

Appendix D

VARIATIONS CONSIDERED: AOS FOR AIRPORTS NPS

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VARIATIONS TO SCHEMES

1.1 BACKGROUND

- 1.1.1 The three schemes which are considered within this Appraisal of Sustainability (AoS) are those assessed by the Airport Commission. The shortlisted scheme promoters continued to refine their schemes following the formal submission of scheme designs in May 2014 to the Airports Commission (AC).
- 1.1.2 The three schemes remain fundamentally the same as those assessed by the AC in most respects. However, further variations to the scheme designs were captured by Government and the scheme promoters in the form of a Statement of Principles (SoP) for each scheme¹. These SoP set out the scheme proposed by the promoters including the variations to the scheme design originally assessed by the AC which are presented within the AoS. The SoPs set out the proposed schemes which have been considered prior to the publication of the National Policy Statement.
- 1.1.3 The variations set out within the SoPs have been subject to a high-level screening as part of the AoS. This screening has been undertaken to determine whether the variations result in differences to the original AC schemes which could give rise to a change in the significance of environmental or sustainability effects which are reported in the AoS. The principal changes to scheme design as described in the SoPs comprise:
- London Gatwick Second Runway (LGW-2R): Change in phasing of construction; the first phase of the new terminal would open at the same time as the new runway in 2025;
 - London Heathrow Extended Northern Runway (LHR-ENR): The M4 would not require widening to cope with the increased demand resulting from expansion; surface access proposals

¹ The Secretary of State for Transport and Gatwick Airport Limited, 2016. *Statement of Principles*

¹ The Secretary of State for Transport and Heathrow Hub Limited and Runway Innovations Limited, 2016. *Statement of Principles*

¹ The Secretary of State for Transport and Heathrow Airport Limited, 2016. *Statement of Principles*

comprising M25 works and tunnelling on a like for like replacement basis (J14 to the south and J15 to the north); local road diversions and improvements including for the A4 and A3044; and

- London Heathrow North West Runway (LHR-NWR): The M4 would not require widening to cope with the increased demand resulting from expansion.

1.1.4 The variations to the scheme are described in Section 2 below.

1.2 SCREENING ASSESSMENT METHODOLOGY

1.2.1 A screening process was used to determine whether, based on the existing evidence, there is likely to be a change for each AoS topic. This uses the Appraisal Framework comprising objectives and appraisal questions as presented in Section 4 of the AoS Report. It considers the following:

- the assessment of the proposal as submitted to the AC;
- the likely change to the assessment;
- whether the change is likely to change the assessment of significance;
- where the assessment of significance is likely to change, where further assessment is required; and
- any uncertainties, assumptions or limitations of the existing information on the variation.

1.2.2 The screening assessment was undertaken using publically available sources of mapping, such as MAGIC², to identify environmental constraints.

1.2.3 The results of the Screening Assessment are reported in Tables 4 to 7.

1.2.4 Subsequent to the screening assessment, this assessment considers AoS objectives and questions where potential changes in the significance of effects were identified. The results of this assessment are reported in Section 3. In addition, the assessment provides a more detailed review of the screening assessment conclusions, where additional impacts are anticipated, but these do not result in a change to significance.

² Department for Farming and Rural Affairs, 2016. *Magic*. [[online](#)] Accessed 10/10/2016

2

STATEMENT OF PRINCIPLES VARIATIONS

2.1 LGW-2R VARIATIONS

2.1.1

The LGW-2R SoP describes the proposed phasing arrangements for construction of airport expansion at Gatwick. The phasing arrangements described are summarised below. The SoP sets out when passenger capacity will be delivered, and when airport facilities and surface access systems will be constructed to deliver the necessary increase capacity at each phase.

PHASE 1 (OPEN IN 2025)

- Second runway which will be built to its full paved length of 3,400m;
- Capacity of the two-runway Airport initially to 63mppa (millions of passengers per annum), which is expected to be reached by 2029;
- First phase of the new terminal would open;
- A23 re-routed along the southern boundary of the extended Airport and then parallel with the railway where it will connect (temporarily) back into the existing roadway which passes beneath South Terminal;
- Balcombe Road will be diverted maintaining a through-route for local traffic passing around the eastern boundary of the Airport;
- A short section of Ifield Road will be diverted around the southwest corner of the Airport;
- New dual carriageway road access connecting the M23 (Junction 9) and the new terminal;
- Further capacity improvements will be made to the junctions serving North and South Terminals as well as Longbridge Roundabout (the junction of the A23 and A217) located to the north of the Airport; and
- The first phase will also include land outside the Airport boundary required for landscape and habitat management which will form part of the mitigation measures designed to off-set the environmental impacts of expansion.

PHASE 2 (OPEN IN 2030)

- Capacity to 73mppa;
- Further improvements to airport terminals and facilities within the airport site; and
- Completion of full A23 diversion to east of railway.

PHASE 3 (OPEN IN 2035)

- Capacity to 82mppa; and
- Further improvements to airport terminals and facilities within the airport site.

PHASE 4 (OPEN IN 2040)

- Capacity to 95mppa; and
- Further improvements to airport terminals and facilities within the airport site.

2.1.2 The phasing arrangements for LGW-2R do not change the completed facilities or surface access systems which would be provided in support of airport expansion, only the timing of at which these are delivered.

2.2 LHR-ENR VARIATIONS

2.2.1 The AC carried out its assessment of LHR-ENR on the basis of the same 'on-site' Surface Access Strategy as LHR-NWR (Table 1 below). For the rail network, an identical surface access strategy is proposed to that for LHR-NWR. The road interventions vary slightly between the two schemes, as the footprint of LHR-ENR requires a different strategy for improvements to the local road network, as although similar roads are affected, they are in a different location.

Table 1 LHR-ENR Surface Access Strategy Assessed by the Airports Commission³

Category	Location	Description of Surface Access Arrangements
Strategic Road	M4 J3 to J4	Road widening
	M4 Airport Spur	Road widening
	M4 J2 to J3	Road widening
	M4 J4 and J4B	Road widening
	M4	Large M4 Junction 4b replacement
	M4	Higher capacity at M4 Junction 4a
	M4	Capacity improvements to existing main airport tunnel
	M25	M25 tunnelling (south of Junction 15)
Local Road Network	M25 J13 (A13) D2	Grade-separated junction and flyover/bridge structures
	Tunnel From A4 to T5	
	A4 Access	Tunnel running parallel to M25 – expected to have light traffic
	New roundabouts on access roads	Southern Road Tunnel/Southern Perimeter Road Interchange
	Airport Roads	New link from Junction 13
	Heathrow Road Tunnel	Providing new spur access
	Airport One Way	One way system for western campus
Rail	Southern Rail Access to Staines	

³ Airports Commission, 2015. *Final report*, p. 159. [\[online\]](#) Accessed 05/01/2016.

2.2.2

The LHR-ENR Surface Access Strategy which was assessed by the AC has undergone further review by the promoter to address potential air quality impacts. Variations proposed to the Department for Transport (DfT) and described within the SoP include iterations (see Figures 1 and 2) which are considered by the promoter to be deliverable, and could provide reductions in adverse air quality impacts relative to the surface access proposals assessed by the AC and described in Table 1 above.

2.2.3

Table 2 describes the LHR-ENR surface access arrangements considered by the AC assessment, and also Iterations proposed by the promoter.

Table 2 LHR-ENR Related Surface Access Strategy⁴

Category	Location	Description of Surface Access Strategy		
		AC's LHR-ENR	SoP Variation Iteration 3	SoP Variation Iteration 4
Strategic Road	M4 J3 to J4		Road widening	
	M4 Airport Spur		Road widening	
	M4 J2 to J3		Road widening	
	M4 J4 and J4B		Road widening	
	M4		Large M4 Junction 4b replacement	
	M4		Higher capacity at M4 Junction 4a	
	M4		Capacity improvements to existing main airport tunnel	
	M25		M25 tunnelling (south of Junction 15)	
	M25	N/A	M25 Junction 14 connection to Terminal 5/6 Access	
Local Road Network	A4 Diversion to M4 Spur	N/A	Diversion of the A4 north west of Hamondsworth Diversion of the A4 east Sipson Existing A4 downgraded to single carriageway west of M4 Spur and stopped up at BA Waterside	N/A
	Traffic Management on Existing A4	N/A	N/A	Traffic management along line of existing A4, between A3044 and M4 Spur junction at Terminal 2
	A4 to Southern Perimeter Road connection via A3044 Diversion	A3044 diverted through tunnel running parallel to M25 – expected to have light traffic	A4/ A3044 access to Southern Perimeter Road reconfigured to accommodate M25 Junction 14 link	
	New roundabouts on access roads	Southern Road Tunnel/ Southern Perimeter Road Interchange junction at Terminal 5/6	Southern Perimeter Road Interchange junction configuration altered to accommodate M25 Junction 14 link Southern Road Tunnel under southern runway unaffected.	
	Airport Roads	A3044 diverted to link Terminal 5/6 with M25 J13	New M25 Junction 14 connection to Terminal 5/6	

⁴ Airports Commission, 2015. *Final report*, p. 159. [\[online\]](#) Accessed 05/01/2016.

	M25 J13 D2	Grade-separated junction and flyover/bridge structures	New M25 Junction 14 connection to Terminal 5/6
	Heathrow Road Tunnel	Providing new spur access	
	Airport One Way	One way system for western campus	
Rail	Southern Rail Access to Staines		

2.2.4

The primary differences between the surface access arrangements are set out below:

- AC's Extended Northern Runway Surface Access strategy (see Figure 1):
 - Terminal 5/6 connected to M25 Junction 13 via diversion of the A3044;
 - No improvements on the A4 west of Stanwell Moor Road;
 - Traffic congestion disbenefits of these arrangements; and
 - Congestion on the A4 and connecting roads.
- Iteration 3 (see Figure 2):
 - M25 Junction 14, providing connection between M25 and Terminal 5/6 via A3044 south west of the airport;
 - A4 diverted north and west of Harmondsworth and north and east of Sipson. The diversion will be partly online, and partly offline and will provide a direct connection between the A4 at A3044 Stanwell Moor Road and the M4 at Junction 4;
 - Existing A4 downgraded to single carriageway west of M4 Spur and stopped up at BA Waterside; and
 - Potential traffic congestion benefits of Iteration 3 Surface Access relative to the AC's surface access arrangements:
 - Traffic moving east via the A4 would be directed north via the A4 diversion, the existing A4 would be stopped up at BA waterside. This would reduce congestion caused by both airport users and through traffic using the A4;
 - Traffic accessing Terminal 5 and A3044 Stanwell Moor Road from the east via the M4 Junction 4 would travel via the A4 diversion, instead of using the M4 Spur and the current A4 alignment. This would reduce congestion caused by airport users on the A4;
 - Reduced congestion on the A4 would reduce congestion on connecting roads; and
 - Traffic accessing Terminal 5/6 via travelling north or south via the M25 will travel via improved M25 Junction 14, and A3044 diversion. This will reduce congestion on the M25 at Junction 13.
- Iteration 4 (see Figure 3):
 - M25 Junction 14 connection M25 and Terminal 5/6 south west of the airport;
 - Traffic management on the A4 west of Stanwell Road connecting to M4 Spur;
 - Potential traffic congestion benefits of Iteration 3 Surface Access relative to the AC's surface access arrangements:
 - Traffic moving between the A3044 Stanwell Road Junction and the M4 Spur would be subject to traffic management. This would reduce congestion caused by airport users and through traffic using the A4;
 - Reduced congestion on the A4 would reduce congestion on connecting roads; and
 - Traffic accessing Terminal 5/6 via travelling north or south via the M25 will travel via improved M25 J14, and A3044 diversion. This will reduce congestion on the M25 at J13.

2.2.5

Iteration 3 and Iteration 4 would both reduce congestion on the A4 when compared to the AC's Extended Northern Runway Surface Access proposals.

AIR QUALITY AND ENR VARIATIONS

- 2.2.6 Under the EU Ambient Air Quality Directive, the UK Government has a legal obligation to achieve air quality limit values. A key aspect of the AC's air quality assessment, and subsequently the AoS, was consideration of the likely impact of the schemes on the UK's compliance with the EU limit values.
- 2.2.7 The UK Government assesses compliance with EU limit values using a combination of monitoring and modelling with the Pollution Climate Mapping (PCM) model. The UK is divided into 43 zones and agglomerations for reporting purposes. A zone or agglomeration is defined as being compliant when the maximum monitored or modelled concentration within that zone or agglomeration is less than or equal to the limit value.
- 2.2.8 The PCM model is used to estimate pollutant concentrations at background and roadside locations throughout the UK. Background concentrations are modelled on a 1km grid covering the entire UK; roadside concentrations are modelled for locations adjacent to approximately 9000 roads (A-roads and motorways) across the UK.
- 2.2.9 In December 2015, the Government published an Air Quality Plan (the 2015 Plan) and associated evidence base; this was updated in July 2017 (the 2017 Plan). Alongside the AoS, WSP | Parsons Brinckerhoff was requested to undertake a re-analysis of the AC's modelling and EU limit value compliance assessment taking into account the publication of the 2015 Plan. Additional work has been undertaken by WSP to assess the implications of the 2017 Plan and PCM modelling, on the conclusions of the AC's air quality assessment in relation to EU Directive limit value compliance^{5,6,7}. A principal conclusion of the WSP | Parsons Brinckerhoff re-analysis study was that LHR-ENR, as assessed by the AC (without surface access variations), was likely to delay the compliance of the Greater London Urban Area Agglomeration with EU limit values.
- 2.2.10 This was due in part to the combined impact of on-airport emission sources and road traffic on the A4 to the west of the M4 spur (Bath Road) on annual mean nitrogen dioxide concentrations, but also to impacts on major arterial roads into central London from the west (A40). The impact of on-airport emission sources near Bath Road is inherent to the particular design of LHR-ENR, with an increase in activity relatively close to the existing northern boundary of the airport. In addition, road traffic on the A4, which runs parallel to the northern runway under the AC's surface access strategy for LHR-ENR is subject to long term growth in non-airport related traffic but also increases with the option since it is the primary route through which traffic arriving from London via the M4 would access Terminal 5 and 6. However, in this area, it is the impact of airside emissions rather than road transport that dominates and the risk of exceedance of EU limit values with LHR-ENR is, therefore, strongly influenced by the localised impact of on-airport sources.
- 2.2.11 The WSP Updated Re-analysis Study and the AC's report also identified that whilst the modelled increases on arterial roads into central London with the airport are small in magnitude, they have the potential to affect the compliance with EU limit values. On these roads, the impact of airside emissions was imperceptible, and the impact of the schemes was solely related to road traffic.
- 2.2.12 The significant risk of an impact on compliance with EU limit values was a key constraint to the surface access strategy for LHR-ENR as assessed by the AC, and a reason why LHR-ENR performed relatively poorly compared to the LHR-NWR scheme on air quality.
- 2.2.13 With LHR-NWR, the majority of the traffic on the existing A4 is rerouted to the north (closer to the M4 and along the existing A3044) and the existing A4 (on a section of Bath Road) is used only for access to local businesses. As such, the potential for the coincidence of significant impacts from airport sources (due to proximity to airside activity) and busy roads (the A4) is reduced in comparison to LHR-ENR.

2.2.14 Iterations 3 and 4 of the Surface Access Strategy for LHR-ENR seek to replicate the performance of the LHR-NWR surface access arrangements for air quality effects. They are considered qualitatively in this Appendix.

⁵ WSP | Parsons Brinckerhoff, 2016, *Air Quality Re-analysis, impact of new pollution climate mapping projection and national air quality plan*. [\[online\]](#) Accessed 01/12/2016

⁶ WSP | Parsons Brinckerhoff, February 2017, *Updated Air Quality Re-Analysis, published as part of the draft Airports NPS Consultation documentation*

⁷ WSP, October 2017, *2017 Plan Update to Air Quality Re-Analysis*

[illegible]

Iteration 3

-
- The diagram illustrates the proposed interchange between the M25 and M4. Key features include:
- Highways:** M25 WEST, M25 NORTH, M25 SOUTH, M4 EAST, and M4 WEST.
 - Interchange Structure:** A multi-level interchange with ramps for M25 NORTH, M25 SOUTH, and M4 EAST/WEST.
 - Re-routed A4:** A red line shows the new route for the A4 road, bypassing the area where the PCM compliance link was located.
 - Removed Link:** A dashed line with 'X' marks indicates the location of the 'PCM COMPLIANCE LINK REMOVED EXISTING A4'.
 - Other Labels:** U15, U16, U17, U18, T5/6, and T2 are marked on the interchange.
 - Source:** LHR - ENR, ITERATION 3.

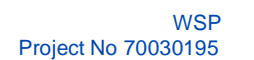
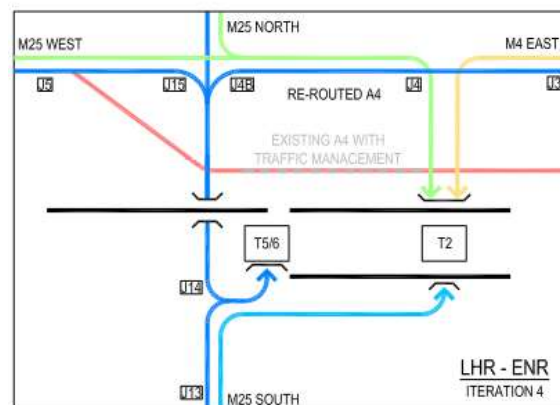


Figure 3 **LHR-ENR Iteration 4**

Iteration 4

- A4 retained as existing, with traffic management measures introduced between A3044 and M4 spur junctions
- A4 diversion route safeguarded
- M25 J14 added as NWR scheme



2.3 LHR-NWR VARIATIONS

2.3.1 The SoP for LHR-NWR sets out the Surface Access Strategy for airport expansion. For example, the road and rail improvements which were included in the surface access strategy for the LHR-NWR included tunnelling a section of the M25 to the west of the airport.

2.3.2 The specific proposed improvements to the M4 which were assessed by the AC are not considered to be a necessary improvement solely to support airport expansion within the SoP. Future improvements to the M4 will be considered as part of the Government's future investment planning process and would be developed and delivered independently of airport expansion.

2.3.3 The revised road and rail options, which are considered necessary specifically to support airport expansion, are set out in Table 2.4 below.

Table 3 LHR-NWR SoP Surface Access Strategy

CATEGORY	LOCATION	DESCRIPTION OF AC'S SURFACE ACCESS STRATEGY	DESCRIPTION OF LHR-NWR SOP SURFACE ACCESS STRATEGY
Strategic Road	M4 J3 to J4	Road widening	Not considered to be a necessary improvement within the SoP solely to support airport expansion.
	M4 Airport Spur	Road widening	
	M4 J2 to J3	Road widening	
	M4 J4 and J4B	Road widening	
	M4	Large M4 Junction 4b replacement	
	M4	Higher capacity at M4 Junction 4a	
	M4	Capacity improvements to existing main airport tunnel	
	M25	M25 tunnelling (south of Junction 15)	No Change
Local Road Network	A4	Diversion of A4 road alignment, dual carriageway	No Change
	A3044	Diversion of A3044 road alignment, dual carriageway	No Change
	Airport Roads	Airport Way/Southern Perimeter Road Interchange, grade-separated junction and flyover/bridge structures	No Change
	Heathrow Road Tunnel	Southern Road Tunnel/Southern Perimeter Road Interchange	No Change
	Airport One Way	One way system for western campus	No Change
Rail	Southern Rail Access to Staines		No Change

3

VARIATION SCREENING AND ASSESSMENT RESULTS

3.1 LGW-2R VARIATION: PHASING ARRANGEMENTS

- 3.1.1 The LGW-2R SoP sets out variations to airport expansion relating to the timing of construction, and provides additional detail to the diversion and arrangements for different phases.
- 3.1.2 The results of the Screening Assessment are reported in Table 4.
- 3.1.3 The Screening Assessment determined that the SoP Variation will not result in an increase or decrease in impacts which would change the significance of impacts reported within the AoS as assessed against the Appraisal Questions or Objectives.
- 3.1.4 No further assessment subsequent to screening was required for this scheme.

3.2 LHR- ENR VARIATION: ITERATION 3

- 3.2.1 The summary of the screening and assessment results for each Appraisal Objective and Appraisal Question are presented below. This follows and supports the screening assessment which is presented in Table 5.
- 3.2.2 The Screening Assessment concluded that the Iteration 3 variation may result in a change in the significance of effects for the AoS Appraisal Objectives and Questions relating to air quality. Further information relating to this change is presented below.
- 3.2.3 The Screening Assessment identified potential increases and decreases in impacts associated with development in or near areas which are sensitive for environmental or sustainability reasons (for example designated sites or residential properties). In addition to potential benefits for the air quality objectives, increases or decreases in sustainability impacts are presented for other questions and objectives. However, for other topics this was not sufficient for the overall significance of impacts assessed in the AoS to change. This is because due to the scale of the infrastructure proposed, smaller changes to the magnitude or other impact characteristics are not sufficient to change whether the impact has been assessed as significant or not. The results of the screening process and assessment are presented below.

Objective 1: To avoid or minimise negative effects on community viability, including housing, facilities and indirect effects

- 3.2.4 The A4 diversion could increase loss of community facilities including Heathrow Special Needs Centre and potential loss of land at the Little Brook Nursery. Housing in Harmondsworth and Sipson would be within 100m of the A4 diversion, but would not be affected by land take.
- 3.2.5 No increase in demand for housing and community facilities is anticipated.
- 3.2.6 The A4 diversion would result in mixed positive and negative impacts on community viability:
 - Improved traffic movements, and reduced journey times;
 - The A4 diversion has the potential to increase severance and lead to a reduction in the quality of amenity, particularly around Harmondsworth;
 - Reduced congestion, and a shorter delay to compliance with Air Quality Directive Limit Values in the Greater London Urban Area; and

- The diversion of the A4 will create a new source of noise for residents in Harmondsworth and Sipson; overall noise effects associated with the A4 diversion are not expected to result in a material increase.

3.2.7 No changes to the overall significance of impacts reported within the AoS are expected.

Objective 2: To avoid or minimise disproportionate impacts on any social group.

3.2.8 Iteration 3 would result in mixed effects on social groups:

- Improved traffic movements, and reduced journey times;
- Reduced congestion, and a shorter delay to compliance with Air Quality Directive Limit Values in the Greater London Urban Area;
- Causes loss of community facilities including Heathrow Special Needs Centre and potential loss of land at the Little Brook Nursery, this would potentially increase effects on disabled people and children;
- The A4 diversion has the potential to increase severance and lead to a reduction in the quality of amenity, particularly around Harmondsworth; and
- The diversion of the A4 will create a new source of noise for communities residing in Harmondsworth and Sipson. Overall noise associated with the A4 diversion and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are not expected to result in an increase in noise impacts.

3.2.9 No changes to the significance of impacts reported within the AoS are expected.

Objective 3: To maintain and where possible improve the Quality of Life (QoL) for local residents and the wider population

3.2.10 Iteration 3 would result in mixed effects on quality of life:

- The variation has the potential to improve the resilience of the surface access systems, improving quality of life;
- The A4 diversion would lead to an increase in severance during operation and disruption for road users during construction;
- The A4 diversion would potentially cause loss of community facilities including Heathrow Special Needs Centre and potential loss of land at the Little Brook Nursery. Additional housing in Harmondsworth and Sipson would be within 100m of the A4 diversion, but would not be affected by land take;
- The variation would not result in any change to operational employment. The diversion of the A4 to a small increase in overall construction employment compared to the AC's surface access arrangements;
- Would not increase noise effects assessed, as aviation would be the main source of noise;
- Has the potential to reduce congestion, particularly where a delay in compliance with EU Limit Values has been identified to the north of Heathrow in the AC's surface access arrangements;
- The diversion of the A4 north of Harmondsworth would cross areas which are designated as being sensitive for nature conservation and cultural heritage reasons, including the Colne Valley Park west of Harmondsworth, and the site of Harmondsworth Priory Cell. This would increase the detrimental effects on nature and conservation, and reduce quality of life; and
- Although there are changes to some of the flood zones affected, the variation is not expected to result in a change to flood risk which would affect quality of life.

3.2.11 No changes to the significance of impacts reported within the AoS are expected.

Objective 4: To maximise economic benefits and to support the competitiveness of the UK economy

3.2.12 No changes to the significance of impacts reported within the AoS are expected.

Objective 5: To promote employment and economic growth in the local area and surrounding region

3.2.13 The diversion of the A4, alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 would improve the functioning of the surface access arrangements in the short term. However, similarly to the AC's surface access arrangements the benefits to accessibility are expected to be negated by long term increases in transport demand for surface transport systems, including the road network. Further enhancements to the surface network may be required to ensure accessibility benefits are maintained in the long term.

3.2.14 There is potential for the diversion of the A4 to contribute to the growth of the local economy in the surrounding area, including potential for a small increase in overall construction employment compared the AC's surface access arrangements for LHR-ENR.

Objective 6: To minimise and where possible reduce Noise impacts on human receptors

3.2.15 While variations to surface access transportation have the potential to change road traffic noise, any such effects would be localised and limited in spatial extent. Although the AoS considers noise from surface access, it is acknowledged that aviation noise is the predominant source of impact and therefore no changes to the significance of impacts reported within the AoS are expected.

Objective 7: To protect and enhance designated sites for nature conservation

3.2.16 The following potential impacts on internationally, nationally and locally designated sites are anticipated:

- The alterations to the M25 at Junction 14 is expected to increase direct effects, primarily due to land lost from the Staines Moor Site Special Scientific Interest (and therefore the South West (London Waterbodies Special Protection Area (SWLW SPA)) when compared to the AC's surface access arrangements for LHR-ENR; and
- The A4 diversion is likely to result in increased direct effects on a locally designated site, as it involves the loss of part of the Harmondsworth Moor (Hillingdon) Site Importance Nature Conservation.

3.2.17 No changes to the significance of impacts reported within the AoS are expected.

Objective 8: To conserve and enhance undesignated habitats⁸, species, valuable ecological networks and ecosystem functionality

3.2.18 The following potential impacts on undesignated habitats, internationally and nationally protect species and valuable ecological networks are anticipated:

- The A4 diversion likely to cause increased loss of priority deciduous woodland and traditional orchards habitat to the west of Harmondsworth;

⁸ Undesignated habitats are not covered by a nature conservation designation listed in Objective 7.

- The A4 diversion would require a new crossing above the Colne River; and
- A shorter diversion of the A3044 to connect the M25 Junction 14 would be required, and would reduce the requirement for new crossings or culverting of the Wraysbury River.

3.2.19 The variation has the potential to increase the effects on priority habitats from these sources, but would not change the outcome of the assessment.

