

A27

Arundel Bypass

Preliminary Environmental Information Report

Volume 2a

11 January 2022 – 8 March 2022



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About this report

Thank you for taking part in our statutory public consultation on the proposed A27 Arundel Bypass Scheme. This consultation is an important step towards delivering the Scheme, which will bring many benefits to local communities and the region's economy, whilst making journeys quicker and safer, and freeing Arundel town and neighbouring communities from congestion.

To inform this consultation, we have prepared a suite of information which you can find on National Highway's website (www.nationalhighways.co.uk/our-work/south-east/a27-arundel-bypass), and which includes this Preliminary Environmental Information Report (PEI Report). This report is set out in four volumes and describes the environmental setting of the Scheme and our preliminary assessments of the Scheme's potential significant environmental effects as described below:

Volume 1 - PEI Report Non-Technical Summary (NTS), a short summary which uses non-technical language.

Volume 2 - PEI Report, a detailed technical report (in two parts), which introduces the Scheme and describes its details, the alternatives considered, and the approach taken for the environmental assessment. The PEI Report presents and then summarises the preliminary assessment of the likely significant environmental effects of the Scheme as well as considers the potential inter-relationships between the topics covered, and between the Scheme and other developments in the surrounding area.

Volume 3 – PEI Report Figures, which provide further information in the form of figures to support the initial findings presented in Volume 2.

Volume 4 – PEI Report Technical Appendices, which provide further information in the form of technical information (in three parts) to support the initial findings presented in Volume 2.

Each volume's Contents Page lists all the topics discussed. Due to their size, Volume 2 is presented in two parts (2a and 2b) and Volume 4 is presented in three parts (4a, 4b and 4c). It should be noted that those topics that are not included in the individual sub-volumes are greyed out.

This report should be read alongside the other supporting consultation materials such as the consultation brochure, which will explain where you can find more details regarding the Scheme and how to provide your comments.

This consultation is an important opportunity for you to share your comments on the Scheme ahead of submission of our Development Consent Order application, which is expected to happen later in 2022. We'd like to hear what you think, so please share any ideas, local knowledge or concerns that you may have. Your feedback to this consultation is important and will continue to help shape the design of the Scheme.

Table of contents

Those items below that are highlighted in **Grey** do not form part of this volume.

Chapter	Pages
1. Introduction	1-1
1.1 Overview	1-1
1.2 Purpose of the report.....	1-1
1.3 Legislative and policy framework	1-2
1.4 Stakeholder Engagement.....	1-5
1.5 Structure of the Preliminary Environmental Information (PEI).....	1-6
1.6 Next steps	1-7
2. The Scheme	2-1
2.1 Need for the Scheme	2-1
2.2 Scheme objectives	2-2
2.3 Scheme location	2-2
2.4 Description of the Scheme	2-5
2.5 Design and embedded mitigation.....	2-14
2.6 Design options.....	2-17
2.7 Construction	2-20
2.8 Operation and maintenance	2-26
2.9 Decommissioning	2-26
3. Assessment of Alternatives	3-1
3.1 Introduction.....	3-1
3.2 History of the Scheme	3-1
3.3 The current project lifecycle	3-3
3.4 Selection of the preferred route.....	3-6
3.5 Design development.....	3-7
4. Environmental Assessment Methodology	4-1
4.1 General approach.....	4-1
4.2 Study area and the draft Order Limits	4-4
4.3 Existing baseline and future conditions	4-5
4.4 Potential significant effects and mitigation	4-6
4.5 Major events.....	4-13

4.6	Transboundary Assessment.....	4-13
5.	Air Quality.....	5-1
5.1	Introduction.....	5-1
5.2	Stakeholder engagement	5-3
5.3	Assessment assumptions and limitations.....	5-3
5.4	Study area	5-5
5.5	Baseline conditions	5-6
5.6	Potential impacts	5-22
5.7	Design, mitigation and enhancement measures	5-22
5.8	Assessment of effects	5-23
5.9	Scheme options.....	5-30
6.	Cultural Heritage	6-1
6.1	Introduction.....	6-1
6.2	Stakeholder engagement	6-4
6.3	Assessment assumptions and limitations.....	6-5
6.4	Study area	6-5
6.5	Baseline conditions	6-6
6.6	Potential impacts	6-14
6.7	Design, mitigation and enhancement measures	6-15
6.8	Assessment of likely significant effects	6-17
6.9	Scheme options.....	6-21
7.	Landscape and Visual	7-1
7.1	Introduction.....	7-1
7.2	Stakeholder engagement	7-4
7.3	Assessment assumptions and limitations.....	7-4
7.4	Study area	7-5
7.5	Baseline conditions	7-8
7.6	Design, mitigation and enhancement measures	7-16
7.7	Assessment of likely significant effects	7-20
7.8	Scheme options.....	7-26
8.	Biodiversity	8-1
8.1	Introduction.....	8-1
8.2	Stakeholder engagement	8-3
8.3	Assessment assumptions and limitations.....	8-3
8.4	Study area	8-5

8.5	Biodiversity receptors	8-11
8.6	Design, mitigation and enhancement measures	8-57
8.7	Summary of significant effects	8-60
8.8	Scheme options.....	8-63
9.	Geology and Soils	9-1
9.1	Introduction.....	9-1
9.2	Stakeholder engagement	9-2
9.3	Assessment assumptions and limitations.....	9-2
9.4	Study area	9-3
9.5	Baseline conditions	9-3
9.6	Potential impacts	9-17
9.7	Design, mitigation and enhancement measures	9-21
9.8	Assessment of effects	9-24
9.9	Scheme options.....	9-25
10.	Material Assets and Waste	10-1
10.1	Introduction.....	10-1
10.2	Stakeholder engagement	10-3
10.3	Assessment assumptions and limitations.....	10-3
10.4	Study area	10-4
10.5	Baseline conditions	10-4
10.6	Potential impacts	10-11
10.7	Design, mitigation and enhancement measures	10-13
10.8	Assessment of effects	10-14
10.9	Scheme options.....	10-16
11.	Noise and Vibration.....	11-18
11.1	Introduction.....	11-18
11.2	Stakeholder engagement	11-19
11.3	Assessment assumptions and limitations.....	11-19
11.4	Study area	11-21
11.5	Baseline conditions	11-22
11.6	Potential impacts	11-25
11.7	Design, mitigation and enhancement measures	11-26
11.8	Assessment of effects	11-27
11.9	Scheme options.....	11-31
12.	Population and Human Health	12-1

12.1	Introduction.....	12-1
12.2	Stakeholder engagement	12-2
12.3	Assessment assumptions and limitations.....	12-2
12.4	Study area	12-4
12.5	Baseline conditions	12-4
12.6	Potential impacts	12-17
12.7	Design, mitigation and enhancement measures	12-20
12.8	Assessment of effects	12-22
12.9	Scheme options.....	12-31
13.	Road Drainage and the Water Environment	13-1
13.1	Introduction.....	13-1
13.2	Stakeholder engagement	13-2
13.3	Assessment assumptions and limitations.....	13-3
13.4	Study area	13-4
13.5	Baseline conditions	13-5
13.6	Potential impacts	13-26
13.7	Design, mitigation and enhancement measures	13-30
13.8	Assessment of effects	13-33
13.9	Scheme options.....	13-35
14.	Climate	14-1
14.1	Introduction.....	14-1
14.2	Stakeholder engagement	14-2
14.3	GHG impact assessment	14-3
14.4	Vulnerability to climate change.....	14-15
14.5	Scheme options.....	14-26
15.	Cumulative, In-combination and Project-wide Effects	15-28
15.1	Introduction.....	15-28
15.2	Cumulative effects	15-29
15.3	In-combination effects	15-41
15.4	Summary of effects	15-43
16.	Summary of effects	16-1
17.	Glossary	17-1
18.	Key Abbreviations	18-1

1. Introduction

1.1 Overview

- 1.1.1 This document relates to National Highways' (formally Highways England) proposed A27 Arundel bypass (hereafter referred to as the 'Scheme'). The A27 is the only east-west trunk road south of the M25. It links many of the towns and cities along the south coast, including Portsmouth, Havant, Chichester, Arundel, Worthing, Adur, Brighton and Hove, Lewes and Eastbourne.
- 1.1.2 The A27 also provides access to the wider Strategic Road Network (SRN) and is therefore an important corridor for both longer distance travel and local traffic. Two-thirds (67%) of the traffic that currently uses the A27 between Crossbush roundabout and Causeway roundabout in Arundel is through-traffic, while the remaining third (33%) is local (Ref 1-1), which reinforces the strategic nature of the A27.
- 1.1.3 A series of alternative options for the route of the Scheme has previously been explored, as explained in *Chapter 3: Assessment of Alternatives* of this Preliminary Environmental Information (PEI) Report. On 15 October 2020, an announcement was made confirming that the 'Grey route' (Option 5BV1) was the preferred route (Ref 1-2). Since the preferred route announcement, the design of the Scheme has developed as described within *Chapter 2: The Scheme* of this PEI Report. The Scheme comprises a new dual two-lane carriageway extending approximately 8 km, located to the south of the existing A27. In the west, the Scheme would tie in approximately 1 km east of the A27/A29 Fontwell East roundabout to the west of Arundel. In the east, the proposed bypass would tie in to the existing Crossbush Junction which would be reconfigured. The Scheme aims to improve safety, reduce congestion by increasing capacity and protect the quality of the surrounding environment.
- 1.1.4 National Highways is the 'Promoter' for the Scheme and the Strategic Highways Company, as defined in the *Infrastructure Act 2015* (Ref 1-3), charged with modernising and maintaining the SRN, as well as managing the network and keeping traffic moving.

1.2 Purpose of the report

- 1.2.1 This document is a PEI Report, which presents a description of the Scheme, and reports the potential likely significant environmental effects caused by the Scheme based on the preliminary environmental information currently available. This PEI Report aims to support consultees in developing an informed view of the potential likely

Ref 1-1 Highways England, A27 Arundel Bypass Further consultation strategic model (2015 base)

Ref 1-2 Highways England, A27 Arundel Bypass Preferred route announcement (Accessed: July 2021)

Ref 1-3 Infrastructure Act (2015) Strategic Highways Companies

significant environmental effects of the Scheme, and the mitigation measures currently proposed.

- 1.2.2 National Highways is continuing to gather environmental information, identifying the potential impacts of the Scheme, and further developing measures to avoid or reduce adverse effects - a process known as Environmental Impact Assessment (EIA). The results of the EIA will be presented in an Environmental Statement (ES) which will be submitted with the Development Consent Order (DCO) application.
- 1.2.3 This PEI Report forms part of the consultation material provided for the statutory consultation process under the Planning Act 2008 (as amended) (PA 2008) on which National Highways is seeking the views of consultees. Further details are provided within *Section 1.6: Next Steps*.

1.3 Legislative and policy framework

Planning Act 2008

- 1.3.1 The Scheme is defined as a Nationally Significant Infrastructure Project (NSIP) under Section 14(1)(h) and Section 22 of the PA 2008 by virtue of the fact that:
- It comprises the construction of a highway
 - The highway to be constructed is wholly in England.
 - The Secretary of State is the highway authority for the highway.
 - The speed limit for any class of vehicle on the highway is to be 50 miles per hour or greater, and the area for the construction of the highway is greater than 12.5 hectares (ha).
- 1.3.2 In accordance with the PA 2008, a DCO is required to allow the construction, operation and maintenance of the Scheme.
- 1.3.3 The Planning Inspectorate (the Inspectorate) has published a series of advice notes to inform applicants, consultees, the public and others about a range of matters in relation to applications under the PA 2008. Of particular reference to this PEI Report is *Advice Note Seven: Environmental Impact Assessment: Preliminary Environmental Information, Screening and Scoping* (Ref 1-4).

The EIA Regulations

- 1.3.4 The Scheme is considered to be 'EIA development' and specifically a Schedule 2 Regulation 3(1) Part 10 (f) (construction of roads) development and will therefore be subject to an EIA which will be reported within an ES, pursuant to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations).

- 1.3.5 In accordance with Regulation 8(1)(b) of the EIA Regulations, National Highways has notified the Secretary of State for Transport (Secretary of State) in a letter to the Inspectorate dated 14 September 2020 that an ES presenting the findings of the EIA will be submitted with the DCO application.
- 1.3.6 An *EIA Scoping Report* (Ref 1-5) was submitted to the Secretary of State on 25 February 2021. This is included as Appendix 1-A to this PEI Report.
- 1.3.7 The purpose of the *EIA Scoping Report* was to:
- Provide a summary of the Scheme and alternatives considered to date.
 - Set out the proposed scope of work and methods to be applied in carrying out the EIA.
 - Set out the proposed structure and coverage of the ES to be submitted with the DCO application.
 - Support a formal request for a scoping opinion from the Secretary of State under Regulation 10 of the EIA Regulations.
- 1.3.8 On behalf of the Secretary of State, the Inspectorate reviewed and consulted on the *EIA Scoping Report* (Ref 1-5) and published an *EIA Scoping Opinion* (Ref 1-6) on 14 April 2021. This is included as Appendix 1-B to this PEI Report.
- 1.3.9 National Highways acknowledges the comments of the Inspectorate on behalf of the Secretary of State given within the *EIA Scoping Opinion* (Ref 1-6) and also notes the comments provided by the statutory consultees to the Inspectorate in Appendix 2 of the Scoping Opinion. Both the *EIA Scoping Opinion* and the comments from the consultees have been considered in undertaking the ongoing EIA and in preparing this PEI Report. Responses to the *EIA Scoping Opinion* are included as Appendix 1-C to this PEI Report.
- 1.3.10 Furthermore, National Highways recognises the submissions made by members of the public in response to the *EIA Scoping Report* (Ref 1-5). These responses will continue to be addressed as part of the EIA.

The decision maker and planning policy

- 1.3.11 The Localism Act 2011 provided the Secretary of State with the authority and responsibility for processing DCO applications for NSIPs, with the power to appoint the Inspectorate. In its role, the Inspectorate will examine the DCO application for the Scheme and then will make a recommendation to the Secretary of State who will then decide whether to grant a DCO.

- 1.3.12 In accordance with section 104(2) of the PA 2008, the Secretary of State is required to have regard to the relevant National Policy Statement (NPS), amongst other matters, when deciding whether or not to grant a DCO. The relevant NPS for the Scheme is the *National Policy Statement for National Networks* (NPSNN) (Ref 1-7).
- 1.3.13 The Secretary of State will also consider other important and relevant national and local planning policy. The *National Planning Policy Framework* (NPPF) (Ref 1-8), first published in 2012 and amended in July 2021, is relevant national planning policy. The NPPF is supported by the *Planning Practice Guidance* (PPG) (Ref 1-9), which explains the requirements of the Government's policies on different aspects of planning.
- 1.3.14 The local planning policy relevant to the Scheme consists of the following adopted plans:
- a. West Sussex County Council (WSCC) – *The West Sussex Plan 2017 – 2022* (Ref 1-10)
 - b. WSCC – *West Sussex Transport Plan 2011 – 2026* (Ref 1-11)
 - c. Arun District Council (ADC) – *Arun Local Plan 2011 – 2031* (Ref 1-12)
 - d. South Downs National Park Authority (SDNPA) – *South Downs Local Plan 2014 – 2033* (Ref 1-13)
 - e. Adur and Worthing Council (AWC) – *Adur Local Plan 2017* (Ref 1-14)
 - f. Chichester District Council (CDC) – *Chichester Local Plan: Key Policies 2014 – 2029* (Ref 1-15)
 - g. Horsham District Council (HDC) – *Draft Horsham District Local Plan 2019 – 2036* (Ref 1-16)
 - h. Adur and Worthing Council – *Worthing Borough Council Draft Local Plan 2016 – 2033* (Ref 1-17)
 - i. WSCC – *West Sussex Waste Local Plan 2014 – 2031* (Ref 1-18)
 - j. WSCC & SDNPA – *West Sussex Joint Minerals Local Plan 2018 – 2033* (Ref 1-19)

Ref 1-7 HMSO (2014) National Policy Statement for National Networks

Ref 1-8 HMSO (2021) National Planning Policy Framework

Ref 1-9 HMSO (2021) National Planning Practice Guidance

Ref 1-10 West Sussex County Council, *The West Sussex Plan* (2017)

Ref 1-11 West Sussex County Council (2011). *West Sussex Transport Plan*

Ref 1-12 Arun District Council (2018). *Arun Local Plan*

Ref 1-13 South Downs National Park Authority (2019). *South Downs Local Plan*

Ref 1-14 Adur District Council (2017). *Adur Local Plan 2017*

Ref 1-15 Chichester District Council (2015). *Chichester Local Plan: Key Policies 2014-2029*

Ref 1-16 Horsham District Council (2020). *Draft Horsham District Local Plan 2019-2036*

Ref 1-17 Worthing Borough Council (2018). *Worthing Borough Council Draft Local Plan 2016 – 2033*. October 2018

Ref 1-18 West Sussex County Council (2014). *West Sussex Waste Local Plan*

Ref 1-19 West Sussex County Council (2018). *Joint Minerals Local Plan*

- 1.3.15 The *EIA Scoping Report* (Ref 1-5) submitted to the Inspectorate described the national and local planning policies relevant to the assessment with a summary provided for each environmental topic. These policies will be restated in the ES. The purpose of considering relevant planning policy during the EIA is twofold:
- a. To identify policy that could influence the sensitivity of receptors (and therefore the significance of environmental effects) and any requirements for mitigation.
 - b. To identify planning policy that could influence the methodology of the EIA. For example, a planning policy may require the assessment of a particular impact or the use of a particular methodology.

