

M5 Junction 10 Improvements Scheme

Change Application 2 Environmental Statement Addendum TR010063 – APP 10.23

Nationally Significant Infrastructure Projects: Changes to an application after it has
been accepted for examination

Planning Act 2008

Volume 10
October 2024

Infrastructure Planning Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

M5 Junction 10 Improvements Scheme Development Consent Order 202[x]

DCO Change Application Environmental Statement Addendum

Regulation Number:	Regulation 5 (2) (a)
Planning Inspectorate Scheme Reference	TR010063
Application Document Reference	TR010063/APP/10.23
Author:	M5 Junction 10 Improvements Scheme Project Team

Version	Date	Status of Version
Rev 0	October 2024	Change Application 2

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Non-Technical Summary

Overview

An application seeking a Development Consent Order (DCO) for the M5 Junction 10 Improvements Scheme (the Scheme) was submitted by Gloucestershire County Council (The Applicant) to the Planning Inspectorate on 19 December 2023 and accepted for Examination on 16 January 2024. The Scheme involves improvements to the M5 Junction 10, consisting of a new all-movements junction; the widening of the A4019 east of the M5 J10 to the Gallagher Retail Park Junction; and a new West Cheltenham Link Road (Link Road) (the Link Road from the A4019 to the B4634). A small section of the A4019 will also be widened to the west of the M5 J10.

The Applicant is proposing eight changes to the Scheme during the Examination stage.

Change Application 1

In relation to Change Application 1, the proposed changes (Change 8 of the Notification Letter) constitute an upgrade on the rights sought in relation to specific plots within the Order limits. The proposed changes included in Change Application 1 do not translate into any works and do not constitute development. As a result, Change Application 1 does not trigger the requirement for environmental assessment.

Change Application 2

In parallel with the DCO process, the design has been evolving from preliminary to detailed design, together with further stakeholder engagement. Opportunities to deliver a more efficient, sustainable and affordable Scheme have been identified.

Change Application 2 includes seven changes as described in previous submissions to the Secretary of State c/o The Planning Inspectorate.

The seven changes are:

- Change 1 - Link Road replacement of swales with filter drains
- Change 2 - Link Road replacement of box culverts with bridges
- Change 3 - Link Road River Chelt bridge structural form
- Change 4 - Link Road alignment
- Change 5 - Relocation of existing National Roadside Telecommunications Service (NRTS) transmission station (TS)
- Change 6 - Flood storage area (FSA) reconfiguration
- Change 7 - Infill of existing northbound on-slip loop

This Environmental Statement Addendum (ESA) presents an assessment of whether any new or different potential significant effects are likely to result from the changes to the Scheme and seeks to support the Examining Authority (ExA) in developing an informed view of the likely significant effects of the Scheme.

Environmental Conclusions

It is considered that the seven changes will either result in no change or a betterment to the significance of effects as reported in the Environmental Statement (ES) [TR010063 - APP 5.9 to APP 6.13] submitted for the DCO application (and the subsequent updates submitted into DCO Examination through to Deadline 5), hereon referred to as the ES.

1. Introduction

1.1. Background

- 1.1.1. This Environmental Statement Addendum (ESA) relates to an application submitted by Gloucestershire County Council (the Applicant) to the Secretary of State for Transport (through the Planning Inspectorate) for a Development Consent Order (DCO) under the Planning Act 2008. The M5 Junction 10 Improvements Scheme (the Scheme) involves improvements to the M5 Junction 10, consisting of a new all-movements junction; the widening of the A4019 east of the M5 J10 to the Gallagher Retail Park Junction; and a new West Cheltenham Link Road (Link Road) (from the A4019 to the B4634). A small section of the A4019 will also be widened to the west of the M5 J10.
- 1.1.2. A DCO application for the Scheme was accepted for examination by the Planning Inspectorate on 16 January 2024 (DCO Application). The Scheme is currently in examination which started on 4 June 2024 and is due to close on 4 December 2024.
- 1.1.3. Since the DCO application was made, the Applicant has continued to refine designs to identify opportunities to further improve the Scheme to deliver a more efficient, sustainable and affordable Scheme. As a result of this, the Applicant is proposing seven changes to the Scheme during the Examination stage to implement improvements to the Scheme.
- 1.1.4. Notification of the intention to submit 8 non-material changes was made to the ExA on 12 August 2024 [AS-061]. The ExA issued a Rule 9 letter in respect of the proposed changes on 21 August 2024 [PD-014]. Since then, the Applicant has decided to split the proposed change application into two separate applications, to differentiate between those aspects of the proposed changes that relate exclusively to upgrades in the rights the Applicant is seeking and engage the Infrastructure Planning (Compulsory Acquisition) Regulations 2010 ("CA Regulations") ("Change Application 1") [which includes Change 8 as set out in the Notification Letter] and those that relate to changes in the design of the Scheme ("Change Application 2") [which includes Changes 1 to 7 as set out in the Notification Letter]. This is to ensure the necessary Statutory Consultation and examination of change can be accommodated in the time left in the examination.
- 1.1.5. Change Application 1 was accepted, and acceptance recorded in the Rule 9 letter issued by the ExA on the 17 September 2024.
- 1.1.6. The proposed changes included in Change Application 1 (Change 8 of the Notification Letter) do not translate in any works and do not constitute development. As a result, Change Application 1 does not trigger the requirement for environmental assessment.
- 1.1.7. Change Application 2 includes seven changes as described in previous submissions to the Secretary of State c/o The Planning Inspectorate. The seven changes to the Scheme are:
- Change 1 - Link Road replacement of swales with filter drains
 - Change 2 - Link Road replacement of box culverts with bridges
 - Change 3 - Link Road River Chelt bridge structural form
 - Change 4 - Link Road alignment
 - Change 5 - Relocation of existing National Roads Telecommunication Services (NRTS) Transmission Station (TS)
 - Change 6 - Flood storage area (FSA) reconfiguration
 - Change 7 - Infill of existing northbound on-slip loop

1.2. Purpose of this Environmental Statement Addendum

- 1.2.1. The purpose of this ESA is to present an assessment of whether any new or different significant effects are likely to result from the seven changes to the Scheme, and to support the ExA in developing an informed view of the likely significant environmental effects of the Scheme, with the changes incorporated into it.
- 1.2.2. This ESA only considers whether there are changes to the assessment outcomes provided in the ES. If no change is listed in this ESA, then the conclusions are the same as those presented in the ES.

1.3. Structure of this Environmental Statement Addendum

- 1.3.1. This ESA follows a similar structure to the ES submitted with the DCO application, but with a focus on areas that have changed as a result of the changes. The structure of this ESA is set out in Table 1-1.
- 1.3.2. Where relevant, this ESA cross refers to the ES (as submitted into DCO Examination through to Deadline 4) to explain how the changes have changed the submitted ES. In these instances, where the changes are accepted, the information contained in this ESA supersedes the information presented in the submitted ES and represents the updates to the ES chapters.

Table 1-1 Structure of this ESA

Subject	Description
Non-technical summary	A summary of the ESA using non-technical language.
Chapter 1: Introduction	A brief introduction to the proposed DCO changes and the purpose and structure of the ESA, including approach to consideration of legislation and policy.
Chapter 2: Proposed DCO application changes	Description of the seven proposed design changes, including the reasons why the changes are being proposed.
Chapter 3: Assessment of alternatives	Describes changes to the assessment of alternatives. This section notes that the seven proposed design changes are alternatives to the Scheme.
Chapter 4: Consultation	Summary of the targeted non-statutory consultation undertaken for the proposed DCO changes.
Chapter 5: Environmental assessment methodology	Describes the scope, assessment methodology, and assumptions and limitations for this ESA.
Chapter 6: Air quality	Describes whether there will be any changes to the outcomes of each topic assessment, as set out in the relevant topic assessment, as a result of the proposed seven design changes.
Chapter 7: Noise and Vibration	
Chapter 8: Biodiversity	
Chapter 9: Road Drainage and Water Environment	
Chapter 10: Landscape and Visual	

Subject	Description
Chapter 11: Geology and Soils	
Chapter 12: Cultural Heritage	
Chapter 13: Materials and Waste	
Chapter 14: Population and Human Health	
Chapter 15: Climate	
Chapter 16: Cumulative effects assessment	Describes any changes to the cumulative effects assessment as a result of the proposed design changes.
Chapter 17: Summary	Summarises the ESA and describes any changes to the ES Summary chapter as a result of the proposed design changes.
References, acronyms, glossary	References and a definition of acronyms and technical terms used in the ESA.
Figures	Figures showing the proposed design changes.

1.3.3. Plans submitted as part of the DCO application have been updated for Change Application 2, where they are relevant to the changes. The updated plans only comprise the sheets of the plans that are relevant to the changes. If the changes are accepted by the ExA, then updated whole sets of plans will be submitted into Examination and will supersede the versions of those plans already in Examination.

1.4. Legislation and policy

1.4.1. To ensure a like for like consideration of the assessment outcomes no changes in legislation or policy have been considered in this ESA.

1.5. Competency statement

1.5.1. This ESA has been completed by Arcadis on behalf of the Applicant.

1.5.2. Arcadis is registered to the Institute of Environmental Management and Assessment's (IEMA) Environmental Impact Assessment (EIA) Quality Mark. The IEMA EIA Quality Mark is a commitment to excellence in EIA activities and to allow Arcadis' EIA activities to be independently reviewed by IEMA.

1.5.3. The chapters of the ESA were prepared by suitably qualified and experienced environmental consultants, or technical specialists. Table 1-2 lists the qualifications of the authors and reviewers of each chapter within the ESA.

Table 1-2 Statement of Competence

Chapter number	Chapter title	Author qualifications	Reviewer qualifications
Chapter 1	Introduction	BSc (Hons), MIEMA, REIA CEnv	BSc MSc CGeog PIEMA REIA APMP
Chapter 2	Proposed DCO application changes	BSc (Hons), MIEMA, REIA, CEnv	BSc MSc CGeog PIEMA REIA APMP
Chapter 3	Assessment of alternatives	BSc (Hons), MIEMA, REIA CEnv	BSc MSc CGeog PIEMA REIA APMP
Chapter 4	Consultation	BSc (Hons), MIEMA, REIA CEnv	BSc MSc CGeog PIEMA REIA APMP
Chapter 5	Environmental Assessment methodology	BSc (Hons), MIEMA, REIA CEnv	BSc MSc CGeog PIEMA REIA APMP
Chapter 6	Air quality	MSc, BSc, MIAQM, AIES	BSc (Hons), MRes, MIEnvSc, MIAQM, CEnv
Chapter 7	Noise and vibration	BSc, PGDip, TechIOA	MIOA, PGDip
Chapter 8	Biodiversity	BSc (Hons) MSc MBA CEnv MCIEEM PIEMA CMgr MCMI	BSc (Hons) CEnv MCIEEM
Chapter 9	Road Drainage and Water Environment	Surface water quality, Hydromorphology/WFD - BSc, MSc, MCIWEM Flood Risk BSc(Hons), MSc, CWEM, MCIWEM Groundwater - MSc FGS CGeol BSc, MSc CGeol MSci (Hons), GradCIWEM. MSci (Hons) C.WEM BSc MSc MCIWEM CWEM	MSc (BU et Cagliari), CEng BSc, MSc, MCIWEM C.WEM
Chapter 10	Landscape and Visual	MPhil, BSc, CMLI	CMLI, MADip, BA (Hons)
Chapter 11	Geology and soils	Geology/Land quality - BSc, MSc, FGS Soils - BSc MSc PhD CSci MISoilSci FACTS	Geology/Land quality - BSc MSc CEnv MIEnvSc FGS

Chapter number	Chapter title	Author qualifications	Reviewer qualifications
Chapter 12	Cultural Heritage	BA (Hons) PCIFA	BA (Hons), MA
Chapter 13	Materials and Waste	MSc, BSc (Hons), FRGS, CWEM, MCIWEM, MCIWM	BSc (Hons) MSc MCIWM FGS APMP
Chapter 14	Population and human health	BSc, MSc, AMIOA	BSc MSc CGeog PIEMA REIA APMP
Chapter 15	Climate	Carbon - BSc, PhD, FIEMA, CEnv. Climate Resilience - BSc, MSc, GradIEMA	MSc, BSc, MSc, PIEMA
Chapter 16	Cumulative effects assessment	BSc (Hons), PIEMA, CEnv	BSc MSc CGeog PIEMA REIA APMP
Chapter 17	Summary	BSc, MSc, AMIOA	BSc MSc CGeog PIEMA REIA APMP
Non-Technical Summary	Non-Technical Summary	BSc, MSc, AMIOA	BSc MSc CGeog PIEMA REIA APMP

2. Proposed DCO application changes

2.1. Overview

2.1.1. This ESA covers seven changes forming part of Change Application 2, which are:

- Change 1 - Link Road replacement of swales with filter drains
- Change 2 - Link Road replacement of box culverts with bridges
- Change 3 - Link Road River Chelt bridge structural form
- Change 4 - Link Road alignment
- Change 5 - Relocation of existing NRTS TS
- Change 6 - FSA reconfiguration
- Change 7 - Infill of existing northbound on-slip loop

2.1.2. The above proposed design updates, as well as the reason for the changes, are described below in Sections 2.2 to 2.8 of this ESA and are reflected in the design drawings submitted with Change Application 2.

2.2. Change 1 - Link Road replacement of swales with filter drains

Change description

2.2.1. The Scheme submitted as part of the DCO application proposed three swales as the surface water collection method on the Link Road. The change is to replace these swales with filter drains. The change is shown in General Arrangement Plan – Sheets 12, 15 and 16.

2.2.2. Furthermore, the cross-section of the Link Road will be altered which allows the number of filter drain runs to be reduced from three to two. In combination with the optimisation of the two-way footway cycleway in Change 4, these changes result in a 4m reduction in the width of the Link Road. The land in the 4m width reduction will be seeded/planted. The top of the filter drain would be finished with a topsoil/seed mix.

Reasons for change

2.2.3. The change would allow the width of the Link Road to be reduced. This would decrease the quantity of fill material to be imported, and the footprint of the Link Road in the floodplain. Filter drains would also provide hydraulic connectivity across the structures (River Chelt Bridge and the bridges) and farm accesses.

2.3. Change 2 - Link Road replacement of box culverts with bridges

Change description

2.3.1. In the Scheme submitted as part of the DCO application, the flood alleviation structures on the Link Road consist of two sets of culverts constructed from pre-cast units. The change is to improve this arrangement by changing the structural form of this flood conveyance from culverts to bridges. The change is shown in Structural Details – New West Cheltenham Link Road Flood Alleviation Bridge 1 Sheet 5 of 12 and Structural Details – New West Cheltenham Link Road Flood Alleviation Bridge 2 Sheet 6 of 12.

Reasons for change

- 2.3.2. The change will reduce risk in the construction programme, reduce the potential for construction impacts on the floodplain, and improve the structural performance of the structure. The change will also provide minor improvements in ecological connectivity and the passage of floodwater.

2.4. Change 3 - Link Road River Chelt bridge structural form

Change description

- 2.4.1. In the Scheme submitted as part of the DCO application the River Chelt bridge is a skewed structure with reinforced earth wing walls and a skewed span of 26.38m. The Scheme also includes some reprofiling of the existing riverbank to reduce the risk of erosion and create more natural channel profiles. The change is to utilise the requirement for the reprofiling works to straighten the river under the Link Road River Chelt Bridge (to run perpendicular to the Link Road), thereby allowing the installation of a straight (rather than skewed) structure with abutments running perpendicular to the Link Road. To mitigate for the section of straightened channel, the River Chelt will be realigned to exaggerate the natural meandering upstream and downstream of the River Chelt bridge. The pools and riffles between meanders described in the ES will be retained. The ES Scheme mitigation, including enhancements to riparian vegetation, bank reprofiling to create more natural profiles and installation of in channel enhancements, will also be further developed within the Order limits which are extended 160m upstream and 100m downstream of the River Chelt Link Road bridge. A constructability review by the Applicant has identified the need for a temporary diversion channel to allow for the construction of the River Chelt reprofiling and mitigation associated with the Link Road River Chelt bridge. The requirement for the temporary diversion was not assessed as a construction activity within the ES. A temporary diversion would also be required for the change but would be no different from the diversion identified from the constructability review for the Scheme. To ensure any impacts from the temporary diversion are suitably mitigated, the Register of Environmental Actions and Commitments (REAC) [REP4-018] will be updated (B23, WE1 and WE3) as this was not included in the ES. The updated details are provided by the Applicant in the 'Summary of Changes to the Register of Environmental Actions and Commitments' document [APP 10.26], submitted as part of the Change application 2.
- 2.4.2. The change is shown in Structural Details – New West Cheltenham Link Road River Chelt Bridge Sheet 4 of 12 and Environmental Master Plan Sheet 15 of 16.

Reasons for change

- 2.4.3. The change will improve constructability of the River Chelt Bridge, thereby reducing risk in the construction programme, and will improve the long-term performance of the River Chelt Bridge structure.

2.5. Change 4 - Link Road alignment

Change description

- 2.5.1. The Link Road is to be constructed on an embankment, consisting primarily of imported fill material. The vertical limit of deviation (LoD) set out in Article 8 of the draft DCO is a maximum of 0.5 metres upwards or 1.0 metre downwards, in the height of the Link Road. The Scheme design for the Link Road includes a 4m wide two-way cycleway.
- 2.5.2. The change is to optimise the vertical alignment of the Link Road beyond the LoD, by reducing the height of the embankment by over 1m in localised areas. In addition, the Applicant proposes to reduce the width of the two-way footway cycleway from 4m to 3m to optimise the width of the Link Road. A review of the potential number of future cyclists identified that a 3m wide cycleway would be more than sufficient for the number of users

identified. The land in the 4m width reduction will be seeded/planted. The change is shown in General Arrangement Plan – Sheets 12, 15 and 16 and Engineering Section Drawings Plan and Profiles Sheet 5 of 7.

Reasons for change

- 2.5.3. The change would reduce the volume of fill materials required, with associated environmental benefits, particularly carbon benefits. It would also reduce the footprint of the Link Road in the floodplain.

2.6. Change 5 - Relocation of existing NRTS TS

Change description

- 2.6.1. In the Scheme submitted as part of the DCO application the Uckington TS is located in very close proximity (4.9m) to the construction works proposed for the Piffs Elm interchange. It is proposed that the TS is relocated, and a new, modular TS is constructed within the Order limits and highway boundary, approximately 2.6km south of the current location. There will be very limited vegetation clearance required for this change, as the footprint of the TS will be smaller than the existing substation and will be located on existing hardstanding adjacent to the M5 southbound carriageway.
- 2.6.2. Once the TS is relocated, retaining walls will no longer be required for the Piffs Elm North bridge. As a result, the retaining walls on the north side of the east and west abutments would be replaced with planted embankments. The change is shown in General Arrangement Plan – Sheets 5 and 8 and Structural Details New Piffs Elm Interchange Bridge North Sheet 1 of 12 and Sheet 2 of 12.

Reasons for change

- 2.6.3. The proximity of the TS to the construction works, within the Scheme, poses significant health and safety risk to operatives, and also poses risk to the operation of the TS. It is therefore not appropriate to retain the TS at its current location.
- 2.6.4. Further to the conclusions in ES Chapter 13: Population and Human Health [REP1-022], the Applicant completed a constructability review of the retaining walls proposed for the Piffs Elm north bridge eastern abutment. The Applicant identified that the proximity of the TS to the construction works for the retaining wall poses significant health and safety risk to operatives, and also poses risk to the operation of the TS.

