A417 Missing Link

Preliminary Environmental Information Report

Chapter 4 Environmental Assessment Methodology

28 September 2020

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4 Environmental assessment methodology

4.1 Introduction

4.1.1 This chapter of the Preliminary Environmental Information (PEI) report details the approach taken to undertake the Environmental Impact Assessment (EIA) of the proposed scheme. The chapter introduces the requirements of the Design Manual for Roads and Bridges (DMRB) and sets out the overall approach to the assessment of the likely significant effects of the proposed scheme.

4.1.2 The adopted scope, approach and method of assessment for each topic are outlined in the topic specific chapters (chapters 5-14), with further details such as survey methods provided.

4.2 Environmental scoping

4.2.1 An EIA scoping report[1] was submitted by Highways England to the Planning Inspectorate (PINS) on 14 May 2019. The scoping report sets out the proposed scope of work and methods to be applied in carrying out the EIA, and the proposed structure of the Environmental Statement (ES).

4.2.2 The Inspectorate reviewed and consulted on the EIA Scoping Report and published a Scoping Opinion on 24 June 2019. The Scoping Opinion is available on the Planning Inspectorate's website at the following address:

https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010056/TR010056-000046-TR010056%20-%20Scoping%20Opinion.pdf

4.2.3 The Scoping Opinion and the comments from the consultees has been considered in undertaking the EIA and in preparing the PEI report.

4.2.4 The EIA scoping report states that topic assessments are based on DMRB Volume 11. DMRB standards were updated in the second half of 2019. The PEI report (and the ES to be submitted with the DCO application) is written in accordance with the requirements presented in the new DMRB standards under "Sustainability & Environment Appraisal".

4.2.5 It is considered that the EIA Scoping Report (May 2019) is valid and the changes to the standards and the scheme are capable of being assessed accordingly within the relevant topic chapters.

Scope of assessment

Scoped in

4.2.6 The environmental assessment will consider the following environmental factors in line with the requirements of the EIA Directive (Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment):

- air quality;
- cultural heritage;
- landscape and visual;
- biodiversity;

- geology and soils;
- material assets and waste;
- noise and vibration;
- population and human health;
- road drainage and the water environment; and
- climate.

4.2.7 The PEI report also considers the vulnerability of the proposed development to major accidents or disasters (within the appropriate chapters) that are relevant to that development. This is covered in further detail in section 4.9.

Scoped out

Heat and radiation

4.2.8 The Infrastructure Planning Regulations 2017 (the EIA Regulations) also introduced the requirement for the emission of heat and radiation to be considered. The proposed scheme does not introduce any sources of heat and radiation and there are no sensitive receptors (for example, hospitals or schools) within the route corridor. Hence the topic of heat and radiation has been scoped out based on negligible risk.

4.2.9 The Inspectorate stated in the Scoping Opinion that "*owing to the nature of the Proposed Development it is considered unlikely that heat and radiation effects associated with the proposals are likely to arise. Given this, any further assessment has been scoped out. The Inspectorate considers that this is a reasonable approach to adopt.*"

Electric and Magnetic Fields (EMF)

4.2.10 In response to the scoping report, Public Health England (PHE) requested that the possible health impacts of Electric and Magnetic Fields (EMF) should be considered. The proposed development does not impact any receptors from potential sources of EMF due it being a road construction scheme. There are no electrical installations such as substations and connecting underground cables or overhead lines from the proposed scheme, therefore there are no health impacts associated with EMF. The EMF have subsequently been scoped out of the assessment.

Transboundary effects

4.2.11 Regulation 32 of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 requires the consideration of any likely significant effects on the environment of another European Economic Area (EEA) State.

4.2.12 Guidance on the consideration of transboundary effects is provided in Planning Inspectorate's Advice Note Twelve: development with significant transboundary impacts consultation[2].