3.2.20 No changes to the significance of impacts reported within the AoS are expected.

Objective 9: To protect sites designated for geodiversity

3.2.21 No changes to the significance of impacts reported within the AoS are expected.

Objective 10: To minimise loss of undeveloped soils and of Best and Most Versatile agricultural land, and protect soil against erosion, contamination and degradation

3.2.22 There would be an increase in land take around M25 Junction 14, and associated with the diversion of the A4. There would also be a decrease in land take associated with the A3044 diversion to Junction 13 (which would not be required under this variation). Overall there would be an increase in land take and loss of agricultural land. The areas affected by increased land take may include areas of Best and Most Versatile agricultural land.

3.2.23 No changes to the significance of impacts reported within the AoS are expected.

Objective 11: To protect the quality of surface and groundwaters, and use water resources sustainably

3.2.24 Iteration 3 would potentially result in changes to the quantity of watercourses to be culverted, effecting hydromorphology and the quality of surface watercourses. These effects include:

- The A4 diversion would increase the requirement for culverting of watercourses connecting the Colne River west of Harmondsworth; and
- The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 would remove the need for the diversion of the A3044 to run parallel with the M25 south west of the Airport, as considered with the AC's surface access arrangements for LHR-ENR. This would decrease the requirement for culverting in the area adjacent to the Wraysbury River.

3.2.25 No changes to the significance of impacts reported within the AoS are expected.

Objective 12: To minimise flood risk and ensure resilience to climate change

3.2.26 The variation involves diversion of the A4 across the Colne River, and would require new development within Flood Zone 2 and 3. Overall there will be a reduction in development within Flood Zone 2 and 3, as the A3044 diversion to connect with the M25 Junction 13, which travels through the Wraysbury River floodplain would not be required.

3.2.27 No changes to the significance of impacts reported within the AoS are expected.

Objective 13: To improve air quality and reduce emissions consistent with EU, national and local standards and requirements.

3.2.28 Compliance with EU directives is assessed by UK Government alongside roads included in the PCM model.

- 3.2.29 Flows on the existing A4 will be significantly reduced whilst flows on the route of the A4 diversion will increase. Indeed, with the A4 stopped up at BA Waterside, the PCM link from the M4 spur to the Colnbrook By-pass will no longer exist in its current form or will at least have significantly reduced flows such that it is unlikely to be considered to be 'at risk' of exceeding the EU limit value.
- 3.2.30 It is not possible to determine whether the A4 diversion would be included in future PCM modelling at all, but in any case, it is likely that total flows on the diversion will be lower than those modelled in the AC's assessment for the A4 without restriction. Some traffic will still need to access the existing premises along the A4 but this will be lower than modelled by the AC. Furthermore, the route of the diverted A4 is further from the airport emission sources than the existing A4 and, therefore, the maximum impact alongside the diverted A4 is likely to be lower than that modelled by the AC which occurred at a location in proximity to high airside emissions and a busy road. As such, the scheme is likely to significantly reduce the risk of LHR-ENR impacting on compliance with limit values in the vicinity of the airport. In 2030, with the Government's 2017 Plan, LHR-ENR with the scheme does not impact on compliance with EU limit values. The scheme will not, however, remove all risk of impacts on compliance with limit values alongside individual links since the risk of impacts on links in Central London will be unaffected by the changes in the vicinity of the airport.
- 3.2.31 The existing A3113, running eastwards from Junction 14 of the M25 to the airport Southern Perimeter Road, is currently included within the PCM model. The PCM modelling shows existing exceedances of the EU limit value on this link, although the PCM projections from the 2017 Plan (both baseline and with measures scenarios)⁹ showed a rapid decrease in concentrations over time. Notwithstanding this, Iteration 3 reintroduces access to the airport from Junction 14 of the M25 and flows on this route are likely to increase with airport expansion, albeit along a revised alignment. If the realigned A3113 from the M25 to the airport is included in future PCM modelling, then there is a risk that LHR-ENR could impact on compliance with EU limit values alongside the link. This risk did not exist in the AC's assessment since Junction 14 of the M25 was removed.
- 3.2.32 Therefore, whilst the risk of impacts to compliance with EU limit values would be reduced in the vicinity of the airport by Iteration 3, LHR-ENR would remain at risk of worsening exceedances alongside individual roads in Central London even with this surface access strategy. As such, the significance of the effect is unlikely to change.
- 3.2.33 Iteration 3 would not affect UK Air Quality Objective Compliance. In addition, it is not likely to introduce exceedances of the UK's air quality objectives for the protection of human health. Indeed, since maximum impacts with the scheme occurred to the north of the runway under the AC's surface access strategy, maximum impacts might decrease slightly since the traffic component of the impact at this location would be reduced with Iteration 3.

Objective 14: To minimise carbon emissions in airport construction and operation

- 3.2.34 The variation is not expected to change the significance of carbon emissions from the AC's surface access arrangements.

⁹ In the reanalysis the PCM datasets comprise:

- 2017 Plan PCM Baseline – PCM data, generated from a 2015 base year, based on COPERT v5 emissions factors and the measures identified in the UK's 2015 Air Quality Plan
- 2017 Plan PCM With Clean Air Zones – 2017 Plan PCM data, based on COPERT v5 emissions factors and taking into account the CAZ identified in the UK's 2017 Plan

WSP, October 2017, *2017 Plan Update to Air Quality Re-analysis*, published as part of the revised draft Airports NPS Consultation documentation.

Objective 15: To minimise consumption of natural, particularly virgin non-renewable, resources.

3.2.35 The diversion of the A4 would increase the volumetric consumption of construction materials required.

3.2.36 No changes to the significance of impacts reported within the AoS are expected.

Objective 16: To minimise the generation of waste in accordance with the principles of the Resource Efficiency Hierarchy.

3.2.37 The variation would not increase the volume of waste generated.

3.2.38 No changes to the significance of impacts reported within the AoS are expected.

Objective 17: Conserve and where appropriate enhance heritage assets and the wider historic environment including buildings, structures, landscapes, townscapes and archaeological remains

3.2.39 The following potential effects on designated and non-designated heritage assets are anticipated:

- The diversion of the A4 could affect the setting of Grade I, II* and a number of Grade II listed buildings. In particular, these include a Grade I Listed Tithe Barn north west of Harmondsworth (The Great Barn), and a Grade II* Listed Church (The Church of St. Mary);
- East of Sipson, an offline section of the diversion of the A4 re-joins the current A408 adjacent to Sipson House, a Grade II Listed Building;
- The setting of Harmondsworth Conservation Area has the potential to be affected by the diversion of the A4 to travel 200m north of the Conservation Area;
- Two Archaeological Priority Areas are located north and west of Harmondsworth and also surrounding Sipson, and would be crossed by the A4 diversion. The Archaeological Priority Area west of Harmondsworth includes the site of a former Benedictine Priory;
- There are Listed Buildings on the periphery of Stanwell Moor which may have views of the current A3113 and M25. The arrangement of the M25 Junction 14 and A3044 connection to Terminal 5/6 are not expected to generate an increase in effects relative to the AC's surface access arrangements;
- Data collection for non-designated heritage assets has not been undertaken, but there are likely to be increased effects on non-designated assets;
- The A4 diversion is expected to generate an increase in noise, pollution and visual intrusion on heritage assets relative to the AC's surface access arrangements;
- The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are unlikely to change noise, pollution and visual intrusion on heritage assets relative to the AC's surface access arrangements; and
- The variation would increase the number of heritage assets affected, including an additional effect on below ground archaeological remains associated with Harmondsworth Priory, but will not affect the assessment outcome.

3.2.40 The variation would increase effects on heritage assets, however changes to the significance of impacts reported within the AoS are not expected.

Objective 18: To promote the protection and improvement of landscapes, townscapes, waterscapes and the visual resource including areas of tranquillity and dark skies.

3.2.41 The following effects on landscapes and sensitive views are anticipated:

- The diversion of the A4 north of Harmondsworth and Sipson would result in adverse impacts on landscape features including the Hillingdon Lower Colne Floodplain, Harmondsworth, and Sipson;
- The A3044 would no longer be required to connect to the M25 at Junction 13. This would reduce the adverse impact on the Colne River Floodplain landscape character area between Wraysbury and King George Reservoir;
- The variation would increase the impacts on the Colne Valley Regional Park, as the A4 diversion would travel through the Park west of Harmondsworth;
- The variation would increase the impacts on views from properties in Harmondsworth and Sipson, as the A4 diversion would be located in close proximity. This would decrease the sense of openness in these villages. Impacts would also increase on views from the Colne Valley Way and Harmondsworth Moor; and
- The variation would decrease the impacts on views from properties in Stanwell Moor and Stanwell, as the footprint of the surface access arrangements in this area would be reduced.

3.2.42 No changes to in the significance of impacts reported within the AoS are expected.

3.3 LHR- ENR VARIATION: ITERATION 4

3.3.1 The summary of the screening and assessment results for each Appraisal Objective and Appraisal Question are presented below. This follows and supports the initial screening assessment which is presented in Table 6.

3.3.2 The Screening Assessment concluded that the Appraisal Objectives and Questions relating to air quality may be subject to a potential change in the significance of effects. Further commentary on the potential change is presented below.

3.3.3 The Screening Assessment identified potential increases and decreases in impacts associated with development in or near areas which are sensitive for environmental or sustainability reasons. In addition to potential benefits for the air quality objectives, increases or decreases in environmental impacts are presented for other questions and objectives. The results of the screening process and assessment are presented below.

Objective 1: To avoid or minimise negative effects on community viability, including housing, facilities and indirect effects

3.3.4 No additional loss of housing or community facilities or increase in demand for housing and community facilities are anticipated.

3.3.5 There would be beneficial impacts on community viability:

- Improved traffic movements, and reduce journey times.

3.3.6 No changes to the significance of impacts reported within the AoS are expected.

Objective 2: To avoid or minimise disproportionate impacts on any social group.

3.3.7 The Iteration 4 variation would beneficial impacts on social groups:

→ The variation would improve traffic movements, and reduce journey times.

3.3.8 No changes to the significance of impacts reported within the AoS are expected.

Objective 3: To maintain and where possible improve the QoL for local residents and the wider population

3.3.9 The Iteration 4 variation would result in mixed effects on quality of life:

- Has the potential to improve the resilience of the surface access systems, improving quality of life;
- Traffic management on the A4 and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 has potential to reduce the disruption to road users and severance during operation;
- No additional loss of housing or community facilities are anticipated;
- No change to operational employment;
- No increase in noise effects, as aviation would be the main source of noise; and
- Not expected to result in a change to flood risk which would affect quality of life.

3.3.10 No changes to the significance of impacts reported within the AoS are expected.

Objective 4: To maximise economic benefits and to support the competitiveness of the UK economy

3.3.11 No changes to the significance of impacts reported within the AoS are expected.

Objective 5: To promote employment and economic growth in the local area and surrounding region

3.3.12 The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 would improve the functioning of the surface access arrangements in the short term. However, similar to the AC's surface access arrangements, the benefits to accessibility are expected to be negated by long term increases in transport demand for surface transport systems, including the road network. Further enhancements to the surface network may be required to ensure accessibility benefits are maintained in the long term.

3.3.13 There is potential for the traffic management on the A4 to contribute to the growth of the local economy in the surround area, including potential for a small increase in overall construction employment compared the AC's surface access arrangements.

3.3.14 No changes to the significance of impacts reported within the AoS are expected.

Objective 6: To minimise and where possible reduce Noise impacts on human receptors

3.3.15 While variations to surface access transportation have the potential to change road traffic noise, any such effects would be localised and limited in spatial extent. Although the AoS considers noise from surface access, it is acknowledged that aviation noise is the predominant source of impact and therefore no changes to the significance of impacts reported in the AoS are expected.

Objective 7: To protect and enhance designated sites for nature conservation

3.3.16 The following potential impacts on internationally, nationally and locally designated sites are anticipated:

- The alterations to the M25 at Junction 14 are expected to increase direct effects, primarily due to land lost from the Staines Moor Site of Special Scientific Interest (SSSI) (and therefore the SWLW SPA) when compared to the AC's surface access arrangements.

3.3.17 No changes to the significance of impacts reported within the AoS are expected.

Objective 8: To conserve and enhance undesignated habitats¹⁰, species, valuable ecological networks and ecosystem functionality

3.3.18 The following potential impacts on undesignated habitats, internationally and nationally protected species and valuable ecological networks are anticipated:

- The variation would require a shorter diversion of the A3044 to connect the M25 Junction 14, and would reduce the requirement for new crossings or culverting of the Wraysbury River.

3.3.19 The variation would decrease the effects on priority habitats, but would not change the outcome of the assessment.

3.3.20 No changes to the significance of impacts reported within the AoS are expected.

Objective 9: To protect sites designated for geodiversity

3.3.21 No additional impacts on geodiversity are expected.

Objective 10: To minimise loss of undeveloped soils and of Best and Most Versatile agricultural land, and protect soil against erosion, contamination and degradation

3.3.22 There would be an increase in land take around M25 Junction 14. There would be a larger decrease in land take as the A3044 diversion to Junction 13 would not be required under this variation. The areas affected by land take may include areas of Best and Most Versatile agricultural land.

3.3.23 No changes to the significance of impacts reported within the AoS are expected.

Objective 11: To protect the quality of surface and groundwaters, and use water resources sustainably

3.3.24 The variation would involve changes to the quantity of watercourses to be culverted, effecting hydromorphology and the quality of surface watercourses. These effects include:

- The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 would remove the need for the diversion of the A3044 to run parallel with the M25 south west of the airport, as considered with the AC's surface access arrangements for LHR-ENR. This would decrease the requirement for culverting in the area adjacent to the Wraysbury River.

3.3.25 No changes to the significance of impacts reported within the AoS are expected.

Objective 12: To minimise flood risk and ensure resilience to climate change

¹⁰ Undesignated habitats are not covered by a nature conservation designation listed in Objective 7.

3.3.26 The variation is expected to lead to a reduction in development within Flood Zone 2 and 3, as the A3044 diversion to connect with the M25 Junction 13, which travels through the Wraysbury River floodplain would not be required.

3.3.27 No changes to the significance of impacts reported within the AoS are expected.

Objective 13: To improve air quality and reduce emissions consistent with EU, national and local standards and requirements.

3.3.28 Traffic management measures on the A4 may reduce congestion somewhat but significant reductions in traffic flow are unlikely to occur. As such, it is unlikely that significant reductions in emissions from road traffic will occur and the scheme will have little impact on compliance with EU limit values. That is to say, LHR-ENR would remain at risk of impacts on compliance with limit values alongside some roads within the Greater London Urban Area Zone, both in the vicinity of the airport and in central London. The risk to compliance with EU limit values on the A4 relates primarily to the combined effects of road and airside emissions in proximity to the PCM link. This combined effect is unlikely to reduce significantly with congestion relief.

3.3.29 The existing A3113, running eastwards from Junction 14 of the M25 to the airport Southern Perimeter Road, is currently included within the PCM model. The PCM modelling shows existing exceedances of the EU limit value on this link, although the PCM projections from the 2017 Plan (both baseline and with measures scenarios) showed a rapid decrease in concentrations over time. Notwithstanding this, Iteration 4 re-introduces access to the airport from Junction 14 of the M25 and flows on this route are likely to increase with airport expansion, albeit along a revised alignment. If the realigned A3113 from the M25 to the airport is included in future PCM modelling, then there is a risk that LHR-ENR could impact on compliance with EU limit values alongside the link. This risk did not exist in the AC's assessment since Junction 14 of the M25 was removed.

3.3.30 Iteration 4 would not affect UK Air Quality Objective Compliance. In addition, it is not likely to introduce exceedances of the UK's air quality objectives for the protection of human health. Any benefits due to congestion relief are likely to be marginal and not significant.

3.3.31 No changes to the significance of impacts reported within the AoS are expected. Compliance with EU limit values would not be supported by the Iteration 4 Surface Access Strategy. LHR-ENR would remain at risk of worsening exceedances alongside individual roads in Central London even with this surface access strategy and likely to impact on the EU Directive zone compliance for Greater London.

Objective 14: To minimise carbon emissions in airport construction and operation

3.3.32 Iteration 4 is not expected to change the significance of carbon emissions from the AC's surface access arrangements.

Objective 15: To minimise consumption of natural, particularly virgin non-renewable, resources.

3.3.33 The A3044 diversion to connect to M25 Junction 13 would no longer be required. This would decrease the volumetric consumption of construction materials required.

3.3.34 No changes to the significance of impacts reported within the AoS are expected.

Objective 16: To minimise the generation of waste in accordance with the principles of the Resource Efficiency Hierarchy.

3.3.35 The variation would not increase the volume of waste generated.

3.3.36 No changes to the significance of impacts reported within the AoS are expected.

Objective 17: Conserve and where appropriate enhance heritage assets and the wider historic environment including buildings, structures, landscapes, townscales and archaeological remains

3.3.37 The following potential effects on designated and non-designated heritage assets are anticipated:

- The A4 traffic management is expected to consist entirely of online improvements, and therefore is unlikely to harm heritage assets; and
- There are Listed Buildings on the periphery of Stanwell Moor which may have views of the current A3113 and M25. The arrangement of the M25 Junction 14 and A3044 connection to

Terminal 5/6 is not expected to generate an increase in effects relative to the AC's surface access arrangements.

3.3.38 No changes to the significance of impacts reported within the AoS are expected.

Objective 18: To promote the protection and improvement of landscapes, townscapes, waterscapes and the visual resource including areas of tranquillity and dark skies.

3.3.39 The following effects on landscapes and sensitive views are anticipated:

- The A3044 would no longer be required to connect to the M25 at Junction 13. This would reduce the adverse impact on the Colne River Floodplain landscape character area between Wraysbury and King George Reservoir; and
- There would be decreased impacts on views from properties in Stanwell Moor and Stanwell, as the footprint of the surface access arrangements in this area would be reduced.

3.3.40 No changes to the significance of impacts reported within the AoS are expected.

3.4 LHR-NWR VARIATION: M4

3.4.1 The LHR-NWR SoP sets out variations to the surface access arrangements, in particular that the primarily online improvements to the M4 were no longer considered to be a necessary improvement (Section 2) solely as a result of airport expansion. Under the SoP, HAL would undertake to reduce traffic demand to the airport and increase the number of airport users travelling on public transport. Any improvements to the M4 would be undertaken independently of airport expansion, and would subsequently be considered as part of the Government's road investment planning process.

3.4.2 The Screening Assessment results are set out in Table 7. A shorter summary of environmental effects is provided within the Screening Table.

3.4.3 Unlike the screening assessment for LHR-ENR variations, the SoP would involve a reduction in development, as the M4 improvement works are no longer considered a necessary element of airport expansion.

3.4.4 The M4 improvements were primarily to the existing road network, and do not involve development in areas which are sensitive for environmental or sustainability reasons, so discounting these impacts from the AoS would not result in a corresponding decrease in impact.

3.4.5 Although any improvements to the M4 would take place independently of airport expansion, the noise and air quality impacts associated with traffic on the road network will not be negated by progressing these improvements independently of airport expansion. As a consequence, it would not be appropriate to discount these impacts from the AoS.

3.4.6 The Screening Assessment determined that the SoP Variation would not result in an increase or decrease in impacts which would change the significance of impacts reported within the AoS as assessed against the Appraisal Questions or Objectives.

3.4.7 No further assessment subsequent to screening was required for this scheme.

4

VARIATIONS SCREENING ASSESSMENT TABLES

4.1.1

The results of the Screening Assessment are presented within the summary tables within this section.

Table 4 **SOP Variation Elements**

Sop	Sop Variation Elements	Screening Table
LGW-2R	Construction Phasing Arrangements	Table 5
LHR-ENR Iteration 3	Surface Access Arrangements	Table 6
LHR-ENR Iteration 4	Surface Access Arrangements	Table 7
LHR-NWR	Surface Access Arrangements	Table 8

Table 5 LGW-2R Variation Screening Assessment: Phasing

Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
Community	1. To avoid or minimise negative effects on community viability, including housing, facilities and indirect effects.	1. Will it lead to a loss of housing and community facilities?	Significant Negative effect (–) The loss of the following housing and community facilities ¹¹ : → 168 residential properties likely to be demolished for airport expansion; → up to 37 residential properties could be demolished for surface access, since they fall within the buffer zone for construction works; → potential secondary impacts of relocated households on existing communities; → Trent House care home; → loss of industrial/employment land; → two places of worship (a church used by Seventh Day Adventists, and a Hindu temple); → one charity facility - Outreach 3 Way, which helps people with learning difficulties; → five pre-schools/ nurseries; → Crawley Rugby club, with its sporting and social facilities; → The northern part of Rowley Wood; → other formal and informal recreation sites; → public rights of way; → cycle routes; and → Impacts on local journey times, either from severance or increased traffic. Mitigation has been recommended.	The phasing of construction for airport facilities, and surface access systems would not result in a change in the number of houses or community facilities lost.	The significance of effects is not expected to change.	The land take effects of the surface access arrangements are expected to be in the same location.	No further assessment is proposed, because no change to the overall significance is expected.
		2. Will it lead to increasing demand for housing and community facilities?	Minor Negative effect (-) High demand scenarios indicate 9,300-18,400 homes would be required up to 2030. Additional housing expected to be required is 136 additional housing units per local authority per year. Additional spaces in local schools are likely to be required and two additional GPs per local authority to 2030 ¹² . There is also likely to be a need for additional parks or open spaces.	The phasing of construction for airport facilities, and surface access systems would not result in a change in demand for housing and community facilities.	The significance of effects is not expected to change.	The demand scenarios would not be affected by construction phasing.	No further assessment is proposed, because no change to the overall significance is expected.
		3. Will there be indirect effects on community viability?	Minor Negative effect (-) Traffic movements - may lead to more traffic and increased journey times. This may lead to issues of severance, loss of sense of place, breakdown in community cohesion, and a reduction in the quality of amenity within the community. Air Quality - 51,328 people will experience a rise in annual mean NO2 levels. No exceedances of UK air quality objectives are anticipated ¹³ .	The phasing of airport elements would not lead to any additional indirect effects on community viability, although the timing of impacts associated with construction may change.	The significance of effects is not expected to change.	The significance of the air quality and noise effects which impact upon community viability will not change.	No further assessment is proposed, because no change to the overall significance is expected.

¹¹ Airports Commission, 2014. *Community: Impact Assessment*, pp. 9-10. [online] Accessed 24/12/2015.

¹² Airports Commission, 2014. *Local Economy Impacts: Assessment*, p. 109 [online] Accessed 24/12/2015.

¹³ Airports Commission, 2015. *Quality of Life: Equalities Impacts Report*. [online] Accessed 24/12/2015.

Table 5 LGW-2R Variation Screening Assessment: Phasing

Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
			<p>Noise - There is a predicted increase of 16,200 people exposed to airspace noise exceeding 54dB L_{Aeq16 hr} by 2030, which increases further to 21,300 by 2050¹⁴. Increases in exposure to levels of noise >63 dB L_{Aeq,16hr} are expected to be 400 in 2030, 200 in 2040 and 400 in 2050.</p> <p>Strategic development- No allocated housing sites will be lost as a result of airport expansion. However, housing allocations close to the edge of the airport site in Crawley and on the northern edge of Horsham may be subject to noise effects.</p>				
	2. To avoid or minimise disproportionate impacts on any social group.	4. Will it minimise disproportionate negative effects on particular regions, users or vulnerable social groups?	<p>Minor negative effect (-)</p> <p>With the loss and relocation of housing and of some community facilities such as day-care and nurseries, Trent House Care Home, the Outreach 3 Way facility, a Hindu temple and a church used by Seventh Day Adventists, recreational ground and transport links, disproportionate effects may be experienced by vulnerable social groups within the area. Furthermore, indirect effects due to increased traffic, reduced air quality and increased noise effects may be experienced disproportionately by such groups.</p> <p>The population around Crawley is predominantly white but there is also a significant Black, Asian, and minority ethnic (BAME) community across local wards, particularly at Langley Green. There is potential for BAME groups to therefore experience disproportionate effects.</p>	The phasing of airport elements would not lead to any additional effects on particular regions, users or vulnerable social groups, although the timing of impacts associated with construction may change.	The significance of effects is not expected to change.	The community facilities affected will be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.
Quality of Life	3. To maintain and where possible improve the quality of life for local residents and the wider population.	5. Will it help to maintain and improve quality of life?	<p>Traffic Volume</p> <p>Significant disruption to road users and severance of small local communities will be experienced during the construction phase of the scheme, causing distress and anxiety to residents.</p> <p>During the operational period of the scheme, improved infrastructure and access to public transport may provide improvements to QoL in the short term, however these are expected to be negated by long term increasing demand for infrastructure.</p> <p>Housing and Communities</p> <p>Loss of housing/ forced moves will cause distress and have significant adverse impacts upon wellbeing. Social isolation likely to increase during construction from loss of community facilities, resulting in a reduction in the QoL of those directly affected by relocation or disruption during the construction period.</p> <p>New housing and community facilities will provide greater opportunities for leisure.</p> <p>Employment and the Economy</p> <p>New employment and business from an expanded airport will be of significant benefit to QoL locally and nationally from enhanced local and national economic growth.</p> <p>Noise</p> <p>Local exposure to construction noise and vibration can cause annoyance, for the duration of works.</p> <p>Increases in significant community annoyance due to aircraft noise exposure.</p> <p>Increases in effects which would lead to negative health outcomes, including due to sleep disturbance. Loss of sleep can increase anxiety and hypertension.</p> <p>Mixed impacts on QoL of school children: some schools could be at risk of increased exposure to excessive aircraft noise levels (potentially leading to impaired learning). Some schools may be subject</p>	The phasing of airport elements would not lead to any additional effects on quality of life, although the timing of impacts associated with construction may change.	The significance of effects is not expected to change.	The significance of the air quality and noise effects which impact upon quality of life would not change.	No further assessment is proposed, because no change to the overall significance is expected.

¹⁴ All noise figures are predicted changes in population exposures in the do something, relative to the do minimum for central scenario assumptions.

