

A417 Missing Link

Preliminary Environmental Information Report

Chapter 15 Assessment of Cumulative Effects

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15 Assessment of cumulative effects

15.1 Introduction

- 15.1.1 Cumulative effects are those that arise as a result of impacts from more than one project, or element of a single project, combining to have an effect on a receptor, or group of receptors, that may be larger than if the effect were considered separately.
- 15.1.2 The Design Manual for Roads and Bridges (DMRB) LA 104 *Environmental assessment and monitoring* states that environmental assessments shall assess cumulative effects which include those from:
- a single project (for example, numerous different effects impacting a single receptor). These are known as ‘combined’ impacts/effects or ‘impact interactions’; and
 - different projects (together with the project being assessed). These are known as ‘cumulative’ effects with other existing development and/or approved development.
- 15.1.3 In addition, to align with the requirements of EU Directive 2014/52/EU and the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, the in-combination climate change impact (ICCI) assessment of the proposed scheme where the focus is on those effects of the proposed scheme identified by an environmental factor that are also affected by climate change is assessed on a case by case basis by the environmental factors. The preliminary ICCI assessment (Appendix 14.3) does not conclude any new or different significant effects to those already provisionally identified in the environmental factor chapters of this Preliminary Environmental Information (PEI) report.
- 15.1.4 This PEI report chapter details the legislative context and methodology for the assessment of combined and cumulative effects. It presents the preliminary findings of the combined effects assessment, and where required, goes on to identify any preliminary design, mitigation and enhancement measures, and any ongoing monitoring requirements.
- 15.1.5 DMRB LA 104 *Environmental assessment and monitoring* notes that cumulative effects should be assessed when the conclusions of individual environmental factor assessments have been reached and reported. Therefore, cumulative effects are not reported in this PEI report, but will be assessed and reported in the Environmental Statement (ES).

15.2 Legislative context

- 15.2.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 sets out in paragraph 5 of Schedule 4 that an ES should include:
- “the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.”*
- 15.2.2 The requirement to consider cumulative effects is also outlined in planning policy. The National Policy Statement for National Networks, paragraph 4.3 states that:

“In considering any proposed development, and in particular, when weighing its adverse impacts against its benefits, the Examining Authority and the Secretary of State should take into account:

- *its potential benefits, including the facilitation of economic development, including job creation, housing and environmental improvement, and any long-term or wider benefits;*
- *its potential adverse impacts, including any longer-term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts.”*

15.3 Cumulative assessment methodology

15.3.1 There is currently no standard methodology for cumulative effects assessment (CEA) and combined effects assessment although there is a range of guidance available. The following standards and guidance have been taken into consideration during the preparation of the PEI report:

- DMRB LA 104 *Environmental assessment and monitoring* (section 3.19 – 3.22), which sets out a high-level methodology for assessing cumulative effects on highways projects¹; and
- Planning Inspectorate *Advice note 17 Cumulative Effects Assessment*, which sets out a methodology, relevant to nationally significant infrastructure projects (NSIP)².

15.3.2 Consistent with the distinction between combined effects and cumulative effects, as defined within DMRB LA 104 *Environmental assessment and monitoring*, and outlined in section 15.1 above, the assessment is split in to two sections:

- **Combined effects assessment:** comprising an assessment of the combined impact of a number of different impacts from the proposed scheme upon a single resource/receptor, which are individually assessed, and preliminary findings reported within each environmental factor chapter of this PEI report; and
- **Cumulative effects assessment:** comprising an assessment of cumulative impacts of a number of different projects within the vicinity, in combination with the environmental impact of the proposed scheme on a single resource/receptor.

15.3.3 The methodology for each of these assessments is described separately below.

Combined effects assessment

15.3.4 Combined impacts from the action of a number of different impacts upon a single resource/receptor are considered within the environmental factor chapters of the PEI report as follows. The preliminary combined effects are summarised in section 15.4 and Table 15-6.

- Chapter 6 Cultural heritage considers effects from different sources on heritage assets, such as visual impacts during construction and noise impacts during operation;
- Chapter 7 Landscape and visual considers effects from different sources on landscape and visual receptors, such as heritage assets and biodiversity and noise during construction and operation;
- Chapter 8 Biodiversity considers the combined ecological effects on single receptors of a number of individual environmental impacts such as area of

land required, disturbance due to noise, changes in air quality and airborne dust deposition, surface run-off and pollution events and cumulative loss of certain habitat types;

- Chapter 12 Population and human health: For amenity impacts to community assets such as residential property, recreation infrastructure and existing businesses, the assessment draws on the conclusions of other environmental factors such as changes in traffic, severance, air quality, landscape, visual and noise impacts. The human health assessment considers combined effects since health determinants are influenced by a wide range of environmental factors such as air quality, noise and visual amenity;
- Chapter 13 Road drainage and the water environment considers combined effects such as the accumulation of impacts on water resources and receptors such as rivers and aquifers, which when considered together constitute a greater impact; and
- Chapter 14 Climate considers the ICCI of the proposed scheme where the focus is on those effects of the proposed scheme identified by an environmental factor that are also affected by climate change. The preliminary findings of the ICCI assessment are presented in Appendix 14.3 In-combination climate change impacts assessment.

15.3.5 The combined effects outlined above are considered to adequately report on the full range of potential combined effects from the proposed scheme and further assessment is therefore not undertaken within this chapter.

Cumulative effects assessment

15.3.6 *Planning Inspectorate Advice note 17* provides a systematic approach to cumulative effects assessment which can be split into four distinct phases explained in Table 15-1. Paragraph 2.5 of the guidance notes that the recommended process focusses on cumulative effects with 'other existing development and/or approved development'.

