M5 Junction 10 Improvements Scheme

Environmental Statement
Appendix 7.13 Habitats Regulations Assessment Screening
TR010063 - APP 6.15

Regulation 5 (2) (g)

Planning Act 2008

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

Volume 6
July 2024

Gloucestershire COUNTY COUNCIL

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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]

Environmental Statement:

Appendix 7.13 Habitats Regulations Assessment Screening

Regulation Number:	Regulation 5(2)(g)
Planning Inspectorate Scheme Reference	TR010063
Application Document Reference	TR010063/APP/6.15
Author:	M5 Junction 10 Improvements Scheme Project Team

Version	Date	Status of Version
Rev 0	December 2023	DCO Application
Rev 1	July 2024	Deadline 3

Document accessibility

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1. Introduction

1.1. Terms of reference

1.1.1. Atkins, member of the SNC-Lavalin group, was commissioned by Gloucestershire County Council (GCC) to undertake a Habitats Regulations Assessment (HRA) in relation to the M5 Junction 10 Improvements Scheme (hereafter referred to as 'the Scheme').

1.1.2. This report presents the results of the HRA Stage 1: Screening of likely significant effects (LSE) for the Scheme.

1.1.3. It has been prepared to support the Development Consent Order (DCO) application for the Scheme, and forms part of the Environmental Statement (ES). It is also intended as a standalone report.

1.2. Scheme background

1.2.1. Gloucestershire faces significant challenges to achieve its vision for economic growth. The Joint Core Strategy (JCS) is a partnership between Gloucester City Council, Cheltenham Borough Council (CBC) and Tewkesbury Borough Council (TBC) which sets out a strategic planning framework for the three areas. The Adopted JCS 2011-2031 is a coordinated strategic development plan, adopted in December 2017, which shows how the region will develop and includes a shared spatial vision targeting 35,175 new homes and 39,500 new jobs by 2031.

1.2.2. Major development of new housing (c.9,000 homes) and employment land is proposed in the JCS in strategic and safeguarded allocations to the west and north-west of Cheltenham, these being: West Cheltenham (Golden Valley); North West Cheltenham (Elms Park); and safeguard land to the west and the north-west of Cheltenham. The West Cheltenham development, in turn, is linked to wider economic investment, including a government supported cyber business park (Cyber Central UK) adjacent to the Government Communications Headquarters (GCHQ) site in west Cheltenham.

1.2.3. The existing M5 Junction 10 only provides access and egress to and from the north, with no connectivity to M5 south; this causes existing traffic to cross Cheltenham through various routes to access and leave the M5 from the south using other M5 junctions. This contributes significantly to existing traffic flows across Cheltenham, with significant congestion at peak times. To unlock the housing and job opportunities, a highway network is needed that has the capacity to accommodate the increased traffic it will generate, within a sustainable transport context.

1.2.4. Upgrading M5 Junction 10 to an all movements junction has been identified as a key infrastructure requirement to enable the housing and economic development proposed by the JCS and supported in the Gloucestershire Local Enterprise Partnership's (GFirst LEP) Strategic Economic Plan and the transport network sought by GCC in the adopted Gloucestershire Local Transport Plan. Improvements to M5 J10 are critical to maintaining the safe and efficient operation of the junction; and enabling the planned development and economic growth. A bid was submitted in March 2019 to Homes England to the Housing Infrastructure Fund (HIF), wherein an investment case was made for the following infrastructure improvements. Funding was successfully awarded by Homes England in March 2020 for:

- Element 1: Improvements to Junction 10 on the M5 and a new road linking Junction 10 to west Cheltenham.
- Element 2: A38/A4019 Junction Improvements at Coombe Hill.
- Element 3: A4019 widening, east of Junction 10.
- Element 4: An upgrade to Arle Court Park and Ride.

1.2.5. Elements 1 and 3 comprise the M5 Junction 10 Improvements Scheme. The upgrade to Arle Court Park and Ride (now known as the Arle Court Transport Hub) (Element 4) and the junction improvements at Coombe Hill (Element 2) were included as part of the package of improvements funded by Homes England. As they do not form part of the proposed improvement of M5 Junction 10, and are located some distance from the junction, GCC has decided to take these two elements forward as separate packages of work in order to accelerate the programme for these elements.

1.2.6. This ES forms part of an application for a Development Consent Order (DCO) under S.22 of the Planning Act 2008 ("the Act") for the carrying out of works to M5 Junction 10, consisting of a new all-movements motorway junction; a new West Cheltenham Link Road (the Link Road from the A4019 to the B4634 (Old Gloucester Road)[1]), and the widening of the A4019 (Tewkesbury Road)[2] east of the junction to the Gallagher Retail Park Junction. A small section of the A4019 will be realigned to the west of the junction.

1.3. Scheme description

1.3.1. An overview of the Scheme is provided below. Further details are included in Chapter 2 of the Environmental Statement (Application document TR010063 – APP 6.2).

1.3.2. The proposed alterations to M5 Junction 10 are to increase the capacity of the junction, and to upgrade the current restricted movements junction to an all-movements junction. To enable travel both south and north on the M5, the two existing Junction 10 slip roads will be removed, and four new slip roads will be constructed to provide access and egress to the M5 in all directions.

1.3.3. Two new overbridges (Piffs Elm Interchange Bridge North and Piffs Elm Interchange Bridge South) will be constructed over the M5, centred either side of the existing Piffs Elm Interchange Bridge (carrying the A4019 over the M5), which will then be demolished. The new overbridges will create a new elongated roundabout junction over the M5.

1.3.4. The A4019 will be realigned to provide an appropriate entry angle to the new roundabout. A dedicated route for cyclists and pedestrians will be provided at grade through the junction. As a result of the new slip roads, the Piffs Elm culvert and the Leigh Brook culvert (also referred to as the Barn Farm culvert), that pass under the M5, will be extended by 100.2m and 16.4m respectively. The alignment of the new southbound on and northbound off slip roads means that an extension of the River Chelt culvert under the M5 will not be required. The speed limit along the A4019 across the new roundabout will be 50mph. The national speed limit for motorways will apply on the new slip roads. The new roundabout, and the approaches to it (from the motorway and the A4019) will be lit.

1.3.5. The creation of new north facing slip roads means that the existing 53.5m long culvert for the Leigh Brook underneath the M5 to the north of Junction 10 will be extended at either end, to a total of 69.9m in length. The riverbanks 200m downstream of the culvert will be reprofiled and planted with appropriate vegetation to improve hydromorphological and ecological diversity. The new south facing slip roads will not extend far enough south to require an extension of the River Chelt culvert, although the river banks 100m upstream and downstream of the culvert will be reprofiled and planted to improve hydromorphological and ecological diversity of this section of the River Chelt.

1.3.6. The existing retaining wall to the south side of the A4019, immediately to the east of the M5, will be demolished.

1.3.7. Highway drainage from the new slip roads and roundabout will be to two new attenuation basins located to west of the M5, to the north and south of the junction.

[1] B4634 Old Gloucester Road referred to subsequently as the 'B4634'.
[2] A4019 Tewkesbury Road referred to subsequently as the 'A4019'.

1.3.8. The embankment to the north of the A4019, and west of the M5 will be steepened to enable an area of priority habitat along the north side of a section of Stanboro Lane to be retained. The existing crib wall retaining wall in this location will be demolished.

1.3.9. A new access track will be created to the northeast of the M5 Junction 10, as a replacement for the existing access points to the field areas and the informal Traveller site, that have been lost as a result of the new southbound off-slip.

1.3.10. To the southeast of the M5 Junction 10, an area of land will be reprofiled by the excavation of material. This area will provide flood storage for the Scheme, and compensation for the loss of flood storage from construction of the Scheme. The land adjacent to (and surrounding) the excavated area will be landscaped to provide a mix of habitats to support biodiversity enhancements within the Scheme. Collectively the excavated area and the landscaped area are referred to as the 'flood storage area'. The preliminary design for the flood storage area is provided in the Environmental Masterplan (Application document TR010063 – APP 2.13).

1.3.11. Whilst the final layout for this flood storage area will be determined at detailed design stage, the layout selected will provide the following design parameters:

- Excavation to no deeper than the Piffs Elm culvert, with capacity to store 190,298m^3 of floodwater;
- To provide a sufficient level of flood storage within the parameters of a 1 in 100 year flood event with a 53% climate change allowance.
- The outfall from the attenuation basin adjacent to the flood storage area will provide a regular supply of water into the excavated area (from highway drainage that has been treated through the attenuation basin). This will supply a permanent body of water located between the outfall from the attenuation basin and the Piffs Elm culvert, which will be created by excavating to a greater depth than Piffs Elm culvert. This permanent body of water will not affect the flood storage capacity of the excavated area.

1.3.12. A structure for roosting bats has been included within the flood storage area, to provide mitigation for the loss of roosting sites within the Scheme area.

1.3.13. An underpass (the 'Withybridge (A4019) underpass') will be constructed under the A4019 immediately to the east of Junction 10 to provide a traffic free route for bats to cross under the A4019, as well as pedestrians, cyclists and equestrians. The underpass will be constructed from two precast concrete U-sections to provide a clear opening of 4m height and 5m width, and with wingwalls and a headwall at either end, and a total length of 55m. Physical measures will be in place to prevent vehicular access through the underpass. The underpass will be lit during the day, with the lights switched off between sunset and sunrise.

1.3.14. Works to install signage and technology equipment will be undertaken along the M5 to the north and south of Junction 10. The exact locations of these works will be determined at detailed design and will be limited to works at discrete locations in the existing highway verge (for the installation of new signage for example) or the installation of cabling along the edge of the existing motorway. The specific locations of the signage and cabling works is not fixed at this stage and will be determined at detailed design stage, subject to ecological investigations to ensure that specific impacts (to badgers for example) are avoided.

West Cheltenham Link Road

1.3.15. The Link Road element of the Scheme comprises a new single carriageway 1.4km in length, between the B4634 to the A4019, designed to provide greater connectivity between the reconfigured M5 Junction 10 and the West Cheltenham Development Area. The Link Road has a segregated cycleway (3m in width) and footway (2m in width) all the way along its west side. The speed limit on the Link Road will be 50mph, reducing to 40mph at the junction with the B4634.

1.3.16. The Link Road crosses predominantly agricultural land. The design of the Link Road includes flood mitigation structures across the floodplain to the north of the River Chelt, and a single span bridge over the River Chelt. The bridge construction will be a single span precast beam bridge with integral full height reinforced concrete abutments, resting on a piled foundation (comprising 1m diameter bored concrete pile). The bridge will cross the River Chelt at an angle, with the bridge abutments set back from the riverbanks by a minimum of 4m on each side of the river. As the abutments will also be on an angle to the riverbank, then at some points the abutments will be greater than 4m from the riverbank.

1.3.17. The bridge will have a clear span of 24m between the front faces of the abutments (equivalent to a 24.9m skew span), and the bridge deck will be 20.8m wide. The clearance underneath the bridge (between the underside of the bridge and the top of the riverbank) will be 2.8m. This clearance provides sufficient space for floodwater to pass underneath the bridge in the 1% annual exceedance probability event (1 in 100-year return period) including an allowance for climate change (+53% in flow) with a minimum of 600mm freeboard to soffit.

1.3.18. The clearance underneath the bridge, and the space between the riverbank and bridge abutments will also allow access for small vehicles and livestock along either riverbank at this point.

1.3.19. In order to ensure that access under the River Chelt bridge is maintained, a short section of hard bank protection, such as rip-rap or non-biodegradable geotextile, will be installed along both banks of the River Chelt underneath the River Chelt bridge.

1.3.20. Flood mitigation structures will be provided underneath the Link Road at two locations between the River Chelt and the A4019. These are to ensure that the Link Road does not impede the natural movement of floodwater from the River Chelt north-westerly from a point upstream of the proposed River Chelt bridge. The flood mitigation structures will comprise two groups of precast concrete box culverts, laid on top of 1m of imported granular fill material:

- Group 1: eighteen 3m span x 1.25m clearance box culverts; with one 6m span x 2m clearance box culvert to accommodate a field drain. All culverts will be 31.85m in length and laid perpendicular to the carriageway, with the total group being 63.9m in length parallel to the carriageway.
- Group 2: eighteen 3m span x 1.25m clearance box culverts. The culverts will be 37.4m in length perpendicular to the carriageway, with the total group being 70.9m in length parallel to the carriageway. Group 2 will be located approximately 70.5m south of Group 1.

1.3.21. Two new junctions will connect the Link Road with the existing A4019 (to the north) and the B4634 (to the south).

1.3.22. Street lighting along the Link Road will be limited to the two new junctions and the sections of the Link Road adjacent to the junctions.

1.3.23. Highway drainage from the Link Road will be to two new attenuation basins located at the northern and southern end of the Link Road. The attenuation basin at the northern end of the Link Road also receives highway drainage from the A4019.

A4019 widening

1.3.24. The A4019 links the M5 Junction 10 to north-west Cheltenham. Currently, the A4019 is a dual carriageway over the M5 Junction, returning to single carriageway east of the junction to serve the turning into Withybridge Lane. The A4019 continues eastwards to Cheltenham as a single carriageway, where it ties into an existing dual carriageway at the Gallagher Retail Park.

1.3.25. The section of the A4019 covered by the Scheme runs from just west of the M5 Junction 10 (at the junction of Stoke Road and the A4019) eastwards through to the existing dual carriageway at the Gallagher Retail Park (finishing just east of the junction of the B4634 and A4019).

1.3.26. As part of the highway improvements incorporated into the Scheme, the A4019 will be widened to a two-lane dual carriageway from Withybridge Lane, eastwards through to the Gallagher Retail Park, where the Scheme will tie into the existing dual carriageway. Widening of the A4019 through Uckington will be predominantly to the southern side of the A4019. Widening to the east and the west of Uckington will be to the northern side of the A4019. To the west of Junction 10 the existing section of two-lane dual carriageway will be replaced with single lanes.

1.3.27. The elevation of the A4019, in the vicinity of the Withybridge Lane junction, will be raised to remove an existing low point that experiences surface water flooding currently. Existing culverts under the A4019 in this location will be removed.

1.3.28. Street lighting will extend for most of the length of the A4019 within the Scheme boundary. The exceptions will be a section to the east and the west of Uckington where there will be no street lighting so as to provide mitigation for bats.

1.3.29. A speed limit along the A4019 of 50mph is proposed from the western extent of the Scheme through to a point west of Uckington between the junction with the new Link Road and Cooks Lane, where the speed limit will be reduced to 40mph through to the Gallagher junction.

1.3.30. The Scheme will include a segregated cycleway (3m width) and footway (2m width) on the northern side of the A4019, which with the exception of a short section of shared use path through Uckington will extend from the junction of the A4019 with Stanboro Lane in the west through to the Gallagher junction at the eastern end of the Scheme. The Scheme will also include a bus lane on the eastbound carriageway between the West Cheltenham Fire Station and the Gallagher junction.

1.3.31. Highway drainage from the A4019 will be to three new attenuation basins located:

- At the western end of the A4019 (off Stanboro Lane).
- Adjacent to the Cheltenham West Community Fire Station (on the A4019).
- At the northern end of the Link Road. This attenuation basin will also receive highway drainage from the northern section of the Link Road.

1.3.32. Enhancements to existing hedgerows and the creation of new hedgerows will be made in several locations to the north of the A4019 to provide mitigation for dormice found to be present in this area. A new structure will be constructed within the highway boundary to the north of the A4019 and east of Uckington, for roosting bats, to provide mitigation for the loss of existing roosts.

1.4. HRA consultation

1.4.1. Key consultees for biodiversity are Natural England and the Environment Agency. As well as being consulted during the statutory and non-statutory consultation process, dialogue with both stakeholders has been ongoing since 2020.

1.4.2. Early consultation meetings with the Environment Agency were undertaken on 16 January 2020 and 15 July 2021 as part of the development of the preliminary design (presented as two iterations of the developing design, and referred to as Design Fix 2 (DF2) and DF3). The DF2 design was presented as part of the statutory consultation (December 2021 – February 2022). The DF3 design is the preliminary design submitted with the DCO application.

1.4.3. Further to these meetings, the Environment Agency provided consultation responses outlining key points for consideration. These included the need for consideration of connectivity to downstream watercourses and functionally linked habitats; presence of protected and notable species, including migratory and non-migratory fish species; opportunities for enhancements to aquatic habitats (watercourses and wetlands); and the need for a Water Framework Directive (WFD) assessment.

1.4.4. Natural England was consulted on an Interim HRA Screening Report[3] and has provided comment (comments received 15 April 2021, see letter from Natural England in Appendix N, as well as Atkins' response to the comments). Comments have been addressed in this report.

1.4.5. Statutory consultation took place from December 2021, supported by the Preliminary Environmental Information Report (PEIR) which included the HRA (this assessment incorporated Screening and Appropriate Assessment into one document)[4].

1.4.6. The following comments relevant to the HRA were received, which have been taken into consideration in this updated version of the HRA:

- Natural England commented: 'In relation to NPS NN paragraphs 5.22 – 23 relating to designated sites we also draw your attention to:
  A. the emerging Cotswold Beechwoods Special Area of Conservation (SAC) 'strategic solution.' This project's focus on informal recreation involves an area of land ('zone of influence') which includes the scheme red line boundary. This represents a further consideration and an opportunity to integrate the Scheme's design with the strategic allocations' land use planning context.
  B. The ongoing joint commission by Gloucestershire's local planning authorities to conduct visitor surveys of key destinations around the Severn Estuary and sites within the Sever Vale identified as having proven or possible functional linkages with the Severn Estuary Special Protection Area (SPA). The latter include Coombe Hill Canal Site of Special Scientific Interest (SSSI) and Coombe Hill Meadows Nature Reserve a short drive west from the Scheme.'
- Gloucestershire Wildlife Trust commented: 'A study commissioned by Natural England found that land at Coombe Hill Canal SSSI and nature reserve is functionally linked to the SPA through the bird assemblages that move between the sites. Impacts on the SSSI and land functionally linked to the SPA are not adequately covered by the PEIR, which does not assess impact on recreational pressure. To be compliant with The Conservation of Habitats and Species Regulations 2017 (As amended) the PEIR should undertake a Habitats Regulations Assessment. This should include assessment of cumulative impacts on the SSSI, and SPA linked land that will result from providing enhanced access for the growing population, which is due to several strategic housing allocations being near to the Scheme.'

1.4.7. The HRA assessment that supported the PEIR has now been split into separate Screening and Appropriate Assessment reports. Comments received during Statutory consultation have been addressed in this updated Screening report and Technical Appendix 7.14 - Statement to Inform an Appropriate Assessment (SIAA) (Application document TR010063 - APP 6.15).

1.4.8. On 7 November 2022 the updated HRA was provided to Natural England (this Screening report and Technical Appendix 7.14 - Statement to Inform an Appropriate Assessment (SIAA) (Application document TR010063 - APP 6.15). On 9 November 2022 Natural England responded with regard to the Screening report that they are in agreement with the conclusion that likely significant effects as a result of recreational impacts to the Cotswold Beechwood SAC and the Severn Estuary designations can be ruled out; that likely significant effects on the Severn Estuary SPA and Walmore Common SPA can be ruled out; and that likely significant effects as a result of air quality impacts can be ruled out. Comments from Natural England's freshwater team were received on 30 November 2022 with regard to the SIAA, and these have been addressed in the SIAA report.

[3] Atkins (November 2019) M5 Junction 10 Improvement, Interim HRA Screening Report
[4] Atkins (16/11/21) M5 Junction 10 Improvements Scheme Preliminary Environmental Information Report (PEIR) Biodiversity Chapter. Refer to Appendix 7.13. Online: https://www.gloucestershire.gov.uk/highways/major-projects-list/m5-junction-10-improvements-scheme

2. HRA methodology

2.1. Overview of HRA

2.1.1. HRA is required by Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (as amended)[5] for all plans and projects which may have likely significant effects on a European Site[6] and are not directly connected with or necessary to the management of the European Site. The Scheme is not directly connected with, or necessary to, the nature conservation management of any European Sites.

2.1.2. European Sites include SACs and SPAs. HRA is also required, as a matter of UK Government policy, for potential SPAs (pSPA), candidate SACs (cSAC) and listed and proposed Wetlands of International Importance (Ramsar sites and pRamsar sites) for the purposes of considering plans and projects, which may affect them[7]. Hereafter, all the above designated nature conservation sites are referred to as 'European Sites.'

2.1.3. The stages of the HRA process are as follows:

- Stage 1 – Screening: To test whether a plan or project either alone or in-combination with other plans and projects is likely to have a significant effect on a European Site.
- Stage 2 – Appropriate Assessment: To determine whether, in view of a European Site's conservation objectives, the plan or project (either alone or in-combination with other projects and plans) would have an adverse effect (or risk of this) on the integrity of the site with respect to the site structure, function and conservation objectives. If adverse impacts are anticipated, potential mitigation measures to alleviate impacts should be proposed and assessed.
- Stage 3 – Assessment of alternative solutions: Where a plan is assessed as having an adverse impact (or risk of this) on the integrity of a European Site, there should be an examination of alternatives (e.g. alternative locations and designs of development).
- Stage 4 – Assessment where no alternative solutions remain and where adverse impacts remain: In exceptional circumstances (e.g. where there are imperative reasons of overriding public interest), compensatory measures to be put in place to offset negative impacts.

2.1.4. This report comprises Stage 1 of the HRA process.

2.1.5. The document has followed current good practice guidance published by National Highways[8]. The Habitats Regulations Handbook[9], Planning Inspectorate (PINS) Advice Note Ten[10] and government guidance[11] have also been referred to for guidance.

[5] As amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019.
[6] Following the changes made to the Conservation of Habitats and Species Regulations 2017 (as amended) by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019, SACs and SPAs in the UK no longer form part of the EU's Natura 2000 ecological network and now form part of a UK national site network. In this document they are still referred to as European Sites.
[7] Ministry of Housing, Communities and Local Government (July 2021) National Planning Policy Framework.
[8] Highways England (2020). Design Manual for Roads and Bridges. LA 115 Habitats Regulations Assessment (formerly HD 44/09). (January 2020, version 1) Online: http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section4/LA%20115%20Habitats%20Regulations%20assessment%20-web.pdf
[9] Tyldesley, D., and Chapman, C., (2013) The Habitats Regulations Assessment Handbook, January 2018 edition UK: DTA Publications Limited www.dtapublications.co.uk.
[10] National Infrastructure Planning (August 2022, version 9) Advice Note Ten: Habitats Regulations Assessment relevant to nationally significant infrastructure projects. Online: Advice Note Ten: Habitats Regulations Assessment relevant to nationally significant infrastructure projects | National Infrastructure Planning (planninginspectorate.gov.uk).
[11] Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government (July 2019) Appropriate assessment – Guidance on the use of Habitats Regulations Assessment. Online: Appropriate assessment - GOV.UK (www.gov.uk).

2.2. Stage 1 Screening

2.2.1. All available information about the Scheme was gathered in order to identify the nature of potential impacts arising from the project during construction and operation.

2.2.2. With regards to determining the European Sites to include in the Screening assessment ('Scoping'), the guidance in paragraph 3.7 of LA 115[12] states HRA screening shall be completed where the Scheme:

- Is within 2 km of a European Site or functionally linked land.
- Is within 30 km of a SAC where bats are a qualifying feature.
- Crosses or lies adjacent to, upstream of, or downstream of, a watercourse which is designated as a European Site.
- Has a potential hydrological or hydrogeological linkage to a European Site containing a groundwater dependent terrestrial ecosystem (GWDTE).
- Has an Affected Road Network (ARN) which triggers the need for assessment of air quality impacts. The ARN refers to the parts of the road network that would be affected by a change in traffic levels as the result of the Scheme. LA 105[13] states that designated habitats (European Sites, statutory and non-statutory designated nature conservation sites, nature improvement areas, areas of ancient woodland and veteran trees) within 200 m of the ARN should be included in the air quality assessment. This is linked to potential air quality impacts to habitats as a result of NOx emissions and nitrogen deposition from road traffic. Further detail around the establishment of the ARN, and the air quality assessment itself, is presented in Chapter 5 – Air Quality (Application document TR010063 – APP 6.3). The ARN is shown on Figure 7-13A in Appendix A. The LA 105 200 m distance criterion aligns with Natural England's guidance on assessing road traffic emissions on European sites[14].

2.2.3. In addition, paragraph 3.7.2 of LA 115 states that additional European Sites should be subject to screening where other forms of ecological connectivity exist between them and the Scheme.

2.2.4. Information on the qualifying features was obtained from the Natural England website[15] and the Joint Nature Conservation Committee (JNCC) website[16]. Condition assessment information for the underpinning SSSI was obtained from the Natural England website[17] to provide important contextual information.

2.2.5. The Habitats Regulations require assessment of the potential for likely significant effects of the project 'in-combination' with other projects and plans. This refers to the cumulative effects which will or might result from the addition of the effects of other relevant plans or projects to the effects of the subject plan or project.

2.2.6. The Habitats Regulations Handbook[18] advises that any plans or projects at the following stages may be relevant to an in-combination assessment:

[12] Highways England (2020). Design Manual for Roads and Bridges. LA 115 Habitats Regulations Assessment (formerly HD 44/09). (January 2020, version 1) Online: http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section4/LA%20115%20Habitats%20Regulations%20assessment%20-web.pdf
[13] Highways England (2019). Design Manual for Roads and Bridges. LA 105 Air Quality (formerly HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13, part of IAN 185/15). (November 2019, version 0) Online: 10191621-07df-44a3-892e-c1d5c7a28d90 (standardsforhighways.co.uk).
[14] Natural England (June 2018). Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations (V1.4). Online: NEA001 Advising CAs on Road Traffic and HRA June 2018 (4).pdf
[15] http://publications.naturalengland.org.uk/category/5755515191689216 [Accessed: June 2022].
[16] https://sac.jncc.gov.uk/site/ [Accessed: June 2022].
[17] https://designatedsites.naturalengland.org.uk/SiteSearch.aspx [Accessed: June 2022].
[18] Tyldesley, D., and Chapman, C., (2013) The Habitats Regulations Assessment Handbook, January 2018 edition UK: DTA Publications Limited www.dtapublications.co.uk.