Table 5 LGW-2R Variation Screening Assessment: Phasing

Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
			<p>to noise reductions, which could reduce negative effects on cognitive development. Increased noise levels in primary schools can delay reading development.</p> <p>Air Quality</p> <p>Poor air quality has a direct impact upon sensitive receptors, exacerbates symptoms surrounding cardiovascular and impaired lung functions and has strong dose-response relations with increased morbidity and mortality.</p> <p>Access to nature and cultural heritage</p> <p>Indirect potential negative impact upon wellbeing during construction as a consequence of a reduction in recreational amenity of the Crawley public rights of way and the Tandridge Border Path.</p> <p>Indirect temporary loss of high amenity during the construction phase could result in potentially negative impacts on wellbeing during construction.</p> <p>Indirect negative impact on wellbeing due to permanent loss of Ancient Woodland during construction and operational phases.</p> <p>Indirect potential negative impact upon wellbeing as a consequence a reduction in recreational amenity for users of the Ifieldwood and the Tandridge Border Path during operation.</p> <p>Onsite mitigation and offsite enhancement measures of high amenity areas could potentially indirectly off-set any negative impacts on wellbeing during operational phase of the airport.</p> <p>Flooding</p> <p>Direct potential negative impact upon wellbeing during construction and operation as a consequence of potential and perceived increase in flood risk. It is acknowledged that detailed design at the next stage will identify opportunities to mitigate flood risk.</p>				
Economy	4. To maximise economic benefits and to support the competitiveness of the UK economy.	6. Will it enhance economic growth?	<p>Significant Positive effect (++)</p> <p>Direct impacts:</p> <p>The total passenger benefits are valued at £48.5bn and include:</p> <ul style="list-style-type: none"> → Lower fares: £64.5bn; → Frequency benefits: £4.0bn; → Reduced delays: £0.8bn; → Other direct benefits are as follows: → Total producer impact: £-65.1bn; and → Government revenue: £4.6bn. <p>Wider economic impacts:</p> <ul style="list-style-type: none"> → Business output benefits: £1.2bn; and → Tax wedge: £-1.1bn to £0.1bn <p>The trade benefits have been estimated at either £10.9bn, £20.0bn, or £59.5.0bn depending on the approach taken. However, it should be noted that these are not additive to the other wider economic impacts.</p> <p>Total benefits (excluding trade and producer impacts): £74.1 – 75.3bn</p>	The phasing of airport elements would not lead to any additional effects on economic growth.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		7. Will it contribute to sustainable	<p>Significant Positive effect (++)</p> <p>Although there will be local impacts, the extent of employment impacts at a national level remains unclear (due to displacement).</p>				

Table 5 LGW-2R Variation Screening Assessment: Phasing

Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
		growth in employment?	It is also anticipated that many jobs will be created during the construction phase, although these may again be displaced from other potential construction activities.	timing of employment associated with construction activities would change.			overall significance is expected.
		8. Will it support the competitiveness of the UK economy?	Significant Positive effect (++) Three types of wider productivity-related impacts are estimated: → enhanced productivity through increased trade and associated spin-off benefits; → change in tax revenue due to relocation of employment to areas with different levels of productivity;; and → increased business output.	The phasing of airport elements would not lead to any additional effects on competitiveness.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
	5. To promote employment and economic growth in the local area and surrounding region.	9. Will it incorporate accessibility improvements, particularly with key local employment centres and areas of high unemployment?	Neutral (0) Long term increases in surface passengers associated with the airport are anticipated. In addition, there are also expected to be increases in the use of surface access systems by additional users not associated with the airport. The improvements to surface access planned under the do minimum scenario are expected to accommodate the additional passengers associated with airport expansion. However, long term increases in airport and non-airport related transport demand are expected to negate any network benefits to journey times for other users of surface transport systems around the airport. As a consequence no accessibility benefits to key local employment centres (such as Crawley) are anticipated ¹⁵ . Further enhancements to the surface transport network may be required to ensure accessibility benefits are maintained in the long term.	The timing of any disruption to accessibility caused by construction activities would change, however this would not result in an additional impact.	The significance of effects is not expected to change.	The surface access systems affected by the phasing arrangements would be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.
		10. Will it contribute to growth in the local economy?	Significant Positive effect (++) The DfT developed a range of local employment estimates following from the AC's original estimates. These indicated that between 9,000 and 21,000 additional local jobs would be generated by 2030 with between 25,000 and 60,000 generated by 2050 ¹⁶ . The quantity and distribution of high skilled jobs has not been determined at this stage of the assessment. It is considered likely that airport expansion will serve as a catalyst to business investment in the surrounding area, continuing to attract high value firms. Employment and business which develops, or is maintained by the expansion of the airport will benefit the local economy and enhance local economic growth.	The timing of any disruption to accessibility caused by construction activities would change, however this would not result in an additional impact on growth in the local economy.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
Noise	6. To minimise and where possible reduce noise impacts	11. Will it avoid or reduce the harmful effects due to exposure of people and	Predominant Significant Negative effects (--) Construction phase impacts are likely to be negative, with potential for significance at sensitive	The timing of any noise associated with construction activities will change, however	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the

¹⁵ Jacobs, 2014. *Local Economy Impacts: Assessment*, p. 96. [online] Accessed 24/12/2015.

¹⁶ Department for Transport, 2017. *Airport Capacity in the South East: Updated Appraisal Report*.

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Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
	on human receptors.	sensitive buildings to noise?	<p>receptors near to the new runway or along construction routes. The effects cannot yet be assessed in detail but as a worst case estimate can be considered as potentially Significant Negative (--).</p> <p>The effects of changes in airspace noise exposure on the local population from the LGW-2R scheme (assessment of need carbon traded scenario) are considered to be predominantly Significant Negative (--).</p> <p>The effects of changes in airspace noise exposure on local NSBs from the LGW-2R scheme (assessment of need carbon capped scenario) are considered to be mixed Positive (+) / Negative (-).</p> <p>The local effects of ground noise from the LGW-2R scheme are considered to be Positive (+).</p> <p>The overall effects of the LGW-2R scheme on the health outcomes assessed are considered to be Significant Negative (--), since it would result in increases in disability-adjusted life year (DALYs) lost compared with the Do minimum.</p> <p>The local effects of airspace noise from the LGW-2R scheme on children's cognitive development are considered to be mixed Significant Positive/Negative (+/-).</p> <p>The national effects of the LGW-2R scheme are considered to be Positive (+).</p>	this would not result in additional noise effects.			overall significance is expected.
Biodiversity	7. To protect and enhance designated sites for nature conservation.	12. Will it affect internationally, nationally and locally designated biodiversity sites?	<p>Significant Negative effect (--)</p> <p>International Sites:</p> <p>Mole Gap to Reigate Escarpment Special Area of Conservation (SAC)</p> <p>Ashdown Forest SAC and Special Protection Area (SPA)</p> <p>Significant adverse effects have been identified with regard to air quality impacts associated with increased traffic flow, and direct and indirect impacts upon supporting habitat as a result of the surface access strategy</p> <p>National Sites</p> <p>Glover's Wood SSSI</p> <p>Leith Hill SSSI</p> <p>Vann Lake and Ockley Woods SSSI</p> <p>Reigate Heath SSSI</p> <p>Mole Gap to Reigate Escarpment SSSI</p> <p>Hedgecourt SSSI</p> <p>Weir Wood Reservoir SSSI</p> <p>Wakehurst and Chiddingly Woods SSSI</p> <p>Cow Wood and Harrys Wood SSSI</p> <p>St Leonards Wood SSSI</p> <p>Potential impacts principally associated with air and water quality changes that could result in adverse effects to the habitats and species interest features of these sites.</p> <p>Local Sites</p> <p>Willoughby Fields Site of Nature Conservation Interest (SNCI) / local nature reserve (LNR),</p> <p>Rowley Wood SNCI</p> <p>Horleyland Wood SNCI</p>	The phasing of airport elements would not lead to any additional effects on biodiversity sites, although the timing of impacts associated with construction may change.	The significance of effects is not expected to change.	The sites affected by the phasing arrangements would be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.

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Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
			Bridges Wood proposed Site of Nature Conservation Interest (pSNCI) Bridges Fields pSNCI The Roughs SNCI Potential impacts including, loss, disturbance, air and water quality changes.				
	8. To conserve and enhance undesignated habitats, species, valuable ecological networks and ecosystem functionality.	13. Will it conserve and enhance undesignated habitats, internationally and nationally protected species and valuable ecological networks, such as priority habitats and priority species?	Significant Negative effect (--) Habitats lowland mixed deciduous woodland, including ancient woodland; hedgerow including ancient hedgerow; rivers and brooks including canalised or conduited channel; and ponds Species A range of species protected under UK (and EU) wildlife legislation including but not limited to bat species (inc Bechsteins), dormice, and great crested newts. In addition it is likely the area will support species of principal importance as identified under Section 41 of the NERC Act 2006 Potential impacts including, loss, disturbance, habitat severence/ fragmentation, air and water quality changes, mortality.	The phasing of airport elements would not lead to any additional effects on ecological networks, although the timing of impacts associated with construction may change.	The significance of effects is not expected to change.	The sites affected by the phasing arrangements would be the same as originally assessed.	Limited additional assessment is recommended in order to establish that the likely change does not result in a significant change.
		14. Will it increase the exposure of wildlife to transport noise, air pollution, and water pollution?	Assessment significance: Significant Negative effect (--) International Sites: Mole Gap to Reigate Escarpment SAC Ashdown Forest SAC and SPA Significant adverse effects have been identified with regard to air quality impacts associated with increased traffic flow as a result of the surface access strategy. National Sites Glover's Wood SSSI Leith Hill SSSI Vann Lake and Ockley Woods SSSI Reigate Heath SSSI Mole Gap to Reigate Escarpment SSSI Hedgecourt SSSI Weir Wood Reservoir SSSI Wakehurst and Chiddingly Woods SSSI Cow Wood and Harrys Wood SSSI St Leonards Wood SSSI Potential impacts principally associated with air and water quality changes that could result in adverse effects to the habitats and species interest features of these sites.	The phasing of airport elements would not lead to any additional effects on wildlife due to pollution, although the timing of impacts associated with construction may change.	The significance of effects is not expected to change.	The sites affected by the phasing arrangements would be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.

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			Local Sites Willoughby Fields SNCI/LNR Rowley Wood SNCI Horleyland Wood SNCI Bridges Wood pSNCI Bridges Fields pSNCI The Roughs SNCI Potential impacts including, disturbance, air and water quality changes. Habitats lowland mixed deciduous woodland, including ancient woodland; hedgerow including ancient hedgerow; rivers and brooks including canalised or conduited channel; and ponds Species A range of species protected under UK (and EU) wildlife legislation including but not limited to bat species (inc Bechsteins), dormice, and great crested newts. In addition it is likely the area will support species of principal importance as identified under Section 41 of the NERC Act 2006 Potential impacts including disturbance, habitat severance/fragmentation, air and water quality changes, mortality.				
Soil	9. To protect sites designated for geodiversity.	15. Will it preserve, protect and improve geodiversity?	Neutral effect A review of sites which are designated for geodiversity reasons, including geological SSSIs and regionally important geological sites (RIGS) has been undertaken. Newdigate (North) RIGS is situated 5 km to the northwest of London Gatwick Airport. No impacts on the RIGS in relation to loss of tranquillity from noise, direct land take, air quality effects on exposed geology, and contamination are anticipated.	The phasing of airport elements would not lead to any additional effects on geodiversity.	The significance of effects is not expected to change.	The sites affected by the phasing arrangements would be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.
	10. To minimise loss of undeveloped soils and of Best and Most Versatile agricultural land, and protect soil against erosion, contamination	16. Will it maximise construction on previously developed land, minimise use of greenfield land?	Significant Negative effect (–) This option scheme entails land take of 624 ha, with up to further 78 ha potentially affected by surface access. ¹⁷ The site area of the airport incorporates approximately 421 ha of agricultural land, a proportion of which is likely to be BMV agricultural land. Agricultural land is a finite and irreplaceable resource, and although compensation will be provided to land owners, the loss of the land cannot be mitigated. As a consequence of the site location, a high proportion of the land take required is from agricultural land, the quantity of land PDL should be considered a correspondingly small proportion.	The phasing of airport elements would not lead to any additional effects on previously developed land, or greenfield land.	The significance of effects is not expected to change.	The land take required for the phasing arrangements would be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.

¹⁷ Jacobs, 2014. 10. *Place: Assessment*, pp. 16-18. [\[online\]](#) Accessed 24/12/2015.

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	and degradation.	17. Will it lead to the disturbing, harm, contamination or loss of soil resources?	<p>Negative effect (-)</p> <p>Development may result in soil loss or burial, physical damage including compaction, sealing, and structural damage, changes to soil water regime, effects on organic matter and soil stripping and storage. In addition, development has the potential to result in contamination of soil, resulting in risks to human health or the environment.</p> <p>The use of large areas of previously undeveloped land will affect the quality of soil and land resources meaning these areas of land will no longer be suitable for other uses, including farming.</p>	The phasing of airport elements would not lead to any additional effects due to contamination, the timing of the construction effects may change.	The significance of effects is not expected to change.	The land take required for the phasing arrangements would be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.
Water	11. To protect the quality of surface and ground waters, and use water resources sustainably.	18. Will proposals have adverse effects on the achievement of the environmental objectives established under the Water Framework Directive?	<p>Negative effect (-)</p> <p>Physical impacts are considered in question 19 below. Water quality impacts arising from polluted runoff during construction and operation. The scheme could lead to a decrease in pesticides and herbicides applied to the land.</p> <p>A further risk during construction is posed by the historic landfill within the proposed development footprint, posing a risk if contaminants are mobilised.</p> <p>A number of measures would be considered to improve water quality.</p> <p>Waste water will continue to be sent to an expanded Crawley Sewage Treatment Works (STW) for treatment. Alternatively a local treatment plan would be installed to allow contaminated runoff to be treated on site. Additional sewage and waste water wetland treatment system would be built.</p> <p>To ensure that water resources are used efficiently rainwater harvesting will be installed along with other water saving design.</p> <p>Discharges could affect Glovers Wood SSSI which is hydrologically connected via minor watercourses to Gatwick although it is unlikely given its location upstream of the airport.</p>	The phasing of airport elements would not lead to any additional effects on the environmental objectives established under the Water Framework Directive.	The significance of effects is not expected to change.	The watercourses affected by the phasing arrangements would be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.
		19. Will it result in the modification of watercourses?	<p>Negative effect (-)</p> <p>Estimated that approximately 7km of existing watercourse would be replaced with diverted/realigned channels.</p> <p>Of particular note is: the diversion of approximately 1km of the River Mole to the west of the airport; and the diversion of the Crawter's Brook and the addition of a weir to compensate for a 2m reduction in bed level at the Crawter's Brook/River Mole confluence. The diversion with appropriate mitigation will enhance the existing engineered channel as the River Mole would be removed from approximately 600m of existing culvert and engineered channel. Whilst the weir has the potential to have impacts in terms of creating a barrier to flow and sediment processes as well as fish migration and can act as a segregating factor for the river corridor habitats.</p> <p>Changes to the sedimentation processes can lead to deterioration in water quality and could impact the waterbody status should the sediment contain contaminants.</p> <p>No new culverting is proposed.</p>	The phasing of airport elements would not lead to any additional effects due to modification of watercourses, the timing of the construction effects may change	The significance of effects is not expected to change.	The watercourses affected by the phasing arrangements would be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.
		20. Will it result in the loss in productivity of fisheries?	<p>Negative effect (-)</p> <p>Replacement of 7km of the existing watercourse with diverted/realigned channels and diversions of River Mole and Crawters Brook may cause a deterioration of the ecological status, which could affect the productivity of fisheries. In addition the creation of a weir may prevent the passage of fish.</p>	The phasing of airport elements would not lead to any additional effects due to modification of the productivity of fisheries, the timing of the construction effects may change	The significance of effects is not expected to change.	The watercourses affected by the phasing arrangements would be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.

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		21. Will it lead to an increase in the consumption of available water resources?	<p>Significant Negative effect (--)</p> <p>Total annual potable water demands for 2025 and 2050 are 0.77 Mm³/year (million cubic metres per year) and 1.33 Mm³/year, respective increases of 0.05 Mm³/year and 0.61 Mm³/year from 2012 demands.</p> <p>A doubling of 2012 passenger numbers has been forecast after the completion of the second runway at Gatwick to 69.4 million per year by 2050, which despite water efficiency measures reducing demand per passenger by 10% to 0.0192 m³ pp, a reduction on 0.0310m³ in 2010 would result in an increase in demand for water at the airport to 1.33 Mm³pa by 2050. No figures are available for 2085 due to limitations in the forecast figures and information within the WRMP.</p> <p>Sutton and East Surrey Water state they currently have a surplus in the water resource zone and are completing resilience measures to supply Gatwick Airport from alternative water treatment works.</p> <p>Construction of the scheme will lead to short term increases in water demand.</p>	The phasing of airport elements would not lead to any additional effects on the consumption of water resources, although the timing of construction effects would change.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
	12. To minimise flood risk and ensure resilience to climate change.	22. Will it increase flood risk through increased runoff?	<p>Negative effect (-)</p> <p>Increase in impermeable areas, without suitable mitigation, could lead to runoff rates greater than the greenfield rate resulting in increased risks of flooding elsewhere. There are methods of reducing flood risk.</p> <p>Conservative greenfield runoff rates have been used to estimate the required attenuation volumes. Two schemes have been put forward for the storage a 'Business as Usual' and an 'Exemplar scheme'.</p> <p>Business as Usual scheme involves collector drains, tanks and culverts prior to pumping to an attenuation pond and discharge to the River Mole at greenfield rates.</p> <p>Discharge route for entire site is not known, meaning additional attenuation volumes are required. This may mean that this is an increase in flood risk.</p> <p>Exemplar Scheme may provide a volume of storage near the Jacobs estimates, however, refinement of the types of SuDs incorporated will need to be reviewed to ensure contamination is prevented.</p>	The phasing of airport elements would not lead to any additional effects on flood risk, although the timing of construction effects would change.	The significance of effects is not expected to change.	The impermeable area required for the phasing arrangements would be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.
		23. Will it increase area of development within areas at risk of flooding?	<p>Negative effect (-)</p> <p>Approximately half of the area proposed for development is located in Flood Zones 2 and 3 and at risk from fluvial flooding. Flooding from the River Mole and Gatwick Stream are recognised problems in the area, with two flood risk alleviation schemes currently being implemented. The Upper Mole Flood Alleviation Scheme is anticipated to provide protection up to a 2% annual exceedance probability (AEP) flood event, whilst the Gatwick Stream Flood Alleviation Scheme is designed to provide protection up to a 1% event. This situation should represent the baseline in 2025, however may not be sufficient to cover the predicted increases in peak river flows of between 35% and 70% by 2085. This in turn may impact on increased developed areas at risk outside the airport development.</p> <p>Proposed area for the runway and terminal buildings cover areas of medium surface water flood risk, with areas to the west of the site at high surface water risk.</p> <p>Risks of groundwater flooding or flooding from reservoirs at the proposed site are considered negligible.</p> <p>Peak flow and rainfall is expected to increase from the baseline to 2086, meaning that developments on the floodplain and zones susceptible to groundwater flooding could be at risk from increases in rainfall intensity.</p>	The phasing of airport elements would not increase development within areas at risk of flooding, although the timing of the construction effects would change.	The significance of effects is not expected to change.	The areas required for the phasing arrangements would be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.
		24. Will it be able to adapt to climate change?	<p>Negative effect (-)</p> <p>Without appropriate mitigation the scheme could result in increased risks to itself and sites elsewhere as a result of increased peak river/overland flows, runoff rates from across the scheme and altered volumes available for abstraction for water use.</p>	The phasing of airport elements would not increase development within areas at risk of flooding, although the	The significance of effects is not expected to change.	The areas required for the phasing arrangements would be the	No further assessment is proposed, because no change to the

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			Scheme promoter has applied a 20% increase in peak flows and rainfall, a 40% allowance will need to be assessed to be compliant with current guidance. The WRMP demonstrates that sufficient water is available to meet potable and non- potable requirements.	timing of construction effects would change.		same as originally assessed.	overall significance is expected.
Air Quality	13. To improve air quality and reduce emissions consistent with EU, national and local standards and requirements.	25. Will it support compliance with local, national and European air quality requirements or legislation?	Negative effect (-) A reassessment of compliance ¹⁸ with the EU Air Quality Directive taking account the Government's 2017 Air Quality Plan indicates that LGW-2R will not impact on compliance with EU limit values. This conclusion has low vulnerability to uncertainties since sensitivity testing demonstrated that the scheme is at low risk of impacting on compliance with limit values. NOx and PM _{2.5} emissions are currently projected to exceed the NECD target for 2030 – but the increase with the scheme is a very small fraction of the target. The maximum predicted annual mean NO ₂ concentration with the scheme in place at any receptor in Principal Study Area is 38.6µg/m ³ in 2030. ¹⁹	The phasing of airport elements would not affect compliance with air quality requirements or legislation.	The magnitude of the impact may be reduced but the significance of the effect is not expected to change		No further assessment is proposed, because no change to the overall significance is expected.
		26. Will it reduce the exposure to air quality issues for local communities and sites designated for nature conservation?	Significant Negative effect (- -) There are no predicted exceedances of the air quality objective at any receptor location with LGW-2R. The scheme will increase exposure to pollution at 20,985 properties, of which 62 are considered 'at risk' (>32µg/m ³). There is a risk that with opening earlier than 2030 that exceedances of air quality objectives could occur. The scheme results in worsened exceedances of critical levels and critical loads over sites designated for nature conservation at 9 out of 10 sites assessed (including Mole Gap to Reigate Escarpment SAC), with one site showing a reduction in exposure to air pollution. Increase in national emissions of NOx and PM _{2.5} .	The phasing of airport elements would not affect exposure to air quality issues for local communities or nature conservation, although the timing of construction effects may change.	The magnitude of the impact may be reduced but the significance of the effect is not expected to change		No further assessment is proposed, because no change to the overall significance is expected.
Carbon	14. To minimise carbon emissions in airport construction and operation.	27. Will the approach to the development be consistent with overall carbon requirements?	Significant Negative effect (--) Over the 60-year Appraisal Period (2025 to 2085), under the Carbon-Capped scenario, it is forecast that the development of a second runway at Gatwick Airport will result in the emission of a further 192.1 MtCO ₂ over the baseline case ²⁰ . Over the same Appraisal Period under the Carbon-Traded scenario, it is forecast that the development of a second runway at Gatwick Airport will result in the emission of a further 200.5 MtCO ₂ over the baseline case ²¹ . In both cases, construction emissions will contribute a further 3.9 MtCO _{2e} to UKemissions, however, this is a one-off impact at the beginning of the Appraisal Period ²² .	The phasing of airport elements would not affect compliance with carbon emissions requirements.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		28. Will the approach minimise carbon	Significant Negative effect (--)	The phasing of airport elements would not affect carbon emissions, but may affect the timing of emissions	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the

¹⁸WSP, October 2017, 2017 Plan Update to Air Quality Re-analysis.

¹⁹ Jacobs, 2015. *Module 6: Air Quality Local Assessment - Detailed Emissions Inventory and Dispersion Modelling*, p. 64. [\[online\]](#) Accessed 06/01/2016

²⁰ Jacobs, 2014. *Module 8. Carbon: Assessment, Table 3.17*. [\[online\]](#) Accessed 04/01/2016.

²¹ Jacobs, 2015. *Module 8. Carbon: Further Assessment, Table 1.12* [\[online\]](#) Accessed 04/01/2016.

²² Jacobs, 2014. *Module 8. Carbon: Assessment, Table 3.17*. [\[online\]](#) Accessed 04/01/2016.

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		emissions associated with surface transportation?	Over the 60-year Appraisal Period (2025 to 2085), under the carbon-traded scenario, it is forecast that the development of a second runway at Gatwick Airport will result in the emission of an additional 9.7 MtCO ₂ due to Passenger and Staff Surface Access over the baseline case ²³ . In the DfTs revised carbon-capped scenario, demand is unaffected by the abatement measures implemented, so the surface access CO ₂ estimates are the same as in the carbon-traded Case Emissions from freight transport movements are also likely to rise, but these were not quantified in the DfT's assessment. It is recommended that they be assessed by the Scheme Promotor during the Detailed Design stage.	associated with construction effects.			overall significance is expected.
Resources and Waste	15. To minimise consumption of natural, particularly virgin non-renewable, resources.	29. Will it be possible to minimise the consumption of natural resources?	Significant Negative effect (--) Consumption of large volumes of construction material. Operational consumption reduced by comparison with construction phase.	The phasing of airport elements would not affect overall consumption of natural resources but would affect the timing of consumption.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance of impact is expected.
	16. To minimise the generation of waste in accordance with the principals of the resource efficiency hierarchy.	30. Will it be possible to minimise waste generated during construction and operation?	Significant Negative effect (--) Generation of large volumes of construction waste that could be sent to landfill. Volumes of waste to be generated during operation are likely to be greatly reduced by comparison with construction. Forecasts for waste generation in operation are the lowest of all three schemes, across all operational scenarios.	The phasing of airport elements would not affect generation of waste but would affect the timing of waste generated during construction.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance of impact is expected.
Historic Environment	17. Conserve and where appropriate enhance heritage assets and the wider historic environment including buildings, structures, landscapes, townscapes and archaeological remains.	31. Will it affect the significance of internationally and nationally designated heritage assets and their settings?	Significant Negative effect (--) Land take study area (including surface access corridors) Construction activities including the demolition or partial demolition of structures will impact on 22 Listed Buildings (Grade II* and II) resulting in their total or partial loss. Total loss is substantial harm. Partial loss could result in assets being put at risk. Partial loss can also result in substantial harm. The significance of assets lying outside of the land take but associated with those within it will be at risk of harm. Intermediate Study Area Construction and operation will impact on the setting of 2 scheduled monuments, 6 Listed Buildings (Grade II) and 2 conservation areas. This will result in harm to the significance of the assets. Outer study area Operation of the scheme will impact on the setting of 2 Scheduled Monuments, 153 Listed Buildings (all Grades) and 5 Conservation Areas. This will result in harm to the significance of the assets.	The phasing of airport elements would not generate additional effects on designated heritage assets, although the timing of impacts associated with construction may change.	The significance of effects is not expected to change.	The assets affected by the phasing arrangements would be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.

²³ Jacobs, 2014. *Module 8. Carbon: Assessment, Table 3.17.* [online] Accessed 04/01/2016.