1.4 Stakeholder Engagement

- 1.4.1 Stakeholder engagement for the Scheme is based on the following principles:
- a. Early and ongoing engagement to inform and influence the Scheme development process.
 - b. Seeking an appropriate level of feedback at each stage in the iterative design process and ensuring that comments received are taken into consideration.
 - c. Building of long-term relationships with key stakeholders throughout the different stages of the Scheme design development to help better understand their views.
 - d. Where possible and practicable, ensuring concerns are addressed.
 - e. Ensuring appropriate statutory consultation is undertaken in accordance with requirements of the PA 2008 and associated guidance.
- 1.4.2 Effective stakeholder engagement and consultation have formed a fundamental part of the development of the Scheme design from the initial identification and appraisal of route options, through to the selection of a single preferred route.
- 1.4.3 National Highways has engaged a wide range of stakeholders as part of the ongoing design development and initial assessment of the Scheme, the objectives being to inform design evolution, and identify and record preliminary views and feedback (and where practicable ensure concerns are addressed). This engagement is fundamental to the ongoing development of the EIA.
- 1.4.4 Stakeholders engaged to date include landowners, statutory consultees, local communities, and specialist interest groups. Engagement has involved meetings and workshops to discuss the Scheme design and technical matters, such as the design of environmental mitigation, as well as liaison with organisations and elected members to understand local issues and concerns.

- 1.4.5 Forums have been established to engage a range of statutory environmental bodies and other key stakeholders, including both local and national groups, the aim being to bring together organisations with shared and related interests in the Scheme. These have included, for example, an Elected Representatives Forum, a statutory environmental body Focus Group, and Sub-Groups covering environment, engineering and traffic.
- 1.4.6 Organisations invited to participate in the environmental Focus and Sub-Groups include the Environment Agency, Historic England, Natural England, the SDNPA and the Forestry Commission. Through the Sub-Groups, these organisations have provided views and feedback on the Scheme design, potential effects and mitigation.
- 1.4.7 Engagement has also taken place with other key stakeholders, including local landowners, parish councils, local community institutions and facilities and utility companies.

1.5 Structure of the Preliminary Environmental Information (PEI)

- 1.5.1 The PEI provided for statutory consultation is described below. Due to their size, some volumes have been split for the purposes of publication.
- 1.5.2 Volume 1 – PEI Report Non-Technical Summary (NTS), which summarises the information presented in the PEI Report in non-technical language.
- 1.5.3 Volumes 2a and 2b – PEI Report, which includes:
- a. Volume 2a: Chapters 1 to 4 introduce the Scheme, describe the details of the Scheme, the alternatives considered, and the approach taken for the environmental assessment.
 - b. Volume 2b: Chapters 5 to 18 present a preliminary assessment of the likely significant environmental effects of the Scheme in relation to specific environmental topics and supporting information:
 - i. Chapter 5: Air Quality
 - ii. Chapter 6: Cultural Heritage
 - iii. Chapter 7: Landscape and Visual
 - iv. Chapter 8: Biodiversity – follows a different structure to the other environmental topic chapters in that it presents the baseline information and identification of potential effects on a receptor by receptor basis to aid reader comprehension in relation to specific aspects of biodiversity
 - v. Chapter 9: Geology and Soils
 - vi. Chapter 10: Materials and Waste
 - vii. Chapter 11: Noise and Vibration
 - viii. Chapter 12: Population and Human Health

- ix. Chapter 13: Road Drainage and the Water Environment
 - x. Chapter 14: Climate - follows a different structure to the other environmental topic chapters in that it presents the assessment separately for greenhouse gas and climate change resilience.
 - xi. Chapter 15 considers the potential inter-relationships between the topics covered in Chapters 5 to 14, and between the Scheme and other developments in the surrounding area, which together have the potential to generate cumulative and in-combination effects.
 - xii. Chapter 16 presents a summary of the preliminary assessment of potential likely significant environmental effects.
 - xiii. Chapter 17 and 18 presents a Glossary and schedule of Key Abbreviations to aid reader comprehension.
- 1.5.4 Volume 3 – PEI Report Figures, which provides further information in the form of figures to support the initial findings presented in the PEI Report chapters outlined above.
- 1.5.5 Volumes 4a, 4b and 4c – PEI Report Technical Appendices, which provide further information in the form of technical information to support the initial findings presented in the PEI Report chapters outlined above. These include:
- a. Volume 4a:
 - i. Appendix 1-A EIA Scoping Report
 - b. Volume 4b:
 - i. Appendix 1-B EIA Scoping Opinion
 - c. Volume 4c:
 - i. Appendix 1-C EIA Scoping Opinion Response
 - ii. Appendix 7-A Landscape and Visual Baseline
 - iii. Appendix 8-A-1 Advice Note 10 HRA Screening Matrices
 - iv. Appendix 9-A Land Contamination Methodology
 - v. Appendix 13-A WFD Scoping Report.

1.6 Next steps

- 1.6.1 As noted at *Section 1.2*, this PEI Report has been prepared to support consultees in developing an informed view of the potential likely significant environmental effects of the Scheme.
- 1.6.2 An eight week consultation on the Scheme runs from Tuesday 11 January 2022 to Tuesday 8 March 2022 to enable people to review the proposals and provide feedback. National Highways invites comments on the Scheme and the environmental issues addressed in the PEI Report and the Non-technical Summary (NTS) which summarises the information presented in the PEI Report in non-technical language.

- 1.6.3 Further details on the consultation and copies of the full PEI Report, the consultation brochure and feedback form, and further information on the Scheme, can be downloaded at:
<https://www.nationalhighways.co.uk/a27arundel>
- 1.6.4 To support the consultation, a series of live and virtual events are being held where people will be able to view information on the Scheme and speak to members of the project team who will also provide responses to the consultation.
- 1.6.5 Copies of the consultation documents are also available for viewing at a number of locations. Full details of the consultation events and locations where copies of the consultation documents can be viewed are available in the Statement of Community Consultation (SoCC), which is available on the project website (via the link above). This consultation will be carried out in accordance with the arrangements set out in the SoCC.
- 1.6.6 Responses to the consultation can be made by completing the response form online or by email or letter using any of the following addresses:
- Online: <https://www.nationalhighways.co.uk/a27arundel>
 - Email: A27ArundelBypass@highwaysengland.co.uk
 - Post: completed feedback forms can be sent by Freepost (you do not need a stamp) to the following address: **Freepost A27 ARUNDEL**
- 1.6.7 Following the consultation, National Highways will review all the responses received and will have regard to comments made when considering the need for further assessment or modification to the Scheme design or mitigation measures.
- 1.6.8 The comments received will also be used to produce a Consultation Report in accordance with section 37 of the Planning Act 2008, which will be submitted to the Secretary of State with the DCO application. The Consultation Report will summarise the views and comments received and outline how regard has been given to those comments in the Scheme design and the EIA.
- 1.6.9 Following submission of the DCO application, the Inspectorate will consider, on behalf of the Secretary of State, whether the application should be accepted for examination. If the application is accepted, consultees including the general public will then be able to make relevant representations about the Scheme and its potential impacts. The documents accompanying the DCO application will be publicly available on the Inspectorate's website, and consultees will be able to submit comments to the Inspectorate (known as relevant representations). These relevant representations, along with evidence provided by the Promoter and various statutory consultees via hearings and written submissions, will then be considered as part of the examination into the DCO application. Following completion of the examination, the Inspectorate will make a recommendation to the Secretary of State, who will then decide whether to grant a DCO.

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- 1.6.10 If the DCO is granted, construction is planned to start in 2024 such that the Scheme would open to traffic in 2027.

2. The Scheme

2.1 Need for the Scheme

- 2.1.1 East and west of Arundel, the A27 is a dual carriageway with capacity to carry existing traffic flows and more able to cope with future traffic growth. The single carriageway section of the A27 through Arundel creates a bottleneck, leading to congestion which, in turn affects commuters, businesses, communities and visitors.
- 2.1.2 The *A27 Corridor Feasibility Study* (Ref 2-1) found that, at Arundel, the A27 is already operating at 100%-150% vehicle capacity. The Scheme is required to improve safety, reduce journey time and minimise uncertainty issues for travellers within the local area of Arundel that arise from current peak hour congestion, which is forecast to increase. In addition, the Scheme would help address these same issues for travellers using the wider A27 corridor past Arundel.
- 2.1.3 Congestion on the A27 at Arundel causes traffic to use other routes, which has a knock-on effect on traffic flows through neighbouring towns and villages. This affects the quality of life for residents and causes significant disruption locally, including across the South Downs National Park (SDNP).
- 2.1.4 Relatively poor transport connectivity in the area has also contributed to pockets of deprivation by restricting access to employment opportunities. The Scheme would address the pinch-point constraint that affects the ability of the wider A27 corridor to function to its potential as a strategic route. It would address safety, journey time and journey time uncertainty for travellers within the vicinity of Arundel that arises from current peak hour congestion, which is forecast to increase.
- 2.1.5 The Scheme would also help remove the severance issues experienced specifically at Arundel in the area of Ford Road roundabout, but also more generally as a result of the constraints for motorised and non-motorised travellers when travelling north-south across the A27 corridor at Arundel.
- 2.1.6 The Scheme would support planned growth within Arun District and other local authority areas served by the wider A27 corridor. In the absence of the Scheme, this planned growth and the associated benefits, may not be fully realised. Failure to deliver the necessary transport infrastructure could result in a constrained housing supply, higher housing costs and reduced accessibility to employment
- 2.1.7 The *Road Investment Strategy (RIS) 2015* (Ref 2-2) outlines the Government's planned investment in England's Strategic Road Network from 2015 to 2020. The Scheme is identified as one of three schemes

Ref 2-1 Parsons Brinckerhoff on behalf of Highways Agency, A27 Corridor Feasibility Study (February 2015)

Ref 2-2 Department for Transport (March 2015) Road Investment Strategy: for the 2015/16 – 2019/20 Road Period.

along the A27 that aim to address congestion, delays to roads users, community separation, air pollution and the number of accidents.

- 2.1.8 Although first identified in the *RIS 2015*, the Scheme continues to be a committed scheme under the *Road Investment Strategy 2: 2020-2025* (Ref 2-3).
- 2.1.9 In its *Economic Connectivity Review* (Ref 2-4) for the south east, Transport for the South East (TFSE) identifies the A27/M27 corridor as crucial to the region's success in coming decades, in order to improve business connectivity, labour market efficiency, enable development, provide access to international gateways and support deprived communities.
- 2.1.10 It is considered that the Scheme, through increased connectivity, adding capacity and easing travel, would support regeneration initiatives in the local area at Littlehampton, and in urban areas served by the A27 further afield in Shoreham and Newhaven, Bognor Regis, Brighton and Hove and in the west at Portsmouth and Chichester.

2.2 Scheme objectives

- 2.2.1 The high-level objectives for the Scheme have been formulated both to address identified problems and to take advantage of the opportunities that new infrastructure would provide, and are as follows:
- Improve the safety of travellers along the A27 and, consequently, the wider local road network.
 - Ensure that customers and communities are fully considered throughout the design and delivery stages.
 - Improve capacity of the A27 whilst supporting local planning authorities to manage the impact of planned economic growth.
 - Reduce congestion, reduce travel time and improve journey time reliability along the A27.
 - Improve accessibility for all users to local services and facilities.
 - Deliver a Scheme that minimises environmental impact and seeks to protect and enhance the quality of the surrounding environment through its high-quality design.
 - Respect the SDNP and its special qualities in our decision-making.

2.3 Scheme location

- 2.3.1 The Scheme is located south of Arundel within West Sussex. The landscape surrounding Arundel is mostly rural and relatively flat in nature. Minor elements of the Scheme including works to the existing A27 are within the SDNP boundary. The SDNP is recognised due to a selection of special qualities and its exceptional natural beauty and is situated just

Ref 2-3 Department for Transport (March 2020) *Road Investment Strategy 2: 2020-2025*.

Ref 2-4 Transport for the South East (July 2018). *Economic Connectivity Review*.

north of the Scheme. The Scheme also passes over the River Arun and its floodplain.

- 2.3.2 The Scheme would feature a new dual two-lane carriageway extending approximately 8 km, located to the south of the existing A27. In the west, the Scheme would tie-in approximately 1 km east of the A27/A29 Fontwell East roundabout to the west of Arundel. In the east, the proposed bypass would tie in to the existing Crossbush Junction which would be reconfigured. The Scheme would also include other elements as identified in *Section 2.4*, including the de-trunking (downgrading) and works to approximately 6.6 km of the existing A27 between the junctions with Tye Lane and Mill Road and Crossbush Junction, subject to an agreement with WSCC.

South Downs National Park (SDNP)

- 2.3.3 The SDNP is an area of land that stretches from Winchester to Eastbourne. The SDNP has been nationally designated due to its seven special qualities:
- a. Diverse, inspirational landscapes and breath-taking views.
 - b. A rich variety of wildlife and habitats including rare and internationally important species.
 - c. Tranquil and unspoilt places.
 - d. An environment shaped by centuries of farming and embracing new enterprise.
 - e. Great opportunities for recreational activities and learning experiences.
 - f. Well-conserved historical features and a rich cultural heritage.
 - g. Distinctive towns and villages, and communities with real pride in their area.
- 2.3.4 The preferred route was designed to remain outside the SDNP as far as possible, which is an important consideration in planning policy terms. However, the Eastern end of the Scheme proposals, which was common to all the routes considered at the time of the Preferred Route Announcement, cannot be constructed without some minor incursions into the National Park. This is, primarily, related to works within the existing highway boundary of the A27 and is a direct consequence of the need to connect the new route with the existing highway infrastructure. In addition, some minor incursions are required to provide ecological mitigation measures in line with the statutory purposes of the National Park designation.
- 2.3.5 Furthermore, the de-trunking of the existing A27 carriageway may involve some works within the National Park given that a large section of it is located within the designated area.

Cultural heritage

- 2.3.6 The area surrounding the Scheme has an array of cultural heritage assets which contribute to the heritage value in the area. There are 275 listed buildings within 1 km of the Scheme. Elsewhere within Arundel are 11 highly graded listed buildings, including six at Grade II* and five at Grade I. One of particular note among these is the Grade I listed Arundel Castle, which lies within 1 km of the Scheme and lies just north of the existing A27 within the town of Arundel (Arundel Castle is also a scheduled monument and within a Grade II* Registered Park and Garden (RPG)). Due to the nature of the asset and wider influence of their setting, there is the potential for these buildings to be influenced by changes associated with the Scheme.
- 2.3.7 There are six scheduled monuments and five conservation areas located within the 1 km study area. There are a further 13 Grade I listed buildings, 15 Grade II* listed buildings and 14 scheduled monuments within the 5 km study area. There are a large number of non-designated heritage assets within the study area. Further details of these cultural heritage assets are provided in *Chapter 6: Cultural Heritage* of this PEI Report.

Biodiversity

- 2.3.8 Within the study areas as detailed in *Chapter 8: Biodiversity* of this PEI Report there are seven internationally designated sites, two national designated sites, eight local wildlife sites designation and one designated road verge. One nationally designated site and two local nature reserves are also located within 200 m of the affected road network.
- 2.3.9 There are a number of notable terrestrial habitat types located within 2 km of the Scheme, including the priority habitats deciduous woodland, wood-pasture and parkland, ancient and veteran trees, ponds, coastal floodplain and grazing marsh and orchard. The River Arun is a notable habitat representing river, coastal saltmarsh, mudflats and intertidal foreshore habitats. The habitats within the study area are known to support a wide variety of protected and notable faunal and flora species.

Woodland

- 2.3.10 Whilst it is unlikely that the Scheme would have any direct loss of ancient woodland, there are areas of woodland, including ancient woodland and ancient and veteran trees, which are located within 2 km of the Scheme. The woodland is crossed by footpaths facilitating recreational use. Further information on woodland is reported in *Chapter 7: Landscape and Visual* and *Chapter 8: Biodiversity* of this PEI Report.

Agricultural land

- 2.3.11 Both grazing and arable land is featured within the study area of varying soil quality. Further information is provided in *Chapter 9: Geology and Soils* and *Chapter 12: Population and Human Health* of this PEI Report.

Urban areas

- 2.3.12 The principal urban areas within 5 km of the Scheme are Arundel and Littlehampton. A number of smaller settlements and villages are also located within 5 km of the Scheme. These include but are not limited to Crossbush, Lyminster, Tortington, Binsted, Walberton, Eastergate, Yapton, Barnham, Fontwell and Slindon. The Scheme is located within the county of West Sussex and the local district of Arun. The population of Arun was 161,123 in 2020, whilst the population of West Sussex was 867,635. Further details of urban areas are given in *Chapter 12: Population and Human Health* of this PEI Report

Watercourses and floodplains

- 2.3.13 The River Arun flows north to south and is tidal at the point the Scheme would cross the river. Other watercourses including Binsted Rife and Tortington Rife are crossed by the Scheme. A number of ordinary watercourses and drainage ditches are also located within 5 km of the Scheme.
- 2.3.14 Floodplains are present within the River Arun, Binsted Rife and Tortington Rife catchments. The Scheme would pass through each of these floodplains.