4.2.13 On the 11th October 2019, the Planning Inspectorate confirmed on behalf of the Secretary of State, they have undertaken a transboundary screening of the A417 Missing Link scheme. This concluded that the proposed scheme is unlikely to have a significant effect either alone or cumulatively on the environment in another European Economic Area State. On this basis transboundary effects have been scoped out.

4.3 Surveys and predictive techniques and methods

Requirements of DMRB

4.3.1 All aspects of the development, environmental assessment and design requirements of motorways and all-purpose trunk road projects are governed by standards set out in the Design Manual for Roads and Bridges (DMRB).

4.3.2 All EIA work and environmental reporting on the proposed scheme has been undertaken in accordance with the standards set out in DMRB.

4.3.3 DMRB standards on EIA set out three 'levels' of EIA assessment and reporting: *'scoping'*, *'simple'* and *'detailed'*. These levels are not intended to be sequential (i.e. applied one after another in order), but 'consequential', in that the level to be applied at any stage of environmental reporting is determined on a topic-by-topic basis according to the following factors:

- the results of any previous assessment work (especially the scoping report);
- the likely scale or significance of impact (not the scale of development);
- the nature of the decision-making process to which the report relates; and
- the degree of uncertainty about the potential impact of the proposed scheme.

4.3.4 DMRB defines topic specific requirements for each level of assessment and reporting. The levels of assessment to be applied to the various topics in this scoping report are given in each of the specialist topic chapters (chapters 5-14).

Draft Development Consent Order (DCO) boundary and study area

4.3.5 The DCO boundary is based on the land anticipated to be potentially required temporarily and/or permanently for the construction, operation and maintenance of the proposed scheme. Plans to illustrate this will be developed and submitted as part of the DCO application.

4.3.6 Since completing the 2019 PEI report, the design of the proposed scheme has continued to be developed and the DCO boundary has been reviewed and refined as appropriate to reflect requirements from consultation. The development and refinement of the DCO boundary has not led to any changes that materially affect the content of the scoping opinion.

4.3.7 Study areas have been defined individually for each environmental factor in the relevant topic chapter (chapters 5-14), taking account of DMRB, the geographic scope of the potential impacts relevant to that topic or of the information required to assess those impacts. The study areas are described within each relevant chapter of this report.

4.3.8 The study area for environmental impact assessment for each environmental factor incorporates the DCO boundary as a minimum for the proposed scheme.

4.3.9 The EIA and ES will be based on the DCO boundary presented in the DCO application.

Identification of baseline and future conditions

4.3.10 In order to identify the effects of the proposed scheme on the environment, it is important to understand the environment that would be affected by the proposed scheme (the 'baseline conditions'). Understanding the baseline allows the measurement of changes that would be caused by the proposed scheme.

4.3.11 The baseline conditions are not necessarily the same as those that exist at the current time; they are the conditions that would exist in the absence of the proposed scheme either (a) at the time that construction is expected to start, for impacts arising from construction or, (b) at the time that the proposed scheme is expected to open to traffic, for impacts arising from the operation of the proposed scheme. Therefore, the identification of the baseline and future conditions involves predicting changes that are likely to happen in the intervening period, for reasons unrelated to the proposed scheme. This would entail taking current conditions and committed development into consideration and using experience and professional judgment to predict what the baseline and future conditions might look like prior to start of construction and operation.

4.3.12 It is essential for an EIA that sufficient data is obtained to form the basis of the assessment. Each topic chapter includes a description of the current (baseline) environmental conditions and future baseline scenario. This is based on the study area identified for each topic chapter.

4.3.13 The PEI report presents baseline information representing the conditions of the environment at the time of writing. When describing the future baseline scenario for each environmental factor within the respective topic chapters, readily available information such as local plans and climate change scenario data has been utilised to provide a description of the natural changes in the local environment over an appropriate timescale that the datasets support.

