 50	0	0
≥ 100	0	0
≥ 200	0	0

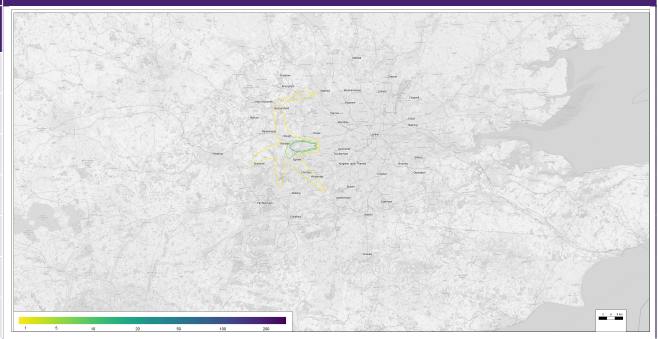
Overflight (0-7000 ft) contour map



Aircraft Noise Events

Rate	Population experiencing noise events above N60 each day	
	Baseline	Option D
≥ 1	292,900	408,400
≥ 5	42,800	36,600
≥ 10	19,700	17,200
≥ 20	0	0
≥ 50	0	0
≥ 100	0	0
≥ 200	0	0

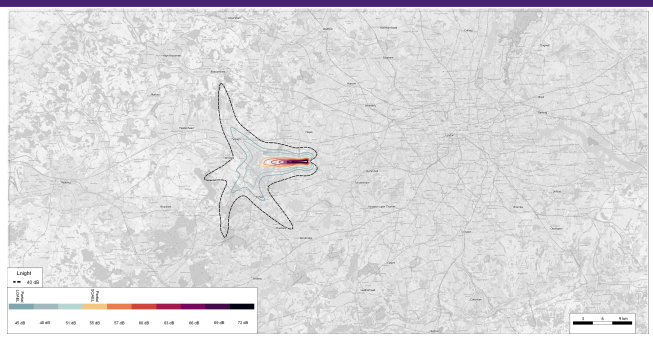
N60 events contour map



Noise Exposures

Population count	Baseline	Option D
Estimated total population above WHO Threshold (>40 dB L_{night})	166,600	186,700
Total population within Partial LOAEL (>45 dB $L_{Aeq,8h}$)	35,700	79,600

Partial LOAEL contour map

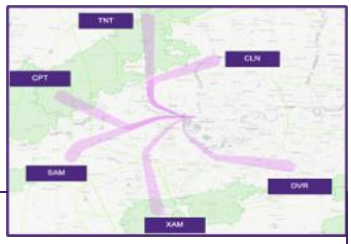


Noise Exposure Change

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL
Partial LOAEL	9,700 (of which 6,700 brought out of Partial LOAEL by Option)	18,700	57,900 (of which 50,600 brought into Partial LOAEL by Option)

Change in noise exposure map

PBN SIDs – RWY 27R Option E



Option Description

This option was developed to address DP9.

Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA_{eq}, 16h)	161,700	+2,000
Population above Partial LOAEL (night-time, LA_{eq}, 8h)	43,400	+7,700
Population experiencing at least one event of N65 (daytime)	611,000	-1,800
Population experiencing at least one event of N60 (night-time)	305,200	+12,300

Communities - Air Quality

Introduction of PBN SIDs at Heathrow could affect track distribution below 1000ft within an AQMA. This may or may not have an effect on Air Quality. This is the same for all departure options and is not a differentiating factor at this stage. Any Air Quality impacts will be investigated at Full Options Appraisal (FOA).

Wider Society – Greenhouse Gas Impact

Metric	Option Value	Difference to Baseline
Overall Track Miles of the option (nm)	450	-5

Wider Society – Tranquillity & Biodiversity

Metric	Option Value	Difference to Baseline
Total Area of AONBs/National Parks (NPs) overflown between 0-7000ft once a day on average (daytime)	107km^2	-188km^2
Total Area of AONBs/NPs overflown experiencing at least one event of N65 on average (daytime)	37km^2	-7km^2
Total Area of Richmond Park overflown between 0-7000ft at least once a day on average (daytime)	0km^2	No change
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown between 0-1640ft which observe a potential change in location overflown	3	+3
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown between 0-3000ft which observe a potential change in location overflown	13	+13

Wider Society – Capacity/Resilience

Expected to perform better than the 'Do Nothing' scenario owing to anticipated improved departure separations.