Draft Order Limits

- 2.3.15 The land likely to be required either temporarily or permanently for the construction, operation and maintenance of the Scheme is shown in Figure 1-1 in Volume 1: Non-Technical Summary which highlights the draft Order Limits. The PEI Report is based on the maximum area of land likely to be required for construction and operation of the Scheme. It is important to note that the land required may eventually be slightly less than shown, due to the ongoing development of the design and construction methodology. The maximum area of land potentially required has therefore been presented and used to undertake the preliminary assessments contained within this PEI Report, resulting in a realistic worst-case assessment of the potential impacts associated with the Scheme and the likely significant environmental effects. The DCO application will define the boundary within which the development of the Scheme would take place and will set out limits of deviation as the design is refined. A more detailed explanation of the study area and the draft Order Limits is provided at *Section 4.2*.

2.4 Description of the Scheme

Scheme overview

- 2.4.1 The development of the Scheme design is an ongoing, iterative process in conjunction with the EIA. It is being informed by existing knowledge of environmental constraints, as well as the environmental assessment of emerging design proposals and ongoing engagement with stakeholders. This PEI Report has been based on the design presented at statutory consultation, as described below and as presented in the Preliminary

Landscape and Environmental Masterplan (PLEM) provided in Figure 2-1. This shows the layout of the Scheme and the associated indicative environmental mitigation (which is subject to further review and evolution). The PLEM shows the Scheme as presented in the PEI Report, but does not reflect the various design options under consideration, which are described in *Section 2.6* below.

- 2.4.2 The preliminary assessments contained within this report are based on a point in time and the full assessments will be further developed as design evolves, environmental surveys/data interpretation is completed and stakeholder engagement and feedback is received. The further development of the Scheme design will consider the feedback received during statutory consultation and ongoing stakeholder engagement, to produce a preliminary design that will be used as the basis of the DCO application. As such, the draft design described below will be subject to refinement prior to the DCO application. The preliminary design, and the assessment of its likely significant environmental effects, will be presented in the ES submitted with the DCO application.
- 2.4.3 The Scheme, as assessed in the preliminary assessments in this report is described briefly below, including the current route and details of side roads and accesses from west to east. Some aspects of the Scheme design below are subject to potential design options, which are detailed in *Section 2.6: Design options*. Any additional impacts associated with the options are detailed separately within each technical chapter. To minimise the number of junctions, minor roads crossed by the Scheme would be accommodated by either an underbridge or an overbridge or they would be closed and diverted. The specific treatment at each location is subject to further assessment and design development. Starting at the western end of the scheme:

Fontwell East Roundabout to Tye Lane

- a. Fontwell East roundabout would be the start and finish of a new 50 mph speed limit. From Fontwell East roundabout the 50 mph speed limit would continue until the new dual carriageway passes the Church of St Mary's, Binsted.
- b. The left-turn access onto Arundel Road (heading towards Fontwell Village) from the westbound carriageway of the A27 would be closed. Traffic from Arundel Road in this location would be able to join the westbound carriageway of the A27, heading towards the Fontwell East Roundabout.
- c. The existing junction at Arundel Road, opposite the entrance to Silver Wings, would be closed preventing direct access on and off the A27 in this location. An alternative access for the properties on this section of Arundel Road would be created by linking Arundel Road (at Greenlands Farm) to the section of Arundel Road by the entrance to Fordingbridge Plc.

- d. The new dual carriageway would diverge from the existing A27 in a south east direction where Bridleway 392 crosses.
- e. A section of Bridleway 392 at Copse Lane would be realigned to the east of its current alignment to allow a new Bridleway Overbridge (BR392) to provide safe access across the A27 in this location.
- f. An eastbound off-slip road is proposed to link eastbound traffic with the existing A27 eastbound.
- g. The existing A27 just west of Tye Lane would be de-trunked and transferred to WSCC as the local highway authority all the way to where it joins with Crossbush Junction. This de-trunked section of road would be retained for local traffic, public transport and alternative transport (walking and cycling).
- h. The Mill Road/Tye Lane junction of the existing A27 would be reconfigured into a limited movements junction.
- i. As the new dual carriageway continues south east from Arundel Road to Tye Lane, it would be in a shallow cutting as it passes north of Hooe Farm Industrial Estate.
- j. Tye Lane would be severed by the new dual carriageway, which would be in a cutting approximately 3 m below ground level and would pass under the realigned Tye Lane. The realigned Tye Lane would be on an embankment and would pass over the new dual carriageway via a new bridge (Tye Lane Overbridge) at a height of approximately 5.3 m above the carriageway. Tye Lane Overbridge would be one-way, southbound only. A westbound on-slip road would allow traffic from the existing westbound A27 to join the new dual carriageway via Tye Lane. A T-junction south of the new dual carriageway would provide access to Hooe Farm Industrial Estate as well as access to the westbound on-slip road. Tye Lane to the north of the A27 would be used as a connector road between the existing A27 and slip road.
- k. South of the new dual carriageway, the existing section of Tye Lane towards Walberton would be stopped up and would become a no-through road. A new footway/cycleway connection would connect the stopped up Tye Lane to the Tye Lane Overbridge, maintaining two-way pedestrian and cycle access along the whole of Tye Lane.

Tye Lane to Binsted Rife

- a. From Tye Lane continuing south east, the new dual carriageway passes through the Avisford Park Golf Club and south of the Avisford Park Hotel. As it passes through the golf course the new dual carriageway progresses into cutting on the approach to Yapton Lane, and then turns east to pass under Yapton Lane, passing immediately north of the access to Avisford Grange housing development, which is currently under construction. Yapton Lane would pass over the new dual carriageway on a bridge (Yapton Lane Overbridge) and remain on its current alignment, approximately at ground level. Avisford Park

Road, which is used to access the Avisford Park Golf Club, would be realigned approximately 50 m north of its current alignment - this provides space for the new dual carriageway and also maintains access for the Avisford Park Golf Club. Access would be maintained to the Avisford Grange housing development.

- b. The new dual carriageway continues south east with the depth of cutting, moving onto a short section of embankment before crossing over Binsted Rife (rife is a local term for a watercourse draining to tidal waterbodies), south west of the Church of St Mary's, Binsted. The new dual carriageway would cross Binsted Rife on an underbridge (Binsted Rife Underbridge) with a squared portal structure, approximately 30 m clear span, 27 m wide and 6 m high at its maximum extents. The proposed road level across the underbridge is approximately 11.5 m above ground level at the point it crosses the existing watercourse.
- c. Public Right of Way (PRoW) 350 would be realigned beneath the underbridge structure. The Binsted Rife watercourse would also be realigned beneath the underbridge structure.

Binsted Rife to Tortington Lane

- a. East of the crossing of Binsted Rife the new dual carriageway would continue south east, transitioning into cutting approximately between 1 m and 2 m below ground level.
- b. Binsted Lane would be severed by the new dual carriageway in two locations, near Oakley's Barn and south of Meadow Lodge. Binsted Lane would be realigned so that it runs from west to east on the north side of the new dual carriageway. A T-junction would provide a link to a bridge over the new dual carriageway (Binsted Lane Overbridge) to connect with the existing Binsted Lane south of the new dual carriageway. The realigned Binsted Lane would be built up on an embankment and the overbridge would pass over the new dual carriageway at a height of approximately 8 m. The new dual carriageway would be in a shallow cutting at this location as it passes beneath the realigned Binsted Lane. PRoW 354 would be realigned over the overbridge alongside Binsted Lane to retain connectivity. This solution would allow the existing road to remain open for as long as possible during the construction stage. The Binsted Lane overbridge is proposed to be a 'green bridge' structure. In addition to maintaining road and footpath connectivity, this overbridge would provide ecological connectivity across the new dual carriageway.
- c. East of Binsted Lane, the new dual carriageway continues eastwards on an embankment before crossing over Tortington Rife. The new dual carriageway would cross Tortington Rife on an arched underbridge (Tortington Rife Underbridge), with an approximate 29 m span, approximately 31 m wide and 6 m high at its maximum extents. The proposed road level across the underbridge would be

approximately 10.2 m above ground level at the point it crosses the existing watercourse.

- d. East of Tortington Rife the new dual carriageway transitions from embankment into a slight cutting approximately 320 m east of Tortington Rife. As the road continues east, the level rises from a cutting to an embankment approximately 90 m west of Tortington Lane.

Tortington Lane to Arun Valley Railway

- a. The new dual carriageway crosses a small section of common land at Tortington Lane.
- b. Tortington Lane would be realigned to the east of the existing Tortington Lane and cross the new dual carriageway as part of a green bridge (Tortington Lane Overbridge) with embankment approaches to the north and south. The realigned Tortington Lane would tie into the existing Tortington Lane to the south of the new dual carriageway at Rookery Cottages, and to the north of the new dual carriageway approximately 100 m north of Broad Green Cottages.
- c. The green bridge would provide ecological connectivity over the new dual carriageway at Tortington Lane. It would also incorporate the realigned PRow 3403, as well as providing vehicle access.
- d. East of Tortington Lane the level of the new dual carriageway would continue to rise until it approaches the western end of the proposed Arun Valley Viaduct, west of Ford Road, approximately 180 m south of Tortington Priory scheduled monument. The viaduct would cross over Ford Road and continue for approximately 1.5 km eastwards to a point approximately 175 m west of the Arun Valley railway line. Between these points the viaduct would cross the River Arun and the Arun floodplain.
- e. Between the Arun Valley Viaduct and the railway line, there would be a short section of embankment before the new dual carriageway crosses the Arun Valley railway line on a single span bridge (Arun Valley Railway Overline Bridge).

Arun Valley Railway to Crossbush Junction

- a. Under the eastern side of the Arun Valley Railway Overline Bridge, space would be provided between the railway line and the embankment to allow footpath 2207 to be diverted and to provide a new farm access; maintaining connectivity between the fields on either side of the new dual carriageway.
- b. East of the Arun Valley Railway Overline Bridge the new dual carriageway continues on a short section of embankment before transitioning into a section of cutting through Crossbush Junction where it ties in with the existing A27.

- c. The existing Crossbush roundabout would be removed and a new grade separated dumbbell junction constructed. The new dual carriageway would tie-in to the existing A27 dual carriageway to the east of the new Crossbush Junction.
- d. New on and off slip roads would be provided to give access to a reconfigured Crossbush Junction from and to the westbound carriageway of the new dual carriageway. The current slip roads at Crossbush Junction that connect to the existing A27 eastbound dual carriageway would be incorporated into the Scheme.

2.4.4 Utility diversions would be required at locations along the whole of the Scheme and land has been included within the draft Order Limits to facilitate these diversions.

Lowered Arun Valley Viaduct and Arun Valley Railway Overline Bridge refinement

2.4.5 A design refinement is being considered where the Scheme crosses the River Arun floodplain on a viaduct and the Arun Valley Railway Overline Bridge. In these locations, the Scheme as detailed in this chapter, represents the maximum potential vertical alignment. Given the required clearances over Ford Road, the River Arun and the Arun Valley Railway, there is an opportunity to lower the alignment across these three locations, which would have a number of implications including for land take, buildability, flooding, landscape and biodiversity. As such, further time will be taken to consider this design refinement, particularly in relation to feedback obtained from statutory consultation.

2.4.6 Table 2-1 presents the current height of the Scheme and minimum clearances in accordance with standards at these three locations, which represents the minimum height that the floodplain viaduct and Arun Valley Railway Overline Bridge could be lowered to. Where potential effects are associated with the flexibility afforded by this design refinement, these will be referred to in the topic specific assessments.

Table 2-1 Potential heights of the Scheme vertical alignment crossing the River Arun floodplain and Arun Valley Railway

Location	Current Scheme design clearance	Minimum clearance	Potential difference
Ford Road	9.6 m	5.7 m	Up to 3.9 m lower
River Arun	8.7 m	5.9 m	Up to 2.8 m lower
Arun Valley Railway	9.2 m	5.8 m	Up to 3.4 m lower

Highway design

- 2.4.7 The preferred route was designed to remain outside the SDNP as far as possible which is an important consideration in planning policy terms. However, the eastern end of the Scheme proposals, which was common to all the routes considered at the time of the Preferred Route Announcement, cannot be constructed without some minor incursions into the SDNP. These incursions relate primarily to works within the existing highway boundary of the A27 and are a direct consequence of the need to connect the new route with the existing highway infrastructure. In addition, some small incursions are required to provide ecological mitigation measures in line with the statutory purposes of the National Park designation; these incursions are minor in nature.
- 2.4.8 The following fundamental highway design considerations are being applied in the development of the Scheme design:
- a. The design is based on good practice, as embodied in Highway England's *Design Manual for Roads and Bridges* (DMRB) (Ref 2-5) and *Manual for Streets* (MfS) (Ref 2-6).
 - b. An 'earthworks balance' is sought to minimise importing or exporting earthworks materials to/from the site during the construction phase.
 - c. Roadside features such as lighting would be minimised to reduce visual impacts, whilst remaining consistent with safety requirements.
 - d. Planting to provide visual screening, landscape integration and habitat creation, with a minimum Biodiversity Net Gain of 10%.
 - e. Mitigation to secure the Scheme's target of 10% biodiversity net gain.
 - f. Coordination of proposed, but yet to be confirmed, utility diversions to provide safe access for maintenance.
 - g. Consideration of construction operations in the design process to ensure that construction can be undertaken as safely as possible whilst minimising disruption to sensitive receptors during the construction phase.
 - h. Consideration of maintenance operations in the design process (including provision of maintenance hardstanding areas and accesses) to improve safety for road users and maintenance operatives during maintenance works and to minimise disruption to sensitive receptors.
 - i. Consideration of operational safety in the design of the Scheme to make the Scheme more understandable for road users.
- 2.4.9 In order to supplement the implementation of these design principles and recognise the considerable sensitivity of the environment around the

existing A27 in Arundel, further measures as discussed below have been taken into consideration within the design process.

- 2.4.10 Carbon and waste reduction workshops have been held to identify initiatives that can be incorporated into the Scheme design and construction phase. In addition, ongoing discussions between the design team and the environmental team are taking place which enables the Scheme design to evolve and respond to environmental sensitivities. An example of where environmental team input has had a key influence on the Scheme design relates to the provision of the two proposed green bridges (Binsted Lane Overbridge and Tortington Lane Overbridge) – these green bridges would provide PRoW access as well as ecological connectivity over the new dual carriageway which is of particular importance for bats.
- 2.4.11 National Highways' *'The Road to good design'* (Ref 2-7) has been used to guide the Scheme design within the context of the natural, built and historic environment. As well as this, consultation with the Design Council has also taken place to help inform design. The Design Council was encouraged by elements of the embedded mitigation being considered, such as the reduction in speed limits to help avoid environmental impacts.
- 2.4.12 The Scheme would be a dual two-lane all-purpose trunk road formed of two carriageways each approximately 9.3 m wide (comprising two 3.65 m wide running lanes and a further 1 m hard strip on either side), typically with approximate 2.5 m wide verges and an approximate 2.5 m wide central reserve. The verge and central reserve width would be increased as required to provide the appropriate unobstructed visibility around curves. Further localised increases in verge width to accommodate highway features such as signs, vehicle restraint systems, communication equipment and laybys would be included where required. As the Scheme design develops, there may be scope in some areas to reduce the width of the central reserve, lane widths and verge widths in order to minimise the footprint of the new dual carriageway, although this is subject to maintenance and operation considerations.
- 2.4.13 It is currently proposed that there would be one layby in each direction, with both of these laybys located between Tortington Rife and Tortington Lane.
- 2.4.14 Maintenance hardstanding areas would be included where necessary in order to allow for safe maintenance of the new dual carriageway.
- 2.4.15 Vehicle restraint systems would be provided in accordance with the required standards. Throughout the length of the Scheme, there would be either a concrete or steel safety barrier along the central reserve. Vehicle restraint systems would also be needed in the verges, on the approaches to structures and where the new dual carriageway is on embankment, for example.

Emergency and maintenance cross over points

- 2.4.16 Emergency and maintenance cross over points would be required which would be located on the main carriageway. To support the operation of these cross overs, temporary lighting and signage would be provided as needed. Further discussions are required to determine the cross over points.

Lighting

- 2.4.17 Lighting is an important consideration within the Scheme design and its application will be subject to good practice associated with appropriate safety assessments. The lighting strategy will be developed as the design progresses and will consider impacts on nocturnal species (such as bats), landscape and visual receptors, impacts on the setting of cultural heritage assets and will aim to minimise visual intrusion upon nearby residents. The strategy will also look to reduce carbon dioxide (CO₂) emissions by using more energy efficient lighting in the form of Light Emitting Diodes.
- 2.4.18 The current proposals include lighting at Crossbush Junction and at the western tie-in junction. It is not expected that there would be street lighting between these two points.

Drainage

- 2.4.19 Surface water drainage would consist of a combination of attenuation measures (for example, ponds or ditches) and kerbs and gullies, concrete v-channels, culverts only where required or more natural swales to capture, direct and attenuate surface water flows to maintain the current rates of discharge into existing watercourses. Details of the proposed drainage will be developed in discussion with the Environment Agency, WSCC as the Lead Local Flood Authority and ADC.

Earthworks and landform

- 2.4.20 The Scheme would require a number of embankments and cuttings to be formed to accommodate the horizontal and vertical alignment.
- 2.4.21 Earth retaining structures would be required in the form of embedded retaining walls or reinforced concrete structures.
- 2.4.22 In addition to earthworks to support and facilitate the alignment of the new dual carriageway, there would be additional earthworks such as earth bunds to provide noise and visual mitigation.
- 2.4.23 The current landscape proposals include the following earthworks:
- a. The grading back of cut slopes in order to integrate the highway earthworks into the adjacent landform. This would include the areas of deeper cutting where the main alignment passes beneath Tye Lane and Tortington Lane.
 - b. The grading of embankments to assist in integrating the highway earthworks into the adjacent landform. The main area for earthwork regrading would be to the bridge structures built on embankments

and re-aligned roads which cross over the main alignment via embankments.