Defining assessment years and scenarios

4.3.14 The assessment of effects in this PEI report involves comparing a scenario without the project and scenario with the project. These are referred to as the do-minimum and do-something scenarios respectively.

4.3.15 The do-minimum scenario represents the future baseline with minimal interventions and without new infrastructure.

4.3.16 The likely significant environmental effects for do-something scenarios are assessed for the baseline year and future year, or series of future years, depending on the environmental factor.

4.3.17 For assessing construction phase effects, the baseline year represents the conditions prior to construction starting. The proposed start of construction is 2023.

4.3.18 The opening year when the proposed scheme is to become operational, i.e. open to traffic is 2025. The future year scenario (a period after the proposed scheme opens for traffic) is 2040, 15 years after opening, when mitigation measures are likely to have achieved their desired outcome.

4.3.19 For assessing operation phase effects (such as the effects of traffic on noise and air quality) the baseline year represents the situation prior to any effect e.g. opening the project to traffic. For the PEI report, the traffic models are based on an opening year of 2024 and 2039 (15 years after opening). It is noted that the modelled years do not coincide with the revised opening and design year for the proposed scheme. It is considered that these do not materially affect the results of the assessments undertaken.

4.3.20 Current scientific knowledge and methods of assessment have been used to identify foreseeable changes.

Combined and cumulative effects

4.3.21 Combined and cumulative effects result from multiple actions on receptors over time and are generally additive or interactive (synergistic) in nature. They can also be considered as effects resulting from incremental changes caused by other past, present or reasonably foreseeable actions together with the proposed scheme, identified as:

- combined effects from a single project – the proposed scheme (i.e. the interrelationship between different environmental factors where numerous different effects impact a single receptor); and
- cumulative effects from different projects (together with the scheme being assessed).

4.3.22 The methodology for cumulative effects with other proposed developments is presented in Chapter 15 (Assessment of cumulative effects). The combined and cumulative effects of the proposed scheme in conjunction with other proposed developments will be assessed and the findings will be presented within the ES.

4.4 General assessment assumptions and limitations

Dealing with uncertainty

4.4.1 In assessing the effects of the proposed scheme from an environmental perspective, the principle of the 'Rochdale Envelope' will be applied, in accordance with PINS advice note nine: Rochdale Envelope[3]. The advice note states:

4.4.2 *The 'Rochdale Envelope' approach is employed where the nature of the Proposed Development means that some details of the whole project have not been confirmed (for instance the precise dimensions of structures) when the application is submitted, and flexibility is sought to address uncertainty.*

4.4.3 At the current stage in the design process, absolute certainty about construction timing, phasing and methodology is not possible. It is anticipated that as the design develops more certainty will be gained. This will be documented in the ES.

Limits of Deviation

4.4.4 Limits of Deviation (LOD) are the limits within which the draft DCO will authorise the A417 to be constructed. Changes to the preliminary scheme design may occur typically as a result of ground conditions or environmental factors which it may not be possible to identify in the period prior to the DCO application. The LOD allow for a small tolerance with respect to any distances and points shown on the plans that will accompany the DCO application. All works would take place within the LOD, the extent of which will be subject to full consideration as part of the Environmental Impact Assessment (EIA) for the proposed scheme.

4.4.5 The draft DCO will allow for the proposed scheme to be constructed anywhere within the maximum extent of the defined LOD. This would include a vertical deviation and a lateral deviation. As a result, there is some necessary flexibility as to the exact scheme detail taken through to construction.

4.4.6 The LOD will be contained in the DCO and will be considered within the topic specific chapters of the ES, having regard to the scope for change from the

highway alignment. The assessment approach outlined here accords with the Rochdale Envelope approach outlined above.

4.5 Significance criteria

Environmental assessment methodology

4.5.1 The EIA process has taken into account relevant DMRB standards, including the following:

- DMRB LA 101 Introduction to Environmental Assessment[4];
- DMRB LA 102 - Screening projects for Environmental Impact Assessment[5];
- DMRB LA 103 - Scoping projects for environmental assessment[6]; and
- DMRB LA 104 - Environmental assessment and monitoring[7].