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		32. Will it affect the significance of non-designated heritage assets and their settings?	<p>Significant Negative effect (--)</p> <p>Land take Study Area (including surface access corridors)</p> <p>35 assets are present and 12 archaeological notification areas.</p> <p>Total removal of any archaeological remains during construction activities and earth-moving activities in particular.</p> <p>The significance of non-designated remains will be subject to substantial harm or total loss.</p> <p>Intermediate Study Area</p> <p>20 assets are present and one archaeological notification area.</p> <p>Any impact within the intermediate area will be to the significance of the setting of the assets. This has the potential to result in harm to the significance of the assets.</p> <p>Outer Study Area</p> <p>None identified. HER search does not extend into outer Study Area. Any impact within the outer area will be to the significance of the setting of the assets. This has the potential to result in harm to the significance of the assets.</p>	The phasing of airport elements would not generate additional effects on non-designated heritage assets, although the timing of construction effects may change.	The significance of effects is not expected to change.	The assets affected by the phasing arrangements would be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.
		33. Will it conserve or enhance heritage assets and the wider historic environment including landscapes, townscapes, buildings, structures, and archaeological remains?	<p>Significant Negative effect (--)</p> <p>No beneficial impacts have been identified. However, it is possible that following mitigation positive outcomes could be realised through some enhancement to Conservation Areas and community engagement and by addressing Heritage at Risk (including those that become at risk as a result of the scheme), improving the setting of heritage assets, together with opportunities for community engagement including improving access to and/or interpretation, understanding and appreciation of heritage assets.</p>	The phasing of airport elements would not conserve or enhance heritage assets and the wider historic environment, or result in additional effect on these assets, although the timing of construction effects may change.	The significance of effects is not expected to change.	The assets affected by the phasing arrangements would be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.
		34. Will it harm significance of heritage assets, for example from the generation of noise, pollutants and visual intrusion?	<p>Significant Negative effect (--)</p> <p>There is likely to be increased light and noise levels from construction and operation in addition to any lights and noise from aircraft whilst on the ground and in flight.</p> <p>The setting of ten designated heritage assets could be affected within 300m of the scheme area (six Grade II Listed Buildings, two Scheduled Monuments and two Conservation Areas) and from 300m to 2km the setting of a further 160 designated assets could potentially be affected (five Grade I, four Grade II*, 144 Grade II Listed Buildings, two Scheduled Monuments and five Conservation Areas).</p> <p>The setting of twenty non-designated assets could be affected.</p> <p>Historic landscape and townscape character will be affected.</p> <p>There is unlikely to be an impact on below-ground archaeological remains.</p> <p>Data was only available for the intermediate study area i.e. 300m of the scheme area.</p>	The phasing of airport elements would not lead to additional harm to the significance of heritage assets although the timing of impacts associated with construction may change.	The significance of effects is not expected to change.	The assets affected by the phasing arrangements would be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.
Landscape	18. To promote the protection and improvement of landscapes townscapes,	35. Will it protect and enhance nationally and locally designated	<p>Negative effect (-)</p>	The phasing of airport elements would not lead to additional impacts on landscape, townscape and waterscape although the	The significance of effects is not expected to change.	The areas affected by the phasing arrangements would be the	No further assessment is proposed, because no change to the

Table 5 LGW-2R Variation Screening Assessment: Phasing

Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
	waterscapes and the visual resource, including areas of tranquillity and dark skies.	landscape, townscape and waterscape?	<p>National Landscape Designations: Potential indirect impacts from new lighting and the direction / height / number of flights: Surrey Hills Area of Outstanding Natural Beauty (AONB), High Weald AONB, Kent Downs AONB.</p> <p>Local Landscape Designations: Long distance views from the Surrey Area of Great Landscape Value which adjoins the Surrey Hills AONB. Potential indirect impacts from new lighting and the direction / height / number of flights.</p> <p>Local Townscape Designations: Effects on tranquillity of Ifield and Langley Townscape Character Areas (TCAs)</p> <p>Other areas with landscape character value: Loss of Ancient Woodland on Bonnetts Lane. The LW8 Northern Vales character area would experience the greatest impact.</p>	timing of impacts associated with construction may change.		same as originally assessed.	overall significance is expected.
		36. Will it lead to impact on sensitive views and their settings?	<p>Significant Negative effect (- -)</p> <p>Potential for deterioration in valued views and vistas from Surrey Hills AONB, Kent Downs AONB and High Weald AONB due to new lighting and the direction / height / number of flights over the AONBs.</p> <p>The most significant views towards the proposed scheme would be from B2036 and Radford Road properties, Crawley, public rights of way and the Tandridge Border Path during construction; and would continue into operation for Ifieldwood and the Tandridge Border Path.</p>	The phasing of airport elements would not lead to additional impacts on sensitive views although the timing of impacts associated with construction may change.	The significance of effects is not expected to change.	The areas affected by the phasing arrangements would be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.
		37. Will it lead to a loss of tranquillity and increase in light pollution?	<p>Negative effect (-)</p> <p>Potential for increased numbers of aircraft over-flying areas of higher tranquillity, including AONBs and to the east and west of the airport. Potential for increased aircraft noise and views of aircraft in flight.</p> <p>There is likely to be increased light levels from construction and operational lighting, in addition to any lights from aircraft whilst on the ground and in flight. Lighting from the airport will particularly affect open views to the west around Ifieldwood.</p>	The phasing of airport elements would not lead to additional effects on tranquillity or light pollution although the timing of impacts associated with construction may change.	The significance of effects is not expected to change.	The areas affected by the phasing arrangements would be the same as originally assessed.	No further assessment is proposed, because no change to the overall significance is expected.

Table 6 LHR-ENR Variation Screening Assessment: Iteration 3

Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
Community	1. To avoid or minimise negative effects on community viability, including housing, facilities and indirect effects.	1. Will it lead to a loss of housing and community facilities?	Significant Negative effect (--) The loss of the following housing and community facilities ²⁴ : → 242 residential properties likely to be required for airport expansion; → up to 165 residential properties could be required for surface access, since they fall within the potential buffer zone for construction works; → potential secondary impacts of relocated households on existing communities; → loss of industrial/employment land; → loss of three pubs during construction; → noise implications for Pippins Primary School; → part of the Colne Valley Regional Park; → other formal and informal recreation sites; → public rights of way; → cycle routes; → severance of section of the Colne Valley Way running from Colnbrook to Horton; → severance of Poyle Road, which currently links Poyle and Colnbrook with Wraysbury and Horton; and → severance of route to Poyle from the west along Bath Road. Mitigation has been recommended.	The A4 diversion causes loss of community facilities including Heathrow Special Needs Centre and potential loss of land at the Little Brook Nursery. The A4 diversion and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are not expected to result in any additional loss of housing beyond those affected by the AC's surface access arrangements for LHR-ENR.	There is an increase in the community facilities and industrial/employment land lost. The significance of effects is not expected to change.	The assessment is based on a schematic layout for Iteration 3 - Figure 2, publicly available mapping and sources of information regarding the location of community facilities. There is a potential that all facilities affected by Iteration 3 have not been identified within a desk-study. However, given the scale of the overall impacts expected this is unlikely to affect the outcome of the assessment.	No further assessment is proposed, because no change to the overall significance is expected.
		2. Will it lead to increasing demand for housing and community facilities?	Minor Negative effect (-) High demand scenarios indicate up to 60,600 new homes may be required up to 2030. Up to 450 homes would be required per local authority per year. Additional spaces in local schools are likely to be required and two additional GPs and two primary care centres per local authority to 2030 ²⁵ . There is also likely to be a need for additional parks or open spaces.	No increase in demand for housing and community facilities are anticipated, as the surface access proposals are not considered to be the main source of demand.	The significance of effects is not expected to change.	The effects of Iteration 3 on overall employment, particularly during the construction phase, and consequently on housing demand and community facilities have not been quantified. However, it is reasonable to assume that these are a small proportion of the workers required to construct the airport as a whole.	No further assessment is proposed, because no change to the overall significance is expected.
		3. Will there be indirect effects on community viability?	Significant Negative effect (--) Traffic movements- may lead to more traffic and increased journey times. This may lead to issues of severance, loss of sense of place, breakdown in community cohesion, and a reduction in the quality of amenity within the community Air Quality- 100,392 people will experience a rise in annual mean NO2 levels. No exceedances of UK air quality objectives are anticipated ²⁶ . Noise – There is a predicted increase of 27,200 people exposed to airspace noise exceeding 54dB LAeq16hr by 2030, which reduces steadily over time until an overall (beneficial) reduction in population exposure to levels >54 dB	Traffic Management: The A4 diversion and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 have the potential to improve traffic movements, and reduce journey times. The A4 diversion has the potential to increase severance, and lead to a reduction in the quality of amenity during operation. Air Quality: has the potential to reduce congestion, particularly where a delay in compliance with EU Limit Values has been identified to the north of Heathrow in the AC's	Iteration 3 would have mixed effects on community viability. There may be reductions in adverse air quality effects, although the overall significance of effects is not expected to change.	The assessment is based on the conclusions presented in other topics considered within this assessment. The conclusions presented within these other topics are based on their own assumptions.	No further assessment is proposed, because no change to the overall significance is expected.

²⁴ Airports Commission, 2014. *Community: Impact Assessment*, pp. 9-10. [online] Accessed 24/12/2015.

²⁵ Airports Commission, 2014. *Local Economy Impacts: Assessment*. [online] Accessed 24/12/2015.

²⁶ Airports Commission, 2015. *Quality of Life: Equalities Impacts Report*. [online] Accessed 24/12/2015.

Table 6 LHR-ENR Variation Screening Assessment: Iteration 3

Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
			<p>L_{Aeq,16hr} of 18,200 people is expected by 2050. Exposure to noise >63 dB L_{Aeq,16hr} is expected to increase by 41,600 in 2030, reducing to 22,400 by 2050.Strategic Development- No allocated housing sites will be lost as a result of airport expansion, however housing allocations to the east and west of Heathrow will be subject to noise effects, particularly around Windsor. Undeveloped land in the areas surrounding Heathrow is highly constrained by the London Green Belt and other designations. Increases in noise effects may act as an additional constraint to current housing allocations or to future housing proposals, restricting the ability of the affected local authorities to meet housing delivery targets.</p>	<p>surface access arrangements. Noise: The diversion of the A4 would create a new source of noise for residents in Harmondsworth and Sipson. Overall noise effects associated with the A4 diversion and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are not expected to increase relative to the noise effects generated by the AC's surface access arrangements for LHR-ENR. Strategic Development: No additional allocated housing or employment sites would be lost, beyond those lost in the AC's surface access arrangements for LHR-ENR.</p>			
	2. To avoid or minimise disproportionate impacts on any social group.	4. Will it minimise disproportionate negative effects on particular regions, users or vulnerable social groups?	<p>Minor negative effect (-)</p> <p>With the loss and relocation of housing and community facilities such as primary schools, community centres, nurseries, recreational ground and transport links, disproportionate effects may be experienced by vulnerable social groups within the area. Furthermore, indirect effects due to increased traffic, reduced air quality and increased noise effects may be experienced disproportionately by such groups.</p> <p>There are higher than average BAME communities around the airport, with a particularly high proportion of BAME populations in the local authority areas surrounding Heathrow. There is potential for BAME groups to therefore experience disproportionate effects.</p>	<p>The A4 diversion would lead to a potential increase in the loss of community facilities, including the Heathrow Special Needs Centre and potential loss of land at the Little Brook Nursery. The diversion of the A4 would create a new source of noise for residents in Harmondsworth and Sipson. Overall noise effects associated with the A4 diversion and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are not expected to increase relative to the noise effects generated by the AC's surface access arrangements for LHR-ENR. Has the potential to reduce congestion, particularly where a delay in compliance with EU Limit Values has been identified to the north of Heathrow in the AC's surface access arrangements;</p>	<p>The diversion of the A4 may have a disproportionate effect on particular regions, users or vulnerable social groups. There would be an increase the loss of community facilities, in particular for disabled people and children.</p> <p>There would be reduced adverse air quality effects.</p> <p>The significance of effects is not expected to change.</p>	<p>The assessment is based on a schematic layout for Iteration 3 - Figure 2, and on publically available sources of information.</p>	<p>No further assessment is proposed, because no change to the overall significance is expected.</p>
Quality of Life	3. To maintain and where possible improve the quality of life for local residents and the wider population.	5. Will it help to maintain and improve quality of life?	<p>Traffic Volume</p> <p>Significant disruption to road users and severance of small local communities will be experienced during the construction phase of the scheme, causing distress and anxiety to residents.</p> <p>During the operational period of the scheme, improved infrastructure and access to public transport may provide improvements to QoL in the short term, however these are expected to be negated by long term increasing demand for infrastructure.</p> <p>Housing and Communities</p> <p>Loss of housing/ forced moves will cause distress and have significant adverse impacts upon wellbeing. Social isolation likely to increase during construction from loss of community facilities, resulting in a reduction in the QoL of those directly affected by relocation or disruption during the construction period.</p> <p>New housing and community facilities will provide greater opportunities for leisure.</p> <p>Employment and the Economy</p> <p>New employment and business from an expanded airport will be of significant benefit to QoL locally and nationally from enhanced local and national economic growth.</p> <p>Noise</p> <p>Local exposure to construction noise and vibration can cause annoyance, for the duration of works.</p> <p>Increases in significant community annoyance due to aircraft noise exposure.</p>	<p>Traffic Volume: The A4 diversion would lead to an increase in severance during operation and disruption for road users during construction. The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 would not increase disruption to road users or severance. Housing and Communities: The A4 diversion, alterations to the M25 at Junction 14, and A3044 connection to Terminal 5/6 are not expected to result in any additional loss of housing. Employment: beneficial employment effects are anticipated during construction of the A4 diversion. Noise: The A4 diversion would create a new source of noise for residents in Harmondsworth and Sipson. However, aviation would be the main source of noise from LHR-ENR. Air quality: has the potential to reduce congestion, particularly where a delay in compliance with EU Limit Values has been identified to the north of Heathrow in the AC's surface access arrangements; Access to Nature and Cultural Heritage: The diversion of the A4 would cross areas which are designated as being sensitive for nature conservation reasons, particularly in the Colne Valley west of Harmondsworth.</p>	<p>The diversion of the A4 and the arrangement of the M25 junction are expected to increase the construction and operational impacts. However, these are not expected to generate a significant change in the environmental effects which would reduce or improve Quality of Life.</p> <p>The significance of effects is not expected to change.</p>	<p>The assessment is based on the conclusions presented in other topics considered within this assessment. The conclusions presented within these other topics are based on their own assumptions.</p>	<p>No further assessment is proposed, because no change to the overall significance is expected.</p>

Table 6 LHR-ENR Variation Screening Assessment: Iteration 3

Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
			<p>Increases in effects which would lead to negative health outcomes. Reductions in night-time noise-related sleep disturbance. Reduced loss of sleep could lower anxiety and hypertension.</p> <p>General increases in noise exposure of schools, which can delay reading development.</p> <p>Air Quality</p> <p>Poor air quality has a direct impact upon sensitive receptors, exacerbates symptoms surrounding cardiovascular and impaired lung functions and has strong dose-response relations with increased morbidity and mortality.</p> <p>Access to nature and cultural heritage</p> <p>Negative impact on the wellbeing of users of high value recreational areas including the Colne Valley Regional Park, and local residents who value the presence of such amenity areas.</p> <p>Indirect overall benefit to wellbeing through improving access to nature and the living environment, through mitigation and improvement measures, involving compensation of habitat and displacement of recreational areas.</p> <p>Flooding</p> <p>Direct potential negative impact upon wellbeing during construction and operation as a consequence of potential and perceived increase in flood risk. It is acknowledged that detailed design at the next stage will identify opportunities to mitigate flood risk.</p>	Flooding: The changes to the surface access arrangements are not expected to result in a change to flood risk which would affect quality of life.			
Economy	4. To maximise economic benefits and to support the competitiveness of the UK economy.	6. Will it enhance economic growth?	<p>Significant Positive effect (++)</p> <p>Direct impacts:</p> <p>The total benefits (excluding trade and producer impacts) are valued at £ 57.2bn and include:</p> <ul style="list-style-type: none"> → Lower fares: £54.4bn; → Frequency benefits: £2.6bn; and → Reduced delays: £0.1bn. <p>Other direct benefits are as follows:</p> <ul style="list-style-type: none"> → Total producer impact: £ -46.4bn; and → Government revenue: £2.9bn. <p>Wider economic impacts:</p> <ul style="list-style-type: none"> → Business output benefits: £1.1bn; and → Tax wedge: £0.5bn to 1.7bn. <p>The trade benefits have been estimated at either £7.5bn, £14.3bn or £106.6bn depending on the approach taken. However, it should be noted that these are not additive to the other wider economic impacts.</p> <p>Total benefits (excluding trade and producer impacts): £61.7 – 62.8bn</p>	The diversion of the A4, alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are not expected to result in change to economic benefits to growth in addition to those in the AC's surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.	The impacts which are considered within this topic are considered at a national scale, rather than a local scape. In addition, the sources of economic benefits are business and airport service provision based, rather than relating to local accessibility enhancements. As a consequence, it is assumed that there is no change to economic growth as a result of change to surface access.	No further assessment is proposed, because no change to the overall significance is expected.
		7. Will it contribute to sustainable growth in employment?	<p>Significant Positive effect (++)</p> <p>Although there will be local impacts, the extent of employment impacts at a national level remains unclear (due to displacement).</p> <p>It is also anticipated that many jobs will be created during the construction phase, although these may again be displaced from other potential construction activities.</p>	The construction of the A4 diversion, alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 may result in a small increase in employment associated with construction activities to those in the AC's surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.	The number and phasing of jobs created through construction of individual surface access schemes has not been quantified. It is reasonable to assume these would be similar to other road schemes and are unlikely to significantly affect the outcome of the assessment.	No further assessment is proposed, because no change to the overall significance is expected.

Table 6 LHR-ENR Variation Screening Assessment: Iteration 3

Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
		8. Will it support the competitiveness of the UK economy?	Significant Positive effect (++) Three types of wider productivity-related impacts are estimated: → enhanced productivity through increased trade and associated spin-off benefits; → Change in tax revenue due to relocation of employment to areas with different levels of productivity; and → Increased business output.	The diversion of the A4, alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are not expected to change competitiveness of the UK economy.	The significance of effects is not expected to change.	The impacts which are considered within this topic are considered at a national scale, rather than a local scape. In addition, the sources of economic benefits are business and airport service provision based, rather than relating to local accessibility enhancements. As a consequence, it is assumed that there is no change to competitiveness as a result of change to surface access.	No further assessment is proposed, because no change to the overall significance is expected.
	5. To promote employment and economic growth in the local area and surrounding region.	9. Will it incorporate accessibility improvements, particularly with key local employment centres and areas of high unemployment?	Neutral (0) Long term increases in surface passengers associated with the airport are anticipated. In addition, there are also expected to be increases in the use of surface access systems by additional users not associated with the airport. Under the do minimum scenario, the planned improvements to the local transport network, particularly rail, will improve connectivity for those who live and work near these routes. ²⁷ However, long term increases in airport and non-airport related transport demand are expected to negate any network benefits to journey times for other users of surface transport systems around the airport. Further enhancements to the surface transport network may be required to ensure accessibility benefits are maintained in the long term.	The diversion of the A4, alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 would improve the functioning of the surface access arrangements in the short term. However, similar to the AC's surface access arrangements for LHR-ENR benefits to accessibility are expected to be negated by long term increases in demand for surface access transport systems, including the road network. Further improvements would be required to ensure accessibility benefits are sustained in the long term.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		10. Will it contribute to growth in the local economy?	Significant Positive effect (++) The DfT has developed a range of local employment estimates following from the AC's original estimates. These indicate that between 48,000 and 97,000 additional local jobs would be generated by 2030 with between 31,000 and 63,000 generated by 2050 ²⁸ . The quantity and distribution of high skilled jobs has not been determined at this stage of the assessment. It is considered likely that airport expansion will serve as a catalyst to business investment in the surrounding area, continuing to attract high value firms ²⁹ . Employment and business which develops, or is maintained by the expansion of the airport will benefit the local economy and enhance local economic growth.	There is potential for the diversion of the A4 to contribute to the growth of the local economy in the surround area, including potential for a small increase in overall construction employment compared the AC's surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.	The number and phasing of jobs created through construction of individual surface access schemes has not been calculated at this stage of assessment. However, assuming these are similar to other road schemes these are unlikely to significantly affect the outcome of the assessment.	No further assessment is proposed, because no change to the overall significance is expected.
Noise	6. To minimise and where possible reduce noise impacts on human receptors.	11. Will it avoid or reduce the harmful effects due to exposure of people and sensitive	Predominant Significant Negative effects (--) Construction phase impacts are likely to be negative, with potential for significance at sensitive receptors near to the runway extension or along construction routes. The effects cannot yet be assessed in detail but as a worst case estimate can be considered as potentially Significant Negative (--).	The diversion of the A4 has the potential to generate an increase in local traffic noise experienced by neighbouring communities, including Harmondsworth and Sipson, although the predominant source of noise would be from aviation. The alterations to the M25 at Junction 14 and	The predominant source of noise is from aviation. The significance of effects is not expected to change.	Aircraft and airport operational noise is the predominant sources of noise.	No further assessment is proposed, because no change to the overall significance is expected.

²⁷ Jacobs, 2014. *Local Economy Impacts: Assessment*, p. 96. [online] Accessed 24/12/2015.

²⁸ Department for Transport, 2017. *Airport Capacity in the South East: Updated Appraisal Report*

²⁹ Jacobs, 2014. *Local Economy Impacts: Assessment*, p. 54. [online] Accessed 24/12/2015.

Table 6 LHR-ENR Variation Screening Assessment: Iteration 3

Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
		buildings to noise?	<p>The effects of changes in airspace noise exposure on the local population from the LHR-ENR scheme are considered to be predominantly Significant Negative (--).</p> <p>The effects of changes in airspace noise exposure on local NSBs from the LHR-ENR scheme are considered to be predominantly Significant Negative (-).</p> <p>The local effects of ground noise from the LHR-ENR scheme are considered to be Positive (+).</p> <p>The overall effects of the LHR-ENR scheme on the health outcomes assessed are considered to be predominantly Significant Negative (--), since it would result in increases in DALYs lost compared with the Do minimum.</p> <p>The local effects of airspace noise from the LHR-ENR scheme on children's cognitive development are considered to be predominantly Significant Negative (--).</p> <p>The national effects of the LHR-ENR scheme are considered to be Significant Negative (--).</p>	A3044 connection to Terminal 5/6 remain similar in location to the AC's surface access arrangements for LHR-ENR, so are unlikely to increase noise effects.			
Biodiversity	7. To protect and enhance designated sites for nature conservation.	12. Will it affect internationally, nationally and locally designated biodiversity sites?	<p>Significant Negative effect (--)</p> <p>International Sites:</p> <p>SWLW SPA / Ramsar</p> <p>Significant adverse effects have been identified with regard to; land take; construction disturbance; operation disturbance including flights; hydrological impacts; air quality changes; disturbance through increased levels of bird scaring/control as part of birdstrike risk management measures.</p> <p>Windsor Forest and Great Park SAC</p> <p>Burnham Beeches SAC</p> <p>Thursley, Ash, Pirbright and Chobham SAC</p> <p>Thames Basin Heaths SPA</p> <p>Richmond Park SAC</p> <p>Wimbledon Common SAC</p> <p>Significant adverse effects have been identified with regard to air quality impacts associated with increased traffic flow, and direct and indirect impacts upon supporting habitat as a result of the surface access strategy.</p> <p>National Sites</p> <p>Staines Moor SSSI,</p> <p>Wraysbury Reservoir SSSI</p> <p>Wraysbury No.1 Gravel Pit SSSI</p> <p>Wraysbury and Hythe End Gravel Pits SSSI</p> <p>Kempton Park Reservoirs SSSI</p> <p>Potential impacts principally associated with air and water quality changes that could result in adverse effects to the habitats and species interest features of these sites.</p> <p><u>Local Sites</u></p> <p>Arthur Jacob LNR,</p> <p>East Poyle Meadows SNCI,</p> <p>Greenham's Fishing Pond SINC,</p> <p>Lower Colne Sites of Metropolitan Importance for Nature Conservation (SMINC),</p> <p>River Colne.</p> <p>Potential impacts from direct land take due to surface access requirements.</p>	<p>A4 diversion likely to cause the loss of priority deciduous woodland and traditional orchards habitat to the west of Harmondsworth.</p> <p>A4 diversion likely to cause the loss of part of the Colne Valley which is identified within the Hillingdon Local Plan Policies map as a Nature Conservation Sites of Metropolitan or Borough Grade I Importance.</p> <p>A4 diversion and M25 junction arrangement would cross the Colne River, Wraysbury River and other watercourses.</p> <p>The alterations to the M25 at Junction 14 may increase the area of land lost from the Staines Moor SSSI when compared to the AC's surface access arrangements for LHR-ENR.</p> <p>No effects on any other sites designated for nature conservation.</p>	The significance of effects is not expected to change.	The assessment has been completed through the identification of designated biodiversity sites via publically available mapping sources and a schematic layout for Iteration 3 - Figure 2.	No further assessment is proposed, because no change to the overall significance is expected.

Table 6 LHR-ENR Variation Screening Assessment: Iteration 3

Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
	8. To conserve and enhance undesignated habitats, species, valuable ecological networks and ecosystem functionality.	13. Will it conserve and enhance undesignated habitats, internationally and nationally protected species and valuable ecological networks, such as priority habitats and priority species.	<p>Significant Negative effect (--)</p> <p>Habitats deciduous woodland, traditional orchard, rivers and brooks, reedbeds and lowland meadows.</p> <p>Species There are birdstrike management issues for LHR-ENR associated with the nearby complex of open water bodies. The closer proximity of the runway and increased air traffic is likely to result in an increased strike risk, and a corresponding requirement for an increase in bird management and control activities is anticipated.</p> <p>Methods of deterring/scaring and controlling bird species potentially hazardous to aviation operations could potentially have an adverse effect on non-target species and biodiversity including those not listed on the designation interest features.</p> <p>A range of protected species including, bats, otter, water vole, reptiles (including grass snake and slow worm), and various species of birds within 2km of the scheme boundary have been identified. It is considered feasible that the area would support a range of other species protected under UK (and EU) wildlife legislation including but not limited to dormice, and great crested newts.</p> <p>Potential impacts including, loss, disturbance, habitat severance/fragmentation, air and water quality changes, mortality.</p>	<p>A4 diversion likely to cause the loss of priority deciduous woodland and traditional orchards habitat to the west of Hamondsworth.</p> <p>A4 diversion likely to cause the loss of part of the Colne Valley which is identified within the Hillingdon Local Plan Policies map as a Nature Conservation Sites of Metropolitan or Borough Grade I Importance.</p> <p>A4 diversion and alterations to the M25 at Junction 14 would cross the Colne River, Wraysbury River and other watercourses. It is considered likely that the area would support a range of species protected under UK (and EU) wildlife legislation.</p>	The significance of effects is not expected to change.	<p>The assessment has been completed through the identification of habitats via publically available mapping sources and a schematic layout for Iteration 3 - Figure 2. Site visits or surveys have not been undertaken in the area, so the actual presence or absence of certain species is unknown.</p> <p>Given the scale of the overall impacts expected this is unlikely to affect the outcome of the assessment.</p>	No further assessment is proposed, because no change to the overall significance is expected.
		14. Will it increase the exposure of wildlife to transport noise, air pollution, and water pollution?	<p>Assessment significance: Significant Negative effect (--)</p> <p>International Sites: SWLW SPA/Ramsar Windsor Forest and Great Park SAC Burnham Beeches SAC Thursley, Ash, Pirbright and Chobham SAC Thames Basin Heaths SPA Richmond Park SAC Wimbledon Common SAC</p> <p>Significant adverse effects have been identified with regard to disturbance, air quality impacts associated with increased traffic flow, and direct and indirect impacts upon supporting habitat as a result of the surface access strategy.</p> <p>National Sites Staines Moor SSSI, Wraysbury Reservoir SSSI, Wraysbury No.1 Gravel Pit SSSI, Wraysbury and Hythe End Gravel Pits SSSI, Kempton Park Reservoirs SSSI</p> <p>Potential impacts principally associated with air and water quality changes that could result in adverse effects to the habitats and species interest features of these sites.</p> <p>Local Sites Arthur Jacob LNR, East Poyle Meadows SNCI, Greenham's Fishing Pond SINC, Lower Colne SMINC,</p>	<p>Impacts due to exposure of wildlife include disturbance, habitat severance/fragmentation, air and water quality changes and mortality these may arise due to the alterations to the M25 at Junction 14 and to the diversion of the A4. The alterations to the M25 at Junction 14 may increase the area of land lost from the Staines Moor SSSI when compared to the AC's surface access arrangements for LHR-ENR.</p>	The significance of effects is not expected to change.	<p>The assessment has been completed using publically available mapping sources and a schematic layout for Iteration 3 - Figure 2. Given the scale of the overall impacts expected this is unlikely to affect the outcome of the assessment.</p>	No further assessment is proposed, because no change to the overall significance is expected.