2.7. Change 6 - Flood storage area reconfiguration

Change description

- 2.7.1. In the Scheme submitted as part of the DCO application, a FSA (c.82,000m³ of below ground storage with c.200,000m³ of total excavated material) is proposed to the south-east of the Piffs Elm Interchange, between the M5 Corridor, A4019 and Link Road. This FSA would sever the existing hydraulic connectivity that conveys floodwater from south to north of the A4019. The M5 and A4019 road embankments would act as impoundment structures and the FSA would need to be registered as a large, raised reservoir under the Reservoirs Act 1975. This would place onerous responsibilities on maintaining parties and been raised as an area of significant concern by National Highways.
- 2.7.2. The change will amend the FSA design as follows:
- Provide two separate basins to store approximately 23,500m³ and 62,000m³ entirely below the current ground level (which would require a total excavation of c.145,000m³ of material), with conveyance channels to pass flood water under the M5 and the A4019 road embankments. The larger basin would be a reservoir under the

Reservoirs Act 1975. Under the current legislation the smaller basin would not be a reservoir and would be designed as an operational wetland.

- New culverts will be created under the A4019, with a new channel to carry flows to Leigh brook, which then passes under the M5 through Barn Farm culvert (also referred to as the Leigh brook culvert). In order to create sufficient space for the new channel to Leigh brook, the M5 southbound off-slip road has been shortened by 55m to 348m total length. No departure is required for this adjustment.
- Lower the Withybridge A4019 Underpass invert level to convey flood water during the design flood event under the A4019.
- Replace the existing 750mm pipes under A4019 with new culverts.

2.7.3. The change is shown in General Arrangement Plan – Sheets 5, 6 and 12 and Engineering Section Drawings Plan and Profiles Sheet 2 of 7.

Reasons for change

2.7.4. The change would reduce the maintenance responsibilities (when compared to the Scheme) by removing the requirement to use either the M5 or the A4019 road embankments as a means of impounding a reservoir.

2.8. Change 7 - Infill of existing northbound on-slip loop

Change description

2.8.1. In the Scheme submitted as part of the DCO application, the existing M5 junction 10 northbound on-slip loops onto the M5 carriageway. The change is to infill the loop with site won material to provide a new, raised platform to extend woodland planting from the retained vegetation at the outer bank of the existing slip road and provide strengthened screening of the Piffs Elm Interchange. The change is shown in Environmental Master Plan Sheet 5 of 16.

Reasons for change

2.8.2. The change would provide woodland planting to improve visual screening of Piffs Elms Interchange and allow site won material to be reused with associated carbon and financial benefits.

2.9. Land take

2.9.1. No additional land take will be required for the changes. All of the changes can be accommodated within the Order limits of the Scheme.

2.10. Traffic

2.10.1. There may be localised changes to construction traffic due to the reductions in materials required at certain locations resulting from the changes. However, changes in construction traffic movements or composition are not anticipated to be of sufficient magnitude to materially change the construction phase traffic flows or traffic volumes considered in the ES.

2.10.2. The changes will not alter the proposed operational traffic flows or traffic volumes, which will remain as considered in the ES.

2.11. Construction

2.11.1. The changes will not change the location of site compounds.

- 2.11.2. The Scheme construction programme and associated temporary traffic management / road closures are highly unlikely to change due to the nature of the changes.

3. Assessment of alternatives

- 3.1.1. ES Chapter 3: Assessment of alternatives [APP-062] summarises the design development for the Scheme. The purpose of the chapter is to show how alternative designs, including associated environmental implications have been considered throughout the design development process.
- 3.1.2. With regards to the proposed changes, an alternative has been considered for Change 6 (FSA reconfiguration). The alternative solution provided flood storage north of the A4019 in order to reduce the storage volume required south of the A4019. This proposal would have been within the Scheme's Order limits but would have required additional permanent land acquisition and interference with private rights. This solution was discarded by the Applicant due to the additional constraints in the extent to which the land required for this alternative could be used.
- 3.1.3. This ESA considers the seven changes which essentially form alternatives to the Scheme. All information in ES Chapter 3: Assessment of Alternatives [APP-062] remains unchanged.

4. Consultation

4.1. Background

- 4.1.1. As part of the development of the Scheme, the Applicant undertook several consultations which informed the design that was submitted to the Planning Inspectorate as part of DCO application on 19 December 2023. Information on the consultation leading up to the DCO application can be found in the DCO application documents, including Chapters 5 to 14 [AS-012, AS-014, REP1-012, REP1-014, REP1-016, REP1-018, APP-070, REP1-020, REP3-022 and REP1-024].
- 4.1.2. The Scheme has been in Examination since 4 June 2024, during which: hearings have been held, written questions answered, written representations made, Local Impact Reports submitted by the local authorities, and site visits undertaken by the Examining Authority. During this Examination process, the Applicant identified the seven changes described in Chapter 2 of this ESA and undertook consultation with selected stakeholders on these changes, as summarised in Section 4.2 and 4.3.

4.2. DCO change application non-statutory consultation

- 4.2.1. The DCO change application non-statutory consultation meetings with key stakeholders and affected parties were held between 9 July 2024 and 11 July 2024, with further consultation on 19 August, 27 August and 17 September 2024. The purpose of these consultation meetings was to seek views on the seven changes to the DCO application submitted to the Planning Inspectorate in December 2023.
- 4.2.2. Meetings were held to present the seven changes to the Joint Councils, Natural England, Environment Agency, National Highways and Lead Local Flood Authority (LLFA). The presentation included an overview of each change, the reason for the change and a summary of any changes to the potential environmental effects. Future consultation with stakeholders will be undertaken in a similar manner as that to inform the DCO application.

4.3. Summary of DCO change consultation feedback

- 4.3.1. Feedback relating to the environment from key environmental stakeholders, relevant to the changes, is summarised in Table 4-1.

Table 4-1 Consultation comments from key environmental stakeholders

Stakeholder	Summary of feedback	How comments have been addressed
Cheltenham Borough Council	<p>Change 1 - Cheltenham Borough Council queried the cycleway reduction from 4m to 3m on the basis of the number of cyclists anticipated by the developers</p> <p>Change 2 – Cheltenham Borough Council request for the proposals to be shared with the Cheltenham Borough Council flood team for review.</p>	<p>Change 1 - N/A no action required. The Applicant confirmed that 3m is consistent with the provision of two-way cycleways elsewhere in the county. 4m is the maximum width required by LTN1/20 for cycle infrastructure design and the proposal exceeds the requirement for the number of cyclists reported.</p> <p>Change 2 – The Applicant has shared the proposals with the Applicant's LLFA as Cheltenham Borough Council do not currently have a flood team.</p>

Stakeholder	Summary of feedback	How comments have been addressed
	<p>Change 3 – Cheltenham Borough Council requested for the LLFA to be included in the consultation.</p> <p>Change 4 - no comments</p> <p>Change 5 - no comments</p> <p>Change 6 - Please give the LLFA early sight of these proposals.</p> <p>Change 7 - no comments</p>	<p>Change 3 – The Applicant has shared the proposals with the LLFA</p> <p>Change 4 – N/A no action required.</p> <p>Change 5 – N/A no action required</p> <p>Change 6 – The Applicant has shared the proposals with the LLFA.</p> <p>Change 7 – N/A no action required.</p>
Joint Councils	<p>Change 1 - The Joint Councils commented that filter drains would increase maintenance in comparison with swales.</p> <p>The Joint Councils queried why a vehicle restraint system (VRS) was not provided in the proposed cross-section.</p> <p>Change 2 – The Joint Council commented that this change provides significant betterment for maintenance personnel.</p>	<p>Change 1 – The Applicant confirmed that it was not hydraulically possible to provide swales for the full length of the Link Road and an alternative surface water collection method was required to achieve hydraulic connectivity. Swales can be implemented where possible, but this will be piecemeal and not achieve the potential reductions in cross section.</p> <p>The Applicant confirmed that the “standard” maintenance for filter drains is media replacement approx. every 10 years and catchpit cleaning every 5 to 10 years. The more routine maintenance of removing debris and litter, and cutting back vegetation, would be the same for the filter drains and the swales.</p> <p>No action required.</p> <p>The Applicant confirmed that during DF4 a Road Restraint Risk Assessment Process (RRRAP) assessment has been completed, which determines that VRS is only required on some sections of the Link Road. The RRRAP and VRS design will continue to develop through detailed design to ensure the hazards to road users are suitably mitigated.</p> <p>Change 2 – N/A no action.</p>

Stakeholder	Summary of feedback	How comments have been addressed
	<p>Change 3 – The Joint Council highlighted that the Environment Agency may apply constraints to working windows within the river due to ecology seasonality and queried if this will cause issues in the construction programme?</p> <p>The Joint Council commented that the Environment Agency has requested additional enhancements to the River Chelt, and this proposal may help to satisfy some of those requests.</p> <p>The Joint Council queried if sufficient width is provided on the banks under the bridge.</p> <p>Change 4 – The Joint Councils concluded that this change would be an easy win. The Joint Council queried why the DF3 design proposed a more conservative vertical alignment?</p> <p>Change 5 - no comments</p> <p>Change 6 - The Joint Councils seeks clarification on the proposals for Withybridge Underpass.</p> <p>Change 7 - no comments</p>	<p>Change 3 – The Applicant confirmed that the Scheme includes works within the channel of the River Chelt and seasonal constraints for this are already accounted for in the construction programme. The change is over the same length of the river as proposed in the Scheme, albeit they are more onerous. In order to maintain the same programme for the works in the river, the Contractor can allocate more plant to the works.</p> <p>The Applicant confirmed that the minimum widths on the banks under the bridge would be the same as those included in the DCO.</p> <p>Change 4 – The Applicant confirmed that the DF3 design is robust to ensure that all environmental impacts of the Scheme were suitably considered and accounted for in the DCO. Further to this, value engineering has been identified through design development. The DF3 was only a preliminary design.</p> <p>Change 5 – N/A no action</p> <p>Change 6 - The Applicant confirmed that Withybridge Underpass was kept artificially high in the Scheme, so it did not convey flows in the design flood event. The underpass has been lowered to the same level at which the current A4019 would be overtopped. In minor flood events (for example a 1in25-year) the underpass would remain dry. The headroom of the underpass has been checked to ensure suitable mitigation is still provided for bats.</p> <p>Change 7 – N/A no action</p>
Natural England	No comments	N/A

Stakeholder	Summary of feedback	How comments have been addressed
<p>Environment Agency</p>	<p>Change 1 – no comments</p> <p>Change 2 - The Environment Agency confirmed their preference was for bridges instead of for culverts.</p> <p>The Environment Agency confirmed the bridges must span the width of floodplain 3b.</p> <p>The Environment Agency stated that updated flood modelling will be required as the bridges will permit more flow underneath the link road. This is not necessarily negative but will need to be reviewed.</p> <p>The Environment Agency requested that groundwater with regards to the piling is considered in the ESA.</p> <p>Change 3 - The Environment Agency confirmed their preference for access underneath the structure is 8m + 5m although the minimum of 4m +4m is acceptable. This would have to be maintained in the proposed design.</p> <p>The Environment Agency confirmed that a square bridge is generally better.</p> <p>The Environment Agency queried that the environmental overview presented states that there would be no change to biodiversity, however the changes to the river would change the BNG (Biodiversity Net Gain).</p> <p>Change 4 - no comments</p> <p>Change 5 - no comments</p> <p>Change 6 – The Environment Agency queried if the proposal had been tested in the flood model?</p>	<p>Change 1 – N/A – no action</p> <p>Change 2 - N/A – no action</p> <p>Change 2 – The Applicant noted the comment on the span of the bridge for review in detailed design.</p> <p>The Applicant confirmed that initial flood modelling of the proposals has been carried out and verified against the conclusions of the ES. The modelling will be shared for Consultation.</p> <p>The Applicant noted this request, and it has been addressed in this ESA.</p> <p>Change 3 – The Applicant confirmed that the minimum widths provided in the Scheme would be maintained. The access provision will be reviewed and updated to ensure that the Environment Agency minimum requirements are met.</p> <p>No action required.</p> <p>The Applicant confirmed that the same BNG conclusions reported in the Environment Statement could be met. Although there would be a different impact in comparison with that from the Scheme, the overall conclusion of BNG should be the same.</p> <p>Change 4 – N/A no action</p> <p>Change 5 – N/A no action</p> <p>Change 6 – The Applicant confirmed that the change was a concept design, but it had been tested. There is an iterative process of tweaking the size and levels of the culverts and outlets to optimise the solution. The results of the flood</p>

Stakeholder	Summary of feedback	How comments have been addressed
	<p>The Environment Agency queried that if flood waters are being stored below ground level, will this affect groundwater?</p> <p>The Environment Agency asked would the model updates be consulted on as part of the requirement in the REAC [REP4-018] to agree detailed design, or will the models be shared as part of the consultation for the change?</p> <p>The Environment Agency asked what the solution (i.e. the proposed design change) considers with regards to groundwater?</p> <p>The Environment Agency would need cross-sections to review.</p> <p>The Environment Agency also requested a long section along the conveyance channel down the M5 to the River Chelt to be provided.</p> <p>The Environment Agency asked will the larger basin fill up from the River Chelt through the conveyance channels.</p> <p>The Environment Agency highlighted their need for models to review. The current floodplain would not return to the River Chelt so this would introduce a new return mechanism which the Environment Agency would want to review within the models. As long as design justification is provided within the submission this point this proposed</p>	<p>modelling will be submitted for Consultation.</p> <p>The invert level of the proposed ponds is the same as / comparable to the invert level of the reservoir in the DF3 proposals. The principles of the DF3 design with regards to groundwater will be maintained.</p> <p>The Applicant confirmed that the models are currently being reviewed. Once that check is complete, the models can be shared for consultation with an accompanying, explanatory technical note.</p> <p>The Applicant confirmed that the solution (i.e. the change) maintains the same assumptions and basin invert level as the proposal in the Scheme. Groundwater monitoring in the FSA will be completed this Winter to inform detailed design development.</p> <p>The Applicant confirmed that a long section has been created through the A4019, and through the ponds and the M5.</p> <p>The Applicant noted this and it will be provided as part of the formal DCO change consultation process.</p> <p>The Applicant confirmed that a non-return valve has been modelled in that channel to ensure that the basin will not fill from the River Chelt. The basin will not drain until flood levels in the River Chelt have dropped.</p> <p>Noted. Models will be provided as part of the consultation.</p>

Stakeholder	Summary of feedback	How comments have been addressed
	<p>design change will not need to be discussed further with the Environment Agency.</p> <p>Change 7 – no comments</p>	<p>Change 7 – N/A no action.</p>
<p>Environment Agency (National Team)</p>	<p>No comment.</p>	<p>N/A – no action.</p>
<p>National Highways</p>	<p>Change 1 – National Highways asked if the swales would be grassed? Assume this would impact BNG.</p> <p>Change 2 – National Highways commented that it appeared to be a positive change.</p> <p>Change 3 – National Highways queried if the Scheme included re-profiling of the river.</p> <p>Change 4 - No comments.</p> <p>Change 5 – National Highways queried if advanced works were essential or just possible and if the TS had to remain live during construction.</p>	<p>Change 1 – Yes, the swales were proposed to be grassed. The filter drains would be topsoiled and seeded with grass and the ditches for embankment drainage have been made sinuous to offset any reduction in BNG</p> <p>Change 2 – N/A no action required.</p> <p>Change 3 – The Applicant confirmed that the Scheme included re-profiling of the river.</p> <p>Change 4 – N/A no action required</p> <p>Change 5 – The Applicant confirmed that it would depend on the duration of the works. If a design was in place and it took weeks rather than months to construct the new TS and connect it, then advanced works may not be critical. The NRTS team did suggest that the new TS could be a cabinet site rather than a modular building, in which case the works could be completed under permitted development rather than the DCO. But this is subject to design by the NRTS team.</p> <p>The Applicant confirmed that the TS would need to remain live during construction. This was one of the design team’s key concerns as the interrupter bypass would have to dogleg through the works to feed the TS.</p>

Stakeholder	Summary of feedback	How comments have been addressed
	<p>National Highways queried if the TS was in National Highways land.</p> <p>National Highways agreed that replacing the retaining walls with planted embankments would provide a visual betterment and consistency across the structures is preferable.</p> <p>Change 6 - What are the views of the Environment Agency in terms of reservoir classification?</p> <p>National Highways queried how this affects the documents submitted in the DCO, such as land and works plans.</p> <p>The flood storage area would remain a GCC asset for maintenance.</p> <p>National Highways agreed that the proposed design change is a positive one, and if the Environment Agency accept change 6 National Highways would be pleased to see it implemented.</p> <p>Is it likely that the volume of a reservoir under the Act would be reduced to 10,000m³?</p> <p>Change 7 – National Highways highlighted that the change was on blue land, and queried if it impacted land rights?</p> <p>National Highways queried what is the primary reason for the change?</p>	<p>Yes, it is within the existing highways boundary and the RLB.</p> <p>N/A no action.</p> <p>Change 6 - The Applicant confirmed that the local team said that the Environment Agency's National team would have to confirm on the classification, but the National team representative did not provide comment.</p> <p>The Applicant confirmed that an initial review of the land plans had been completed and the land plans or proposed acquisitions do not need to be amended.</p> <p>Correct, No action.</p> <p>N/A no action.</p> <p>The Applicant confirmed that the design team believe this is currently the case in Wales and it is a change that the Environment Agency have wanted to introduce for a while. However, as it would bring numerous bodies of water under the Act, there has obviously been significant push back. It is not something the Applicant believes is a likely, imminent change. But as there is a potential, we thought we should make you aware of the potential risk.</p> <p>Change 7- The Applicant confirmed that the change would need the land temporarily for construction, but permanently it would remain as National Highways land.</p> <p>The Applicant confirmed that the change would improve operational</p>

Stakeholder	Summary of feedback	How comments have been addressed
	<p>National Highways queried if the highways boundary could be amended to avoid concerns with adjacent landowners?</p> <p>National Highways queried who would maintain the proposed design change?</p> <p>National Highways confirmed that the raised area of landscaping would provide improved screening which would be the biggest positive.</p> <p>National Highways noted that the existing loop is planted, so there would be some vegetation lost from this change and there are limited receptors to these views. In that case there would be short term detriment but long-term gains.</p>	<p>screening of the interchange from the southwest, reuse site won material and have carbon and financial benefits.</p> <p>The Applicant confirmed that land would have to be acquired from National Highways, so there would be a strip of the Applicant's land between National Highways ownership and the landowner. This may not be a pragmatic arrangement.</p> <p>The Applicant confirmed that the Scheme in the location of the change will be under National Highways maintenance and the change would also remain under National Highways maintenance.</p> <p>N/A no action.</p> <p>There is a PROW at the base of the embankment, which would be a visual receptor.</p>
LLFA	<p>Change 1 – Were the swales proposed to be used for storage? Will the capacity of the network change if filter drains are provided instead of swales?</p> <p>Would BNG be impacted?</p> <p>In terms of water quality, LLFA believes the CIRIA manual determines that filter</p>	<p>Change 1 - The Applicant confirmed that the Scheme proposed several attenuation basins for storage, which is also the case for the change. To ensure the swales had sufficient capacity for the network they were quite wide – up to 1.9m, but they were only conveying the flows, not providing storage.</p> <p>The Applicant confirmed that the filter drains will be topsoiled and seeded, but they are narrower than the swales so there would be a reduction in grassland adjacent to the carriageway. This can be offset at the toe of the embankment. No change in BNG is anticipated.</p> <p>The Applicant confirmed that a HEWRAT assessment has been</p>