4.5.2 Other topic specific legislation and good practice guidance has been considered and details of these can be found in the topic chapters within this PEI report.

4.5.3 The assessment of each environmental factor forms a separate chapter of this PEI report. For each chapter within this PEI report, the following has been addressed in conformity to DMRB and EIA Regulations.

- legislative and policy framework;
- assessment methodology;
- assessment assumptions and limitations;
- definition of the study area;
- description of the baseline environmental conditions;
- identification of potential impacts (including effects arising during the construction and operational phases);
- identification of design, mitigation and enhancement measures, where appropriate;
- a preliminary assessment of the likely significant effects of the proposed scheme; and
- preliminary details of any likely monitoring requirements.

4.5.4 Each topic chapter provides details of the methodology for baseline data collection and evaluation of effects based on EIA good practice guidance documents and relevant topic specific guidance where available.

Assessment of effects

4.5.5 The EIA process requires the identification of the likely significant environmental effects of the proposed scheme. This includes consideration of the likely effects during the construction and operational phases of the proposed scheme.

4.5.6 DMRB LA 104 provides a standard approach to the determination of significance of environmental effects for highway schemes. This includes consideration of the following;

- assigning value (or sensitivity) of receptors;
- assigning magnitude of impact; and
- assigning significance.

Assigning value of receptors

4.5.7 Receptors are defined as individual environmental features that have the potential to be affected by a scheme. For each topic, baseline studies have informed the identification of potential environmental receptors. Some receptors will be more sensitive to certain environmental effects than others. The value (or sensitivity) of a receptor may depend, for example, on its frequency, extent of occurrence or conservation status at an international, national, regional or local level.

4.5.8 Value (or sensitivity) is defined within each topic chapter and takes into account factors including the following:

- vulnerability of the receptor to change;
- recoverability of the receptor (ability of recover from a temporary impact); and
- importance of the receptor.

4.5.9 As a general guide, the definitions set out in Table 3.2N of DMRB LA 104 have been taken into account (except where topic standard/guidance requires otherwise). This includes a five-point scale for assigning environmental value (or sensitivity) as shown in Table 4-1 below.

Table 4-1 Environmental value (sensitivity) and descriptions

Value (sensitivity) of receptor/resource	Typical description
Very high	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale, and limited potential for substitution.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution.
Low	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

Based on Table 3.2N of DMRB LA 104

Magnitude of impact

4.5.10 In line with DMRB LA 104 the magnitude of impacts on receptors shall be reported within the environmental assessments. The descriptions for magnitude of impact (as outlined in Table 4-2) are applied by the proposed scheme. Where relevant, individual topic chapters set out variations in magnitude description requirements.

4.5.11 For each topic, the likely environmental impacts have been identified and will be refined further within the ES. The likely environmental impact arising from the proposed scheme has been identified and compared with the baseline (the situation without the proposed scheme). Impacts are divided into those occurring during the construction and operation phases.

4.5.12 As a general guide, the definitions set out in Table 3.4N of DMRB LA 104 have been taken into account (except where topic standard/guidance requires otherwise). This includes a five-point scale for assigning impact magnitude as shown in Table 4-2.

Table 4-2 Magnitude of impact and typical descriptions

Magnitude of impact		Typical criteria descriptions
Major	Adverse	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements.
	Beneficial	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality.
Moderate	Adverse	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.
	Beneficial	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Minor	Adverse	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.
	Beneficial	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	Adverse	Very minor loss or detrimental alteration to one or more characteristics, features or elements.
	Beneficial	Very minor benefit to or positive addition of one or more characteristics, features or elements.
No change		No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Based on Table 3.4N of DMRB LA 104

Assigning significance

4.5.13 In DMRB LA 104 it states the significance of effects must be reported in accordance with the EIA Directive.

4.5.14 DMRB LA 104 recognises *"the approach to assigning significance of effect relies on reasoned argument, the professional judgement of competent experts and using effective consultation to ensure the advice and views of relevant stakeholders are taken into account."*

4.5.15 Each topic chapter defines the approach taken to the assessment of significance. Where appropriate, topic chapters have adopted the general approach set out in Table 3.7 within DMRB LA 104 (see Table 4-3). Where relevant, individual environmental factors have set out variations in significance description requirements.