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			<p>River Colne.</p> <p>Potential impacts from direct land take due to surface access requirements</p> <p>Habitats</p> <p>deciduous woodland, traditional orchard, rivers and brooks, reedbeds and lowland meadows.</p> <p>Species</p> <p>A range of protected species including, bats, otter, water vole, reptiles (including grass snake and slow worm), and various species of birds within 2km of the scheme boundary have been identified. It is considered feasible that the area would support a range of other species protected under UK (and EU) wildlife legislation including but not limited to dormice, and great crested newts.</p> <p>Potential impacts including, disturbance, habitat severance/fragmentation, air and water quality changes, mortality.</p>				
Soil	9. To protect sites designated for geodiversity.	15. Will it preserve, protect and improve geodiversity?	<p>Neutral effect</p> <p>A review of sites which are designated for geodiversity reasons, including geological SSSIs and RIGS has been undertaken. No Geological SSSIs or RIGS were identified within this radius. No impacts on geodiversity are anticipated.</p>	No effects on sites of Geological conservation interest (SSSI or RIGS)	The significance of effects is not expected to change.	<p>The assessment has been completed through the identification via publically available mapping sources and a schematic layout for Iteration 3 - Figure 2.</p> <p>Given the scale of the overall impacts expected this is unlikely to affect the outcome of the assessment.</p>	No further assessment is proposed, because no change to the overall significance is expected.
	10. To minimise loss of undeveloped soils and of Best and Most Versatile agricultural land, and protect soil against erosion, contamination and degradation.	16. Will it maximise construction on previously developed land, minimise use of greenfield land?	<p>Significant Negative effect (--)</p> <p>This scheme entails land take of 336 ha, with a further 330 ha potentially affected by surface access and 57 ha identified for flood storage.</p> <p>The site area of the airport incorporates approximately 371ha of agricultural land, a significant proportion of which is likely to be BMV agricultural land. Agricultural land is a finite and irreplaceable resource, and although compensation will be provided to land owners, the loss of the land cannot be mitigated.</p> <p>As a consequence of the site location, a high proportion of the land take required is from agricultural land, the quantity of PDL should be considered a correspondingly small proportion.</p>	There would be an increase in land take around M25 Junction 14, and due to the diversion of the A4, but also a decrease in land take as the A3044 diversion to Junction 13 considered as part of the AC's surface access arrangements would not be required. The land take areas potentially include areas of Best and Most Versatile agricultural land.	The significance of effects is not expected to change.	<p>The assessment has been completed through the identification via publically available mapping sources and a schematic layout for Iteration 3 - Figure 2.</p> <p>Given the scale of the overall impacts expected this is unlikely to affect the outcome of the assessment.</p>	No further assessment is proposed, because no change to the overall significance is expected.
		17. Will it lead to the disturbing, harm, contamination or loss of soil resources?	<p>Negative effect (-)</p> <p>Development may result in soil loss or burial, physical damage including compaction, sealing, and structural damage, changes to soil water regime, effects on organic matter and soil stripping and storage. In addition, development has the potential to result in contamination of soil, resulting in risks to human health or the environment.</p> <p>The use of large areas of previously undeveloped land will affect the quality of soil and land resources meaning these areas of land will no longer be suitable for other uses, including farming.</p>	The diversion of the A4 takes place in an area which is currently undeveloped. The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 at the roads affected remain similar in land take area to the AC's surface access arrangements for LHR-ENR. There would be a smaller increase in land take around Junction 14, but a larger decrease in land take, as the A3044 diversion to Junction 13 considered as part of the AC's surface access arrangements would not be required. These are not expected to result in a change to the impacts	The significance of effects is not expected to change.	<p>The assessment has been completed through information via publically available mapping sources and schematic information on Iteration 3.</p> <p>Given the scale of the overall impacts expected this is unlikely</p>	No further assessment is proposed, because no change to the overall significance is expected.

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				on soil resources, including due to increased potential for contamination.		to affect the outcome of the assessment.	
Water	11. To protect the quality of surface and ground waters, and use water resources sustainably.	18. Will proposals have adverse effects on the achievement of the environmental objectives established under the Water Framework Directive?	<p>Negative effect (-)</p> <p>Physical impacts are considered in question 19 below. Water quality impacts arising from polluted runoff during construction and operation.</p> <p>A further risk during construction is posed by the historic landfill within the proposed development footprint, posing a risk if contaminants are mobilised.</p> <p>Two of the WFD water bodies in the study area are classified as having a 'Failing' chemical status, so a potential increase in pollutants could have a more magnified impact on these water bodies.</p> <p>A number of measures would be considered to improve water quality.</p> <p>Surface water quality monitoring would be undertaken in key risk construction areas in close proximity to surface watercourses and boreholes will be installed.</p> <p>A Sustainable Drainage Strategy will include dedicated areas for de-icing aircraft and a glycol recovery procedure to reduce the concentration of glycol within surface water runoff and separate storage tanks for 'clean' and 'first flush' surface water.</p> <p>Possible addition of a new STW with some of the treated water to be re-used for non-potable purposes within the airport.</p> <p>Re-use of surface water would be maximised, including rainwater harvesting, which will be installed.</p> <p>There is potential for hydrological conditions to be altered on Staines Moor SSSI from diversion of the River Colne and this would need to be addressed during detailed design.</p> <p>There would also be works directly adjacent to King George VI Reservoir, which forms part of Staines Moor SSSI and South West London Waterbodies Special Protection Area (SWLW SPA) and nearby Wraysbury Reservoir (also part of the SWLW SPA). This could have negative effects, depending on design (also see Appendix A.5).</p> <p>There are a number of reservoirs and gravel pits which make up the SWLW SPA further downstream from the Airport, (see Appendix A.5 for effects on site integrity).</p>	No changes to the effects assessed as being associated with the AC's Surface Access arrangements.	The significance of effects is not expected to change.	<p>The assessment has been completed through the identification of the areas surrounding watercourses via publically available mapping sources and schematic layout of Iteration 3.</p> <p>Given the scale of the overall impacts expected this is unlikely to affect the outcome of the assessment.</p>	No further assessment is proposed, because no change to the overall significance is expected.
		19. Will it result in the modification of watercourses?	<p>Significant Negative effect (--)</p> <p>Approximately 12km of existing watercourse would be replaced with diverted/realigned channels and culverts. The diversions of the Colne Brook and Poyle Channel (approx. 5km) around the west end of an extended north runway would be technically difficult and are likely to have effects on the hydromorphology/ geomorphology due to the changed gradients and other associated uncertainties.</p> <p>An initial estimate suggests there could be in excess of 12km of additional culverts. The Longford River, the Duke of Northumberland's River, River Colne and Wraysbury River would be culverted underneath the proposed runway.</p> <p>Water bodies are sensitive and extensive diversions/culverting would counteract improvements to waterbodies, including environmentally friendly flood schemes (as part of the Lower Colne Catchment flood scheme) maintaining open channels for Heathrow Terminal 5. The WFD strongly discourages culverting due to the detrimental impacts on the overall environment both that of the waterbody and the surrounding area. There are also significant cumulative impacts from culverting on the biodiversity, soils and landscape.</p>	<p>The A4 diversion would increase the requirement for culverting of watercourses connecting the Colne River.</p> <p>The M25 junction 14 would require culverting of watercourses including the Colne River and Wraysbury River, however this would not be a material increase beyond the AC's surface access arrangements for LHR-ENR .</p> <p>The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 will remove the need for the diversion of the A3044 to run parallel with the M25 south west of the airport in the AC's surface access arrangements for LHR-ENR. This would decrease the need for culverting in the area adjacent to the Wraysbury River.</p>	The significance of effects is not expected to change.	<p>The assessment has been completed through the identification of watercourses via publically available mapping sources and schematic layout of Iteration 3.</p> <p>Given the scale of the overall impacts expected this is unlikely to affect the outcome of the assessment.</p>	No further assessment is proposed, because no change to the overall significance is expected.

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			Changes to the sedimentation processes can lead to deterioration in water quality and could impact the waterbody status should the sediment contain contaminants.				
		20. Will it result in the loss in productivity of fisheries?	Significant Negative effect (--) Diversion of Colne Brook and Poyle Channel and culverting of the Longford River, the Duke of Northumberland's River, River Colne and Wraysbury River may affect the hydromorphology/geomorphology which may cause a deterioration of the ecological status, potentially affecting productivity of fisheries. Construction of approximately 12km of culvert as part of the scheme would have negative impacts on fisheries. Fisheries could also be negatively impacted by residual water quality impacts from polluted runoff.	The A4 diversion would increase the requirement for culverting of watercourses connecting the Colne River. The M25 junction 14 would require culverting of watercourses including the Colne River and Wraysbury River, however this would not be a material increase beyond the AC's surface access arrangements for LHR-ENR. The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 will remove the need for the diversion of the A3044 to run parallel with the M25 south west of the airport. This would decrease the need for culverting in the area adjacent to the Wraysbury River. The changes to culverting are not expected to result in a change to the productivity of fisheries.	The significance of effects is not expected to change.	The assessment has been completed through the identification of watercourses via publically available mapping sources and schematic layout of Iteration 3. Given the scale of the overall impacts expected this is unlikely to affect the outcome of the assessment.	No further assessment is proposed, because no change to the overall significance is expected.
		21. Will it lead to an increase in the consumption of available water resources?	Significant Negative effect (--) Total annual potable water demands for 2026 and 2050 are 2.62Mm³/year and 3.76 Mm³/year, respective increases of 0.32Mm³/year and 1.46 Mm³/year from 2013 demands. A 77% increase in passenger numbers relative to 2013 has been forecast after the completion of the extended northern runway to 134.9 million per year by 2050. Rainwater harvesting is expected to account for 9% of the additional demand. Water efficiency measures are considered able to reduce the demand by 2 to 5%. Leakage reduction measures could also save up to 0.115Mm³. No figures are available for 2085 due to limitations in the forecast figures and information within the WRMP. The scheme promoter' submission outlines that the water demands for the Shortlisted Scheme can be feasibly met by increased abstraction from surface and/or groundwater. The Affinity Water WRMP concluded that there is a deficit in the Water Resource Zone that supplies Heathrow, in 2013 only 46% of the licensed volume was abstracted. Construction of the scheme will lead to short term increases in water demand.	Construction may alter water consumption although the change is not likely to result in a change relative to the AC's surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
	12. To minimise flood risk and ensure resilience to climate change.	22. Will it increase flood risk through increased runoff?	Negative effect (-) Increase in impermeable areas, without suitable mitigation, could lead to runoff rates greater than the greenfield rate resulting in increased risks of flooding elsewhere. There are methods of reducing flood risk. Scheme promoter may need to update method for estimating the attenuation requirements as more appropriate methodologies are available. Despite this the volume is similar to estimates by Jacobs. Elevated groundwater may also contribute to the surface water runoff to the ponds during significant rainfall events or prolonged wet periods. This may further reduce the attenuation volumes available.	The construction of the A4 diversion would result in an increase in impermeable areas. Flood risk may increase as a consequence of a higher runoff rate in comparison to the areas greenfield rate. The alternative M25 Junction 14 arrangement is not expected to materially increase the quantity of impermeable area. There is likely to be a decrease in the impermeable area created due to A3044 connection to Terminal 5/6 not being required. The Iteration 3 arrangements are not expected to result in a material increase in flood risk when compared to the AC's surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.	The assessment has been completed through the identification of the areas Flood Risk Zone via publically available mapping sources and the schematic layout of Iteration 3. Given the scale of the overall impacts expected this is unlikely to affect the outcome of the assessment.	No further assessment is proposed, because no change to the overall significance is expected.

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		23. Will it increase area of development within areas at risk of flooding?	<p>Significant Negative effect (--)</p> <p>Proposed runway will extend onto the floodplains of the River Colne, Wraysbury River and the Colne Brook, resulting in occupying floodplain areas designated as Flood Risk Zones 2 and 3. The existing fluvial flood risk to Heathrow Airport is low.</p> <p>Development is expected to lead to a loss of up to 45 ha of undefended flood plain with only a 33 ha being set aside for compensation purposes. Assessment method has potentially led to an underestimation of the loss of flood plain storage. Consequences of this flood storage loss would be direct increase of flood areas downstream, with the likely impact of increased risk to developed areas.</p> <p>There are isolated areas within the extended footprint that are at medium or high risk of surface water flooding.</p> <p>Heathrow Airport and the proposed new runway are located on River Terrace Gravels, which is classified as Primary and Secondary Aquifers. There is the potential for elevated groundwater levels and/or groundwater flooding in the area.</p> <p>Risk of flooding from reservoirs is considered negligible.</p> <p>Peak flow and rainfall is expected to increase from the baseline to 2086, meaning that developments on the floodplain and zones susceptible to groundwater flooding could be at risk from increases in rainfall intensity.</p>	<p>The A4 diversion travels through Flood Zone 2 west of Hamondsworth. This would increase the area of development within areas at risk of flooding when compared to the AC's surface access arrangements.</p> <p>The M25 junction 14 arrangement travels through Flood Zone 2 west of the existing M25, this is not expected to result in a change to the area of development at risk from flooding.</p> <p>There would be a decrease in the area of development within an area of flood risk due to A3044 connection to Terminal 5/6 not being required.</p>	<p>The significance of effects is not expected to change.</p>	<p>The A4 diversion has the potential to increase risk of flooding and without further information on design it is not possible to be certain that potential adverse effects can be mitigated.</p>	<p>No further assessment is proposed, because no change to the overall significance is expected.</p>
		24. Will it be able to adapt to climate change?	<p>Negative effect (-)</p> <p>Without appropriate mitigation the scheme could result in increased risks to itself and sites elsewhere as a result of increased peak river/overland flows, runoff rates from across the scheme and altered volumes available for abstraction for water use.</p> <p>Scheme promoter has applied a 20% increase in peak flows and rainfall, a 40% allowance will need to be assessed to be compliant with current guidance.</p> <p>No consideration appears to be given to the implications of climate change on the River Terrace Gravels, other than the scheme will be raised above existing ground levels, no consideration is given to the implications of raised ground levels across the wider area.</p> <p>The WRMP demonstrates that sufficient water is available to meet potable and non- potable requirements.</p>	<p>No information is available on design for climate change.</p>	<p>The significance of effects is not expected to change.</p>		<p>No further assessment is proposed, because no change to the overall significance is expected.</p>
Air Quality	13. To improve air quality and reduce emissions consistent with EU, national and local standards and requirements.	25. Will it support compliance with local, national and European air quality requirements or legislation?	<p>Significant Negative effect (--)</p> <p>A reassessment of compliance^{30,31} with the EU Air Quality Directive taking account the government's 2017 Air Quality Plan indicates that LHR-ENR impacts on compliance with EU limit values.</p> <p>NOx and PM_{2.5} emissions are projected to exceed the NECD target for 2030 – but the increase with the scheme is a very small fraction of the target.</p> <p>The maximum predicted annual mean NO₂ concentration with the scheme in place at any receptor in Principal Study Area is 37.2µg/m³ in 2030.</p>	<p>The diversion of the A4, alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 may prevent the scheme from impacting on compliance with EU limit values in the vicinity of the airport. However, given the uncertainties inherent in air quality modelling, there remains a risk of worsening exceedances of limit values alongside individual links, most notably in central London.</p> <p>The magnitude of the impact to the north of the runway may decrease.</p>	<p>The significance of the effect may change with the variation and further analysis was undertaken.</p>		<p>Further qualitative assessment was undertaken to determine whether the significance of effect would change as a result of the variation. Assessment found that with the updated surface access strategy, the scheme does not impact on compliance with limit values in 2030. There is, however, a risk that the option will delay</p>

³⁰ WSP | Parsons Brinckerhoff, February 2017, *Updated Air Quality Re-Analysis*, published as part of the draft Airports NPS Consultation documentation

³¹ WSP, October 2017, *2017 Plan Update to Air Quality Re-analysis*.

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							compliance with limit values and the risk increases the earlier the assumed opening year for the option. The risk is high until 2029 with the updated access strategy; very high in all years without the updated access strategy.
		26. Will it reduce the exposure to air quality issues for local communities and sites designated for nature conservation?	Significant Negative effect (--) There are no predicted exceedances of the air quality objective at any receptor location, in either the Do-Minimum or LHR-ENR scenarios. The scheme will increase exposure to pollution at 38,656 properties, of which 113 are considered 'at risk' (>32µg/m³). There is a risk that with opening earlier than 2030 that exceedances of air quality objectives could occur. The scheme results in increased exposure to pollution over sites designated for nature conservation at all 10 sites assessed, including sites where the critical level is currently exceeded and South West London Waterbodies Ramsar/SPA. No exceedances of critical loads are modelled with the scheme. Increase in national emissions of NOx and PM2.5.	The magnitude of the maximum impact to the north of the runway may decrease, but air quality already meets the objectives	The significance of the effect is unlikely to be affected.		Further qualitative assessment is required to determine whether the significance of effect would change as a result of the variation.
Carbon	14. To minimise carbon emissions in airport construction and operation.	27. Will the approach to the development be consistent with overall carbon requirements?	Significant Negative effect (--) Over the 60-year Appraisal Period (2026 to 2086), under the Carbon-Capped scenario, it is forecast that the development of an extended Northern runway at Heathrow Airport will result in the emission of a further additional further 256.1 MtCO ₂ over the baseline case. Over the same Appraisal Period under the Carbon-Traded scenario, it is forecast that the development of an extended Northern runway at Heathrow Airport will result in the emission of a further 266.7 MtCO ₂ over the baseline case. In both cases, construction emissions will contribute a further 10.1 MtCO ₂ e to UK emissions, however this is a one-off impact at the beginning of the Appraisal Period.	Not applicable - see Question 28 below.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		28. Will the approach minimise carbon emissions associated with surface transportation?	Significant Negative effect (--) Over the 60-year Appraisal Period (2026 to 2086), under the carbon-traded scenario, it is forecast that the development of an extended Northern runway at Heathrow Airport will result in the emission of an additional 8.1 MtCO ₂ due to Passenger and Staff Surface Access over the baseline case. In the DfT's revised carbon-capped scenario demand is unaffected by the abatement measures implemented, so the surface access CO ₂ estimates are the same as in the carbon-traded case Emissions from freight transport movements are also likely to rise, but these were not quantified in the DfT's assessment. It is recommended that they be assessed by an applicant at the time of detailed design.	The iteration 3 arrangements are not expected to materially alter carbon emissions from the AC's surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
Resources and Waste	15. To minimise consumption of natural, particularly virgin non-renewable, resources.	29. Will it be possible to minimise the consumption of natural resources?	Significant Negative effect (--) Consumption of large volumes of construction material. Operational consumption reduced by comparison with construction phase.	The consumption of natural, non-renewable resources would occur during construction and operation of the surface access arrangements. It is not anticipated that Iteration 3 or Iteration 4 would significantly augment the adverse impacts arising from the AC's core surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.	The volume of construction materials to be consumed for individual surface access arrangements has not yet been determined. However, due to the scale of the resource consumption	No further assessment is proposed, because no change to the overall significance of impact is expected.

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						required to deliver the airport expansion, the surface access arrangements are unlikely to change the overall significance of effect.	
	16. To minimise the generation of waste in accordance with the principals of the resource efficiency hierarchy.	30. Will it be possible to minimise waste generated during construction and operation?	Significant Negative effect (--) Generation of large volumes of construction waste that could be sent to landfill. Volumes of waste to be generated during operation are likely to be greatly reduced by comparison with construction. Forecasts for waste generation in operation are marginally lower than the highest forecasts (LHR-NWR), across all operational scenarios.	It is not anticipated that waste generated would contribute significantly to the volume arising from the AC's core surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.	The volume of waste likely to be generated for individual surface access arrangements has not yet been determined. Due to the scale of the impacts associated with the core airport expansion works, waste generated by Iteration 3 or Iteration 4, is unlikely to change the overall significance of effect.	No further assessment is proposed, because no change to the overall significance of impact is expected.
Historic Environment	17. Conserve and where appropriate enhance heritage assets and the wider historic environment including buildings, structures, landscapes, townscapes and archaeological remains.	31. Will it affect the significance of internationally and nationally designated heritage assets and their settings?	Significant Negative effect (--) Land take study area (including surface access corridors) Construction activities including the demolition or partial demolition of structures will impact on 7 Grade II Listed Buildings resulting in their total or partial loss. Total loss is substantial harm. Partial loss could result in assets being put at risk. Partial loss can also result in substantial harm. A Conservation Area will also be affected. The significance of assets lying outside of the land take but associated with those within it will be at risk of harm. Intermediate Study Area Construction and operation will impact on the setting of 2 Scheduled Monuments, 23 listed buildings (Grades II* and II) and 5 Conservation Areas. This will result in harm to the significance of the assets. Outer study area Operation of the scheme will impact on the setting of a Scheduled Monument, 160 Listed Buildings (all Grades), a Registered Park and Garden and 6 Conservation Areas. This will result in harm to the significance of the assets.	The diversion of the A4 could affect the setting of Grade I, II* and a number of Grade II listed buildings. In particular, these include a Grade I Listed Tithe Barn north west of Hamondsworth (The Great Barn), and a Grade II* Listed Church (The Church of St. Mary). East of Sipson, an offline section of the diversion of the A4 re-joins the current A408 adjacent to Sipson House, a Grade II Listed Building. In addition, the setting of Hamondsworth Conservation Area would be affected. There are Listed Buildings on the periphery of Stanwell Moor which may have views of the current A3113 and M25, the proposed arrangement of the M25 Junction 14 and A3044 connection to Terminal 5/6 is unlikely to generate an increase in effects relative to the AC's surface access arrangements for LHR-ENR. No change in the effects on designated heritage sites of either international or national importance (World Heritage Site, Scheduled Monuments and Registered Parks and Gardens) is anticipated.	The significance of effects is not expected to change.	The assessment has been completed through information via publically available mapping sources and schematic information on Iteration 3.	No further assessment is proposed, because no change to the overall significance is expected.
		32. Will it affect the significance of non-designated heritage assets and their settings?	Significant Negative effect (--) Land take Study Area (including surface access corridors) 74 assets are present. Total removal of any archaeological remains during construction activities and earth-moving activities in particular. The significance of non-designated remains will be subject to substantial harm. Intermediate Study Area 79 assets are present. Any impact within the intermediate study area s will be to the significance of	The diversion of the A4 travels close to Sipson and Hamondsworth. Data collection for non-designated heritage assets for Iteration 3 has not been undertaken but there are likely to be increased effects on non-designated assets. An area north of Hamondsworth and also surrounding Sipson are identified as Archaeological Priority Areas, so there is potential for effects on buried archaeology. These include the site of a former Benedictine Priory west of Hamondsworth.	The significance of effects is not expected to change.	The assessment has been completed through information via publically available mapping sources and schematic information on Iteration 3.	No further assessment is proposed, because no change to the overall significance is expected.

Table 6 LHR-ENR Variation Screening Assessment: Iteration 3

Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
			the setting of the assets. This has the potential to result in harm to the significance of the assets. Outer Study Area None identified. HER search does not extend into outer Study Area. Any impact within the outer area will be to the significance of the setting of the assets. This has the potential to result in harm to the significance of the assets.	The alterations to the M25 J14 take place in an area which would be developed as part of the assessed design so no change is predicted.			
		33. Will it conserve or enhance heritage assets and the wider historic environment including landscapes, townscapes, buildings, structures, and archaeological remains?	Significant Negative effect (--) No beneficial impacts are presented in the ACs report. All impacts listed are adverse. However, it is possible that following mitigation positive outcomes could be realised through some enhancement to Conservation Areas and community engagement and by addressing Heritage at Risk (including those that become at risk as a result of the scheme), improving the setting of heritage assets, together with opportunities for community engagement including improving access to and/or interpretation, understanding and appreciation of heritage assets'	No beneficial impacts are known.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		34. Will it harm the significance of heritage assets, for example from the generation of noise, pollutants and visual intrusion?	Significant negative effect (--) There is likely to be increased light levels from construction and operational lighting in addition to any lights from aircraft whilst on the ground and in flight. The setting of 30 designated heritage assets could be affected within 300m of the scheme area (1 Grade II* Listed buildings 22 Grade II, two Scheduled Monuments and five Conservation Areas) and from 300m to 2km the setting of a further 168 designated assets could potentially be affected (four Grade I, five Grade II* and 151 Grade II Listed Buildings, one Scheduled Monuments and six Conservation Areas and 1 Registered Park and Garden. The setting of seventy-nine non-designated assets could be affected. Historic landscape and townscape character will be affected. Historic landscape and townscape character will be affected. There is unlikely to be an impact on below-ground archaeological remains. Data was only available for the intermediate study area i.e. 300m of the scheme area.	The diversion of the A4 could affect the significance of Grade I, II* and a number of Grade II listed buildings. In particular, these include a Grade I Listed Tithe Barn north west of Harmondsworth (The Great Barn), and a Grade II* Listed Church (The Church of St. Mary). East of Sipson, an offline section of the diversion of the A4 re-joins the current A408 adjacent to Sipson House, a Grade II Listed Building. In addition, the setting of Harmondsworth Conservation Area would be affected. The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are unlikely to materially change noise, pollution and visual intrusion on heritage assets relative to the AC's surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.	The assessment has been completed through information via publically available mapping sources and schematic information on Iteration 3.	No further assessment is proposed, because no change to the overall significance is expected.
Landscape	18. To promote the protection and improvement of landscapes townscapes, waterscapes and the visual resource, including areas of tranquillity and dark skies.	35. Will it protect and enhance nationally and locally designated landscape, townscape and waterscape?	Negative effect (-) National Landscape Designations: Potential indirect impacts of new lighting and the direction / height / number of flights over the Chilterns AONB. Local Landscape Designations: Long distance views from Area of Landscape Importance; impacts upon the Hillingdon Lower Colne Floodplain, Hillingdon Open Gravel Terrace, Slough Road Infrastructure and Hillingdon Historic Core character areas. Local Townscape Designations: The loss of landscape features would be permanent within the Hillingdon Historic Core. Other areas with landscape character value: Loss of the Colne Valley Regional Park and views from the park at Colnbrook and Poyle would be impacted by the construction works.	No additional effects on designated sites of either international, national importance are anticipated. The diversion of the A4 west of Harmondsworth is within an area which is locally classified by the London Borough of Hillingdon as the Lower Colne Floodplain. It is also part of the Colne Valley Park. The diversion of the A4 would increase the effects on these local designations. The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 would avoid the requirement for a diversion of the A3044 to run parallel with the M25. This would reduce the amount of land take required within the Colne River Floodplain landscape character area between Wraysbury and King George Reservoir. The amount of land required to accommodate a roundabout for Terminal 5/6 would also reduce landtake north west of Stanwell Moor, within the	The significance of effects is not expected to change.	The assessment has been completed through information via publically available mapping sources and schematic information on Iteration 3.	No further assessment is proposed, because no change to the overall significance is expected.