Stakeholder	Summary of feedback	How comments have been addressed
	<p>drains and swales have a similar effect on water quality.</p> <p>Change 2 - Are they in the same location? Do they serve the same function?</p> <p>LLFA can't remember why the Applicant rejected the option of a bridge but can't see any issues as it would maintain connectivity. What did the Environment Agency say?</p> <p>Change 3 - No comments.</p> <p>Change 4 – No comments</p> <p>Change 5 – No comments</p> <p>Change 6 - Will this be a reservoir?</p> <p>Are we permitting connectivity north of the A4019?</p> <p>Will the A4019 flood?</p>	<p>completed and it demonstrates that there would be no change to the conclusion of the ES.</p> <p>Change 2 - The Applicant confirmed that the bridges will be in the same location as the culverts proposed in the Scheme. The bridges will improve flows under the Link Road and reduce the risk of blockages.</p> <p>The Applicant has presented these slides to the Environment Agency, and they had no comments. The Environment Agency were generally in support of a bridge in preference to culverts. Further meetings are to be held to discuss the flood models in more detail.</p> <p>Change 3 – N/A</p> <p>Change 4 – N/A</p> <p>Change 5 – N/A</p> <p>Change 6 - The Applicant confirmed that part of the reconfigured FSA would be a large, raised reservoir. Our original aim was to completely remove the requirement for a reservoir. Unfortunately, this would have required some flood storage north of the A4019 which would have been outside the permanent land take. This solution is achievable within the permanent land take, but because the M5 and A4019 are not acting as impoundment structures, it reduces the maintenance burden (when compared to the Scheme).</p> <p>The Applicant confirmed that this is correct.</p> <p>The Applicant noted that in the baseline scenario the A4019 floods. However, the A4019 is being raised to meet the level of the new gyratory so would no longer flood.</p>

Stakeholder	Summary of feedback	How comments have been addressed
	<p>Will the new channels convey flows to the north?</p> <p>Change 7 – Is this in a flood zone?</p>	<p>The Applicant confirmed that in lower return storm events, the larger pond will discharge to the River Chelt, the small pond will discharge to Piffs Elm culvert. In larger storm events, there are higher level channels: the larger pond discharges to Piffs Elm culvert and the smaller pond discharges north of A4019.</p> <p>Change 7 - The Applicant confirmed that it is not within a flood zone.</p>

5. Environmental assessment methodology

5.1. Approach to the assessment

- 5.1.1. There is no change to the assessment scope reported in ES Chapter 4: Environmental Assessment Methodology [APP-063]. All environmental aspects have been considered in relation to the seven changes to the design submitted as part of the DCO application.
- 5.1.2. No updates to the existing surveys have been completed, no biodiversity net gain calculations and no noise and air quality modelling have been undertaken to inform this ESA. Hydraulic modelling has been completed for the seven changes. No further assessment has been undertaken and the ESA is based on an evaluation, using professional judgement of the likely implications of the changes to the assessment outcomes as set out in the ES.
- 5.1.3. There is no change to the assessment approach or methodology for determining significant effects as set out in ES Chapter 4: Environmental Assessment Methodology [APP-063] and the assessment methodology section of each aspect chapter in the ES. All assessment of potential change to the likely significant residual effects takes mitigation into consideration such that the assessment is on a like for like basis with the ES.
- 5.1.4. There is no change to the approach to design, mitigation and enhancement measures, as set out in ES Chapter 4: Environmental Assessment Methodology [APP-063]. There are no changes to the Environmental Management Plan (EMP) (1st iteration) [AS-025] and its annexes submitted to the Examination [AS-031 to AS-043 and AS-052] are therefore still valid. Some changes will be required to the REAC [REP4-018] as a result of the seven changes. The REAC [REP4-018] will be updated if the proposed design changes are accepted into Examination. In the interim a summary of the proposed changes to the REAC have been provided as part of the Change application 2 documents [APP 10.26].

5.2. Update to the supporting assessments

- 5.2.1. A HRA Addendum [APP 20.24] is included in Change Application 2 and considers if the seven changes would impact ecological European designated sites. The conclusions of the ES Appendix 7.13 Habitats Regulations Assessment (HRA) - Screening [REP3-024] remain valid and would not change as a result of the seven changes. There would be no changes to the Order limits, the changes would not introduce any new European Sites in addition to those already assessed in the HRA and there would be no new impact pathways from the seven changes.
- 5.2.2. The seven changes would not change the following in the Severn estuary SAC/Ramsar during construction and operation:
- functionally linked habitat
 - water quality
 - disturbance to fish
 - Injury or result in mortality of fish
 - fragmentation due to disturbance and pollution
- 5.2.3. Therefore, the seven changes would have no change to the conclusions of the ES Appendix 7.14 Habitats Regulations Assessment - Statement to Inform an Appropriate Assessment [REP3-026].
- 5.2.4. The assessment of operational flood risk is considered in a separate Flood Risk Assessment (FRA) Addendum [APP 10.25] provided as part of Change Application 2.

- 5.2.5. BNG is considered in Chapter 8: Biodiversity of this ESA.
- 5.2.6. There is no change to major accidents and disasters or transboundary effects as a result of the changes. These topics have not been considered further in this ESA. The transboundary effects matrix submitted with the DCO application (the ES Appendix 1.4 Major accidents and disasters assessment [APP-078]) remains valid.

5.3. Assumptions and limitations

- 5.3.1. No updates to the existing surveys have been completed to inform the ESA. The ESA is based on a qualitative assessment based on professional judgement. No biodiversity net gain calculations or air quality and noise modelling have been completed to inform this ESA. Hydraulic modelling has been completed to inform this ESA.

6. Air quality

6.1. Change to potential impacts

6.1.1. The impacts and potential for significant effects on air quality due to the Scheme are considered within the assessment of effects presented in ES Chapter 5: Air Quality [AS-012] and the following supporting appendices:

- Appendix 5.1: Air Quality Emission Modelling [APP-081]
- Appendix 5.2 Air Quality Chapter Figures [APP-082]
- Appendix 6.16 Statement of Statutory Nuisance [APP-136].

6.1.2. The sections below set out the consideration of whether there will be any changes to the outcomes, as set out in the air quality assessment, as a result of the changes.

6.1.3. The seven changes are not anticipated to materially change the construction phase traffic flows or traffic volumes, but these may be reduced in localised areas due to the reductions in materials required. The potential effect due to construction vehicle emissions was reported as not significant in the ES Chapter 5: Air Quality [AS-012]. As such, the potential effect due to construction traffic emissions will remain as not significant for all changes.

6.1.4. The construction dust assessment presented in ES Chapter 5: Air Quality [AS-012] concluded that the Scheme would have a “high” construction dust risk potential and suitable mitigation measures for this level of construction dust risk potential were proposed. The seven changes fall within the Order limits, which were used to calculate the number of sensitive receptors likely to be affected by construction, therefore the number of sensitive receptors that could potentially be affected remain the same as for the Scheme, and there is no change to the construction dust risk potential. The reduction in imported fill may provide some reductions in dust generation but these would be localised. The seven changes would therefore not change the potential impacts from dust during the construction phase presented in the ES Chapter 5: Air Quality [AS-012].

6.1.5. The construction impacts would therefore remain as reported in the ES Chapter 5: Air Quality [AS-012].

6.1.6. The seven changes are not anticipated to change the operational traffic flows or traffic volumes that were considered in the ES Chapter 5: Air Quality [AS-012]. As the operational traffic will remain as reported in the ES, the potential impact of emissions from operational phase vehicles will not change from those assessed in the ES Chapter 5: Air Quality [AS-012].

6.2. Change to mitigation and enhancement measures

6.2.1. No additional mitigation measures to those set out in the ES Chapter 5: Air Quality [AS-012] and EMP (1st iteration) [AS-025] have been proposed on the basis that the seven changes will not change the air quality assessment outcomes in the ES, which notes that there would be no likely significant air quality effects, in accordance with Design Manual for Roads and Bridges (DMRB) LA 105. No change to the construction dust risk potential level is anticipated as a result of the changes. As such, no additional mitigation measures would be required for any of the changes.

6.3. Change to assessment of likely significant effects

6.3.1. The changes will not change the assessment outcomes relating to dust during the construction phase which will remain as reported in the ES Chapter 5: Air Quality [AS-012].

6.3.2. The seven changes are not anticipated to materially change the construction phase traffic flows or traffic volumes, but they may be reduced in localised areas due to the reductions

in materials required. No change to r operational traffic is anticipated as a result of the changes. Therefore, the assessment outcomes for vehicle emissions for both the construction and operational phases remain as reported in ES Chapter 5: Air Quality [AS-012], which concludes that there would be no overall significant adverse air quality effects.

7. Noise and Vibration

7.1. Change to potential impacts

7.1.1. The impacts and potential for significant effects on noise and vibration receptors due to the Scheme are considered within the assessment of effects presented in ES Chapter 6: Noise and Vibration [AS-014] and the following supporting appendices:

- Appendix 6.1: Noise Chapter Figures [APP-084 to APP-086]
- Appendix 6.16 Statement of Statutory Nuisance [APP-134].

7.1.2. The sections below set out the consideration of whether there will be any changes to the outcome, as set out in the Noise and Vibration assessment, as a result of the changes.

Change 1 - Link Road replacement of swales with filter drains

7.1.3. This change results in a reduction in the width of the embankment, which in turn will reduce the amount of imported material required. The traffic flows, plant and programme requirements associated with the construction stage will be the same as, or less than those set out in the assessment of construction effects presented in ES Chapter 6: Noise and Vibration [AS-014]. The assessment of construction effects allowed for a total 18-week programme for the drainage works associated with the Link Road, which can accommodate the construction of the filter drains, and will generate similar levels of noise. It is therefore concluded that there are not likely to be any changes to the noise assessment outcome due to this change.

7.1.4. This change will not alter the operational traffic flow characteristics of the Link Road and therefore there will be no change to the conclusion of the operational noise assessment presented in ES Chapter 6: Noise and Vibration [AS-014].

Change 2 - Link Road replacement of box culverts with bridges

7.1.5. This change will result in localised reductions in traffic flows and associated traffic related noise during the construction stage as there will no longer be the need to import approximately 640 precast concrete units for construction. Therefore, there is no change in the assessment of construction effects presented in ES Chapter 6: Noise and Vibration [AS-014].

7.1.6. The change from pre-cast culverts to a bridge structure, and the introduction of piling at this location means there is some potential for the generation of noise from an additional noise source i.e. piling. However, the ES already considers the noise impacts due to piling in relation to other structures (such as the River Chelt Bridge) and the impact due to this change will not be greater than the impact that has already been assessed.

7.1.7. The nearest representative receptor location to this change, used in the construction noise assessment in the ES is at Butlers Court Cottages on Withybridge Lane. The ES notes that the daytime Lowest Observed Adverse Effect Level (LOAEL) and Significant Observed Adverse Effect Level (SOAEL) thresholds here are set at 55 and 65 dB respectively. The noise prediction for the construction of the River Chelt Bridge, which includes piling, is 59.0 dB in the absence of any mitigation. The ES notes that a reduction in noise level of 10dB can be obtained by providing temporary noise screening and implementing Best Practicable Means, which would remove any adverse impacts. Bored piling is the preferred piling technique for the Scheme, and the new bridge structures proposed in the change. As these works are no closer than the piling works for the River Chelt Bridge and equivalent screening will be provided, it can be concluded that the change will not alter the overall assessment outcomes reported in the ES.

7.1.8. This change will not alter the operational traffic flow characteristics of the Link Road and there will be no change to the conclusion of the operational noise assessment presented in ES Chapter 6: Noise and Vibration [AS-014].

Change 3 - Link Road River Chelt bridge structural form

- 7.1.9. The programme of works, Order limits, plant list and construction traffic associated with the River Chelt Bridge are anticipated to remain unchanged from those considered in ES Chapter 6: Noise and Vibration [AS-014]. Therefore, the conclusion of the construction noise assessment will remain as presented in ES Chapter 6: Noise and Vibration [AS-014]. The assessment assumed a 28-week programme for structures on the River Chelt, which included 3 weeks for piling and pile installation.
- 7.1.10. This change will not alter the operational traffic flow characteristics of the Link Road. The horizontal alignment of the road would change slightly by virtue of removing the bridge skew, but this is not expected to change the outcome of the operational noise assessment presented in the ES Chapter 6: Noise and Vibration [AS-014].

Change 4 - Link Road alignment

- 7.1.11. The construction noise assessment presented in the ES Chapter 6: Noise and Vibration [AS-014] contained a 35-week programme for the earthworks associated with the Link Road. It is anticipated that this programme will either not change or will be reduced, and the plant required for the works will remain unchanged. As the change is a reduction in both the embankment and vertical alignment, the nature of the works and distance to surrounding properties will remain as assessed in the ES. This change is not expected to change the outcome of the existing assessment of construction noise.
- 7.1.12. In addition, the change would result in a net reduction in imported fill material requirements and consequently an associated reduction in lorry movements. However, whilst this reduction is likely to provide some localised benefits, it will not change the overall outcomes of the construction traffic noise assessment.
- 7.1.13. This change will not alter the operational traffic flow characteristics of the Link Road. Reducing the vertical alignment will not result in an adverse change in operational noise relative to the assessment in ES Chapter 6: Noise and Vibration [AS-014]. Furthermore, it is possible that by lowering the vertical alignment of the road the overall noise scenario may be marginally improved.

Change 5 - Relocation of existing NRTS TS

- 7.1.14. The change is not anticipated to materially change the construction phase traffic flows or traffic volumes. Therefore, there will be no change to traffic related noise. Given the modular nature of the TS it is anticipated that the implementation of the change would not require additional construction programme or plant to that considered in the ES. This change is not anticipated to change the conclusion of the assessment of operational or construction noise presented in the ES Chapter 6: Noise and Vibration [AS-014].

Change 6 - Flood storage area reconfiguration

- 7.1.15. The main activities to consider from a noise and vibration perspective during the construction of the FSA, will be associated with the earthworks. The assessment of effects due to construction noise and vibration in the ES Chapter 6: Noise and Vibration [AS-014] is based on a programme of 64 weeks for the FSA earthworks. The construction assessment predicted an unmitigated noise level of 52.5dB at the nearest representative location (Butlers Court Cottages). The ES states this is 2.5dB below the 55dB daytime LOAEL threshold and 12.5dB below the daytime SOAEL threshold.
- 7.1.16. The change will continue to result in earthworks within the Order limits, however the earthworks for the proposed basin will be approximately 20m closer to Butlers Court Cottages than the earthworks for the proposed basin within the Scheme. In addition, the conveyance channel from the larger basin to the River Chelt would be within the footprint of the earthwork. This conveyance channel would require earthworks that would be located in close proximity and in parallel with the filter drain that has already been considered as part of Change 1 in this ESA. Given that the total separation distance

between the Order limits and Butlers Court Cottages is approximately 200m, it is predicted that this change would not lead to an increase of more than 2.5dB at Butlers Court Cottages, meaning that the LOAEL threshold will remain unbreached for this activity. The change is anticipated to not require any changes to the programme, plant requirements or the location of construction compounds. This change will not change the outcome of the construction noise assessment presented in the ES Chapter 6: Noise and Vibration [AS-014].

- 7.1.17. The change will alter the general arrangement of the terrain around the FSA, although the general terrain surface will remain largely unchanged. The traffic patterns and flows that the operational noise predictions are based on are not going to change and will remain as reported in the ES.
- 7.1.18. Consideration has been given to whether the change in the general terrain through the FSA could result in a change to the ground absorption effect between the M5 / Piffs Elm interchange and noise sensitive receptors along portions of Withybridge Lane and the Western extent of Uckington. However, given relative separation distance considered, and the minor changes to surface level terrain and the other surrounding noise sources, the effects at these receptors are likely to be marginal and are not expected to change the assessment outcome or mitigation provision presented in the ES Chapter 6: Noise and Vibration [AS-014].

Change 7 - Infill of existing northbound on-slip loop

- 7.1.19. The noise assessment for the Scheme assumed a programme of 64 weeks for the Scheme's earthworks. The change will not increase this programme or alter plant requirements; therefore, the change will not change the outcomes of the construction noise assessment presented in the ES Chapter 6: Noise and Vibration [AS-014].
- 7.1.20. The change will not alter the operational traffic patterns or flows for the Scheme but may affect noise propagation between the noise source and receptors. There are noise sensitive receptors in Boddington, to the Southwest of Piffs Elm interchange that may be affected by this change. Given the change introduces intervening ground and will not alter the vertical alignment of any noise sources it's likely that any change in noise would be beneficial. Any beneficial change to predicted noise levels would be slight and therefore there would be no change to the operational noise assessment outcomes in the ES Chapter 6: Noise and Vibration [AS-014].

7.2. Change to mitigation and enhancement measures

- 7.2.1. The changes are not expected to adversely change the construction traffic flows, plant requirements, compound locations or Order limits. Additional piling works are required to install the bridge structures on the Link Road, this will be bored piling which has less noise and vibration impact than percussive piling. The piling has been considered in the context of the noise predictions to the nearest representative location (Butlers Court Cottages) contained in the ES Chapter 6: Noise and Vibration [AS-014] and it was concluded that given the assessment already considers the piling associated with the construction of the River Chelt Bridge, the additional piling would not introduce any further adverse impacts. As Best Practicable Means (BPM) will be implanted as recommended within BS 5228-1:2009+A1:2014 then no change to the mitigation or enhancement measures associated with the construction noise assessment presented in the ES Chapter 6: Noise and Vibration [AS-014] are expected to be required.
- 7.2.2. The changes are not expected to change the characteristics of the traffic patterns and flows associated with the assessment of operational noise. There are predicted to be some localised changes to the prevailing terrain, but it is not anticipated to change the assessment outcomes or require any change to the mitigation provisioned within the ES Chapter 6: Noise and Vibration [AS-014].

7.3. Change to assessment of likely significant effects

- 7.3.1. The changes will not change the construction programme, plant, or compound locations. While the changes may result in changes to predicted levels at some receptors locations, these changes are not expected to be of sufficient magnitude to alter the assessment outcomes in the ES Chapter 6: Noise and Vibration [AS-014], especially as BPM will be implemented.
- 7.3.2. The changes are not expected to change the traffic flows or patterns that were used to inform the assessment of operational noise in the ES Chapter 6: Noise and Vibration [AS-014]. The only potential changes to the outcomes of the assessment are changes to terrain profile in some localised areas. These have been considered with regard to the nature of the change and the context of the surrounding area. It is concluded that there may be marginal changes to predicted levels at certain receptors, but they will not change the significance of effect as reported in the ES Chapter 6: Noise and Vibration [AS-014].