Table 15-1 Stages of cumulative effects assessment (CEA)

CEA stage	Activity
Stage 1: Establish the Zone of Influence (ZOI) of the proposed scheme and identify long list of 'other developments'	<ul style="list-style-type: none"> • identify the ZOI for each of the environmental factors covered by the ES; • identify a long list of other developments in the vicinity of the proposed scheme which may have cumulative effects; and • undertake desktop review of available environmental information for identified cumulative developments.
Stage 2: Identify short list of 'other developments'	<ul style="list-style-type: none"> • identify which of the identified other developments from Stage 1 has the potential to give rise to significant cumulative effects by virtue of overlaps in temporal scope, due to the scale and nature of the 'other development'/receiving environment; or any other relevant factors.
Stage 3: Information gathering	<ul style="list-style-type: none"> • information related to the shortlisted cumulative developments is gathered and reviewed.
Stage 4: Assessment	<ul style="list-style-type: none"> • CEA of shortlisted cumulative development is undertaken. Each individual 'other development' is reviewed in turn to identify whether there is potential for significant cumulative effects; and • mitigation measures are identified.

Stage 1 establish the NSIP's zone of influence and long list of 'other development'


Establishing the zone of influence

- 15.3.7 The zone of influence (ZOI) refers to the spatial area over which an effect from a project is likely to be experienced. The ZOI for the proposed scheme varies for each environmental factor and is set out in the study area for each environmental factor assessment, shown in Figure 15.1 Cumulative zone of influence.

Establishing the long list of 'other developments'

- 15.3.8 *Advice note 17* recommends that a wide range of future projects is included within the CEA which can be tiered (from Tier 1 – 3) according to how far advanced the development is within the planning system and to the level of detail that is likely to be available for each tier. The tiers are set out in Table 15-2.

Table 15-2 Project tiering to assign certainty for the purpose of CEA (as provided in Table 2 within Advice note 17)

Tier 1	<ul style="list-style-type: none"> • projects under construction³; • permitted application(s) but not yet implemented; and • submitted application(s) but not yet determined⁴. 	<p>Decreasing level of detail likely to be available.</p> 
Tier 2	<ul style="list-style-type: none"> • Projects on the Planning Inspectorate's Programme of Projects where a scoping report has been submitted⁵. 	
Tier 3	<ul style="list-style-type: none"> • Projects on the Planning Inspectorate's Programme of Projects where a scoping report has not been submitted⁶; • Identified in the relevant Development Plan (and emerging Development Plans - with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited⁷; and • Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward. 	

- 15.3.9 The less information that is available for the future projects (for example environmental impacts predicted and project definition), the less likely that the CEA will be able to make any robust assessment in relation to these projects. Reasonable steps have been taken to review publicly available information when conducting the CEA.
- 15.3.10 Whilst projects that are Tier 2 and Tier 3, as defined by the Planning Inspectorate guidance are included within this assessment, it is considered that there is limited value in assessing developments for which there is no environmental assessment information available as it will be more challenging to identify environmental effects arising from those projects. Moreover, it will be challenging to determine the timeframe (temporal scope) within which effects arising from these developments are likely to occur.
- 15.3.11 In accordance with the methodology outlined in DMRB LA 104 *Environmental assessment and monitoring* (section 3.21.2), the assessment of cumulative effects with other developments for the proposed scheme will report on:
- "roads projects which have been confirmed for delivery over a similar timeframe⁸;
 - other development projects with valid planning permissions or consent orders, and for which EIA is a requirement; and

- *proposals in adopted development plans with a clear identified programme for delivery”.*

15.3.12 Relevant ‘other developments’, as listed above, have been identified through a combination of consultation with the relevant planning authorities and directly from published sources⁹. Relevant planning authorities within 3.1 miles (5 kilometres) of the proposed scheme (the greatest ZOI) were included as follows, as shown on Figure 15.1 Cumulative zone of influence:

- The Planning Inspectorate¹⁰;
 - consented Nationally Significant Infrastructure Projects (NSIPs) within 3.1 miles (5 kilometres) of the proposed scheme;
- The Department for Transport (DfT);
 - approved Transport and Works Act Order (TWAO) applications¹¹ within 3.1 miles (5 kilometres) of the proposed scheme;
- Gloucestershire County Council;
 - approved planning applications (EIA development only) within 3.1 miles (5 kilometres) of the proposed scheme;
 - site allocations within adopted planning policy (within 3.1 miles (5 kilometres) of the proposed scheme):
 - Minerals Local Plan for Gloucestershire (2018 - 2032) (adopted March 2020);
 - Waste Core Strategy (adopted 2012);
 - Waste Local Plan 2002-2012 Saved Policies (adopted 2004);
 - Local Transport Plan, 2015-2031 (adopted 2016, updated 2017). Note at the time of writing the LTP is undergoing a further review, with public consultation having concluded in March 2020 and adoption due in the autumn 2020;
- Cotswold District Council;
 - approved planning applications (EIA development only) within 3.1 miles (5 kilometres) of the proposed scheme;
 - site allocations within adopted planning policy (within 3.1 miles (5 kilometres) of the proposed scheme):
 - Local Plan 2011 – 2031 (adopted August 2018);
 - made neighbourhood plans;
- Tewkesbury Borough Council;
 - approved planning applications (EIA development only) within 3.1 miles (5 kilometres) of the proposed scheme;
 - site allocations within adopted planning policy (within 3.1 miles (5 kilometres) of the proposed scheme):
 - Tewkesbury Borough Local Plan 2006 – 2011 Saved Policies (adopted 2006);
 - The emerging Tewkesbury Local Plan 2011 – 2031 Pre-Submission Tewkesbury Borough Plan (October 2019), submitted for examination on 18 May 2020. ;
 - Gloucester City Council, Tewkesbury Borough Council and Cheltenham Borough Council Joint Core Strategy 2011-2031 (adopted 2017);
 - made neighbourhood plans;
- Gloucester City Council;
 - approved planning applications (EIA development only) within 3.1 miles (5 kilometres) of the proposed scheme;