Table 6 LHR-ENR Variation Screening Assessment: Iteration 3

Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
				Colne River Valley Floor Landscape Character Area.			
		36. Will it lead to impact on sensitive views and their settings?	Significant negative effect (- -) Potential for deterioration in valued views and vistas on the Chilterns AONB from the direction / height / number of flights overhead. Views from properties in Stanwell, Stanwell Moor, Harmondsworth and Sipson would be impacted during construction and operation. Views from the Public Rights of Way south of the M4 during construction and operation.	Diversion of the A4 is likely to affect views and visual amenity for locally sensitive receptors at Sipson and Harmondsworth during construction and operation. The impact on views from properties in Stanwell, Stanwell Moor would decrease as the alignment of the M25 J14 and connection to Terminal 5/6 would occupy less land north east, north, north west and west of Stanwell Moor than the previously assessed diversion of the A3044 adjacent and to the east of the M25.	The significance of effects is not expected to change.	The assessment has been completed through information via publically available mapping sources and schematic information on Iteration 3.	No further assessment is proposed, because no change to the overall significance is expected.
		37. Will it lead to a loss of tranquillity and increase in light pollution?	Negative effect (-) Potential for increased numbers of aircraft over-flying the Chilterns AONB, which may reduce tranquillity levels. Potential for increased aircraft noise and views of aircraft in flight. There is likely to be increased light levels from construction and operational lighting, in addition to any lights from aircraft whilst on the ground and in flight. Impacts would be the greatest for those receptors to the west around Colnbrook, and to the north around Harmondsworth and Sipson.	Construction and operation of the A4 diversion is likely to lead to an increase in light pollution, in particular to the west of Harmondsworth and east of Sipson. The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are not likely to materially alter tranquillity or light pollution at Stanwell Moor.	The significance of effects is not expected to change.	The assessment has been completed through information via publically available mapping sources and schematic information on Iteration 3.	No further assessment is proposed, because no change to the overall significance is expected.

Table 7 LHR-ENR Variation Screening Assessment: Iteration 4

Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
Community	1. To avoid or minimise negative effects on community viability, including housing, facilities and indirect effects.	1. Will it lead to a loss of housing and community facilities?	Significant Negative effect (--) The loss of the following housing and community facilities ³² : → 242 residential properties likely to be required for airport expansion; → up to 165 residential properties could be required for surface access, since they fall within the potential buffer zone for construction works; → potential secondary impacts of relocated households on existing communities; → loss of industrial/employment land; → loss of three pubs during construction; → noise implications for Pippins Primary School; → part of the Colne Valley Regional Park; → other formal and informal recreation sites; → public rights of way; → cycle routes; → severance of section of the Colne Valley Way running from Colnbrook to Horton; → severance of Poyle Road, which currently links Poyle and Colnbrook with Wraysbury and Horton; and → severance of route to Poyle from the west along Bath Road. Mitigation has been recommended.	Traffic management on the A4 and the alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 and are not expected to increase land take from housing or community facilities beyond those affected by the AC's surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.	The assessment is based on a schematic layout for Iteration 4 - Figure 3, publically available mapping and sources of information regarding the location of community facilities.	No further assessment is proposed, because no change to the overall significance is expected.
		2. Will it lead to increasing demand for housing and community facilities?	Minor Negative effect (-) High demand scenarios indicate up to 60,600 new homes may be required up to 2030. Up to 400 homes would be required per local authority per year. Additional spaces in local schools are likely to be required and two additional GPs and two primary care centres per local authority to 2030 ³³ . There is also likely to be a need for additional parks or open spaces.	No increase in demand for housing and community facilities are anticipated, as the surface access arrangements are not considered to be the main source of demand.	The significance of effects is not expected to change.	The effects of Iteration 4 on overall employment, particularly during the construction phase, and consequently on housing demand and community facilities have not been quantified. However, it is reasonable to assume that these are a small proportion of the workers required to construct the airport as a whole.	No further assessment is proposed, because no change to the overall significance is expected.
		3. Will there be indirect effects on community viability?	Significant Negative effect (--) Traffic movements - may lead to more traffic and increased journey times. This may lead to issues of severance, loss of sense of place, breakdown in community cohesion, and a reduction in the quality of amenity within the community Air Quality - 100,392 people will experience a rise in annual mean NO2 levels. No exceedances of UK air quality objectives are anticipated ³⁴ . Noise – There is a predicted increase of 27,200 people exposed to airspace noise exceeding 54dB LAeq,16hr by 2030, which reduces steadily over time until an overall (beneficial) reduction in population exposure to levels >54 dB LAeq,16hr of 18,200 people is expected by 2050. Exposure to noise >63 dB LAeq,16hr is expected to increase by 41,600 in 2030, reducing to 22,400 by 2050. Strategic Development - No allocated housing sites will be lost as a result of airport expansion, however housing allocations to the east and west of Heathrow will be subject to noise effects, particularly around Windsor. Undeveloped land in the areas surrounding Heathrow is highly constrained by the London Green Belt and other designations. Increases in noise effects may act as an additional constraint to current housing	Traffic Management: Traffic management on the A4 and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are designed to improve traffic movements, and reduce journey times. Air Quality: Traffic management on the A4 and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 would reduce congestion, and may result in a shorter delay to compliance with Air Quality Directive Limit Values in the Greater London Urban Area Noise: Traffic management on the A4 and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are not expected to alter the significance of the noise effects, which would primarily be generated by aircraft movements. Strategic Development: No additional allocated housing or employment sites would be lost, beyond those lost in the AC's surface access arrangements for LHR-ENR.	Iteration 4 would have mixed effects on community viability. It is anticipated that traffic management alone is not likely to reduce the future potential air quality exceedances. The significance of effects is not expected to change.	The assessment is based on the conclusions presented in other topics considered within this assessment. The conclusions presented within these other topics are based on their own assumptions.	No further assessment is proposed, because no change to the overall significance is expected.

³² Airports Commission, 2014. *Community: Impact Assessment*, pp. 9-10. [online] Accessed 24/12/2015.

³³ Airports Commission, 2014. *Local Economy Impacts: Assessment*. [online] Accessed 24/12/2015.

³⁴ Airports Commission, 2015. *Quality of Life: Equalities Impacts Report*. [online] Accessed 24/12/2015.

	2. To avoid or minimise disproportionate impacts on any social group.	4. Will it minimise disproportionate negative effects on particular regions, users or vulnerable social groups?	<p>allocations or to future housing proposals, restricting the ability of the affected local authorities to meet housing delivery targets.</p> <p>Minor negative effect (-) With the loss and relocation of housing and community facilities such as primary schools, community centres, nurseries, recreational ground and transport links, disproportionate effects may be experienced by vulnerable social groups within the area. Furthermore, indirect effects due to increased traffic, reduced air quality and increased noise effects may be experienced disproportionately by such groups. There are higher than average BAME communities around the airport, with a particularly high proportion of BAME populations in the local authority areas surrounding Heathrow. There is potential for BAME groups to therefore experience disproportionate effects.</p>	<p>No increase in land take, loss of community facilities or housing is anticipated. Noise effects associated with traffic management on the A4 and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are not expected to increase relative to the noise effects generated by the AC's surface access arrangements for LHR-ENR. Traffic management on the A4 and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 may improve traffic congestion and reduce potential air quality effects where future potential exceedances have been identified to the north of Heathrow in the AC's surface access arrangements for LHR-ENR.</p>	<p>The diversion of the A4 and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are not expected to have a disproportionate effect on particular regions, users or vulnerable social groups. There would be reduced adverse air quality effects. The significance of effects is not expected to change.</p>	<p>The assessment is based on the route options which have been proposed, and on publically available sources of information.</p>	<p>No further assessment is proposed, because no change to the overall significance is expected.</p>
Quality of Life	3. To maintain and where possible improve the quality of life for local residents and the wider population.	5. Will it help to maintain and improve quality of life?	<p>Traffic Volume Significant disruption to road users and severance of small local communities will be experienced during the construction phase of the scheme, causing distress and anxiety to residents. During the operational period of the scheme, improved infrastructure and access to public transport may provide improvements to QoL in the short term, however these are expected to be negated by long term increasing demand for infrastructure. Housing and Communities Loss of housing/ forced moves will cause distress and have significant adverse impacts upon wellbeing. Social isolation likely to increase during construction from loss of community facilities, resulting in a reduction in the QoL of those directly affected by relocation or disruption during the construction period. New housing and community facilities will provide greater opportunities for leisure. Employment and the Economy New employment and business from an expanded airport will be of significant benefit to QoL locally and nationally from enhanced local and national economic growth. Noise Local exposure to construction noise and vibration can cause annoyance, for the duration of works. Increases in significant community annoyance due to aircraft noise exposure. Increases in effects which would lead to negative health outcomes. Reductions in night-time noise-related sleep disturbance. Reduced loss of sleep could lower anxiety and hypertension. General increases in noise exposure of schools, which can delay reading development. Air Quality Poor air quality has a direct impact upon sensitive receptors, exacerbates symptoms surrounding cardiovascular and impaired lung functions and has strong dose-response relations with increased morbidity and mortality. Access to nature and cultural heritage Negative impact on the wellbeing of users of high value recreational areas including the Colne Valley Regional Park, and local residents who value the presence of such amenity areas. Indirect overall benefit to wellbeing through improving access to nature and the living environment, through mitigation and improvement measures, involving compensation of habitat and displacement of recreational areas. Flooding Direct potential negative impact upon wellbeing during construction and operation as a consequence of potential and perceived increase in flood</p>	<p>Traffic Volume: Traffic management on the A4 and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 has potential to reduce the disruption to road users or severance during operation. Housing and Communities: The A4 traffic management and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 would not increase the loss of housing. Employment: There are unlikely to any operational changes to employment as a result of Traffic management on the A4 and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6. Beneficial employment effects are anticipated during construction of the A4 traffic management. Noise: Traffic management on the A4 and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are not expected to increase noise effects, which will primarily be generated by aircraft movements. Air quality: Traffic management on A4 and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 would reduce congestion, and may result in a shorter delay to compliance with Air Quality Directive Limit Values in the Greater London Urban Area Access to Nature and Cultural Heritage: Traffic management on A4 and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are not expected to decrease access to nature and cultural heritage. Flooding: The changes to the surface access arrangements are not expected to result in a significant change to flood risk which would affect quality of life.</p>	<p>Iteration 4 would have mixed effects on community viability. There may be reductions in adverse air quality effects, although the overall significance of effects is not expected to change.</p>	<p>The assessment is based on the conclusions presented in other topics considered within this assessment. The conclusions presented within these other topics are based on their own assumptions.</p>	<p>No further assessment is proposed, because no change to the overall significance is expected.</p>

			risk. It is acknowledged that detailed design at the next stage will identify opportunities to mitigate flood risk.				
Economy	4. To maximise economic benefits and to support the competitiveness of the UK economy.	6. Will it enhance economic growth?	Significant Positive effect (++) Direct impacts: The total passenger benefits are valued at £46.9bn and include: → Lower fares: £54.5bn; → Frequency benefits: £2.6bn; and → Reduced delays: £0.1bn. Other direct benefits are as follows: → Total producer impact: £-46.4bn; and → Government revenue: £2.9bn. Wider economic impacts: → Business output benefits: £1.1bn; and → Tax wedge: £0.5bn to 1.7bn The trade benefits have been estimated at either £7.5bn, £14.3bn or £106.6bn depending on the approach taken. However, it should be noted that these are not additive to the other wider economic impacts. Total benefits (excluding trade and producer impacts): £61.7 – 62.8bn	Traffic management on the A4 and alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are not expected to result in change to economic benefits to growth in addition to those in the AC's surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.	The impacts which are considered within this topic are considered at a national scale, rather than a local scape. In addition, the sources of economic benefits are business and airport service provision based, rather than relating to local accessibility enhancements. As a consequence, it is assumed that there is no change to economic growth as a result of surface access.	No further assessment is proposed, because no change to the overall significance is expected.
		7. Will it contribute to sustainable growth in employment?	Significant Positive effect (++) Although there will be local impacts, the extent of employment impacts at a national level remains unclear (due to displacement). It is also anticipated that many jobs will be created during the construction phase, although these may again be displaced from other potential construction activities.	Construction of traffic management on the A4, alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 may result in a small increase in employment associated with construction activities to those in the AC's surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.	The number and phasing of jobs created through construction of individual surface access schemes has not been quantified. It is reasonable to assume these would be similar to other road schemes and are unlikely to significantly affect the outcome of the assessment.	No further assessment is proposed, because no change to the overall significance is expected.
		8. Will it support the competitiveness of the UK economy?	Significant Positive effect (++) Two types of productivity-related impacts are expected to arise: → enhanced productivity through increased trade and associated spin-off benefits; and → Increased productivity through strengthening agglomerations and clusters.	Traffic management on the A4, alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are not expected to change competitiveness of the UK economy.	The significance of effects is not expected to change.	The impacts which are considered within this topic are considered at a national scale, rather than a local scape. In addition, the sources of economic benefits are business and airport service provision based, rather than relating to local accessibility enhancements. As a consequence, it is assumed that there is no change to competitiveness as a result of change to surface access.	No further assessment is proposed, because no change to the overall significance is expected.
		5. To promote employment and economic growth in the local area and surrounding region.	9. Will it incorporate accessibility improvements, particularly with key local employment centres and	Neutral (0) Long term increases in surface passengers associated with the airport are anticipated. In addition, there are also expected to be increases in the use of surface access systems by additional users not associated with the airport. Under the do minimum scenario, the planned improvements to the local transport network, particularly rail, will improve connectivity for those who live and work near these routes. ³⁵ However, long term increases in	Traffic management of A4, alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 would improve the functioning of the surface access arrangements in the short term. However, similar to the AC's surface access arrangements for LHR-ENR benefits to accessibility are expected to be negated by long term increases in demand for surface access transport systems, including the road	The significance of effects is not expected to change.	

³⁵ Jacobs, 2014. *Local Economy Impacts: Assessment*, p. 96. [online] Accessed 24/12/2015.

		areas of high unemployment?	airport and non-airport transport demand are expected to negate any network benefits to journey times for other users of surface access systems around the airport. Further enhancements to the surface transport network may be required to ensure accessibility benefits are maintained in the long term.	network. Further improvements would be required to ensure accessibility benefits are sustained in the long term.			
		10. Will it contribute to growth in the local economy?	Significant Positive effect (++) The DfT developed a range of local employment estimates following from the AC's original estimates. These indicated that between 48,000 and 97,000 additional local jobs would be generated by 2030 with between 31,000 and 63,000 generated by 2050. ³⁶ The quantity and distribution of high skilled jobs has not been determined at this stage of the assessment. It is considered likely that airport expansion will serve as a catalyst to business investment in the surrounding area, continuing to attract high value firms ³⁷ . Employment and business which develops, or is maintained by the expansion of the airport will benefit the local economy and enhance local economic growth.	There is potential for traffic management on the A4 to contribute to the growth of the local economy, including potential for a small increase in overall construction employment compared to the AC's surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.	The number and phasing of jobs created through construction of individual surface access schemes has not been calculated at this stage of assessment. However, assuming these are similar to other road schemes these are unlikely to significantly affect the outcome of the assessment.	No further assessment is proposed, because no change to the overall significance is expected.
Noise	6. To minimise and where possible reduce noise impacts on human receptors.	11. Will it avoid or reduce the harmful effects due to exposure of people and sensitive buildings to noise?	Predominant Significant Negative effects (--) Construction phase impacts are likely to be negative, with potential for significance at sensitive receptors near to the runway extension or along construction routes. The effects cannot yet be assessed in detail but as a worst case estimate can be considered as potentially Significant Negative (--). The effects of changes in airspace noise exposure on the local population from the LHR-ENR scheme are considered to be predominantly Significant Negative (--). The effects of changes in airspace noise exposure on local NSBs from the LHR-ENR scheme are considered to be predominantly Significant Negative (--). The local effects of ground noise from the LHR-ENR scheme are considered to be Positive (+). The overall effects of the LHR-ENR scheme on the health outcomes assessed are considered to be predominantly Significant Negative (--), since it would result in increases in DALYs lost compared with the Do minimum. The local effects of airspace noise from the LHR-ENR scheme on children's cognitive development are considered to be predominantly Significant Negative (--). The national effects of the LHR-ENR scheme are considered to be Significant Negative (--).	Traffic management on the A4 is not expected to generate an increase in local traffic noise. The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 at the roads affected remain similar in location to the AC's surface access arrangements for LHR-ENR, so are unlikely to increase noise effects.	The predominant source of noise is from aviation. The significance of effects is not expected to change.	Aircraft and airport operational noise is the predominant sources of noise.	No further assessment is proposed, because no change to the overall significance is expected.
Biodiversity	7. To protect and enhance designated sites for nature conservation.	12. Will it affect internationally, nationally and locally designated biodiversity sites?	Significant Negative effect (--) International Sites: SWLW SPA / Ramsar Significant adverse effects have been identified with regard to; land take; construction disturbance; operation disturbance including flights; hydrological impacts; air quality changes; disturbance through increased levels of bird scaring/control as part of birdstrike risk management measures. Windsor Forest and Great Park SAC Burnham Beeches SAC Thursley, Ash, Pirbright and Chobham SAC Thames Basin Heaths SPA Richmond Park SAC Wimbledon Common SAC Significant adverse effects have been identified with regard to air quality impacts associated with increased traffic flow, and direct and indirect impacts upon supporting habitat as a result of the surface access strategy.	The alterations to the M25 at Junction 14 may increase the area of land lost from the Staines Moor SSSI when compared to the AC's surface access arrangements for LHR-ENR. No effects on any other sites designated for nature conservation.	The significance of effects is not expected to change.	The assessment has been completed through the identification of designated biodiversity sites via publically available mapping sources and a schematic layout for Iteration 4 - Figure 3.	No further assessment is proposed, because no change to the overall significance is expected.

³⁶ Department for Transport, 2017. *Airport Capacity in the South East: Updated Appraisal Report*

³⁷ Jacobs, 2014. *Local Economy Impacts: Assessment*, p. 54. [\[online\]](#) Accessed 24/12/2015.

			<p>National Sites Staines Moor SSSI Wraysbury Reservoir SSSI Wraysbury No.1 Gravel Pit SSSI Wraysbury and Hythe End Gravel Pits SSSI Kempton Park Reservoirs SSSI Potential impacts principally associated with air and water quality changes that could result in adverse effects to the habitats and species interest features of these sites. <u>Local Sites</u> Arthur Jacob LNR, East Poyle Meadows SNCI, Greenham's Fishing Pond SINC, Lower Colne Sites of Metropolitan Importance for Nature Conservation (SMINC), River Colne. Potential impacts from direct land take due to surface access requirements.</p>				
	8. To conserve and enhance undesignated habitats, species, valuable ecological networks and ecosystem functionality.	13. Will it conserve and enhance undesignated habitats, internationally and nationally protected species and valuable ecological networks, such as priority habitats and priority species.	<p>Significant Negative effect (--) Habitats deciduous woodland, traditional orchard, rivers and brooks, reedbeds and lowland meadows. Species There are birdstrike management issues for LHR-ENR associated with the nearby complex of open water bodies. The closer proximity of the runway and increased air traffic is likely to result in an increased strike risk, and a corresponding requirement for an increase in bird management and control activities is anticipated. Methods of deterring/scaring and controlling bird species potentially hazardous to aviation operations could potentially have an adverse effect on non-target species and biodiversity including those not listed on the designation interest features. A range of protected species including, bats, otter, water vole, reptiles (including grass snake and slow worm), and various species of birds within 2km of the scheme boundary have been identified. It is considered feasible that the area would support a range of other species protected under UK (and EU) wildlife legislation including but not limited to dormice, and great crested newts. Potential impacts including, loss, disturbance, habitat severance/fragmentation, air and water quality changes, mortality.</p>	<p>The alterations to the M25 at Junction 14 would cross the Colne River, Wraysbury River and numerous other watercourses. It is considered feasible that the area would support a range of species protected under UK (and EU) wildlife legislation.</p>	<p>The significance of effects is not expected to change.</p>	<p>The assessment has been completed through the identification of habitats via publically available mapping sources and a schematic layout for Iteration 3 - Figure 2</p>	<p>No further assessment is proposed, because no change to the overall significance is expected.</p>
		14. Will it increase the exposure of wildlife to transport noise, air pollution, and water pollution?	<p>Assessment significance: Significant Negative effect (--) International Sites: SWLW SPA/Ramsar Windsor Forest and Great Park SAC Burnham Beeches SAC Thursley, Ash, Pirbright and Chobham SAC Thames Basin Heaths SPA Richmond Park SAC Wimbledon Common SAC Significant adverse effects have been identified with regard to disturbance, air quality impacts associated with increased traffic flow, and direct and indirect impacts upon supporting habitat as a result of the surface access strategy. National Sites Staines Moor SSSI, Wraysbury Reservoir SSSI, Wraysbury No.1 Gravel Pit SSSI, Wraysbury and Hythe End Gravel Pits SSSI,</p>	<p>The alterations to the M25 at Junction 14 may increase the area of land lost from the Staines Moor SSSI when compared to the AC's surface access arrangements for LHR-ENR. Impacts due to exposure of wildlife include disturbance, habitat severance/fragmentation, air and water quality changes and mortality Iteration 4 is unlikely to result in a material increase in exposure to these effects.</p>	<p>The significance of effects is not expected to change.</p>	<p>The assessment has been completed using publically available mapping sources and a schematic layout for Iteration 4 - Figure 3. Given the scale of the overall impacts expected this is unlikely to affect the outcome of the assessment.</p>	<p>No further assessment is proposed, because no change to the overall significance is expected.</p>

			<p>Kempton Park Reservoirs SSSI Potential impacts principally associated with air and water quality changes that could result in adverse effects to the habitats and species interest features of these sites.</p> <p>Local Sites Arthur Jacob LNR, East Poyle Meadows SSCI, Greenham's Fishing Pond SINC, Lower Colne SMINC, River Colne. Potential impacts from direct land take due to surface access requirements</p> <p>Habitats deciduous woodland, traditional orchard, rivers and brooks, reedbeds and lowland meadows.</p> <p>Species A range of protected species including, bats, otter, water vole, reptiles (including grass snake and slow worm), and various species of birds within 2km of the scheme boundary have been identified. It is considered feasible that the area would support a range of other species protected under UK (and EU) wildlife legislation including but not limited to dormice, and great crested newts. Potential impacts including, disturbance, habitat severance/fragmentation, air and water quality changes, mortality.</p>				
Soil	9. To protect sites designated for geodiversity.	15. Will it preserve, protect and improve geodiversity?	<p>Neutral effect A review of sites which are designated for geodiversity reasons, including geological SSSIs and RIGS has been undertaken. No Geological SSSIs or RIGS were identified within this radius. No impacts on geodiversity are anticipated.</p>	No effects on sites of Geological conservation interest (SSSI or RIGS)	The significance of effects is not expected to change.	The assessment has been completed through the identification via publically available mapping sources and a schematic layout for Iteration 4 - Figure 3. Given the scale of the overall impacts expected this is unlikely to affect the outcome of the assessment.	No further assessment is proposed, because no change to the overall significance is expected.
	10. To minimise loss of undeveloped soils and of Best and Most Versatile agricultural land, and protect soil against erosion, contamination and degradation.	16. Will it maximise construction on previously developed land, minimise use of greenfield land?	<p>Significant Negative effect (--) This scheme entails land take of 336 ha, with a further 330 ha potentially affected by surface access and 57 ha identified for flood storage. The site area of the airport incorporates approximately 371ha of agricultural land, a significant proportion of which is likely to be BMV agricultural land. Agricultural land is a finite and irreplaceable resource, and although compensation will be provided to land owners, the loss of the land cannot be mitigated. As a consequence of the site location, a high proportion of the land take required is from agricultural land, the quantity of PDL should be considered a correspondingly small proportion.</p>	The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 at the roads affected remain similar in land take area to the AC's surface access arrangements for LHR-ENR. There would be a smaller increase in land take around Junction 14, but a larger decrease in land take as the A3044 diversion to Junction 13 considered as part of the AC's surface access arrangements for LHR-ENR would not be required. These are not expected to result in a change to the impacts on agricultural land.	The significance of effects is not expected to change.	The assessment has been completed through the identification via publically available mapping sources and a schematic layout for Iteration 3[SOURCE]. Given the scale of the overall impacts expected this is unlikely to affect the outcome of the assessment.	No further assessment is proposed, because no change to the overall significance is expected.
		17. Will it lead to the disturbing, harm, contamination or loss of soil resources?	<p>Negative effect (-) Development may result in soil loss or burial, physical damage including compaction, sealing, and structural damage, changes to soil water regime, effects on organic matter and soil stripping and storage. In addition, development has the potential to result in contamination of soil, resulting in risks to human health or the environment. The use of large areas of previously undeveloped land will affect the quality of soil and land resources meaning these areas of land will no longer be suitable for other uses, including farming.</p>	The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 at the roads affected remain similar in land take area to the AC's surface access arrangements for LHR-ENR. There would be a smaller increase in land take around Junction 14, but a larger decrease in land take as the A3044 diversion to Junction 13 considered as part of the AC's surface access arrangements would not be required. These are not expected to result in a change to the impacts on soil resources, including due to increased potential for contamination.	The significance of effects is not expected to change.	The assessment has been completed through the identification of the areas surrounding watercourses via publically available mapping sources and the route options proposed. Given the scale of the overall impacts expected this is unlikely to affect	No further assessment is proposed, because no change to the overall significance is expected.