- Applications lodged but not yet determined.
- Projects subject to periodic review e.g., annual licences, during the time that their renewal is under consideration.
- Refusals subject to appeal procedures and not yet determined.
- Projects authorised but not yet started.
- Projects started but not yet completed.
- Known projects that do not require external authorisation.
- Proposals in adopted plans.
- Proposals in finalised draft plans formally published or submitted for final consultation, examination or adoption.

Assessing Likely Significant Effects

2.2.7. A critical part of the HRA Screening process is determining whether the proposals are likely to have a significant effect on European Sites and, therefore, if they will require an Appropriate Assessment. The concept of 'likely significant effect' as embodied in Article 6(3) of the Habitats Directive and regulation 63(1) of the Habitats Regulations is well established in law and guidance and embraces the precautionary principle.

2.2.8. The European Court Waddenzee judgement[19] provides clarification regarding the term 'likely'. It concludes that 'any plan or project not directly connected with or necessary to the management of the site is to be subject to an appropriate assessment of its implications for the site in view of the site's conservation objectives if it cannot be excluded, on the basis of objective information, that it will have a significant effect on that site, either individually or in-combination with other plans or projects.'

2.2.9. Clarification has also been provided through case law on the meaning of 'likely' in relation to Bagmoor Wind Ltd v The Scottish Ministers[20]. 'The word 'likely' in the regulation is not to be construed as an expression of probability, in a legal sense, but as a description of the existence of a risk (or possibility).' Consequently, if the possibility of a significant effect cannot be excluded based on objective information, an Appropriate Assessment will be required.

2.2.10. The European Court Waddenzee judgement also provides further clarification regarding the term 'significant': 'where a plan or project not directly connected with or necessary to the management of a site is likely to undermine the site's conservation objectives, it must be considered likely to have a significant effect on that site. The assessment of that risk must be made in the light *inter alia* of the characteristics and specific environmental conditions of the site concerned by such a plan or project.'

2.2.11. The Bagmoor Wind case also provides guidance on the term 'objective.' It states: 'Objective, in this context, means information based on clear verifiable fact rather than subjective opinion.' The Habitats Regulations Handbook states: 'It will not normally be sufficient for an applicant merely to assert that the plan or project will not have an adverse effect on a site, nor will it be appropriate for a competent authority to rely on reassurances based on supposition or speculation. On the other hand, there should be credible evidence to show that there is a real rather than a hypothetical risk of effects that could undermine the site's conservation objectives. Any serious possibility of a risk that the conservation objectives could be undermined should trigger an 'appropriate assessment'.

2.2.12. The test for likelihood of significant effects requires that consideration is given to potential impact pathways. This requires information to be obtained on both the Scheme and the

[19] Case C – 127/02 Waddenzee, reference for a preliminary ruling from the Raad van State: Landelijke Vereniging tot Behoud van de Waddenzee, Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij, 7th September 2004.
[20] Bagmoor Wind Limited v The Scottish Ministers, Court of Sessions [2012] CSIH 93.

European Site. In the absence of a potential impact pathway, it can be concluded that no likely significant effect would arise. Relevant aspects (effects) of the Scheme have been checked against all features of the relevant European Sites (i.e. screened) to determine whether a likely significant effect may arise.

2.2.13. Sources of information may include evidence from projects where similar operations have affected sites with similar qualifying features and conservation objectives and the judgement of relevant specialists that an effect is likely, as well as survey data collected to date for a particular project. In line with the precautionary principle, where there is uncertainty and/or information is lacking in relation to the capacity of the effect to undermine the site's conservation objectives, it must be assumed that there will be an effect, unless further information can be made available to eliminate any areas of doubt.

2.2.14. Supplementary Advice[21] from Natural England describes the measures necessary to achieving the Conservation Objectives for a European site. Based on Supplementary Advice on Conservation Objectives (SACOs), potential effects on the Conservation Objectives for a European site can include, but are not limited to, the following:

- Habitat loss and fragmentation.
- Species disturbance (visual, noise, vibration).
- Changes to water quality.
- Changes to air quality.
- Changes to surface and groundwater hydrology.
- Introduction of Invasive Non-Native Species (INNS).
- Recreation.

2.2.15. The following potential impact pathways are considered within this Screening report. This list aligns with the list of impacts identified in the LA 115 Screening Matrices (Presented in Appendix B to H of the HRA Screening report):

- **Reduction of habitat area** – Includes direct loss of habitats under the footprint of temporary or permanent works. Indirect effects through the loss of functionally linked habitats, i.e. habitats that support species outside of the European Site boundary.
- **Disturbance to key species** – visual, noise or vibration disturbance. This refers to disturbance during construction, operation or decommissioning works to species that may cause behavioural effects, e.g. avoidance, change in foraging behaviour and could result in reduced success in key life stages such as breeding, migration or over wintering, or ultimately physical injury or death. Physical works, vehicle movements, light pollution and presence of staff/workers are all considered.
- **Habitat or species fragmentation** - barrier effects resulting in species being unable to disperse or move through their environment as a result of habitat severance or being deterred from using normal routes as a result of disturbance or pollution. This could result in reduced success in key life stages such as breeding, migration or over wintering, or ultimately physical injury or death.
- **Reduction in species density** – Effects on the overall population either in terms of overall population size or distribution, which result in local or widespread reduction in density. Includes injury or mortality to species which could occur as a result of damaging works, or as a result of high levels of disturbance, changes to water quality or air quality etc.

[21] Natural England. (2015) *Conservation objectives for land-based protected sites in England: how to use the site advice* [online]. Available from <https://www.gov.uk/guidance/conservation-objectives-for-land-based-protected-sites-in-england-how-to-use-the-site-advice> [accessed November 2020].

- **Changes in key indicators of conservation value (water quality etc)** – includes the following:
  - *Changes to water quality* – considers effects on species (and their prey) as a result of contamination, changes in pH, increased nutrient loads, salinity, turbidity, alterations in the thermal regime, discharges or changes in sediment levels.
  - *Changes to air quality* – evaluates the risk of discharges to air, including fugitive dust and combustion emissions.
  - *Changes to surface and groundwater hydrology* – changes to the flow, supply, availability and drainage of water, and increased risks associated with flooding.
  - *Introduction of Invasive Non-Native Species (INNS)* – the risk of introducing or spreading INNS as a result of the Proposed Scheme.
  - *Recreation* – direct and indirect impacts on species and habitats as a result of increased recreational use, including increased visitor numbers, dog walkers, vehicle or watercraft use and associated issues such as dog fouling, litter and anti-social behaviour (littering, vandalism and fires).
- **Climate change** – long term shifts in temperature and weather patterns.

2.2.16. The implication of the Court of Justice of the European Union (CJEU) judgement referred to as People Over Wind (Peter Sweetman v Coillte Teoranta, Case C-323/17) is that competent authorities cannot take account of any 'measures that are intended to avoid or reduce the harmful effects of the envisaged project on the site concerned', when considering at the HRA screening stage whether the plan or project is likely to have an adverse effect on a European Site. The effect of this is that the screening stage must be undertaken on a precautionary basis with no regard to any proposed integrated or additional avoidance or reduction measures. Where the likelihood of significant effects cannot be excluded on the basis of objective information, the competent authority must proceed to carry out an Appropriate Assessment to establish whether the plan or project will affect the integrity of the European Site, which can include at that stage consideration of the effectiveness of the proposed avoidance or reduction measures.

2.2.17. Subsequent case law[22] included a statement that elements that 'are not the mitigating or protective measures which featured in the People Over Wind ruling' and 'are properly characterised as integral features of the project…' should reasonably be included in a HRA screening decision. This view was not subsequently challenged in 2019[23].

2.2.18. Case law in 2017 referred to as the 'Wealden Judgement'[24] prompted Natural England to make their internal guidance on assessing the effects of road traffic emissions on European Sites, public[25]. The guidance provides further information on the in-combination assessment at screening stage with regard to air quality effects.

[22] R (Langton) v SSEFRA & Natural England: [2018] EWHC 2190)
[23] R (Langton) v SSEFRA & Natural England: [2019] EWCA Civ 1562
[24] Case no: CO/3943/2016 – Between Wealden District Council and Secretary of State for Communities and Local Government, Lewes District Council and South Downs National Park Authority and Natural England.
[25] Natural England (June 2018). Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations (V1.4). Online: NEA001 Advising CAs on Road Traffic and HRA June 2018 (4).pdf
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3. Identification of European Sites and coarse screening

3.1. Scoping the European Sites

3.1.1. Seven European Sites have been identified which meet one or more of the screening criteria set out in paragraphs 2.2.2 and 2.2.3. These are detailed below and shown on Figure 7-13A in Appendix A.

Wye Valley and Forest of Dean Bat Sites SAC

3.1.2. The Wye Valley and Forest of Dean Bat Sites SAC is located within 30 km of the Scheme and supports bats as qualifying features. The SAC represents a complex of 13 component SSSIs on the border between England and Wales. The nearest of these (Blaisdon Hall SSSI) is located 21 km west of the Scheme. The SAC has a combined total area of approximately 145 ha. Qualifying features of the SAC include:

- 1303 Lesser horseshoe bat (*Rhinolophus hipposideros*) – the greatest concentration of this species in the UK (26% of the national population). The site has been selected on the grounds of the exceptional breeding population, and the majority of sites within the complex are maternity roosts. The bats are believed to hibernate in the many disused mines in the area[26].
- 1304 Greater horseshoe bat (*R. ferrumequinum*) – the site represents the northern part of its range (6% of the UK population). The site contains the main maternity roost for bats in this area, which are believed to hibernate in the many disused mines in the Forest.

Walmore Common SPA/Ramsar site

3.1.3. Walmore Common SPA/Ramsar site has been included as there is the potential for functionally linked land associated with this European Site to be affected by the Scheme. Walmore Common SPA/Ramsar site is located 17.5 km south-west of the Scheme. The site covers a total area of 53 ha, consisting of damp grassland and ditches which flood regularly during the winter.

3.1.4. Walmore Common is designated as a SPA and Ramsar site.

3.1.5. Qualifying features of the SPA comprise:

- This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive over winter:
    - Bewick's swan (*Cygnus columbianus bewickii*) – 104 individuals representing at least 1.5% of the wintering population in Great Britain (5-year peak mean 1991/2 - 1995/6). Walmore Common historically supported internationally important numbers of Bewick's swans during the winter months, and when the SPA was classified in 1991 it represented 3% of the total British wintering population and 1.5% of the European's population (104 birds). The population has since declined significantly to a five-year peak mean of 55 individuals in 2000/1-2004/05[27]..

3.1.6. Qualifying features of the Ramsar site comprise:

[26] sac.jncc.gov.uk/site/UK0014794
[27] Natural England (October 2018) European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features. Walmore Common Special Protection Area (SPA). Site code UK9007051.

- Internationally important populations of wintering birds (Ramsar Criterion 6) including:
    - Bewick's swan – 43 individuals, representing an average of 0.5% of the total British population (5 year peak mean 1998/9 – 2002/3).

Severn Estuary SAC/SPA/Ramsar site

3.1.7. All watercourses which are crossed by the Scheme (River Chelt, Leigh Brook, and their tributaries) eventually flow into the River Severn, which is approximately 7.5 km downstream from the closest Scheme interaction. From the nearest confluence point, where the River Chelt joins the River Severn, just upstream of Wainlode Cliff, the Severn Estuary SAC/SPA/Ramsar site designations boundary is a further 40 km downstream (a total distance of approximately 47.5 km downstream of the Scheme).

3.1.8. The Severn Estuary is designated as a SAC, SPA and Ramsar site.

3.1.9. Qualifying features of the SAC comprise[28]:

- 1130 Estuaries – one of the best areas in the UK.
- 1140 Mudflats and sandflats not covered by seawater at low tide – one of the best areas in the UK.
- 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) – one of the best areas in the UK.
- 1110 Sandbanks which are slightly covered by seawater all the time – the site is thought to support a significant presence of this habitat.
- 1170 Reefs – the site is thought to support a significant presence of this habitat.
- 1095 Sea lamprey (*Petromyzon marinus*) – one of the best areas in the UK.
- 1099 River lamprey (*Lampetra fluviatilis*) – one of the best areas in the UK.
- 1103 Twaite shad (*Alosa fallax*) – one of the best areas in the UK.

3.1.10. Qualifying features of the SPA comprise[29]:

- This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive over winter:
    - Bewick's swan – 280 individuals representing 3.9% of the GB population (5 year peak mean 1991/2 - 1995/6).
- The site also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species over winter:
    - Gadwall (*Anas strepera*) – 282 individuals representing 0.9% of the population (5 year peak mean 1991/2 - 1995/6).
    - European white-fronted goose (*Answer albifrons albifrons*) – 2,664 individuals representing 0.4% of the population (5 year peak mean 1991/2 - 1995/6).
    - Dunlin (*Calidris alpina alpina*) – 44,624 individuals representing at least 3.3% of the population (5 year peak mean 1991/2 - 1995/6).
    - Shelduck (*Tadorna tadorna*) – 3,330 individuals representing 1.1% of the population (5 year peak mean 1991/2 - 1995/6).
    - Redshank (*Tringa totanus*) – 2,330 individuals representing 1.3% of the population (5 year peak mean 1991/2 - 1995/6).

[28] https://sac.jncc.gov.uk/site/UK0013030
[29] Stroud, D.A., Chambers, D., Cook, S., Buxton, N., Fraser, B., Clement, P., Lewis, P., McLean, I., Baker, H. & Whitehead, S. (eds). 2001. The UK SPA network: its scope and content. JNCC, Peterborough.

- Ringed plover (*Charadrius hiaticula*) on passage[30].

- The site also qualifies under Article 4.2 of the Directive (79/409/EEC) for supporting an internationally important assemblage of birds. Over winter the site regularly supports 84,317 waterfowl (5 year peak mean 1991/2 - 1995/6). The most recent Natura 2000 Standard Data Form for the Severn Estuary SPA does not include a list of species which make up the waterfowl assemblage. However, the 2001 SPA Review[31] listed 12 species in addition to the 'SPA qualifying species' listed above, as follows (wigeon, teal, mallard, pintail, shoveler, pochard, tufted duck, grey plover, lapwing, whimbrel, curlew, spotted redshank).

3.1.11. Qualifying features of the Ramsar site comprise[32]:

- Estuarine habitats (Ramsar Criteria 1 and 3)
- Migratory fish (Ramsar Criteria 4 and 8) including:
  - Atlantic salmon
  - Sea trout
  - Sea lamprey
  - River lamprey
  - Allis shad
  - Twaite shad
  - European eel
  - The fish of the whole estuarine and river system is one of the most diverse in Britain, with over 110 species recorded. Salmon, sea trout, sea lamprey, river lamprey, allis shad, twaite shad and European eel use the Severn Estuary as a key migration route to their spawning grounds in the many tributaries that flow into the estuary[33]. The site is important as a feeding and nursery ground for many fish species particularly allis shad and twaite shad. In addition, the Severn Estuary has the largest European eel run in Great Britain[33].
- Internationally important populations of wintering birds (Ramsar Criterion 6) including:
  - Tundra swan
  - White fronted-goose
  - Shelduck
  - Gadwall
  - Dunlin
  - Common redshank
- Wintering waterfowl assemblage of international importance (Ramsar Criterion 5)
- Breeding lesser black-backed gull (*Larus fuscus graellsii*) was identified subsequent to designation for possible future consideration under Ramsar Criterion 6 - 4167 apparently occupied nests representing an average of 2.8% of the western Europe/Mediterranean/west African breeding population (Seabird 2000 Census).

[30] Although not included on the most recent update of the Natura 2000 Standard Data Form for the Severn Estuary SPA, ringed plover is included here because the 2009 advice issued under Regulation 33(2)(a) of the Conservation of Natural Habitats and Species Regulations 1994 (as amended) lists this species as a qualifying species added during the 2001 SPA Review.
[31] Stroud, D.A., Chambers, D., Cook, S., Buxton, N., Fraser, B., Clement, P., Lewis, P., McLean, I., Baker, H. & Whitehead, S. (eds) (2001). The UK SPA Network: Its Scope and Content. JNCC, Peterborough.
[32] https://jncc.gov.uk/jncc-assets/RIS/UK11081.pdf
[33] Natural England and the Countryside Council for Wales (2009). The Severn Estuary/Mor Hafren European Marine Site

Cotswold Beechwoods SAC

3.1.12. Although Cotswold Beechwoods SAC does not meet the criteria listed in paragraph 2.2.2 above, it has been included following comments received during statutory consultation, as outlined in paragraph 1.4.5. This is also in line with the screening criteria set out in paragraph 2.2.3.

3.1.13. One of the objectives of the Scheme is to unlock the proposed housing developments in the area by providing the necessary highways infrastructure. The statutory consultation comments raised the possibility that, in turn, this could result in increased recreational pressure on the Cotswold Beechwoods SAC.

3.1.14. The Cotswold Beechwoods SAC is located 7.4 km south of the Scheme. The site consists of ancient beech woodland and unimproved grassland. The woodlands are amongst the most diverse and species-rich of their type, and the grasslands typify the unimproved calcareous pastures for which the area is famous. Qualifying features of the SAC include:

- 9130 *Asperulo-Fagetum* beech forests (Beech forests on neutral to rich soils).
- 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (Dry grasslands and scrublands on chalk or limestone).

3.2. Coarse screening

Wye Valley and Forest of Dean Bat Sites SAC

3.2.1. Wye Valley and Forest of Dean Bat Sites SAC is located 21 km from the Scheme at the closest point, separated by towns, villages and major roads. This is well beyond the zone of influence for any Scheme impacts relating to direct habitat loss, habitat degradation, habitat fragmentation or disturbance (via noise/vibration or artificial lighting).

3.2.2. The distance is also considered to be too great for there to be a significant functional linkage between the Scheme and the qualifying feature bat populations. This is because the distance is at least seven times larger than the core sustenance zones[34] identified by the Bat Conservation Trust (BCT)[35] for lesser horseshoe bats (2 km) and greater horseshoe bats (3 km)[36].

3.2.3. In terms of bat behaviour in this SAC specifically, flight lines and feeding grounds within the wider ecological network are critical in supporting the SAC. Lesser horseshoe bats tend to forage within two to three kilometres of their roost, with density of bats associated with the SAC declining sharply after this[37]. In the winter, the foraging range is thought to be around half this. A conservation objective of the SAC is to maintain a wide area of supporting habitat for bats, with the Site Improvement Plan[38] suggesting the creation of a feeding area of a radius of approximately 4 km around maternity roosts[38]. A radiotracking study of greater horseshoe bats in Dean Hall, a constituent SSSI of the SAC, found that bats forage up to 9 km from the roost using a number of night roosts during the feeding period[38]. At a distance of 21 km at the nearest point, the Scheme is well beyond these foraging distances.

3.2.4. In fragmented areas, linear features are essential for providing corridors between foraging areas for the lesser and greater horseshoe bat populations that this SAC supports[37]. There is no continuous connectivity such as hedgerows or watercourses between the SAC and

[34] The area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost.
[35] Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.
[36] CSZs specific to the Wye Valley and Forest of Dean Bat Sites SAC have not been published.
[37] Countryside Council for Wales (2008). Core Management Plan Including Conservation Objectives for Wye Valley and Forest of Dean Bat SAC
[38] Improvement Programme for England's Natura 2000 Sites (2015). Site Improvement Plan: Wye Valley and the Forest of Dean Bat Sites

the Scheme. Furthermore, greater horseshoe bats are vulnerable to the effects of urbanisation and use of insecticide, therefore are less likely to be found in the more urban areas associated with the Scheme[37].

3.2.5. In addition, the SAC is beyond the ARN for the Scheme, and as a result will not be impacted by air quality pollution impacts.

3.2.6. The site has been scoped out from further assessment, as it is considered that there is no route or mechanism for a LSE on the interest features and therefore the integrity of the site. Given that no impacts are anticipated on this site, no minor residual effects are predicted, and the potential for in-combination effects with other plans or projects was also ruled out. Further detail is included in the Screening Matrix in Appendix B.

Walmore Common SPA/Ramsar site

3.2.7. Walmore Common SPA and Ramsar site are located 17.5 km south-west of the Scheme. Although this is a considerable distance, the agricultural habitats present within the Scheme extent have the potential to support the qualifying populations of Bewick's swan which are associated with the SPA. It is therefore not considered appropriate to rule out an LSE on the Walmore Common SPA at this Coarse Screening stage, and it has therefore been subject to further, more detailed assessment for screening in Section 4 of this report.

Severn Estuary SAC/SPA/Ramsar site

3.2.8. The Scheme has direct hydrological connection to the Severn Estuary designations. There is potential for functional linkage between the Scheme and the qualifying feature populations of migratory fish, as it is considered likely that these species can all migrate over 40 km upstream where there are no barriers, such as weirs or waterfalls[39,40,41]. In addition, there is also a possible functional linkage between the Scheme and the qualifying bird species that the Ramsar site and SPA support.

3.2.9. Coombe Hill Canal SSSI is located approximately 1.9 km north-west of the Scheme and has been shown to be functionally linked to the Severn Estuary SPA/Ramsar site, being of high importance to all of the wintering surface-feeding ducks as well as lapwing. In autumn, the site is of high importance to mallard and snipe and in spring it is of high importance to gadwall and mallard.[42]. This is beyond the zone of influence for any Scheme impacts relating to direct habitat loss, habitat degradation, habitat fragmentation or disturbance (via noise/vibration or artificial lighting). It is acknowledged that there is a hydrological connection between the River Chelt and Coombe Hill Canal SSSI at times of flooding, when flow is reversed/backs up and water floods from the River Chelt into Coombe Hill Canal SSSI. This happens over 6 km downstream from the Scheme, with water flowing into the SSSI. Therefore, for the purposes of this assessment, there is not considered to be a hydrological connection between the SSSI and the Scheme. The SSSI is beyond the ARN for the Scheme. Water quality impacts or air quality pollution impacts to Coombe Hill Canal SSSI are therefore not anticipated. The statutory consultation comments raised the possibility that the Scheme, in-combination with the proposed housing developments that the Scheme will facilitate, could result in increased recreational pressure at Coombe Hill Canal SSSI.

[39] Maitland, P.S. (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.
[40] Maitland, P.S. & Hatton-Ellis, T.W. (2003). Ecology of the Allis and Twaite Shad. Conserving Natura 2000 Rivers Ecology Series No. 3. English Nature, Peterborough.
[41] Hendry K & Cragg-Hine D (2003). Ecology of the Atlantic Salmon. Conserving Natura 2000 Rivers Ecology Series No. 7. English Nature, Peterborough.
[42] Palmer, E. and Smart, M. (2021) Identification of wintering and passage roosts on functionally linked land of the Severn Estuary - Gloucestershire and Worcestershire (Phase 5). Natural England Commissioned Reports. NECR401.

3.2.10. It is therefore not considered appropriate to rule out an LSE on the Severn Estuary SAC, SPA or Ramsar site at this Coarse Screening stage, and it has therefore been subject to further, more detailed assessment for screening in Section 4 of this report.

Cotswold Beechwoods SAC

3.2.11. The Cotswold Beechwoods SAC is located 7.4 km south of the Scheme. This is well beyond the zone of influence for any Scheme impacts relating to direct habitat loss, habitat degradation, habitat fragmentation or disturbance (via noise/vibration or artificial lighting). In addition, there is no hydrological connection between the SAC and the Scheme, and the SAC is beyond the ARN for the Scheme. Water quality impacts or air quality pollution impacts are therefore not anticipated.

3.2.12. There is no route or mechanism for a LSE on the interest features of the SAC as a result of the Scheme alone, and LSE for the Scheme alone have been ruled out. However, one of the objectives of the Scheme is to unlock a number of proposed housing developments by providing the necessary highways infrastructure. The Cotswold Beechwoods SAC is sensitive to recreational pressure. The Site Improvement Plan[43] for the Cotswold Beechwoods SAC identifies public access/disturbance as a threat to the site and the Standard Data Form also identifies recreational activities as a threat.

3.2.13. The Cotswold Beechwoods SAC Recreation Mitigation Strategy[44] has identified a zone of influence around the SAC of 15.4 km[45], within which housing growth may result in an increase in recreational use of the SAC.

3.2.14. On the basis that the Scheme will facilitate housing developments within this zone of influence and considering that the SAC is sensitive to recreational pressure, it is therefore not considered appropriate to rule out an LSE in-combination with other projects on the Cotswold Beechwoods SAC at this Coarse Screening stage. It has therefore been subject to further, more detailed assessment for screening in Section 4 of this report.

[43] http://publications.naturalengland.org.uk/publication/6276086220455936 [Accessed: June 2022]

[44] Liley, D., & Panter, C. (2022). Cotswold Beechwoods SAC Recreation Mitigation Strategy. Unpublished report by Footprint Ecology.

[45] Based on a visitor survey undertaken in 2019, 15.4 km represents the 75th percentile distance for interviewees who had travelled directly from home.

4. Stage 1: Screening for Likely Significant Effects

4.1. Walmore Common SPA/Ramsar site

4.1.1. Further details on Walmore Common SPA/Ramsar site are presented in the Screening Matrix in Appendix C and Appendix D.

Baseline survey information

4.1.2. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive. The detailed methods and results are provided in Technical Appendix 7.9 Wintering Bird Survey (Application document TR010063/APP/6.15).