Heathrow's capacity for this ACP is limited by the existing 480,000 movement cap.

General Aviation – Access

No additional CAS envisaged.

Systemised SIDs requiring less tactical intervention and with improved CCO could facilitate release of portions of CAS.

Option not expected to impact existing helicopter routes.

General Aviation / Commercial Airlines – Economic impact from increased effective capacity

If this option did enable sponsors to release some portions of CAS there could be a small, positive economic effect on GA operations outside CAS but this is not quantifiable at this stage.

The economic impact on commercial airlines from a reduction in ground delay is expected to provide an overall benefit in comparison to the Baseline.

Commercial Airlines – Training costs

None identified.

Airport/ANSP – Infrastructure costs

Option may require re-location and/or addition of Noise Monitoring Terminals.

Airport/ANSP – Deployment costs

There will be significant costs associated with deployment in terms of operational training and system upgrades which will be quantified in Stage 3. However, no differences are expected in these costs between the different options.

Safety

Designing first turn within PANS OPS may be challenging.

Although new or revised safety assurances may be needed, an acceptable safety argument is envisaged to be achievable.

Interdependencies, Conflicts & Trade-Offs

Option is expected to result in conflicts/interdependencies with RAF Northolt, Luton, Biggin Hill, Stansted, London City, Farnborough and Gatwick.

General Aviation / Commercial Airlines – Fuel Burn

Change in Fuel Burn (compared to the Baseline - annual - tonnes)	-1,150

Commercial Airlines – Other costs

None identified.

Airport/ANSP – Operational costs

This option is not anticipated to change airport or ANSP operational costs. The implementation of PBN SIDs removes Heathrow's dependency on conventional ground-based navigation equipment (VORs), which contributes to a reduction in Heathrow and NERL's operational costs as it enables VOR rationalisation.

Option may lead to a change in the number of properties eligible for the noise insulation scheme which could lead to a change in operational costs for the airport.

Adherence to AMS

Supports the AMS through increased systemisation and meeting the Government's key environmental objectives by utilising PBN. Used in combination with suitable arrival options, the option supports CCO/CDA operations enabling quicker & cleaner journeys. PBN Departures provide opportunity to potentially reduce CAS & enable integration of UAM in the future. Efficiency benefits to the LTMA are not yet known.

Outcome of PBN SID RWY27R Option E

Option E provides a reduction in overflight of AONBs and NPs, a small reduction in track miles and a negligible decrease in the population experiencing at least one N65 (daytime) noise event. It indicates a better airport resilience performance than the Baseline.

There are significant increases in the population above the Partial LOAEL (night) and a significant number of biodiversity sites between 0-3000ft that may experience a change in location overflown There is an increase in the population experiencing at least one N60 (night) noise event. This option will be explored further in Stage 3.

OPTION CARRIED FORWARD TO STAGE 3

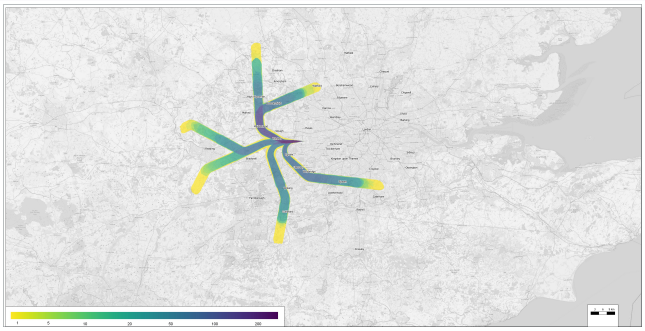
PBN Departures – RWY 27R Option E (Day)

07:00 - 23:00

Overflight

Rate	Population Overflown	
	Baseline	Option E
≥ 1	1,492,600	679,300
≥ 5	671,500	541,100
≥ 10	444,700	472,700
≥ 20	285,200	391,000
≥ 50	108,900	134,300
≥ 100	25,100	26,700
≥ 200	1,000	1,000