						the outcome of the assessment.	
Water	11. To protect the quality of surface and ground waters, and use water resources sustainably.	18. Will proposals have adverse effects on the achievement of the environmental objectives established under the Water Framework Directive?	Negative effect (-) Physical impacts are considered in question 19 below. Water quality impacts arising from polluted runoff during construction and operation. A further risk during construction is posed by the historic landfill within the proposed development footprint, posing a risk if contaminants are mobilised. Two of the WFD water bodies in the study area are classified as having a 'Failing' chemical status, so a potential increase in pollutants could have a more magnified impact on these water bodies. A number of measures would be considered to improve water quality. Surface water quality monitoring would be undertaken in key risk construction areas in close proximity to surface watercourses and boreholes will be installed. A Sustainable Drainage Strategy will include dedicated areas for de-icing aircraft and a glycol recovery procedure to reduce the concentration of glycol within surface water runoff and separate storage tanks for 'clean' and 'first flush' surface water. Possible addition of a new STW with some of the treated water to be re-used for non-potable purposes within the airport. Re-use of surface water would be maximised, including rainwater harvesting, which will be installed. There is potential for hydrological conditions to be altered on Staines Moor SSSI from diversion of the River Colne and this would need to be addressed during detailed design. There would also be works directly adjacent to King George VI Reservoir, which forms part of Staines Moor SSSI and South West London Waterbodies Special Protection Area (SWLW SPA) and nearby Wraysbury Reservoir (also part of the SWLW SPA). This could have negative effects, depending on design (also see Appendix A.5). There are a number of reservoirs and gravel pits which make up the SWLW SPA further downstream from the Airport, (see Appendix A.5 for effects on site integrity).	No changes to the effects assessed as being associated with the AC's Surface Access arrangements.		The assessment has been completed through the identification of the areas surrounding watercourses via publically available mapping sources and schematic layout of Iteration 4. Given the scale of the overall impacts expected this is unlikely to affect the outcome of the assessment.	No further assessment is proposed, because no change to the overall significance is expected.
		19. Will it result in the modification of watercourses?	Significant Negative effect (--) Approximately 12km of existing watercourse would be replaced with diverted/realigned channels and culverts. The diversions of the Colne Brook and Poyle Channel (approx. 5km) around the west end of an extended north runway would be technically difficult and are likely to have effects on the hydromorphology/ geomorphology due to the changed gradients and other associated uncertainties. An initial estimate suggests there could be in excess of 12km of additional culverts. The Longford River, the Duke of Northumberland's River, River Colne and Wraysbury River would be culverted underneath the proposed runway. Water bodies are sensitive and extensive diversions/culverting would counteract improvements to waterbodies, including environmentally friendly flood schemes (as part of the Lower Colne Catchment flood scheme) maintaining open channels for Heathrow Terminal 5. The WFD strongly discourages culverting due to the detrimental impacts on the overall environment both that of the waterbody and the surrounding area. There are also significant cumulative impacts from culverting on the biodiversity, soils and landscape. Changes to the sedimentation processes can lead to deterioration in water quality and could impact the waterbody status should the sediment contain contaminants.	The M25 junction 14 would require culverting of watercourses including the Colne River and Wraysbury River, however this would not be a material increase beyond the AC's surface access arrangements for LHR-ENR. The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 would remove the need for the diversion of the A3044 to run parallel with the M25 south west of the airport in the AC's surface access arrangements for LHR-ENR. This would decrease the need for culverting in the area adjacent to the Wraysbury River.	The significance of effects is not expected to change.	The assessment has been completed through the identification of watercourses via publically available mapping sources and schematic layout of Iteration 4. Given the scale of the overall impacts expected this is unlikely to affect the outcome of the assessment.	No further assessment is proposed, because no change to the overall significance is expected.
		20. Will it result in the loss in productivity of fisheries?	Significant Negative effect (--) Diversion of Colne Brook and Poyle Channel and culverting of the Longford River, the Duke of Northumberland's River, River Colne and Wraysbury River may affect the hydromorphology/geomorphology which may cause a deterioration of the ecological status, potentially affecting productivity of fisheries. Construction of approximately 12km of culvert as part of the scheme would have negative impacts on fisheries. Fisheries could also be negatively impacted by residual water quality impacts from polluted runoff.	The M25 junction 14 would require culverting of watercourses including the Colne River and Wraysbury River, however this would not be a material increase beyond the AC's surface access arrangements for LHR-ENR. The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 would remove the need for the diversion of the A3044 to run parallel with the M25 south west of the airport in the AC's surface	The significance of effects is not expected to change.	The assessment has been completed through the identification of watercourses via publically available mapping sources and schematic layout of Iteration 4. Given the scale of the	No further assessment is proposed, because no change to the overall significance is expected.

				access arrangements for LHR-ENR. This would decrease the need for culverting in the area adjacent to the Wraysbury River.		overall impacts expected this is unlikely to affect the outcome of the assessment.	
		21. Will it lead to an increase in the consumption of available water resources?	Significant Negative effect (--) Total annual potable water demands for 2026 and 2050 are 2.62Mm³/year and 3.76 Mm³/year, respective increases of 0.32Mm³/year and 1.46 Mm³/year from 2013 demands. A 77% increase in passenger numbers relative to 2013 has been forecast after the completion of the extended northern runway to 134.9 million per year by 2050. Rainwater harvesting is expected to account for 9% of the additional demand. Water efficiency measures are considered able to reduce the demand by 2 to 5%. Leakage reduction measures could also save up to 0.115Mm³. No figures are available for 2085 due to limitations in the forecast figures and information within the WRMP. The scheme promoter' submission outlines that the water demands for the Shortlisted Scheme can be feasibly met by increased abstraction from surface and/or groundwater. The Affinity Water WRMP concluded that there is a deficit in the Water Resource Zone that supplies Heathrow, in 2013 only 46% of the licensed volume was abstracted. Construction of the scheme will lead to short term increases in water demand.	The changes to culverting are not expected to result in a change to the productivity of fisheries. The surface access modifications and traffic management are not anticipated to change water resources use during construction or operation.		It is not possible to determine the amount of water resources required for construction and operation at this stage of design. Due to the scale of the impacts associated with airport expansion it is unlikely to change the overall significant presented in the AoS.	No further assessment is proposed, because no change to the overall significance is expected.
	12. To minimise flood risk and ensure resilience to climate change.	22. Will it increase flood risk through increased run off?	Negative effect (-) Increase in impermeable areas, without suitable mitigation, could lead to runoff rates greater than the greenfield rate resulting in increased risks of flooding elsewhere. There are methods of reducing flood risk. Scheme promoter may need to update method for estimating the attenuation requirements as more appropriate methodologies are available. Despite this the volume is similar to estimates by Jacobs. Elevated groundwater may also contribute to the surface water runoff to the ponds during significant rainfall events or prolonged wet periods. This may further reduce the attenuation volumes available.	The alternative M25 Junction 14 arrangements and traffic management on the A4 are not expected to materially increase the quantity of impermeable area. There is likely to be a decrease in the impermeable area created due to A3044 connection to Terminal 5/6 not being required. The Iteration 4 arrangements are not expected to result in a material increase in flood risk when compared to the AC's surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.	The assessment has been completed through the identification of the areas Flood Risk Zone via publically available mapping sources and the route options proposed. These could provide inaccuracies regarding their proximity and the extent of the Flood Risk Zones in question. Given the scale of the overall impacts expected this is unlikely to affect the outcome of the assessment.	No further assessment is proposed, because no change to the overall significance is expected.
		23. Will it increase area of development within areas at risk of flooding?	Significant Negative effect (--) Proposed runway will extend onto the floodplains of the River Colne, Wraysbury River and the Colne Brook, resulting in occupying floodplain areas designated as Flood Risk Zones 2 and 3. The existing fluvial flood risk to Heathrow Airport is low. Development is expected to lead to a loss of up to 45 ha of undefended flood plain with only a 33 ha being set aside for compensation purposes. Assessment method has potentially led to an underestimation of the loss of flood plain storage. Consequences of this flood storage loss would be direct increase of flood areas downstream, with the likely impact of increased risk to developed areas. There are isolated areas within the extended footprint that are at medium or high risk of surface water flooding. Heathrow Airport and the proposed new runway are located on River Terrace Gravels, which is classified as Primary and Secondary Aquifers. There is the potential for elevated groundwater levels and/or groundwater flooding in the area. Risk of flooding from reservoirs is considered negligible.	The M25 junction 14 arrangement travels through Flood Zone 2 west of the existing M25. This is not expected to result in a change to the area of development at risk from flooding. There would be a decrease in the area of development within an area of flood risk due to A3044 connection to Terminal 5/6 not being required.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.

			Peak flow and rainfall is expected to increase from the baseline to 2086, meaning that developments on the floodplain and zones susceptible to groundwater flooding could be at risk from increases in rainfall intensity.				
		24. Will it be able to adapt to climate change?	Negative effect (-) Without appropriate mitigation the scheme could result in increased risks to itself and sites elsewhere as a result of increased peak river/overland flows, runoff rates from across the scheme and altered volumes available for abstraction for water use. Scheme promoter has applied a 20% increase in peak flows and rainfall, a 40% allowance will need to be assessed to be compliant with current guidance. No consideration appears to be given to the implications of climate change on the River Terrace Gravels, other than the scheme will be raised above existing ground levels, no consideration is given to the implications of raised ground levels across the wider area. The WRMP demonstrates that sufficient water is available to meet potable and non-potable requirements.	No information is available on design for climate change.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
Air Quality	13. To improve air quality and reduce emissions consistent with EU, national and local standards and requirements.	25. Will it support compliance with local, national and European air quality requirements or legislation?	Significant Negative effect (--) A reassessment of compliance ³⁸ with the EU Air Quality Directive taking account the government's 2017 Air Quality Plan indicates that LHR-ENR impacts on compliance with EU limit values. NOx and PM2.5 emissions are currently projected to exceed the NECD target for 2030 – but the increase with the scheme is a very small fraction of the target. The maximum predicted annual mean NO2 concentration with the scheme in place at any receptor in Principal Study Area is 37.2µg/m3.	Traffic management on the A4, alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 may reduce traffic impacts on the existing A4, but the risk of impact on compliance is related to airside emissions as well as traffic emissions and, as such, impacts are not expected to reduce significantly.	The significance of the effect is not expected to change		No further assessment is proposed, because no change to the overall significance is expected.
		26. Will it reduce the exposure to air quality issues for local communities and sites designated for nature conservation?	Significant Negative effect (--) There are no predicted exceedances of the air quality objectives at any receptor location, in either the Do-Minimum or LHR-ENR scenarios. The scheme will increase exposure to pollution at 38,656 properties, of which 113 are considered 'at risk' (>32µg/m ³). The scheme results in increased exposure to pollution over sites designated for nature conservation at all 10 sites assessed, including sites where the critical level is currently exceeded and South West London Waterbodies Ramsar/SPA. No exceedances of critical loads are modelled with the scheme. Increase in national emissions of NOx and PM _{2.5} .	Traffic management on the A4, alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 may reduce traffic impacts on the existing A4, but impacts of the scheme are related to airside emissions as well as traffic emissions and, as such, impacts are not expected to reduce significantly.	The significance of the effect is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
Carbon	14. To minimise carbon emissions in airport construction and operation.	27. Will the approach to the development be consistent with overall carbon requirements?	Significant Negative effect (--) Over the 60-year Appraisal Period (2026 to 2086), under the Carbon-Capped scenario, it is forecast that the development of an extended Northern runway at Heathrow Airport will result in the emission of a further additional 256.1 MtCO2 over the baseline case. Over the same Appraisal Period under the Carbon-Traded scenario, it is forecast that the development of an extended Northern runway at Heathrow Airport will result in the emission of a further 266.7 MtCO2 over the baseline case. In both cases, construction emissions will contribute a further 10.1 MtCO2e to UK emissions, however this is a one-off impact at the beginning of the Appraisal Period.	Not applicable - see Question 28 below.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		28. Will the approach minimise carbon emissions associated with surface transportation?	Significant Negative effect (--) Over the 60-year Appraisal Period (2026 to 2086), under the carbon-traded scenario, it is forecast that the development of an extended Northern runway at Heathrow Airport will result in the emission of an additional 8.1 MtCO2 due to Passenger and Staff Surface Access over the baseline case. In DfT's revised carbon-capped scenario demand is unaffected by the abatement measures implemented, so the surface access CO2 estimates are the same as in the carbon-traded case.	The surface access arrangements are not expected to materially alter carbon emissions from the AC's surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.

³⁸ WSP, October 2017, 2017 Plan Update to Air Quality Re-analysis

			Emissions from staff surface access and freight transport movements are also likely to rise, but these were not quantified in the AC's assessment. It is recommended that they be assessed by an applicant during the detailed design.				
Resources and Waste	15. To minimise consumption of natural, particularly virgin non-renewable, resources.	29. Will it be possible to minimise the consumption of natural resources?	Significant Negative effect (--) Consumption of large volumes of construction material. Operational consumption reduced by comparison with construction phase.	The consumption of natural, non-renewable resources would occur during construction and operation. It is not anticipated that these would be materially different to the AC's surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.	It is not possible to determine the amount of waste that could be minimised at this stage of design. Due to the scale of the impacts associated with airport expansion it is unlikely to change the overall significant presented in the AoS.	No further assessment is proposed, because no change to the overall significance is expected.
	16. To minimise the generation of waste in accordance with the principals of the resource efficiency hierarchy.	30. Will it be possible to minimise waste generated during construction and operation?	Significant Negative effect (--) Generation of large volumes of construction waste that could be sent to landfill. Volumes of waste to be generated during operation are likely to be greatly reduced by comparison with construction. Forecasts for waste generation in operation are marginally lower than the highest forecasts (LHR-NWR), across all operational scenarios.	It is not anticipated that waste generated would be materially different to the AC's surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.	It is not possible to determine the amount of waste that could be minimised at this stage of design. Due to the scale of the impacts associated with airport expansion it is unlikely to change the overall significant presented in the AoS.	No further assessment is proposed, because no change to the overall significance is expected.
Historic Environment	17. Conserve and where appropriate enhance heritage assets and the wider historic environment including buildings, structures, landscapes, townscapes and archaeological remains.	31. Will it affect the significance of internationally and nationally designated heritage assets and their settings?	Significant Negative effect (--) Land take study area (including surface access corridors) Construction activities including the demolition or partial demolition of structures will impact on 7 Grade II Listed Buildings resulting in their total or partial loss. Total loss is substantial harm. Partial loss could result in assets being put at risk. Partial loss can also result in substantial harm. A Conservation Area will also be affected. The significance of assets lying outside of the land take but associated with those within it will be at risk of harm. Intermediate Study Area Construction and operation will impact on the setting of 2 Scheduled Monuments, 23 listed buildings (Grades II* and II) and 5 Conservation Areas. This will result in harm to the significance of the assets. Outer study area Operation of the scheme will impact on the setting of a Scheduled Monument, 160 Listed Buildings (all Grades), a Registered Park and Garden and 6 Conservation Areas. This will result in harm to the significance of the assets.	Traffic management on the A4 is likely to be entirely online, and is unlikely to increase effects on the setting of heritage assets. There are Listed Buildings on the periphery of Stanwell Moor which may have views of the current A3113 and M25, the proposed arrangement of the M25 Junction 14 and A3044 connection to Terminal 5/6 is unlikely to generate an increase in effects relative to the AC's surface access arrangements for LHR-ENR. No change in the effects on designated heritage sites of either international or national importance (World Heritage Site, Scheduled Monuments and Registered Parks and Gardens) is anticipated.	The significance of effects is not expected to change.	The assessment has been completed through information via publically available mapping sources and schematic information on Iteration 4.	No further assessment is proposed, because no change to the overall significance is expected.
		32. Will it affect the significance of non-designated heritage assets and their settings?	Significant Negative effect (--) Land take Study Area (including surface access corridors) 74 assets are present. Total removal of any archaeological remains during construction activities and earth-moving activities in particular. The significance of non-designated remains will be subject to substantial harm. Intermediate Study Area 79 assets are present. Any impact within the intermediate study area s will be to the significance of the setting of the assets. This has the potential to result in harm to the significance of the assets. Outer Study Area None identified. HER search does not extend into outer Study Area. Any impact within the outer area will be to the significance of the setting of the assets. This has the potential to result in harm to the significance of the assets.	The A4 traffic management is likely to be entirely online, and therefore is unlikely to affect non designated heritage assets. The alterations to the M25 J14 take place in an area which would be developed as part of the assessed design so no change is predicted.	The significance of effects is not expected to change.	The assessment has been completed through information via publically available mapping sources and schematic information on Iteration 4.	No further assessment is proposed, because no change to the overall significance is expected.

		33. Will it conserve or enhance heritage assets and the wider historic environment including landscapes, townscapes, buildings, structures, and archaeological remains?	Significant Negative effect (--) No beneficial impacts are presented in the ACs report. All impacts listed are adverse. However, it is possible that following mitigation positive outcomes could be realised through some enhancement to Conservation Areas and community engagement and by addressing Heritage at Risk (including those that become at risk as a result of the scheme), improving the setting of heritage assets, together with opportunities for community engagement including improving access to and/or interpretation, understanding and appreciation of heritage assets'	No beneficial impacts are known.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		34. Will it harm the significance of heritage assets, for example from the generation of noise, pollutants and visual intrusion?	Significant negative effect (--) There is likely to be increased light and noise levels from construction and operation. In addition to any lights and noise from aircraft whilst on the ground and in flight. The setting of 30 designated heritage assets could be affected within 300m of the scheme area (1 Grade II* Listed buildings 22 Grade II, two Scheduled Monuments and five Conservation Areas) and from 300m to 2km the setting of a further 168 designated assets could potentially be affected (four Grade I, five Grade II* and 151 Grade II Listed Buildings, one Scheduled Monuments and six Conservation Areas and 1 Registered Park and Garden. The setting of seventy-nine non-designated assets could be affected. Historic landscape and townscape character will be affected. Historic landscape and townscape character will be affected. There is unlikely to be an impact on below-ground archaeological remains. Data was only available for the intermediate study area i.e. 300m of the scheme area.	The A4 traffic management is likely to be entirely online, and therefore is unlikely to harm the significance of heritage assets. The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 are unlikely to materially change noise, pollution and visual intrusion on heritage assets relative to the AC's surface access arrangements for LHR-ENR.	The significance of effects is not expected to change.	The assessment has been completed through information via publically available mapping sources and schematic information on Iteration 4.	No further assessment is proposed, because no change to the overall significance is expected.
Landscape	18. To promote the protection and improvement of landscapes townscapes, waterscapes and the visual resource, including areas of tranquillity and dark skies.	35. Will it protect and enhance nationally and locally designated landscape, townscape and waterscape?	Negative effect (-) National Landscape Designations: Potential indirect impacts of new lighting and the direction / height / number of flights over the Chilterns AONB. Local Landscape Designations: Long distance views from Area of Landscape Importance; impacts upon the Hillingdon Lower Colne Floodplain, Hillingdon Open Gravel Terrace, Slough Road Infrastructure and Hillingdon Historic Core character areas. Local Townscape Designations: The loss of landscape features would be permanent within the Hillingdon Historic Core. Other areas with landscape character value: Loss of the Colne Valley Regional Park and views from the park at Colnbrook and Poyle would be impacted by the construction works.	No additional effects on designated sites of either international, national importance are anticipated. The A4 Traffic Management would be entirely online to no changes to landscape character are anticipated. The alterations to the M25 at Junction 14 and A3044 connection to Terminal 5/6 would avoid the requirement for a diversion of the A3044 to run parallel with the M25. This would reduce the amount of land take required within the Colne River Floodplain landscape character area between Wraysbury and King George Reservoir. The amount of land required to accommodate a roundabout for Terminal 5/6 would also reduce landtake north west of Stanwell Moor, within the Colne River Valley Floor Landscape Character Area.	The significance of effects is not expected to change.	The assessment has been completed through information via publically available mapping sources and schematic information on Iteration 4.	No further assessment is proposed, because no change to the overall significance is expected.
		36. Will it lead to impact on sensitive views and their settings?	Significant negative effect (- -) Potential for deterioration in valued views and vistas on the Chilterns AONB from the direction / height / number of flights overhead. Views from properties in Stanwell, Stanwell Moor, Harmondsworth and Sipson would be impacted during construction and operation. Views from the Public Rights of Way south of the M4 during construction and operation.	The significance of effects is not expected to change.	The significance of effects is not expected to change.	The assessment has been completed through information via publically available mapping sources and schematic information on Iteration 4.	No further assessment is proposed, because no change to the overall significance is expected.
		37. Will it lead to a loss of tranquillity and increase in light pollution?	Negative effect (-) Potential for increased numbers of aircraft over-flying the Chilterns AONB, which may reduce tranquillity levels. Potential for increased aircraft noise and views of aircraft in flight. There is likely to be increased light levels from construction and operational lighting, in addition to any lights from aircraft whilst on the ground and in flight.	The significance of effects is not expected to change.	The significance of effects is not expected to change.	The assessment has been completed through information via publically available mapping sources and schematic information on Iteration 4.	No further assessment is proposed, because no change to the overall significance is expected.

			Impacts would be the greatest for those receptors to the west around Colnbrook, and to the north around Hamondsworth and Sipson.				
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Table 8 LHR-NWR Variation Screening Assessment: M4 Widening

Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
Community	1. To avoid or minimise negative effects on community viability, including housing, facilities and indirect effects.	1. Will it lead to a loss of housing and community facilities?	Significant Negative effect (--) The loss of the following housing and community facilities ³⁹ : <ul style="list-style-type: none"> → 783 residential properties likely to be required for airport expansion; → up to 289 residential properties could be required for surface access, since they fall within the potential buffer zone for construction works; → potential secondary impacts of relocated households on existing communities; → loss of industrial/employment land; → Hamondsworth Primary School; → Hamondsworth Community hall (including the Wonderland day nursery); → Sipson community centre; → Heathrow special needs centre in Longford; → Nursery schools in Longford, Hamondsworth and Sipson; → White Horse and Kings Arms pubs at Longford; → Sipson recreation ground and facilities; → other formal and informal recreation sites; → part of the Colne Valley Regional Park; and → public rights of way; → cycle routes; → Impacts on local journey times and severance, particularly from A4/M25/Southern Rail Access works. Mitigation has been recommended.	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		2. Will it lead to increasing demand for housing and community facilities?	Minor Negative effect (-) High demand scenarios indicate up to 70,800 homes would be required. Between 300 and 500 additional homes would be required per local authority per year. Additional spaces in local schools are likely to be required and two additional GPs and two primary care centres per local authority to 2030 ⁴⁰ . There is also likely to be a need for additional parks or open spaces.	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.			

³⁹ Airports Commission, 2014. *Community: Impact Assessment*, pp. 9-10. [online] Accessed 24/12/2015.

⁴⁰ Airport Commission, 2014. *Local Economy Impacts: Assessment*, p. 109. [online] Accessed 24/12/2015.

Topic	Objective	Appraisal Question	Summary Of Existing Assessment (And Significance)	Potential Change To Effects (Increase Impact/ Decrease Impact/ Unknown)	Likely Change To Significance	Assumptions/ Limitations Based On Existing Information	Summary Of Further Assessment To Be Taken (Or N/A)
		3. Will there be indirect effects on community viability?	<p>Significant Negative effect (--)</p> <p>Traffic movements - may lead to more traffic and increased journey times. This may lead to issues of severance, loss of sense of place, breakdown in community cohesion, and a reduction in the quality of amenity within the community.</p> <p>Air Quality – 121,377 people will experience a rise in annual mean NO2 levels. No exceedances of UK air quality objectives are anticipated.⁴¹</p> <p>Noise – There is a predicted increase of 92,700 people exposed to airspace noise exceeding 54dB LAeq16hr by 2030, reducing to 36,800 in 2050. Exposure to noise >63 dB LAeq,16hr is expected to increase by 21,700 in 2030, reducing to 2,600 by 2050.</p> <p>Strategic Development - No allocated housing sites will be lost as a result of airport expansion, however housing allocations to the east and west of Heathrow will be subject to noise effects, particularly around Windsor. Undeveloped land in the areas surrounding Heathrow is highly constrained by the London Green Belt and other designations. Increases in noise effects may act as an additional constraint to current housing allocations or to future housing proposals, restricting the ability of the affected local authorities to meet housing delivery targets.</p>	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
	2. To avoid or minimise disproportionate impacts on any social group.	4. Will it minimise disproportionate negative effects on particular regions, users or vulnerable social groups?	<p>Minor negative effect (-)</p> <p>With the loss and relocation of housing and community facilities such as the Punch Bowl Pub and primary school, recreational ground and transport links, disproportionate effects may be experienced by vulnerable social groups within the area. Furthermore, indirect effects due to increased traffic, reduced air quality and increased noise effects may be experienced disproportionately by such groups.</p> <p>There are higher than average BAME communities around the airport, with a particularly high proportion of BAME populations in the local authority areas surrounding Heathrow in Heathrow Villages, Slough and Hounslow. There is potential for BAME groups to therefore experience disproportionate effects.</p>	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
Quality of Life	3. To maintain and where possible improve the quality of life for local residents and the wider population.	5. Will it help to maintain and improve quality of life?	Traffic Volume	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.

⁴¹ Airports Commission, 2015. *Quality of Life: Equalities Impacts Report*. [\[online\]](#) Accessed 24/12/2015.

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			<p>Significant disruption to road users and severance of small local communities will be experienced during the construction phase of the scheme, causing distress and anxiety to residents.</p> <p>During the operational period of the scheme, improved infrastructure and access to public transport may provide improvements to QoL in the short term, however these are expected to be negated by long term increasing demand for infrastructure.</p> <p>Housing and Communities</p> <p>Loss of housing/ forced moves will cause distress and have significant adverse impacts upon well-being. Social isolation likely to increase during construction from loss of community facilities, resulting in a reduction in the QoL for those directly affected by relocation or disruption during the construction period.</p> <p>Improvement to local infrastructure, new housing and community facilities as well as greater connectivity via improved public transport will provide greater opportunities for leisure and employment.</p> <p>Employment and the Economy</p> <p>New employment and business from an expanded airport will be of significant benefit to QoL locally and nationally from enhanced local and national economic growth.</p> <p>Noise</p> <p>Increases in significant community annoyance due to aircraft noise exposure, which can lead to stress-related changes in cardiovascular health.</p> <p>Loss of sleep significantly increases anxiety and hypertension.⁴²</p> <p>Noise increase in noise levels in primary schools can have a 2 month delay in reading age development.</p> <p>Increased road traffic growth may increase noise disturbance to nearby residents.</p> <p>Air Quality Effect unknown at this stage</p> <p>Poor air quality has a direct impact upon sensitive receptors, exacerbates symptoms surrounding cardiovascular and impaired lung functions and has strong dose-response relations with increased morbidity and mortality.</p> <p>Access to nature/ and cultural heritage Negative effect (-)</p> <p>Negative impact on the well-being of users of the recreational area and local residents who value the presence of these amenity areas.</p> <p>Indirect overall benefit to well-being through improving Access to Nature and the living environment, involving extensive mitigation and improvement measures.</p> <p>Flooding Negative effect (-)</p> <p>Direct potential negative impact upon well-being during construction and operation as a consequence of potential and perceived increase in flood risk. It is acknowledged that detailed design at the next stage will identify opportunities to mitigate flood risk.</p>				
Economy	4. To maximise economic benefits and to support the competitiveness of the UK economy.	6. Will it enhance economic growth?	<p>Significant Positive effect (++)</p> <p>Direct impacts:</p> <ul style="list-style-type: none"> → The total passenger benefits are valued at £67.6bn and include: → Lower fares: £64.3bn; → Frequency benefits: £3.0bn; → Reduced delays: £0.2bn; <p>Other direct benefits are as follows::</p>	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.

⁴² Clark, C, 2015. *Aircraft noise effects on health*. [online] Accessed 30/03/2016.