4.1.3. The method employed for wintering bird surveys broadly conformed to that used for the Common Bird Census (CBC) survey, devised and run between 1962 and 2000 by the British Trust for Ornithology (BTO) as detailed in in Gilbert et al. (1998) and Bibby et al. (2000)[46]. CBC uses a mapping method in which a series of visits are made to a site during the wintering season, and observations of birds, by sight or sound, are recorded on a map during a walked transect.

4.1.4. Seven survey visits were carried out, one each month from September 2019 to March 2020. This was considered proportionate for a relatively localised road improvement Scheme, allowing sufficient observations of birds to produce clusters of registrations and minimising the risk of overlooking scarce and/or priority species. Eight representative transects of varying lengths were surveyed, which gave suitable coverage of the study area. Six of these transects are within the study area of the current Scheme. The direction in which the transect was walked was varied between visits to optimise detection and minimise recording bias.

4.1.5. The surveyor, with the aid of binoculars, recorded all observations of birds by either sight or sound by walking through the Survey Area at a slow and steady pace. The positions of the recorded birds were plotted as accurately as possible on a suitably scaled base map, i.e. a ‘visit map’. Standard BTO codes and symbols were used for mapping species (including sex and age, e.g. juvenile, immature or adult) and bird activity where relevant (including foraging, loafing and in flight).

4.1.6. During the surveys, no Bewick’s swans, the qualifying feature of the SPA and Ramsar site, were identified.

4.1.7. Gloucestershire Centre for Environmental Records (GCER) was contacted to obtain recent records[47] of protected and notable species within 1 km of the Scheme. No records of Bewick’s swan were provided. In addition, a review of existing literature was conducted, which indicated that the agricultural grassland habitats surrounding the Scheme are not key areas for populations of Bewick’s swan[48].

[46] Gilbert, G., Gibbon, D.W. and Evans J. (1998). Bird Monitoring Methods: A Manual of Techniques for Key UK Species. Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire; Bibby C.J. Burgess, N.D. Hill D.A. Mustoe S. and Lambton S. (2000). Bird Census Techniques. Academic Press London
[47] Records of observations within the last 10 years.
[48] Robinson, JA, K Colhoun, JG McElwaine & EC Rees (2004). Bewick’s Swan *Cygnus columbianus bewickii* (Northwest Europe population) in Britain and Ireland 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.

Stage 1 Screening conclusions

Assessment of the Scheme alone

4.1.8. No functional linkage between Walmore Common SPA/Ramsar site and the Scheme study area has been identified, and therefore no likely significant effects have been identified for the Walmore Common SPA/Ramsar site.

In-combination assessment

4.1.9. No potential minor residual effects are predicted on Walmore Common SPA/Ramsar site. Therefore, the potential for in-combination effects with other plans or projects was also ruled out.

4.2. Severn Estuary SAC/SPA/Ramsar site

4.2.1. Further details on the designations are presented in the Screening Matrices in Appendices E, F and G.

Baseline survey information

Bird surveys

4.2.2. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive, as described under Section 4.1, above. The detailed methods and results are provided in Technical Appendix 7.9 Wintering Bird Survey (Application document TR010063/APP/6.15).

4.2.3. During these surveys, two qualifying species of the Severn Estuary SPA were recorded: lapwing (two individuals) and mallard (peak count of nine individuals).

4.2.4. A recent study[49] was also reviewed, which identifies functionally linked land associated with the Severn Estuary SPA. The maps which accompany this study do not identify that these species regularly move between the SPA and the Survey Area. However, the study also indicates that lapwing have been recorded within the Survey Area (in the vicinity of Boddington Manor Farm, adjacent to the Scheme) in numbers which reached or exceeded the equivalent of the 1% SPA population criterion for importance on at least one occasion.

4.2.5. The same study shows that Coombe Hill Canal SSSI is functionally linked to the Severn Estuary SPA/Ramsar site, being of high importance to all of the wintering surface-feeding ducks as well as lapwing. In autumn, the site is of high importance to mallard and snipe and in spring it is of high importance to gadwall and mallard.

4.2.6. Lesser black-backed gull was recorded in reasonably high numbers on one occasion (a peak count of 148 in September 2019).

Fish surveys

4.2.7. The detailed methods and results of the fish surveys are provided in Technical Appendix 7.12 – Aquatic Ecology Survey (Application document TR010063/APP/6.15).

4.2.8. No Environment Agency data was available from within the last five years from within 2 km of the Scheme. However, a review of Environment Agency fish data from a wider area from the last ten years was undertaken. Seven sites were identified on the River Chelt which have been surveyed within the last ten years. Six of these sites were identified as supporting varying life stages of European eel, with the closest record 1.7 km upstream of the existing M5 River Chelt crossing. Environment Agency fish data also identified

[49] Palmer, E. and Smart, M. (2021) Identification of wintering and passage roosts on functionally linked land of the Severn Estuary - Gloucestershire and Worcestershire (Phase 5). Natural England Commissioned Reports. NECR401.

sea/brown trout[50] within the River Chelt at three Environment Agency monitoring sites, the closest of which is 1.7 km upstream of the existing M5 River Chelt crossing, recorded during surveys conducted in 2013 and 2014. Atlantic salmon were recorded on one occasion in low numbers at a site 7.6 km downstream of the existing M5 River Chelt crossing in 2014. This is summarised in Table 4-1 below. Following consultation with the Environment Agency, it has also been confirmed that salmon parr have been recorded during a fish rescue undertaken approximately 5 km downstream of the existing M5 River Chelt crossing prior to a weir removal project (no date provided).

Table 4-1 - Review of Environment Agency sites

Site ID	Description	Qualifying Species Present
10409	6.5 km upstream of the existing M5 crossing with the River Chelt. Last survey conducted on 22 July 2014	European eel Sea/brown trout
51163	5.4 km downstream from the existing M5 crossing on the River Chelt. Last surveyed 11 September 2013	European eel
51183	1.6 km upstream from the existing M5 crossing with the River Chelt. Last surveyed 11 September 2013	European eel
51184	1.7 km upstream from the existing M5 crossing with the River Chelt. Last surveyed 11 September 2013	European eel Sea/brown trout
54023	4.9 km downstream from the existing M5 crossing with the River Chelt. Last surveyed 23 July 2014	European eel elvers European glass eels
56463	5.4 km upstream from the existing M5 crossing with the River Chelt. Last surveyed 22 July 2014	European eel elvers Sea/brown trout
52484	7.6 km downstream of the existing M5 crossing with the River Chelt. Surveyed once on 29 July 2015.	Atlantic salmon (four recorded during the survey)

4.2.9. The aquatic walkover survey, undertaken on 23 and 24 July 2019, focused around the points of interaction with the Scheme (i.e. proposed crossing point of a watercourse) and, where feasible, 250 m up and downstream of these interactions.

4.2.10. During the walkover survey, habitat characteristics were recorded broadly following habitat descriptors outlined in the River Habitat Survey (RHS) methodology[51], which includes substrates, vegetation types, flow types, approximate channel dimensions and presence of artificial features (channel/bank re-sectioning and/or existing crossing structures, weirs or outfalls).

4.2.11. MoRPh (Modular River Physical) survey was used to assess river habitat condition of the Leigh Brook and River Chelt, during May and July 2022, respectively. The MoRPh method[52] is a quantitative visual geomorphological assessment of a river and riparian zone that records a list of features which are marked as extensive, present, trace or absent

[50] Brown trout and sea trout are the same species. Brown trout spend all of their time in freshwater habitats, while sea trout feed and mature in the sea and migrate to freshwater to spawn.
[51] Environment Agency (2003) River Habitat Survey in Britain and Ireland - Field Survey Guidance Manual and National Rivers Authority (1992). River Corridor Surveys: Methods and Procedures.
[52] Details of the method can be found at: https://modularriversurvey.org/

based on their extent across the survey reach. Such features include elements such as channel form, in-channel habitats (e.g., riffles, pools, berms), bed substrates, bank material as well as flow types. Broad aquatic ecological plant community structure and characteristics of the bankside and riparian zone were also recorded.

4.2.12. Following review of background records, other scheme data, and observations from the walkover survey, further detailed aquatic species and habitat surveys were undertaken on watercourses which exhibited suitable habitat considered likely to support valuable assemblages of aquatic species. These surveys included:

- River Habitat Survey (RHS)[53] undertaken in July 2020.
- River Corridor Survey (RCS)[54] undertaken in July 2020.
- Macrophytes (LEAFPACS) undertaken in July 2020.
- Macroinvertebrates[55] undertaken in October 2020.
- Fish (electric fishing)[56] undertaken in July 2020.

4.2.13. Surveys conducted on the River Chelt in 2020 identified the presence of European eel at two locations (SO 90140 24760 - SO 90053 24787 and SO 90645 24606 – SO 90518 24634) on 28 and 29 July 2020.

4.2.14. Two brook/river lamprey ammocoetes (young/larvae) were recorded in the downstream survey site (SO 90140 24760 – SO 90053 24787) on 29 July 2020. It is difficult to distinguish between brook and river lamprey when in the ammocoete stage. As a precaution, they are assumed to be river lamprey.

4.2.15. Of the watercourses that would be directly affected by the Scheme, only the River Chelt is considered to provide suitable spawning and recruitment habitat for fish. All the other watercourses, including Leigh Brook, are heavily modified drainage ditches and are not considered to provide suitable habitat for qualifying features of the SAC/Ramsar site.

Construction and operation phase impacts

4.2.16. There is potential functional linkage between the agricultural grassland habitats within and surrounding the Scheme and the wintering and migratory bird qualifying species of the Severn Estuary SPA/Ramsar site. As such, there is the potential for temporary/permanent loss of functionally linked land outside of a designated site but used by qualifying features of the designated site.

4.2.17. Works required during construction and operation have the potential to disturb qualifying bird species using functionally linked land in the vicinity of the Scheme through noise, vibration, lighting and/or visual disturbance.

4.2.18. Habitat loss and disturbance could also result in habitat fragmentation/barrier effects, with qualifying bird species unable to disperse or move through their environment as a result of habitat severance or being deterred from using normal routes to feeding/roosting/breeding grounds.

4.2.19. Changes in air quality may have an adverse effect on sensitive habitats within designated sites, or within functionally linked land, and consequent ecological effects on qualifying bird species that rely on these habitats. Such impacts may arise from dust from

[53] Environment Agency, 2003. River Habitat Survey in Britain and Ireland. Field Survey Guidance Manual.
[54] National Rivers Authority, 1992. River Corridor Surveys: Methods and Procedures. Conservation Technical Handbook.
[55] Aquatic macroinvertebrate samples were collected using a standard three-minute kick-sampling technique in accordance with River Invertebrate Prediction & Classification Systems (RIVPACS) standard sampling protocols. RIVPACS is the model implemented within the RICT (River Invertebrate Classification Tool) used by the Environment Agency to determine WFD invertebrate classifications. Reference: EU Star UK (2006) RIVPACS Macroinvertebrate Sampling Protocol. Available at: http://www.eu-star.at/pdf/RivpacsMacroinvertebrateSamplingProtocol.pdf (accessed April 2021)
[56] UKTAG (2008). River Assessment Methods: Fish Fauna (Fisheries Classification Scheme 2) by Water Framework Directive - United Kingdom Technical Advisory Group (WFD-UKTAG): https://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Biological%20Method%20Statements/river%20fish.pdf

construction related activities, or vehicle exhaust emissions of oxides of nitrogen (NOx) from construction traffic, particularly heavy-duty vehicles. Operational phase air quality impacts may arise as a result of increases in traffic volume.

4.2.20. The statutory consultation comments raised the possibility that the Scheme, in-combination with the proposed housing developments that the Scheme will facilitate, could result in increased recreational pressure at Coombe Hill Canal SSSI, which has been shown to be functionally linked to the Severn Estuary SPA/Ramsar site.

4.2.21. There is potential for functional linkage between the Scheme and the qualifying feature fish populations of the SAC/Ramsar site, as it is considered likely that these species can all migrate over 40 km upstream where there are no barriers such as weirs or waterfalls[57],[58],[59]. Desk study data and fish surveys have confirmed the presence of European eel, a feature of the Severn Estuary Ramsar site, from within the River Chelt. Fish surveys have confirmed the potential presence of river lamprey, a feature of the Severn Estuary SAC and Ramsar site, from within the River Chelt. In addition, the desk study data included records of Atlantic salmon and sea/brown trout, features of the Severn Estuary Ramsar site, from the River Chelt. During the desk study and fish surveys, no other qualifying fish species were identified. On this basis, other qualifying fish species are assumed to be absent, or present in only low numbers. The following paragraphs discuss the potential impacts to European eel, river lamprey, Atlantic salmon and sea trout (referred to collectively as 'migratory fish species').

4.2.22. There is potential for short-term impacts to migratory fish species within or surrounding the Scheme as a result of noise or vibration disturbance during construction of the new Link Road, in particular the construction of the new bridge over the River Chelt. The new bridge abutments will be set back from the banks of the River Chelt by 4 m. The bridge construction will be a single span precast beam bridge with integral full height reinforced concrete abutments, resting on a piled foundation (comprising 1 m diameter bored concrete pile). Ten piles would be rotary drilled on each side of the River Chelt. In addition, a temporary River Chelt crossing will be required during construction.

4.2.23. Furthermore, in order to ensure that access under the River Chelt bridge is maintained, a short section of hard bank protection such as rip-rap or non-biodegradable geotextile will be installed along both banks of the River Chelt underneath the River Chelt bridge. The precise method of bank protection will be determined at the detailed design stage but there may be a requirement for partial dewatering of the channel which would result in a temporary reduction in extent of functionally linked habitat and could also result in injury or mortality to river lamprey ammocoetes, which spend a number of years in burrows in sediment during the larval development stage.

4.2.24. Although there will be no new permanent in-river structures that would impact on passage of migratory fish species along the River Chelt, disturbance during construction could result in habitat fragmentation/barrier effects, with migratory fish species unable to disperse or move along the River Chelt as a result of such disturbance.

4.2.25. There is potential for water quality impacts to habitats within designated sites, or to functionally linked habitats. Given the direct hydrological connection between the Scheme and the Severn Estuary SAC/SPA/Ramsar site (as all watercourses which are crossed by the Scheme, including the River Chelt, Leigh Brook and their tributaries, eventually flow into the River Severn), there is potential for impacts to downstream qualifying habitats and species within the SAC, and downstream habitats within the SPA/Ramsar site that support qualifying species. There is also the potential for impacts to fish, particularly European eel, river lamprey, Atlantic salmon and sea trout, and functionally linked habitat within or surrounding the Scheme as a result of a pollution event during construction and operation.

[57] Maitland, P.S. (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

[58] Maitland, P.S. & Hatton-Ellis, T.W. (2003). Ecology of the Allis and Twaite Shad. Conserving Natura 2000 Rivers Ecology Series No. 3. English Nature, Peterborough.

[59] Hendry K & Cragg-Hine D (2003). Ecology of the Atlantic Salmon. Conserving Natura 2000 Rivers Ecology Series No. 7. English Nature, Peterborough.

Such impacts could arise through changes to water quality as a result of mobilization of suspended sediments leading to silt laden runoff entering watercourses; and potential for accidental contamination associated with the spillage or leakage of fuels, lubricants and other chemicals required for construction. In particular, such impacts could occur during the construction of the new bridge over the River Chelt and the temporary River Chelt crossing. Such pollution impacts could also result in habitat fragmentation/barrier effects, with migratory fish species unable to disperse or move along the River Chelt as a result of pollution.

Detailed Assessment of Likely Significant Effects alone

4.2.26. Table 4-2 below investigates the potential impacts identified on the qualifying features of the Severn Estuary SAC/SPA/Ramsar site, using existing information about the Scheme and taking into account the baseline survey information described above. To avoid repetition as far as possible, qualifying features are grouped into habitats, migratory fish and wintering and passage birds.

Table 4-2 - Assessment of Likely Significant Effects of the Scheme alone for Severn Estuary SAC/SPA/Ramsar site

Qualifying Feature	Potential Impacts	Potential exposure to hazard and mechanism of effect/impact if known	Potential for LSE
Habitats within the SAC/Ramsar site designation (Estuaries, mudflats and sandflats, Atlantic salt meadows, sandbanks, reefs)	Water quality impacts to downstream qualifying habitats within the SAC/Ramsar site, which also support qualifying species, as a result of a pollution event during construction and operation.	The habitats associated with the River Severn designation are greater than 40 km downstream of the Scheme. Although there is a direct hydrological connection between the Scheme and the Severn Estuary SAC/Ramsar site, at such a distance, it is considered that the potential for direct impacts via release of pollutants from the Scheme during construction and operation would be eliminated by dilution. DMRB guidance LA 113 states that "for assessment of impacts associated with soluble pollutants, outfalls within 1 km (measured along the watercourse) shall be aggregated for the purposes of cumulative assessment[60]". It therefore follows that soluble pollutants are considered to be sufficiently diluted beyond 1 km. Although not relied upon for the screening conclusions, pollution prevention methods will be in place as part of the embedded mitigation for the Scheme, including standard water protection measures to avoid chemical or sediment pollution of any watercourses. Works will proceed following standard good practice working methods for environmental protection which will adhere to the Guidance for Pollution Prevention (GPPs)[61] and the Construction Industry Research and Information Association[62] (CIRIA) C715 Environmental good practice. These will be secured via the Register of Environmental Actions and Commitments (REAC) (Application document TR010063 – APP 7.4). The drainage strategy to be implemented by the Scheme incorporates Sustainable Drainage Systems (SuDS) to mitigate the pollution risk associated with road runoff as well as accidental spills[62]. However, given the relatively small size of the proposed works in comparison with the distance, size and mixing of the receptor designations, risks of significant spillage of chemical contaminant or silt pollution could be discounted even without any additional pollution controls.	No
	Changes in air quality to qualifying habitats within the SAC/Ramsar site, which also support qualifying species, during construction and operation.	The Institute of Air Quality Management (IAQM) guidance document 'Guidance on the assessment of dust from demolition and construction[63]' states that where an ecological receptor is beyond 50 m of the boundary of the site, or beyond 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s), no significant effect as a result of dust is likely. DMRB guidance LA 105[64] states that at a distance of beyond 200 m from a construction activity, construction dust risk potential is minimal. The designated site is beyond such distances. DMRB guidance LA 115[65] states that HRA screening shall be completed where the Scheme has an ARN which triggers the need for assessment of air quality impacts, with DMRB guidance LA 105[64] confirming that this should include designated habitats[66] within 200 m of the ARN. This 200 m distance criteria aligns with Natural England's guidance on assessing road traffic emissions on European sites[67]. The SAC/Ramsar site is more than 200 m from the ARN for the Scheme, and as a result will not be impacted by air quality pollution impacts during operation.	No
Migratory fish species that are qualifying features of the SAC/Ramsar site (Sea lamprey, river lamprey, twaite shad, Atlantic salmon, sea trout, Allis shad, European eel)	Water quality impacts to functionally linked habitat within the River Chelt as a result of a pollution event during construction and operation.	Survey results and desk study records (detailed in Technical Appendix 7.12 – Aquatic Ecology Survey (Application document TR010063/APP/6.15)) indicate that European eel, river lamprey, Atlantic salmon and sea trout are present, or potentially present, in the vicinity of the Scheme. In the absence of mitigation, pollution as a result of the Scheme (through, for example, silt laden runoff, accidental contamination associated with a spillage or leakage, or untreated road runoff) could impact migratory European eel, Atlantic salmon and sea trout associated with the Severn Estuary Ramsar site designation and river lamprey associated with the Severn Estuary SAC and Ramsar site designations. Impacts could occur as a result of direct toxic effects to the qualifying fish species or their prey, leading to injury or mortality, or smothering important habitats.	Yes
	Disturbance to qualifying fish species using functionally linked habitat within the River Chelt as a result of noise or vibration disturbance during construction.	Survey results and desk study records (detailed in Technical Appendix 7.12 – Aquatic Ecology Survey (Application document TR010063/APP/6.15)) indicate that European eel, river lamprey, Atlantic salmon and sea trout are present, or potentially present, in the vicinity of the Scheme. In the absence of mitigation, disturbance impacts as a result of the Scheme during construction could impact migratory European eel, Atlantic salmon and sea trout associated with the Severn Estuary Ramsar site designation and river lamprey associated with the Severn Estuary SAC and Ramsar site designations.	Yes

[60] Highways England (2020). Design Manual for Roads and Bridges LA 113 Road drainage and the water environment (formerly HD 45/09). (March 2020, version 1) Online: d6388f5f-2694-4986-ac46-b17b62c21727 (standardsforhighways.co.uk)
[61] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[62] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.
[63] Institute of Air Quality Management (IAQM) (2014) Guidance on the assessment of dust from demolition and construction activities
[64] Highways England (2019). Design Manual for Roads and Bridges. LA 105 Air Quality (formerly HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13, part of IAN 185/15). (November 2019, version 0) Online: 10191621-07df-44a3-892e-c1d5c7a28d90 (standardsforhighways.co.uk)
[65] Highways England (2020). Design Manual for Roads and Bridges. LA 115 Habitats Regulations Assessment (formerly HD 44/09). (January 2020, version 1) Online: http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section4/LA%20115%20Habitats%20Regulations%20assessment%20-web.pdf
[66] Including Ramsar sites, SPAs, SACs, SSSIs, local nature reserves, local wildlife sites, nature improvement areas, ancient woodland and veteran trees.
[67] Natural England (June 2018). Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations (V1.4). Online: NEA001 Advising CAs on Road Traffic and HRA June 2018 (4).pdf

Qualifying Feature	Potential Impacts	Potential exposure to hazard and mechanism of effect/impact if known	Potential for LSE
	Injury or mortality of river lamprey ammocoetes potentially present in burrows in the sediment should partial dewatering of the channel of the River Chelt be required.	Survey results (detailed in Technical Appendix 7.12 – Aquatic Ecology Survey (Application document TR010063/APP/6.15)) indicate that river lamprey are potentially present in the vicinity of the Scheme. In the absence of mitigation, should partial dewatering of the River Chelt be required during construction, there is the potential for injury or mortality of river lamprey ammocoetes potentially present in burrows in the sediment.	Yes
	Fragmentation as a result of disturbance and pollution, which could result in barrier effects, with qualifying fish species unable to disperse or move along the River Chelt.	Survey results and desk study records indicate that European eel, river lamprey, Atlantic salmon and sea trout are present, or potentially present, in the vicinity of the Scheme. In the absence of mitigation, the pollution and disturbance impacts described above could impact migratory European eel, Atlantic salmon and sea trout associated with the Severn Estuary Ramsar site designation and river lamprey associated with the Severn Estuary SAC and Ramsar site designations by causing a barrier effect whereby fish are deterred from dispersing or moving along the River Chelt. The Scheme will not introduce a physical barrier to fish migration.	Yes
	Temporary reduction in the extent of functionally linked habitat in the event that dewatering part of the River Chelt channel is required during construction.	Survey results and desk study records indicate that European eel, river lamprey, Atlantic salmon and sea trout are present, or potentially present, in the vicinity of the Scheme. Should partial dewatering of the River Chelt channel be required in order to install hard bank protection beneath the River Chelt bridge, there would be a temporary reduction in the extent of functionally linked habitat available to European eel, Atlantic salmon and sea trout associated with the Severn Estuary Ramsar site designation, and river lamprey associated with the Severn Estuary SAC and Ramsar site designations during construction. The full width of the River Chelt channel would not require dewatering, therefore the Scheme will not introduce a physical barrier to fish migration.	Yes
Wintering and migratory birds that are qualifying features of the SPA/Ramsar site (Bewick's swan, gadwall, European white-fronted goose, dunlin, shelduck, redshank, ringed plover, lesser black-backed gull)	Water quality impacts to supporting habitats within designated sites, or to functionally linked habitats as a result of a pollution event during construction and operation.	The habitats associated with the River Severn designation are approximately 40 km downstream of the Scheme. Although there is a direct hydrological connection between the Scheme and the Severn Estuary SPA/Ramsar site, at such a distance, it is considered that the potential for direct impacts via release of pollutants from the Scheme during construction and operation would be eliminated by dilution. Although not relied upon for the screening conclusions, pollution prevention methods will be in place as part of the embedded mitigation for the Scheme, including standard water protection measures to avoid chemical or sediment pollution of any watercourses. Works will proceed following standard good practice working methods for environmental protection which will adhere to GPPs[61] and the CIRIA C715 Environmental good practice[62]. These will be secured via the Register of Environmental Actions and Commitments (REAC) (Application document TR010063 – APP 7.4). The drainage strategy to be implemented by the Scheme incorporates SuDS to mitigate the pollution risk associated with road runoff as well as accidental spills[62]. However, given the relatively small size of the proposed works in comparison with the distance, size and mixing of the receptor designations, risks of significant spillage of chemical contaminant or silt pollution could be discounted even without any additional pollution controls. As discussed below (and detailed in Technical Appendix 7.9 Wintering Bird Survey (Application document TR010063/APP/6.15)), the results of the wintering and migratory bird surveys and desk study indicate that qualifying bird species do not regularly use and are not dependent on the aquatic habitat in the vicinity of the Scheme. As discussed in paragraph 3.2.9, there is no hydrological connection between functionally linked habitat within Coombe Hill Canal SSSI and the Scheme, so water quality impacts to this SSSI are not anticipated.	No
	Changes in air quality to supporting habitats within designated sites, or to functionally linked habitats during construction and operation.	The Institute of Air Quality Management (IAQM) guidance document 'Guidance on the assessment of dust from demolition and construction[63]' states that where an ecological receptor is beyond 50 m of the boundary of the site, or beyond 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s), no significant effect as a result of dust is likely. DMRB guidance LA 105[64] states that at a distance of beyond 200 m from a construction activity, construction dust risk potential is minimal. The designated site is beyond such distances, and the results of the wintering and migratory bird surveys and desk study (detailed in Technical Appendix 7.9 Wintering Bird Survey (Application document TR010063/APP/6.15) indicate that qualifying bird species do not regularly use or are dependent on the habitat in the vicinity of the Scheme. DMRB guidance LA 115[65] states that HRA screening shall be completed where the Scheme has an ARN which triggers the need for assessment of air quality impacts, with DMRB guidance LA 105[64] confirming that this should include designated habitats[66] within 200 m of the ARN. This 200 m distance criteria aligns with Natural England's guidance on assessing road traffic emissions on European sites[67]. The SPA/Ramsar site and functionally linked habitat within Coombe Hill Canal SSSI is more than 200 m from the ARN for the Scheme, and as a result will not be impacted by air quality pollution impacts during operation.	No