- c. Earth bunds of approximately 2 m in height to form ‘false cuttings’, would be included along sections of the Scheme. These would be associated with the regrading of the embankments described above and would help reduce views of the traffic on the Scheme and noise levels in the surrounding area.

Existing A27

- 2.4.24 The existing A27 would be de-trunked and retained for local traffic and public transport, with maintenance responsibility transferred to WSCC as the highway authority. The extent of works on the existing A27 is still being determined; details will be provided within the ES after further engagement with WSCC and the SDNPA.

Public Rights of Way

- 2.4.25 From west to east the new dual carriageway would cross the following PRoW:
- a. PRoW 392 (bridleway), which runs from north of Walberton to the existing A27. The Scheme is proposing a bridleway bridge, which crosses over the new dual carriageway.
 - b. PRoW 350 (footpath), which runs between Binsted and Walberton across Binsted Rife. This PRoW would be realigned beneath Binsted Rife underbridge.
 - c. PRoW 354 (footpath), which runs across the u-shaped southern end of Binsted Lane. This PRoW would be realigned to pass over the Binsted Lane green bridge.
 - d. PRoW 3403 (footpath), which runs north of Tortington. This PRoW would be realigned to pass over the Tortington Lane green bridge.
 - e. PRoW 206 (footpath), which runs along the western bank of the River Arun. This PRoW would remain in its current location alongside the River Arun.
 - f. PRoW 2207 (footpath), which runs between Lyminster and Arundel Station. This PRoW would be realigned and would pass beneath the Arun Valley Railway Overline Bridge.

2.5 Design and embedded mitigation

Embedded environmental mitigation

- 2.5.1 The Scheme design incorporates embedded mitigation measures to address environmental sensitivities and constraints. The PLEM presented in Figure 2-1 represents the current indicative embedded mitigation measures that form part of the Scheme design. These measures currently include, but are not limited to:

- a. 50 mph at western tie-in – the speed at the western tie-in was reduced from 70 mph to 50 mph to allow the new dual carriageway to tie into the existing A27 at an earlier point than what would have been possible with the 70 mph proposal. This was an important consideration given the significance of bats within this area, particularly the information gained from radiotracking surveys that showed bats used the vegetation in this area to cross the existing A27. This design change resulted in reduced habitat loss, reduced the number of trees to be lost, improvements associated with operational noise and air quality and also improvements in safety of the westbound approach to Fontwell East roundabout compared with the 70 mph option.
- b. Horizontal and vertical alignment – the location and height of the alignment of the Scheme has been developed to minimise potential environmental effects where practicable to do so, or with consideration of conflicting environmental issues. This process is still ongoing for some aspects of the Scheme as discussed in *Section 2.6: Design options* through the consideration of the alignment through Avisford Park and for the Arun Valley Viaduct and Arun Valley Railway Overline Bridge alignment options. Emphasis has been placed on minimising vegetation loss, including maximising the retention of trees with particular emphasis on those trees that could be considered veteran or ancient. Additionally, the lowering of the road, often in cutting, has been used to minimise impacts on sensitive receptors, including residential receptors and reduce setting impacts on heritage features.
- c. Planting and vegetation – planting is proposed to reduce the visual impacts of the Scheme and maintain important habitat connectivity. This includes native, locally characteristic, tree and shrub species and planting design to reflect existing vegetation patterns. Further information can be found in *Chapter 7: Landscape and Visual*.
- d. Green bridges – Binsted Lane Overbridge and Tortington Lane Overbridge - where avoidance of impacts on protected species movement, such as bat flight paths, was not possible, green bridges have been incorporated within the design to afford habitat connectivity over the proposed new carriageway, with proposed native hedgerows on each side of the overbridge, as well as a central translocated hedge/mature specimen trees. The purpose of the green bridges is to provide a redirected route over the highway for protected species, whilst also providing a realigned route for PRow 354 linking to Lake Copse for Binsted Lane Overbridge and PRow 3403 leading to Tortington Priory for Tortington Lane Overbridge. Further information can be found in *Chapter 8: Biodiversity*.
- e. Rife underbridges – the structures that cross Binsted Rife and Tortington Rife have been designed to maintain ecological function and existing access, whilst being visually sensitive to the surrounding environments. The underbridges have been designed to have a

minimum functional cross-sectional area of 75 m², which is three times what might normally be expected as a minimum (5 m x 5 m) to maintain viable flight paths for a range of bat species. The underbridge at Tortington Rife has been designed as an arched structure due to the need to accommodate bat activity whilst softening the visual impact within the wider rife environment. At Binsted Rife, the underbridge is currently designed as a portal structure, providing a more rectangular opening to maximise the cross-sectional area for bat movements, whilst allowing engineered embankments and associated planting to be incorporated sensitively into the local landscape to respect the setting of the Grade II* listed Church of St Mary's, Binsted.

- f. Landform – landscape contouring of embankments and cuttings is proposed whereby they are re-profiled to sit more sensitively within the surrounding landscape. Examples of this include Binsted Lane overbridge crossing, Tortington Lane overcrossing and the Bridleway Overbridge (BR392) at the western end of the Scheme.
- g. Bridleway Overbridge (BR392) – to maintain existing PRoW 392 access to the SDNP and enhance safety for users by avoiding crossing the A27 at grade which is the current situation.
- h. Low noise surfacing – surfacing defined as a Level 3 'very quiet surfacing material' in Table 9/17 within the *Manual of Contract Documents for Highway Works* (Ref 2-8), would be used throughout the Scheme. Consideration will also be given to utilising very low noise surfacing at targeted locations along the Scheme where practicable to do so. These locations will be identified by the noise modelling to be undertaken in support of the ES. This could be particularly relevant along the proposed carriageway close to the Grade II* listed Church of St Mary's, Binsted where alternative noise mitigation measures (such as noise barriers) are not appropriate due to conflicts with the setting of the heritage asset. Further information can be found in *Chapter 11: Noise and Vibration*.
- i. Lighting – this is only being proposed at Crossbush Junction and the western tie-in. At these two locations, lighting is critical to road safety and would not be implemented across the wider Scheme to minimise effects on landscape and visual, biodiversity and residential receptors, whilst minimising energy use where practicable.
- j. Replacement common Land – to mitigate the loss of common land at Broad Green Waste, it is proposed that woodland planting, adjacent grassland and tree planting would replace common land that would be lost and severed as part of Tortington Lane realignment. Common land would be replaced at a ratio of at least 1:1, adjacent to the

common land that is lost. Replacement of common land is shown on Figure 2-1 Preliminary Landscape and Environmental Masterplan.

- k. PRoW realignments – the following PRoW are intercepted by the Scheme and would be realigned in order to maintain access to the wider PRoW network within the surrounding landscape:
 - i. PRoW 392 (bridleway), which runs from north of Walberton to the existing A27.
 - ii. PRoW 350 (footpath), which runs between Binsted and Walberton across Binsted Rife.
 - iii. PRoW 354 (footpath), which runs across the u-shaped southern end of Binsted Lane.
 - iv. PRoW 3403 (footpath), which runs north of Tortington.
 - v. PRoW 2207 (footpath), which runs between Lyminster and Arundel Station.
- l. Attenuation ponds – located at strategic positions along the proposed carriageway to allow surface water run-off to be stored and managed to reduce the risk of flooding, including accounting for climate change and provide appropriate treatment for discharge into existing watercourses. They would discharge to four different waterbodies depending on location.
- m. Flood mitigation – provision of replacement floodplain storage compensation in the Tortington Rife and River Arun floodplains and flood relief culverts within the embankments at these locations.
- n. Rife realignment – realignment of the existing Binsted Rife to accommodate the Binsted Rife Underbridge. Realignment would be required for a short section of the rife in order to meander under the Binsted rife Underbridge, whilst also allowing for wetland habitat creation.
- o. Arun Valley Viaduct – the crossing of the River Arun and Arun floodplain would be by viaduct as opposed to an embankment. This is proposed as it minimises impacts from a flood risk, biodiversity and landscape perspective.

2.6 Design options

- 2.6.1 There are two potential options for the Scheme. These options are required in order to give National Highways a degree of flexibility where surveys and stakeholder engagement are ongoing and may influence the final design. This also allows for comments received from consultees on the additional information to be considered as part of the final design where practicable. The below sub-sections discuss these two options in turn. The assessments in the ten specialist topics presented in Chapters 5 to 14 of this PEI Report consider the Scheme as described above in the Scheme overview, and then consider these two alignment options within each of the chapters.

Options for Avisford Park Golf Club re-provision

- 2.6.2 The proposed route alignment cuts through land that forms part of Avisford Park Hotel and the Avisford Park Golf Club. There would be no physical impact on the hotel and conferencing facilities arising from the Scheme.
- 2.6.3 The Scheme would directly affect the golf course, resulting in a loss of, or direct impact on, approximately 9 of the 18 holes, car parking spaces, the existing golf club access onto Yapton Lane and loss of the clubhouse within the grounds of the hotel. Provisional assessment work undertaken by consultants acting independently of National Highways, identifies that, whilst Avisford Park Golf Club, an existing sports facility, cannot be considered to be surplus to requirements, all other golf courses within a 20 minute drive radius of the club provide similar, 18-hole facilities. This indicates that a general need exists in the area for smaller facilities which serve beginners or time constrained golfers, such as 9-hole golf courses or golf courses with driving range facilities. This assessment has been informed by discussions with ADC, England Golf and Sports England.
- 2.6.4 National Highways is currently looking at ways it can mitigate the impact on the golf course to maintain a viable facility in close proximity to the Avisford Park Golf Club. We are in discussions with the owners of the Club and have commissioned a golf course architect to understand if a viable golfing facility can remain in this location. Currently, National Highways is actively considering two potential mitigation options to maintain golfing facilities in this location, which are described below. The assessments in the ten specialist topics presented in Chapters 5 to 14 of this PEI Report consider the Scheme as described above in the Scheme overview, and then consider these two design alignment options within the “Scheme options” sub-section within each of the chapters.

Option 1: 9 Hole Golf Course with driving range or practice facilities

- 2.6.5 Land has been included within the draft Order Limits around the boundary of the existing golf course to re-provide a new access to the golf club off Yapton Lane, allowing the reconfiguration of holes within the existing golf course to maintain at least 9 holes and to allow the re-provision of car parking and clubhouse facilities. This would allow a golf course to remain in this location, but as a smaller facility which would help diversify golfing facilities in this location for which there is a general need, as identified in the Needs Assessment as identified in 2.6.3 above.

Option 2: Replacement 18 Hole Golf course

- 2.6.6 In addition to including land currently used for the golf course to re-provide the golfing facilities affected by the Scheme, the draft Order Limits has been extended to include land to the east/north-east of the back nine holes of the golf club, surrounding Binsted Farm. To also allow for the creation/re-provision of a further 9 holes to maintain Avisford Park Golf Club as an 18 hole facility.

- 2.6.7 National Highways is continuing to engage with the owners of the facility, existing golf club members and users, ADC, England Golf and Sports England to discuss these mitigation options or alternative provision that would best meet the needs identified in the golf Needs Assessment.

Option for raised vertical alignment with offline Yapton Lane overbridge

- 2.6.8 An option is being considered where the Scheme passes between Avisford Park and the new Avisford Grange housing development, and the existing Yapton Lane. This is required due to emerging potential issues associated with high groundwater in this location and the safe constructability of the Scheme. Data from ongoing ground investigations suggests that the level of groundwater may be higher than previously identified. Whilst in engineering terms this is surmountable, there would be a greater risk of a deeper cutting impacting on groundwater resources. Additionally, construction within groundwater presents additional concerns with respect to construction worker safety due to more complex construction practices.
- 2.6.9 There is the potential to raise the overall alignment of the new dual carriageway by approximately 4 m compared with that described in the Scheme overview. This would reduce the amount of cut that is required in this location. The existing Yapton Lane would also be realigned offline approximately 30 m to the east, and slightly raised to approximately 2 m so that it can cross over the new dual carriageway on an overbridge. Should this design refinement be taken forward, arrangements to maintain access for properties on Yapton Lane and Manser Road will be discussed with stakeholders including homeowners as part of ongoing Scheme development, with details included in the DCO application and reported in the ES.

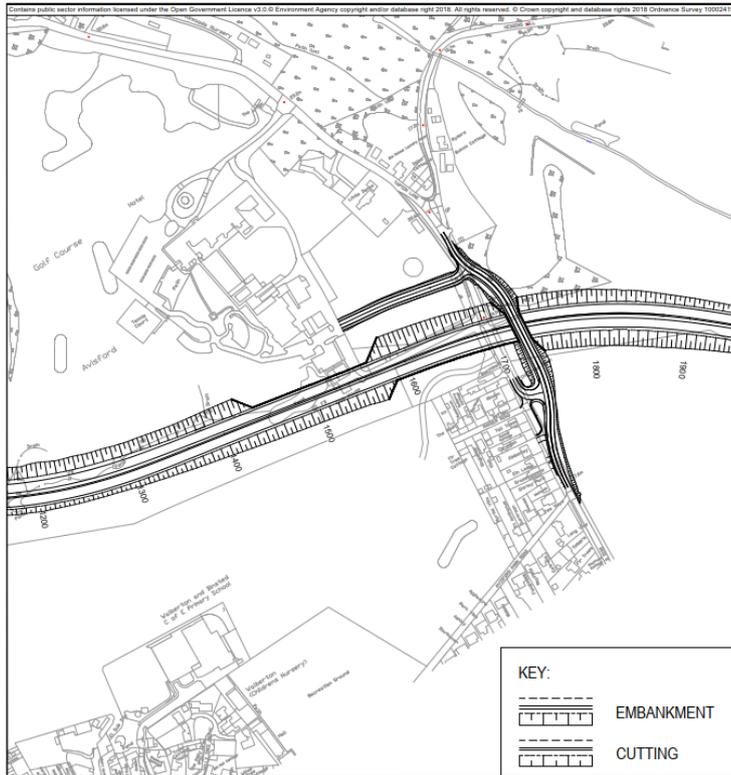


Plate 2-1 Avisford Park: raised vertical alignment with offline Yapton Lane overbridge

2.7 Construction

Construction activities

- 2.7.1 The main aspects of construction would be the construction of the roads, earthworks, structures, drainage including attenuation ponds and the diversion of utility company apparatus. The Scheme construction activities are anticipated to require the following:
- Installation and use of temporary offices and welfare facilities, construction compounds, vehicle parking, material storage areas, fuel storage bunds and worksites
 - Installation and use of temporary accesses and haul routes, demolition of existing structures, removal of existing infrastructure, vegetation clearance and soil removal
 - Potential for a concrete batching plant
 - Ground and excavation works
 - Piling
 - Infrastructure construction activities, routing of services and utilities
- 2.7.2 The draft Order Limits shown in Figure 1-1 allows for temporary roads, temporary working and storage areas, material stockpiles, haul roads,

and provision for site and office compounds to be used during the construction of the Scheme.

- 2.7.3 The main construction phase roadworks would be separated into the following three work packages:
- a. Work package 1: Fontwell tie-in and Crossbush tie-in.
 - b. Work package 2: Ford Road to Arun Valley Railway.
 - c. Work package 3: Tye Lane to Ford Road.

Construction programme

- 2.7.4 Scheme construction is expected to commence in 2024 (subject to the grant of development consent for the Scheme) and is envisaged to continue until the targeted completion in 2027 when the Scheme would be open to traffic. However, early works (such as site compound setup, haul road setup and tree and hedge translocation or removal) are planned to commence in 2023 prior to the main construction programme, subject to the DCO being granted by that time. Further details regarding the main phases of the construction programme will be provided in the ES.

Construction compounds and site accesses

- 2.7.5 The Scheme has good connectivity to the east and west via the existing A27, but poor connectivity through the length of the construction site. The current proposals, which are subject to confirmation, include two main construction compounds, one located at each end of the Scheme, plus a temporary eastern floodplain compound to the west of the railway. It is envisaged that temporary welfare units would be required at localised work sites, but these would be self-contained and moved to suit.
- 2.7.6 An aspiration for the construction of the Scheme is to minimise vehicles travelling on the local road network and where possible to avoid travelling through Arundel as well as the surrounding villages, such as Binsted and Walberton. In order to achieve this, the following logistics plans and assumptions are proposed and would be contained within the Construction Traffic Travel Plan, which would be secured as a requirement of the DCO:
- a. All private vehicles used by construction workers to park at one of the two main compounds.
 - b. All plant and material deliveries to enter the construction site at the two main construction compounds and then travel through the site using defined haulage routes to their required location.
 - c. Two-way haul roads (minimum 8 m width) would be in place to facilitate travel through the extent of the site.
 - d. Manoeuvrable plant, including mobile cranes and wheeled excavators, would be returned to a secure compound at the end of each shift. Less manoeuvrable plant, including tracked excavators and piling rigs, would remain secured in-situ.

- e. Fuelling would be predominately via fuel bowsers based out of the two main compounds.
- f. Plant crossings would likely be required at Tye Lane, Yapton Lane, Tortington Lane, Ford Road and Binsted Lane
- g. Where possible materials for the minor structures would be delivered using a 'just in time' principle, where materials are only delivered when needed, with laydown areas supplied where necessary.
- h. Stockpiles would be minimised and kept confined to the area of works. For example, topsoil bunds would be run parallel to the works.
- i. No large/bulk materials would be stored within the River Arun floodplain.
- j. The level crossing or existing accommodation bridge at the Arun Valley railway line would not be used for any construction plant movements. It is therefore proposed that an additional temporary haul road would be required for access off Fitzalan Road.