8. Biodiversity

8.1. Change to potential impacts

- 8.1.1. The impacts and potential for significant effects on biodiversity due to the Scheme are considered within the assessment of effects presented in ES Chapter 7: Biodiversity [REP1-012].
- 8.1.2. The baseline conditions upon which the ES assessment has been based is presented in the following supporting appendices:
- Appendix 7.1: Phase 1 Habitat Survey [APP-084],
 - Appendix 7.2 Hedgerow Survey [APP-087]
 - Appendix 7.3 Bat Survey [AS-022 and APP-089]
 - Bat Roost Technical Appendix Addendum [REP3-045]
 - Appendix 7.4 Dormouse Survey [APP-090]
 - Appendix 7.5 Badger Survey [APP-091]
 - Appendix 7.6 Otter Survey [APP-092]
 - Appendix 7.7 Water Vole Survey [APP-093]
 - Appendix 7.8 Breeding Bird Survey [APP-094]
 - Appendix 7.9 Wintering Bird Survey [APP-095]
 - Appendix 7.10 Reptile Survey [APP-096]
 - Appendix 7.11 Great Crested Newt Survey [APP-097]
 - Appendix 7.12 Aquatic Ecology Surveys [APP-098]
 - Appendix 7.13 HRA Screening [REP3-024]
 - Appendix 7.14 HRA Statement to Inform an Appropriate Assessment [REP3-026]
 - Appendix 7.15 Bat Mitigation Strategy [APP-101]
 - Appendix 7.16 Barn Owl Survey [APP-102]
 - Appendix 7.17 Validation report [APP-103]
 - Appendix 7.18 Biodiversity Net Gain [APP-104]
 - Appendix 7.19 Biodiversity Chapter Figures [APP-105].
- 8.1.3. The sections below set out the consideration of whether there will be any changes to the outcomes, as set out in the biodiversity assessment due to the changes.
- 8.1.4. The following Important Ecological Features (IEFs) change have been reviewed as part of this ESA.
- Severn Estuary SAC/Ramsar
 - Terrestrial habitat - unimproved neutral grassland / lowland meadow priority habitat
 - Terrestrial habitat - Stanboro Lane orchard habitat complex and potentially present noble chafer population
 - Terrestrial habitat – Hedgerows priority habitat
 - Terrestrial habitat – A4019 habitat complex
 - Terrestrial habitat – M5 Junction 10 and motorway embankments habitat complex
 - Bats

- Dormouse
 - Otter
 - Other priority mammals
 - Badger
 - Breeding birds (excluding barn owl)
 - Wintering birds
 - Barn owl
 - Reptiles
 - Fish
 - Amphibians (including Great Crested Newt)
 - River Chelt
 - Leigh Brook
 - Other Ordinary Watercourses (MW3, Drain 8, Drain 9, Drain 10, Drain 11, Drain 12, Drain 14, Drain 15, Drain 16, Drain 20, Drain 21 and Drain 22)
 - Standing waterbodies.
- 8.1.5. Only those IEFs that have the potential to be affected by a change are discussed in the text below. If an IEF is not specifically mentioned, then it should be assumed that no change to the assessment of effects for the IEF will occur as result of the change. See Chapter 2 in this ESA for further details of the changes considered in this chapter.

Change 1 - Link Road replacement of swales with filter drains

- 8.1.6. Whilst the filter drains will be narrower than the previously proposed swales, they will still be topsoiled and seeded and safeguard the water environment. The filter drains will have a smaller footprint than the swales, and additional planting and seeding at the toe of the embankments will be incorporated into the change.
- 8.1.7. The filter drains will provide the same degree of environmental protection as swales during the operational phase. Swales have an ecological value as a linear wetland features which would be lost due to the change. The change is not anticipated to alter the conclusions of the biodiversity assessment as reported within ES Chapter 7: Biodiversity [REP1-012].

Change 2 - Link Road replacement of box culverts with bridges

- 8.1.8. The change would allow Drain 12 to be retained as an open channel, spanned by the bridge structure, rather than it being culverted. ES Chapter 7: Biodiversity [REP1-012] reports a minor adverse impact on Drain 12 due to the Scheme. The bridge structure will result in shading of vegetation. However, the change will provide a better ecological design in the longer term than box culverts, and will reduce impacts upon Drain 12, with a slight reduction in bank side habitat loss. This will provide some minor localised betterment in the long-term, but this will not change the biodiversity assessment outcomes reported within the ES.
- 8.1.9. The bridge structure will provide longer-term benefits, such as an increase in the air space available beneath the structure, thereby posing less of a restriction to commuting and foraging bats. This change will provide betterment locally for bats, but this will not change the assessment outcomes within ES Chapter 7: Biodiversity [REP1-012].
- 8.1.10. The change will also provide improved conditions locally during the operational phase for otter, and potentially water vole in the future if their range increases and they move into the local area.

- 8.1.11. The change will not alter the assessment outcomes as reported within ES Chapter 7: Biodiversity [REP1-012].

Change 3 - Link Road River Chelt bridge structural form

- 8.1.12. The change will straighten the river channel directly under the bridge in order to square up the bridge and reduce the bridge span.
- 8.1.13. The straightening of the River Chelt beneath the bridge may locally reduce the amount of hard engineering on the channel banks of the River Chelt to protect the structure. As described in the ES, the requirement for hard bank protection will be determined at detailed design following the completion of a scour assessment.
- 8.1.14. To mitigate for the section of straightened channel, the River Chelt will be reprofiled to exaggerate the natural meandering upstream and downstream of the River Chelt bridge. The pools and riffles between meanders described in the ES will be retained. The extent of works within the River Chelt will extend 160m upstream and 100m downstream of the River Chelt Link Road bridge but will remain within the Order limits.
- 8.1.15. A constructability review by the Applicant identified the requirement for a temporary river diversion to allow for the construction of the River Chelt reprofiling and mitigation associated with the Link Road River Chelt Crossing included in the ES Scheme design (ES Chapter 2: The Scheme [AS-010]). The requirement for the temporary diversion was not assessed as a construction activity within the ES. A temporary diversion would also be required for the change but would be no different from the diversion identified from the constructability review for the ES Scheme design. With the mitigation measures (as included in the updates to the REAC [APP 10.26] (WE1, WE3 and B23)) there would be no change to the outcomes of the assessment as reported in ES Chapter 8: Road Drainage and Water Environment [REP1-014].
- 8.1.16. It is anticipated that the fish species using the River Chelt would be exposed to similar construction impacts as those reported in ES Chapter 7: Biodiversity [REP1-012]. However, the river realignment would result in more intensive in channel working. With the mitigation measures (as included in the updates to the REAC [APP 10.26] (WE1, WE3 and B23)) both the construction and operation phase effects (including embedded and essential mitigation) are anticipated to remain as presented in ES Chapter 7: Biodiversity [REP1-012].
- 8.1.17. During the operational phase, the change would provide localised improved foraging habitat for some bird species in the long-term resulting from the overall increase in channel length. The change will not alter the assessment outcomes with respect to birds that is reported within ES Chapter 7: Biodiversity [REP1-012].
- 8.1.18. The change is not anticipated to change habitat connectivity for bats. The longer-term increase in riparian habitats, resulting from the increase in channel length would provide a localised betterment in feeding resource available for bats.
- 8.1.19. There will need to be some localised additional tree felling to accommodate the change. These trees will be included in the bat surveys that are to be undertaken in 2025. If roosting bats are confirmed as present in any tree that needs to be felled, these trees (which were initially identified as being retained) will be incorporated into the Final Bat Development Licence and mitigation/ compensation increased as appropriate. As trees are utilised by crevice dwelling species, if further mitigation and/ or compensatory measures are required, additional bat boxes would be included within the mitigation as detailed in the licence in conjunction with all measures which have already been discussed and agreed with Natural England. The environmental assessment outcomes in relation to bats are anticipated to remain as reported within ES Chapter 7: Biodiversity [REP1-012].
- 8.1.20. The structure will remain a clear span bridge such that the top of bank is exposed and accessible. The change will retain the top of bank and abutment offsets ensuring habitat connectivity and the avoidance of fragmentation effects on otter. The change is not

anticipated to change the environmental assessment outcomes in relation to otter as reported within ES Chapter 7: Biodiversity [REP1-012].

- 8.1.21. The change is not anticipated to alter the impact on biodiversity, or result in a change to the assessment outcomes, as reported in the ES Chapter 7: Biodiversity [REP1-012].

Change 4 - Link Road alignment

- 8.1.22. The change will retain the numerous crossing points and mitigation measures, including oversized culverts and bat hop-overs. The changes in vertical alignment will not alter the proposed culvert and mammal pipe provision, or the planting mixes proposed for the bat hop-over locations. The change will reduce the planting area available on the Link Road embankments, but this will be offset by planting at the toe of the embankments.
- 8.1.23. With respect to the River Chelt and other Ordinary Watercourses, the change is not anticipated to result in any changes in the environmental assessment outcomes. All the environmental protection and working methods will remain as set out in the Scheme.
- 8.1.24. With respect to birds, the change will ensure there is no change in long-term habitat provision and availability. The footprint of the works will be slightly reduced and no change in vegetation clearance extents is anticipated. The impact on birds will remain as previously assessed.
- 8.1.25. The change in vertical alignment will not reduce or remove the mitigation currently proposed in relation to bats for the Scheme. The footprint of the works will be slightly reduced and no change in vegetation clearance extents is anticipated. The change is therefore not anticipated to change the assessment outcomes in the ES.
- 8.1.26. With respect to otter and water vole, although the vertical alignment of the Link Road will be reduced, the culvert and crossing point mitigation will be retained. The environmental protection and working methods will remain as assessed in the ES. The footprint of the works will be slightly reduced and no change in overall vegetation clearance extents is anticipated.
- 8.1.27. The change is not anticipated to change the assessment outcomes as reported in the ES Chapter 7: Biodiversity [REP1-012].

Change 5 - Relocation of existing NRTS TS

- 8.1.28. There will be very limited vegetation clearance required for this change as the footprint of the TS will be smaller than the existing substation and will be located on existing hardstanding adjacent to the M5 southbound carriageway. The change is not anticipated to change the assessment outcomes as reported in the ES Chapter 7: Biodiversity [REP1-012].

Change 6 - Flood storage area reconfiguration

- 8.1.29. The change is not anticipated to affect the Severn Estuary SAC/ Ramsar. The change includes a new conveyance channel that will discharge to the Leigh Brook in the event that the basins are filled to capacity. Leigh Brook, which forms part of the Severn Estuary catchment, has been identified as heavily modified, with fairly poor river condition. Given the existing condition of the Leigh Brook, the dilution that would occur and distance to the Severn Estuary SAC/SPA/Ramsar, the Scheme is not anticipated to affect the Severn Estuary SAC/SPA/Ramsar. The southwestern outlet pipe from the FSA will discharge into the River Chelt. However, this arrangement does not differ from that assessed within the ES.
- 8.1.30. The change will result in a change in construction activities and will retain the existing connection to Leigh Brook as per the baseline conditions, which is severed in the Scheme. The change incorporates the pollution prevention measures as reported in ES Chapter 7: Biodiversity [REP1-012] which remain appropriate. Both the construction and operation phase effects (including embedded and essential mitigation) are anticipated to remain as

presented in ES Chapter 7: Biodiversity [REP1-012]. The change will not impact upon any other Ordinary Watercourses.

- 8.1.31. The change will retain existing connection to Leigh Brook (as exists in the baseline conditions) and provide a range of wetland planting and habitat creation, as well as some permanent areas of standing water of varying depths. This will provide valuable habitat for a range of bird and bat species. Planting will be provided around the FSA ponds / basins, providing a similar mosaic of habitats described within the ES. This change will still provide a localised benefit for different bird assemblages and provide valuable foraging habitat for bats. The change is not anticipated to result in a change to the assessment outcomes as reported in the ES Chapter 7: Biodiversity [REP1-012].
- 8.1.32. Whilst the invert level for the Withybridge A4019 Underpass will be lowered to allow for water to enter the conveyance channel to the north of the existing A4019, the air space within the structure at the times of flood will remain the same as set out in the design for the Scheme. Therefore, there will be no change to the conditions present and therefore no change to the ES outcomes in relation to bats.
- 8.1.33. The change will not change the level of flood risk to the hedgerow proposed for dormouse displacement north of the A4019 as in the Scheme. The flood depth in extreme flood depths in this area would continue to be 20mm in the change, the same as in the Scheme. The habitat creation and retention proposals in this area as detailed in the draft dormouse licence would still be provided in the change. There is no change to the assessment outcomes in the ES in relation to dormouse.
- 8.1.34. The wetland habitat provision still includes areas of standing water and habitat suitable for use by otter. This area will be of value to otter and potentially water vole (which are currently considered absent but known to be present within the wider area).
- 8.1.35. The change is not anticipated to change the assessment outcome as reported in ES Chapter 7: Biodiversity [REP1-012].

Change 7 - Infill of existing northbound on-slip loop

- 8.1.36. The change would require some additional vegetation clearance in the M5 J10 northbound on-slip loop. However, the infill would create a larger area of shallower gradient embankment, increasing the overall area of planting and may provide small, localised benefits to birds and bats.
- 8.1.37. The change will not change the assessment outcomes as reported in the ES Chapter 7: Biodiversity [REP1-012].

8.2. Change to mitigation and enhancement measures

- 8.2.1. Change 3 will require additional mitigation measures (as detailed in the updates to items WE1, WE3 and B23 in the REAC [APP 10.26]) to ensure that the overall conclusions as reported in the ES Chapter 7: Biodiversity [REP1-012] are not changed as a result of change 3. Additional mitigation or enhancement measures are not required for the other changes.

8.3. Change to assessment of likely significant effects

- 8.3.1. Whilst there would be some localised benefits from some of the changes in the context of the Scheme for each IEF, the changes will not change the assessment of likely significant effects that is reported in the ES Chapter 7: Biodiversity [REP1-012].

8.4. Biodiversity Net Gain

- 8.4.1. Appendix 7.18 of ES: Biodiversity Net Gain [APP-104] summarised the biodiversity net gain for the Scheme. The calculation has not been updated, but a review of each change by an experienced BNG professional has been undertaken. The potential for any of the seven changes to change the calculated biodiversity net gain has been reviewed based

on professional judgement and is presented in this ESA. Overall, the changes are not expected to change the Scheme's BNG outcomes and the BNG REAC commitment (B9) will be achieved.

Change 1 - Link Road replacement of swales with filter drains

- 8.4.2. In the ES (Appendix 7.18 Biodiversity Net Gain) [APP-104] the swales are classified as moderate condition modified grassland of high strategic significance. Replacing them with filter drains will result in the habitat being changed to moderate condition modified grassland with an underground watercourse, which will result in a slight drop in biodiversity unit delivery, as (based on the methodology in the ES) the habitat type and condition will be unchanged, but the habitat would no longer be wet and therefore not of strategic significance. In addition, the filter drains will be a reduced width which will also result in a slight drop in biodiversity unit delivery.
- 8.4.3. The change will result in the overall width of the Link Road being reduced. This would increase biodiversity units and have a slight positive impact on BNG as the space created by this reduction would be planted with habitat such as species rich grassland to make up for the loss of verge within the carriageway and the loss of swale.
- 8.4.4. No change in BNG is anticipated for this change.

Change 2 - Link Road replacement of box culverts with bridges

- 8.4.5. This change will result in an improved river condition outcome, with bridge structures having a lower impact than culverts. The Link Road bridge structures will be narrower than the culverts but will be slightly longer in span than the culverts due to tie ins with the bank tops. Overall, no impacts to habitat units are anticipated.
- 8.4.6. Overall, no change in BNG is anticipated for this change.

Change 3 - Link Road River Chelt bridge structural form

- 8.4.7. Altering the river channel can have negative impacts on the condition of the watercourse, due to reduced naturalness. The resulting increase in channel length will increase the natural features upstream and downstream of the River Chelt (e.g. in-channel or marginal features, riparian planting etc). As the change is (partly) under the bridge, there is limited scope to naturalise the river underneath the bridge span.

Change 4 - Link Road alignment

- 8.4.8. This option has a reduced earthworks footprint compared to the Scheme. There is no reduction in BNG anticipated overall as planting will be provided at the toe of the embankment instead of on the embankment.

Change 5 - Relocation of existing NRTS TS

- 8.4.9. This change will have a slight positive impact on BNG as habitat will be created on the new embankments for the Piffs Elm bridge north, as retaining walls are no longer required to accommodate the TS. The new substation will be located on existing hardstanding where very limited vegetation removal is required for construction, and the footprint of the TS will be smaller than the existing substation.

Change 6 - Flood storage area reconfiguration

- 8.4.10. The combined volumes of the two basins in the change, will be smaller than the original proposed single FSA in the Scheme. The change incorporates a mosaic of different habitat types within the FSA, similar to the Scheme Therefore, no change in BNG is anticipated from this change.

- 8.4.11. The changes to pipes/culverts/underpasses are not expected to have an impact on the BNG outcome.

Change 7 - Infill of existing northbound on-slip loop

- 8.4.12. This change involves clearing the inside of the northbound on-slip loop, including pavement and planting with woodland. This will require the loss of existing plantation woodland that was to be retained as part of the Scheme. This change would result in a localised reduction in biodiversity unit delivery due to the woodland loss. However, the Scheme will still achieve the BNG REAC commitment.

9. Road Drainage and Water Environment

9.1. Change to potential impacts

- 9.1.1. The impacts and potential for significant effects on Road Drainage and the Water Environment (RDWE) receptors, due to the Scheme are considered within the assessment of effects presented in ES Chapter 8: RDWE [REP1-014] and the following supporting appendices:
- Appendix 8.1: Flood Risk Assessment [REP5-008 and REP5-010]
 - Appendix 8.2: Water Framework Directive (WFD) Compliance Assessment [REP1-028]
 - Appendix 8.2A: WFD Surface Water Impact Assessment [APP-109]
 - Appendix 8.2B: WFD Groundwater Impact Assessment [APP-110]
 - Appendix 8.3: Surface Water Quality Assessment [APP-111]
 - Appendix 8.4: Road Drainage and the Water Environment Chapter Figures [APP-112].
- 9.1.2. The RDWE topics assessed in ES Chapter 8: RDWE [REP1-014] are as follows: surface water quality, hydromorphology, groundwater and flood risk. WFD compliance is also considered in ES Chapter 8: RDWE [REP1-014]. ES Chapter 8: RDWE [REP1-014] also makes reference to Chapter 7: Biodiversity [REP1-012] for details on the ecological assessment.
- 9.1.3. In ES Chapter 8: RDWE [REP1-014] it was considered that all scour calculations, assessments and mitigations measures would be undertaken at detailed design. Therefore, this ESA has taken the same approach, and scour is not considered in this ESA.

Change 1 - Link Road replacement of swales with filter drains

Surface Water Quality

- 9.1.4. The change is not anticipated to change the assessment of impacts on surface water quality during construction as reported in ES Chapter 8: RDWE [REP1-014] subject to the implementation of the mitigation measures, relating to construction.
- 9.1.5. The change results in a change to the embedded mitigation as reported in ES Chapter 8: RDWE [REP1-014], in the operational phase, namely the replacement of swales (as the embedded mitigation) with filter drains. It is recognised that filter drains are less efficient than swales in removing sediment pollution. A routine runoff assessment has therefore been undertaken using the National Highways (previously Highways England) Water Risk Assessment Tool (HEWRAT), as prescribed in Design Manual for Roads and Bridges (DMRB) LA 113 – Road drainage and the water environment, to assess effects of the change on the water quality of receiving watercourses during operation. The HEWRAT routine runoff assessment included an individual outfall assessment for the Link Road drainage catchments (L2 and J2) and a cumulative assessment of drainage catchments J1 and J2. The HEWRAT routine runoff results indicate that there will be no change to the assessment of impacts during operation as reported in ES Chapter 8: RDWE [REP1-014].
- 9.1.6. The change is therefore not anticipated to impact WFD compliance with respect to water quality.

Hydromorphology

- 9.1.7. The change will not change the conclusions from the assessment of impacts relating to hydromorphology and this aspect of WFD compliance as reported in ES Chapter 8: RDWE [REP1-014], as this change would have no bearing on drainage discharge rates to the receiving water environment, nor flow regimes of receiving watercourses. Therefore, this change will not change the assessment outcomes for construction and operation as reported in ES Chapter 8: RDWE [REP1-014].