Table 4-3 Significance categories and typical descriptions

Significance category	Typical description
Very large	Effects at this level are material in the decision-making process
Large	Effects at this level are likely to be material in the decision-making process
Moderate	Effects at this level can be considered to be material decision-making factors
Slight	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

Based on Table 3.7 of DMRB LA 104

4.5.16 The evaluation of significance takes into account industry and professional standards and guidance, codes of practice, policy objectives regulations or standards, advice from statutory consultees and other stakeholders, as well as expert judgement of the EIA practitioners, based on specialist experience. For some topics, a simplified or quantitative approach is considered appropriate as set out in Table 3.8.1 within DMRB LA 104 (see Table 4-4).

Table 4-4 Significance matrix

		Magnitude of impact (degree of change)				
Environmental value (sensitivity)		**No change**	**Negligible**	**Minor**	**Moderate**	**Major**
	Very high	Neutral	Slight	Moderate or large	Large or very large	Very large
	High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

Based on Table 3.8.1 of DMRB LA 104

4.5.17 Where Table 4-4 includes two significance categories, evidence will be provided to support the reporting of a single significance category.

4.5.18 Slight, moderate, large or very large effects may be beneficial or adverse. Except where guidance requires otherwise, the significance of effect is described using the terms **very large, large, moderate, slight and neutral**. In terms of the EIA Regulations, 'significant' effects are generally those where the significance of the effect is 'moderate' or greater. Effects determined to be slight or neutral are deemed 'non-significant', and as such will not be reported in detail in the ES and will not require specific mitigation. The exception to this is where the combination of multiple slight effects has the potential to lead to a significant (i.e. moderate or above) cumulative effect.

4.5.19 Not all environmental factors use the above approach. For example, some topics do not use a matrix-based approach but instead use numerical values to identify impacts (e.g. noise and vibration). The approach for each environmental factor is defined in the relevant DMRB standard.

4.5.20 The assessment of the significance of environmental effects shall cover the following factors:

- the receptors/resources (natural and human) which would be affected and the pathways for such effects;
- the geographic importance, sensitivity or value of receptors/resources;
- the duration (long or short term); permanence (permanent or temporary) and changes in significance (increase or decrease);
- reversibility - e.g. is the change reversible or irreversible, permanent or temporary;
- environmental and health standards (e.g. local air quality standards) being threatened; and

- feasibility and mechanisms for delivering mitigating measures, e.g. Is there evidence of the ability to legally deliver the environmental assumptions which are the basis for the assessment?

4.6 Duplication of assessment

4.6.1 The ES will be prepared, taking into account other relevant environmental assessments with a view to avoiding duplication of assessment.

Habitats Regulations Assessment (HRA)

4.6.2 A HRA Screening has been undertaken for each Special Area of Conservation (SAC) and Special Protection Area (SPA) that could be affected. Where a likely significant effect could not be dismissed beyond reasonable scientific doubt, this will determine any requirement for an Appropriate Assessment. The HRA Screening and any subsequent assessments will define any requirement for mitigation that is necessary to ensure there is no adverse effect on the integrity of these sites, alone or in combination with other plans and projects. Any required mitigation would then be incorporated into the proposed scheme. Details of these assessments will be included within the ES and the full reports will accompany the DCO application.