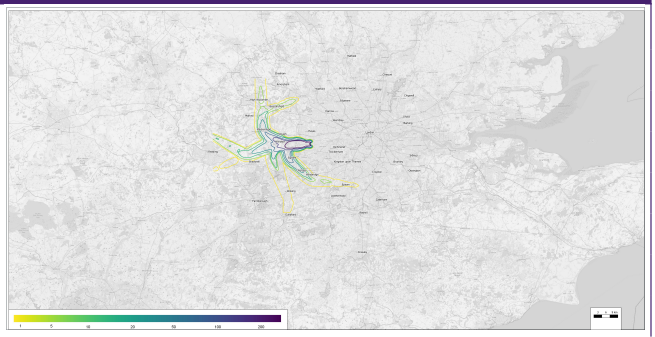
Overflight (0-7000 ft) contour map



Aircraft Noise Events

Rate	Population experiencing noise events above N65 each day	
	Baseline	Option E
≥ 1	612,800	611,000
≥ 5	288,800	301,500
≥ 10	209,700	216,800
≥ 20	155,700	152,900
≥ 50	66,800	76,600
≥ 100	22,300	23,300
≥ 200	11,800	11,100

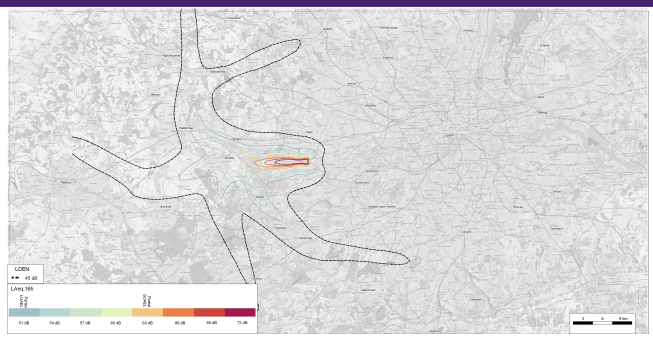
N65 events contour map



Noise Exposures

Population count	Baseline	Option E
Estimated total population above WHO Threshold (>45 dB L_{den})	597,500	643,500
Total population within Partial LOAEL (>51 dB $L_{Aeq,16h}$)	159,700	161,700

Partial LOAEL contour map



Noise Exposure Change

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL
Partial LOAEL	28,100 (of which 13,700 brought out of Partial LOAEL by Option)	98,000	49,200 (of which 15,600 brought into Partial LOAEL by Option)

Change in noise exposure map

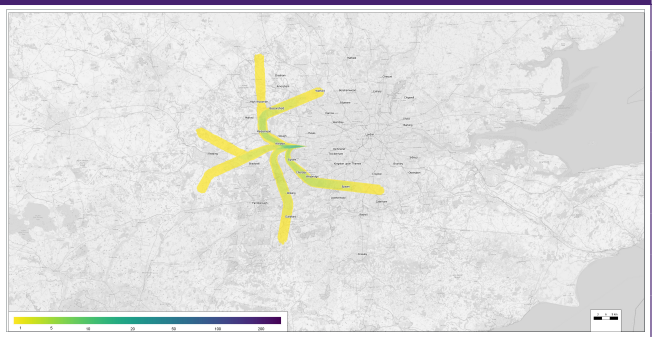
PBN Departures – RWY 27R Option E (Night)

23:00 - 07:00

Overflight

Rate	Population Overflown	
	Baseline	Option E
≥ 1	190,500	393,600
≥ 5	2,000	5,100
≥ 10	1,000	800
≥ 20	0	0
≥ 50	0	0
≥ 100	0	0
≥ 200	0	0

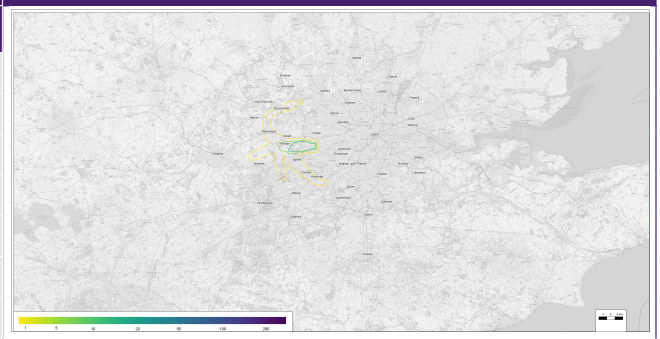
Overflight (0-7000 ft) contour map



Aircraft Noise Events

Rate	Population experiencing noise events above N60 each day	
	Baseline	Option E
≥ 1	292,900	305,200
≥ 5	42,800	46,800
≥ 10	19,700	15,900
≥ 20	0	0
≥ 50	0	0
≥ 100	0	0
≥ 200	0	0