Groundwater

- 9.1.8. The change will locate the filter drains at the top of the Link Road embankment, above the existing ground level and therefore they would not interact with groundwater. Therefore, this change will not change the assessment outcomes for construction and operation as reported in ES Chapter 8: RDWE [REP1-014] and will result in no change to the WFD compliance assessment.

Flood Risk

- 9.1.9. The change is not anticipated to change the assessment outcomes for flood risk during the construction phase as described in the ES Chapter 8: RDWE [REP1-014]. As noted in the ES, detailed hydraulic modelling of the construction phase will be undertaken prior to construction and the measures in the EMP will be refined, if needed.
- 9.1.10. The change will not have a significant effect on fluvial flood risk during the operational phase, as the filter drains will be located on top of the Link Road embankment and therefore elevated above potential flooding when considering the design fluvial flood event. The change does provide localised benefits by reducing the overall built footprint within the floodplain. The impact that this would have on the risk of flooding was tested in the hydraulic model and the results did not change the overall assessments of impacts.
- 9.1.11. The change would not result in a reduction in the capacity of the surface water drainage system and there would be no change in eventual outfall rates from the proposed attenuation ponds. As such there is no change to the assessment outcomes for surface water flood risk during construction and operation as reported in ES Chapter 8: RDWE [REP1-014].

Change 2 - Link Road replacement of box culverts with bridges

Surface Water Quality

- 9.1.12. As the change would still involve broadly similar works in proximity to surface water environment receptors, it is anticipated that there would be no change to the surface water quality impacts during construction and operation as reported in ES Chapter 8: RDWE [REP1-014], following the implementation of the embedded mitigation measures.
- 9.1.13. The change is not anticipated to impact WFD compliance with respect to water quality.

Hydromorphology

- 9.1.14. The change would still involve works in proximity to water environment receptors, and the ES sets out measures to manage potential impacts. It is anticipated that there would be no change to the construction assessment outcomes reported in ES Chapter 8: RDWE [REP1-014] relating to WFD compliance and hydromorphology, due to the embedded mitigation measures in the design.
- 9.1.15. This change would have beneficial operational implications from a hydromorphological perspective as it would reduce the direct physical impact of the structure(s), allowing channel banks of Drain 12 to be retained and reducing disturbance of the immediate riparian corridor, as well as improving floodplain connectivity due to the use of bridges rather than culverts. The change would therefore have a lower risk of hydromorphological impacts compared to the Scheme. ES Chapter 8: RDWE [REP1-014] reports a minor

adverse impact on Drain 12 from the Scheme, however with the change the impact would be negligible.

Groundwater

- 9.1.16. The change includes piles for the bridges that would extend below the groundwater table. In the construction phase, formation of the piles would be subject to the preparation of piling risk assessments. With the mitigation measures provided through the piling risk assessments, as secured in the REAC (WE10) [REP4-018] there would be no change to the outcomes of the assessment as reported in ES Chapter 8: RDWE [REP1-014].
- 9.1.17. In the operational phase, the change would be expected to cause no or negligible change to groundwater flow, since the change would have little interaction with groundwater flow. This is because the change would have piles that would be arranged parallel to groundwater flow and therefore would not disrupt groundwater flow.
- 9.1.18. In summary, the change is not anticipated to change the construction and operation assessment outcomes reported in ES Chapter 8: RDWE [REP1-014] and will result in no change to the WFD compliance assessment.

Flood Risk

- 9.1.19. The change is not anticipated to change the conclusions from the assessment of impacts on flood risk during the construction phase. As noted in the ES, detailed hydraulic modelling of the construction phases will be undertaken prior to construction and the measures in the EMP will be refined, if needed.
- 9.1.20. The flood alleviation bridges require fewer supporting structures along their length compared to the culverts and therefore will have less interaction with flow pathways than the culverts. Therefore, baseline conditions with regard to the movement of floodwaters will be more closely retained, reducing impacts on floodplain connectivity. The piers in the bridge structures will still result in a limited restriction to flow but less restriction than the culverts. The floodwaters will still back up against the Link Road where there are no openings. Hydraulic modelling has been updated to reflect the change and to assess the impact the change would have on flood risk. The hydraulic modelling has shown a slight increase in flood depths around the upstream face of the flood alleviation bridges in the range 0.01 to 0.05m, associated with the funnelling of water through the structures. These increases are less than the 0.06m as reported in ES Chapter 8: RDWE [REP1-014]. There are still locations within the River Chelt floodplain where there are increases in flood depth of greater than 0.05m, this is unchanged from the assessment outcomes for the Scheme.
- 9.1.21. The surface water flood mechanisms in the area are similar to those shown in the fluvial flood model and therefore the impacts on these mechanisms will also be similar.
- 9.1.22. The change will not change the operational assessment outcomes as reported in ES Chapter 8: RDWE [REP1-014].

Change 3 - Link Road River Chelt bridge structural form

Surface Water Quality

- 9.1.23. There are no anticipated changes to the surface water quality impacts from this change, as there are no changes to surface water drainage arrangements or other elements that would impact the identified receptors. Therefore, the change will not change the assessment outcomes for construction and operation as reported in ES Chapter 8: RDWE [REP1-014].
- 9.1.24. The change is not anticipated to impact WFD compliance with respect to water quality.

Hydromorphology

- 9.1.25. A constructability review by the Applicant identified the need for a temporary diversion channel to allow for the construction of the River Chelt reprofiling and mitigation

associated with the Link Road River Chelt Bridge. The requirement for the temporary diversion was not assessed as a construction activity within the ES. A temporary diversion would also be required for the change but would be no different from the diversion identified from the constructability review for the Scheme. With the mitigation measures, as secured in the updates to the REAC (WE1, WE3 and B23) [APP 10.26] there would be no change to the outcomes of the assessment as reported in ES Chapter 8: RDWE [REP1-014].

- 9.1.26. Change 3 does not change the other construction impacts as reported in ES Chapter 8: RDWE [REP1-014] relating to hydromorphology and the associated WFD compliance.
- 9.1.27. During operation, this change would remove the skew on the bridge that is in the Scheme. The effects on the water environment of straightening the channel through the structure would be offset by realigning works upstream and downstream to create increased sinuosity, to offset hydromorphological effects. In ES Chapter 8: RDWE [REP1-014] a minor adverse impact is assessed for the River Chelt as a result of the River Chelt Bridge. The enhancements to the river channel will form part of the embedded mitigation, therefore the change could result in this impact changing to negligible.
- 9.1.28. There will be no impact on the conclusions of the WFD assessment as the permanent impacts associated with the change are not anticipated to be any different to those already reported in the ES submission.

Groundwater

- 9.1.29. Change 3 would not change the assessment outcomes as described in ES Chapter 8: RDWE [REP1-014] for the construction phase since mitigation is embedded in the form of good practice, including piling risk assessments.
- 9.1.30. There are no implications to the groundwater environment for the operational phase since any hydraulic interaction with groundwater is likely to be minimal due to the short section of riverbank proposed to be reprofiled and the short section of river proposed to be realigned. Therefore, the change will not change the assessment outcomes during operation as reported in ES Chapter 8: RDWE [REP1-014] and will result in no change to the WFD compliance assessment.

Flood Risk

- 9.1.31. Change 3 would not change the assessment outcomes in relation to flood risk during the construction phase as reported in ES Chapter 8: RDWE [TR010063 - APP 6.6REP1-014]. As noted in the ES, detailed hydraulic modelling of the construction phases will be undertaken prior to construction (as detailed in REAC item WE15 [REP4-018]) and the measures in the EMP will be refined, if needed.
- 9.1.32. The FRA Addendum [APP 10.25], Chapter 5.4, reports a minor increase in flood depth on the floodplain of the River Chelt west of the Link Road in a 4% AEP event. This impact results from the location of the interpolates and cross-sections in the baseline model. The impact of the river realignment on model conveyance is shown a significant distance from the area proposed for realignment. This is a function of the model representation in this location rather than a result of the design change and these impacts will not be shown in the detailed design flood model which will be submitted to the EA to satisfy the REAC [REP4-018] commitment (WE17).
- 9.1.33. As stated in the FRA Addendum [APP 10.25], the effects not mitigated by embedded mitigation do not change the flood risk to those areas and can be considered a non-significant impact. This proposal would not change the assessment outcomes associated with flooding as reported in ES Chapter 8: RDWE [REP1-014].
- 9.1.34. The risk of flooding associated with the River Chelt bridge and associated river realignment are entirely associated with fluvial flood and therefore there will be no change to the assessment outcomes in relation to the risk of flooding from surface water as reported in ES Chapter 8: RDWE [REP1-014].

Change 4 - Link Road alignment

Surface Water Quality

- 9.1.35. There are no implications for surface water quality impacts during construction and operation from this change, as there are no changes to surface water drainage arrangements or other elements that would impact the identified receptors. Therefore, Change 4 would not change the assessment outcomes for surface water quality during construction and operation as reported in ES Chapter 8: RDWE [REP1-014].
- 9.1.36. The change is not anticipated to impact WFD compliance with respect to water quality.

Hydromorphology

- 9.1.37. There are no implications for hydromorphological impacts from this change. The proposed lowering has no implications for the flow regime of the watercourses crossed by the alignment and would not change any surface water flow paths. No discernible impact due to increased shading of watercourses is anticipated as a result of this change compared to the design assessed in the ES. Change 4 would not alter the assessment outcomes relating to hydromorphology during construction and operation as reported in ES Chapter 8: RDWE [REP1-014]. There is anticipated to be no change in the findings of the WFD compliance assessment in relation to hydromorphological quality elements.

Groundwater

- 9.1.38. There are no implications to the groundwater environment because the change refers to a reduction in the vertical alignment of the embankment and therefore there would be no additional cutting below natural ground level because of the change. Therefore, change 4 would not change the assessment outcomes associated with groundwater during construction and operation as reported in ES Chapter 8: RDWE [REP1-014] and will result in no change to the WFD compliance assessment.

Flood Risk

- 9.1.39. The change is not anticipated to change the assessment outcomes in relation to flood risk during the construction phase as reported in ES Chapter 8: RDWE [REP1-014]. As noted in the ES, detailed hydraulic modelling of the construction phases will be undertaken prior to construction (as detailed in REAC item WE15 [REP4-018]) and the measures in the EMP (1st iteration) [AS-025] will be refined, if needed.
- 9.1.40. The change in vertical alignment of this change sits above the maximum water level produced in the design flood event, as demonstrated by the hydraulic model. The change does provide some localised benefits by reducing the overall built footprint within the floodplain.
- 9.1.41. The Link Road is set high enough that a change in its vertical profile would have limited impact on surface water flow paths and therefore it is not anticipated to impact the surface water flood mechanisms in the area.
- 9.1.42. Therefore, Change 4 would not change the assessment outcomes associated with flooding during operation as reported in ES Chapter 8: RDWE [REP1-014].

Change 5 - Relocation of existing NRTS TS

Surface Water Quality

- 9.1.43. The footprint of the proposed new NRTS TS is small and is proposed to be located on existing surfaced verge and hardstanding area. There would be negligible extent of excavation below existing ground level, and any foundations would be subject to mitigation including foundation risk assessments. When applying the source-pathway-receptor principle, no pathways for impacts on RDWE receptors have been identified.

- 9.1.44. Therefore, Change 5 would not change the assessment outcomes in relation to RDWE receptors during construction and operation as reported in ES Chapter 8: RDWE [REP1-014].

Change 6 - Flood storage area reconfiguration

Surface Water Quality

- 9.1.45. It is anticipated that this change would result in a reduction in requirement for water management during excavation activities compared to the Scheme. Therefore, the change would have a slightly lower risk to surface water quality during construction compared to the Scheme. Other than this Change 6 would not change the assessment outcomes during construction in relation to surface water quality as reported in ES Chapter 8: RDWE [REP1-014].
- 9.1.46. The change includes an operational wetland within one of the FSA basins. Surface water runoff will outfall into this wetland. This is in line with the Scheme. Therefore, there are no changes in the embedded mitigation measures for the corresponding drainage catchment, as outlined in Table 8-13 of ES Chapter 8: RDWE [REP1-014] (noting that there is change from swale to filter drain as addressed previously). Routine runoff HEWRAT calculations were undertaken and confirmed that there would be no change to the corresponding magnitude of impact as reported in ES Chapter 8: RDWE [REP1-014].
- 9.1.47. The change is not anticipated to impact WFD compliance with respect to water quality.

Hydromorphology

- 9.1.48. ES Chapter 8: RDWE [REP1-014] references hydromorphology however not with specific reference to the FSA. As for the Scheme the change will still require consideration of hydromorphological impacts at detailed design, including scour and low flow assessment, with reference to WFD requirements. These scour and low flow assessments are the same as those required for the River Chelt Link Road bridge and committed to under REAC (WE4) [REP4-018]. This applies to both construction and operational phase. Flood modelling has demonstrated that, compared to the Scheme, the change only results in a marginal increase in flood flows through the A4019, during events with a return period exceeding 1 in 50 years. No significant effects are therefore anticipated, with no change to the assessment outcomes in the ES.

Groundwater

- 9.1.49. Change 6 is not anticipated to change the assessment of impacts on groundwater during the construction phase, following the implementation of the embedded mitigation measures described in the ES Chapter 8: RDWE [REP1-014], as there will be no changes to the construction approach (e.g., excavation).
- 9.1.50. The invert levels within the change are approximately the same as those for the Scheme. Similarly, both designs have outfalls into watercourses. Change 6 would not change the assessment outcomes associated with groundwater during operation as reported in ES Chapter 8: RDWE [REP1-014] and will result in no change to the WFD compliance assessment.

Flood Risk

- 9.1.51. The change is not anticipated to change the assessment of impacts on flood risk during the construction phase as reported in ES Chapter 8: RDWE [REP1-014]. As noted in the ES, detailed hydraulic modelling of the construction phases will be undertaken prior to construction (as detailed in REAC item WE15 [REP4-018]) and the measures in the EMP will be refined, if needed.
- 9.1.52. The Scheme included a compensatory floodplain area upstream of the Link Road and a FSA upstream of the M5. The magnitude of impact from flood risk during operation on the River Chelt floodplain (upstream of M5) was assessed in the ES Chapter 8: RDWE [REP1-

014] as having 'some areas of major adverse but majority is major beneficial'. The major adverse magnitude of impact referred to in ES Chapter 8: RDWE [REP1-014] is related to the proposed FSA which has been designed to accommodate an increased volume of floodwater. It is therefore anticipated that the magnitude of impact would remain as major beneficial.

- 9.1.53. In Change 6 the Withybridge A4019 Underpass and two new proposed culverts would convey water flow under the A4019 and link to a new channel which would convey the water flow to Barn Farm culvert in the 1% annual exceedance probability (AEP) event and higher magnitude flood events. In the 1% AEP event the entire flow passing beneath the A4019 is conveyed by the proposed channel and there is therefore no change in flood risk north of the A4019 in this flood event. In the 1% AEP event plus climate change flood event for the change there is an increase in flood risk to the land to the north of A4019 compared to the Scheme. However, the change will have a reduction in flood depth of up to 0.5m in comparison with the baseline conditions.
- 9.1.54. The ES Chapter 8: RDWE [REP1-014] did not use the 1% AEP event in its significance of effects assessment. As reported in Chapter 5.4 of the FRA Addendum [APP 10.25], in a 1% AEP event the change would result in an increase in flood level in the Leigh Brook catchment downstream of Barn Farm culvert in the range 0.01-0.05m. If this increase in flood level was assessed against the significance of effects methodology, then it would be considered a slight adverse impact and a non-significant effect. Future refinement of the design of the reservoir alternative option will attempt to remove this minor increase in flood level.
- 9.1.55. In the design 1% AEP event plus 53% climate change flood event, a reduction in flood depth of up to 0.50m is predicted in comparison with the baseline conditions. Since this was the only event that was used for the significance of effects assessment in the ES Chapter 8: RDWE [REP1-014], there is no overall change to the conclusion of the assessment for the Leigh Brook catchment or the River Chelt.
- 9.1.56. The surface water flood mechanisms in the area of the change are similar to those shown in the fluvial flood model and it would not change the assessment outcomes associated with surface water flood risk as reported in ES Chapter 8: RDWE [REP1-014].

Change 7 - Infill of existing northbound on-slip loop

Surface Water Quality

- 9.1.57. The potential impacts on surface water quality during construction for this change would be the same as those described in the ES Chapter 8: RDWE [REP1-014] (e.g. pollution risk, siltation).
- 9.1.58. The change would affect a ditch that would serve to collect operational runoff from the embankment and direct overland flows. This ditch would not receive and convey highway drainage/runoff. As a result of the reprofiling, the ditch would no longer be required. The change therefore does not alter the results of the HEWRAT assessment and therefore there would be no change to the corresponding magnitudes of impacts assessed as reported in ES Chapter 8: RDWE [REP1-014].
- 9.1.59. The change is not anticipated to impact WFD compliance with respect to water quality.

Hydromorphology

- 9.1.60. Change 7 would not change the assessment of impacts during the construction phase as reported in ES Chapter 8: RDWE [REP1-014].
- 9.1.61. In terms of operational impacts, it is considered that this change would result in no change in the hydromorphology impact as reported in ES Chapter 8: RDWE [REP1-014].
- 9.1.62. It is considered that the change would not cause deterioration to supporting elements of the WFD at a water body scale and would not change the overall conclusions of the existing WFD compliance assessment as reported in ES Chapter 8: RDWE [REP1-014].

Groundwater

- 9.1.63. The change would not involve excavation beneath the existing ground level and the area is relatively small by being restricted to be within the existing northbound on slip loop. Therefore, the change is not anticipated to change the assessment of impacts on groundwater during the construction phase or operational phase subject to the implementation of the mitigation measures as reported in ES Chapter 8: RDWE [REP1-014].

Flood Risk

- 9.1.64. The change is not anticipated to change the assessment of impacts on flood risk during the construction phase as described in the ES Chapter 8: RDWE [REP1-014]. As noted in the ES, detailed hydraulic modelling of the construction phases will be undertaken prior to construction and the measures in the EMP will be refined, if needed.
- 9.1.65. Change 7 would not change the assessment of impacts associated with fluvial flood risk during construction and operation as reported in ES Chapter 8: RDWE [REP1-014] as this area is outside of the fluvial floodplain.
- 9.1.66. The Scheme includes realignment of an existing ditch designed to convey the excess flows from the grassed embankment. As a result of the reprofiling in this change, this ditch is no longer required and there will no change to the assessment of impacts associated with flooding as reported in ES Chapter 8: RDWE [REP1-014].

9.2. Change to mitigation and enhancement measures

- 9.2.1. Change 3 will require additional mitigation measures to those described in ES Chapter 8: RDWE [REP1-014] which will be captured in the updates to the REAC [REP4-018] (WE1, WE3 and B23).
- 9.2.2. Scour assessment and hydraulic modelling will be undertaken at the detailed design stage, as outlined in the ES Chapter 8: RDWE [REP1-014]. In addition, low flow assessment will be undertaken. The assessment outcomes will be used to refine the mitigation embedded in the design (operation) and the EMP (construction), where required, to ensure there will be no significant adverse effects on the water environment topics.

9.3. Change to assessment of likely significant effects

Change 1 - Link Road replacement of swales with filter drains

- 9.3.1. The changes are not anticipated to change the assessment outcomes for construction and operation as reported in ES Chapter 8: RDWE [REP1-014] for surface water quality, hydromorphology, WFD compliance, groundwater and flood risk.