Water Framework Directive (WFD) Compliance Assessment

4.6.3 A WFD Compliance Assessment will be produced alongside the ES. This PEI report will consider the extent to which the proposed scheme could impact on the current and future target WFD status of the water bodies. Where potential adverse effects are identified, an assessment of these effects will inform what mitigation measures need to be incorporated into the design and construction methods of the proposed scheme to remove or reduce the effect. The results will be presented in the ES.

4.7 Design, mitigation and enhancement measures

4.7.1 One of the key requirements of an EIA is that measures are taken to avoid, reduce and, where possible, remedy significant adverse environmental effects. These are termed mitigation measures and their development is part of an iterative EIA process.

4.7.2 Environmental assessment and design shall incorporate mitigation measures using a hierarchical system as per Table 4-5.

Table 4-5 Mitigation hierarchy

Mitigation hierarchy	Description
1 avoidance and prevention	Design and mitigation measures to prevent the effect (e.g. alternative design options or avoidance of environmentally sensitive sites).
2 reduction	Where avoidance is not possible, then mitigation is used to lessen the magnitude or significance of effects.
3 remediation	Where it is not possible to avoid or reduce a significant adverse effect, these are measures to offset the effect.

4.7.3 Mitigation measures shall be developed in response to the findings of surveys, initial assessments and consultation. These mitigation measures shall be designed principally to address impacts whose occurrence, timing and location

can be predicted in advance and are intrinsic to the design of the proposed scheme.

4.7.4 Environmental assessment shall report on the following categories of mitigation:

- **embedded mitigation**: project design principles adopted to avoid or prevent adverse environmental effects; and
- **essential mitigation**: measures required to reduce and if possible offset likely significant adverse environmental effects, in support of the reported significance of effects in the environmental assessment.

Embedded mitigation

4.7.5 The first preference in mitigating any impact is to seek engineering design measures to entirely avoid or eliminate the impact. Where this is not possible, the mitigation should seek to reduce the magnitude of the impact. Impacts can be avoided or reduced, for instance, through changes to the horizontal or vertical alignment of the proposed scheme, junction strategy or other aspects of the proposed scheme layout; or through changes in the methods and/or materials to be used in construction.

4.7.6 The proposed scheme assessed within this PEI report includes a number of engineering design measures that have been designed to avoid or reduce significant adverse environmental effects arising, where practicable. Those measures forming part of the scheme design are summarised within Chapter 2 The Project. Such measures are therefore not proposed or reported in this PEI report as mitigation.

Essential mitigation

4.7.7 Where avoidance of an impact through engineering design measures is not possible, or is only partly effective, further mitigation measures may be required. Essential mitigation falls into three broad categories:

- Measures that do not remove an impact but make it less significant. A typical example on the proposed scheme includes planting trees to screen views of the road where it is visually intrusive.
- The like-for-like replacement of a feature that would be lost. For example, this includes the creation of hedgerows on the proposed scheme alignment to replace those that cannot be avoided.
- The provision of a beneficial effect that is related to the impact but is not a like-for-like replacement of the feature to be lost. A typical example would be the construction of a bridge to replace an existing culvert, allowing associated watercourse renaturalisation and improving the wildlife corridor function.

4.7.8 Mitigation measures can produce adverse as well as beneficial effects e.g. an environmental noise barrier can increase visual intrusion.

4.7.9 Measures identified during the EIA process to further prevent, reduce and, where possible, offset any adverse effects on the environment will be described in the relevant topic chapters and shown on the Environmental Master Plans as part of the DCO application.

4.7.10 The essential mitigation measures identified in the topic chapters of the ES will be summarised in the Register of Environmental Actions and Commitments (REAC),

contained within the Environmental Management Plan (EMP) as part of the DCO application.

4.7.11 The significance of an effect is reported after an assessment of the effectiveness of the design and mitigation measures (the residual effect). Assigning significance to an effect after an assessment of the effectiveness of the design allows for positive contribution of all mitigation that is effective, deliverable and committed.