Qualifying Feature	Potential Impacts	Potential exposure to hazard and mechanism of effect/impact if known	Potential for LSE
	Temporary/permanent loss of functionally linked land; disturbance to qualifying bird species using functionally linked land; habitat fragmentation/barrier effects.	The wintering and migratory bird surveys (detailed in Technical Appendix 7.9 Wintering Bird Survey (Application document TR010063/APP/6.15)) recorded two qualifying species of the Severn Estuary SPA: lapwing (two individuals) and mallard (peak count of nine individuals). Given the low numbers recorded, they are unlikely to be a significant component of the SPA populations. The maps that accompany a recent study[68] that was reviewed do not identify that these species regularly move between the SPA and the study area. However, the study also indicates that lapwing have been recorded within the Survey Area (in the vicinity of Boddington Manor Farm, adjacent to the Scheme) in numbers which reached or exceeded the equivalent of the 1% SPA population criterion for importance on at least one occasion. No lapwing were recorded at this location during the wintering and passage bird surveys and, as the study indicates that there are no regular movements between the SPA and this location, it is therefore considered that this area is not regularly used by or of significant importance for lapwing. Lesser black-backed gull were recorded in reasonably high numbers on one occasion (a peak count of 148 in September 2019). It is considered that these individuals are likely to be from breeding populations within urban areas such as Cheltenham and/or Gloucester, which are closer to the Scheme than the Ramsar site breeding colonies at Steep Holm and Flat Holm[69] (approximately 90 km south west). Cheltenham Borough Council states that "Lesser Black-Backed Gulls nest in the residential areas of Cheltenham and on industrial units in the Kingsditch area"[70]. The JNCC Seabird Monitoring Programme online database states that the Gloucestershire Urban Gulls Cheltenham site (85627) supported 273 lesser black-backed gull apparently occupied territories in 2011 (year of last count) and the Gloucester City: Gloucester site (86737) supported 2230 lesser black-backed gull apparently occupied nests in 2009 (year of last count)[71]. It follows that the lesser black-backed gulls recorded are unlikely to be part of the Ramsar site qualifying feature population. The habitats within the Survey Area are not considered to provide a role in maintaining the SPA or Ramsar site populations or to be functionally linked to the Severn Estuary SPA or Ramsar sites.	No
	Reduction in prey species, specifically the migratory fish species European eel, river lamprey, Atlantic salmon and sea trout as a result of impacts to migratory fish described above.	It is acknowledged that there is a link between the migratory fish associated with the Severn Estuary SAC and Ramsar site, and the birds associated with the Severn Estuary SPA and Ramsar site, where fish form a component of the food source for SPA and Ramsar site qualifying bird species. However, as already described, the Scheme area is not important for qualifying bird species. Furthermore, the aquatic habitats within the Scheme are not key feeding habitats for qualifying bird species (i.e. they do not include mud-flats, sand-flats or saltmarsh). Therefore, qualifying bird species using functionally linked habitat in the vicinity of the Scheme and feeding on fish within functionally linked habitat within the River Chelt can be discounted. In addition, only four species of fish have been identified as present or potentially present within the River Chelt in the vicinity of the Scheme, and there is a diverse fish population within the Severn Estuary that supports qualifying bird species, as well as other important prey species including crustaceans, molluscs, worms and seeds. Any impacts would only affect a small proportion of the overall populations of the four fish species identified, and therefore only a very small proportion of a limited selection of the available prey species would be affected. Any impacts to small numbers of four migratory fish species within functionally linked habitat would therefore not have any perceptible effect on the prey resource available to qualifying bird species. Therefore, it is considered that LSE on qualifying bird species associated with the Severn Estuary SPA and Ramsar site can confidently be ruled out, despite a LSE on four migratory fish species associated with the Severn Estuary Ramsar site and SAC.	No

[68] Palmer, E. and Smart, M. (2021) Identification of wintering and passage roosts on functionally linked land of the Severn Estuary - Gloucestershire and Worcestershire (Phase 5). Natural England Commissioned Reports. NECR401.
[69] Burton, N.H.K., Musgrove, A.J., Rehfisch, M.M., and Clark N.A. (2010) Birds of the Severn Estuary and Bristol Channel: Their current status and key environmental issues. Marine Pollution Bulletin 61 (2010) 115–123
[70] Cheltenham Borough Council (2018) Urban Gulls Scrutiny Task Group Report. Available at https://democracy.cheltenham.gov.uk/documents/s27390/2018_12_04_CAB_Urban_Gulls_scrutiny_report.pdf
[71] Available at https://app.bto.org/seabirds/public/index.jsp

Stage 1 Screening conclusions

Assessment of the Scheme alone

4.2.27. The Screening assessment has concluded that, without mitigation, there is potential for LSE to occur in relation to migratory fish species that are qualifying features of the Severn Estuary SAC/Ramsar site (European eel, Atlantic salmon and sea trout, qualifying features of the Severn Estuary Ramsar site designation, and river lamprey, a qualifying feature of the Severn Estuary SAC and Ramsar site designations). As presented in Table 4-2 above (blue shaded rows), the following five potential pathways have been identified that could result in a LSE on the migratory fish species of the Severn Estuary SAC and Severn Estuary Ramsar site alone:

- Temporary reduction in the extent of functionally linked habitat available to migratory European eel, Atlantic salmon and sea trout associated with the Severn Estuary Ramsar site, and river lamprey associated with the Severn Estuary SAC and Ramsar site, in the event that dewatering part of the River Chelt channel is required during construction.
- Water quality impacts to functionally linked habitat within the River Chelt as a result of a pollution event during construction and operation, and consequent detrimental effects to migratory European eel, Atlantic salmon and sea trout associated with the Severn Estuary Ramsar site, and river lamprey associated with the Severn Estuary SAC and Ramsar site.
- Disturbance impacts to migratory European eel, Atlantic salmon and sea trout associated with the Severn Estuary Ramsar site, and river lamprey associated with the Severn Estuary SAC and Ramsar site, using functionally linked habitat within the River Chelt during construction as a result of noise and vibration.
- Injury or mortality to river lamprey ammocoetes associated with the Severn Estuary SAC and Ramsar site using functionally linked habitat within the River Chelt if they are present within burrows in the sediment in the event that dewatering of part of the channel is required during construction.
- Fragmentation as a result of disturbance and pollution, which could result in barrier effects, with European eel, Atlantic salmon and sea trout associated with the Severn Estuary Ramsar site, and river lamprey associated with the Severn Estuary SAC and Ramsar site, unable to disperse or move along the River Chelt.

4.2.28. Where effect pathways have been screened in alone there is no need to subsequently consider them at screening in-combination. They are taken through to appropriate assessment in the HRA SIAA (Application document TR010063 - APP 6.15) where they are considered further alone. This approach is in line with established guidance[9] which states 'when a plan or project is screened as having a likely significant effect alone, the appropriate assessment should initially concentrate on its effects alone.'

In-combination assessment

4.2.29. LSE for the Scheme alone have been ruled out for the following potential impacts identified in Table 4-2 (grey shaded rows):

- Habitats within the SAC/Ramsar site designation:
  - Water quality impacts to downstream qualifying habitats, or supporting habitats, within the Severn Estuary SAC/ Ramsar site.
  - Changes in air quality to qualifying habitats within the SAC/Ramsar site or supporting habitats within the SAC/Ramsar site.
- Wintering and migratory birds that are qualifying features of the SPA/Ramsar site:

- Water quality impacts to supporting habitats within designated sites, or to functionally linked habitats.
- Changes in air quality to supporting habitats within designated sites, or to functionally linked habitats.
- Loss of functionally linked habitat used by qualifying SPA/Ramsar site bird species; disturbance to qualifying bird species using functionally linked land; habitat fragmentation/barrier effects to qualifying bird species.
- Reduced prey of qualifying SPA/Ramsar site bird species.

4.2.30. Consideration has been given to whether there is potential for LSE in-combination with other projects and plans, in relation to these potential impacts. Following statutory consultation comments, consideration has also been given to the potential for increased recreational pressure as a result of the combined effects of the housing developments that the Scheme will facilitate. These pathways are considered in-combination with other plants and project in the subsequent sections under the headings 'water quality,' 'air quality,' 'Loss of functionally linked habitat/disturbance to qualifying bird species using functionally linked land/habitat fragmentation/barrier effects,' 'reduced prey species' and 'recreational pressure' to ascertain whether any in-combination effect pathways need to be taken through to appropriate assessment. This is in line established guidance[9] which states 'the requirement for an appropriate assessment arises from a finding on screening (Stage 1) that the subject project is likely to have a significant effect on a European site either alone or in combination with other plans or projects.'

Water quality

4.2.31. As discussed in Table 4-2, water quality impacts via the release of pollutants from the Scheme into the watercourse network upstream of the Severn Estuary designations would be eliminated by dilution over the distance of at least 40 km that any pollutants would have to travel. The results of the wintering and migratory bird surveys indicate that qualifying bird species do not regularly use and are not dependent on the aquatic habitat in the vicinity of the Scheme.

4.2.32. The Scheme would therefore not add to any water quality effects associated with other plans or projects.

Air quality

4.2.33. As discussed in Table 4-2, the potential for changes in air quality to qualifying habitats within the SAC/Ramsar site or supporting habitats within the SAC/Ramsar site /SPA, or to functionally linked habitats, has been discounted. This is on the basis of the distance between the designated sites and any construction activity and the ARN, and the results of the wintering and migratory bird surveys, which indicate that habitats in the vicinity of any construction activity and the ARN are not functionally linked to the Severn Estuary SPA/Ramsar site designations. The Scheme would therefore not add to any air quality effects associated with other plans or projects.

4.2.34. In addition, the potential for changes in air quality to functionally linked habitat within Coombe Hill Canal SSSI has been discounted on the basis of the distance between the SSSI and any construction activity and the ARN. As there is no hydrological connection between the SSSI and the Scheme, water quality impacts and air quality impacts have been discounted, as discussed in paragraph 3.2.9.

4.2.35. It should be noted that the air quality assessment (Chapter 5 – Air Quality (Application document TR010063 – APP 6.3)) has included an assessment of air quality impacts for the opening year (2027) and the future year scenario (2042) in order to account for expected traffic growth associated with additional development facilitated by the Scheme. The Severn Estuary designations and the Coombe Hill Canal SSSI are not within 200 m of the ARN in any scenario; therefore, in-combination air quality impacts can be confidently ruled out.

4.2.36. This aligns with the HRA of the JCS[72] and the HRA[73] of the Tewkesbury Borough Plan 2011 – 2031 (TBP)[74] which concluded no LSE on the Severn Estuary designations as a result of air quality impacts. The HRA of the JCS refers to a number of policies that seek to protect air quality, as follows:

- SP2 Distribution of Development – focuses on development in and around existing urban areas, which will help to promote and improve sustainable transport and reduce use of private vehicles.
- SD14 (referred to in the HRA of the JCS as SD15) Health and Environmental Quality – the Policy requires that new development must result in no unacceptable levels of air pollution either alone or cumulatively, with respect to national and EU limit values.
- SD3 (referred to in the HRA of the JCS as SD4) Sustainable Design and Construction – requires that development proposals will demonstrate how they contribute to the aims of sustainability by increasing energy efficiency, minimising waste and avoiding the unnecessary pollution of air or interference in other natural systems.
- SD4 (referred to in the HRA of the JCS as SD5) Design Requirements – requires that new development should be designed to prioritise movement by sustainable transport modes.
- INF1 Transport Network – requires that all proposals must ensure that connections should be provided where appropriate to existing walking, cycling and passenger transport networks and should be designed to enable and encourage maximum potential use. It also requires that mitigation is put in place to prevent congestion at junctions. The Policy requires that development will need to assess its impact on the transport network and where impacts on factors including noise and atmospheric pollution are considered to be severe then mitigation will need to be provided to the satisfaction of the Local Planning Authority.
- INF3 (referred to in the HRA of the JCS as INF4) Green Infrastructure – Development is required to conserve and enhance Green Infrastructure (GI) assets in order to deliver a series of multifunctional, linked green corridors across the JCS area. Development proposals should consider and contribute positively towards GI, including the wider landscape context and strategic corridors between major assets and populations. Where new residential development will create, or add to, a need for publicly accessible green space or outdoor space for sports and recreation, this will be fully met in accordance with Policy INF4.
- INF6 (referred to in the HRA of the JCS as INF7) Infrastructure Delivery – The Policy requires that where need is generated as a result of individual site proposals and/or as a consequence of cumulative impact, new development will be served and supported by adequate and appropriate on- and/or off-site infrastructure and services. It states that where need for additional infrastructure and services and/or impacts on existing infrastructure and services is expected to arise, the local planning authority will seek to secure appropriate and proportionate infrastructure provision in respect of in particular: climate change mitigation/adaptation; the highway network, traffic management, sustainable transport and disabled people's access; protection of environmental assets and the potential for their enhancement and provision of GI including open space.
- SD9 (referred to in the HRA of the JCS as SD10) Biodiversity and Geodiversity – states that the biodiversity and geological resource of the JCS area will be protected and enhanced in order to establish and reinforce ecological networks that are resilient to current and future pressures. The policy also requires that any

[72] Efusion (May 2014) Pre-Submission Draft Joint Core Strategy Habitats Regulations Report.
[73] Efusion (July 2019) Tewkesbury Borough Plan 2011 – 2013: Pre-Submission Regulation 19 Consultation. Habitats Regulations Assessment (HRA) Screening & Appropriate Assessment (AA)
[74] Tewkesbury Borough Council (October 2019) Pre-Submission Tewkesbury Borough Plan 2011 - 2031

development that has potential to have a likely significant effect on an international site will be subject to a HRA.

Loss of functionally linked habitat/disturbance to qualifying bird species using functionally linked land/habitat fragmentation/barrier effects

4.2.37. As discussed in Table 4-2, the habitats within the Survey Area are not considered to perform a role in maintaining the SPA or Ramsar site populations of qualifying bird species, or to be functionally linked to any SPAs or Ramsar sites. The Scheme would therefore not add to any effects in relation to habitat loss/disturbance/fragmentation on qualifying bird features associated with other plans or projects.

Reduced prey species

4.2.38. As discussed in Table 4 2, the Scheme area is not important for qualifying bird species and the aquatic habitats within the Scheme are not key feeding habitats for qualifying bird species. The possibility of qualifying bird species using functionally linked habitat in the vicinity of the Scheme and feeding on fish within functionally linked habitat within the River Chelt can be discounted. Furthermore, any impacts to small numbers of four migratory fish species within functionally linked habitat would not have any perceptible effect on the prey resource available to qualifying bird species. The Scheme would therefore not add to any effects in relation to reduced prey species on qualifying bird features associated with other plans or projects.

Recreational pressure

4.2.39. One of the objectives of the Scheme is to unlock the proposed strategic developments in the area by providing the necessary highways infrastructure. In particular, the Scheme will facilitate the following proposed developments:

- 16/02000/OUT – North West Cheltenham Development Area –Located to the east of Uckington stretching to the Gallagher retail Park and Swindon Farm, this is an outline application for up to 4,115 new homes and associated employment areas, retail, educational, and recreational facilities.
- Safeguarded land to the north-west of Cheltenham - Located between the M5 and Uckington, this land is safeguarded for development of approximately 2,300 homes and 300ha of office, industrial and warehousing development.
- West Cheltenham Development Area – Located south of the B4634 and stretching between the proposed Link Road junction and Springbank, this area will include residential development, sports pitches, a primary school and community hub.

4.2.40. The statutory consultation comments raised the possibility that, in turn, this could result in increased recreational pressure at Coombe Hill Canal SSSI. The SSSI is located approximately 1.9 km north-west of the Scheme and has been shown to be functionally linked to the Severn Estuary SPA/Ramsar site as a result of the bird assemblages that move between the sites. Consideration has been given to this potential in-combination effect in the paragraphs below.

4.2.41. A recent study[75] states ‘Coombe Hill is of high importance to all of the wintering surface-feeding ducks as well as lapwing. In autumn, the site is of high importance to mallard and snipe and in spring it is of high importance to gadwall and mallard.’ The same study identifies that disturbance, particularly by dog walkers, is an issue at the SSSI. Visitor surveys were carried out here (and at other sites) between 29 January and 3 April 2022. An interim report has been provided[76] which states that 26 interviews (out of a total of 586 interviews across all of the sites) were undertaken at Coombe Hill. The majority of all interviewees were on a day trip from home, with 50% of interviewees visiting a location that they go to at least once a week, with dog walking the most common activity. Crucially,

[75] Palmer, E. and Smart, M. (2021) Identification of wintering and passage roosts on functionally linked land of the Severn Estuary - Gloucestershire and Worcestershire (Phase 5). Natural England Commissioned Reports. NECR401.
[76] Footprint Ecology (2022) Severn Estuary Visitor Survey 2022.

information about where visitors to Coombe Hill SSSI travel from is not currently available. However, based on the interim results, it is considered that residents of the new housing developments that will be facilitated by the Scheme are within the zone of influence of Coombe Hill SSSI, within which housing growth may result in an increase in recreational use of the SSSI.

4.2.42. The HRA of the JCS[72] concluded no LSE, either alone or in-combination, on the Severn Estuary SAC/SPA/Ramsar site as a result of disturbance. The measures provided by the JCS policies were considered sufficient to address any potential adverse impacts. Relevant policies include:

- SD9 (referred to in the HRA of the JCS as SD10) Biodiversity and Geodiversity – described above.
- INF3 (referred to in the HRA of the JCS as INF4) Green Infrastructure – described above.
- INF4 (referred to in the HRA of the JCS as INF5) Social and Community Infrastructure – Where new residential development will create, or add to, a need for community facilities, it will be fully met as on-site provision and/or as a contribution to facilities or services off-site.
- INF6 (referred to in the HRA of the JCS as INF7) Infrastructure Delivery – described above.
- INF7 (referred to in HRA of JCS as INF8) – Developer contributions – provides the mechanism for the delivery of infrastructure through requiring financial contributions from developers.

4.2.43. The HRA[73] of the Tewkesbury Borough Plan 2011 – 2031 (TBP)[74] identifies that, although the Severn Estuary designated area is approximately 10 km from the JCS/TBP area, the rivers draining into the Estuary are important to maintain the assemblages of fish and overwintering birds, and land/watercourses can be functionally linked to the estuary designations. It states that increased recreational activity has the potential to result in disturbance to birds using supporting habitats through noise and visual disturbance. The TBP HRA states that individual site allocations are unlikely to result in LSE, but there is uncertainty for in-combination effects, and this is taken through to Appropriate Assessment. At the Appropriate Assessment stage, TBP Policy NAT1 is considered to provide strong mitigation measures to protect the integrity of designated sites. The Appropriate Assessment concludes that, as mitigation measures are in place, the TBP will not have adverse effects, alone or in-combination, on the Severn Estuary SAC/SPA/Ramsar site with regard to recreational disturbance.

4.2.44. The HRA of Cheltenham Local Plan[77] does not scope the Severn Estuary designations into the plan-level HRA on the basis that they are more than 15 km from the Cheltenham Borough administrative boundary.

4.2.45. As has been established, the Scheme itself will not result in increased recreational pressure on the Severn Estuary designations but will facilitate housing developments that have the potential to result in increased recreational pressure on land that has been shown to be functionally linked to the Severn Estuary SPA/Ramsar site (namely Coombe Hill SSSI). The potential in-combination effects of the combined housing developments within the JCS/TBP area, some of which the Scheme will facilitate, are known, and the above policies are in place to deal with the potential effects, to ensure that cumulative effects do not occur. The proposed housing developments will not receive planning permission unless they demonstrate compliance with the policy framework that is in place. This will be documented in detail in HRAs for the individual housing developments. The HRA for the Elms Park development[78] includes a commitment to create approximately 100 ha of

[77] Efusion (November 2016) Cheltenham Local Plan: Regulation 19 Habitats Regulations Assessment (HRA) Screening Report

[78] FPCR Environment and Design Ltd, for Bloor Homes and Persimmon Homes (March 2022) Elms Park, Cheltenham. Shadow Habitats Regulations Assessment.

GI and produce a Public Open Space Access Strategy for the two primary areas of public open space to ensure that a number of features are provided, including: the main access locations; waymarked walking routes; information boards; locations of play areas, dog bins etc; and details of any leaflets or web-based public information for the public open space. The information leaflet will include specific information about Coombe Hill Canal SSSI, explaining the reasons why the site is designated and request that visitors respect wildlife, detail specific 'do's and don'ts' and seasons where extra care should be taken. Natural England has confirmed that it is in agreement with these measures, and that they should be secured by a planning condition or obligation attached to any planning permission[79].

4.2.46. Potential for in-combination effects as a result of the Scheme and surrounding housing developments on the Severn Estuary designations has therefore been discounted and is not considered further.

4.3. Cotswold Beechwoods SAC

4.3.1. Further details on Cotswold Beechwoods SAC are presented in the Screening Matrix in Appendix H.

Baseline survey information

4.3.2. No baseline surveys have been undertaken, but, following statutory consultation comments, a desk study review of relevant documents has been carried out. The Scheme will facilitate housing developments within 15.4 km of the SAC, a zone of influence around the SAC within which housing growth may result in an increase in recreational use of the SAC[80]. The SAC is sensitive to recreational pressure. The Site Improvement Plan[81] for the Cotswold Beechwoods SAC identifies public access/disturbance as a threat to the site and the Standard Data Form also identifies recreational activities as a threat. Specifically, mountain biking and horse riding are identified in the Site Improvement Plan as occurring beyond the limited network of bridleways, creating additional trackways and increasing the erosion of the ground flora and potentially opportunities for water erosion. Dog walking is also identified as an issue, causing disturbance to wildlife as well as local nutrification through dog faeces. Recreational activities can also cause excessive soil compaction around ancient trees, damaging the soil structure and affecting the tree roots and associated mycorrhizal fungi.

4.3.3. Therefore, consideration has been given to this potential in-combination effect in the paragraphs below.

Stage 1 Screening conclusions

Assessment of the Scheme alone

4.3.4. There is no route or mechanism for a LSE on the interest features of the SAC as a result of the Scheme alone, and LSE for the Scheme alone have been ruled out.

In-combination assessment

4.3.5. The HRA Screening report of the JCS[82] concluded that, despite the measures provided by the JCS policies, there was uncertainty as to whether the Plan alone and in-combination is likely to have significant effects on the Cotswold Beechwoods SAC through increased disturbance. As a result, increased disturbance was carried forward to the

[79] Letter dated 9 September 2022 (ref 399272) available on the planning portal 16_02000_OUT-NATURAL_ENGLAND-1084186.pdf (tewkesbury.gov.uk)

[80] Liley, D., & Panter, C. (2022). Cotswold Beechwoods SAC Recreation Mitigation Strategy. Unpublished report by Footprint Ecology.

[81] http://publications.naturalengland.org.uk/publication/6276086220455936 [Accessed: June 2022]

[82] Efusion (May 2014) Pre-Submission Draft Joint Core Strategy Habitats Regulations Report.

Appropriate Assessment for further consideration with regard to the Cotswold Beechwoods SAC.

4.3.6. The JCS contains policies that seek to protect and enhance European sites as well as provide open space and recreational areas. These include SD9, INF3, INF4, INF6 and INF7, detailed above. The Plan contains a strong policy on GI that requires development to conserve and enhance GI assets. The supporting text in Policy INF3 requires existing GI assets to be retained (where appropriate), improved and better managed, and new features to be created. This includes requiring developer contributions for such provision. Policy INF6 requires that where need is generated as a result of individual site proposals and/or as a consequence of cumulative impact, new development will be served and supported by adequate and appropriate on- and/or off-site infrastructure and services, which includes the protection of environmental assets and the potential for their enhancement. Policy INF7 provides the mechanism for the delivery of infrastructure through requiring financial contributions from developers. This gives the Council's the ability to secure financial contributions from developers that would go towards the management of the Cotswolds Beechwoods SAC to address any potential increase in recreation.

4.3.7. The HRA of the JCS concludes that the measures provided in the JCS policies and available at the project level will address the potential for adverse effects alone and in-combination on the Cotswold Beechwoods SAC as a result of increased recreational activity. This is in line with the conclusion of the HRA of the TBP[73], which also refers to the following relevant TBP policies:

- LAN4 Locally Important Open Spaces and LAN5 Local Green Spaces - relate to protection of local green space. These areas will be protected from development unless the development proposed would clearly enhance the area for the purpose it was designated and is demonstrably supported by the local community.
- NAT1 Biodiversity, Geodiversity and important Natural Features - requires development to conserve and where possible enhance biodiversity. It includes clear requirements that proposals that are likely to have a significant effect on an internationally designated habitats site (either alone or in-combination with other plans or projects) will not be permitted unless a HRA has concluded that the proposal will not adversely affect the integrity of the site.
- NAT3 Green Infrastructure: Building with Nature - requires new development to contribute appropriately to provision, protection and enhancement of the wider GI network.
- NAT5 Cotswold Beechwoods – states that development will not be permitted where it would be likely to lead directly or indirectly to an adverse effect upon the integrity of the Cotswold Beechwoods SAC (alone or in-combination) and the effects cannot be mitigated. The policy requires that all development that leads to a net increase in dwellings will be required to mitigate any adverse effects or increased recreational pressure, and that any proposals that would lead to an adverse effect must contribute towards mitigation specified in the SAC mitigation and implementation strategy or through a bespoke HRA.