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			<p>→ Total producer impact: £55.0bn; and</p> <p>→ Government revenue: £3.5bn.</p> <p>Wider economic impacts:</p> <p>→ Business output benefits: £1.2bn; and</p> <p>→ Tax wedge: £0.5bn to £1.9bn.</p> <p>The trade benefits have been estimated at either £8.8bn, £16.7bn, or £130.9bn depending on the approach taken. However, it should be noted that these are not additive to the other wider economic impacts.</p> <p>Total benefits (excluding trade and producer impacts): £72.8 – 74.2bn</p>	change in the outcome of the assessment.			
		7. Will it contribute to sustainable growth in employment?	<p>Significant Positive effect (++)</p> <p>Although there will be local impacts, the extent of employment impacts at a national level remains unclear (due to displacement).</p> <p>It is also anticipated that many jobs will be created during the construction phase.</p>	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		8. Will it support the competitiveness of the UK economy?	<p>Significant Positive effect (++)</p> <p>Three types of productivity-related impacts are estimated:</p> <p>→ enhanced productivity through increased trade and associated spin-off benefits;</p> <p>→ change in tax revenue due to relocation of employment to areas with different levels of productivity; and</p> <p>→ increased business output.</p>	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
	5. To promote employment and economic growth in the local area and surrounding region.	9. Will it incorporate accessibility improvements, particularly with key local employment centres and areas of high unemployment?	<p>Neutral (0)</p> <p>Long term increases in surface passengers associated with the airport are anticipated. In addition, there are also expected to be increases in the use of surface access systems by additional users not associated with the airport.</p> <p>Under the do minimum scenario, the planned improvements to the local transport network, particularly rail, will improve connectivity for those who live and work near these routes.⁴³ However, long term increases in demand and traffic are expected to negate any benefits to journey times for other users of surface access</p>	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.

⁴³ Jacobs, 2014. *Local Economy Impacts: Assessment*, p. 96. [\[online\]](#) Accessed 24/12/2015.

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			systems around the airport. Further enhancements to the surface network would be required to ensure accessibility benefits are maintained in the long term	surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.			
		10. Will it contribute to growth in the local economy?	<p>Significant Positive effect (++)</p> <p>The DfT has developed a range of local employment estimates following from the AC's original estimates. These indicated that between 57,000 and 114,000 additional local jobs would be generated by 2030 with between 39,000 and 78,000 generated by 2050.⁴⁴</p> <p>The quantity and distribution of high skilled jobs has not been determined at this stage of the assessment.</p> <p>It is considered likely that airport expansion will serve as a catalyst to business investment in the surrounding area, continuing to attract high value firms⁴⁵.</p> <p>Employment and business which develops, or is maintained by the expansion of the airport will benefit the local economy and enhance local economic growth.</p>	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
Noise	6. To minimise and where possible reduce noise impacts on human receptors.	11. Will it avoid or reduce the harmful effects due to exposure of people and sensitive buildings to noise?	<p>Predominant Significant Negative effects (--)</p> <p>Construction phase impacts are likely to be negative, with potential for significance at sensitive receptors near to the new runway or along construction routes. The effects cannot yet be assessed in detail but as a worst case estimate can be considered as potentially Significant Negative (--).</p> <p>The effects of changes in airspace noise exposure on the local population from the LHR-NWR scheme (assessment of need carbon traded scenario) are considered to be predominantly Significant Negative (--).</p> <p>The effects of changes in airspace noise exposure on local NSBs from the LHR-NWR scheme (assessment of need carbon capped scenario) are considered to be Significant Negative (--).</p> <p>The local effects of ground noise are considered to be Positive (+).</p> <p>The overall effects of the LHR-NWR scheme on the health outcomes assessed are considered to be predominantly Significant Negative (--), since it would result in increases in DALYs lost compared with the Do minimum.</p> <p>The local effects of airspace noise from the LHR-NWR scheme on children's cognitive development are considered to be predominantly Significant Negative (--).</p> <p>The national effects of the LHR-NWR scheme are considered to be mixed Positive/Significant Negative (+/--).</p>	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
Biodiversity	7. To protect and enhance designated sites for nature conservation.	12. Will it affect internationally, nationally and locally designated biodiversity sites?	<p>Significant Negative effect (--)</p> <p>International Sites:</p> <p>SWLW SPA / Ramsar</p> <p>Significant adverse effects have been identified with regard to; land take; construction disturbance; operation disturbance including flights; hydrological impacts; air quality changes; disturbance through increased levels of bird scaring/control as part of birdstrike risk management measures.</p> <p>Windsor Forest and Great Park SAC</p> <p>Burnham Beeches SAC</p> <p>Thursley, Ash, Pirbright and Chobham SAC</p> <p>Thames Basin Heaths SPA</p> <p>Richmond Park SAC</p> <p>Wimbledon Common SAC</p>	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.

⁴⁴ Department for Transport, 2017. *Airport Capacity in the South East: Updated Appraisal Report*

⁴⁵ Jacobs, 2014. *Local Economy Impacts: Assessment*, p 54. [\[online\]](#) Accessed 24/12/2015.

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	8. To conserve and enhance undesignated habitats, species, valuable ecological networks and ecosystem functionality.		<p>Significant adverse effects have been identified with regard to air quality impacts associated with increased traffic flow, and direct and indirect impacts upon supporting habitat as a result of the surface access strategy.</p> <p>National Sites Staines Moor SSSI, Wraysbury Reservoir SSSI, Wraysbury No.1 Gravel Pit SSSI, Wraysbury and Hythe End Gravel Pits SSSI, Kempton Park Reservoirs SSSI Potential impacts principally associated with air and water quality changes that could result in adverse effects to the habitats and species interest features of these sites.</p> <p>Local Sites Old Slade Lake Local Wildlife Sites (LWS), Lower Colne SMINC Stanwell II SNCI</p> <p>Potential impacts from direct land take due to surface access requirements.</p>				
		13. Will it conserve and enhance undesignated habitats, internationally and nationally protected species and valuable ecological networks, such as priority habitats and priority species.	<p>Significant Negative effect (--)</p> <p>Habitats deciduous woodland; traditional orchard; rivers and brooks; reedbeds and lowland meadows.</p> <p>Species There are birdstrike management issues for LHR-ENR associated with the nearby complex of open water bodies. The closer proximity of the runway and increased air traffic is likely to result in an increased strike risk, and a corresponding requirement for an increase in bird management and control activities is anticipated.</p> <p>Methods of deterring/scaring and controlling bird species potentially hazardous to aviation operations could potentially have an adverse effect on non-target species and biodiversity including those not listed on the designation interest features.</p> <p>A range of protected species including, bats, otter, water vole, reptiles (including grass snake and slow worm), and various species of birds within 2km of the scheme boundary have been identified. It is considered feasible that the area would support a range of other species protected under UK (and EU) wildlife legislation including but not limited to dormice, and great crested newts. Potential impacts including, loss, disturbance, habitat severance/fragmentation, air and water quality changes, mortality.</p>	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		14. Will it increase the exposure of wildlife to transport noise, air pollution, and water pollution?	<p>Assessment significance: Significant Negative effect (--)</p> <p>International Sites: SWLW SPA/Ramsar Windsor Forest and Great Park SAC Burnham Beeches SAC Thursley, Ash, Pirbright and Chobham SAC Thames Basin Heaths SPA Richmond Park SAC Wimbledon Common SAC Significant adverse effects have been identified with regard to disturbance, air quality impacts associated with increased traffic flow, and direct and indirect impacts upon supporting habitat as a result of the surface access strategy.</p> <p>National Sites Staines Moor SSSI</p>		The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.

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			<p>Wraysbury Reservoir SSSI Wraysbury No.1 Gravel Pit SSSI Wraysbury and Hythe End Gravel Pits SSSI Kempton Park Reservoirs SSSI Potential impacts principally associated with air and water quality changes that could result in adverse effects to the habitats and species interest features of these sites.</p> <p>Local Sites</p> <p>Old Slade Lake LWS Lower Colne SMINC Stanwell II SNCI</p> <p>Potential impacts from direct land take due to surface access requirements.</p> <p>Habitats deciduous woodland; traditional orchard; rivers and brooks; reedbeds and lowland meadows.</p> <p>Species A range of protected species including, bats, otter, water vole, reptiles (including grass snake and slow worm), and various species of birds within 2km of the scheme boundary have been identified. It is considered feasible that the area would support a range of other species protected under UK (and EU) wildlife legislation including but not limited to dormice, and great crested newts. Potential impacts including, disturbance, habitat severance/fragmentation, air and water quality changes, mortality.</p>				
Soil	9. To protect sites designated for geodiversity.	15. Will it preserve, protect and improve geodiversity?	<p>Neutral effect A review of sites which are designated for geodiversity reasons, including geological SSSIs and RIGS has been undertaken. No Geological SSSIs or RIGS were identified within this radius. No impacts on geodiversity are anticipated.</p>		The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
	10. To minimise loss of undeveloped soils and of Best and Most Versatile agricultural land, and protect soil against erosion, contamination and degradation.	16. Will it maximise construction on previously developed land, minimise use of greenfield land?	<p>Significant Negative effect (-) This scheme entails land take of 569 ha, with up to further 294 ha potentially affected by surface access and 43 ha identified for flood storage. The site area of the airport incorporates approximately 431ha of agricultural land, a proportion of which is likely to be BMV agricultural land. Agricultural land is a finite and irreplaceable resource, and although compensation will be provided to land owners, the loss of the land cannot be mitigated. As a consequence of the site location, a high proportion of the land take required is from agricultural land, the quantity of PDL should be considered a correspondingly small proportion.</p>		The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		17. Will it lead to the disturbing, harm, contamination or loss of soil resources?	<p>Negative effect (-) Development may result in soil loss or burial, physical damage including compaction, sealing, and structural damage, changes to soil water regime, effects on organic matter and soil stripping and storage. In addition, development has the potential to result in contamination of soil, resulting in risks to human health or the environment. The use of large areas of previously undeveloped land will affect the quality of soil and land resources meaning these areas of land will no longer be suitable for other uses, including farming.</p>	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.

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Water	11. To protect the quality of surface and ground waters, and use water resources sustainably.	18. Will proposals have adverse effects on the achievement of the environmental objectives established under the Water Framework Directive?	<p>Negative effect (-)</p> <p>Physical impacts are considered in question 19 below. Water quality impacts arising from polluted runoff during construction and operation. The scheme could lead to a decrease in pesticides and herbicides applied to the land.</p> <p>A further risk during construction is posed by the currently permitted and historic landfill within the proposed development footprint, posing a risk if contaminants are mobilised.</p> <p>Long term storage would be provided to delay the additional surface water volume from being discharged to watercourses, by infiltration, rainwater harvesting or by restricting the discharge rate to 2 litres per second per hectare (l/s/ha).</p> <p>Surface runoff from paved areas (which is likely to be contaminated) would receive at least two levels of treatment, including interception source control features. Clean water would be discharged and polluted water treated.</p> <p>The interceptor would also provide storage for any major spills. Polluted runoff would be attenuated within a polluted water holding tank and released for treatment at a rate agreed with the treatment plant operator;</p> <p>To ensure that water resources are used efficiently rainwater harvesting will be installed along with other water saving design.</p> <p>There is the potential for a 10 - 15% saving on current potable water demand from the use of wastewater recycling/reverse osmosis.</p> <p>There is potential for hydrological conditions to be altered on Staines Moor SSSI from diversion of the River Colne and this would need to be addressed during detailed design.</p> <p>There are a number of reservoirs and gravel pits which make up the SWLW SPA further downstream from the Airport, (see Appendix A.5 for effects on site integrity).</p>	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		19. Will it result in the modification of watercourses?	<p>Significant Negative effect (--)</p> <p>Approximately 12km of existing watercourse would be replaced with diverted/realigned channels. Diversion of approximately 1km of the Colne Brook around the western end of a new runway, diversions of parts of the Duke of Northumberland's River and River Colne to the south of the new runway and creation of a new channel (the 'River Colne Spur') would be technically difficult and affect the hydromorphology and geomorphology.</p> <p>Combining the River Colne and Wraysbury River into a single culvert and the Duke of Northumberland's and Longford Rivers into a single culvert would reduce total channel length and change the channel morphology including sediment processes with concurrent ecological implications.</p> <p>Approximately 3km of currently open channels would be culverted. The water bodies are sensitive and extensive diversions/culverting would counteract improvements to waterbodies, including environmentally friendly flood schemes (as part of the Lower Colne Catchment flood scheme) maintaining open channels for Heathrow Terminal 5. The WFD strongly discourages culverting due to the detrimental impacts on the overall environment both that of the waterbody and the surrounding area. There are also significant cumulative impacts from culverting on the biodiversity, soils and landscape.</p> <p>Changes to the sedimentation processes can lead to deterioration in water quality and could impact the waterbody status should the sediment contain contaminants.</p>	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		20. Will it result in the loss in productivity of fisheries?	<p>Significant Negative effect (--)</p> <p>Shortlisted Scheme will result in the combination of the River Colne and Wraysbury River, which would reduce total channel length significantly and could fundamentally alter the channel morphology including sediment processes with concurrent adverse changes to ecological status.</p> <p>Construction of approximately 3km of culvert as part of the option Shortlisted Scheme would have adverse impacts on fisheries.</p> <p>The fisheries could also be negatively impacted through changes in runoff rates that could mobilise contaminated sediments along and the residual water quality impacts from polluted runoff and impact the waterbody status.</p>	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		21. Will it lead to an increase in the consumption of available water resources?	<p>Significant Negative effect (--)</p> <p>Total annual potable water demands for 2026 and 2050 are 2.64Mm³/year (million cubic metres per year) and 3.94 Mm³/year, respective increases of 0.34Mm³/year and 1.64 Mm³/year from 2013 demands.</p> <p>An 86% increase in passenger numbers relative to 2013 has been forecast after the completion of the northwest runway to 150.7 million per year by 2050. Rainwater harvesting is expected to account for 2% of the additional demand. Water efficiency measures are considered able to reduce the demand by 2 to</p>	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall

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	12. To minimise flood risk and ensure resilience to climate change.		5%. Leakage reduction measures could also save up to 0.115Mm3. No figures are available for 2085 due to limitations in the forecast figures and information within the WRMP. Affinity Water has not been consulted, however the scheme promoter's submission outlines a reduction in the reliance on potable water supply from Affinity Water both with and without the scheme. The Affinity Water WRMP concluded that there is a deficit in the Water Resource Zone that supplies Heathrow, in 2013 only 46% of the licensed volume was abstracted. Construction of the scheme will lead to short term increases in water demand.	associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.			significance is expected.
		22. Will it increase flood risk through increased run off?	Negative effect (-) Increase in impermeable areas, without suitable mitigation, could lead to runoff rates greater than the greenfield rate resulting in increased risks of flooding elsewhere. There are methods of reducing flood risk. Scheme promoter appears to have underestimated the attenuation volume required based upon Jacobs assessment and may need to reevaluate findings as a design stage. In addition the runoff rate is greater than the appropriate greenfield rate. As a consequence the attenuation volumes may be underestimates. This is particularly a concern as non-paved areas draining to the ponds appears to have used a low value for the percentage runoff from hard standing which also drains to these ponds. Elevated groundwater may contribute to the surface water runoff to the ponds during significant rainfall events or prolonged wet periods. This may further reduce the attenuation volumes available. Scheme promoter has used a greenfield estimate of 4l/s/ha which is greater than that calculated for the expected rate in the AC baseline assessment of 1l/s/ha. Scheme promoter has assumed that there will be a SUDs scheme draining into attenuation tanks which will require pumping at greenfield rates.	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		23. Will it increase area of development within areas at risk of flooding?	Neutral effect (0) Proposed runway will extend onto the floodplains of the River Colne, Wraysbury River and the Colne Brook, resulting in development occupying floodplain areas designated as Flood Risk Zones 2 and 3. The existing fluvial flood risk to Heathrow Airport is low. Development is expected to lead to a loss of up to 40 ha of undefended flood plain with 47 ha being set aside for compensation purposes. This is likely to lead to an increase in the overall flood storage for the catchment. The assessment of the mitigation solution does not detail how the mitigation will be achieved or if it can be implemented without detrimental impact on the conveyance. There are isolated areas within the extended footprint that are at medium or high risk of surface water flooding. Heathrow Airport and proposed new runway are located on River Terrace Gravels, which is classified as Primary and Secondary Aquifers. There is the potential for elevated groundwater levels and/or groundwater flooding in the area. It is considered that groundwater flood risk is a concern across the proposed site. Risk of flooding from reservoirs at the proposed site is considered negligible. Peak flow and rainfall is expected to increase from the baseline to 2086, meaning that developments on the floodplain and zones susceptible to groundwater flooding could be at risk from increases in rainfall intensity.	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		24. Will it be able to adapt to climate change?	Negative effect (-) Without appropriate mitigation the scheme could result in increased risks to itself and sites elsewhere as a result of increased peak river/overland flows, runoff rates from across the scheme and altered volumes available for abstraction for water use. Scheme promoter has applied a 20% increase in peak flows and rainfall, a 40% allowance will need to be assessed to be compliant with current guidance. The scheme promoter has also used the Environment Agency's Flood Zone 2 as a proxy for the impacts of climate change. No consideration appears to be given to the implications of climate change on the River Terrace Gravels. The WRMP demonstrates that sufficient water is available to meet potable and non- potable requirements.	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
Air Quality	13. To improve air quality and reduce emissions consistent with EU, national	25. Will it support compliance with local, national and European air quality	Significant Negative effect (--)	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects	The significance of the effect will not change.		No further assessment is proposed, because no change to the overall

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	and local standards and requirements.	requirements or legislation?	A reassessment of compliance ⁴⁶ with the EU Air Quality Directive taking account the government's 2017 Air Quality Plan indicates that LHR-NWR does not impact on compliance with EU limit values in 2030. There is, however, a risk that the option will delay compliance with limit values. The risk is high until 2029. NOx and PM _{2.5} emissions are likely to exceed the NECD target for 2030 – but the increase with the scheme is a very small fraction of the target. The maximum predicted annual mean NO2 concentration with the scheme in place at any receptor in Principal Study Area is 34.7µg/m ³ . ⁴⁷	associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.			significance is expected.
		26. Will it reduce the exposure to air quality issues for local communities and sites designated for nature conservation?	Significant Negative effect (–) There are no predicted exceedances of the air quality objective at any receptor location, in either the Do Minimum or LHR-NWR scenarios. The scheme will increase exposure to pollution at 47,063 properties, of which 14 are considered 'at risk' (>32µg/m ³). There is a risk that with opening earlier than 2030 that exceedances of air quality objectives could occur. The scheme results in increased exposure to pollution over sites designated for nature conservation at all 7 sites assessed, including sites where the critical level is currently exceeded and South West London Waterbodies Ramsar/SPA. No exceedances of critical loads are modelled with the scheme. Increase in national emissions of NOx and PM _{2.5} .	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of the effect will not change.		No further assessment is proposed, because no change to the overall significance is expected.
Carbon	14. To minimise carbon emissions in airport construction and operation.	27. Will the approach to the development be consistent with overall carbon requirements?	Significant Negative effect (–) Over the 60-year Appraisal Period (2026 to 2086), under the Carbon-Capped scenario, it is forecast that the development of a third runway at Heathrow Airport will result in the emission of a further 308.5 MtCO ₂ over the baseline case ⁴⁸ . Over the same Appraisal Period under the Carbon-Traded scenario, it is forecast that the development of a third runway at Heathrow Airport will result in the emission of a further 327.1 MtCO ₂ over the baseline case ⁴⁹ . In both cases, construction emissions will contribute a further 11.3 MtCO ₂ e to UK emissions, however this is a one-off impact at the beginning of the Appraisal Period ⁵⁰ .	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		28. Will the approach minimise carbon emissions associated with surface transportation?	Significant Negative effect (–) Over the 60-year Appraisal Period (2026 to 2086), under the carbon-traded scenario, it is forecast that the development of a third runway at Heathrow Airport will result in the emission of an additional 9.5 MtCO ₂ due to Passenger and Staff Surface Access over the baseline case ⁵¹ . In the DfT's revised carbon-capped scenario demand is unaffected by the abatement measures implemented, so the surface access CO ₂ estimates are the same as in the carbon-traded case Emissions from freight transport movements are also likely to rise, but these were not quantified in the DfT's assessment. It is recommended that they be assessed by an applicant at the time of detailed design.	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.

⁴⁶ WSP, October 2017, 2017 *Plan Update to Air Quality Re-analysis*

⁴⁷ Jacobs, 2015. *Module 6: Air Quality Local Assessment - Detailed Emissions Inventory and Dispersion Modelling*, p. 64. [\[online\]](#) Accessed 06/01/2016

⁴⁸ Jacobs, 2014. *Module 8. Carbon: Assessment, Table 4.18*. [\[online\]](#) Accessed 04/01/2016.

⁴⁹ Jacobs, 2015. *Module 8. Carbon: Further Assessment, Table 2.12* [\[online\]](#) Accessed 04/01/2016.

⁵⁰ Jacobs, 2014. *Module 8. Carbon: Assessment, Table 4.18*. [\[online\]](#) Accessed 04/01/2016.

⁵¹ Jacobs, 2014. *Module 8. Carbon: Assessment, Table 4.18*. [\[online\]](#) Accessed 04/01/2016.

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Resources and Waste	15. To minimise consumption of natural, particularly virgin non-renewable, resources.	29. Will it be possible to minimise the consumption of natural resources?	Significant Negative effect (--) Consumption of large volumes of construction material. Operational consumption reduced by comparison with construction phase.	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance of impact is expected.
	16. To minimise the generation of waste in accordance with the principals of the resource efficiency hierarchy.	30. Will it be possible to minimise waste generated during construction and operation?	Significant Negative effect (--) Generation of large volumes of construction waste that could be sent to landfill. Volumes of waste to be generated during operation are likely to be greatly reduced by comparison with construction. Forecasts for waste generation in operation are the highest of all three schemes, across all operational scenarios	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance of impact is expected.
Historic Environment	17. Conserve and where appropriate enhance heritage assets and wider historic environment including buildings, structures, landscapes, townscapes and archaeological remains.	31. Will it affect the significance of internationally and nationally designated heritage assets and their settings?	Significant Negative effect (--) Land take study area (including surface access corridors) Construction activities including the demolition or partial demolition of structures will impact on 1 Grade 1 listed building, 22 Grade II Listed Buildings, 2 Scheduled Monuments and 2 Conservation Areas resulting in their total or partial loss. Total loss is substantial harm. Partial loss could result in assets being put at risk. Partial loss can also result in substantial harm. The significance of assets lying outside of the land take but associated with those within it will be at risk of harm. Intermediate Study Area Construction and operation will impact on the setting of a scheduled monument, 48 Listed Buildings (all Grades) and five Conservation Areas. This will result in harm to the significance of the assets. Outer study area Operation of the scheme will impact on the setting of a Scheduled Monument, 160 Listed Buildings (all Grades) and 5 Conservation Areas. This will result in harm to the significance of the assets.	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		32. Will it affect the significance of non-designated heritage assets and their settings?	Significant Negative effect (--) Land take Study Area (including surface access corridors) 167 assets are present. Total removal of any archaeological remains during construction activities and earth-moving activities in particular. The significance of non-designated remains will be subject to substantial harm. Intermediate Study Area 90 assets are present.	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.

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			Any impact within the intermediate study area will be to the significance of the setting of the assets. This has the potential to result in harm to the significance of the assets. Outer Study Area None identified. HER search does not extend into outer Study Area. Any impact within the outer area will be to the significance of the setting of the assets. This has the potential to result in harm to the significance of the assets.	change in the outcome of the assessment.			
		33. Will it conserve or enhance heritage assets and the wider historic environment including landscapes, townscapes, buildings, structures, and archaeological remains?	Significant Negative effect (--) No beneficial impacts are presented in the ACs report. All impacts listed are adverse. However, it is possible that following mitigation positive outcomes could be realised through some enhancement to Conservation Areas and community engagement and by addressing Heritage at Risk (including those that become at risk as a result of the scheme), improving the setting of heritage assets, together with opportunities for community engagement including improving access to and/or interpretation, understanding and appreciation of heritage assets'	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		34. Will it harm the significance of heritage assets, for example from the generation of noise, pollutants and visual intrusion?	Significant negative effect (--) There is likely to be increased light and noise levels from construction and operation in addition to any lights and noise from aircraft whilst on the ground and in flight. The setting of a further 54 designated heritage assets could be affected within 300m of the scheme area (1 Grade II Listed Buildings, three Grade II*, 44 Grade II, one Scheduled Monuments and five Conservation Areas) and from 300m to 2km the setting of a further 166 designated assets could potentially be affected (two Grade I, eleven Grade II* and 147 Grade II Listed Buildings, one Scheduled Monuments and five Conservation Areas. The setting of ninety non-designated assets could be affected. Historic landscape and townscape character will be affected. There is unlikely to be an impact on below-ground archaeological remains. Data was only available for the intermediate study area i.e. 300m of the scheme area.	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
Landscape	18. To promote the protection and improvement of landscapes townscapes, waterscapes and the visual resource, including areas of tranquillity and dark skies.	35. Will it protect and enhance nationally and locally designated landscape, townscape and waterscape?	Negative effect (-) Nationally landscape Designation: Potential indirect impacts of new lighting and the direction / height / number of flights over the Chilterns AONB. Local Landscape Designations: Long distance views from Area of Landscape Importance; impacts upon the Hillingdon Lower Colne Floodplain and the Maidenhead Settled Developed Floodplain Local Townscape Designations: Effects on Hillingdon Historic Core character area Other areas with landscape character value: Loss of the Colne Valley Regional Park and views from the park at Colnbrook and Poyle, would be impacted by the construction works.	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.
		36. Will it lead to impact on sensitive views and their settings?	Significant negative effect (- -) Potential for deterioration through increased visual disturbance in areas of the Chilterns AONB, from increased number of flights overhead. Views from properties in Stanwell, Stanwell Moor, Harmondsworth and Sipson would be impacted during construction and operation. Views from the Public Rights of Way south of the M4 during construction and operation.	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.

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				change in the outcome of the assessment.			
		37. Will it lead to a loss of tranquillity and increase in light pollution?	Negative effect (-) Potential for increased numbers of aircraft overflying the Chilterns AONB, which may reduce tranquillity levels. Potential for increased aircraft noise and views of aircraft in flight. There is likely to be increased light levels from construction and operational lighting, in addition to any lights from aircraft whilst on the ground and in flight The effects would be most significant for those receptors to the west around Colnbrook and Horton and to the north at Longford.	The M4 improvements would not be included within the surface access strategy as a necessary improvement. The variation includes improvements to the M4 as part of the baseline of possible future investment projects. The effects associated with this road are expected to be similar to the AC's surface access strategy. The variation is not expected to affect a change in the outcome of the assessment.	The significance of effects is not expected to change.		No further assessment is proposed, because no change to the overall significance is expected.