- site allocations within adopted planning policy (within 3.1 miles (5 kilometres) of the proposed scheme):
 - Gloucester Local Plan (1983) – saved policies;
 - Second Stage Deposit City of Gloucester Local Plan (2002);
 - Gloucester City Plan (pre-submission draft);
 - made neighbourhood plans;
- Cheltenham Borough Council;
 - approved planning applications (EIA development only) within 3.1 miles (5 kilometres) of the proposed scheme;
 - site allocations within adopted planning policy (within 3.1 miles (5 kilometres) of the proposed scheme):
 - Local Plan Second Review 2006 (adopted 2006) (saved policies);
 - The new Cheltenham Plan (adopted 20 July 2020);
 - made neighbourhood plans;
- Stroud District Council;
 - approved planning applications (EIA development only) within 3.1 miles (5 kilometres) of the proposed scheme;
 - site allocations within adopted planning policy (within 3.1 miles (5 kilometres) of the proposed scheme):
 - Stroud District Local Plan (adopted November 2015); and
 - made neighbourhood plans.

Stage 2 identify shortlist of ‘other development’ for CEA

- 15.3.13 The ‘long list’ of other developments identified under Stage 1 has been subject to further threshold and criteria to identify a proportionate list of developments to be assessed within the CEA.
- 15.3.14 The threshold and criteria considered in shortlisting a development is outlined in Table 15-3. Criteria has been adapted from the Planning Inspectorate guidance within *Advice note 17* and the EIA Regulations 2017.

Table 15-3 Criteria for shortlisting ‘other development’

Threshold	Description
The temporal scope of ‘other development’ potential for interaction.	<ul style="list-style-type: none"> • Consideration of relative construction, operation and decommissioning programmes of the ‘other development’ identified in the ZOI with the proposed scheme programme, to establish whether there is overlap, or similar temporal scope for construction and operation phases, and any potential for interaction.
The scale and nature of ‘other development’	<ul style="list-style-type: none"> • consideration of whether the scale and nature of the developments identified in the ZOI are likely to interact with the proposed scheme and to result in a cumulative effect; • characteristics of other developments in relation to use of natural resources, pollution and nuisances, and risks to human health; • the scale of developments which are more than 1 hectare of urban development which is not a dwelling development; • the development includes more than 150 dwellings; or • the overall area of the development exceeds 5 hectares.

Threshold	Description
Any other relevant factors	<ul style="list-style-type: none"> • Nature and/or capacity of the receiving environment that would make a significant cumulative effect with 'other development'. The sensitivity of the receiving environment includes whether the sites are within: <ul style="list-style-type: none"> • wetlands, riparian areas, river mouths; • coastal zones and the marine environment; • mountain and forest areas; • nature reserves and parks; • European sites and other areas classified or protected under national legislation; • areas in which there has already been a failure to meet the environmental quality standards, laid down in Union legislation and relevant to the project, or in which it is considered that there is such a failure; • densely populated areas; and • landscapes and sites of historical, cultural or archaeological significance. • The relative abundance, availability, quality and regenerative capacity of natural resources in the area; • Potential for creation of source-pathway-receptor impacts; or • The likely significance of effects where environmental assessments have been undertaken for the 'other developments' as having moderate to large significance.

15.3.15 Professional judgement has been applied to 'other developments' that exceed the thresholds but do not give rise to discernible effects. Where relevant, the reasons for excluding any 'other development' from further consideration is outlined in Appendix 15.1 Consideration of cumulative effects.

Stage 3 information gathering

15.3.16 In line with *Advice note 17*, the following information on the 'other developments' has been compiled from publicly available information as outlined under 'Stage 1' above (section 15.3.12):

- *“proposed design and location information;*
- *proposed programme of construction, operation and decommissioning; and*
- *environmental assessments that set out baseline data and effects arising from the 'other existing development and/or approved development'”.*

Stage 4 assessment

15.3.17 The assessment of significance of the cumulative effects is determined in accordance with the significance assessment as detailed within Chapter 4 Environmental assessment methodology.

15.3.18 For the purposes of the CEA, the value of a resource and magnitude of impact is determined according to the criteria set within the preceding chapters of this PEI report (Chapters 5-14). The significance of effect is then carried forward from preceding chapters to identify the significance of cumulative effects with other developments.

15.3.19 The significance criteria for cumulative effects has been derived from guidance set out within DMRB LA 104 *Environmental assessment and monitoring*. This is set out in Table 15-4 and will be used in the assessment to be reported in the ES.

15.3.20 Where significant cumulative effects beyond those identified as residual significant effects from the proposed scheme in isolation are identified, an assessment of the need for additional mitigation (further to that already set out in the preceding chapters) (Chapters 5-14) will be undertaken.

Table 15-4 Determining significance of cumulative effects

Significance category	Typical description
Very large (Adverse or Beneficial)	Effects at this level are material in the decision-making process.
Large (Adverse or Beneficial)	Effects at this level are likely to be material in the decision-making process.
Moderate (Adverse or Beneficial)	Effects at this level can be considered to be material decision-making factors.
Slight (Adverse or Beneficial)	Effects at this level are not material in the decision-making process
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

15.3.21 The assessment of cumulative effects will vary depending on each environmental factor's individual assessment criteria and thresholds for significant effects.