4.3.8. The HRA of the TBP refers to the visitor surveys that, at the time of writing, were due to be undertaken, and which will inform a future mitigation strategy that will support NAT5. These visitor surveys have now been completed and the Cotswold Beechwoods SAC Recreation Mitigation Strategy[83] has been written. This strategy states that all new residential development within the 15.4 km zone of influence will contribute towards Strategic Access Management and Monitoring (SAMM) which will comprise: dedicated staff; signs and interpretation; education and awareness training; measures to address contamination; parking and travel related measures; and monitoring. In addition, all new residential development within the zone of influence will either provide bespoke Suitable

[83] Liley, D., & Panter, C. (2022). Cotswold Beechwoods SAC Recreation Mitigation Strategy. Unpublished report by Footprint Ecology.

Alternative Natural Greenspace (SANG) (e.g. as part of a large development) or contribute towards SANG/infrastructure projects. SANGs are greenspaces that are created or enhanced with the specific purpose of absorbing recreation pressure that would otherwise occur at a European site. SANGs are created, or existing greenspaces are enhanced to create a SANG, in order to absorb the level of additional recreation pressure associated with new development. Such sites are likely to be effective in providing areas for dog walking. Natural England's established guidance requires a minimum of 8 ha of SANGs per 1000 new residents[84].Other infrastructure projects may be more appropriate for smaller sites and could include providing dedicated cycle routes or linking up existing cycle and longer walking routes to encourage use away from the European site or enhancing parking to increase capacity at countryside sites away from a European site. The SAMM and SANG/infrastructure projects are designed to work in parallel.

4.3.9. The HRA of Cheltenham Local Plan[77] concludes that no likely significant effects are predicted alone or in-combination on the Cotswold Beechwoods SAC given policy mitigation proposed in the JCS, in particular SD10 and INF4. In addition, the HRA refers to the green space local policies within the Cheltenham Plan itself which should ensure sufficient recreation space is provided within the borough boundary for existing and future local residents and prevent any significant additional recreational pressures on any European site. The relevant green space policy is as follows:

- GI1: Local green space: Development will not be permitted within a Local Green Space, designated either within the Cheltenham Plan or an approved Neighbourhood Plan, unless there are very special circumstances which outweigh the harm to the Local Green Space. Particular attention will be paid to the views of the local community in assessing any development proposals that affect a designated Local Green Space.

4.3.10. As has been established, the Scheme itself will not result in increased recreational pressure but will facilitate housing developments within the established 15.4 km zone of influence around the SAC, which may result in an increase in recreational use of the SAC. The potential in-combination effects of the combined housing developments within the JCS/TBP area, some of which the Scheme will facilitate, are known, and the above policies are in place to deal with the potential effects, to ensure that cumulative effects do not occur. The proposed housing developments will not receive planning permission unless they demonstrate compliance with the policy framework that is in place. This will be documented in detail in HRAs for the individual housing developments. The HRA for the Elms Park development[85] includes a commitment to create approximately 100 ha of GI and produce a Public Open Space Access Strategy for the two primary areas of public open space to ensure that a number of features are provided, including: the main access locations; waymarked walking routes; information boards; locations of play areas, dog bins etc; and details of any leaflets or web-based public information for the public open space. An information leaflet will be provided to every new resident that details public open space and places to visit with visitor facilities at various distances from the new houses. Natural England has confirmed that it is in agreement with these measures, and that they should be secured by a planning condition or obligation attached to any planning permission[86].

4.3.11. Taking a similar approach to recreational pressure, consideration has also been given to whether the Scheme, in facilitating the above-mentioned housing developments, could result in increased air quality effects as a result of the combined effects of the housing developments that the Scheme will facilitate. However, as described above, the air quality assessment (Chapter 5 – Air Quality (Application document TR010063 – APP 6.3)) has included an assessment of air quality impacts for the opening year (2027) and the future

[84] Comment from Gloucestershire Wildlife Trust on the PEIR following statutory consultation. This is confirmed in the Cotswold Beechwoods SAC Recreation Mitigation Strategy (Liley, D., & Panter, C. (2022). Cotswold Beechwoods SAC Recreation Mitigation Strategy. Unpublished report by Footprint Ecology), which also include further guidance on SANG provision.
[85] FPCR Environment and Design Ltd, for Bloor Homes and Persimmon Homes (March 2022) Elms Park, Cheltenham. Shadow Habitats Regulations Assessment.
[86] Letter dated 9 September 2022 (ref 399272) available on the planning portal 16_02000_OUT-NATURAL_ENGLAND-1084186.pdf (tewkesbury.gov.uk)

year scenario (2042) in order to account for expected traffic growth associated with additional development facilitated by the Scheme. The Cotswold Beechwoods SAC is not within 200 m of the ARN in any scenario; therefore, in-combination air quality impacts can be confidently ruled out.

4.3.12. This aligns with the HRA of the JCS[87]. This concluded that while it is unlikely that there would be significant effects on the Cotswold Beechwoods SAC as a result of increased atmospheric pollution given the mitigation provided through JCS policies (SP2, SD14, SD3, SD4, INF1, INF3 and SD9 detailed above), there was still an element of uncertainty. However, it was concluded that this uncertainty is addressed in the JCS through the further mitigation provided by Policies INF6 and INF7 (detailed above) which provide a mechanism to require financial contributions from developers towards the protection and enhancement of environmental assets including the Cotswolds Beechwoods SAC. This is in line with the conclusion of the HRA of the TBP[88], which also refers to the following relevant TBP policies NAT1 and NAT5 (detailed above). The HRA of Cheltenham Local Plan[77] concludes that no likely significant effects alone or in-combination on the Cotswold Beechwoods SAC as a result of air quality given policy mitigation proposed in the JCS.

4.3.13. Potential for in-combination effects as a result of the Scheme and surrounding housing developments on the Cotswold Beechwoods SAC has therefore been discounted and is not considered further.

[87] Efusion (May 2014) Pre-Submission Draft Joint Core Strategy Habitats Regulations Report.

[88] Tewkesbury Borough Council (October 2019) Pre-Submission Tewkesbury Borough Plan 2011 - 2031

5. Conclusion

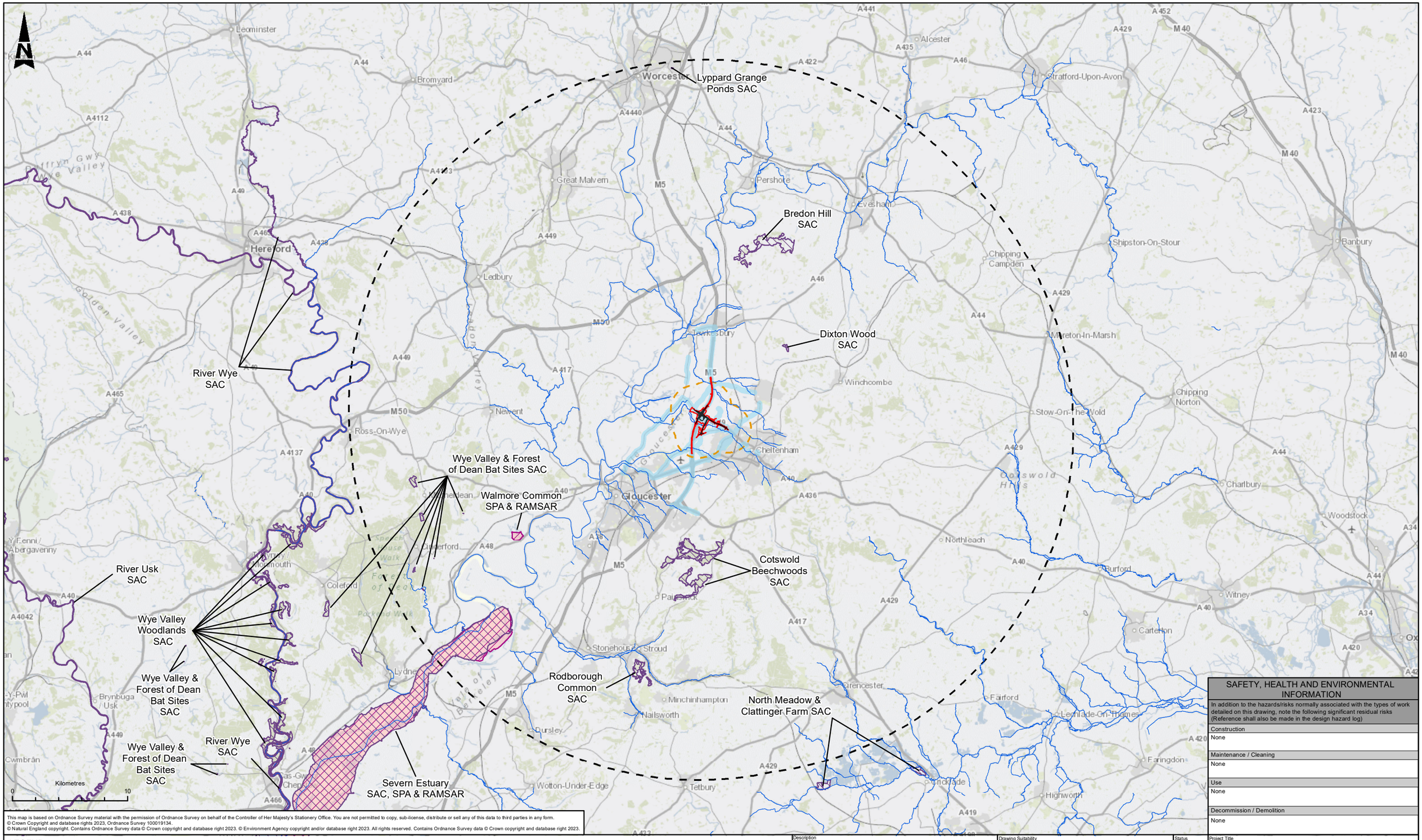
5.1.1. This HRA Screening assessment has concluded that, in the absence of mitigation, pollution, injury/mortality, disturbance, fragmentation and temporary reduction in extent of functionally linked habitat during construction and operation could have effects on European eel, Atlantic salmon, sea trout and river lamprey using the River Chelt, resulting in LSE on these qualifying species of the Severn Estuary SAC (in relation to river lamprey only) and Ramsar site. This Screening assessment has therefore concluded that these elements should be taken through to the second stage of HRA, Appropriate Assessment, and this is set out in the Statement to Inform the Appropriate Assessment (SIAA) (Technical Appendix 7.14 (Application document TR010063 – APP 6.15)).

5.1.2. No other LSE, either alone or in-combination, are anticipated in relation to the other potential impacts identified on the Severn Estuary designations, or any other designated sites. In accordance with LA 115, a 'Finding of No Significant Effects Report Matrix (Screening)' is included for the Wye Valley and Forest of Dean Bat Sites SAC, Walmore Common SPA, Walmore Common Ramsar site, Severn Estuary SPA and Cotswold Beechwoods SAC in Appendices I to M of this document.

Appendices

Appendix A. Figures

Figure reference	Document title	Sheet	Document number	Revision
7-13A	European designated sites	1 of 1	GCCM5J10-ATK-EBD-ZZ-GS-GI-000032	1



LEGEND

- ORDER LIMITS
- SCHEME ALIGNMENT
- 2KM STUDY AREA
- 30KM STUDY AREA
- WATERCOURSES
- AFFECTED ROAD NETWORK 200M BUFFER
- SPECIAL AREAS OF CONSERVATION (SAC)
- SPECIAL PROTECTION AREAS (SPA)
- RAMSAR SITES

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction	None
Maintenance / Cleaning	None
Use	None
Decommission / Demolition	None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P02	SD	LH	CC	LJ	10/07/24

Drawing Suitability: PUBLISHED
Status: A1

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-13A
EUROPEAN DESIGNATED SITES

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Drawing Number: GCCM5J10 - ATK - EBD - ZZ - GS - GI - 000032
(Project | Originator | Volume | Location | Type | Role | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:300,000	5214106	1 of 1	P02

Appendix B.Wye Valley and Forest of Dean Bat Sites SAC Screening Matrix

Wye Valley and Forest of Dean Bat Sites SAC Screening Matrix		
Project	M5 Junction 10 Improvements Scheme	
European Site under Consideration	Wye Valley and Forest of Dean Bat Sites SAC	
Date:	Author (Name/Organisation):	Verified (Name/Organisation)
August 2021	Associate Ecologist Atkins	Associate Director Atkins
Description of Project Describe any likely direct, indirect or secondary impacts of the project (either alone or in-combination with other plans or projects) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	The M5 Junction 10 Improvements Scheme involves construction of improvement works to M5 Junction 10, consisting of a new all-movements motorway junction; a new West Cheltenham Link Road (the Link Road from the A4019 to the B4634 (Old Gloucester Road)), and the widening of the A4019 (Tewkesbury Road) east of the junction to the Gallagher Retail Park Junction. A small section of the A4019 will be realigned to the west of the junction.	
Land-take	The Scheme would not require land-take from the SAC.	
Distance from the European Site or key features of the site (from edge of the project assessment corridor)	The Scheme is approx. 21 km east of the nearest part of the SAC (Blaisdon Hall SSSI).	
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	The Scheme does not require resources from the SAC.	
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	There is no hydrological link between the Scheme and SAC, and therefore no impact pathway by which any water-borne pollution generated by the Scheme could give rise to adverse effects on the European Site. The SAC is located beyond the distance from any construction activity at which dust from demolition or construction would be a potential impact, and more than 200 m from the affected road network (ARN). Therefore, no air quality impacts are anticipated.	
Excavation requirements (e.g. impacts of local hydrogeology)	At a distance of at least 21 km, excavation works associated with the Scheme will not impact the local hydrogeology of the SAC.	
Transportation requirements	Construction traffic will not be routed in the vicinity of the SAC.	

Wye Valley and Forest of Dean Bat Sites SAC Screening Matrix	
Duration of construction, operation, etc	The Scheme would be constructed between 2024 and 2027.
Other	Not applicable (N/A)
Description of avoidance and/or mitigation measures Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:	
Nature of proposals	No mitigation is proposed for the SAC.
Location	N/A
Evidence for effectiveness	N/A
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	N/A
Characteristics of European Site(s) A brief description of the European Site to be produced, including information on:	
Name of European Site and its EU code	Wye Valley and Forest of Dean Bat Sites SAC (UK0014794)
Location and distance of the European Site from the proposed works	The nearest part of the SAC (Blaisdon Hall SSSI) is located approx. 21 km west of the Scheme.
European Site size	144.82 ha (distributed between 13 component sites)
Key features of the European Site including the primary reasons for selection and any other qualifying interests	1303 Lesser horseshoe bat (*Rhinolophus hipposideros*) This complex of sites on the border between England and Wales contains by far the greatest concentration of lesser horseshoe bat in the UK, totalling about 26% of the national population. It has been selected on the grounds of the exceptional breeding population, and the majority of sites within the complex are maternity roosts. The bats are believed to hibernate in the many disused mines in the area. 1304 Greater horseshoe bat (*Rhinolophus ferrumequinum*) This complex of sites on the border between England and Wales represents greater horseshoe bat in the northern part of its range, with about 6% of the UK population. The site contains the main maternity roost for bats in this area, which are believed to hibernate in the many disused mines in the Forest.
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	Principal threats and pressures comprise: • Other ecosystem modifications. • Outdoor sports and leisure activities. • Human induced changes in hydraulic conditions.

Wye Valley and Forest of Dean Bat Sites SAC Screening Matrix	
European Site conservation objectives – where these are readily available	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring: • The extent and distribution of the habitats of qualifying species. • The structure and function of the habitats of qualifying species. • The supporting processes on which the habitats of qualifying species rely. • The populations of qualifying species. • The distribution of qualifying species within the site.
Assessment criteria Describe the individual elements of the project (either alone or in-combination with other plans or projects) likely to give rise to impacts on the European Site.	
The Scheme is located approximately 21 km from the closest component SSSI of the SAC. The only potential impact pathway that has been identified is the potential for construction works to impact upon habitats that might be functionally linked to the SAC. The assessment below discusses this potential impact pathway in more detail.	
Initial assessment The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	The Scheme would not result in a reduction in habitat area from within the SAC. The Scheme would not affect functionally linked habitats either, as the distance is considered to be too great for there to be a significant functional linkage between the Scheme and the qualifying feature bat populations. This is because the distance is at least seven times larger than the core sustenance zones[89] identified by the Bat Conservation Trust (BCT)[90] for lesser horseshoe bats (2 km) and greater horseshoe bats (3 km). In terms of bat behaviour in this site specifically, flight lines and feeding grounds within the wider ecological network are critical in supporting the SAC. Lesser horseshoe bats tend to forage within two to three kilometres of their roost, with density of bats associated with the SAC declining sharply after this[91]. In the winter, the foraging range is thought to be around half this. A conservation objective of the SAC is to maintain a wide area of supporting habitat for bats, with the Site Improvement Plan suggesting the creation of a feeding area of a radius of approximately 4 km around maternity roosts[92]. A radiotracking study of greater horseshoe bats in Dean Hall, a

[89] The area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost.
[90] Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.
[91] Countryside Council for Wales (2008). Core Management Plan Including Conservation Objectives for Wye Valley and Forest of Dean Bat SAC
[92] Improvement Programme for England's Natura 2000 Sites (2015). Site Improvement Plan: Wye Valley and the Forest of Dean Bat Sites

Wye Valley and Forest of Dean Bat Sites SAC Screening Matrix	
	constituent SSSI of the SAC, found that bats forage up to 9 km from the roost using a number of night roosts during the feeding period[92]. At a distance of 21 km at the nearest point, these foraging areas for bats associated with the SAC are significantly less than this. Therefore, the Scheme will not impact any habitat for bats associated with the SAC. In addition, the site is beyond the ARN, and as a result will not be impacted by air quality pollution impacts.
Disturbance to key species	The Scheme is too far from the SAC for there to be any direct disturbance. The Scheme would not result in disturbance of bats within functionally linked habitats either, as the distance is considered to be too great for there to be a significant functional linkage between the Scheme and the qualifying feature bat populations (see above).
Habitat or species fragmentation	The Scheme would not result in fragmentation of the SAC or any functionally linked habitats.
Reduction in species density	The Scheme would not result in a reduction in species density of qualifying features.
Changes in key indicators of conservation value (water quality, etc)	The Scheme would not result in any changes in any key indicators of conservation value.
Climate change	Climate change is not listed as a threat or pressure in relation to this site.
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	No likely significant effects on the structure (i.e. the distribution and abundance of habitats) of the SAC are anticipated as a result of the Scheme alone or in-combination with other plans or projects.
Interference with key relationships that define the function of the site	No likely significant effects on the function (i.e. the capacity of the SAC to support the qualifying features) of the SAC are anticipated as a result of the Scheme alone or in-combination with other plans or projects.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	N/A
Disturbance to key species	N/A
Habitat or species fragmentation	N/A
Loss	N/A
Fragmentation	N/A
Disruption	N/A
Disturbance	N/A
Change to key elements of the site (e.g. water	N/A

Wye Valley and Forest of Dean Bat Sites SAC Screening Matrix	
quality, hydrological regime etc)	
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
N/A	
Outcome of screening stage	Not likely to be significant effects
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence).	Yes

Appendix C. Walmore Common SPA Screening Matrix

Walmore Common SPA Screening Matrix		
Project	M5 Junction 10 Improvements Scheme	
European Site under Consideration	Walmore Common SPA	
Date:	Author (Name/Organisation):	Verified (Name/Organisation)
August 2021	Associate Ecologist Atkins	Associate Director Atkins
Description of Project Describe any likely direct, indirect or secondary impacts of the project (either alone or in-combination with other plans or projects) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	The M5 Junction 10 Improvements Scheme involves construction of improvement works to M5 Junction 10, consisting of a new all-movements motorway junction; a new West Cheltenham Link Road (the Link Road from the A4019 to the B4634 (Old Gloucester Road)), and the widening of the A4019 (Tewkesbury Road) east of the junction to the Gallagher Retail Park Junction. A small section of the A4019 will be realigned to the west of the junction.	
Land-take	The Scheme would not require land-take from the SPA.	
Distance from the European Site or key features of the site (from edge of the project assessment corridor)	The Scheme is 17.5 km north east of the SPA.	
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	The Scheme does not require resources from the SPA.	
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	There is no hydrological link between the Scheme and SPA, and therefore no impact pathway by which any water-borne pollution generated by the Scheme could give rise to adverse effects on the European Site. The SPA is located beyond the distance from any construction activity at which dust from demolition or construction would be a potential impact, and more than 200 m from the affected road network (ARN). Therefore, no air quality impacts are anticipated.	
Excavation requirements (e.g. impacts of local hydrogeology)	At a distance of 17.5 km, excavation works associated with the Scheme will not impact the local hydrogeology of the SPA.	
Transportation requirements	Construction traffic will not be routed in the vicinity of the SPA.	

Walmore Common SPA Screening Matrix	
Duration of construction, operation, etc	The Scheme would be constructed between 2024 and 2027.
Other	Not applicable (N/A)
Description of avoidance and/or mitigation measures Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:	
Nature of proposals	No mitigation is proposed for the SPA.
Location	N/A
Evidence for effectiveness	N/A
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	N/A
Characteristics of European Site(s) A brief description of the European Site to be produced, including information on:	
Name of European Site and its EU code	Walmore Common SPA (UK9007051)
Location and distance of the European Site from the proposed works	The SPA is located 17.5 km south west of the Scheme.
European Site size	52.85 ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: Over winter; • Bewick's swan (*Cygnus columbianus bewickii*), 104 individuals representing at least 1.5% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6).
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	Principal threats and pressures comprise: • Human induced changes in hydraulic conditions. • Changes in biotic conditions. • Outdoor sports and leisure activities. • Modification of cultivation practices.
European Site conservation objectives – where these are readily available	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features. • The structure and function of the habitats of the qualifying features.

Walmore Common SPA Screening Matrix	
	• The supporting processes on which the habitats of the qualifying features rely. • The population of each of the of qualifying features. • The distribution of the qualifying features within the site.
Assessment criteria Describe the individual elements of the project (either alone or in-combination with other plans or projects) likely to give rise to impacts on the European Site.	
The Scheme is located 17.5 km from the SPA. The only potential impact pathway that has been identified is the potential for construction works to impact upon habitats that might be functionally linked to the SPA. The assessment below discusses this potential impact pathway in more detail.	
Initial assessment The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	The Scheme would not result in a reduction in habitat area from within the SPA. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive (detailed within Technical Appendix 7.9 Wintering Bird Survey (Application document TR010063/APP/6.15)). No Bewick's swans (Walmore Common SPA qualifying feature) were observed during the surveys. Gloucestershire Centre for Environmental Records (GCER) was contacted to obtain recent records[93] of protected and notable species within 1 km of the Scheme. No records of Bewick's swan were provided. In addition, a review of existing literature was conducted, which indicated that the agricultural grassland habitats surrounding the Scheme are not key areas for populations of Bewick's swan[94]. The results of the wintering and migratory bird surveys and desk study indicate that Bewick's swan does not regularly use and is not dependent on the habitat in the vicinity of the Scheme.
Disturbance to key species	The Scheme is too far from the SPA for there to be any direct disturbance. The Scheme would not result in disturbance of Bewick's swans within functionally linked habitats either, as there is not considered to be a significant functional linkage between the Scheme and the qualifying feature population (see above).
Habitat or species fragmentation	The Scheme would not result in fragmentation of the SPA or any significant functionally linked habitats.
Reduction in species density	The Scheme would not result in a reduction in species density of qualifying features.
Changes in key indicators of conservation value (water quality, etc)	The Scheme would not result in any changes in any key indicators of conservation value.

[93] Records of observations within the last 10 years.
[94] Robinson, JA, K Colhoun, JG McElwaine & EC Rees (2004). Bewick's Swan *Cygnus columbianus bewickii* (Northwest Europe population) in Britain and Ireland 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.

Walmore Common SPA Screening Matrix	
Climate change	Climate change is not listed as a threat or pressure in relation to this site.
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	No likely significant effects on the structure (i.e. the distribution and abundance of habitats) of the SPA are anticipated as a result of the Scheme alone or in-combination with other plans or projects.
Interference with key relationships that define the function of the site	No likely significant effects on the function (i.e. the capacity of the SPA to support the qualifying features) of the SPA are anticipated as a result of the Scheme alone or in-combination with other plans or projects.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	N/A
Disturbance to key species	N/A
Habitat or species fragmentation	N/A
Loss	N/A
Fragmentation	N/A
Disruption	N/A
Disturbance	N/A
Change to key elements of the site (e.g. water quality, hydrological regime etc)	N/A
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
N/A	
Outcome of screening stage	Not likely to be significant effects
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence).	Yes

Appendix D. Walmore Common Ramsar site Screening Matrix

Walmore Common Ramsar site Screening Matrix		
Project	M5 Junction 10 Improvements Scheme	
European Site under Consideration	Walmore Common Ramsar site	
Date:	Author (Name/Organisation):	Verified (Name/Organisation)
August 2021	Associate Ecologist Atkins	Associate Director Atkins
Description of Project Describe any likely direct, indirect or secondary impacts of the project (either alone or in-combination with other plans or projects) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	The M5 Junction 10 Improvements Scheme involves construction of improvement works to M5 Junction 10, consisting of a new all-movements motorway junction; a new West Cheltenham Link Road (the Link Road from the A4019 to the B4634 (Old Gloucester Road)), and the widening of the A4019 (Tewkesbury Road) east of the junction to the Gallagher Retail Park Junction. A small section of the A4019 will be realigned to the west of the junction.	
Land-take	The Scheme would not require land-take from the Ramsar site.	
Distance from the European Site or key features of the site (from edge of the project assessment corridor)	The Scheme is 17.5 km north east of the Ramsar site.	
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	The Scheme does not require resources from the Ramsar site.	
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	There is no hydrological link between the Scheme and Ramsar site, and therefore no impact pathway by which any water-borne pollution generated by the Scheme could give rise to adverse effects on the European Site. The Ramsar site is located beyond the distance from any construction activity at which dust from demolition or construction would be a potential impact, and more than 200 m from the affected road network (ARN). Therefore, no air quality impacts are anticipated.	
Excavation requirements (e.g. impacts of local hydrogeology)	At a distance of 17.5 km, excavation works associated with the Scheme will not impact the local hydrogeology of the Ramsar site.	