Construction mitigation

4.7.12 There are potential impacts to the environment that could occur as a result of the construction process including incidents during construction. The timing and location of these impacts cannot be accurately predicted at this stage. An example would include spillages of fuels, oils or other chemicals.

4.7.13 The assessment considers reasonably foreseeable construction impacts. The likelihood of occurrence and the severity of any such incidents can be reduced through good construction site management practices. To help ensure adequate consideration of risks identified during the EIA which would relate to the construction period, an Environmental Management Plan (EMP) will be prepared. This will set out how construction stage mitigation measures would be implemented to manage those risks and certain requirements for the contractors.

4.7.14 The EMP will detail the roles and responsibilities, control measures, training and briefing procedures, risk assessments and monitoring systems to be employed during planning and construction for all relevant environmental factor areas.

4.7.15 Each PEI report topic chapter describes measures identified to date to be adopted during construction to avoid and reduce environmental effects, such as pollution control measures.

Implementation and enforcement of mitigation

4.7.16 Mitigation will be secured by way of requirements in the DCO. The proposed scheme must comply with these requirements.

4.7.17 An EMP will be implemented and is secured through a Requirement of the DCO. This will be approved in line with the EMP submitted with the DCO application as part of the ES.

4.7.18 Contractors at detailed design and construction will be obliged to comply with the Requirements of the DCO.

Environmental enhancement

4.7.19 Enhancement is a measure that is over and above what is required to mitigate the adverse effects of a scheme. Enhancement opportunities will be considered throughout the design development and shall be reported within the ES topic chapters.

4.7.20 The following items may be relevant to the design and delivery of enhancement opportunities:

- national and local policy requirements;
- policy and performance requirements of the overseeing organisation; and
- scheme specific objectives.

4.7.21 Where essential mitigation is being delivered for other purposes, this offers an enhancement opportunity where it does not compromise the original objective of that land.

4.8 Monitoring

4.8.1 Where the environmental assessment reported in the ES concludes that there are significant adverse environmental effects, schemes must undertake proportionate monitoring of associated mitigation measures, in accordance with the EIA Directive.

4.8.2 Mitigation and monitoring measures shall be identified and developed through the design and environmental assessment process and documented in the ES.

4.8.3 Monitoring measures should be undertaken as required during construction, handover and through the operation and maintenance periods. These measures will be secured by the EMP, to be submitted with the DCO application.

4.9 Major accidents and disasters

Introduction

4.9.1 This section presents the preliminary findings of the route-wide assessment of likely significant environmental effects arising directly from the proposed scheme if it were to be affected by a major accident and/or disaster (hereafter termed ‘major events’).

4.9.2 The 2014/52/EU EIA Directive, superseding the 2011/92/EU EIA Directive, has been transposed into UK legislation, including, but not limited to the Town and Country Planning (EIA) Regulations 2017 (devolved between England, Wales, Scotland and Northern Ireland), and the Infrastructure Planning (EIA) Regulations 2017. The legislative context is described in PEI report Appendix 4.1 Major accidents and disasters legislation and methodology.

4.9.3 The regulations require consideration of the expected significant adverse effects of the proposed scheme on the environment deriving from the vulnerability of the proposed scheme to major events. This section sets out the legislation and methodology behind the assessment and presents a baseline of existing sources of risk assessment to provide an assessment of the probability, likelihood and frequency of a major event deriving from the vulnerability of the proposed scheme.

4.9.4 The study area for this assessment will be the DCO boundary of the proposed scheme plus a 500m buffer around the proposed scheme.

4.9.5 The methodology is provided in PEI report Appendix 4.1 Major accidents and disasters legislation and methodology. This describes the approach used to assess the potential for significant effects (during construction and operation) of major accidents and disasters and the assumptions and exclusions.