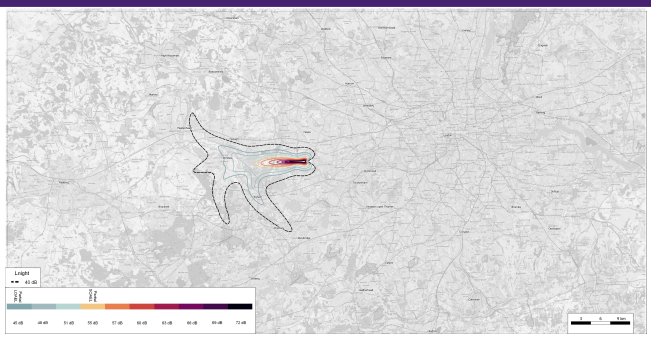
N60 events contour map



Noise Exposures

Population count	Baseline	Option E
Estimated total population above WHO Threshold (>40 dB L_{night})	166,600	166,500
Total population within Partial LOAEL (>45 dB $L_{Aeq,8h}$)	35,700	43,400

Partial LOAEL contour map

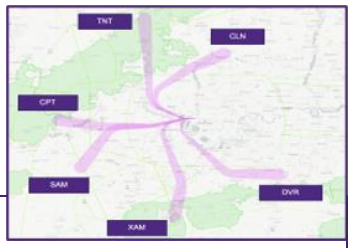


Noise Exposure Change

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL
Partial LOAEL	5,900 (of which 2,700 brought out of Partial LOAEL by Option)	25,200	15,000 (of which 10,300 brought into Partial LOAEL by Option)

Change in noise exposure map

PBN SIDs – RWY 27R Option F



Option Description

This option was developed to represent today's nominal SID centrelines.

Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA_{eq}, 16h)	162,500	+2,800
Population above Partial LOAEL (night-time, LA_{eq}, 8h)	37,400	+1,700
Population experiencing at least one event of N65 (daytime)	655,600	+42,800
Population experiencing at least one event of N60 (night-time)	332,000	+39,100

Communities - Air Quality

Introduction of PBN SIDs at Heathrow could affect track distribution below 1000ft within an AQMA. This may or may not have an effect on Air Quality. This is the same for all departure options and is not a differentiating factor at this stage. Any Air Quality impacts will be investigated at Full Options Appraisal (FOA).

Wider Society – Greenhouse Gas Impact

Metric	Option Value	Difference to Baseline
Overall Track Miles of the option (nm)	448	-7

Wider Society – Tranquillity & Biodiversity

Metric	Option Value	Difference to Baseline
Total Area of AONBs/National Parks (NPs) overflown between 0-7000ft once a day on average (daytime)	81km^2	-214km^2
Total Area of AONBs/NPs overflown experiencing at least one event of N65 on average (daytime)	32km^2	-12km^2
Total Area of Richmond Park overflown between 0-7000ft at least once a day on average (daytime)	0km^2	No change
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown between 0-1640ft which observe a potential change in location overflown	0	No change
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown between 0-3000ft which observe a potential change in location overflown	2	+2

Wider Society – Capacity/Resilience

Expected to perform the same as the 'Do Nothing' scenario.

Heathrow's capacity for this ACP is limited by the existing 480,000 movement cap.

General Aviation – Access

No additional CAS envisaged.

Systemised SIDs requiring less tactical intervention and with improved CCO could facilitate release of portions of CAS.

Option not expected to impact existing helicopter routes.

General Aviation / Commercial Airlines – Economic impact from increased effective capacity

If this option did enable sponsors to release some portions of CAS there could be a small, positive economic effect on GA operations outside CAS but this is not quantifiable at this stage.

There is no change to expected economic impact on commercial airlines from a reduction in ground delay in comparison to the Baseline.

General Aviation / Commercial Airlines – Fuel Burn

Change in Fuel Burn (compared to the Baseline - annual - tonnes)	-1,420

Commercial Airlines – Other costs

None identified.

Commercial Airlines – Training costs

None identified.

Airport/ANSP – Infrastructure costs

Option may require re-location and/or addition of Noise Monitoring Terminals.

Airport/ANSP – Operational costs

This option is not anticipated to change airport or ANSP operational costs. The implementation of PBN SIDs removes Heathrow's dependency on conventional ground-based navigation equipment (VORs), which contributes to a reduction in Heathrow and NERL's operational costs as it enables VOR rationalisation.

Option may lead to a change in the number of properties eligible for the noise insulation scheme which could lead to a change in operational costs for the airport.