2.7.7 The proposed construction compounds are outlined below, noting that the exact locations, types and extents of the compound areas will be refined during ongoing definition of the construction approach and, when finalised, will be fully assessed in the ES.

Crossbush compound

2.7.8 This is proposed to be the primary main compound and would be required for the entire duration of the Scheme construction phase. It would be the main base for all non-operational staff as well as all staff and operatives working on the River Arun floodplain. This location has good access from the east for vehicles/deliveries travelling west and would be used to store all materials and plant for the works on the eastern floodplain, including the Arun Valley Railway Overline Bridge and viaduct structure.

Yapton Lane compound

2.7.9 The Yapton Lane construction compound would also be required for the entire duration of construction and is proposed to be the secondary main compound and would be the main base for operational staff working on the western tie-in and the general works from Fontwell through to Tortington.

Temporary eastern floodplain compound

2.7.10 The proposed temporary eastern floodplain compound is a supplement to the main Crossbush compound and would be used to facilitate the construction of the western embankment for the railway crossing only. It is currently proposed that when access over the railway using the Arun Valley Railway Overline Bridge is in place, this compound would be removed.

Welfare facilities

- 2.7.11 Where significant elements of works are located, localised welfare facilities would be provided. These differ from the itemised construction compounds in so much as they are more limited in terms of provisions and are mobile in nature of their set up. The purpose of these is to reduce travel time for the workers back to main compounds for comfort breaks.

Concrete batching plants

- 2.7.12 It is currently unknown whether a concrete batching plant would be required during construction. Should the need for such a facility be identified, the location of the batching plant would be determined in consultation with stakeholders and provided for within the DCO application.

Material storage and stockpiles

- 2.7.13 Various stockpile areas would be required for topsoil and other materials needed to be retained on site for re-use within the works in order to minimise vehicle movements implementing the cut-fill operations. These would be located along the Scheme within the draft Order Limits and would be minimised and confined to the area of works where possible. The topsoil stockpiles would generally be located at the perimeter of working areas so that they would also screen the works from the public. Where topsoil stockpiles are left for an extended period of time, they would be sown with grass seed to reduce their visual impact. The stockpiles would be approximately 2 m to 3 m in height. The footprint of the stockpiles would be returned to their former use following completion of the works unless the works form part of landscape mitigation. Where possible, excavated material would be used on site at the time of excavation to avoid stockpiling large quantities of material unnecessarily.

Haul routes (on site)

- 2.7.14 Generally, construction plant would travel along the Scheme outside the footprint of the proposed embankments and cuttings. However, two-way haul roads with a minimum width of 8 m would be provided within the construction site and used for earth moving equipment such as dump trucks. The haul route would be constructed from site-won fill material where possible. If this is not possible, capping material would be used that would then be reused within the permanent works. If neither of the previous options are available, a form of imported recycled aggregate would be used. Haul road maintenance and dust control measures would be adopted for the duration of their use.
- 2.7.15 Plant crossings would likely be required at Tye Lane, Yapton Lane, Tortington Lane, Ford Road and Binsted Lane up until Binsted Lane overbridge is completed with consideration being given to any requirements for signalling and wheel washing.
- 2.7.16 All haul routes would be removed upon completion of the earthworks and the land reinstated to its former use.

Construction traffic (off site)

- 2.7.17 Appropriate access routes to the site compounds for people, plant and material would be controlled to ensure that movements are restricted to appropriate routes to minimise local disruption. Engagement will be undertaken with affected local authorities to identify the need for any access restrictions.
- 2.7.18 Excavated material generated during the Scheme construction phase would be used to construct embankments or re-used elsewhere on site where possible. However, if some surplus material cannot be utilised on site, this would likely be transported off-site using the existing A27.
- 2.7.19 Earthworks material would generally be retained and re-used within the Scheme, but there may be some small quantities of contaminated material that would need to be transported to licensed waste management facilities.
- 2.7.20 Other construction traffic would consist of worker traffic and vehicles delivering the products required for the construction of the Scheme, including concrete, bitumen, aggregates, pipes and steel. Some deliveries would arrive as abnormal loads, such as large construction plant.

Existing A27 during construction

- 2.7.21 Appropriate traffic management measures would be put in place to ensure that disruption to traffic on the existing A27 and other local roads is minimised as far as practicable, whilst allowing safe working at the interface between the existing road network and the Scheme construction site. Access for traffic on the existing A27 and other local roads would be maintained, whilst allowing safe working for construction staff and the safety of the local community and people driving.

Plant and equipment

- 2.7.22 Construction of the Scheme would require a large quantity of plant and equipment. The high volume of earth to be moved would require large excavators, dump trucks, dozers, compactors plus graders, bowsers, substantial sized cranes and stabilising plant. An estimation of plant numbers and type will be determined by the construction methodology and reported in the ES.

Construction methods

- 2.7.23 The construction of the Scheme would use typical construction techniques associated with major infrastructure projects, including piling, site clearance and excavations. Earthworks, including cuttings and embankments, would be required at the junctions and crossings. Embankments would be constructed using site-won materials where possible. The pavement construction would use standard techniques, including (where appropriate) capping layer, sub-base, base and surface courses. Soil mixing and soil treatment may be required to meet material requirements. The Scheme would also maximise the use of off-site manufacturing where possible.

Utilities

- 2.7.24 Construction of the Scheme would require the diversion, relocation or protection of a large number of existing utility assets including water, wastewater, electricity, gas and telecommunications. It is likely that most of the required diversions would be undertaken as preliminary works (works authorised by the DCO, early in the construction programme), prior to the main phases of Scheme construction.
- 2.7.25 The construction site compounds for the Scheme would also require new temporary utility connections or stand-alone provision where direct connections are not viable. This includes connections for the provision of water, sewerage disposal, electricity and telecommunications. Electricity connection corridors are included at both ends of the Scheme and once in place the cables would be used to provide power from nearby electricity substations to the construction compounds. The cables would typically be run along roads or tracks and be buried at a depth of approximately 1 m. The power connections created at the start of construction would be retained to provide power for the operational Scheme.
- 2.7.26 Further consultation with utility asset suppliers/owners/managers will be undertaken in order to finalise the utility solutions at each location, but any utility diversions would be accommodated within the draft Order Limits.
- 2.7.27 An assessment of the likely environmental implications of the utility connections that are contained within the draft Order Limits will be presented within each topic chapter of the ES.

Demolition

- 2.7.28 The Scheme does not require the demolition of existing major structures, although the demolition of some minor structures would be required, such as the existing footbridge over Binsted Rife. Demolition is also likely to include any properties that have been acquired and need to be removed to make space for the Scheme, which would be incorporated and managed as part of the wider programme of construction activity.

Excavated materials

- 2.7.29 Construction of the Scheme would generate excavated material as a result of cuttings for the highway. If suitable, the material would be used for essential landscaping mitigation and new habitat creation as well as being used to form embankments. The design aims to balance these cut and fill requirements as far as practicable.
- 2.7.30 Use of excavated material would minimise the need to transport this material off-site using the highway network. This would minimise the environmental impacts associated with the construction of the Scheme, particularly in relation to the air quality and noise impacts associated with construction traffic on people and communities living along potential off site routes. This strategy would also help reduce greenhouse gas emissions during the Scheme construction phase.

Environmental Management Plan

- 2.7.31 The Environmental Management Plan (EMP) specifies the mitigation objectives to be achieved and any specific constraints on the design, construction or operation that need to be implemented. The construction of the Scheme would be controlled by measures and procedures defined within the EMP. This EMP would require the implementation of a mix of industry standard construction practices and bespoke control measures to be employed by the construction contractor, such as the control of dust and the approach to waste management on site.
- 2.7.32 A first iteration EMP will be prepared as part of the ES, with measures to be included within the first iteration EMP to be defined in part by the requirements for mitigation that arise from the technical assessments within the EIA. This PEI Report discusses proposed mitigation measures to be included in the first iteration EMP as appropriate in relation to the preliminary assessments.
- 2.7.33 A second iteration EMP will be prepared for construction, with a third iteration EMP prepared for operation.

2.8 Operation and maintenance

- 2.8.1 Maintenance would be authorised under the DCO. As required by DMRB, industry standard control measures would be applied and encapsulated in the third iteration EMP at the end of construction to inform the handover process, and ensure key requirements are met during operation so that the mitigation implemented continues to be effective. With the implementation of these measures, no significant effects from maintenance are considered likely that will not already be considered for the construction phase and so maintenance activities are not considered separately.

2.9 Decommissioning

- 2.9.1 It is unlikely that the Scheme would be demolished after its design life (envisaged to be 40 years for pavements and 120 years for structures) as the road would have become an integral part of nationally important infrastructure. In the unlikely event of the Scheme needing to be demolished, this would be part of the relevant statutory process at that time, including EIA as appropriate. Demolition of the Scheme is not therefore considered further in this PEI Report, and will not be reported on in detail or assessed within the ES. Consideration is however given, where relevant, to dismantling and replacing particular elements of the Scheme once they reach the end of their design life, if significant effects are likely.

3. Assessment of Alternatives

3.1 Introduction

3.1.1 The NPSNN requires that all projects should be subject to an options appraisal. Regulation 14(2)(d) of the EIA Regulations also states that ‘a description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects’ (Ref 3-1) should be included within the ES.

3.1.2 Whilst the ES will report on the final assessment of alternatives, this PEI Report chapter presents a summary of the history of the scheme, the reasonable alternatives considered and the justification for the design decisions taken for the Scheme to date, bearing in mind stakeholder engagement undertaken. It describes how potential environmental impacts from the Scheme have been taken into account during the option identification and appraisal process.

3.2 History of the Scheme

3.2.1 The proposals for the improvement of the A27 at Arundel have been the subject of extensive study and consultation for many years and a number of routes for a bypass have been proposed and consulted on. The early routes identified between 1987 and 1993 are illustrated in Plate 3-1.

3.2.2 The *A27 Arundel Bypass Environmental Assessment Report* (Ref 3-2) describes the history of the Scheme and details of the historic options considered. The timeline of the main events associated with these initial options are as follows:

- a. 1987 – First public consultation on three routes, termed the ‘orange’, ‘red’ and ‘purple’ routes, was carried out. A modified ‘orange’ route was proposed during consultation.
- b. 1989 – The ‘orange’ route was selected as the preferred route.
- c. 1991 – A second public consultation was held on the ‘orange’ route with an alternative route at the eastern end called the ‘blue’ route and an alternative route at the western end termed the ‘brown’ route. The ‘pink’ route was proposed during consultation as an alternative to the ‘brown’ route.
- d. 1993 – During a further consultation period three alternative routes for the western end were proposed. These were called the ‘green’ routes.

Ref 3-1 The Stationary Office, The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, Schedule 4, Regulation 14(2).

Ref 3-2 Highways England, *A27 Arundel Bypass Environmental Assessment Report* (2019)

- e. 1993 – The combination of the ‘pink’ and ‘blue’ routes was selected as the preferred route. The ‘pink’ route was identified as the least environmentally damaging compared to the ‘green’ routes for the western end.

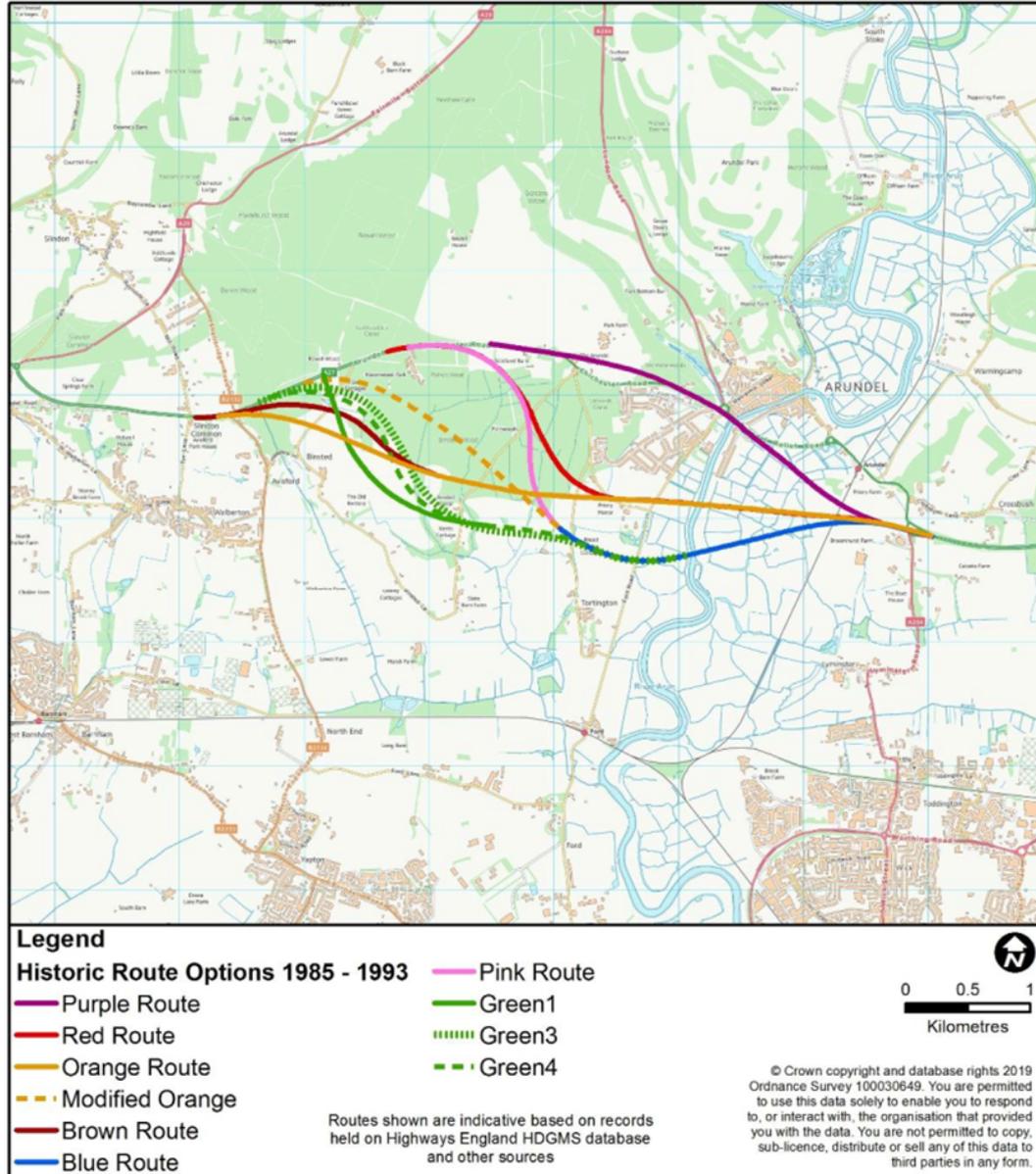


Plate 3-1 Historic options considered between 1987 to 1993

- 3.2.3 Recent main events providing background to the current Scheme include:
 - a. In 2002 – 2003, the *South Coast Multi Modal Study (SoCoMMS)* (Ref 3-3) carried out for the Government as part of a review of transport provision recommended a new bypass at Arundel based on the pink/blue routes. The recommendation was rejected by the Secretary of

State due to its environmental impact and further investigation of less environmentally damaging options was requested.

- b. During 2005 – 2006, further investigations of options were carried out by the Highways Agency (now National Highways) focusing on less environmentally damaging solutions. This included a modified, more environmentally sensitive, version of the pink/blue route.
- c. In 2014 – 2015, the *A27 Corridor Feasibility Study* (Ref 2-1) considered seven route options developed as part of the further investigations undertaken after the SoCoMMS and three sustainable transport options. Following a sifting of options, two bypass options to the south of the existing A27, including the modified pink/blue route and an option that avoided ancient woodland, were selected for an investment case assessment. Sustainable transport measures were assumed to be provided alongside each option. The two dual carriageway bypass options were evaluated, and it was concluded that an investment case existed for a dual carriageway bypass at Arundel.

3.3 The current project lifecycle

3.3.1 The key decision points in the current NSIP lifecycle are shown in Plate 3-2, aligned to National Highways’ Project Control Framework (PCF) stages. The PCF is a joint Department for Transport (DfT) and National Highways approach for managing major highway projects. It is designed to help collaboration to develop and deliver major projects.