Change 2 - Link Road replacement of box culverts with bridges

Hydromorphology

- 9.3.2. The change is not anticipated to change the assessment outcomes relating to WFD compliance and hydromorphology for construction as reported in ES Chapter 8: RDWE [REP1-014].
- 9.3.3. The change has the potential for positive implications for hydromorphology and WFD compliance during operation compared with the findings in the ES. However, potential benefits are not considered to be significant and therefore no changes to the overall conclusion reported in ES Chapter 8: RDWE [REP1-014] are anticipated. The conclusions state no significant effects on hydromorphology are anticipated, taking into account mitigation measures and the Scheme is WFD compliant.

Surface Water Quality, Groundwater and Flood Risk

- 9.3.4. The changes are not anticipated to change the assessment outcomes for construction and operation as reported in ES Chapter 8: RDWE [REP1-014] for surface water quality, groundwater and flood risk.

Change 3 - Link Road River Chelt bridge structural form

Hydromorphology

- 9.3.5. The change is not anticipated to change the assessment outcomes relating to WFD compliance and hydromorphology for construction as reported in ES Chapter 8: RDWE [REP1-014] taking into account the updates to the REAC [APP 10.26] (WE1, WE3, B23).
- 9.3.6. The change is assessed as having a negligible effect on hydromorphology during operation. This is compared with the assessment findings for the Scheme, as set out in the ES, which assessed a minor adverse effect. Potential positive effects resulting from this change are not considered to be significant and therefore no changes to the conclusion reported in ES Chapter 8: RDWE [REP1-014] are anticipated. The conclusions state no significant effects on hydromorphology are anticipated, taking into account mitigation measures and the Scheme is WFD compliant.

Surface Water Quality, Groundwater and Flood Risk

- 9.3.7. Change 3 is not anticipated to change the assessment outcomes for construction and operation as reported in ES Chapter 8: RDWE [REP1-014] for surface water quality, groundwater and flood risk.

Change 4 - Link Road alignment

- 9.3.8. Change 4 is not anticipated to change the assessment outcomes for construction and operation as reported in ES Chapter 8: RDWE [REP1-014].

Change 5 - Relocation of existing NRTS TS

- 9.3.9. Change 5 is not anticipated to change the assessment outcomes for construction and operation as reported in ES Chapter 8: RDWE [REP1-014].

Change 6 - Flood storage area reconfiguration

Hydromorphology

- 9.3.10. Change 6 is not anticipated to change the assessment outcomes for construction and operation as reported in ES Chapter 8: RDWE [REP1-014].

Surface Water Quality, Groundwater and Flood Risk

- 9.3.11. Change 6 is not anticipated to change the assessment outcomes for construction and operation as reported in ES Chapter 8: RDWE [REP1-014] for surface water quality, groundwater and flood risk.

Change 7 - Infill of existing northbound on-slip loop

Hydromorphology

- 9.3.12. Change 7 is not anticipated to change the assessment outcomes relating to WFD compliance and hydromorphology for construction as reported in ES Chapter 8: RDWE [REP1-014].
- 9.3.13. There is no change to the conclusion reported in ES Chapter 8: RDWE [REP1-014] that no significant effects on hydromorphology are anticipated during operation, taking into

account mitigation measures. The change is not anticipated to change the conclusion that the Scheme is WFD compliant.

Surface Water Quality, Groundwater and Flood Risk

- 9.3.14. Change 7 is not anticipated to change the assessment outcomes for construction and operation as reported in ES Chapter 8: RDWE [REP1-014] for surface water quality, groundwater and flood risk.

10. Landscape and Visual

10.1. Change to potential impacts

10.1.1. The impacts and potential for significant effects on landscape and visual receptors due to the Scheme are considered within the assessment of effects presented in ES Chapter 9: Landscape and Visual [REP1-0167] and the following supporting appendices:

- Appendix 9.1: LVIA Chapter Figures [REP3-030]
- Appendix 9.2 Visual Assessment Table [APP-114]
- Appendix 9.3 Photo Sheets [APP-115]
- Appendix 9.4 Arboricultural Survey and AIA [APP-116 and APP-117]

10.1.2. The sections below set out the considerations of whether there will be any changes to the outcomes as set out in the landscape and visual assessment, as a result of the changes.

10.1.3. The locations of the visual receptors considered for the seven changes are shown in Figure 10.1.

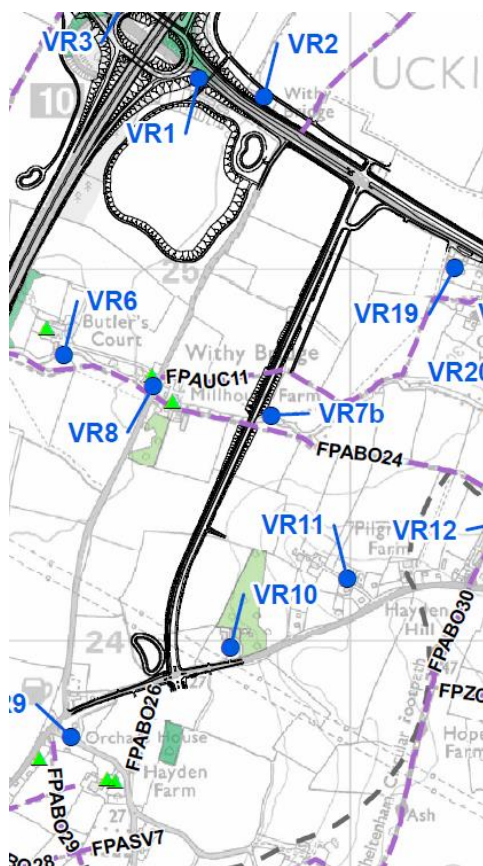


Figure 10-1 Visual receptors as identified in the ES and within proximity of the changes

10.2. Potential impact of the design changes

Landscape character

10.2.1. The local landscape area – West Cheltenham, Bamfurlong to Uckington was identified in the ES as being moderately sensitive to change and experiencing moderate adverse effects due to the Scheme. It is a landscape that already accommodates substantial

infrastructure. The land is flat, and hedgerows and trees limit extended views across the landscape.

- 10.2.2. The changes are very minor in comparison to the Scheme and the existing infrastructure and will not change the assessment outcome for landscape character that are reported in the ES Chapter 9: Landscape and Visual [REP1-016].

Visual amenity

- 10.2.3. The potential visual impacts are distinct to each change. The construction stage visual impacts will be the same with or without the changes, as similar construction activities to those assessed in the ES are required for each change.

- 10.2.4. The operational visual impacts for each change have been considered in turn.

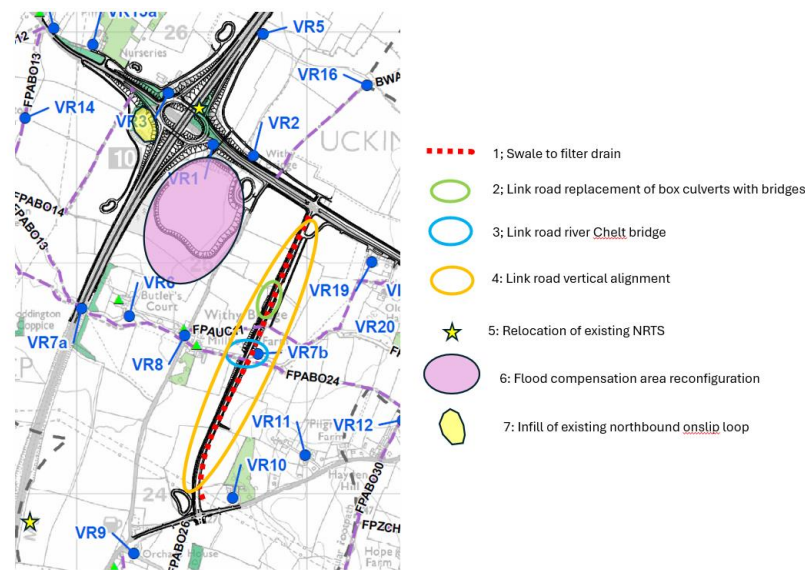


Figure 10-2 The locations of the changes

Change 1 - Link Road replacement of swales with filter drains

- 10.2.5. This change applies to the entire length of both sides of the Link Road. The swales and filter drains are below the level of the immediately adjoining land, so the visual impact of the change will therefore be limited. Swales can form an attractive linear visual feature along the edge of the road, however filter drains due to their design generally lack visual presence, so there will be a loss of visual interest.

- 10.2.6. The key receptors with the potential of experiencing a change in visual impacts due to the change have been considered as follows:

- VR7b PRoW AUC11 and ABO 24 – no change as such the new highway infrastructure will not be visible to users due to the proposed screening
- VR10 Hayden Hill Fruit Farm – no change as filter drains would be screened from views to the east and west by a linear hedgerow with trees at the base of the embankment, so would not be visible from the farm
- VR 8 Withybridge – no change as the filter drains will be screened from views to the east and west by a linear hedgerow with trees along the site boundary.
- VR19 Forge Hill – no change as views from this receptor are partially filtered by property and field boundary vegetation, and the change would not be visible as this receptor is 300m from the Scheme.

- 10.2.7. Overall, there would be no change in visual impacts generated by the change from swales to filter drains along the Link Road. There will not be a change to the assessment outcomes reported in the ES Chapter 9: Landscape and Visual [REP1-016].

Change 2 - Link Road replacement of box culverts with bridges

- 10.2.8. The change would result in a single linear elevated road span in place of a series of concrete box culverts. The bridges will be open structures and will therefore be less intrusive on the landscape and allow views through the embankment.

- 10.2.9. The key receptors with the potential of experiencing a change in visual impacts due to the change are:

- VR7b PRoW AUC11
- VR 8 Withybridge
- VR19 Forge Hill

VR7b PRoW AUC11

- 10.2.10. This route passes close to the Link Road, and users are likely to have views of one of the new structures looking west. The landscape design includes screening along the boundary of the Scheme in the form of hedgerows with intermittent trees which will, over time filter views of the structure from users of the PRoW, the change will still provide this screening. The bridge structure in the change, although a functional design, is a simpler and more visually pleasing elevational design compared to the concreted box culvert solution, so would result in a slight betterment. The change in visual impact is negligible for users of the PRoW. Change 2 would not change the assessment outcomes in the ES Chapter 9: Landscape and Visual [REP1-016].

VR 8 Withybridge

- 10.2.11. This receptor has limited views east towards the Link Road filtered by established mature vegetation along property and field boundaries which will not be impacted by the Scheme or the change. There would be limited views of the bridge abutments, which would be partially screened by the proposed hedgerow and intermittent trees which will provide screening by assessment year 15 in front of the structure. The bridge structure in the change, although a functional design, is a simpler and more visually pleasing elevational design compared to the concreted box culvert solution, so would result in a slight betterment. The change as viewed from the receptor would be negligible. Change 2 would not change the assessment outcomes in the ES Chapter 9: Landscape and Visual [REP1-016].

VR19 Forge Hill

- 10.2.12. Located approximately 300m to the east of the Link Road, views from this receptor are partially filtered by property and field boundary vegetation which will not be affected by the Scheme or the change. There would be limited views of the bridge abutments, in particular the northern structure, which would be largely screened by the proposed hedgerow and intermittent trees, and the proposed habitat planting around the FSA. The bridge structure in the change, although a functional design, is a simpler and more visually pleasing elevational design, compared to the concreted box culvert solution, so would result in a slight betterment. The change would have a negligible impact on views from this receptor, due to the proposed planting. Change 2 would not change the assessment outcomes in the ES Chapter 9: Landscape and Visual [REP1-016].

Change 3 - Link Road River Chelt bridge structural form

- 10.2.13. The change to the alignment of the River Chelt Bridge does not include any change in horizontal alignment of the Link Road and as a result would not impact on any receptors located away from the Scheme.

- 10.2.14. The only receptors which would be impacted by the change are users of PRoW ABO 24 and PRoW AUC11. However, the change in the structural alignment of the bridge would not result in any change in visual impacts. Change 3 would not change the assessment outcomes in the ES Chapter 9: Landscape and Visual [REP1-016].

Change 4 - Link Road alignment

- 10.2.15. The change in vertical alignment would reduce the height of the Link Road by over 1m in a localised area, which will result in the traffic using it being less prominent within the landscape, with a slight increase in screening provided. This would result in a slight beneficial improvement in visual impacts.
- 10.2.16. The key receptor with the potential of experiencing visual impacts due to the change are:
- VR7b PRoW AUC11 and ABO 24
 - VR10 Hayden Hill Fruit Farm
 - VR 8 Withybridge
 - VR19 Forge Hill

VR7b PRoW AUC11 and ABO 24

- 10.2.17. The views from these PRoW will be slightly improved by the change as the new road will be slightly less prominent within the landscape.

VR10 Hayden Hill Fruit Farm

- 10.2.18. The views from this receptor will be slightly improved by the change as the new road will be slightly less prominent within the landscape.

VR8 Withybridge

- 10.2.19. The views from this receptor will be slightly improved by the change as the new road will be slightly less prominent within the landscape.

VR19 Forge Hill

- 10.2.20. Located approximately 300m to the east of the Link Road, views from this receptor are partially filtered by property and field boundary vegetation which will not be affected by the Scheme or the change. By lowering the Link Road, the visual impact will be reduced, but not removed with the change still visible as a new linear feature within the landscape.

Change 5 - Relocation of existing NRTS TS

- 10.2.21. The proposed relocation of the existing TS south along the M5 corridor would remove this element from one area and create a new feature within the motorway network approximately 2.6 km south of the current location.
- 10.2.22. The existing location is screened from all views apart from the users of the M5, who are not identified as a receptor within the ES Chapter 9: Landscape and Visual [REP1-016]. VR5 the informal travellers' site does not have a view of the TS. There are therefore no changes in terms of visual impact by removing the existing TS.
- 10.2.23. The proposed site of the new NRTS TS is anticipated to require minimal vegetation clearance. The proposed structure would form a new minor feature located within the existing motorway boundary. At this location, there is substantial mature vegetation along the eastern and western boundaries of the motorway corridor providing screening which would restrict views of the new structure. The only visual receptors identified within the ES which could be impacted by this change are VR9 The House in the Tree PH, Elm Cottage, Orchard House and PRoW FPAB026.

- 10.2.24. This receptor (VR9) is approximately 350m from the proposed site of the TS and has oblique views north and east towards the motorway corridor, filtered by field boundary hedgerows and occasional trees.
- 10.2.25. The new TS will not be visible to this receptor (VR9) due to the existing vegetation screening views. Change 5 would not change the assessment outcomes in the ES Chapter 9: Landscape and Visual [REP1-016].

Change 6 - Flood storage area reconfiguration

- 10.2.26. The change will reconfigure the FSA and provide two separate basins. The visual impacts would be limited as the visual components of the FSA (open water marginal vegetation and planted slopes) would be the same as the current Scheme, but rearranged.
- 10.2.27. The key receptors with the potential of experiencing visual impacts due to the change are:
- VR1 Withybridge Gardens
 - VR2 Withy Bridge and Laburnum
 - VR6 Butler's Court complex
 - VR8 Withybridge
- 10.2.28. VR1 & VR2 are being demolished so there will be no receptors at these locations to experience any change.

VR6 Butler's Court complex

- 10.2.29. The arrangement of the basins, woodland and other planting areas would be altered. However, the overall view would be good amenity value and the visual impacts as assessed within the ES would not change.

VR8 Withybridge

- 10.2.30. The arrangement of the basins, woodland and other planting areas would be altered. However, the overall view would be good amenity value and the visual impacts as assessed within the ES would not change.

Change 7 - Infill of existing northbound on-slip loop

- 10.2.31. This change introduces a change in landform, removing the existing highway loop pavement and re-profiling the area to create a gradual fall from the Junction southwest towards the motorway boundary. This would result in the removal of additional vegetation located inside the loop and create additional space for mitigation planting of native woodland. All mature woodland to the outer edge of the existing loop will be retained and protected during construction. This change will result in no change in appearance, compared to the Scheme, through an overall increase in vegetation cover and the removal of redundant infrastructure.
- 10.2.32. The key receptor with the potential of experiencing visual impacts due to the change are VR13 Boddington, and VR14 PRoW AB014.

VR13 Boddington

- 10.2.33. This receptor is approximately 900m from the loop and has limited views due to the intervening hedgerows and trees. The change would not be visible from this location and the assessed visual impacts will remain as assessed in the ES Chapter 9: Landscape and Visual [REP1-0167].

VR14 PRoW AB014

- 10.2.34. This receptor lies north-south approximately 230m west of the M5 corridor, running from Boddington to the A4019. Views east towards the Scheme are generally screened by

boundary vegetation lying along the western edge of the M5 motorway corridor, increasing around the M5J10 junction. The change would be screened during construction by the retained vegetation, with some heavily filtered views possible to the northern end of the footpath during winter months. On establishment, the change would increase the overall planting between the PRow and the new M5J10 gyratory and reduce the visibility of the M5J10 gyratory. As such, there is considered to be no change in significance of effect and Change 7 would not change the assessment outcomes in the ES Chapter 9: Landscape and Visual [REP1-016].

10.3. Change to the assessment of likely significant effects

- 10.3.1. All of the changes are considered to be either neutral, or slight beneficial, compared to the Scheme, in terms of visual appearance and form.
- 10.3.2. Overall, the changes would either result in no change or provide a slight betterment to the significance of effects reported in ES Chapter 9: Landscape and Visual [REP1-016] (although resulting in no overall change to that assessed).

11. Geology and soils

11.1. Change to potential impacts

11.1.1. The impacts and potential for significant effects on geology and soils due to the Scheme are considered within the assessment of effects presented in ES Chapter 10: Geology and Soils [REP1-018] and the following supporting appendices:

- Appendix 10.1 Definitions of Probability and Consequence [APP-118]
- Appendix 10.2: Conceptual Site Models [APP-119]
- Appendix 10.3 Land Contamination Impact Assessment Tables [APP-120]
- Appendix 10.4 Agricultural land classification [APP-121]
- Appendix 10.5 Agricultural land survey flood storage area [APP-122]
- Appendix 10.6 Agricultural land survey addition areas [APP-123]
- Appendix 10.7 Ground Investigation Report [APP-124]
- Appendix 10.8 Geology and Soils Chapter Figures [REP5-007]

11.1.2. The sections below set out the consideration of whether there will be any changes to the outcomes, as set out in the geology and soils assessment, as a result of the changes.

11.1.3. The seven changes will be accommodated within the Order limits of the Scheme and will not result in additional agricultural land take. The changes predominately occur within the permanent land take of the Scheme. As a result, the potential impact on agricultural land due to the seven changes will remain the same as assessed in Environmental Statement Chapter 10: Geology and Soils [REP1-018].

Change 1 - Link Road replacement of swales with filter drains

11.1.4. The proposed filter drains are located within the proposed earthworks in a similar location to the original swales and therefore the change will not affect the Scheme with respect to land contamination. The change therefore does not result in any changes to the construction or operation assessment outcomes reported in ES Chapter 10: Geology and Soils [REP1-018].

Change 2 - Link Road replacement of box culverts with bridges

11.1.5. The change would include bored piling for the bridge foundations which was not previously required. Made Ground and contaminative sources are not recorded within the area of the proposed bridge and the piling works are likely to encounter natural strata only. The change therefore does not result in any changes to the potential construction or operation assessment outcomes reported in ES Chapter 10: Geology and Soils [REP1-018].

Change 3 - Link Road River Chelt bridge structural form

11.1.6. The change has a smaller River Chelt bridge footprint in comparison to the Scheme. The foundation design will remain the same as that in the Scheme.