Zone of influence

15.3.22 Table 15-5 explains the rationale for the ZOI extent for potential cumulative impacts with other developments used by each environmental factor. These individual ZOIs were subsequently combined to define an overall ZOI representing the search area within which other development has been identified, as shown on Figure 15.1. The ZOI for Air quality (from the affected road network), Biodiversity (for impacts on Bats) and Materials and waste has been limited to 3.1 miles (5 kilometres) due to the study area for those factors encompassing areas much greater than would be feasible to identify other development. Climate impacts (i.e. those as a consequence of global heating) are observable at a national/global scale. Climate has therefore been scoped out of the cumulative effects assessment in combination with other local/regional developments).

Table 15-5 ZOI extents for assessment of potential cumulative impacts

Environmental factor	Zone of Influence
Air quality	Up to 200m from the proposed scheme (for construction dust) and up to 200m from the affected road network (ARN) once operational. (Note that other development for inclusion within the CEA is only identified out to 3.1 miles (5km) from the proposed scheme)
Cultural heritage	Up to 0.6 miles (1km)
Landscape and visual	Up to 1.9 miles (3km)
Biodiversity	Study areas vary by ecological features, generally up to 1.2 miles (2km) ¹² (Bats, 18.6 miles (30km)).
Geology and soils	Up to 0.31 miles (500m)
Material assets and waste	Includes the whole of Gloucestershire county (though other development for inclusion within the CEA is only identified out to 3.1 miles (5km) from the proposed scheme)
Noise and vibration	Up to 0.4 miles (600m)

Environmental factor	Zone of Influence
Population and human health	Up to 0.3 miles (500m)
Road drainage and the water environment	Up to 0.6 miles (1km)

15.4 Preliminary assessment of combined effects

15.4.1 This section provides a summary of the potential combined effects which have been identified as part of the preliminary assessments reported within the relevant environmental factor chapters of the PEI report (Chapter 6 Cultural heritage, Chapter 7 Landscape and visual, Chapter 8 Biodiversity, Chapter 12 Population and human health, Chapter 13 Road drainage and the water environment and Chapter 14 Climate), and which are considered likely to affect a single resource or receptor. These preliminary in-combination assessments are summarised in Table 15-6.

Table 15-6 Combined effects as assessed and reported in environmental factor assessment chapters

Environmental factor and scope of combined effects assessed within chapter	Residual significant effects
Chapter 6 Cultural heritage considers effects from different sources on heritage assets, such as visual impacts during construction and noise impacts during operation.	See summary of preliminary residual significant effects in Table 15-7 of this chapter.
Chapter 7 Landscape and visual considers effects from different sources on landscape and visual receptors, such as heritage assets, ecological and noise effects during construction and operation.	See summary of preliminary residual significant effects in Table 15-7 of this chapter.
Chapter 8 Biodiversity considers the combined ecological effects on single receptors of a number of individual environmental impacts such as area of land required, disturbance due to noise, changes in air quality and airborne dust deposition, surface run-off and pollution events and cumulative loss of certain habitat types.	See summary of preliminary residual significant effects in Table 15-7 of this chapter.
<p>Chapter 12 Population and human health considers the combined effects from other environmental factors (noise, air quality, traffic, landscape and visual) which could affect people's enjoyment of private property and housing, community land and assets, development land and businesses, agricultural land holdings and routes used by walkers, cyclists and horse riders.</p> <p>The assessment of human health considers the environmental determinants of health including air quality, noise, ground conditions such as contaminated land, climate change and landscape and visual amenity. It also considers impacts to other material assets such as community and transport facilities as a result of the proposed scheme.</p>	See summary of preliminary residual significant effects in Table 15-7 of this chapter.
Chapter 13 Road drainage and the water environment considers combined effects such as the accumulation of impacts on water resources and receptors such as rivers and aquifers, which when considered together constitute a greater impact.	See summary of preliminary residual significant effects in Table 15-7 of this chapter.
Chapter 14 Climate considers the ICCI of the proposed scheme where the focus is on those effects of the proposed scheme identified by an environmental factor that are also affected by climate change. The preliminary findings of the ICCI assessment is presented in Appendix 14.3.	The preliminary findings report no new or different combined significant effects to those already reported in the environmental factor chapters of the PEI report and summarised in Table 15-7 of this chapter.

15.5 Preliminary assessment of cumulative effects

- 15.5.1 Table 15-7 provides a summary of the preliminary significant effects of the proposed scheme (as assessed by each PEI report chapter) and sensitive receptors identified as potentially affected by the other developments. The long-list and short-list of other developments is provided within Appendix 15.1 Consideration of cumulative effects of this PEI report.

Table 15-7 Preliminary significant effects and key receptors for environmental factors