Terminology

4.9.6 For the purpose of this assessment, a major event is defined as an event that threatens immediate or delayed loss of life or permanent injury and/or serious long lasting or permanent damage to the environment and requires the use of resources beyond those of the client or its contractors to manage. This could be

internal to the proposed scheme (e.g. retaining wall collapse) or an external event that could affect the proposed scheme (e.g. a flood).

4.9.7 A disaster is defined as a naturally occurring phenomenon such as an extreme weather event (e.g. storm, flood, temperature) or ground-related hazard events (e.g. subsidence, landslide, earthquake) with the potential to cause an event or situation that meets the definition of a major event.

4.9.8 Major events shall include both man-made and naturally occurring events.

4.9.9 Vulnerability refers to 'exposure and resilience' of the proposed scheme to the risk of a major accident and/or natural disaster in the context of the 2014 EU EIA Directive. An identified, unplanned event, which is considered relevant to the proposed scheme and has the potential to be a major accident or natural disaster, subject to assessment of its potential to result in significant adverse effects on an environmental receptor, is referred to as a 'risk event'.

Baseline conditions

4.9.10 The baseline conditions for the study area are discussed in each of the relevant PEI report chapters.

4.9.11 In addition, the assessment of major incidents and disasters shall consider previous major events in the study area as part of the baseline. The main sources of historical major events in the area of the proposed scheme are vehicle collisions due to inclement weather.

4.9.12 Snow is known to fall on Crickley Hill, which often causes long delays on the A417. On 15 November 2019 this caused widespread flooding resulting in school closures and long delays for motorists especially from the Air Balloon roundabout through Birdlip and onto Cowley[8].

4.9.13 Low visibility due to fog is common around the Air Balloon roundabout. This has been known to cause road accidents and long queues[9].

Stage 1 Long list

4.9.14 A provisional assessment has been undertaken as described in PEI report Appendix 4.1 Major accidents and disasters legislation and methodology. The long list is provided in PEI report Appendix 4.2 Major accidents and disasters long list and short list.

Stage 2 Short list screening

4.9.15 The provisional short list is provided in PEI report Appendix 4.2 Major accidents and disasters long list and short list and includes 20 major events. Of these, eight have been identified for further consideration. These include:

- slope instability, including landslides and rockfall;
- sinkholes;
- flooding;
- blizzards, storms and gales;
- air quality events;
- structural failure (i.e. bridge collapse);
- pollution of watercourses; and
- demolition contamination

4.9.16 Appendix 4.2 Major accidents and disasters long list and short list provides details of where these are given consideration.

4.10 Consideration of climate change

4.10.1 The PEI report considers effects related to climate change as per the requirements of EU Directive 2014/52 and the 2017 EIA Regulations. Chapter 14 Climate outlines a preliminary assessment of the effect of the proposed scheme on climate and the vulnerability of the proposed scheme to climate change. The combined effects of the proposed scheme and potential climate change on the receiving environment, resources, and community (the in-combination climate change impacts) are considered by each topic chapter, and the preliminary findings are presented as an appendix to the climate chapter of this PEI report.

4.10.2 Climate change projections have been embedded into the future baseline of the technical assessments. Current and future climate baselines are outlined in Chapter 14 Climate for key climate parameters, including winter and summer temperature and precipitation. The projections have been obtained from the Met Office UK Climate Projections 2018 (UKCP18), which provides the most up-to-date assessment of how the climate of the UK may change over the 21st century.

4.10.3 Climate change is considered in both the assessment of the proposed scheme effects and the design of mitigation and enhancement measures. The consideration of the proposed scheme's resilience to climate change will be assessed qualitatively, based on the future climate trends outlined in Chapter 14 Climate. The assessment of the proposed scheme's contribution to climate change, through release of greenhouse gas emissions, is a quantitative assessment against the UK Government's carbon budgets.

End Notes & References

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[4] Highways England (July 2019) DMRB LA 101 - Introduction to environmental assessment
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