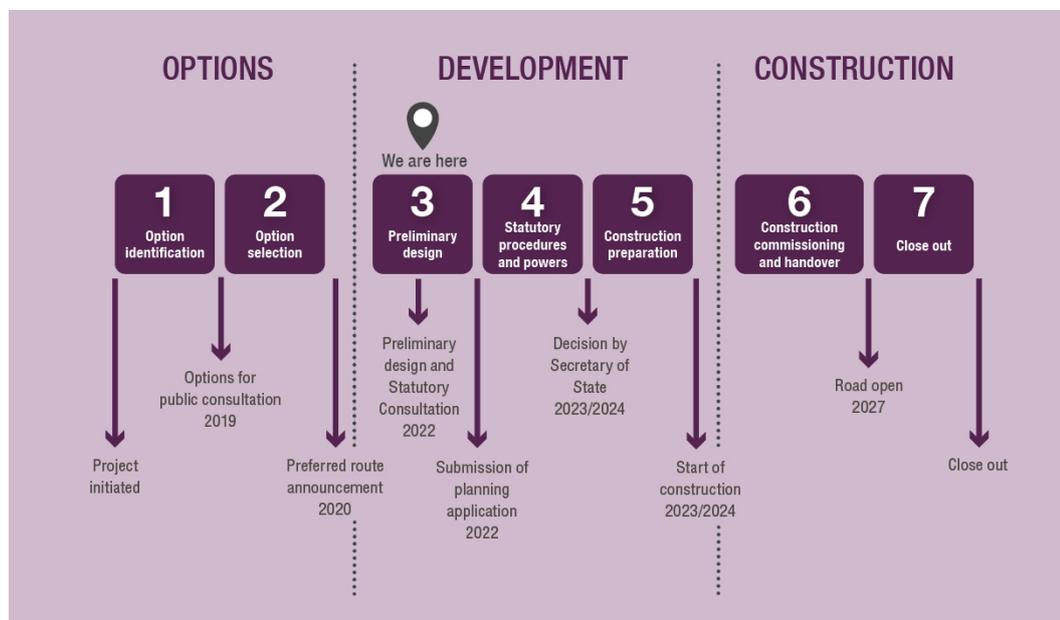


Plate 3-2 Key decision points within the major project lifecycle

3.3.2 The process of option identification and selection undertaken for the Scheme is:

- a. **Stage 1:**
 - i. Identify options to be taken to public consultation.
 - ii. Assess options in terms of environmental impact, traffic forecasts and economic benefits.
 - iii. Refine the cost estimate of options (including an allowance for risk).
 - b. **Stage 2:**
 - i. Carry out public consultation including exhibitions.
 - ii. Analyse comments received and select a preferred option.
 - iii. Refine the cost estimate for preferred option (including allowance for risk).
 - iv. Refine the environmental impact assessment, traffic forecasts, and economic benefits following public consultation if required.
 - v. Produce an outline business case.
 - vi. Announce the preferred route.
- 3.3.3 The *A27 Corridor Feasibility Study* (Ref 2-1) informed the pre-project strategy, shaping and prioritisation of the Scheme, at the start of the PCF lifecycle as illustrated in Plate 3-2. PCF Stage 0 was completed at the end of 2015, which recommended consideration of seven options at the start of the options phase. It was also determined at this stage that, whilst the bus/rail network or alternative methods such as light rail and demand management measures may provide opportunities for modal transfer, these measures were unlikely to be able to adequately address the study objectives of reducing travel time, improving journey time reliability and enabling local planning authorities to manage the impact of planned growth. As such, a need to invest in a road-based solution was taken.
- 3.3.4 Constrained capacity, planned growth in housing and employment, and the limited scope for alternative rail and other solutions to address the current and future problems still persist today and so the conclusion that there is a need to invest in road-based solutions still stands. For these reasons, and the reasons explained above, the option of do-nothing is not considered an appropriate solution. The do-nothing option would also not enable all the high-level objectives for the Scheme as described in *Section 2.4* of this PEI Report to be met.
- 3.3.5 After the publication of the *A27 Corridor Feasibility Study* (Ref 2-1) the Scheme progressed through PCF Stage 1 (Option Identification) through to PCF Stage 2 (Option Selection). In 2017/2018 during PCF Stage 2 there were three route options under consideration as shown in Plate 3-3, culminating in a Preferred Route Announcement in May 2018 for a modified version of Option 5A.

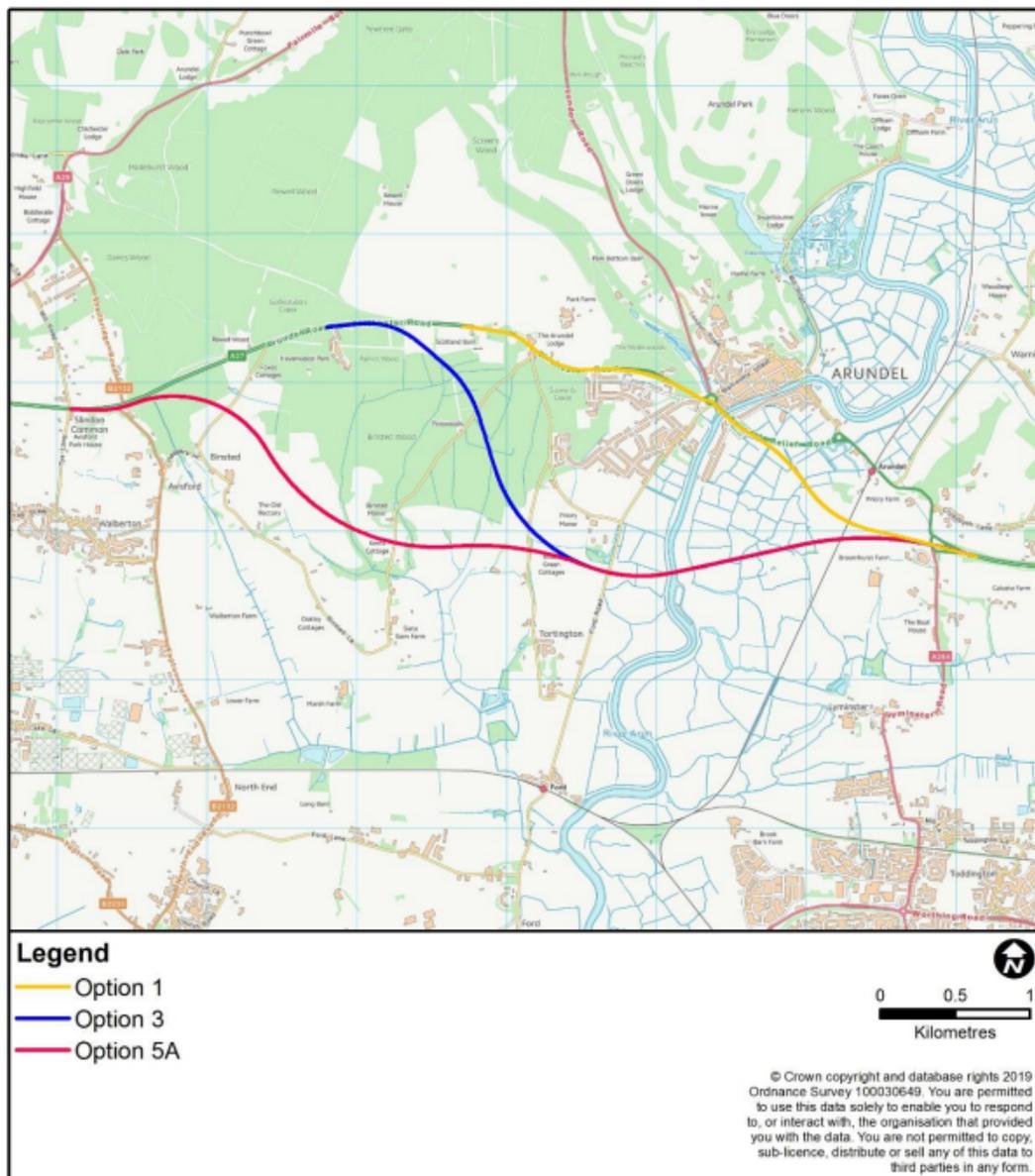


Plate 3-3 2017/2018 PCF Stage 2 Options

- 3.3.6 Following the Preferred Route Announcement, National Highways began carrying out further studies and surveys of the then preferred route and the surrounding area to progress the preliminary design for the Scheme.
- 3.3.7 In October 2018, National Highways announced that a further, non-statutory public consultation would be undertaken on the Scheme and that the Scheme would return to PCF Stage 2 (Option Selection).
- 3.3.8 Following the public consultation, modifications to the options were considered to avoid or reduce impacts on ancient woodland, Tortington Priory and road safety. National Highways wanted to ensure that the decision on the preferred route was made taking into account this information and that consultees were given a fair opportunity to comment on the options through another non-statutory public consultation.

3.4 Selection of the preferred route

- 3.4.1 The further PCF Stage 2 (Option Selection) (2018/2019) work included the identification of a range of potential new Scheme options. The process for identifying and short-listing the new set of Scheme options for consideration in PCF Stage 2 (Option Selection) is set out in the National Highways PCF Stage 2 *Environmental Assessment Report* (Ref 3-2) and the *Interim Scheme Assessment Report* (Ref 3-4).
- 3.4.2 The Interim Scheme Assessment Report assessed all Scheme options: namely 1V5, 1V9, 3V1, 4/5AV1, 4/5AV2 and 5BV1 in order to inform the further non-statutory public consultation. The options assessed at this stage are highlighted in Plate 3-4.

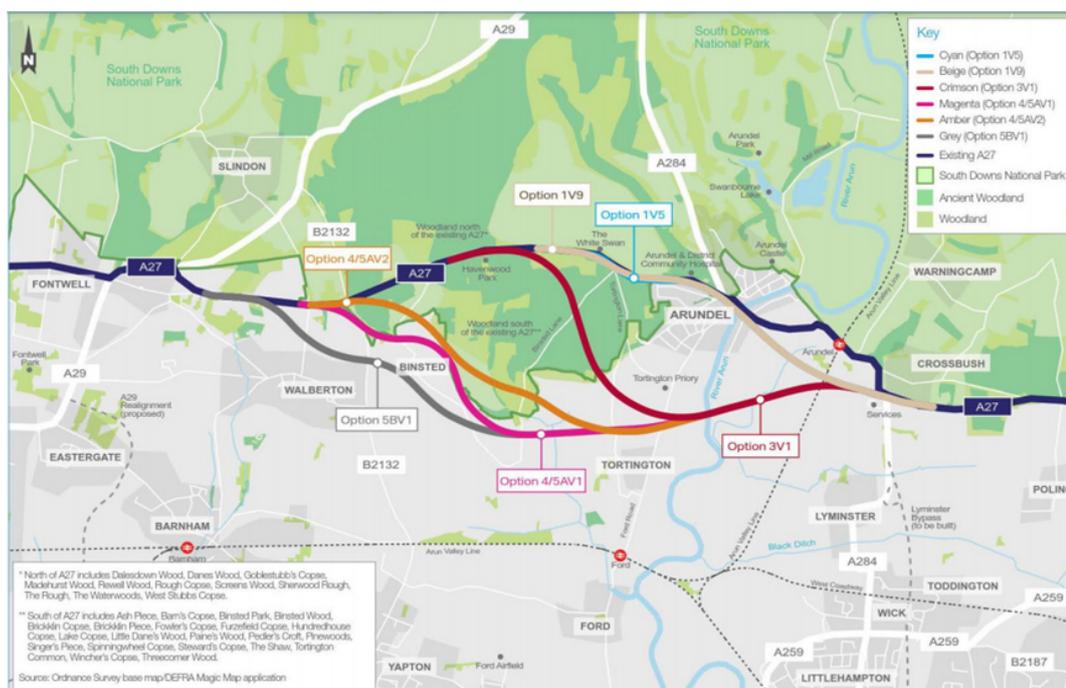


Plate 3-4 2020 PCF Stage 2 Scheme Options

- 3.4.3 The methodology used to make the recommendation on the preferred route followed the structure of the *Design Development Option Assessment Framework* (Ref 3-5) contained within the WebTAG Transport Appraisal Process, which includes environmental and policy considerations as well as being based on the five headline assessments criteria from the DfT's *Transport Business Case Five Case Model* (Ref 3-6), namely:
- Strategic Fit
 - Value for Money (Economic Case)

Ref 3-4 Highways England, A27 Arundel Bypass Further Consultation Interim Scheme Assessment Report (2019)

Ref 3-5 Department for Transport (May 2018), Appendix A, Transport Analysis Guidance The Transport Appraisal Process.

Ref 3-6 Department for Transport (January 2013), The Transport Business Cases.

- c. Financial Case
 - d. Delivery Case
 - e. Commercial Case
- 3.4.4 This was followed by the selection of the preferred route, option '5BV1' otherwise known as the 'Grey route' on 15 October 2020. The Grey route was selected as the preferred route by considering how well the proposed design met the Scheme objectives (contained within the *Interim Scheme Assessment Report* (Ref 3-4); the potential impacts on local communities and the environment around Arundel; the extent to which the proposals comply with planning policy; the feedback received during the public consultation process; and the cost of delivering the Scheme and the value-for-money that would be achieved. The Grey route has provided the basis from which preliminary design of the Scheme has been developed.
- 3.4.5 Whilst the Grey route was preferred, there were still environmental constraints (including veteran trees which have the same status as ancient woodland) and stakeholder and community concerns to consider which have been taken into account in the further development of the Scheme design.

3.5 Design development

- 3.5.1 Since National Highways announced the preferred route for the Scheme, further design development has been undertaken. This is still ongoing and is being informed by the iterative design and EIA process, stakeholder engagement and more in-depth knowledge of the environmental baseline that would potentially be affected by the Scheme, as presented in this PEI Report.
- 3.5.2 National Highways is undertaking ongoing environmental and ground investigation surveys along the preferred route alignment to gain a more detailed understanding of the constraints and opportunities present within the study area. These surveys have helped inform the options appraisal and the design development in order to reduce the potential effects on the environment and local communities. These surveys are also informing the need for mitigation measures, which will be integrated into the Scheme design so that the Scheme is sensitive to the environment and the existing landscape.
- 3.5.3 A number of key design components of the Scheme have undergone design development option appraisals since the preferred route announcement to identify and assess alternative solutions. Environmental effects have been considered during this appraisal process alongside other considerations, including planning policy, cost, buildability (including construction programme, utility diversions, risk of ground settlement and impacts on the road network), maintenance requirements, and considering the health and safety of the construction workforce, landowners and members of the public. Environmental topics considered in this appraisal process include all those that are addressed in this PEI Report.

- 3.5.4 As part of the continuing dialogue with stakeholders regarding the Scheme proposals, it has been suggested that a junction at Ford Road should be included as part of the Scheme. This possibility is currently the subject of ongoing options appraisal. However, initial findings suggest that its inclusion as part of the Scheme is not justified. Should that options appraisal conclude that a junction at Ford Road is required as part of the Scheme, a further targeted consultation will be undertaken on that proposed inclusion. Detail on the options appraisal undertaken and its conclusions will be presented in the ES.
- 3.5.5 The main reasons for the selection of the chosen component options and the rejection of alternatives will be reported in accordance with the requirements of the EIA Regulations in the ES. In this PEI Report chapter, the key differentiators between the options that have been considered during the design development option appraisals are summarised below, along with illustrations of the alternatives as developed at the time. Where a particular environmental topic or other consideration is not discussed below, it is because it was not considered a determining factor in the selection of the option to be taken forward as part of the Scheme design.
- 3.5.6 The options outlined below that have been taken forward as part of the Scheme design development process, are included in the PLEM, presented in Figure 2-1.

Western tie-in

Options considered in this location

- 3.5.7 Options have been considered at the western tie-in to understand the best option for connecting the proposed bypass with the existing A27, and the best alignment for the proposed bypass to take between this connection and Yapton Lane, in the vicinity of the existing Avisford Park Golf Club. A range of potential options were initially identified, but some were ruled out early on due to the need for options to address the following key design aspirations:
- a. Avoiding unnecessary impacts on existing woodland habitat and potentially veteran or ancient trees.
 - b. Minimising impacts on residential properties in terms of land take and amenity.
 - c. Maintaining the existing access arrangements at the Avisford Grange housing development to minimise any impact on development implementation.
 - d. Minimising impacts on the Avisford Park Hotel and Avisford Park Golf Club.
 - e. Promoting safe and attractive opportunities for walkers, cyclists and horse riders.
- 3.5.8 The following three options were appraised:

- a. Design development option a – Southern alignment.
- b. Design development option b – Reduced speed (50 mph) alignment.
- c. Design development option c – Roundabout.

3.5.9 Recognising that a locational change in speed limit represented a significant shift in Scheme design, other options, including 60 mph alignments, were considered. However, given these options did not reduce the environmental impact to that of the reduced speed, or mitigate safety concerns in terms of design, these options were not taken forward for further assessment.