Airport/ANSP – Deployment costs

There will be significant costs associated with deployment in terms of operational training and system upgrades which will be quantified in Stage 3. However, no differences are expected in these costs between the different options.

Safety

Designing first turn within PANS OPS may be challenging.

Although new or revised safety assurances may be needed, an acceptable safety argument is envisaged to be achievable.

Adherence to AMS

Supports the AMS through increased systemisation and meeting the Government's key environmental objectives by utilising PBN. Used in combination with suitable arrival options, the option supports CCO/CDA operations enabling quicker & cleaner journeys. PBN Departures provide opportunity to potentially reduce CAS & enable integration of UAM in the future. Efficiency benefits to the LTMA are not yet known.

Interdependencies, Conflicts & Trade-Offs

Option is expected to result in conflicts/interdependencies with RAF Northolt, Luton, Biggin Hill, Stansted, London City, Farnborough and Gatwick.

Outcome of PBN SID RWY27R Option F

Option F provides a reduction in overflight of AONBs and NPs. There is a small reduction in track miles and similar airport resilience performance to the Baseline.

There are increases in the population experiencing at least one N65 (daytime) noise event and the population above the Partial LOAEL (night). There is a significant increase in the population experiencing at least one N60 (night) noise event and there are small increases in the population above the Partial LOAEL (daytime). A significant number of biodiversity sites between 0-3000ft that may experience a change in location overflown. This option will be explored further in Stage 3.

OPTION CARRIED FORWARD TO STAGE 3

PBN Departures – RWY 27R Option F (Day)

07:00 - 23:00

Overflight

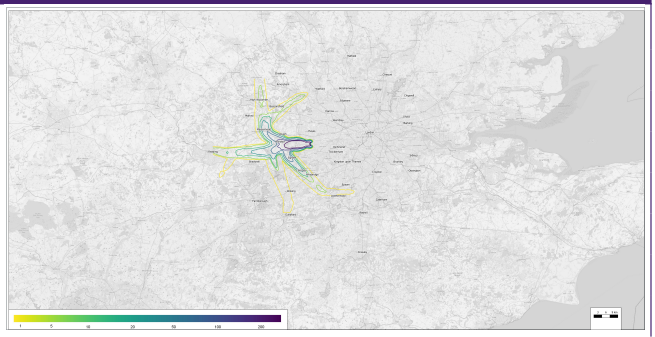
Rate	Population Overflown	
	Baseline	Option F
≥ 1	1,492,600	743,100
≥ 5	671,500	651,900
≥ 10	444,700	537,900
≥ 20	285,200	420,900
≥ 50	108,900	128,700
≥ 100	25,100	33,000
≥ 200	1,000	1,400

Overflight (0-7000 ft) contour map

Aircraft Noise Events

Rate	Population experiencing noise events above N65 each day	
	Baseline	Option F
≥ 1	612,800	655,600
≥ 5	288,800	336,900
≥ 10	209,700	217,300
≥ 20	155,700	156,300
≥ 50	66,800	72,600
≥ 100	22,300	21,800
≥ 200	11,800	11,500

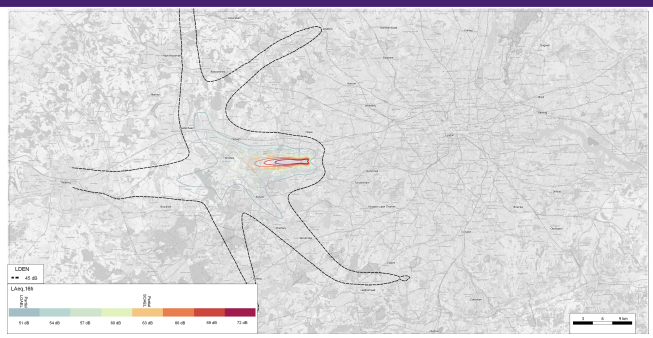
N65 events contour map



Noise Exposures

Population count	Baseline	Option F
Estimated total population above WHO Threshold (>45 dB L_{den})	597,500	696,300
Total population within Partial LOAEL (>51 dB $L_{Aeq,16h}$)	159,700	162,500