Environmental factor	Summary of preliminary significant effects (as reported in environmental factor chapter)	Key receptors provisionally identified as being potentially affected by 'other developments'
Air quality	<p>Construction</p> <ul style="list-style-type: none"> No likely significant effects anticipated from construction activities. <p>Note: An assessment of construction traffic emissions is still to be undertaken and will be reported in the ES.</p> <p>Operation</p> <ul style="list-style-type: none"> No likely significant effects anticipated. 	<p>People living and working within the study and construction area (i.e. 200m from the draft DCO boundary) and once operational, 200m from the ARN).</p> <p>European designated ecological sites.</p>
Cultural heritage	<p>Construction</p> <ul style="list-style-type: none"> Permanent adverse significant effect on Shab Hill Barn Grade II Listed Building resulting from the scheme altering the rural setting of the resource. Permanent adverse significant effect on Emma's Grove scheduled monument resulting from the scheme altering the immediate setting of the resource. Permanent adverse significant effects from the loss or partial loss of six non-designated archaeological heritage resources. Permanent adverse significant effect on the Air Balloon public house (a non-designated heritage resource) resulting from its demolition. Permanent adverse significant effects on below ground archaeology within the footprint of the scheme. <p>Operation</p> <ul style="list-style-type: none"> Permanent adverse significant effect on Shab Hill Barn Grade II Listed Building due to increased traffic noise compared to the existing situation. 	<p>N/A - no 'other development' identified within 0.6 miles (1km) of the proposed scheme.</p>
Landscape and visual	<p>Construction</p> <ul style="list-style-type: none"> Temporary adverse significant effect on some of the Special Qualities of the Cotswolds Area of Outstanding Natural Beauty (AONB). Temporary adverse significant effects on landscape character types (LCT) that are directly affected by the proposed development, including: LCT 2 Escarpment; LCT 7 High Wold; and LCT 8 High Wold Valleys. 	<p>Landscape receptors: LCT 2 Escarpment LCA 2D Cooper's Hill to Winchcombe</p> <p>Visual receptors: Recreational receptors: Cotswold Way National Trail users</p>

Environmental factor	Summary of preliminary significant effects (as reported in environmental factor chapter)	Key receptors provisionally identified as being potentially affected by 'other developments'
	<ul style="list-style-type: none"> • Temporary adverse significant effects experienced by residents of Nettleton Bottom, Shab Hill, Stockwell, visitors to Crickley Hill Country Park, Barrow Wake, Great Witcombe Roman Villa, Leckhampton Hill and users of the Public Rights of Way (PRoW) network, including the Cotswold Way National Trail, Gloucestershire Way long distance footpath and local footpaths, bridleway and byways. Users of the main road network including the A417, A436 and B4070 will also experience temporary adverse significant visual effects. <p>Operation</p> <ul style="list-style-type: none"> • Permanent beneficial significant effects on some of the Special Qualities of the Cotswolds AONB. • Permanent adverse significant effects on LCT that are directly affected by the proposed development, including: LCT 2 Escarpment (year 1); and LCT 7 High Wold (year 1). • Combination of permanent adverse and neutral effects experienced by residents of Shab Hill (adverse at year 1), Stockwell (adverse at year 1), visitors to Crickley Hill Country Park (adverse at year 1 and year 15), Barrow Wake (adverse at year 1 and neutral at year 15), Great Witcombe Roman Villa (adverse at year 1) and users of the PRoW network, including the Cotswold Way National Trail (adverse at year 1 and year 15), Gloucestershire Way long distance footpath (adverse at year 1) and local footpaths, bridleway and byways (adverse at year 1). 	<p>Tourism receptors: Crickley Hill Country Park Great Witcombe Roman villa Barrow Wake</p>
Biodiversity	<p>Construction</p> <ul style="list-style-type: none"> • Adverse significant effect on the Barrow Wake unit of the Crickley Hill and Barrow Wake Site of Special Scientific Interest (SSSI) due to loss 0.07ha of grassland and 0.03ha of woodland. • Adverse significant effect on veteran trees due to the loss of up to nine veteran trees. • Adverse significant effect on semi-natural broadleaved woodland and scattered trees through habitat loss along verges and embankments, loss and severance of beech woodland at Shab Hill. • Beneficial significant effect on semi-natural broadleaved woodland due to planting approximately 19ha of new woodland. 	<p>Designated sites – Crickley Hill and Barrow Wake SSSI; Non-statutory designated sites; Ancient woodland and veteran trees; Semi-natural broadleaf woodland; Species-rich and important hedgerows; Species-rich calcareous grasslands; Semi-improved neutral grassland; Bat building and tree roosts: Trees: one common pipistrelle day roost, two Myotis sp. day roosts;</p>

Environmental factor	Summary of preliminary significant effects (as reported in environmental factor chapter)	Key receptors provisionally identified as being potentially affected by 'other developments'
	<ul style="list-style-type: none"> • Adverse significant effect on important and species-rich hedgerows through habitat loss of approximately 5.5km of hedgerow. • Beneficial significant effect on species-rich hedgerow habitat due to planting approximately 7.7km of new hedgerow. • Adverse significant effect on species-rich neutral grassland due to habitat loss. • Beneficial significant effect on calcareous grasslands across the proposed scheme due to habitat creation. • Adverse significant effect on a petrifying spring with tufa formation through loss of Annex 1 habitat. • Adverse significant effect on bat assemblages due to temporary severance and fragmentation of foraging and commuting features. • Adverse significant effect on barn owl through loss and fragmentation of foraging habitat. 	<p>Buildings: one common pipistrelle maternity roost, three common pipistrelle day roosts, two Myotis species day roosts, one lesser horseshoe day roost and night roost, one Natterer's day roost and one lesser horseshoe and brown long-eared day and night roost respectively all lie within the draft DCO boundary. Lesser Horseshoe bat maternity roost at Haroldstone House cottages within 20m of the proposed scheme;</p> <p>Bat assemblages including Annex II species (foraging and commuting habitat);</p> <p>Badgers;</p> <p>Breeding birds and Wintering birds;</p> <p>Barn Owl populations including loss and fragmentation of foraging habitat;</p> <p>Great Crested Newts;</p> <p>Reptiles populations;</p> <p>Otter;</p> <p>Terrestrial Invertebrate assemblages including Roman Snail;</p> <p>Aquatic Macroinvertebrates;</p> <p>Fish; and</p> <p>Tufa habitat.</p>
	<p>Operation</p> <ul style="list-style-type: none"> • Adverse significant effect on barn owl through increased risk of mortality and injury through traffic collisions due to severance of habitat. 	<p>Barn owl - risk of mortality, disturbance from noise and lighting and loss/fragmentation of foraging habitat;</p> <p>Bats - risk of mortality and habitat fragmentation; and</p> <p>Breeding and wintering birds - increase risk of mortality and disturbance.</p>