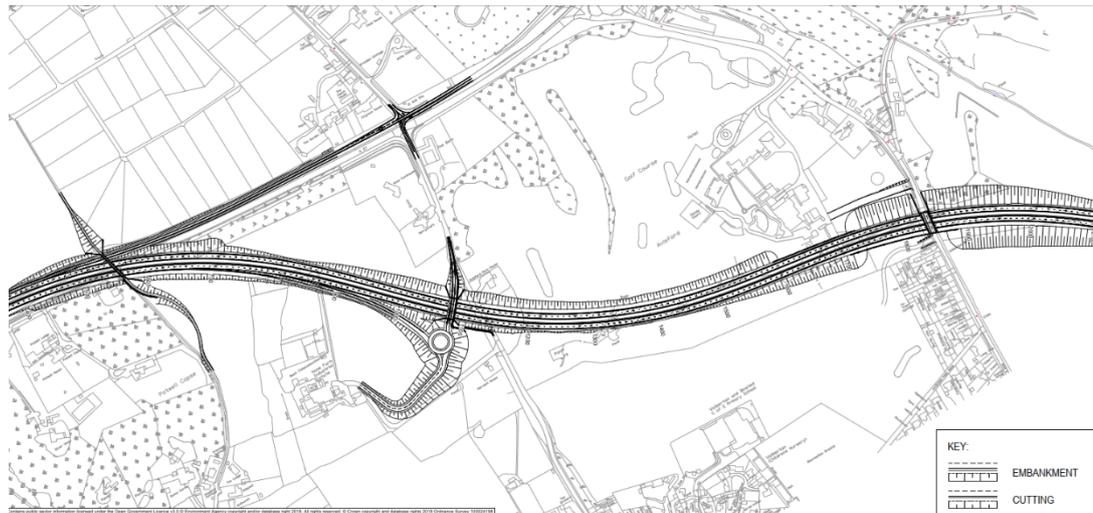


Plate 3-5 Design development option a – southern alignment

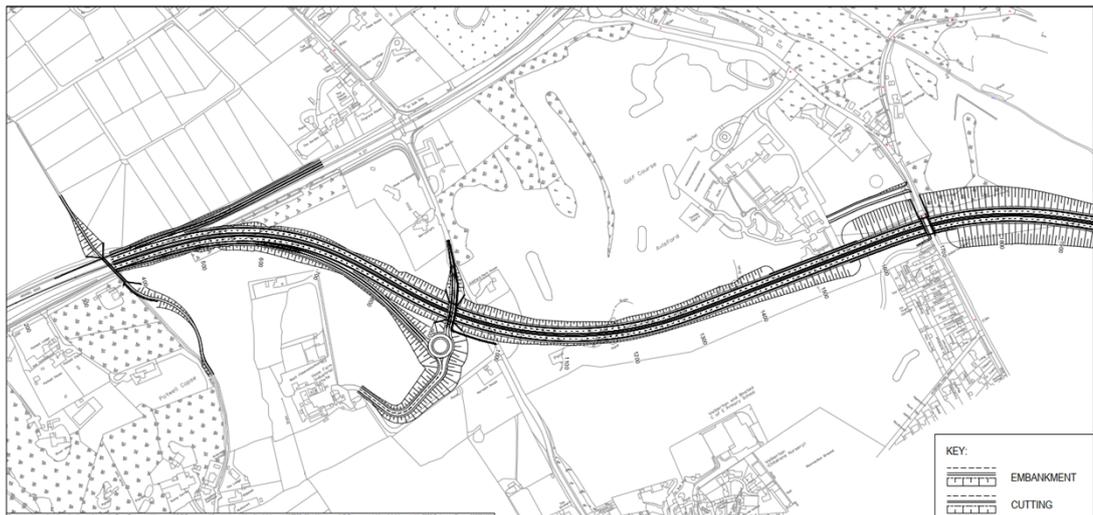


Plate 3-6 Design development option b – reduced speed (50 mph) alignment

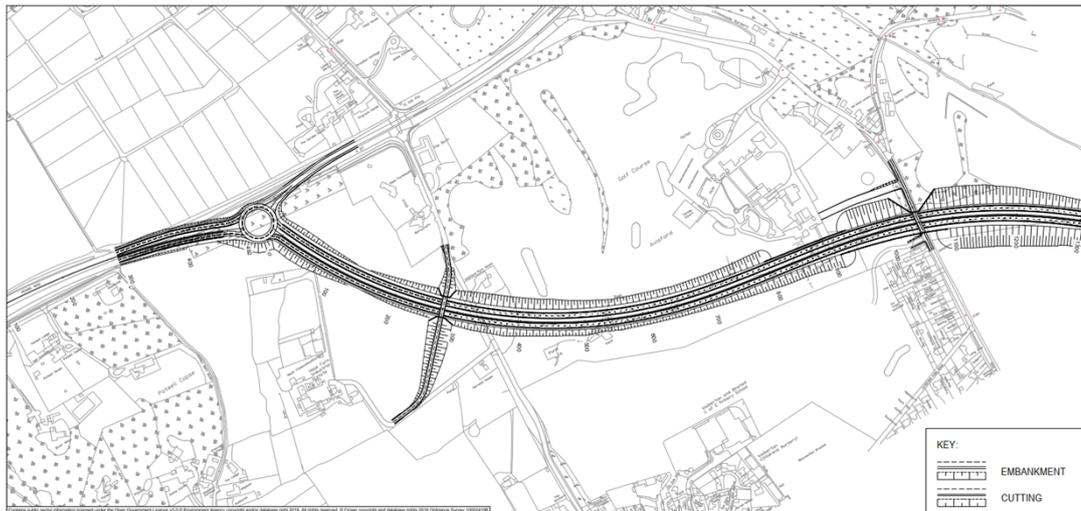


Plate 3-7 Design development option c – roundabout

Summary of the design development option appraisal

- 3.5.10 In terms of air quality and noise, the reduced speed (design development option b) and roundabout (design development option c) perform better as these options are generally further from relevant sensitive receptors at Hooe Farm Industrial Estate. The reduced speed (design development option b) would also likely result in reduced emissions of pollutants and noise levels from vehicles due to the vehicle engines operating at a more efficient speed.
- 3.5.11 In terms of biodiversity and arboriculture, the reduced speed (design development option b) and roundabout (design development option c) are considered to be more favourable than the southern alignment (design development option a), as these options would reduce the extent of the Scheme by approximately 500 m. This is vital as this 500 m extent contains habitat which is likely to be utilised by Annex II bat species and has the potential to sever existing flight lines. Although there is currently uncertainty on the magnitude of impact, the habitat loss has the potential to undermine the Favourable Conservation Status (see *Chapter 8: Biodiversity*) of the local bat population. All options considered would affect ancient and veteran trees. However, the reduced speed (design development option b) would have the least impact.
- 3.5.12 In landscape and visual terms, the reduced speed (design development option b) is considered the best option of the three. This is due to the reduced vegetation clearance alongside the existing A27 to the west of Arundel Road compared with the southern alignment (design development option a) and because of its reduced footprint when compared with the roundabout (design development option c). In heritage terms, the reduced speed (design development option b) is marginally further from the Grade II listed Avisford Park Hotel. The reduced footprint and alignment also reduces the effect on the historic parkland.

- 3.5.13 In planning policy terms, the reduced speed (design development option b) and roundabout (design development option c) are considered the better options given their smaller footprint and because they reduce impacts on areas of biodiversity and arboricultural importance when compared to the southern alignment (design development option a). In terms of the acceptability of departures from standard for Safety Engineering and Standards (SES) and WSCC, the reduced speed (design development option b) design is favourable as it mitigates the existing substandard dual carriageway geometry and visibility east of Fontwell East roundabout. However, the southern alignment (design development option a) is the best option in terms of meeting the Scheme objective of reducing travel time along the A27.
- 3.5.14 In terms of buildability, the reduced speed (design development option b) is considered the best option because it results in less temporary and permanent land take from the golf course compared with the other options. It also reduces the impact on access to the golf course and Hooe Farm Industrial Estate during construction. The reduced speed (design development option b) also results in fewer materials being used in cuttings and embankments and vehicle movements required to construct it are fewer than compared with the other two options.
- 3.5.15 However, whilst design development option b has considerable benefits, it does perform marginally worse in terms of journey times compared to other options, by 36 seconds in the eastbound morning peak periods and 37 seconds in the eastbound evening peak periods.

Outcome of the design development option appraisal

- 3.5.16 Taking into account all the above factors in the design development option appraisal, the option taken forward for the Scheme is the reduced speed alignment (design development option b). As described above, this option is considered the best option of the three from an environmental perspective, whilst it is also considered preferable from a planning policy and buildability perspective.
- 3.5.17 Since the reduced speed alignment (design development option b) was selected, the roundabout shown in Plate 3-7 to the south west of the Tye Lane bridge crossing of the proposed bypass has been modified to a priority junction to Hooe Farm Industrial Estate. This layout provides better access to the proposed bypass, whilst also leaving access from the private road from Tye Lane for the local workers at the industrial estate, which was not possible with a roundabout in this location.

Binsted Rife alignment

Options considered in this location

- 3.5.18 Options have been considered in terms of the alignment of the proposed bypass where it crosses Binsted Rife. The 'Grey route' alignment from the preferred route announcement on 15 October 2020 was compared with three other options which shift the horizontal alignment further south away

from the listed Church of St Mary's, Binsted. Various different heights of the Scheme were also considered. For the purposes of comparison in this design development option appraisal, a viaduct structure was selected across the rife.

3.5.19 The following four options were considered:

- a. 'Grey route' alignment, approximately 40 m from the Church of St Mary's, Binsted (approximately 15.7 m above ground level to the level of the road surface).
- b. Alignment further south approximately 110 m from the Church of St Mary's, Binsted (approximately 9.5 m above ground level to the level of the road surface).
- c. Alignment further south approximately 110 m from the Church of St Mary's, Binsted (approximately 13.8 m above ground level to the level of the road surface).
- d. Alignment further south approximately 110 m from the Church of St Mary's, Binsted (approximately 11.5 m above ground level to the level of the road surface).

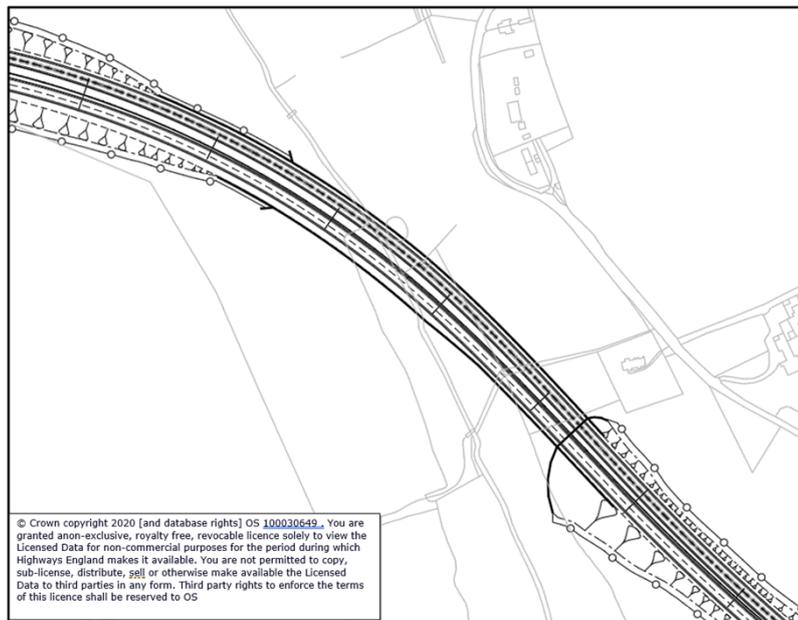


Plate 3-8 Design development option a – 'Grey route' alignment

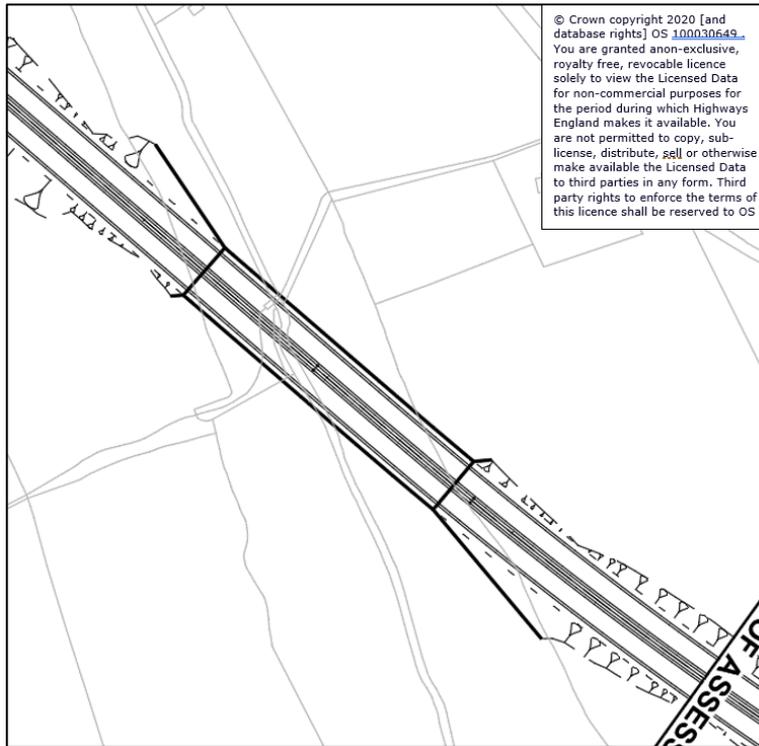


Plate 3-9 Design development option b

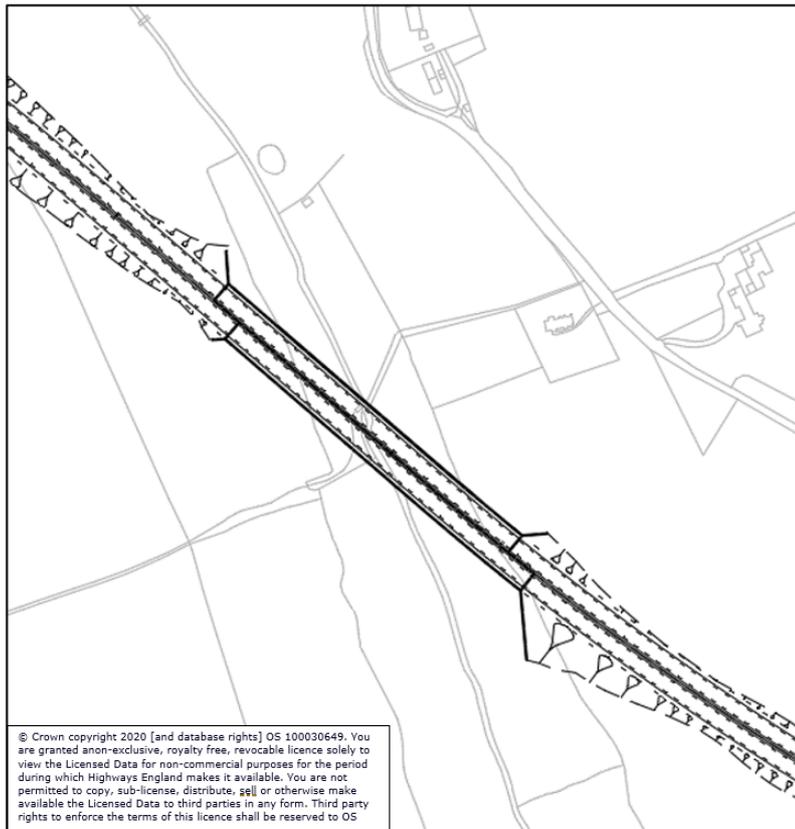


Plate 3-10: Design development option c

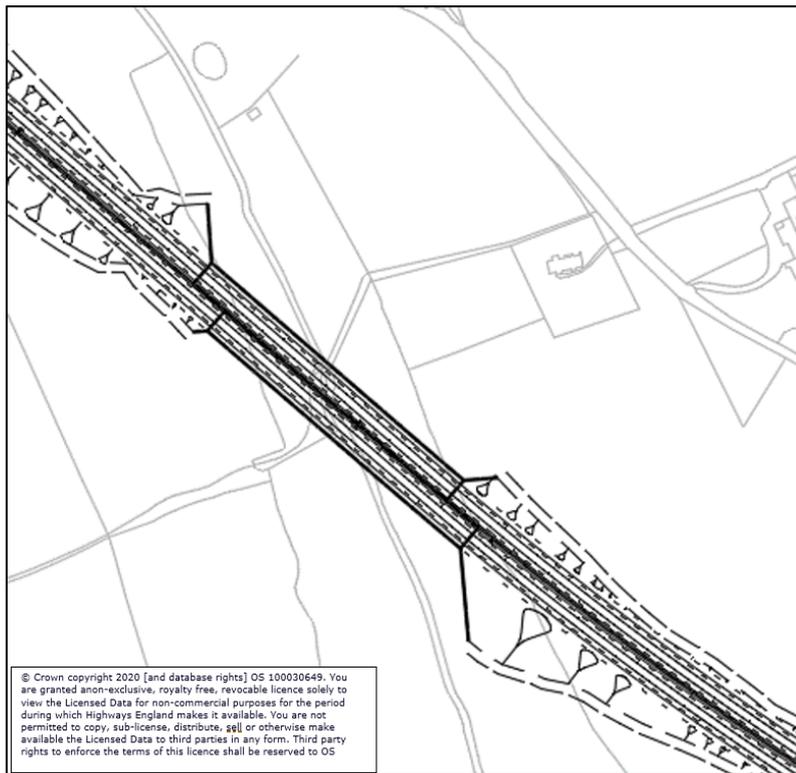


Plate 3-11: Design development option d

Summary of the design development option appraisal

- 3.5.20 From a biodiversity perspective, the better performing options are those with larger clearances and cross-sectional areas beneath the carriageway, which is more likely to provide appropriate commuting routes for bats. Design development option a therefore performs best in this regard, followed by design development options c and d. From a built heritage and visual impact perspective, the options that have a lower elevation of the carriageway and an increased distance between the Church of St Mary's, Binsted and the Scheme are considered likely to have a reduced impact. Therefore, design development option b performs best in this regard. The design development option a alignment would also likely result in the removal of a veteran tree, whereas the other options would not.
- 3.5.21 From a planning policy perspective, the options assessed above which have a reduced impact on the listed Church of St Mary's, Binsted (design development option b performs best in this regard) and which provide adequate clearance for commuting bats (design development option a, followed by design development options c and d) are also considered to be the better options. Design development option d is considered to be the best option on balance when considering both built heritage and biodiversity together, as it is furthest from the listed Church of St Mary's, Binsted and also provides sufficient clearance for bats, but is not as high above ground level as design development option c.

Outcome of the design development option appraisal

- 3.5.22 Taking into account all the above factors in the design development option appraisal, the option taken forward for the Scheme is design development option d as it balances the built heritage and biodiversity considerations. This option is the one furthest south from the Church of St Mary's, Binsted and it has a crossing height that provides sufficient clearance for bats, whilst limiting the height to reduce impacts on views to and from the church. Design development option d also does not impact on the veteran tree that would require removal if design development option a were to be progressed.