Walmore Common Ramsar site Screening Matrix	
Transportation requirements	Construction traffic will not be routed in the vicinity of the Ramsar site.
Duration of construction, operation, etc	The Scheme would be constructed between 2024 and 2027.
Other	N/A
Description of avoidance and/or mitigation measures Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:	
Nature of proposals	No mitigation is proposed for the Ramsar site.
Location	N/A
Evidence for effectiveness	N/A
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	N/A
Characteristics of European Site(s) A brief description of the European Site to be produced, including information on:	
Name of European Site and its EU code	Walmore Common Ramsar site (UK9007051)
Location and distance of the European Site from the proposed works	The Ramsar site is located 17.5 km south west of the Scheme.
European Site size	52.85 ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	Ramsar criterion 6 – species/populations occurring at levels of international importance: Qualifying species/populations (as identified at designation): Species with peak counts in winter: Tundra swan (*Cygnus columbianus bewickii*), 43 individuals, representing an average of 0.5% of the GB population (5 year peak mean 1998/9 – 2002/3).
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	Factors (past, present, or potential) adversely affecting the site's ecological character: • No factors reported
European Site conservation objectives – where these are readily available	No specific conservation objectives found. The overarching objective of the Ramsar Convention is to stem the loss and progressive encroachment on wetlands now and in the future.
Assessment criteria	

Walmore Common Ramsar site Screening Matrix	
Describe the individual elements of the project (either alone or in-combination with other plans or projects) likely to give rise to impacts on the European Site.	
The Scheme is located 17.5 km from the Ramsar site. The only potential impact pathway that has been identified is the potential for construction works to impact upon habitats that might be functionally linked to the Ramsar site. The assessment below discusses this potential impact pathway in more detail.	
Initial assessment The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	The Scheme would not result in a reduction in habitat area from within the Ramsar site. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive (detailed within Technical Appendix 7.9 Wintering Bird Survey (Application document TR010063/APP/6.15)). No tundra swans (Walmore Common Ramsar site qualifying feature) were observed during the surveys. Gloucestershire Centre for Environmental Records (GCER) was contacted to obtain recent records[95] of protected and notable species within 1 km of the Scheme. No records of tundra swan were provided. In addition, a review of existing literature was conducted, which indicated that the agricultural grassland habitats surrounding the Scheme are not key areas for populations of tundra swan[96]. The results of the wintering and migratory bird surveys and desk study indicate that tundra swan does not regularly use and is not dependent on the habitat in the vicinity of the Scheme.
Disturbance to key species	The Scheme is too far from the Ramsar site for there to be any direct disturbance. The Scheme would not result in disturbance of tundra swans within functionally linked habitats either, as there is not considered to be a significant functional linkage between the Scheme and the qualifying feature population (see above).
Habitat or species fragmentation	The Scheme would not result in fragmentation of the Ramsar site or any significant functionally linked habitats.
Reduction in species density	The Scheme would not result in a reduction in species density of qualifying features.
Changes in key indicators of conservation value (water quality, etc)	The Scheme would not result in any changes in any key indicators of conservation value.
Climate change	Climate change is not listed as a threat or pressure in relation to this site.
Describe any likely impacts on the European Site as a whole in terms of:	

[95] Records of observations within the last 10 years.
[96] Robinson, JA, K Colhoun, JG McElwaine & EC Rees (2004). Bewick's Swan *Cygnus columbianus bewickii* (Northwest Europe population) in Britain and Ireland 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.

Walmore Common Ramsar site Screening Matrix	
Interference with the key relationships that define the structure of the site	No likely significant effects on the structure (i.e. the distribution and abundance of habitats) of the Ramsar site are anticipated as a result of the Scheme alone or in-combination with other plans or projects.
Interference with key relationships that define the function of the site	No likely significant effects on the function (i.e. the capacity of the Ramsar site to support the qualifying features) of the Ramsar site are anticipated as a result of the Scheme alone or in-combination with other plans or projects.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	N/A
Disturbance to key species	N/A
Habitat or species fragmentation	N/A
Loss	N/A
Fragmentation	N/A
Disruption	N/A
Disturbance	N/A
Change to key elements of the site (e.g. water quality, hydrological regime etc)	N/A
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
N/A	
Outcome of screening stage	Not likely to be significant effects
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence).	Yes

Appendix E.Severn Estuary SAC Screening Matrix

Severn Estuary SAC Screening Matrix		
Project	M5 Junction 10 Improvements Scheme	
European Site under Consideration	Severn Estuary SAC	
Date:	Author (Name/Organisation):	Verified (Name/Organisation)
August 2021	Associate Ecologist Atkins	Associate Director Atkins
Description of Project Describe any likely direct, indirect or secondary impacts of the project (either alone or in-combination with other plans or projects) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	The M5 Junction 10 Improvements Scheme involves construction of improvement works to M5 Junction 10, consisting of a new all-movements motorway junction; a new West Cheltenham Link Road (the Link Road from the A4019 to the B4634 (Old Gloucester Road)), and the widening of the A4019 (Tewkesbury Road) east of the junction to the Gallagher Retail Park Junction. A small section of the A4019 will be realigned to the west of the junction.	
Land-take	The Scheme would not require land-take from the SAC.	
Distance from the European Site or key features of the site (from edge of the project assessment corridor)	The Scheme is 21 km north east of the SAC, or approx. 40 km via the shortest hydrological connection.	
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	The Scheme does not require resources from the SAC.	
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	Although there is a direct hydrological connection between the Scheme and the Severn Estuary SAC, at such a distance, it is considered that the potential for direct impacts via release of pollutants from the Scheme would be eliminated by dilution. DMRB guidance LA 113 states that "for assessment of impacts associated with soluble pollutants, outfalls within 1 km (measured along the watercourse) shall be aggregated for the purposes of cumulative assessment[97]". It therefore follows that soluble pollutants are considered to be sufficiently diluted beyond 1 km. Although not relied upon for the screening conclusions, pollution prevention methods will be in place including standard water	

[97] Highways England (2020). Design Manual for Roads and Bridges LA 113 Road drainage and the water environment (formerly HD 45/09). (March 2020, version 1) Online: d6388f5f-2694-4986-ac46-b17b62c21727 (standardsforhighways.co.uk)

Severn Estuary SAC Screening Matrix	
	protection measures to avoid chemical or sediment pollution of any watercourses. Works will proceed following standard good practice working methods for environmental protection which will adhere to the Guidance for Pollution Prevention (GPPs)[98] and the Construction Industry Research and Information Association[99] (CIRIA) C715 Environmental good practice. These will be secured via the Register of Environmental Actions and Commitments (REAC) (Application document TR010063 – APP 7.4). The drainage strategy to be implemented by the Scheme incorporates SuDS to mitigate the pollution risk associated with road runoff as well as accidental spills. However, given the relatively small size of the proposed works in comparison with the distance, size and mixing of the receptor designations, risks of significant spillage of chemical contaminant or silt pollution could be discounted even without any additional pollution controls. Water quality impacts to functionally linked habitat within the River Chelt as a result of a pollution event during construction and operation, and consequent detrimental effects to migratory river lamprey cannot be ruled out, as discussed below. The SAC is located beyond the distance from any construction activity at which dust from demolition or construction would be a potential impact, and more than 200 m from the ARN. Therefore, no air quality impacts are anticipated.
Excavation requirements (e.g. impacts of local hydrogeology)	At a distance of 21 km, excavation works associated with the Scheme will not impact the local hydrogeology of the SAC.
Transportation requirements	Construction traffic will not be routed in the vicinity of the SAC.
Duration of construction, operation, etc	The Scheme would be constructed between 2024 and 2027.
Other	Not applicable (N/A)
Description of avoidance and/or mitigation measures Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:	
Nature of proposals	Mitigation has not been considered as part of the screening assessment.
Location	N/A
Evidence for effectiveness	N/A
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	N/A

[98] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[99] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.

Severn Estuary SAC Screening Matrix	
Characteristics of European Site(s) A brief description of the European Site to be produced, including information on:	
Name of European Site and its EU code	Severn Estuary SAC (UK0013030)
Location and distance of the European Site from the proposed works	The SAC is located 21 km south west of the Scheme, or 40 km downstream via the shortest hydrological connection.
European Site size	73,714.11 ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	Annex I habitats that are a primary reason for selection of this site: • 1130 Estuaries. • 1140 Mudflats and sandflats not covered by seawater at low tide. • 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae). Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • 1110 Sandbanks which are slightly covered by sea water all the time. • 1170 Reefs. • Annex II species that are a primary reason for selection of this site: • 1095 Sea lamprey (Petromyzon marinus). • 1099 River lamprey (Lampetra fluvitalis). • 1103 Twaite shad (Alosa fallax).
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	Principal threats and pressures comprise: • Other urbanisation, industrial and similar activities; • Changes in abiotic conditions; • Human induced changes in hydraulic conditions; • Outdoor sports and leisure activities; and • Modification of cultivation practices.
European Site conservation objectives – where these are readily available	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring: • The extent and distribution of qualifying habitats and habitats of qualifying species; • The structure and function (including typical species) of qualifying natural habitats; • The structure and function of the habitats of qualifying species; • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; • The populations of qualifying species; and • The distribution of qualifying species within the site.

Severn Estuary SAC Screening Matrix	
Assessment criteria Describe the individual elements of the project (either alone or in-combination with other plans or projects) likely to give rise to impacts on the European Site.	
The Scheme is located approximately 21 km from the SAC or 40 km via the shortest hydrological connection. Potential impact pathways have been identified via the hydrological connection and via construction impacts on habitats that might be functionally linked to fish populations associated with the SAC site. The assessment below discusses these potential impact pathways in more detail.	
Initial assessment The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	The Scheme would not result in a reduction in habitat area from within the SAC. Survey results (detailed in Technical Appendix 7.12 – Aquatic Ecology Survey (Application document TR010063/APP/6.15) indicate that river lamprey are potentially present in the vicinity of the Scheme within the River Chelt. The Scheme may result in a temporary reduction in the extent of functionally linked habitat in the event that dewatering part of the River Chelt channel is required during construction.
Disturbance to key species	The Scheme is too far from the SAC for there to be any disturbance to species within the SAC itself. Survey results (detailed in Technical Appendix 7.12 – Aquatic Ecology Survey (Application document TR010063/APP/6.15) indicate that river lamprey[100] are potentially present in the vicinity of the Scheme within the River Chelt. As such, there is potential for short-term impacts to this species within or surrounding the Scheme as a result of noise or vibration disturbance during construction of the new Link Road, in particular the construction of the new bridge over the River Chelt. The new bridge abutments will be set back from the banks of the River Chelt by 4 m. Rotary piling will be required in the construction of the bridge. In addition, a temporary River Chelt crossing will be required during construction.
Habitat or species fragmentation	Although the Scheme would not result in a physical barrier to fish migration, the disturbance and pollution impacts described above and below respectively could potentially result in habitat fragmentation/barrier effects.
Reduction in species density	There is the potential for injury/mortality to river lamprey ammocoetes if they are present within burrows in the sediment of the River Chelt in the event that dewatering of part of the channel is required during construction.
Changes in key indicators of conservation value (water quality, etc)	Water quality impacts to functionally linked habitat within the River Chelt as a result of a pollution event during construction and operation, and consequent detrimental effects to migratory river lamprey cannot be ruled out.

[100] Two brook/river lamprey ammocoetes (young/larvae) were recorded. It is difficult to distinguish between brook and river lamprey when in the ammocoete stage. As a precaution, they are assumed to be river lamprey.

Severn Estuary SAC Screening Matrix	
	Such impacts could arise through changes to water quality as a result of mobilization of suspended sediments leading to silt laden runoff entering watercourses; and potential for accidental contamination associated with the spillage or leakage of fuels, lubricants and other chemicals required for construction. In particular, such impacts could occur during the construction of the new bridge over the River Chelt and the temporary River Chelt crossing. Operational phase water quality impacts could arise as a result of contaminated road runoff entering the River Chelt.
Climate change	Climate change is not listed as a threat or pressure in relation to this site.
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	The evidence indicates that water quality impacts to functionally linked habitat within the River Chelt as a result of a pollution event during construction and operation, and consequent detrimental effects to river lamprey associated with the Severn Estuary SAC cannot be ruled out.
Interference with key relationships that define the function of the site	Disturbance impacts to migratory river lamprey associated with the Severn Estuary SAC using functionally linked habitat within the River Chelt during construction cannot be ruled out. Injury or mortality to river lamprey ammocoetes if they are present within burrows in the sediment of the River Chelt in the event that dewatering of part of the channel is required during construction cannot be ruled out. Fragmentation as a result of disturbance and pollution, which could result in barrier effects, with river lamprey unable to disperse or move along the River Chelt, cannot be ruled out.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	Potential LSE in relation to functionally linked habitat
Disturbance to key species	Potential LSE
Habitat or species fragmentation	Potential LSE
Loss	N/A
Fragmentation	N/A
Disruption	N/A
Disturbance	N/A
Change to key elements of the site (e.g. water quality, hydrological regime etc)	Potential LSE
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
Construction of the new bridge over the River Chelt, construction of the temporary River Chelt crossing, dewatering part of the River Chelt channel (if required), operational phase water quality impacts.	

Severn Estuary SAC Screening Matrix	
Outcome of screening stage	Potential for a LSE
Are the appropriate statutory environmental bodies in agreement with this conclusion(delete as appropriate and attach relevant correspondence).	Yes

Appendix F. Severn Estuary SPA Screening Matrix

Severn Estuary SPA Screening Matrix		
Project	M5 Junction 10 Improvements Scheme	
European Site under Consideration	Severn Estuary SPA	
Date:	Author (Name/Organisation):	Verified (Name/Organisation)
August 2021	Associate Ecologist Atkins	Associate Director Atkins
Description of Project Describe any likely direct, indirect or secondary impacts of the project (either alone or in-combination with other plans or projects) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	The M5 Junction 10 Improvements Scheme involves construction of improvement works to M5 Junction 10, consisting of a new all-movements motorway junction; a new West Cheltenham Link Road (the Link Road from the A4019 to the B4634 (Old Gloucester Road)), and the widening of the A4019 (Tewkesbury Road) east of the junction to the Gallagher Retail Park Junction. A small section of the A4019 will be realigned to the west of the junction.	
Land-take	The Scheme would not require land-take from the SPA.	
Distance from the European Site or key features of the site (from edge of the project assessment corridor)	The Scheme is 21 km north east of the SPA, or approx. 40 km via the shortest hydrological connection.	
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	The Scheme does not require resources from the SPA.	
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	Although there is a hydrological link between the Scheme and SPA, at a distance of over 40 km downstream, it is considered that the potential for direct impacts via release of pollutants from the Scheme would be eliminated by dilution. Although there is a direct hydrological connection between the Scheme and the Severn Estuary SPA, at such a distance, it is considered that the potential for direct impacts via release of pollutants from the Scheme would be eliminated by dilution. DMRB guidance LA 113 states that “for assessment of impacts associated with soluble pollutants, outfalls within 1 km (measured along the watercourse) shall be aggregated for the purposes of cumulative	

Severn Estuary SPA Screening Matrix	
	assessment[101]". It therefore follows that soluble pollutants are considered to be sufficiently diluted beyond 1 km. Although not relied upon for the screening conclusions, pollution prevention methods will be in place including standard water protection measures to avoid chemical or sediment pollution of any watercourses. Works will proceed following standard good practice working methods for environmental protection which will adhere to the Guidance for Pollution Prevention (GPPs)[102] and the Construction Industry Research and Information Association[103] (CIRIA) C715 Environmental good practice. These will be secured via the Register of Environmental Actions and Commitments (REAC) (Application document TR010063 – APP 7.4). The drainage strategy to be implemented by the Scheme incorporates SuDS to mitigate the pollution risk associated with road runoff as well as accidental spills. However, given the relatively small size of the proposed works in comparison with the distance, size and mixing of the receptor designations, risks of significant spillage of chemical contaminant or silt pollution could be discounted even without any additional pollution controls. The results of the wintering and migratory bird surveys and desk study (detailed in Technical Appendix 7.9 Wintering Bird Survey (Application document TR010063/APP/6.15) indicate that qualifying bird species do not regularly use or are dependent on the habitat in the vicinity of the Scheme and therefore potential for impacts to functionally linked habitat as a result of emissions has therefore been discounted. The SPA is located beyond the distance from any construction activity at which dust from demolition or construction would be a potential impact, and more than 200 m from the ARN. Therefore, no air quality impacts are anticipated.
Excavation requirements (e.g. impacts of local hydrogeology)	At a distance of 21 km, excavation works associated with the Scheme will not impact the local hydrogeology of the SPA.
Transportation requirements	Construction traffic will not be routed in the vicinity of the SPA.
Duration of construction, operation, etc	The Scheme would be constructed between 2024 and 2027.
Other	Not applicable (N/A)
Description of avoidance and/or mitigation measures Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:	
Nature of proposals	No mitigation is proposed for the SPA.
Location	N/A

[101] Highways England (2020). Design Manual for Roads and Bridges LA 113 Road drainage and the water environment (formerly HD 45/09). (March 2020, version 1) Online: d6388f5f-2694-4986-ac46-b17b62c21727 (standardsforhighways.co.uk).
[102] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[103] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.

Severn Estuary SPA Screening Matrix	
Evidence for effectiveness	N/A
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	N/A
Characteristics of European Site(s) A brief description of the European Site to be produced, including information on:	
Name of European Site and its EU code	Severn Estuary SPA (UK9015022)
Location and distance of the European Site from the proposed works	The SPA is located 21 km south west of the Scheme, or 40km downstream via the shortest hydrological connection.
European Site size	24,700.91 ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive over winter: • Bewick's swan – 280 individuals representing 3.9% of the GB population (5 year peak mean 1991/2 - 1995/6). The site also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species over winter: • Gadwall (*Anas strepera*) – 282 individuals representing 0.9% of the population (5 year peak mean 1991/2 - 1995/6). • European white-fronted goose (*Anser albifrons albifrons*) – 2,664 individuals representing 0.4% of the population (5 year peak mean 1991/2 - 1995/6). • Dunlin (*Calidris alpina alpina*) – 44,624 individuals representing at least 3.3% of the population (5 year peak mean 1991/2 - 1995/6). • Shelduck (*Tadorna tadorna*) – 3,330 individuals representing 1.1% of the population (5 year peak mean 1991/2 - 1995/6). • Redshank (*Tringa totanus*) – 2,330 individuals representing 1.3% of the population (5 year peak mean 1991/2 - 1995/6). • Ringed plover (*Charadrius hiaticula*) on passage[104]. The site also qualifies under Article 4.2 of the Directive (79/409/EEC) for supporting an internationally important assemblage of birds. Over winter the site regularly supports 84,317 waterfowl (5 year peak mean 1991/2 - 1995/6). The most recent Natura 2000 Standard Data Form for the Severn Estuary SPA does not include a list of species which make up the waterfowl assemblage. However, the 2001 SPA

[104] Although not included on the most recent update of the Natura 2000 Standard Data Form for the Severn Estuary SPA, ringed plover is included here because the 2009 advice issued under Regulation 33(2)(a) of the Conservation of Natural Habitats and Species Regulations 1994 (as amended) lists this species as a qualifying species added during the 2001 SPA Review.

Severn Estuary SPA Screening Matrix	
	Review[105] listed 12 species in addition to the 'SPA qualifying species' listed above, as follows (wigeon, teal, mallard, pintail, shoveler, pochard, tufted duck, grey plover, lapwing, whimbrel, curlew, spotted redshank).
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	Principal threats and pressures comprise: • Outdoor sports and leisure activities. • Other urbanisation, industrial and similar activities. • Modification of cultivation practices. • Changes in abiotic conditions. • Human induced changes in hydraulic conditions.
European Site conservation objectives – where these are readily available	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features. • The structure and function of the habitats of the qualifying features. • The supporting processes on which the habitats of the qualifying features rely. • The population of each of the qualifying features. • The distribution of the qualifying features within the site.
Assessment criteria Describe the individual elements of the project (either alone or in-combination with other plans or projects) likely to give rise to impacts on the European Site.	
The Scheme is located approximately 21 km from the SPA or 40 km via the shortest hydrological connection. Potential impact pathways have been identified via the hydrological connection and via construction impacts on habitats that might be functionally linked to bird populations associated with the SPA. The assessment below discusses these potential impact pathways in more detail.	
Initial assessment The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	The Scheme would not result in a reduction in habitat area from within the SPA. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive (detailed within Technical Appendix 7.9 Wintering Bird Survey (Application document TR010063/APP/6.15)). A recent study[106] was also reviewed, which identifies functionally linked land associated with the Severn Estuary SPA.

[105] Stroud, D.A., Chambers, D., Cook, S., Buxton, N., Fraser, B., Clement, P., Lewis, P., McLean, I., Baker, H. & Whitehead, S. (eds) (2001). The UK SPA Network: Its Scope and Content. JNCC, Peterborough.
[106] Palmer, E. and Smart, M. (2021) Identification of wintering and passage roosts on functionally linked land of the Severn Estuary - Gloucestershire and Worcestershire (Phase 5). Natural England Commissioned Reports. NECR401.

Severn Estuary SPA Screening Matrix	
	The wintering and migratory bird surveys recorded two qualifying species of the Severn Estuary SPA: lapwing (two individuals) and mallard (peak count of nine individuals). Given the low numbers recorded they are unlikely to be a significant component of the SPA populations. The maps that accompany a recent study[106] that was reviewed do not identify that these species regularly move between the SPA and the study area. However, the study also indicates that lapwing have been recorded within the Survey Area (in the vicinity of Boddington Manor Farm, adjacent to the Scheme) in numbers which reached or exceeded the equivalent of the 1% SPA population criterion for importance on at least one occasion. No lapwing were recorded at this location during the wintering and passage bird surveys, and as the study indicates that there are no regular movements between the SPA and this location it is therefore considered that this area is not regularly used by or of significant importance for lapwing. The habitats within the Survey Area are not considered to provide a role in maintaining the SPA populations or be functionally linked to the SPA.
Disturbance to key species	The Scheme is too far from the SPA for there to be any direct disturbance. The Scheme would not result in disturbance of qualifying feature populations within functionally linked habitats either, as there is not considered to be a significant functional linkage between the Scheme and the qualifying feature populations (see above).
Habitat or species fragmentation	The Scheme would not result in fragmentation of the SPA or any significant functionally linked habitats.
Reduction in species density	The Scheme would not result in a reduction in species density of qualifying features.
Changes in key indicators of conservation value (water quality, etc)	The Scheme would not result in any changes in any key indicators of conservation value. As described above, potential for impacts to the SPA and functionally linked habitat as a result of changes in key indicators of conservation value such as water quality or air quality are not anticipated. Recreational pressure resulting in disturbance to functionally linked habitats at Coombe Hill Canal SSSI (Coombe Hill Canal SSSI is of high importance to all of the wintering surface-feeding ducks and lapwing, and is of high importance to mallard and snipe in autumn and to gadwall and mallard in spring) as a result of the Scheme facilitating housing developments in the area has been ruled out. This is on the basis that there are planning policies in place to deal with the potential effects and ensure that cumulative effects do not occur. Such planning policies are relevant to, and will be implemented by, the surrounding housing developments.
Climate change	Climate change is not listed as a threat or pressure in relation to this site.

Severn Estuary SPA Screening Matrix	
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	No likely significant effects on the structure (i.e. the distribution and abundance of habitats) of the SPA are anticipated as a result of the Scheme alone or in-combination with other plans or projects.
Interference with key relationships that define the function of the site	No likely significant effects on the function (i.e. the capacity of the SPA to support the qualifying features) of the SPA are anticipated as a result of the Scheme alone or in-combination with other plans or projects.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	N/A
Disturbance to key species	N/A
Habitat or species fragmentation	N/A
Loss	N/A
Fragmentation	N/A
Disruption	N/A
Disturbance	N/A
Change to key elements of the site (e.g. water quality, hydrological regime etc)	N/A
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
N/A	
Outcome of screening stage	Not likely to be significant effects
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence).	Yes

Appendix G. Severn Estuary Ramsar site Screening Matrix

Severn Estuary Ramsar site Screening Matrix		
Project	M5 Junction 10 Improvements Scheme	
European Site under Consideration	Severn Estuary Ramsar site	
Date:	Author (Name/Organisation):	Verified (Name/Organisation)
November 2019	Associate Ecologist Atkins	Associate Director Atkins
Description of Project Describe any likely direct, indirect or secondary impacts of the project (either alone or in-combination with other plans or projects) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	The M5 Junction 10 Improvements Scheme involves construction of improvement works to M5 Junction 10, consisting of a new all-movements motorway junction; a new West Cheltenham Link Road (the Link Road from the A4019 to the B4634 (Old Gloucester Road)), and the widening of the A4019 (Tewkesbury Road) east of the junction to the Gallagher Retail Park Junction. A small section of the A4019 will be realigned to the west of the junction.	
Land-take	The Scheme would not require land-take from the Ramsar site.	
Distance from the European Site or key features of the site (from edge of the project assessment corridor)	The Scheme is 21 km north east of the Ramsar site, or approx. 40 km via the shortest hydrological connection.	
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	The Scheme does not require resources from the Ramsar site.	
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	Although there is a direct hydrological connection between the Scheme and the Severn Estuary Ramsar site, at such a distance, it is considered that the potential for direct impacts via release of pollutants from the Scheme would be eliminated by dilution. DMRB guidance LA 113 states that "for assessment of impacts associated with soluble pollutants, outfalls within 1 km (measured along the watercourse) shall be aggregated for the purposes of cumulative assessment[107]". It therefore follows that soluble pollutants are considered to be sufficiently diluted beyond 1 km.	