11.1.7. The change will require substantial additional excavation of soils due to the straightening, widening and deepening of the River Chelt channel under the bridge. Made Ground has not been recorded during the ground investigation in this area and the additional excavated arisings are expected to comprise natural soils from the following strata: Alluvium, Cheltenham Sand and Gravel, and Charmouth Mudstone Formation.

11.1.8. The change therefore does not result in any changes to the construction or operation assessment outcomes reported in ES Chapter 10: Geology and Soils [REP1-018].

Change 4 - Link Road alignment

- 11.1.9. The change will reduce the height of the proposed embankment, but the alignment remains above the existing ground level and therefore the change does not change the assessment outcomes with respect to land contamination.
- 11.1.10. Change 4 will not change the potential construction or operation assessment outcomes reported in ES Chapter 10: Geology and Soils [REP1-018].

Change 5 - Relocation of existing NRTS TS

- 11.1.11. The TS will be relocated adjacent to the M5 motorway within an asphalt surfaced area beyond the hard shoulder where existing technology infrastructure is present. Ground investigation has not been undertaken in this area. Based on available nearby ground investigation data, historical mapping, and the published geological maps (ES Appendix 10.7: Ground Investigation Report [APP-124]) it is anticipated that Made Ground associated with the motorway will be present at this location underlain by natural strata comprising the Charmouth Mudstone Formation. The change will result in additional excavated Made Ground and natural soils, but it will not change the impact reported in ES Chapter 10: Geology and Soils [REP1-018].
- 11.1.12. Drainage design will consider the risks from any residual contamination and designers may be required to use lined drainage systems in areas of contamination that may be left in situ. If soil and/or groundwater contamination is identified during the demolition of Uckington TS which poses a risk to sensitive receptors, appropriate remediation will be undertaken which may include excavation of sources and importation of new clean fill as appropriate.
- 11.1.13. The change will not change the potential construction or operation assessment outcomes reported in ES Chapter 10: Geology and Soils [REP1-018].

Change 6 - Flood storage area reconfiguration

- 11.1.14. The change results in a reduction in the total volume of material required to be excavated for the main FSA. However, additional excavation will be required relating to the lowering of Withybridge A4019 Underpass, new culverts and new conveyance channels, although the volume associated with these will be less than the reduction caused by the change. Overall, this change will result in a net reduction of material excavated.
- 11.1.15. The ground conditions within the area of excavation are likely to comprise natural strata of Alluvium and Charmouth Mudstone Formation.
- 11.1.16. Change 6 will not change the construction or operation assessment outcomes reported in ES Chapter 10: Geology and Soils [REP1-018].

Change 7 - Infill of existing northbound on-slip loop

- 11.1.17. The change is in an existing wooded area that is being retained in the Scheme. Made Ground associated with the motorway will also be present under the existing northbound on-slip loop underlain by natural strata comprising the Charmouth Mudstone Formation. The change will result in additional excavated Made Ground, natural soils and bituminous material, but will not change the outcome of the assessment reported in ES Chapter 10: Geology and Soils [REP1-018].

11.2. Change to mitigation and enhancement measures

- 11.2.1. During construction, a piling risk assessment (in accordance with EA guidance to assess and manage risks to controlled waters (e.g. groundwater and the nearby River Chelt), will be prepared for Change 2 - Link Road replacement of box culverts with bridges. This requirement will be implemented through existing mitigation as included in ES Chapter 10: Geology and Soils [REP1-018].

Change 5 - Relocation of existing NRTS TS

- 11.2.2. If contamination is identified during demolition and removal of the existing TS and during excavations for the new TS then the discrete anthropogenic materials such as concrete, brick, glass, plastic, clinker etc., or material which has visual/ olfactory evidence of contamination, will be segregated, and stockpiled as necessary, separately from the 'reworked natural' Made Ground, i.e., Made Ground which contains little to no anthropogenic material, and appears to be reworked/disturbed natural material. This approach is in line with the existing mitigation proposed for the Scheme. If present, any recoverable metal, glass, and plastics collected from Made Ground will be segregated and, where possible, recycled and disposed offsite at a suitable licensed facility.
- 11.2.3. Change 5 will not require a change to the mitigation measures in relation to geology, agricultural land and soils stated in the 1st iteration EMP [AS-025].

Change 7 - Infill of existing northbound on-slip loop

- 11.2.4. The on-slip loop pavement contains tar material which will be managed in accordance with process in the REAC [REP4-018] and the 1st iteration EMP [AS-025]. If further contamination is identified during the demolition of the existing northbound on-slip loop pavement then the material which has visual/ olfactory evidence of contamination shall be segregated and stockpiled separately from the 'reworked natural' Made Ground [i.e., Made Ground which contains little to no anthropogenic material, and appears to be reworked/disturbed natural material]. This approach is in line with the existing mitigation proposed for the Scheme. If present, any recoverable material will be segregated and, where possible, recycled and disposed offsite at a suitable licensed facility.

11.3. Change to assessment of likely significant effects

- 11.3.1. The changes do not affect the risk assessments for human health and controlled waters presented in ES Chapter 10: Geology and Soils [REP1-018].
- 11.3.2. The changes therefore do not change the construction or operation assessment outcomes reported in ES Chapter 10: Geology and Soils [REP1-018].

12. Cultural Heritage

12.1. Change to potential impacts

12.1.1. The impacts and potential for significant effects on cultural heritage assets due to the Scheme are considered within the assessment of effects presented in ES Chapter 11: Cultural heritage [APP-070] and the following supporting appendices:

- Appendix 11.1: Gazetteer [APP-126]
- Appendix 11.2 Cultural Heritage Impact Chapter Figures [APP-127]
- Appendix 11.3 Geophysical Survey Report [APP-128],
- Appendix 11.4 Evaluation Trenching Report [APP-129].

12.1.2. The sections below set out the consideration of whether there will be any changes to the outcomes, as set out in the cultural heritage assessment, as a result of the changes.

Change 1 - Link Road replacement of swales with filter drains

12.1.3. The swales along the Link Road are not assessed specifically in the ES Chapter 11: Cultural Heritage [APP-070]; rather, the construction and operational impacts of the Link Road in its entirety is assessed in regard to known recorded heritage assets and potential unrecorded archaeology. However, it has been possible to consider the potential change in impacts from replacing the swales with filter drains.

12.1.4. The ES baseline identifies one known archaeological site as a receptor that would be physically impacted by the Link Road, GHER 8637: Area of cropmarks of later prehistoric or Romano-British settlement and field systems; assessed to be of medium sensitivity (value). The change of replacement of swales with filter drains within the context of the Link Road (as a whole) will not result in greater construction impacts than those already assessed in the ES. Therefore, there would be no change to the assessment outcomes reported in the ES Chapter 11: Cultural heritage [APP-070].

12.1.5. The ES baseline identifies two designated Grade II listed buildings of medium sensitivity (value) located along Withybridge Lane, Withybridge Mill and Adjoining Barn (1305182) and Cottages by Drive to Butler's Court (1088722), that would experience an impact through changes in setting due to the Link Road; these are associated with archaeological remains of Withybridge Mill (GHER 6474). The change will not increase those impacts that are already assessed. The change as considered in Chapter 10 – Landscape and Visual [REP1-016] will be mitigated through planting, however the Link Road even at a reduced height will continue to be a new feature on the landscape and the impact on connectivity between the archaeological and built heritage, remains as considered in the ES. Therefore, there would be no change to the assessment outcomes reported in the ES Chapter 11: Cultural heritage [APP-070].

12.1.6. When this change is considered together with Change 4, there will be a positive change from a heritage perspective, especially when considering potential impact to setting of listed buildings on Withybridge Lane. While the change may provide some limited benefit, the degree of change would not alter the assessment outcomes reported in the ES Chapter 11: Cultural heritage [APP-070].

Change 2 - Link Road replacement of box culverts with bridges

12.1.7. The box culverts along the Link Road are not assessed specifically in the ES Chapter 11: Cultural Heritage [APP-070]; rather, the construction and operational impacts of the Link Road in its entirety is assessed in regard to known recorded heritage assets and potential unrecorded archaeology. However, it has been possible to consider the potential change in impacts due to the replacement of box culverts with bridges (2 no.).

- 12.1.8. The most northerly bridge would fall within the footprint of a (non-designated) heritage receptor, GHER 8637: Area of cropmarks of later prehistoric or Romano-British settlement and field systems; assessed to be of medium sensitivity (value). When considering the scale of the change, within the wider context of the Link Road infrastructure in its entirety, the physical impact would not exceed those impacts already assessed in the ES. Therefore, there would be no change to the assessment outcomes reported in the ES Chapter 11: Cultural heritage [APP-070].

Change 3 - Link Road River Chelt bridge structural form

- 12.1.9. The River Chelt Bridge is not assessed specifically in the ES Chapter 11: Cultural Heritage [APP-070]; rather, the construction and operational impacts of the Link Road in its entirety is assessed in regard to known recorded heritage assets and potential unrecorded archaeology. However, it has been possible to consider the potential change in impacts from the River Chelt Bridge structural changes.
- 12.1.10. The bridge structure will have a visual impact on the setting of two designated Grade II listed buildings of medium sensitivity (value) located on Withybridge Lane, Withybridge Mill and Adjoining Barn (1305182) and Cottages by Drive to Butler's Court (1088722); these buildings are also associated with archaeological remains of Withybridge Mill (GHER 6474) although the remains would not be physically impacted.
- 12.1.11. In relation to the two listed buildings, the ES states:
"The introduction of new infrastructure in the form of the Link Road would therefore impact the significance of these designated heritage assets through changes in setting, should the infrastructure dominate the landscape to the point of being unable to appreciate the connection between the archaeological and built heritage. The Scheme would not result in physical changes to the current state of Withybridge Lane, and landscape planning includes woodland planting on either side of the Link Road to limit visual intrusion. Whilst the landscaping is being established, there may be the potential for noticeable changes, but the long-term residual impact would be slight".
- 12.1.12. The change will continue to provide planting to limit the visual intrusion between the Link Road and listed buildings on Withybridge Lane. Therefore, the impact would remain the same and not exceed those already assessed in the ES.
- 12.1.13. Although the extent of works in the river channel is the same as that for the Scheme, further meanders to the River Chelt will be provided as part of the change. Riverbanks can often contain archaeological/geo-archaeological deposits of interest and therefore, reprofiling of the bank to accommodate the change could potentially impact upon previously unrecorded archaeological remains (if present). As these are potential remains, they are not assessed in the ES but will be managed through measures within the Archaeological Management Plan, which is secured by way of requirement in the DCO.

Change 4 - Link Road alignment

- 12.1.14. The vertical alignment of the Link Road is not assessed specifically in the ES Chapter 11: Cultural Heritage [APP-070]; rather, the construction and operational impacts of the Link Road in its entirety is assessed in regard to known recorded heritage assets and potential unrecorded archaeology. However, it has been possible to consider the potential change to impacts due to the new vertical alignment.
- 12.1.15. The proposed reduction in height of the Link Road in localised areas would broadly be viewed as a positive change from a heritage perspective, especially when considering potential impact to setting of listed buildings on Withybridge Lane. While the change may provide some limited benefit, the degree of change would not alter the assessment outcomes reported in the ES Chapter 11: Cultural Heritage [APP-070].

Change 5 - Relocation of existing NRTS TS

- 12.1.16. The proposed new location for the TS would not result in any impacts to known heritage receptors reported in the ES. As the new proposed TS location lies within the existing road corridor of the M5 motorway, it is anticipated that the area is devoid of below-ground archaeological remains due to previous impacts from the motorway's construction. The change will therefore not change the assessment outcomes reported in the ES Chapter 11: Cultural heritage [APP-070].

Change 6 - Flood storage area reconfiguration

- 12.1.17. There are no known recorded heritage assets located within the proposed FSA as reported in the ES. The Archaeological Management Plan [AS-038] would mitigate the impacts to potential buried archaeology through archaeological excavation and recording in the areas where the reconfigured basins are proposed. The change will therefore not change the assessment outcomes reported in the ES Chapter 11: Cultural heritage [APP-070].

Change 7 - Infill of existing northbound on-slip loop

- 12.1.18. There are no known recorded heritage assets located within the existing northbound on-slip loop as reported in the ES, that would be physically impacted as a result of the change. Furthermore, the increase of height from the infill would not affect the setting of any known designated heritage assets recorded in the ES Chapter 11: Cultural heritage [APP-070] baseline.
- 12.1.19. The area of the existing northbound on-slip loop is likely to be devoid of any below-ground archaeological remains due to impacts from previous works associated with the construction of the existing road corridor. The provision of screening of the Piffs Elm Interchange can be viewed as a positive change from a heritage perspective to reduce potential visual intrusion. While the change may provide some limited benefit, the degree of change would not alter the assessment outcomes reported in the ES Chapter 11: Cultural heritage [APP-070].

12.2. Change to mitigation and enhancement measures

- 12.2.1. The changes do not necessitate any changes to the mitigation and enhancement measures reported in ES Chapter 11: Cultural heritage [APP-070] as there would be no change to the magnitude of potential adverse impacts during either construction or operation. No additional mitigation measures, beyond those to be detailed in the AMP are required.

12.3. Change to assessment of likely significant effects

- 12.3.1. There would be no change in the outcomes to the assessment of the significance of effects reported in the ES Chapter 11: Cultural heritage [APP-070] as none of the changes introduce notable changes in construction or operation impacts on heritage assets from those previously assessed in the ES.

13. Materials and Waste

13.1. Change to potential impacts

- 13.1.1. The impacts and potential significant effects on Materials and Waste due to the Scheme are considered within the assessment of effects presented in ES Chapter 12: Materials and Waste [REP1-020] and Appendix 12.1: Materials and Waste Chapter Figures [APP-130].
- 13.1.2. The sections below set out the consideration of whether there will be any changes to the outcomes of the Materials and Waste assessment as a result of the changes.
- 13.1.3. The quantity of material assets proposed for use during construction for each of the changes, along with an estimation of waste potentially generated has been calculated for the changes as detailed in Table 13-1, Table 13-2 and Table 13-3 and the original estimates as shown in Tables 12-7 and 12-8 of ES Chapter 12: Materials and Waste [REP1-020].

Table 13-1 Material volumes for the seven proposed design changes

Proposed design change	Difference in cut (m ³)	Difference in Fill (m ³)	Aggregate (m ³)	Concrete (m ³)	Steel (m ³)
1 Link Road replacement of swales with filter drain	-8	-22,633	+1,350		
2 Link Road replacement of box culverts with bridges		-8,774		-233 (Bridge 1) -177 (Bridge 2)	
3 Link Road River Chelt bridge structural form				-110	
4 Link Road alignment	+125	-30,779			
5 Relocation of existing NRTS TS	N/A	+5,734		-75	
6 Flood storage area reconfiguration				+218	
7 Infill of existing northbound on-slip loop	N/A	+44,350*			

* This is not an introduction of additional material to be brought on site, this is an opportunity to dispose of onsite material arising in the existing northbound on-slip loop area. The figure shown is the total volume of material available for use in this proposed design change.

Table 13-2 Original and revised design - material quantities

Material Asset	Primary Material Quantity (m ³) Original Design*	Primary Material Quantity (tonnes) Original Design*	Primary Material Quantity (m ³) Proposed Design Changes in total (with quantity change)	Primary Material Quantity (tonnes) Proposed Design Changes in total (with quantity change)
Aggregate	981,524	1,068,891	982,874	1,070,361
Asphalt	44,201	106,083	44,201	106,083
Concrete	19,698	47,276	19,431	46,635
Steel	322	2,518	322	2,518

*replicated from Table 12-7 from ES Chapter 12: Material Assets and Waste [REP1-020].

Table 13-3 Original and revised design - waste quantities

Material Asset	Waste Quantity (m ³) Original Design**	Waste Quantity (tonnes) Original Design**	Waste Quantity (m ³) Revised Design	Waste Quantity (tonnes) Revised Design
Asphalt	15,231	36,555	15,231	36,555
Concrete	4,055	3,806	4,055	3,806
Metal	565	349	565	349
Mixed	269	419	269	419
Soil	184,461	230,577	181,059	226,324
Timber	114	72	114	72
Total	204,695	271,778	201,293	267,525

**replicated from Table 12-8 from ES Chapter 12: Material Assets and Waste [REP1-020].

- 13.1.4. The ES reported the reuse of a minimum of 201,765 tonnes / 148,409m³ (74%) of potential waste on site substituting the use of primary materials. The seven changes in combination propose to reuse a minimum of 267,106 tonnes / 201,024 m³ (99.87%). The majority of the remaining waste requiring management offsite is expected to be recovered/recycled as detailed in ES Chapter 12: Materials and Waste [REP1-020].
- 13.1.5. There would be no changes to the minerals safeguarding areas assessment as detailed in ES Chapter 12: Materials and Waste [REP1-020].
- 13.1.6. The changes will not change the assessment outcomes for construction as reported in ES Chapter 12: Materials and Waste [REP1-020].
- 13.1.7. The consideration of the operational use of Materials and Waste in relation to the changes remain scoped out of the assessment to align with the reporting in the ES Chapter 12: Materials and Waste [REP1-020].

13.2. Change to mitigation and enhancement measures

- 13.2.1. There are no changes to mitigation measures detailed in ES Chapter 12: Materials and Waste [REP1-020]. No additional mitigation measures, beyond those to be detailed in the Site Waste Management Plan [AS-039].

13.3. Change to assessment of likely significant effects

- 13.3.1. The changes will not change the assessment outcomes in relation to the significance of effects during construction reported in the ES Chapter 12: Materials and Waste [REP1-020].
- 13.3.2. There is no change to the likely significant effects during the operational phase which remains scoped out as reported in ES Chapter 12: Materials and Waste [REP1-020].

14. Population and human health

14.1. Change to potential impacts

- 14.1.1. The impacts and potential for significant effects on population and human health due to the Scheme are considered within the assessment presented in ES Chapter 13: Population and Human Health [REP3-022] and Appendix 13.1: Population and Human Health Chapter Figures [APP-131].
- 14.1.2. The sections below set out the consideration of whether there will be any changes to the outcomes, as set out in the population and human health assessment within the ES, as a result of the changes.
- 14.1.3. There is no change in the baseline of health determinants as a result of the changes. No change in construction and operation impacts is predicted on Human Health for the following changes, based on the assessment presented in ES Chapter 13: Population and Human Health [REP3-022]:
- Change 1 - Link Road replacement of swales with filter drains
 - Change 2 - Link Road replacement of box culverts with bridges
 - Change 3 - Link Road River Chelt bridge structural form
 - Change 4 - Link Road alignment
 - Change 7 - Infill of existing northbound on-slip loop
- 14.1.4. The impacts from Change 5 - Relocation of existing NRTS TS on the human health of site operatives, and Change 6 - FSA reconfiguration, on the human health of those living in nearby residential properties (Butlers Court) and development land, are considered in this chapter.

Change 1 - Link Road replacement of swales with filter drains

- 14.1.5. The proposed replacement of swales with filter drains on the Link Road would reduce the width of the road by 3m, reducing the footprint of the Link Road embankment along the westbound carriageway. The land that is no longer included in the Link Road embankment will instead be planted with grassland and will continue to be within the footprint of the permanent works. This part of the design is located within Agricultural Land Holding B as identified in ES Appendix 13.1 Population and Human Health Chapter Figures [APP-131]. No change in construction or operation impacts is predicted in relation to the agricultural land holding, as the overall land use change is the same as that assessed in the ES.
- 14.1.6. The change will not change the construction or operation impacts on private property and housing, community land and assets or development land and business, reported in the ES, as these types of land are not present at this location.
- 14.1.7. No changes to the type or magnitude of the impacts reported in the ES during construction or operation, on walkers, cyclists or horse riders, are expected due to the change.