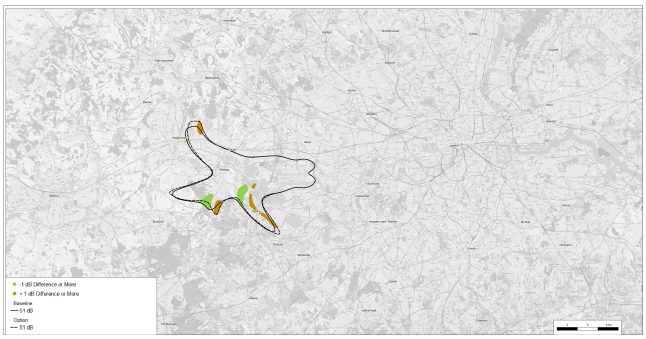
Partial LOAEL contour map



Noise Exposure Change

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL
Partial LOAEL	4,600 (of which 2,500 brought out of Partial LOAEL by Option)	148,800	11,700 (of which 5,300 brought into Partial LOAEL by Option)

Change in noise exposure map



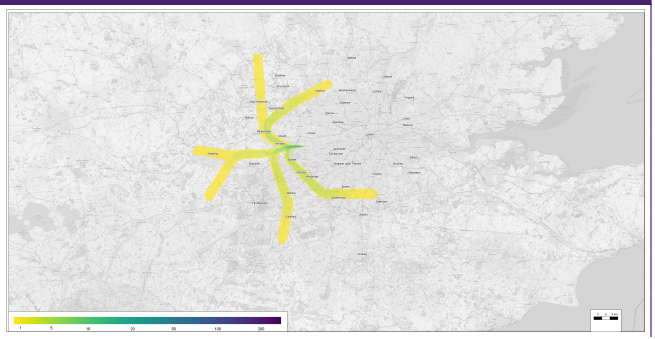
PBN Departures – RWY 27R Option F (Night)

23:00 - 07:00

Overflight

Rate	Population Overflown	
	Baseline	Option F
≥ 1	190,500	399,200
≥ 5	2,000	2,200
≥ 10	1,000	1,300
≥ 20	0	0
≥ 50	0	0
≥ 100	0	0
≥ 200	0	0

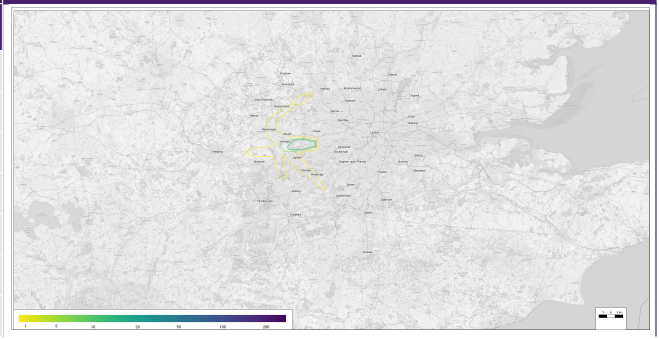
Overflight (0-7000 ft) contour map



Aircraft Noise Events

Rate	Population experiencing noise events above N60 each day	
	Baseline	Option F
≥ 1	292,900	332,100
≥ 5	42,800	42,500
≥ 10	19,700	18,000
≥ 20	0	0
≥ 50	0	0
≥ 100	0	0
≥ 200	0	0

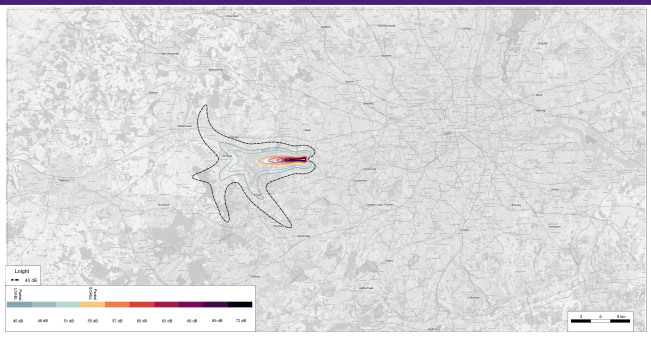
N60 events contour map



Noise Exposures

Population count	Baseline	Option F
Estimated total population above WHO Threshold (>40 dB L_{night})	166,600	166,500
Total population within Partial LOAEL (>45 dB $L_{Aeq,8h}$)	35,700	37,400

Partial LOAEL contour map



Noise Exposure Change

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL
Partial LOAEL	2,100 (of which 1,200 brought out of Partial LOAEL by Option)	32,800	3,800 (of which 2,900 brought into Partial LOAEL by Option)

Change in noise exposure map