[107] Highways England (2020). Design Manual for Roads and Bridges LA 113 Road drainage and the water environment (formerly HD 45/09). (March 2020, version 1) Online: d6388f5f-2694-4986-ac46-b17b62c21727 (standardsforhighways.co.uk)

Severn Estuary Ramsar site Screening Matrix	
	Although not relied upon for the screening conclusions, pollution prevention methods will be in place including standard water protection measures to avoid chemical or sediment pollution of any watercourses. Works will proceed following standard good practice working methods for environmental protection which should adhere to the Guidance for Pollution Prevention (GPPs)[108] and the Construction Industry Research and Information Association[109] (CIRIA) C715 Environmental good practice. These will be secured via the Register of Environmental Actions and Commitments (REAC) (Application document TR010063 – APP 7.4). The drainage strategy to be implemented by the Scheme incorporates SuDS to mitigate the pollution risk associated with road runoff as well as accidental spills. However, given the relatively small size of the proposed works in comparison with the distance, size and mixing of the receptor designations, risks of significant spillage of chemical contaminant or silt pollution could be discounted even without any additional pollution controls. The results of the wintering and migratory bird surveys and desk study (detailed in Technical Appendix 7.9 Wintering Bird Survey (Application document TR010063/APP/6.15) indicate that qualifying bird species do not regularly use or are dependent on the habitat in the vicinity of the Scheme and therefore potential for impacts to functionally linked habitat used by qualifying bird species as a result of emissions has therefore been discounted. Water quality impacts to functionally linked habitat within the River Chelt as a result of a pollution event during construction and operation, and consequent detrimental effects to migratory European eel, Atlantic salmon, sea trout and river lamprey associated with the Severn Estuary Ramsar site cannot be ruled out, as discussed below. The Ramsar site is located beyond the distance from any construction activity at which dust from demolition or construction would be a potential impact, and more than 200 m from the ARN. Therefore, no air quality impacts are anticipated.
Excavation requirements (e.g. impacts of local hydrogeology)	At a distance of 21 km, excavation works associated with the Scheme will not impact the local hydrogeology of the Ramsar site.
Transportation requirements	Construction traffic will not be routed in the vicinity of the Ramsar site.
Duration of construction, operation, etc	The Scheme would be constructed between 2024 and 2027.
Other	Not applicable (N/A)
Description of avoidance and/or mitigation measures Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:	

[108] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[109] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.

Severn Estuary Ramsar site Screening Matrix	
Nature of proposals	Mitigation has not been considered as part of the screening assessment.
Location	N/A
Evidence for effectiveness	N/A
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	N/A
Characteristics of European Site(s) A brief description of the European Site to be produced, including information on:	
Name of European Site and its EU code	Severn Estuary Ramsar site (UK11081)
Location and distance of the European Site from the proposed works	The Ramsar site is located 21 km south west of the Scheme, or 40 km downstream via the shortest hydrological connection.
European Site size	24,662.98 ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	Ramsar criterion 1: Due to immense tidal range (second-largest in world), this affects both the physical environment and biological communities. Habitats Directive Annex I features present on the SAC include: • H1110 Sandbanks which are slightly covered by sea water all the time. • H1130 Estuaries. • H1140 Mudflats and sandflats not covered by seawater at low tide. • H1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae). Ramsar criterion 3: Due to unusual estuarine communities, reduced diversity and high productivity. Ramsar criterion 4: This site is important for the run of migratory fish between sea and river via estuary. Species include salmon (*Salmo salar*), sea trout (*S. trutta*), sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*), allis shad (*Alosa alosa*), twaite shad (*A. fallax*), and European eel (*Anguilla anguilla*). It is also of particular importance for migratory birds during spring and autumn. Ramsar criterion 8: The fish assemblage of the whole estuarine and river system is one of the most diverse in Britain, with over 110 species recorded. Salmon, sea trout, sea lamprey, river lamprey, allis shad, twaite

Severn Estuary Ramsar site Screening Matrix	
	shad and European eel use the Severn Estuary as a key migration route to their spawning grounds in the many tributaries that flow into the estuary. The site is important as a feeding and nursery ground for many fish species, particularly allis shad and twaite shad, which feed on mysid shrimps in the salt wedge. Ramsar criterion 5: Assemblages of international importance: Species with peak counts in winter: 70,919 waterfowl (5 year peak mean 1998/99-2002/03) Ramsar criterion 6 – species/populations occurring at levels of international importance: Qualifying species/populations (as identified at designation): Species with peak counts in winter: • Tundra swan (*Cygnus columbianus bewickii*), NW Europe - 229 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9-2002/3). • Greater white-fronted goose (*Anser albifrons albifrons*), NW Europe – 2,076 individuals, representing an average of 35.8% of the GB population (5 year peak mean for 1996/7-2000/01). • Common shelduck (*Tadorna tadorna*), NW Europe – 3,223 individuals, representing an average of 1% of the population (5 year peak mean 1998/9-2002/3). • Gadwall (*Anas strepera strepera*), NW Europe - 241 individuals, representing an average of 1.4% of the GB population (5 year peak mean 1998/9-2002/3). • Dunlin (*Calidris alpina alpine*), W Siberia/W Europe – 25,082 individuals, representing an average of 1.8% of the population (5 year peak mean 1998/9-2002/3). • Common redshank (*Tringa totanus tetanus*) - 2,616 individuals, representing an average of 1% of the population (5 year peak mean 1998/9-2002/3). Species/populations identified subsequent to designation for possible future consideration under criterion 6: Species regularly supported during the breeding season: • Lesser black-backed gull (*Larus fuscus graellsii*), W Europe/Mediterranean/W Africa – 4,167 apparently occupied nests, representing an average of 2.8% of the breeding population (Seabird 2000 Census). • Species with peak counts in spring/autumn: • Ringed plover (*Charadrius hiaticula*), Europe/Northwest Africa - 740 individuals, representing an average of 1% of the population (5 year peak mean 1998/9-2002/3). • Species with peak counts in winter: • Eurasian teal (*Anas crecca*), NW Europe – 4,456 individuals, representing an average of 1.1% of the population (5 year peak mean 1998/9-2002/3).

Severn Estuary Ramsar site Screening Matrix	
	• Northern pintail (*Anas acuta*), NW Europe - 756 individuals, representing an average of 1.2% of the population (5 year peak mean 1998/9-2002/3).
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	Factors (past, present or potential) adversely affecting the site's ecological character: • Dredging. • Erosion. • Recreational/tourism disturbance.
European Site conservation objectives – where these are readily available	No specific conservation objectives found. The overarching objective of the Ramsar Convention is to stem the loss and progressive encroachment on wetlands now and in the future.
Assessment criteria Describe the individual elements of the project (either alone or in-combination with other plans or projects) likely to give rise to impacts on the European Site.	
The Scheme is located approx. 21 km from the Ramsar site or 40 km via the shortest hydrological connection. Potential impact pathways have been identified via the hydrological connection and via construction impacts on habitats that might be functionally linked to bird and fish populations associated with the Ramsar site. The assessment below discusses these potential impact pathways in more detail.	
Initial assessment The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	The Scheme would not result in a reduction in habitat area from within the Ramsar site. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive (detailed within Technical Appendix 7.9 Wintering Bird Survey (Application document TR010063/APP/6.15)). Lesser black-backed gull was recorded in reasonably high numbers on one occasion (a peak count of 148 in September 2019). It is considered that these individuals are likely to be from breeding populations within urban areas such as Cheltenham and/or Gloucester, which are closer to the Scheme than the Ramsar site breeding colonies at Steep Holm and Flat Holm[110] (approximately 90 km south west). Cheltenham Borough Council states that "Lesser Black-Backed Gulls nest in the residential areas of Cheltenham and on industrial units in the Kingsditch area"[111]. The JNCC Seabird Monitoring Programme online database states that the Gloucestershire Urban Gulls Cheltenham site (85627) supported 273 lesser black-backed gull apparently occupied territories in 2011 (year of last count) and the Gloucester City: Gloucester site (86737) supported 2230 lesser black-backed gull apparently occupied nests

[110] Burton, N.H.K., Musgrove, A.J., Rehfisch, M.M., and Clark N.A. (2010) Birds of the Severn Estuary and Bristol Channel: Their current status and key environmental issues. Marine Pollution Bulletin 61 (2010) 115–123
[111] Cheltenham Borough Council (2018) Urban Gulls Scrutiny Task Group Report. Available at https://democracy.cheltenham.gov.uk/documents/s27390/2018_12_04_CAB_Urban_Gulls_scrutiny_report.pdf

Severn Estuary Ramsar site Screening Matrix	
	in 2009 (year of last count)[112]. It follows that the lesser black-backed gulls recorded are unlikely to be part of the Ramsar site qualifying feature population. The habitats within the Survey Area are not considered to provide a role in maintaining the Ramsar site bird populations. Survey results and desk study records (detailed in Technical Appendix 7.12 – Aquatic Ecology Survey (Application document TR010063/APP/6.15) indicate that European eel, Atlantic salmon, sea trout and river lamprey are present in the vicinity of the Scheme within the River Chelt. The Scheme may result in a temporary reduction in the extent of functionally linked habitat in the event that dewatering part of the River Chelt channel is required during construction.
Disturbance to key species	The Scheme is too far from the Ramsar site for there to be any disturbance to species within the Ramsar site itself. Survey results and desk study records (detailed in Technical Appendix 7.12 – Aquatic Ecology Survey (Application document TR010063/APP/6.15) indicate that European eel, Atlantic salmon, sea trout and river lamprey[113] are present, or potentially present, in the vicinity of the Scheme within the River Chelt. As such, there is potential for short-term impacts to these species within or surrounding the Scheme as a result of noise or vibration disturbance during construction of the new Link Road, in particular the construction of the new bridge over the River Chelt. The new bridge abutments will be set back from the banks of the River Chelt by 4 m. Rotary piling will be required in the construction of the bridge. In addition, a temporary River Chelt crossing will be required during construction. The Scheme would not result in disturbance of qualifying bird species within functionally linked habitats, as there is not considered to be a significant functional linkage between the Scheme and the qualifying feature populations (see above).
Habitat or species fragmentation	Although the Scheme would not result in a physical barrier to fish migration, the disturbance and pollution impacts described above and below respectively could potentially result in habitat fragmentation/barrier effects.
Reduction in species density	There is the potential for injury/mortality to river lamprey ammocoetes if they are present within burrows in the sediment of the River Chelt in the event that dewatering of part of the channel is required during construction.
Changes in key indicators of conservation value (water quality, etc)	Water quality impacts to functionally linked habitat within the River Chelt as a result of a pollution event during construction and operation, and consequent detrimental effects to migratory European eel, Atlantic salmon, sea trout and river lamprey associated with the Severn Estuary Ramsar site cannot be ruled out.

[112] Available at https://app.bto.org/seabirds/public/index.jsp

[113] Two brook/river lamprey ammocoetes (young/larvae) were recorded. It is difficult to distinguish between brook and river lamprey when in the ammocoete stage. As a precaution, they are assumed to be river lamprey.

Severn Estuary Ramsar site Screening Matrix	
	Such impacts could arise through changes to water quality as a result of mobilization of suspended sediments leading to silt laden runoff entering watercourses; and potential for accidental contamination associated with the spillage or leakage of fuels, lubricants and other chemicals required for construction. In particular, such impacts could occur during the construction of the new bridge over the River Chelt and the temporary River Chelt crossing. Operational phase hydrological impacts could arise as a result of contaminated road runoff entering the River Chelt. Recreational pressure resulting in disturbance to functionally linked habitats at Coombe Hill Canal SSSI (Coombe Hill Canal SSSI is of high importance to all of the wintering surface-feeding ducks and lapwing, and is of high importance to mallard and snipe in autumn and to gadwall and mallard in spring) as a result of the Scheme facilitating housing developments in the area has been ruled out. This is on the basis that there are planning policies in place to deal with the potential effects and ensure that cumulative effects do not occur. Such planning policies are relevant to, and will be implemented by, the surrounding housing developments.
Climate change	Climate change is not listed as a threat or pressure in relation to this site.
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	The evidence indicates that water quality impacts to functionally linked habitat within the River Chelt as a result of a pollution event during construction and operation, and consequent detrimental effects to migratory European eel, Atlantic salmon, sea trout and river lamprey associated with the Severn Estuary Ramsar site cannot be ruled out.
Interference with key relationships that define the function of the site	Disturbance impacts to migratory European eel, Atlantic salmon, sea trout and river lamprey associated with the Severn Estuary Ramsar site using functionally linked habitat within the River Chelt during construction cannot be ruled out. Injury or mortality to river lamprey ammocoetes if they are present within burrows in the sediment of the River Chelt in the event that dewatering of part of the channel is required during construction cannot be ruled out. Fragmentation as a result of disturbance and pollution, which could result in barrier effects, with European eel, Atlantic salmon, sea trout and river lamprey unable to disperse or move along the River Chelt, cannot be ruled out.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	Potential LSE in relation to functionally linked habitat
Disturbance to key species	Potential LSE
Habitat or species fragmentation	Potential LSE
Loss	N/A
Fragmentation	N/A

Severn Estuary Ramsar site Screening Matrix	
Disruption	N/A
Disturbance	N/A
Change to key elements of the site (e.g. water quality, hydrological regime etc)	Potential LSE
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
Construction of the new bridge over the River Chelt, construction of the temporary River Chelt crossing, dewatering part of the River Chelt channel (if required), operational phase water quality impacts.	
Outcome of screening stage	Potential for a LSE
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence).	Yes

Appendix H. Cotswold Beechwoods SAC Screening Matrix

Cotswold Beechwoods SAC Screening Matrix		
Project	M5 Junction 10 Improvements Scheme	
European Site under Consideration	Cotswold Beechwoods SAC	
Date:	Author (Name/Organisation):	Verified (Name/Organisation)
June 2022	Associate Ecologist Atkins	Associate Director Atkins
Description of Project Describe any likely direct, indirect or secondary impacts of the project (either alone or in-combination with other plans or projects) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	The M5 Junction 10 Improvements Scheme involves construction of improvement works to M5 Junction 10, consisting of a new all-movements motorway junction; a new West Cheltenham Link Road (the Link Road from the A4019 to the B4634 (Old Gloucester Road)), and the widening of the A4019 (Tewkesbury Road) east of the junction to the Gallagher Retail Park Junction. A small section of the A4019 will be realigned to the west of the junction.	
Land-take	The Scheme would not require land-take from the SAC.	
Distance from the European Site or key features of the site (from edge of the project assessment corridor)	The Scheme is 7.4 km north of the SAC site.	
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	The Scheme does not require resources from the SAC site.	
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	There is no hydrological link between the Scheme and SAC, and therefore no impact pathway by which any water-borne pollution generated by the Scheme could give rise to adverse effects on the European Site. The SAC is located beyond the distance from any construction activity at which dust from demolition or construction would be a potential impact, and more than 200 m from the ARN. Therefore, no air quality impacts are anticipated.	
Excavation requirements (e.g. impacts of local hydrogeology)	At a distance of 7.4 km, excavation works associated with the Scheme will not impact the local hydrogeology of the SAC site.	
Transportation requirements	Construction traffic will not be routed in the vicinity of the SAC.	

Cotswold Beechwoods SAC Screening Matrix	
Duration of construction, operation, etc	The Scheme would be constructed between 2024 and 2027.
Other	Not applicable (N/A)
Description of avoidance and/or mitigation measures Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:	
Nature of proposals	No mitigation is proposed for the SAC.
Location	N/A
Evidence for effectiveness	N/A
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	N/A
Characteristics of European Site(s) A brief description of the European Site to be produced, including information on:	
Name of European Site and its EU code	Cotswold Beechwoods SAC (UK0013658)
Location and distance of the European Site from the proposed works	7.4 km south of the Scheme
European Site size	585.85 ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	9130 *Asperulo-Fagetum* beech forests (Beech forests on neutral to rich soils). 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (Dry grasslands and scrublands on chalk or limestone).
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	Principal threats and pressures comprise: Problematic native species. Outdoor sports and leisure activities, recreational activities. Interspecific faunal relations. Invasive non-native species.
European Site conservation objectives – where these are readily available	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring: The extent and distribution of qualifying natural habitats. The structure and function (including typical species) of qualifying natural habitats. The supporting processes on which qualifying natural habitats rely.
Assessment criteria Describe the individual elements of the project (either alone or in-combination with other plans or projects) likely to give rise to impacts on the European Site.	

Cotswold Beechwoods SAC Screening Matrix	
The Scheme is located approximately 7.4 km from the SAC. The only potential impact pathway that has been identified is the potential for in-combination recreational impacts as a result of the Scheme facilitating housing developments within 15.4 km of the SAC, a zone of influence around the SAC within which housing growth may result in an increase in recreational use of the SAC[114]. The assessment below discusses this potential impact pathway in more detail.	
Initial assessment The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	The Scheme would not result in a reduction in habitat area from within the SAC.
Disturbance to key species	All of the qualifying features of the SAC are Annexe 1 habitats, therefore disturbance impacts can be discounted.
Habitat or species fragmentation	The Scheme would not result in fragmentation of the SAC.
Reduction in species density	The Scheme would not result in a reduction in species density of qualifying features.
Changes in key indicators of conservation value (water quality, etc)	Recreational pressure can cause erosion of ground flora, nutrification and soil compaction, a particular issue around ancient trees. The evidence presented in this report indicates that potential in-combination effects of the combined housing developments within the area, some of which the Scheme will facilitate, are known, and planning policies are in place to deal with the potential effects, to ensure that cumulative effects do not occur. Such planning policies are relevant to, and will be implemented by, the surrounding housing developments.
Climate change	Climate change is not listed as a threat or pressure in relation to this site.
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	No likely significant effects on the structure (i.e. the distribution and abundance of habitats) of the SAC are anticipated as a result of the Scheme alone or in-combination with other plans or projects.
Interference with key relationships that define the function of the site	No likely significant effects on the function (i.e. the capacity of the SAC to support the qualifying features) of the SAC are anticipated as a result of the Scheme alone or in-combination with other plans or projects.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	N/A
Disturbance to key species	N/A
Habitat or species fragmentation	N/A

[114] Liley, D., & Panter, C. (2022). Cotswold Beechwoods SAC Recreation Mitigation Strategy. Unpublished report by Footprint Ecology.

Cotswold Beechwoods SAC Screening Matrix	
Loss	N/A
Fragmentation	N/A
Disruption	N/A
Disturbance	N/A
Change to key elements of the site (e.g. water quality, hydrological regime etc)	N/A
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
N/A	
Outcome of screening stage	Not likely to be significant effects
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence).	Yes

Appendix I. Wye Valley and Forest of Dean Bat Sites SAC Finding of No Significant Effects Report Matrix (Screening)

Wye Valley and Forest of Dean Bat Sites SAC Finding of No Significant Effects Report Matrix (Screening)		
Project Name	M5 Junction 10 Improvements Scheme	
Natura 2000 Site under Consideration	Wye Valley and Forest of Dean Bat Sites SAC	
Date:	Author (Name/Organisation):	Verified (Name/Organisation):
August 2021	Associate Ecologist Atkins	Associate Director Atkins
Name and location of European Site	Wye Valley and Forest of Dean Bat Sites SAC The nearest part of the SAC (Blaisdon Hall SSSI) is located approx. 21 km south west of the Scheme.	
Description of the project	The M5 Junction 10 Improvements Scheme involves construction of improvement works to M5 Junction 10, consisting of a new all-movements motorway junction; a new West Cheltenham Link Road (the Link Road from the A4019 to the B4634 (Old Gloucester Road)), and the widening of the A4019 (Tewkesbury Road) east of the junction to the Gallagher Retail Park Junction. A small section of the A4019 will be realigned to the west of the junction.	
Is the project directly connected with or necessary to the management of the site (provide details)?	No	
Are there other projects or plans that together with the project being assessed could affect the site (provide details)?	No	
Assessment of Significance of Effects		
Describe how the project (alone or in-combination) is likely to affect the European Site	The only potential impact pathway that has been identified is the potential for construction works to impact upon habitats that might be functionally linked to the SAC.	
Explain why these effects are not considered significant	The Scheme would not result in a reduction in habitat area from within the SAC. The Scheme would not affect functionally linked habitats either, as the distance is considered to be too great for there to be a	

Wye Valley and Forest of Dean Bat Sites SAC Finding of No Significant Effects Report Matrix (Screening)			
	significant functional linkage between the Scheme and the qualifying feature bat populations. This is because the distance is at least seven times larger than the core sustenance zones[115] identified by the Bat Conservation Trust (BCT)[116] for lesser horseshoe bats (2 km) and greater horseshoe bats (3 km). In terms of bat behaviour in this site specifically, flight lines and feeding grounds within the wider ecological network are critical in supporting the SAC. Lesser horseshoe bats tend to forage within two to three kilometres of their roost, with density of bats associated with the SAC declining sharply after this[117]. In the winter, the foraging range is thought to be around half this. A conservation objective of the SAC is to maintain a wide area of supporting habitat for bats, with the Site Improvement Plan suggesting the creation of a feeding area of a radius of approximately 4 km around maternity roosts[118]. A radiotracking study of greater horseshoe bats in Dean Hall, a constituent SSSI of the SAC, found that bats forage up to 9 km from the roost using a number of night roosts during the feeding period[118]. At a distance of 21 km at the nearest point, the Scheme is well beyond these foraging distances. Therefore, the Scheme will not impact any habitat for bats associated with the SAC. In addition, the site is beyond the ARN, and as a result will not be impacted by air quality pollution impacts.		
List of agencies consulted: provide contact name and telephone or e-mail address	Natural England		
Response to consultation	In agreement		
Data Collected to Carry out the Assessment			
Who carried out the assessment?	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed
Associate Ecologist Atkins	Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.	Screening in accordance with LA 115	M5 Junction 10 Improvements Scheme Habitats Regulations Assessment Screening, Appendix 7.13 (Application document

[115] The area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost.
[116] Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.
[117] Countryside Council for Wales (2008). Core Management Plan Including Conservation Objectives for Wye Valley and Forest of Dean Bat SAC
[118] Improvement Programme for England's Natura 2000 Sites (2015). Site Improvement Plan: Wye Valley and the Forest of Dean Bat Sites

Wye Valley and Forest of Dean Bat Sites SAC Finding of No Significant Effects Report Matrix (Screening)			
			TR010063 – APP 6.15)

Appendix J. Walmore Common SPA Finding of No Significant Effects Report Matrix (Screening)

Walmore Common SPA Finding of No Significant Effects Report Matrix (Screening)		
Project Name	M5 Junction 10 Improvements Scheme	
Natura 2000 Site under Consideration	Walmore Common SPA	
Date:	Author (Name/Organisation):	Verified (Name/Organisation):
August 2021	Associate Ecologist Atkins	Associate Director Atkins
Name and location of European Site	Walmore Common SPA – 17.5 km south west of the Scheme	
Description of the project	The M5 Junction 10 Improvements Scheme involves construction of improvement works to M5 Junction 10, consisting of a new all-movements motorway junction; a new West Cheltenham Link Road (the Link Road from the A4019 to the B4634 (Old Gloucester Road)), and the widening of the A4019 (Tewkesbury Road) east of the junction to the Gallagher Retail Park Junction. A small section of the A4019 will be realigned to the west of the junction.	
Is the project directly connected with or necessary to the management of the site (provide details)?	No	
Are there other projects or plans that together with the project being assessed could affect the site (provide details)?	No	
Assessment of Significance of Effects		
Describe how the project (alone or in-combination) is likely to affect the European Site	The only potential impact pathway that has been identified is the potential for construction works to impact upon habitats that might be functionally linked to the SPA.	
Explain why these effects are not considered significant	The Scheme would not result in a reduction in habitat area from within the SPA. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive. No Bewick's swans (Walmore Common SPA qualifying feature) were observed within the survey area during this time.	

Walmore Common SPA Finding of No Significant Effects Report Matrix (Screening)			
	Gloucestershire Centre for Environmental Records (GCER) was contacted to obtain recent records[119] of protected and notable species within 1 km of the Scheme. No records of Bewick's swan were provided. In addition, a review of existing literature was conducted, which indicated that the agricultural grassland habitats surrounding the Scheme are not key areas for populations of Bewick's swan[120]. The results of the wintering and migratory bird surveys and desk study indicate that Bewick's swan does not regularly use and is not dependent on the habitat in the vicinity of the Scheme.		
List of agencies consulted: provide contact name and telephone or e-mail address	Natural England		
Response to consultation	In agreement		
Data Collected to Carry out the Assessment			
Who carried out the assessment?	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed
Associate Ecologist Atkins	Robinson *et al*. (2004)[120] Aerial imagery of the Severn Vale[121] Bird survey data (Atkins, September 2019 to March 2020)	Screening in accordance with LA 115	M5 Junction 10 Improvements Scheme Habitats Regulations Assessment Screening, Appendix 7.13 (Application document TR010063 – APP 6.15)

[119] Records of observations within the last 10 years.
[120] Robinson, JA, K Colhoun, JG McElwaine & EC Rees (2004). Bewick's Swan *Cygnus columbianus bewickii* (Northwest Europe population) in Britain and Ireland 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.
[121] Online: https://magic.defra.gov.uk/ [Accessed 04/11/19].