Change 2 - Link Road replacement of box culverts with bridges

- 14.1.8. This change is located within the Order limits of the Scheme, therefore there will be no change in the construction or operation impact on private property and housing, agricultural land holdings, community land and assets or development land and business, as reported in the ES, as these land uses are not affected at this location.
- 14.1.9. The change is not expected to change any impacts on walkers, cyclists or horse riders during construction or operation.

Change 3 - Link Road River Chelt bridge structural form

- 14.1.10. The Scheme was assessed as having a residual slight adverse effect on properties close to the Link Road (properties adjacent to the B4634; properties adjacent to M5 and Withybridge Lane) during construction and operation, due to the loss of rural characteristics associated with the introduction of the Link Road through agricultural land. The change will enhance the visual amenity of the bridge structure in the enhancement of the natural character of the river through planting of local native species. This will provide a localised beneficial impact to the surrounding properties but will not change the assessment outcomes reported in the ES Chapter 13: Population and Human Health [REP3-022].

Change 4 - Link Road alignment

- 14.1.11. The change will not change the construction or operation impacts on private property and housing, agricultural land holdings, community land and assets or development land and business that are reported in ES Chapter 13: Population and Human Health [REP3-022].
- 14.1.12. No changes to the type or magnitude of the impacts reported in the ES during construction or operation, on walkers, cyclists or horse riders, are expected due to the proposed change. The change will reduce the width of the two-way cycle track from 4m to 3m that is compliant with Local Transport Note (LTN) 1/20 Cycle Infrastructure Design. The reduced width of the cycle track, as part of the proposed change, will not impact on the use of the active travel corridors for cyclists so it will not change the assessment outcome in the ES.

Change 5 - Relocation of existing NRTS TS

- 14.1.13. The existing and proposed location for the TS, do not impact any agricultural land holdings, private property and housing, community land and assets or development land and business. Therefore, the change will not change the construction or operation impact reported in ES Chapter 13: Population and Human Health [REP3-022]. on these land uses. Removal of the risk to the human health of site operatives only during construction, by relocating the TS further from the construction works, is a beneficial impact on human health.
- 14.1.14. The change is not expected to change any impacts on walkers, cyclists or horse riders during construction or operation.

Change 6 - Flood storage area reconfiguration

- 14.1.15. The Scheme is assessed as having a residual large adverse significant effect on agricultural land holding B and a residual moderate adverse significant effect on agricultural land holding H during construction, due to permanent land take. Modelling of the conveyance channel through land to the north of the A4019 has shown that no additional agricultural land take will be required as the existing width of channel shown in the Scheme is sufficient to convey the volume of water associated with the change. The flood depth in extreme flood depths in the area to the north of the A4019 which is safeguarded for development would reduce by up to 0.5m as a result of the change, in comparison with the baseline conditions. The change will not change the assessment outcome as reported in the ES Chapter 13: Population and Human Health [REP3-022].
- 14.1.16. The human health impact on Butlers Court from the Scheme is slight adverse. The earthworks for the basin proposed as part of the change will be 20m closer to Butlers Court and construction of the conveyance channel to the River Chelt located to the east of the M5 would be 2m closer to Butlers Court. Given that the total separation distance between the Order limits and Butlers Court Cottages is approximately 200m, it is predicted that this change would not breach the LOAEL noise threshold therefore no change in the magnitude of the noise impact is anticipated. Construction of the conveyance channel would be screened by the existing woodland vegetation to the east of the M5. No change in the magnitude of the human health impact is anticipated during construction. The

permanent works would be closer to Butler's Court, but the operational activities would not change.

- 14.1.17. Change 6 is not considered to result in a change in construction or operation impact on community land and assets.
- 14.1.18. The change is not expected to change any impacts on walkers, cyclists or horse riders during construction or operation.

Change 7 - Infill of existing northbound on-slip loop

- 14.1.19. The change is not expected to change the construction or operation impact on private property and housing, agricultural land holdings, community land and assets or development land and business.
- 14.1.20. The ES concludes that the Scheme will have a moderate adverse residual effect on Walkers, Cyclists, and Horse-riders (WCH) during the construction of Junction 10, primarily due to the length of temporary diversions required. Change 7 is not expected to change the need for or length of temporary diversions to undertake construction works at this location. The ES also concluded that the Scheme would have a large adverse residual effect on landscape amenity due to the presence of the construction works, and this will still be the situation with the Change 7. The retained vegetation screen will be strengthened by the maturing planting on the new platform, with localised benefits for the users of the WCH routes during operation, but this will not change the overall assessment outcomes. Change 7 is not expected to change the assessment outcomes reported in the ES in relation to impacts on WCH during construction or operation.
- 14.1.21. The provision of screening of the Piffs Elm Interchange can be viewed as a positive change during operation from a PRoW perspective, but this will be localised and will not change the outcome of the assessment in the ES Chapter 13: Population and Human Health [REP3-022].

14.2. Change to mitigation and enhancement measures

- 14.2.1. The above assessment of the changes concludes that the relocation of the NRTS TS to reduce the risk to human health of construction workers is the only change to mitigation as reported in ES Chapter 13: Population and Human Health [REP3-022].

14.3. Change to assessment of likely significant effects

- 14.3.1. The changes do alter the type and magnitude of impacts for a number of receptor groups, as set out above. Change 5 provides an essential mitigation that delivers a reduction in risk to human health for construction workers in respect of a specific element of the construction activities, as a supplement to the measures already identified in the ES for this receptor group to ensure that residual effects are not significant.
- 14.3.2. The qualitative assessment set out in this ESA concludes that these alterations will not result in a change to the assessment outcomes in relation to the likely significance of residual effects reported in ES Chapter 13: Population and Human Health [REP3-022].

15. Climate

15.1. Change to potential impacts

- 15.1.1. The impacts and potential for significant effects on climate due to the Scheme, as well as the Scheme's vulnerability to climate change, are considered within the assessment of the significance of effects presented in ES Chapter 14: Climate [REP1-024].
- 15.1.2. The sections below set out the consideration of whether there will be any changes to the outcomes, as set out in the climate assessment, as a result of the changes. There will be no change to the operational phase of the carbon assessment as a result of the seven changes, as the use of the road and, therefore, road user (traffic) data is not impacted.

Change 1 - Link Road replacement of swales with filter drains

Carbon (Effects on climate due to the Scheme)

- 15.1.3. The change is anticipated to decrease carbon emissions arising from the construction phase by 1000 tCO₂e relative to the emissions due to the Scheme, as a result of the more efficient solution in terms of alignment, earthworks and constructability. The reduction in imported fill material by 29,492m³ reduces the carbon from material and transport by 1057 tCO₂e, outweighing the increased carbon arising from additional cut volume (476m³) and aggregate (1,350m³).
- 15.1.4. Change 1 will not change the assessment outcome reported in ES Chapter 14: Climate [REP1-024].

Climate Resilience (Vulnerability to climate change)

- 15.1.5. The change would not alter the vulnerability of the Scheme to future changes in climate in relation to flood risk, as there is no anticipated change to the assessment of impact as described in Section 9.1. Additionally, there is no anticipated negative impacts to seeding or planting, as reported in Section 10.2.
- 15.1.6. Change 1 will not change the construction and operation assessment outcomes relating to climate reported in ES Chapter 14: Climate [REP1-024].

Change 2 - Link Road replacement of box culverts with bridges

Carbon

- 15.1.7. The change to bridges will result in a reduction of 8,774m³ of fill and a reduction of 410m³ concrete (embodied carbon) required. There will also be reduced maintenance requirements (operational carbon).
- 15.1.8. The change will reduce the overall carbon emissions by 420 tCO₂e from material and transport emissions.
- 15.1.9. The change will not change the assessment outcome reported in ES Chapter 14: Climate [REP1-024].

Climate Resilience

- 15.1.10. The change would not alter the vulnerability of the Scheme to future changes in climate in relation to flood risk. As described in Section 9.1 the change will not result in a change to overall assessment outcomes for the Scheme.
- 15.1.11. The change will not change the construction and operation assessment outcomes relating to climate reported in ES Chapter 14: Climate [REP1-024].

Change 3 - Link Road River Chelt bridge structural form

Carbon

- 15.1.12. The change will reprofile the existing riverbank to reduce erosion, removing the skew in the bridge structure. The change would reduce concrete required by 110m³.
- 15.1.13. The change is anticipated to result in a reduction of 28 tCO₂e in material and transport construction phase carbon emissions relative to the Scheme.
- 15.1.14. The change will not change the assessment outcome reported in ES Chapter 14: Climate [REP1-024].

Climate Resilience

- 15.1.15. The change is not anticipated to alter the vulnerability of the Scheme to future changes in climate as there is no anticipated change to the flood risk assessment, as described in Section 9.1. Additionally, there is no anticipated negative change to biodiversity, as described in Section 8.10.
- 15.1.16. The change will not change the construction and operation assessment outcomes relating to climate reported in ES Chapter 14: Climate [REP1-024].

Change 4 - Link Road alignment

Carbon

- 15.1.17. The change will reduce the construction phase carbon emissions relative to the Scheme, due to a reduction in the fill material required on site by 31,394m³ resulting in a reduction of 1125 tCO₂e. There will also be a smaller increase in cut of 414m³, increasing emissions by 8 tCO₂e. The change will result in an overall reduction of 1,117 tCO₂e, based on material and transport emissions.
- 15.1.18. The change will not change the assessment outcome reported in ES Chapter 14: Climate [REP1-024].

Climate Resilience

- 15.1.19. The change is not anticipated to alter the vulnerability of the Scheme to future changes in climate, as the vertical alignment is still located above the maximum flood water level produced when including the climate change allowance, as described in Section 9.1.
- 15.1.20. The change will not change the construction and operation assessment outcomes relating to climate reported in ES Chapter 14: Climate [REP1-024].

Change 5 - Relocation of existing NRTS TS

Carbon

- 15.1.21. The change requires a 5,743m³ increase in fill and a 75m³ reduction in concrete.
- 15.1.22. The change is anticipated to have an increase in construction phase carbon emissions relative to the Scheme by 186 tCO₂e. The increase in fill material increases carbon from material and transport emissions by 205 tCO₂e, whilst the reduction in concrete reduces carbon by 19 tCO₂e.
- 15.1.23. The change will not change the assessment outcome reported in ES Chapter 14: Climate [REP1-024].

Climate Resilience

- 15.1.24. The change is not anticipated to alter the vulnerability of the Scheme to future changes in climate, as there is no anticipated change to the flood risk assessment, as described in Section 9.1.
- 15.1.25. Change 5 will not change the construction and operation assessment outcomes relating to climate reported in ES Chapter 14: Climate [REP1-024].

Change 6 - Flood storage area reconfiguration

Carbon

- 15.1.26. The change is anticipated to increase construction phase emissions by 56 tCO₂e relative to the Scheme, with an increase in concrete volumes of 218m³, resulting from the new culverts through the A4019.
- 15.1.27. The change will not change the assessment outcome reported in ES Chapter 14: Climate [REP1-024].

Climate Resilience

- 15.1.28. Overall, there is a positive impact on flood risk from the change, as described in Section 9.1. However, this is not anticipated to change the vulnerability of the Scheme to future changes in climate in regard to flood risk.
- 15.1.29. The change will not change the construction and operation assessment outcomes relating to climate reported in ES Chapter 14: Climate [REP1-024].

Change 7 - Infill of existing northbound on-slip loop

Carbon

- 15.1.30. Surplus excavation material generated on site could be used on-site for infilling reducing the requirement for transport from site. Material will not be imported to site for this infilling.
- 15.1.31. The change is anticipated to reduce construction phase emissions from the transport of waste material off-site by 788 tCO₂e.
- 15.1.32. The change will not change the assessment outcome reported in ES Chapter 14: Climate [REP1-024].

Climate Resilience

- 15.1.33. The change is not anticipated to alter the vulnerability of the proposed Scheme to future changes in climate in relation to flood risk.
- 15.1.34. The change will not change the construction and operation assessment outcomes relating to climate change vulnerability reported in ES Chapter 14: Climate [REP1-024].

15.2. Change to mitigation and enhancement measures

Carbon

- 15.2.1. The seven change will not change the assessment outcome reported in ES Chapter 14: Climate [REP1-024], which is that the construction and operation phases will not have a significant effect on climate. Therefore, no additional mitigation associated with carbon is proposed.

Climate Resilience

- 15.2.2. Taking into consideration the mitigation that is embedded into the design, no changes to the flood risk mitigation measures, as described in the ES Chapter 8: RDWE [REP1-014],

are required due to the changes. No additional mitigation associated with climate resilience is proposed.

15.3. Change to assessment of likely significant effects

Carbon

- 15.3.1. The seven change will not change the assessment outcome reported in ES Chapter 14: Climate [REP1-024], which is that the construction and operation phases will not have a significant effect on climate. The seven changes are anticipated to reduce construction phase emissions by 3,110 tCO₂e, whilst operational road user emissions are not anticipated to change.

Climate Resilience

- 15.3.2. The vulnerability of the Scheme to climate change is not likely to be affected by the changes, therefore, there are no changes to the likely significant effects in relation to climate resilience as reported in ES Chapter 14: Climate [REP1-024]. With consideration of the mitigation measures, no potential climate vulnerability impacts in relation to flood risk are found to be significant adverse.

16. Cumulative effects assessment

- 16.1.1. The potential for cumulative effects due to the Scheme are considered within the assessment of effects presented in ES Chapter 15: Cumulative Effects Assessment [APP-074] and the following supporting appendices:
- Appendix 15.1 RFFP Long List [APP-132]
 - Appendix 15.2 Cumulative effects assessment figures [APP-133].
- 16.1.2. The sections below set out the consideration as to whether there will be any changes to the outcomes of the cumulative effects assessment as a result of the changes, considering two types of cumulative effects:
- Inter-project cumulative effects: cumulative effects with other existing and, or approved development
 - Intra-Scheme cumulative effects: the combined effects of the changes in terms of the impacts associated with the Scheme only – the contribution of the changes to this draws on the findings of the relevant technical chapters of this ESA.

Inter-project cumulative effects

- 16.1.3. There are no changes to the Scheme Order limits as a result of the seven changes. There are therefore no changes to the short-list of other developments (termed Reasonably Foreseeable Future Projects (RFFPs)) that the Scheme could interact with, as presented in ES Chapter 15: Cumulative Effects Assessment [APP-074], Appendix 15.1: RFFP Long List [APP-132] and Appendix 15.2 Cumulative effects assessment figures [APP-133] due to changes 1, 2, 3, 4 5, and 7.
- 16.1.4. Change 6 will introduce a new channel along the western edge of the Safeguarded Land to the Northwest of Cheltenham (Policy SD5). Change 6 also allows the continuation of the conveyance of water across the A4019 corridor, which is a change from the Scheme (which severed this flow path). Taken together, these aspects of the change will slightly increase the flood risk in this area in the 1% AEP plus climate change scenario, compared to the Scheme. However, this is less than the existing flood risk to this land in the baseline conditions.
- 16.1.5. The seven changes are not associated with any other new impact interactions on environmental receptors that are shared with other developments. The ESA concludes that there is no change to the outcomes in terms of the significance of residual inter-project cumulative effects.

Intra-Scheme cumulative effects

- 16.1.6. There are no new or different significant residual effects reported for any other environmental topics as a result of the changes. There are therefore no changes to the significant residual intra-Scheme cumulative effects as reported in ES Chapter 15: Cumulative Effects Assessment [APP-074].

17. Summary

17.1. Overview

- 17.1.1. The seven changes will either have a minor impact or betterment, but these are localised and would not be great enough to change the assessment outcomes as reported in the ES. There will therefore be no change to the significance of effects as reported in the ES.

18. References

Highways England (now National Highways) (2019). Design Manual for Roads and Bridges, LA 105 Air Quality.

Highways England (now National Highways) (2020) Design Manual for Roads and Bridges LA 113 – Road drainage and the water environment Revision 1

19. Acronyms / Abbreviations

Abbreviations	Term
AIA	Arboriculture Impact Assessment
AIES	Associate Member of Institute of Environmental Sciences
AMIOA	Associate Member of Institute of Acoustics
AMP	Archaeological Management Plan
AEP	Annual Exceedance Probability
APMP	Association for Project Management Practitioner
BA (Hons)	Undergraduate degree - Bachelor of Arts with honours
BSc (Hons)	Undergraduate degree - Bachelor of Science with honours
BNG	Biodiversity Net Gain
BPM	Best Practicable Means
CA	Compulsory Acquisition
CEng	Chartered Engineer
CEnv	Chartered Environmentalist
CGeog	Chartered Geographer
CGeol	Chartered Geologist
CMgr	Chartered Manager
CMLI	Chartered Member of the Landscape Institute
CSi	Chartered Scientist
CWEM	Chartered Institute of Water and Environmental Management
DCO	Development Consent Order
DF3	Design Fix 3
DF4	Design Fix 4
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency
EMP	Environmental Management Plan
ES	Environmental Statement
ESA	Environmental Statement Addendum
ExA	Examining Authority
FACTS	Qualified Advisor for nutrient management
FSA	Flood Storage Area
FGS	Fellow of the Geological Society
FIEMA	Fellow of the Institute of Environmental Management and Assessment
FRA	Flood Risk Assessment
FRGS	Fellow of the Royal Geographical Society
GCC	Gloucestershire County Council
GradCIWEM	Graduate Member of the Chartered Institute of Water and Environmental Management

Abbreviations	Term
GradIEMA	Graduate Member of the Institute of Environmental Management and Assessment
HEWRAT	Highways England Water Risk Assessment Tool
HRA	Habitats Regulation Assessment
IEF	Important Ecological Features
LONI	Letters of No Impediment
LLFA	Lead Local Flood Authority
LOAEL	Lowest Observed Adverse Effect Level
LoD	Limit of Deviation
M5 J10	M5 Junction 10
MA	Master of Arts
MADip	Master of Arts Diploma
MBA	Master of Business Administration
MCIEEM	Chartered Member of the Institute of Ecology and Environmental Management
MCIWM	Chartered Waste Manager
MCIWEM	Chartered Member of Institution of Water and Environmental Management
MCMI	Member of the Chartered Management Institute
MIOA	Member of Institute of Acoustics
MIAQM	Member of the Institute of Air Quality Management
MIEMA	Member of the Institute of Environmental Assessment and Management
MIEnvSc	Full Member of the Institution of Environmental Sciences
MISoilSCi	Full Member of the British Society of Soil Science
MPhil	Master of philosophy
MRes	Master of research
MSc	Master of Science
MSci (Hons)	Master of Science and Humanities with honours
NRTS	National Roads Telecommunication Services
PCIFA	Chartered Institute of Field Archaeologists Practitioner
PIEMA	Practitioner of the Institute of Environmental Management and Assessment
PGDip	Postgraduate diploma
PhD	Doctorate degree
PRoW	Public Right of Way
REAC	Register of Environmental Actions and Commitments
REIA	Registered Environmental Impact Assessment Practitioner
RDWE	Road Drainage and the Water Environment
RRRAP	Road Restraint Risk Assessment Process
SAC	Special Area of Conservation
SOAEL	Significant Observed Adverse Effect Level
TechIOA	Technician Member of the Institute of Acoustics
TS	Transmission Station

Abbreviations	Term
VR	Visual Receptor
VRS	Vehicle Restraint System
WFD	Water Framework Directive

20. Glossary

Definitions for technical terms used in this ESA can be found in Appendix 1.1: Glossary [APP-075], of the ES.



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