Environmental factor	Summary of preliminary significant effects (as reported in environmental factor chapter)	Key receptors provisionally identified as being potentially affected by 'other developments'
Geology and soils	<p>Construction</p> <ul style="list-style-type: none"> • Permanent adverse significant effect on Agricultural Land Classification (ALC) Grade 3a best and most versatile agricultural land. • Permanent adverse significant effect on ALC Grade 3b agricultural land. • Permanent adverse significant effect on controlled waters as a result of identified soil and groundwater hydrocarbon contamination. Further investigations and assessments would be required to identify the source, confirm the risks and design appropriate remediation measures. <p>Operation</p> <ul style="list-style-type: none"> • No likely significant effects anticipated. 	N/A – no 'other development' identified within 500m of the proposed scheme.
Material assets and waste	<p>Construction</p> <ul style="list-style-type: none"> • No likely significant effects anticipated. <p>Operation</p> <ul style="list-style-type: none"> • No likely significant effects anticipated. 	Capacity of waste management infrastructure in the county due to the volume of estimated waste arisings from the proposed scheme.
Noise and vibration	<p>Construction</p> <p>Residential:</p> <ul style="list-style-type: none"> • Temporary adverse significant noise effects from construction activities for fourteen residential properties: <ul style="list-style-type: none"> ○ Receptor R2 Fernbank (7); ○ Receptor R3 Crickley Ridge (2); ○ Receptor R4 Air Balloon Cottages (2) ○ Receptor R6 Rushwood Kennels; and ○ Receptor R12 Shab Hill Farm (2). <p>Non-residential:</p> <ul style="list-style-type: none"> • Temporary adverse significant noise effects from construction activities at non-residential locations: <ul style="list-style-type: none"> ○ Receptor R5 Birdlip Radio Station; ○ Receptor R6 Rushwood Kennels and Cattery; and ○ Receptor R16 Emma's Grove scheduled monument. 	N/A – no 'other development' identified within 600m of the proposed scheme.

Environmental factor	Summary of preliminary significant effects (as reported in environmental factor chapter)	Key receptors provisionally identified as being potentially affected by 'other developments'
	<ul style="list-style-type: none"> Temporary adverse significant noise effects from construction activities identified at PRowS within approximately 500m of major excavation works in the AONB near the new alignment, in particular along a 500m section of the Gloucestershire Way long distance footpath (footpath link ACY3). <p>Operation</p> <p>Residential:</p> <ul style="list-style-type: none"> Direct permanent beneficial significant noise effects have been identified at 45 residential properties. Direct permanent adverse significant noise effects have been identified at 22 residential properties. Indirect permanent beneficial significant noise effects have been identified at 20 residential properties. <p>Non-residential:</p> <ul style="list-style-type: none"> The removal of the existing section of highway would result in noise reductions in this area and along the Cotswold Way which are assessed as direct permanent beneficial significant effects. The proposed new highway alignment would result in noise increases on part of the Gloucestershire Way long distance footpath between the Air Balloon roundabout and Coberley to the east. Noise increases would also occur for footpath links running for approximately one kilometre to the east from Stockwell. These noise increases are assessed as direct permanent significant adverse effects. 	
<p>Population and human health¹³</p>	<p>Construction</p> <ul style="list-style-type: none"> Permanent adverse significant effects on two businesses (Air Balloon Public House and Crickley Hill Tractors) and three residential properties on Crickley Hill (Woodside House, Pinewood and Crickley Ridge). Temporary adverse significant effect on users of Crickley Hill Country Park. 	<p>N/A – no 'other development' identified within 500m of the proposed scheme.</p>

Environmental factor	Summary of preliminary significant effects (as reported in environmental factor chapter)	Key receptors provisionally identified as being potentially affected by 'other developments'
	<ul style="list-style-type: none"> • Permanent adverse significant effect on one Agricultural Holding, Shab Hill Farm. • No adverse health outcomes. <p>Operation</p> <ul style="list-style-type: none"> • Permanent beneficial significant effect on the Cotswold Way National Trail. • Permanent beneficial significant effect on walking, cycling and horse riding / PrOW. • Positive health outcomes identified in relationship to transport and connectivity, open space and nature, air quality and employment and economy. • Mixed health outcomes (both positive and negative) in relation to noise, therefore an overall neutral health outcome across the communities. 	
Road drainage and the water environment	<p>Construction</p> <ul style="list-style-type: none"> • Temporary adverse significant effect on hydromorphology due to the removal of Norman's Brook during the construction phase. <p>Operation</p> <ul style="list-style-type: none"> • No likely significant effects anticipated. <p>Note: The assessment of effects of cuttings on groundwater levels and flows that may affect groundwater dependent features (including springs, abstraction points and Bushley Muzzard SSSI), and aquifer and surface water recharge will be reported in the ES.</p>	Surface water and groundwater within the Norman's Brook catchment.

Identification of other developments to be assessed

- 15.5.2 For each identified 'other development', consideration has been made as to the likelihood that any impacts from the development could occur at the same time as the proposed scheme or affect similar receptors or resources. Appendix 15.1 Consideration of cumulative effects presents the list of other developments identified along with confirmation and justification for those screened out of the assessment.
- 15.5.3 The long list of developments is given in Appendix 15.1 Consideration of cumulative effects. The number of developments to be considered within each environmental factor has been condensed between stage 1 and stage 2 assessments using the criteria listed in Table 15-3.
- 15.5.4 Table 15-8 provides the shortlist of development projects used for this CEA and Figure 15.2 shows the location of each development.