Appendix K.Walmore Common Ramsar site Finding of No Significant Effects Report Matrix (Screening)

Walmore Common Ramsar site Finding of No Significant Effects Report Matrix (Screening)		
Project Name	M5 Junction 10 Improvements Scheme	
Natura 2000 Site under Consideration	Walmore Common Ramsar site	
Date:	Author (Name/Organisation):	Verified (Name/Organisation):
August 2021	Associate Ecologist Atkins	Associate Director Atkins
Name and location of European Site	Walmore Common Ramsar site – 17.5 km south west of the Scheme	
Description of the project	The M5 Junction 10 Improvements Scheme involves construction of improvement works to M5 Junction 10, consisting of a new all-movements motorway junction; a new West Cheltenham Link Road (the Link Road from the A4019 to the B4634 (Old Gloucester Road)), and the widening of the A4019 (Tewkesbury Road) east of the junction to the Gallagher Retail Park Junction. A small section of the A4019 will be realigned to the west of the junction.	
Is the project directly connected with or necessary to the management of the site (provide details)?	No	
Are there other projects or plans that together with the project being assessed could affect the site (provide details)?	No	
Assessment of Significance of Effects		
Describe how the project (alone or in-combination) is likely to affect the European Site	The only potential impact pathway that has been identified is the potential for construction works to impact upon habitats that might be functionally linked to the Ramsar site.	
Explain why these effects are not considered significant	The Scheme would not result in a reduction in habitat area from within the Ramsar site. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive. No Bewick's swans (Walmore Common Ramsar site qualifying feature) were observed within the survey area during this time.	

Walmore Common Ramsar site Finding of No Significant Effects Report Matrix (Screening)			
	Gloucestershire Centre for Environmental Records (GCER) was contacted to obtain recent records[122] of protected and notable species within 1 km of the Scheme. No records of Bewick's swan were provided. In addition, a review of existing literature was conducted, which indicated that the agricultural grassland habitats surrounding the Scheme are not key areas for populations of Bewick's swan[123]. The results of the wintering and migratory bird surveys and desk study indicate that Bewick's swan does not regularly use and is not dependent on the habitat in the vicinity of the Scheme.		
List of agencies consulted: provide contact name and telephone or e-mail address	Natural England		
Response to consultation	In agreement		
Data Collected to Carry out the Assessment			
Who carried out the assessment?	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed
Associate Ecologist Atkins	Robinson *et al*. (2004)[123] Aerial imagery of the Severn Vale[124] Bird survey data (Atkins, September 2019 to March 2020)	Screening in accordance with LA 115	M5 Junction 10 Improvements Scheme Habitats Regulations Assessment Screening, Appendix 7.13 (Application document TR010063 – APP 6.15)

[122] Records of observations within the last 10 years.
[123] Robinson, JA, K Colhoun, JG McElwaine & EC Rees (2004). Bewick's Swan *Cygnus columbianus bewickii* (Northwest Europe population) in Britain and Ireland 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.
[124] Online: https://magic.defra.gov.uk/ [Accessed 04/11/19].

Appendix L. Severn Estuary SPA Finding of No Significant Effects Report Matrix (Screening)

Severn Estuary SPA Finding of No Significant Effects Report Matrix (Screening)		
Project Name	M5 Junction 10 Improvements Scheme	
Natura 2000 Site under Consideration	Severn Estuary SPA	
Date:	Author (Name/Organisation):	Verified (Name/Organisation):
August 2021	Associate Ecologist Atkins	Associate Director Atkins
Name and location of European Site	Severn Estuary SPA – 21 km south west of the Scheme (40 km via the shortest hydrological connection)	
Description of the project	The M5 Junction 10 Improvements Scheme involves construction of improvement works to M5 Junction 10, consisting of a new all-movements motorway junction; a new West Cheltenham Link Road (the Link Road from the A4019 to the B4634 (Old Gloucester Road)), and the widening of the A4019 (Tewkesbury Road) east of the junction to the Gallagher Retail Park Junction. A small section of the A4019 will be realigned to the west of the junction.	
Is the project directly connected with or necessary to the management of the site (provide details)?	No	
Are there other projects or plans that together with the project being assessed could affect the site (provide details)?	No	
Assessment of Significance of Effects		
Describe how the project (alone or in-combination) is likely to affect the European Site	Potential impact pathways have been identified via the hydrological connection, which could provide a route for pollutants to travel downstream to the SPA from the Scheme, and via construction impacts on habitats that might be functionally linked to bird populations associated with the SPA. In addition, potential for recreational disturbance to functionally linked habitats at Coombe Hill Canal SSSI as a result of the Scheme facilitating housing developments in this area, has been identified.	
Explain why these effects are not considered significant	If any pollutants were to be discharged from the Scheme into the adjacent hydrological network, these would be diluted to a negligible level by the time they reached the SPA, over 40 km downstream.	

Severn Estuary SPA Finding of No Significant Effects Report Matrix (Screening)	
	Although there is a direct hydrological connection between the Scheme and the Severn Estuary SAC, at such a distance, it is considered that the potential for direct impacts via release of pollutants from the Scheme would be eliminated by dilution. DMRB guidance LA 113 states that "for assessment of impacts associated with soluble pollutants, outfalls within 1 km (measured along the watercourse) shall be aggregated for the purposes of cumulative assessment[125]". It therefore follows that soluble pollutants are considered to be sufficiently diluted beyond 1 km. Although not relied upon for the screening conclusions, pollution prevention methods will be in place including standard water protection measures to avoid chemical or sediment pollution of any watercourses. Works will proceed following standard good practice working methods for environmental protection which should adhere to the Guidance for Pollution Prevention (GPPs)[126] and the Construction Industry Research and Information Association[127] (CIRIA) C715 Environmental good practice. These will be secured via the Register of Environmental Actions and Commitments (REAC) (Application document TR010063 – APP 7.4). The drainage strategy to be implemented by the Scheme incorporates SuDS to mitigate the pollution risk associated with road runoff as well as accidental spills. However, given the relatively small size of the proposed works in comparison with the distance, size and mixing of the receptor designations, risks of significant spillage of chemical contaminant or silt pollution could be discounted even without any additional pollution controls. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive. A recent study[128] was also reviewed, which identifies functionally linked land associated with the Severn Estuary SPA. The wintering and migratory bird surveys recorded two qualifying species of the Severn Estuary SPA: lapwing (two individuals) and mallard (peak count of nine individuals). Given the low numbers recorded they are unlikely to be a significant component of the SPA populations. Furthermore, at this distance from the SPA (located over 20 km south west of the Scheme at the nearest point), it is considered highly unlikely that the individuals recorded within the study area are part of the SPA qualifying feature populations. The maps that accompany a recent study[128] that was reviewed do not identify that these species regularly move between the SPA and the study area. However, the study also indicates that lapwing have been recorded within the Survey Area (in the vicinity of Boddington Manor Farm, adjacent to the Scheme) in

[125] Highways England (2020). Design Manual for Roads and Bridges LA 113 Road drainage and the water environment (formerly HD 45/09). (March 2020, version 1) Online: d6388f5f-2694-4986-ac46-b17b62c21727 (standardsforhighways.co.uk)
[126] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[127] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.
[128] Palmer, E. and Smart, M. (2021) Identification of wintering and passage roosts on functionally linked land of the Severn Estuary - Gloucestershire and Worcestershire (Phase 5). Natural England Commissioned Reports. NECR401.

Severn Estuary SPA Finding of No Significant Effects Report Matrix (Screening)			
	numbers which reached or exceeded the equivalent of the 1% SPA population criterion for importance on at least one occasion. No lapwing were recorded at this location during the wintering and passage bird surveys, and as the study indicates that there are no regular movements between the SPA and this location it is therefore considered that this area is not regularly used by or of significant importance for lapwing. The habitats within the Survey Area are not considered to provide a role in maintaining the SPA populations or be functionally linked to the SPA. Recreational disturbance to functionally linked habitats at Coombe Hill Canal SSSI (Coombe Hill Canal SSSI is of high importance to all of the wintering surface-feeding ducks and lapwing, and is of high importance to mallard and snipe in autumn and to gadwall and mallard in spring) as a result of the Scheme facilitating housing developments in the area has been ruled out. This is on the basis that there are planning policies in place to deal with the potential effects and ensure that cumulative effects do not occur. Such planning policies are relevant to, and will be implemented by, the surrounding housing developments.		
List of agencies consulted: provide contact name and telephone or e-mail address	Natural England		
Response to consultation	In agreement		
Data Collected to Carry out the Assessment			
Who carried out the assessment?	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed
Associate Ecologist Atkins	Aerial imagery of the Severn Vale[129] Bird survey data (Atkins 2019 – 2020) Link Ecology Ltd (September 2020) Identification of land with proven or possible functional linkages with the Severn Estuary SSSI/SPA Phase 5 (Gloucestershire and Worcestershire) A report to Natural England.	Screening in accordance with LA 115	M5 Junction 10 Improvements Scheme Habitats Regulations Assessment Screening, Appendix 7.13 (Application document TR010063 – APP 6.15)

Appendix M. Cotswold Beechwoods SAC Finding of No Significant Effects Report Matrix (Screening)

Cotswold Beechwoods SAC Finding of No Significant Effects Report Matrix (Screening)		
Project Name	M5 Junction 10 Improvements Scheme	
Natura 2000 Site under Consideration	Cotswold Beechwoods SAC	
Date:	Author (Name/Organisation):	Verified (Name/Organisation):
June 2022	Associate Ecologist Atkins	Associate Director Atkins
Name and location of European Site	Cotswold Beechwoods SAC – 7.4 km south of the Scheme	
Description of the project	The M5 Junction 10 Improvements Scheme involves construction of improvement works to M5 Junction 10, consisting of a new all-movements motorway junction; a new West Cheltenham Link Road (the Link Road from the A4019 to the B4634 (Old Gloucester Road)), and the widening of the A4019 (Tewkesbury Road) east of the junction to the Gallagher Retail Park Junction. A small section of the A4019 will be realigned to the west of the junction.	
Is the project directly connected with or necessary to the management of the site (provide details)?	No	
Are there other projects or plans that together with the project being assessed could affect the site (provide details)?	No	
Assessment of Significance of Effects		
Describe how the project (alone or in-combination) is likely to affect the European Site	The only potential impact pathway that has been identified is the potential for in-combination recreational impacts as a result of the Scheme facilitating housing developments within 15.4 km of the SAC, a zone of influence around the SAC within which housing growth may result in an increase in recreational use of the SAC[130].	
Explain why these effects are not considered significant	The evidence presented in this report indicates that potential in-combination effects of the combined housing developments within the area, some of which the Scheme will facilitate, are known, and planning policies are in place to deal with the potential	

[130] Liley, D., & Panter, C. (2022). Cotswold Beechwoods SAC Recreation Mitigation Strategy. Unpublished report by Footprint Ecology.

Cotswold Beechwoods SAC Finding of No Significant Effects Report Matrix (Screening)			
	effects, to ensure that cumulative effects do not occur. Such planning policies are relevant to, and will be implemented by, the surrounding housing developments.		
List of agencies consulted: provide contact name and telephone or e-mail address	Natural England		
Response to consultation	In agreement		
Data Collected to Carry out the Assessment			
Who carried out the assessment?	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed
Associate Ecologist Atkins	The Joint Core Strategy (JCS)[131] The HRA of the JCS[132] The HRA[133] of the Tewkesbury Borough Plan 2011 – 2031 The Tewkesbury Borough Plan 2011 – 2031 (TBP)[134] The Cotswold Beechwoods SAC Recreation Mitigation Strategy[135]	Screening in accordance with LA 115	M5 Junction 10 Improvements Scheme Habitats Regulations Assessment Screening, Appendix 7.13 (Application document TR010063 – APP 6.15)

[131] Gloucester City, Cheltenham Borough and Tewkesbury Borough (Adopted December 2017) Joint Core Strategy 2011 – 2031.

[132] Efusion (May 2014) Pre-Submission Draft Joint Core Strategy Habitats Regulations Report.

[133] Efusion (July 2019) Tewkesbury Borough Plan 2011 – 2013: Pre-Submission Regulation 19 Consultation. Habitats Regulations Assessment (HRA) Screening & Appropriate Assessment (AA)

[134] Tewkesbury Borough Council (October 2019) Pre-Submission Tewkesbury Borough Plan 2011 - 2031

[135] Liley, D., & Panter, C. (2022). Cotswold Beechwoods SAC Recreation Mitigation Strategy. Unpublished report by Footprint Ecology.

Appendix N. Consultation with Natural England

Natural England comment (16/04/2021)		Atkins response (14/07/2021)
Survey work – Natural England has reviewed the surveys to date and can offer the following comments	The bat surveys are acceptable; it is noted that they are current and up to date. The surveys are a mix of static and transect surveys, covering the whole season. This is agreed with. For clarification, the consultation document, paragraph 2.4.12 regarding thermal cameras is acceptable.	Noted.
	Figure 9, Buildings within the bat roost study area and figure 10, Bat activity survey locations, show further areas of study. Static detector locations and crossing points, in relation to options 2, 2a and 2b have been highlighted. This is accepted. Bat roost potential in relation to options 2, 2a and 2b have been highlighted. This is also accepted. It should be noted that if bats are found on site, an EPS licence will also be needed from Natural England prior to any works taking place.	Noted and agreed.
	Regarding the GCN surveys, they have been restricted to eDNA, with a commitment to undertake population size class assessments in the future, or alternatively engage with Gloucestershire's district level licensing system. This is agreed with. Regarding further GCN surveys, it does not appear that any information is provided here.	Noted. Discussions are ongoing with Naturespace regarding district level licensing. The Applicant will be collecting further data (HSI and eDNA where possible) on ditches and any waterbodies where access has not previously been granted, if this can now be arranged, in 2021. This information will be passed to Naturespace so that they can assess the suitability of the Scheme for district level licensing.
	When the application is submitted in 2022 some of the surveys will be three years old. The Applicant proposes to address this through a further phase 1 habitat survey. This is agreed with.	Noted. An extended Phase 1 validation survey is proposed in 2021. This will focus on targeted areas, namely within the Scheme boundary, where the greatest impact is anticipated. In addition, validation surveys for bats are proposed. These will comprise validation

Natural England comment (16/04/2021)		Atkins response (14/07/2021)
		surveys of seven transects (Transect numbers 2, 4, 5, 7, 8, 9, 19). Three surveys of each transect are proposed during 2021. Further information is included in the Bat Survey Protocol, which is shared with Natural England along with this response.
	It is not considered that likely significant effects (LSE) can be ruled out based on migratory functionally linked species of the Severn Estuary SPA/SAC/Ramsar site. The report concludes that based on the River Chelt, LSE can be ruled out. The premise for this conclusion is based on the lack of Environment Agency survey data for these waterbodies. However, a check shows that for example eel data is available. It should be noted that eels are currently classed as critically endangered. It is recommended therefore, that data is formally requested from the Environment Agency, and used to inform the HRA.	Noted. Previous desk study looked at Environment Agency data <5 years old within 2km of the site. No recent (<5 years old) Environment Agency data are available from within 2 km of the site. However, a wider study area and longer data period has now been reviewed. This indicates that qualifying species (eel and trout) are present on site. This confirms, as per Natural England's comment, that eels have been recorded in the vicinity of the site. In addition, the Applicant has now undertaken fish surveys for the project. Surveys conducted on behalf of Atkins on the River Chelt in 2020 identified the presence of European eel at two locations (SO 90140 24760 - SO 90053 24787 and SO 90645 24606 – SO 90518 24634) on 28 and 29 July 2020. Bullhead, stone loach and minnow were also present. In terms of potential impacts to fish species, the Scheme would not introduce a barrier and is not expected to reduce connectivity for fish movement in operation. Construction practices will adhere to best practice guidelines and methods such as soft start procedures. The assessment will consider potential for temporary harm, disturbance and barriers to fish movement during construction as well as operational impacts. It may be necessary to time works outside of the key ecologically sensitive periods for fish. Ecologically sensitive design of structures such as culverts will be incorporated to the Scheme, to maintain connectivity, continuity of flow and natural substrate establishment. On the basis that there are potential impact pathways, which if not mitigated could impact on qualifying species of a European site,

Natural England comment (16/04/2021)		Atkins response (14/07/2021)
		the Applicant accepts that it is probable that an appropriate assessment will be required.
	Regarding surveys of the other species, it appears to be in line with the relevant guidelines, and no issues appear to have arisen.	Noted.
Habitat Regulations Assessment Stage 1 Screening document	Natural England is currently not satisfied, on the basis of the objective information which has so far been provided, that it can be excluded that the proposed plan or project will have a significant effect on both the Severn Estuary SPA and Walmore Common SPA either individually or in-combination with other plans or projects. Furthermore, Natural England is not yet satisfied that the proposed operations are not likely to damage any of the interest features of the Severn Estuary SSSI. Natural England therefore requests that additional information is provided in order to address these current uncertainties.	See responses to further, more specific comments, below.
Wye Valley and Forest of Dean Bat Site SAC	The HRA Screening document screens out any impacts on the Wye Valley and Forest of Dean Bat Site SAC on distance. The submitted maps highlight the screening distance that has been used. It is stated that the nearest component site is over 21km away and outside of any core sustenance zone for horseshoe bats. Therefore, the distance between the SAC and the proposal site is too great for any significant functional linkage. It is accepted that impacts from the Scheme such as disturbance from lighting and habitat loss and fragmentation would not occur due to distance. The conclusion could be strengthened by considering any commuting/foraging routes in relation to the above information and making clear whether there are any ecological pathways.	Noted. A review of known foraging/commuting routes for qualifying bat species of the SAC will be undertaken, as well as a more in-depth consideration of any ecological pathways between the Scheme and the SAC.

Natural England comment (16/04/2021)		Atkins response (14/07/2021)
Severn Estuary	The report omits the following SAC/Ramsar Site designated species: • Atlantic salmon • Sea trout • Allis shad • European eel We would recommend that the report is revised to consider the ecology of these species. Consultation with the Environment Agency, if not already, may provide up to date local knowledge of which species are to be found in the River Chelt and other nearby watercourses.	Noted. Consultation is ongoing with the Environment Agency. As detailed above review of Environment Agency ecology data has been undertaken. Six Environment Agency sites were identified on the River Chelt that have been surveyed within the last 10 years (detailed above). All six sites identified varying life stages of European eel, from glass eels, elvers and adult eels. Fish surveys have also been undertaken to inform the baseline for the Scheme at two locations on the River Chelt (SO 90140 24760 - SO 90053 24787 and SO 90645 24606 – SO 90518 24634). Both surveys recorded European eel. On the basis that there are potential impact pathways, which if not mitigated could impact on qualifying species of a European site, the Applicant accepts that it is probable that an appropriate assessment will be required.
	3.3.11 Severn Estuary SPA/SAC/Ramsar Site We note that effects on the SAC habitats have been screened out on the basis of distance and corresponding dilution (e.g. pollution). We propose that the narrative should be strengthened by referring to relevant industry standards for construction site practices (fuel/oil storage, surface water run-off from works compounds etc), together with works along the length of the new route(s) and scope for these to be secured via e.g. CEMP or equivalent. The objective should be to prevent pollution rather than to rely on distance and dilution to protect downstream habitats (including the SAC/Ramsar Site)	Noted. The Applicant confirms that construction practices will adhere to industry best practice methodologies. Further information on this will be incorporated into the updated HRA Screening report.
	3.3.12 There is no reference to eels	Noted. The SAC/Ramsar site species that appear to have been omitted will be incorporated into the updated HRA Screening report.

Natural England comment (16/04/2021)		Atkins response (14/07/2021)
	3.3.14 – 15 Please refer to our comments above about SAC/Ramsar Site species omitted from the current version of the report. You should review your conclusions when you have considered these species. With particular regard to European eel, this species' ecology is such that careful consideration should be given to their potential presence in local watercourses/water bodies near the proposed Scheme.	Noted. The SAC/Ramsar site species that appear to have been omitted will be incorporated into the updated HRA Screening report.
	3.3.17 – Functional linkage for Severn Estuary SPA wild birds We note that these species have been screened out on the grounds of distance between the project site and the SPA. In order to strengthen the HRA report narrative, we recommend that you reference the following unpublished report, recently commissioned by Natural England: "Identification of land with proven or possible functional linkages with the Severn Estuary SSSI/SPA – Phase 5 (Gloucestershire and Worcestershire)" (Link Ecology). From our understanding of the report we would conclude that significant effects on functionally linked land may be screened out though the report shows that such land lies much closer to the project area than the SPA itself.	Thank you for sending the Link Ecology report to us. When we come to update the HRA we will strengthen this argument and draw on the aforementioned report as evidence.
	Appendix F: Ramsar site migratory species mentioned however no detail on eels, salmon etc specifically. Looks like copy from SAC section.	Noted. Information on these species will be incorporated into the updated HRA Screening report.
	Lack of detail on pollution prevention mechanisms or whether the channel will be heavily modified in any way as part of the works in HRA. Pollution prevention mention appears to be phrased in a way that may suggest its being used to screen out LSE.	Noted. Further detail will be incorporated into the updated HRA Screening report.

Natural England comment (16/04/2021)		Atkins response (14/07/2021)
	Would like to see SPA species survey detail in HRA and specifically impacted lapwing numbers in relation to estimated number in the Severn Estuary and conservation status. Possible need for bird disturbance strategy depending on work timings and impacted land?	Noted. Further detail will be incorporated into the updated HRA Screening report.
Walmore Common SPA	3.3.9 The document also screens out impacts on Walmore Common SPA for a number of reasons. It is stated that the site is 12.5 km away and there are other suitable habitats closer to the SPA. This is not necessarily agreed with, as it is stated that further surveys will be undertaken. Confirmation is therefore required as to when the wintering and migratory bird species survey be available. The report narrative should then be updated to include reference to this survey work and any issues arising.	Noted. Further detail, including additional survey data, will be incorporated into the updated HRA Screening report.
SSSI Impact Risk Zones	3.3.18 We would caution against using the SSSI Impact Risk Zones as evidence to support screening out significant effects. Our advice above regarding the functional linkage research is provided in order to ensure your reasoning is based on the most up to date available scientific information and takes account of the recent Holohan judgement (Ref C461/17) case law. This reinforces the need for an appropriate assessment, to include an examination of the implications of the proposed project for habitat types and species to be found outside the boundaries of the site provided those implications are likely to affect the conservation objectives of the site.	Noted. Alternative evidence to screen out significant effects will be drawn upon, as appropriate. The probable need for an Appropriate Assessment has already been noted above.
In-combination	3.4 Screening in-combination	Noted. This will be considered when we update the HRA Screening report.

Natural England comment (16/04/2021)		Atkins response (14/07/2021)
	We note that no other relevant plans or projects are referenced. We would encourage you to consider relevant projects (e.g. those permitted but not yet implemented NB there may be other criteria) where ecological pathways may exist (using the source-pathway-receptor approach). For example, the strategic allocations associated with Cheltenham (Gloucester, Cheltenham and Tewkesbury Joint Core Strategy adopted proposals maps document refers) should be considered. Cheltenham planning application reference 16/02000/OUT (4000 homes and 24ha of employment use land) may require consideration accordingly.	
Air quality	It is considered from the submitted documents that there has been an oversight in terms of air quality. The affected road network needs to be identified and confirmed whether any protected sites are within 200m. As part of the process, through the HRA consideration of designated sites is sought and the impacts from air quality examined. This will include for example, consideration of nitrogen deposition on any woodland SSSI's. We would draw the Council's attention to the two pieces of case law; the Wealden Judgement and Dutch Nitrogen Case.	Noted. Traffic data has now been received and the assessment is underway. The Air Quality assessment will follow DMRB LA105. As per LA105, *internationally, nationally and locally designated sites of ecological conservation importance on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity (known as designated habitats) within 200m of the ARN shall be included in the air quality assessment. NOTE Designated habitats include 'Ramsar' sites, special protection areas, special areas of conservation, sites of special scientific interest, local nature reserves, local wildlife sites, nature improvement areas, ancient woodland and veteran trees.*
Air pollution	We would expect the project to address the impacts of air quality on the natural environment. In particular, it should address any traffic impacts associated with new development, particularly where this impacts on European sites and SSSIs. The HRA should also consider any detrimental impacts on the natural environment and suggest	See response above.

Natural England comment (16/04/2021)		Atkins response (14/07/2021)
	appropriate avoidance or mitigation measures where applicable. Natural England advises that one of the main issues which should be considered within the HRA are proposals which are likely to generate additional nitrogen emissions as a result of increased traffic generation, which can be damaging to the natural environment. The effects on local roads in the vicinity of any proposed development on nearby designated nature conservation sites (including increased traffic, construction of new roads, and upgrading of existing roads) and the impacts on vulnerable site from air quality effects on the wider road networks in the area (a greater distance away from the development) can be assessed using traffic projections and the 200m distance criterion followed by local Air Quality modelling where required. We consider that the designated sites at risk from local impacts are those within 200m of a road with increased traffic which feature habitats that are vulnerable to nitrogen deposition/acidification. APIS provides a searchable database and information on pollutants and their impacts on habitats and species.	
Nationally Designated Landscapes	As the development site is adjacent to the Cotswold AONB, consideration should be given to the direct and indirect effects upon this designated landscape and in particular the effect upon its purpose for designation, as well as the content of the relevant management plan for the Cotswold AONB.	Potential impacts to the Cotswold AONB will be considered as part of the landscape and ecology assessments.

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