Table 15-8 Preliminary short listed 'other developments' with the potential to result in cumulative impacts (for assessment in the CEA)

Application reference and local planning authority	Approximate distance from proposed scheme and location	Proposal	Proposed programme of construction, operation and decommissioning	Relevant environmental factor (development is within respective ZOI)
12/01256/OUT (and related approved reserved matters applications: 18/00109/APP, 18/00410/APP, 18/00864/APP, 19/00537/APP) (Tewkesbury Borough Council)	0.68 miles (1.1km) Land at Perrybrook to the North of Brockworth and to the South of the A417 Brockworth	Outline application (EIA) for a mixed-use development of up to 1,500 dwellings, including extra care housing, community facilities including A1, A2, A3, A4 and A5 local retail shops (totalling 2,500m ²), B1/B8 employment uses (totalling 22,000m ²), D1 health facilities and formal and informal public open space (including means of access). The reserved matters applications provide additional detail about the development.	Development of the site appears to have not yet commenced based on aerial imagery. Tewkesbury Borough Council confirmed that the development was recorded as not started in April 2019.	Biodiversity 1.2 miles (2km), Bats 18.6 miles (30km); Landscape and visual 1.9 miles (3km); and Material assets and waste 3.1 miles (5km).
14/00838/FUL (Tewkesbury Borough Council)	1.6 miles (2.5km) Land to the West of Farm Lane, Shurdington	Full application (EIA) for residential development comprising 377 dwellings, including access and associated infrastructure.	The ES indicates that the development will be constructed in three phases: phase 1 2015-2018, phase 2 2018-2019 and phase 3 2019-2020.	Biodiversity (bats only - 18.6 miles (30km)); Landscape and visual 1.9 miles (3km); and Material assets and waste 3.1 miles (5km).
BR1 - Brockworth and Hucclecote Housing Allocation (site allocation within Tewkesbury Borough Local Plan 2006 – 2011 Saved Policies)	2 miles (3.2km) Brockworth	Land is allocated to the south and west of the Gloucester Business Park for approximately 1400 dwellings (29ha net) as shown on the proposals map. Within this area and the adjoining land identified by Stroud District Council for	(1400 dwellings between 2001-2011), however the policy was retained in 2009. Site appears to be partially but not fully built out based on aerial imagery. Related planning applications within the site	Biodiversity (bats only - 18.6 miles (30km)); and Material assets and waste 3.1 miles (5km).

Application reference and local planning authority	Approximate distance from proposed scheme and location	Proposal	Proposed programme of construction, operation and decommissioning	Relevant environmental factor (development is within respective ZOI)
(Tewkesbury Borough Council)		<p>development, the borough council will support proposals for a comprehensive scheme which:</p> <ul style="list-style-type: none"> • Integrates with existing and proposed business uses. • Includes a new local centre and community and recreational facilities. • Makes provision for local educational requirements. • Addresses traffic issues in the context of the existing and proposed highway network. • Provides for/contributes to enhanced pedestrian, cycle and public transport facilities within the site and to and from Gloucester, Cheltenham, Brockworth and Hucclecote. • Respects the high quality landscape setting and introduces planting both within and on the edge of the development consisting of native broadleaved species. • Safeguards the Hucclecote meadows site of special scientific interest and its sustainable management. 	allocation (17/01002/APP 16/00292/APP, 15/01274/APP) were recorded as 'complete' or 'under construction' in May-June 2019 by Tewkesbury Borough Council.	
BR2 - Gloucester Business Park (site allocation within Tewkesbury Borough Local	1.6 miles (2.5km)	Land at Gloucester business park (Brockworth/Hucclecote) is allocated for employment use as shown on the	Site appears to be partially but not fully built out based on aerial imagery. There is a planning	Biodiversity (bats only - 18.6 miles (30km));

Application reference and local planning authority	Approximate distance from proposed scheme and location	Proposal	Proposed programme of construction, operation and decommissioning	Relevant environmental factor (development is within respective ZOI)
Plan 2006 – 2011 Saved Policies) (Tewkesbury Borough Council)	Gloucester Business Park (Brockworth/Hucclecote)	proposals map. New buildings, or the redevelopment or change of use of existing buildings or sites, must be within business (class b1), general industrial (class b2) or warehousing (class b8) use.	application pending within the site allocation (Tewkesbury Borough Council 15/01378/OUT Development of up to 106 dwellings) at the time of writing.	Landscape and visual 1.9 miles (3km); and Material assets and waste 3.1 miles (5km).
BR3 - Brockworth/Hucclecote District Centre (site allocation within Tewkesbury Borough Local Plan 2006 – 2011 Saved Policies) (Tewkesbury Borough Council)	1.7 miles (2.8km) Land at plot 5000, Gloucester Business Park, adjacent to Ermin Street/Hucclecote Road	Land at plot 5000, Gloucester Business Park, adjacent to Ermin Street/Hucclecote Road as shown on the proposals map is allocated for a mixed use district centre incorporating a foodstore of a minimum of 3250sq m net sales area subject to retail assessment, a number of unit shops with a total gross floorspace of about 2375sq m providing a range of other convenience and comparison goods and services, leisure uses not including a cinema, community uses, a hotel, and business and residential uses. Detailed proposals for the development of the site shall include measures to encourage the use of non-car modes, including bus interchange, and shall facilitate the safe movement of pedestrians and cyclists between the adjacent employment and residential areas and the district centre.	185 dwellings between 2001-2011, however the policy was retained in 2009. Site appears to be partially but not fully built out based on aerial imagery. There is a planning application pending decision for part of this allocated site (Tewkesbury Borough Council 18/01239/FUL, Erection of 166 new homes).	Biodiversity (bats only - 18.6 miles (30km)); Landscape and visual 1.9 miles (3km); and Material assets and waste 3.1 miles (5km).
Policy H2 – site allocation MD5 within the Cheltenham Local Plan.	2.2 miles (3.5km) Leckhampton	Site allocation for approximately 350 dwellings and a secondary school (15ha site).	No planning applications have been submitted for the housing at the time of writing. Delivery of the dwellings would be assumed at any	Biodiversity (bats only - 18.6 miles (30km));

Application reference and local planning authority	Approximate distance from proposed scheme and location	Proposal	Proposed programme of construction, operation and decommissioning	Relevant environmental factor (development is within respective ZOI)
(Cheltenham Borough Council)			<p>time up to 2031 (the end of the plan period).</p> <p>A current application for the secondary school (19/0058/CHR3MJ, submitted August 2019), part of the allocation, is being considered by Gloucestershire County Council at the time of writing.</p> <p>Although the Transport Assessment¹⁴ in support of the planning application anticipates opening of the school in September 2021, a local news article in February 2020 suggests that the school would open in 2022¹⁵.</p>	Material assets and waste 3.1 miles (5km).

Significance of cumulative effects

- 15.5.5 DMRB LA 104 *Environmental assessment and monitoring* notes that cumulative effects should be assessed when the conclusions of individual environmental factor assessments have been reached and reported. Therefore, cumulative effects are not reported in this PEI report, but will be assessed and reported in the ES by considering whether:
- there would be any change in magnitude of the significant effects from the proposed scheme, as identified within the environmental factor assessments, taking in to consideration any impacts from the other developments. *For example, a slight adverse significant effect becoming a large adverse significant effect; or*
 - the impacts of the proposed scheme on key receptors potentially affected by 'other developments', as identified in Table 15-7, in combination with any impacts of the other developments would trigger a significant effect where the impacts of the proposed scheme in isolation would not, *i.e. a non-significant effect becoming a significant effect.*
- 15.5.6 Where available, the relevant Environmental Statements for each development will be assessed.

15.6 Monitoring

- 15.6.1 If the assessment of cumulative effects identifies any likely new significant effects, or any requirement for additional mitigation above the measures that will be identified and proposed within the ES and stated in the Environmental Management Plan (EMP), then appropriate monitoring will be identified.

15.7 Summary

- 15.7.1 In line with DMRB LA 104 *Environmental assessment and monitoring*, cumulative effects will be assessed based on the conclusions of individual environmental factor assessments.
- 15.7.2 For this PEI report, a full cumulative effects assessment and combined effects assessment has not been undertaken as the proposed scheme environmental assessments are still being undertaken at this stage. Therefore, this chapter presents the methodology and short list of 'other developments' to be assessed, which will be assessed and reported in the ES.
- 15.7.3 The CEA will identify any significant cumulative or combined effects which would result in any new or different significant effects to those identified in each environmental factor chapter of the ES. It will also identify any requirement for mitigation measures further to those set out in the individual environmental factor chapters and EMP.

End Notes & References

¹ Highways England (2019) Design Manual for Roads and Bridges (DMRB) LA 104 *Environmental assessment and monitoring*. Available online:

<http://www.standardsforhighways.co.uk/ha/standards/dmr/vol11/section2/la104.pdf>

² The Planning Inspectorate (August 2019) Cumulative Effects Assessment, Advice note seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects: <https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2015/12/Advice-note-17V4.pdf>

³ Where other projects are expected to be completed before construction of the proposed scheme and the effects of those projects are fully determined, effects arising from them are considered as part of the baseline or future baseline and will be considered as part of both the construction and operational assessment within the environmental factor chapters of the ES. These developments have not therefore been included in the shortlisted developments for assessment in the CEA.

⁴ Applications which are still to be determined at the time of undertaking the assessment are not shortlisted for assessment in the CEA due to uncertainty and limited detailed information available.

⁵ Note: No projects of this type have been identified within 5km of the proposed scheme

⁶ Note: No projects of this type have been identified within 5km of the proposed scheme

⁷ Note: In line with the DMRB methodology, only adopted planning policy has been included in the CEA.

⁸ Roads projects are limited to those which require planning permission or development consent and does not include maintenance of the existing road network, which is typically carried out under permitted development rights.

⁹ Publicly available published sources such as planning applications on local authority websites, published local authority plans, data published on the Planning Inspectorate website and Transport and Works Act (TWA) applications published by the Department for Transport.

¹⁰ Planning Inspectorate, National Infrastructure Planning. Available online at:

<https://infrastructure.planninginspectorate.gov.uk/>

¹¹ Department for Transport, Transport and Works Act (TWA) applications and decisions: Available online at: <https://www.gov.uk/government/collections/twa-inspector-reports-and-decision-letters#2020-twa-decisions-and-applications>

¹² with the exception of Special Areas for Conservation (SAC) for bat populations and Internationally designated nature conservation sites, which are both up to 30km from the proposed scheme.

¹³ NOTE: The human health assessment only allows for adverse or beneficial effects, rather than significance

¹⁴ Planning application for a New Secondary School, Leckhampton. Appendix K Transport Assessment (July 2019). Available online:

http://caps.gloucestershire.gov.uk/gcc_images/19_0058_CHR3MJ_TRANSP_ASSESS.pdf

¹⁵ Gloucestershire Live (2020). 'Green' concerns delay opening of new Cheltenham secondary school as it has to be carbon neutral. February 2020. Available online:

<https://www.gloucestershirelive.co.uk/news/cheltenham-news/green-concerns-delay-opening-new-3900487>