Binsted Rife crossing

Options considered in this location

- 3.5.23 Options have been considered in this location to appraise the best structural design solution for where the proposed bypass intersects Binsted Rife. The alignment of the proposed bypass across Binsted Rife is considered separately.
- 3.5.24 The following three structural design options were considered:
- a. Design development option – Long underbridge (approximately 140 m long by approximately 20 m wide, over the existing rife).
 - b. Design development option – Viaduct (approximately 160 m long, with the rife to be realigned).
 - c. Design development option c – Single span bridge (approximately 30 m wide, clear span with the rife to be realigned).

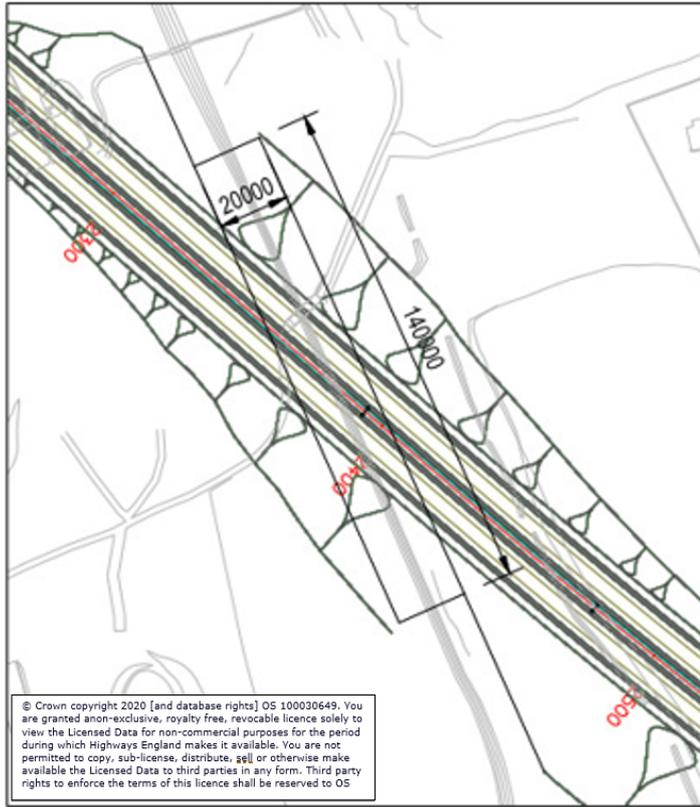


Plate 3-12: Design development option a – long underbridge

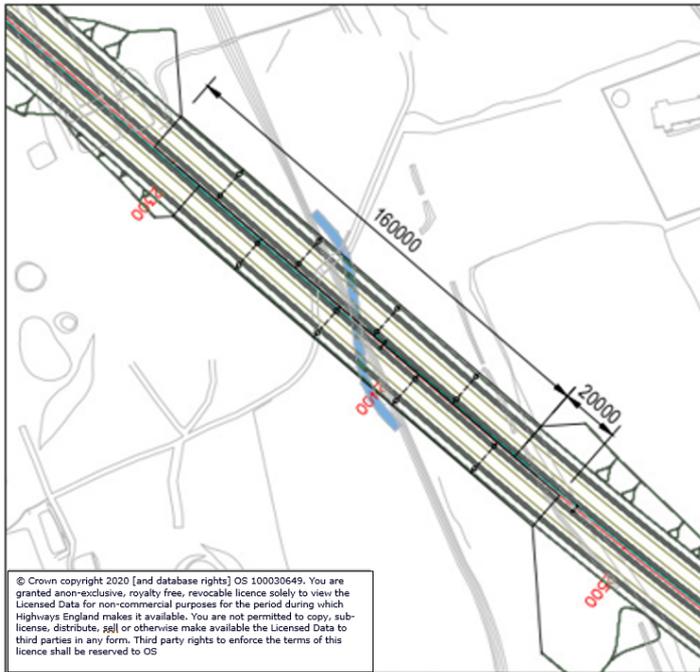


Plate 3-13: Design development option b – viaduct

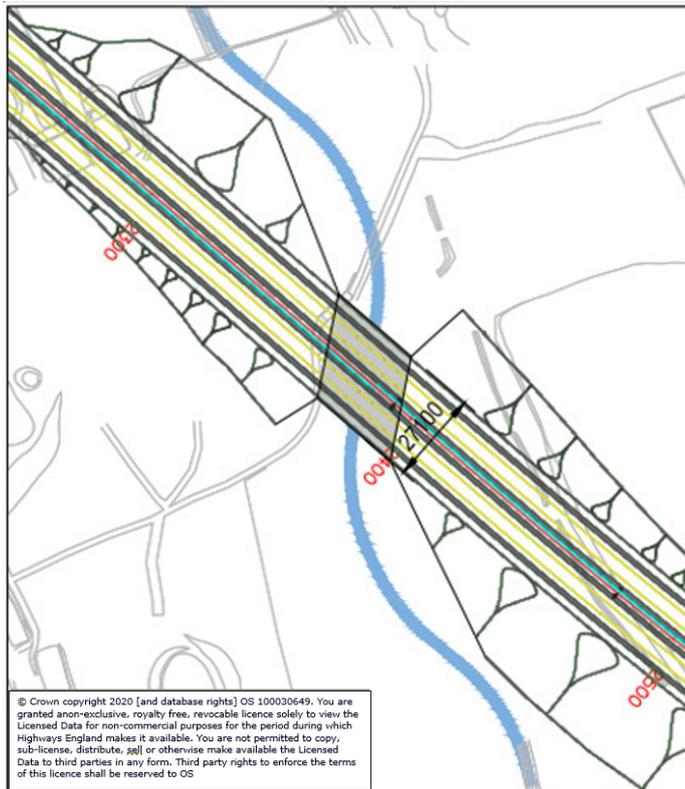


Plate 3-14: Design development option c – single span bridge

Summary of the design development option appraisal

- 3.5.25 From a biodiversity perspective, all options incorporate a localised realignment of the river which would allow for ecological enhancement opportunities. The long underbridge (design development option a) is unlikely to be viable from a bat commuting perspective due to its enclosed nature, whereas the viaduct (design development option b) is inherently open allowing for continued bat commuting. The single span bridge (design development option c) is also likely to be a viable solution in terms of bat commuting.
- 3.5.26 The long underbridge (design development option a) would likely require a considerable realignment of the PRoW 350. The viaduct (design development option b) would not impact the PRoW, whereas the single span bridge (design development option c) would only involve minimal PRoW realignment within its current route corridor.
- 3.5.27 From a buildability perspective, the construction programme of the single span bridge (design development option c) is the shortest of the three options. Less construction plant, lifting operations and piles are required in the construction of this option, when compared with Options a and b.

- 3.5.28 From a cost perspective, the single span bridge (design development option c) is the most economical solution as fill material can be utilised from the site to assist with the overall cut/fill balance. Ongoing maintenance is also reduced with this structure, whereas the viaduct (design development option b) would require more effort to inspect and maintain bearings and movement joints.

Outcome of the design development option appraisal

- 3.5.29 Taking into account all the above factors in the design development option appraisal, the option taken forward for the Scheme is the single span bridge (design development option c). It is regarded as the best design solution when considering environmental, buildability, cost and maintenance issues as a whole.

Binsted Lane

Options considered in this location

- 3.5.30 Options have been considered in this location to determine the best alignment for the proposed bypass in the vicinity of Binsted Lane and the alignment of a north-south road where it crosses the proposed bypass.
- 3.5.31 The following four options were considered:
- a. 'Grey route' alignment (two bridges over the bypass, with the eastern bridge assumed to be a modified green bridge).
 - b. Revised alignment, where two bridges cross over the bypass closely following the existing road layout on Binsted Lane, with a third mixed use bridge in between.
 - c. Revised alignment that connects both parts of Binsted Lane together north of the proposed bypass, with a green bridge (Binsted Lane Overbridge) across the bypass.
 - d. As above for design development option c, with the green bridge (Binsted Lane Overbridge) moved slightly eastwards (to shorten the pedestrian diversion route).

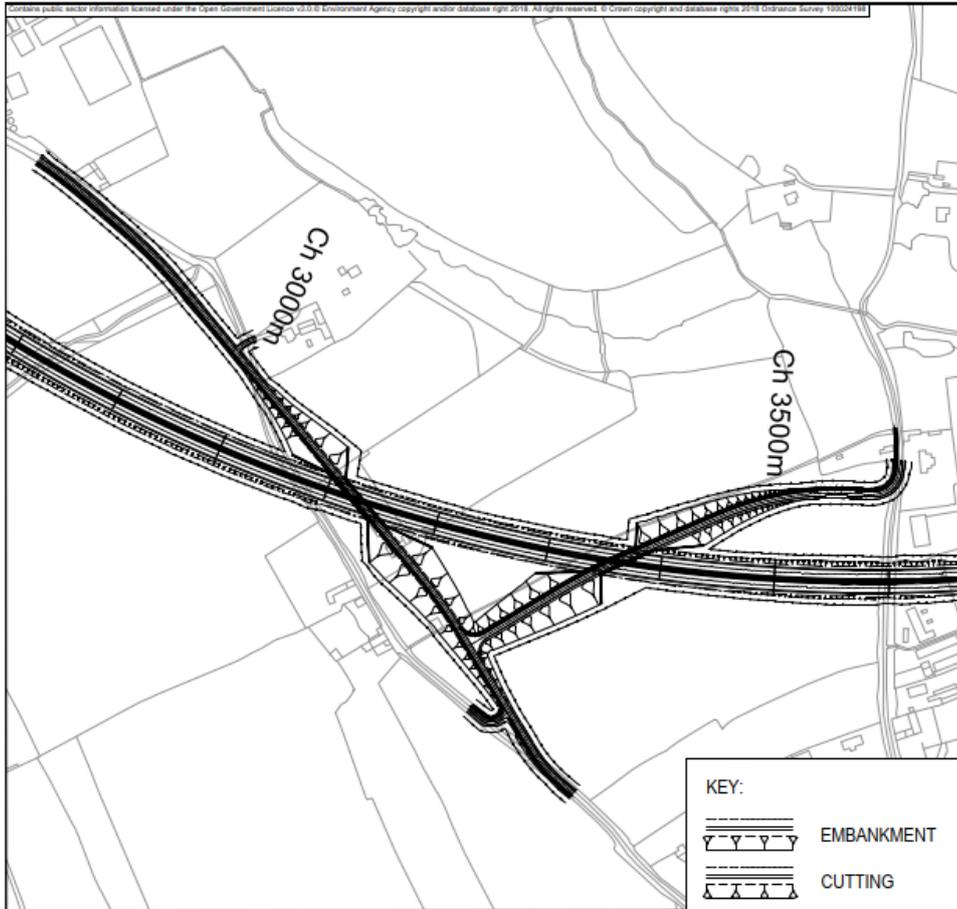


Plate 3-15: Design development option a – ‘grey route’ alignment

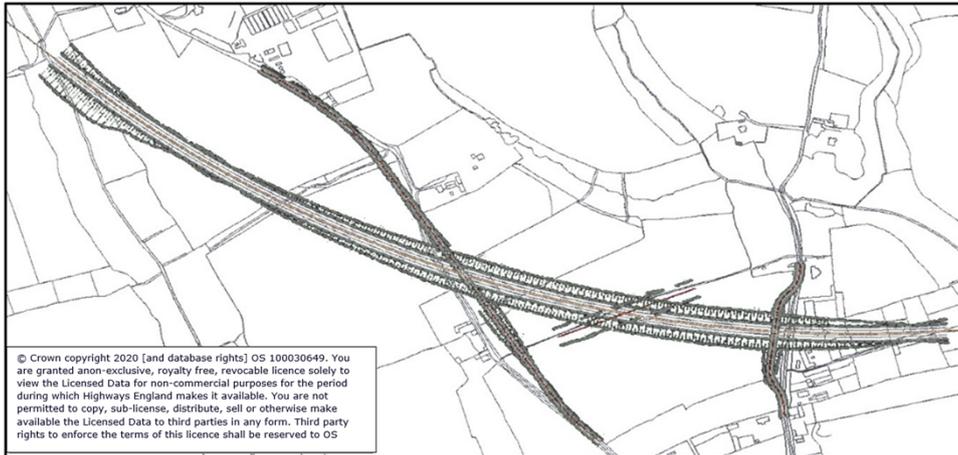


Plate 3-16: Design development option b

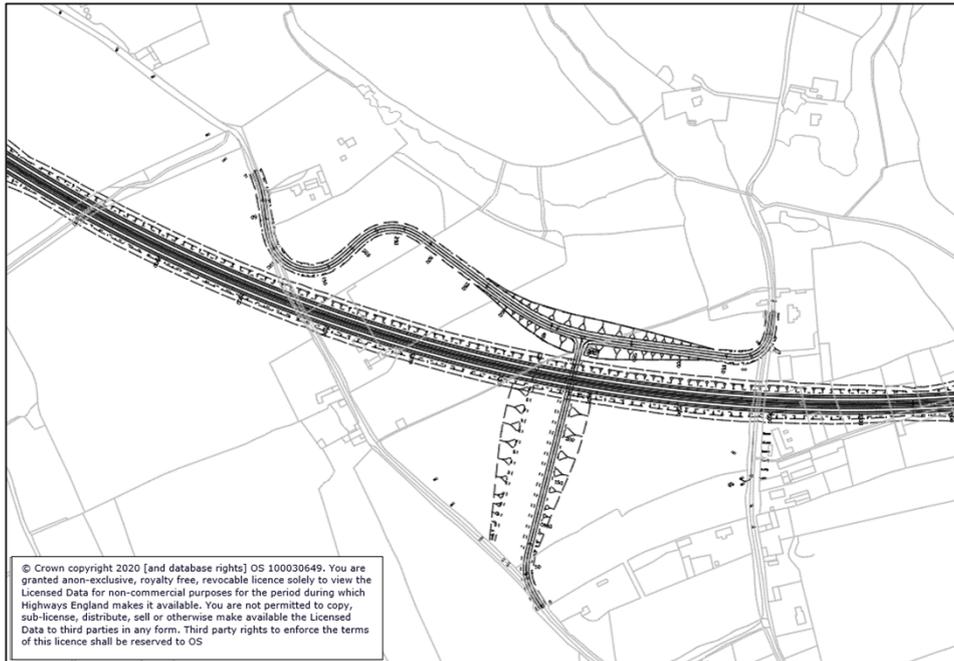


Plate 3-17: Design development option c

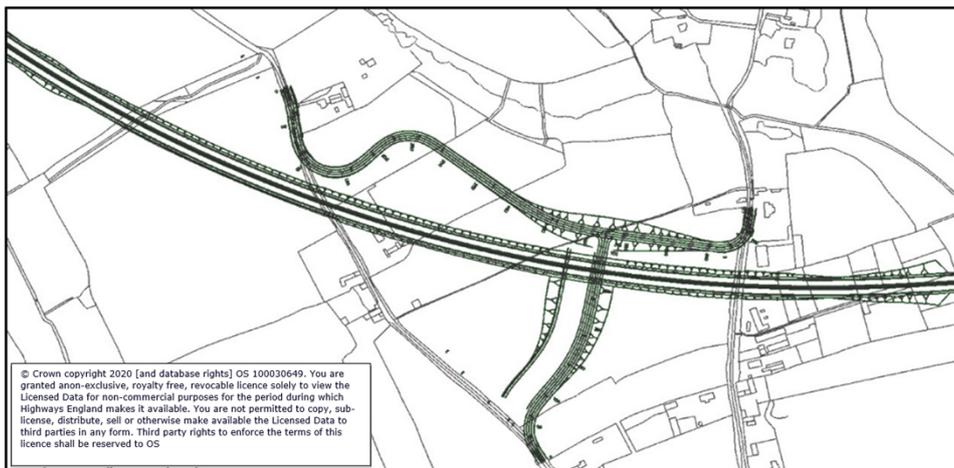


Plate 3-18: Design development option d

Summary of the design development option appraisal

- 3.5.32 From a biodiversity perspective, whilst all options would result in the loss of mature hedgerows and grassland, design development option b would reduce the footprint, and therefore would retain a greater extent of existing habitat and allows greater confidence in the potential success of any proposed mitigation and compensation. This option is also likely to mean that a veteran tree to the east of Binsted Lane could be retained, whereas it would potentially be impacted or lost with all other options.

- 3.5.33 Design development option a is the worst performing of the four options from a biodiversity perspective as the alignment of the road severs hedgerow habitat that is likely to have a supporting function for ancient woodland and for protected/notable species, in particular notable bat populations. Design development options c and d provide a single green bridge which provides better connectivity for habitats than the other options, with design development option d preferred due to being closer to existing bat flight lines.
- 3.5.34 Design development options b, c and d would have the benefit of moving traffic on Tortington Lane further away from existing sensitive receptors, such as residential properties. This is particularly the case for design development options c and d which move the proposed bridges furthest from all existing sensitive receptors. Design development option b also has the advantage of being in deep cutting, with the three bridges all being approximately at grade, thus reducing the visual impact and the requirement for additional visual and noise screening of traffic. Two crossings would also be kept closer to the historic road layout, allowing the partial retention of landscape and field patterns.
- 3.5.35 From a buildability perspective, design development Options c and d are considered to be the better options. They result in less temporary land take, which should enable more access to be maintained to existing land uses during construction. Compared with design development option b, a much smaller amount of material is required to be excavated in order to construct Options a, c and d and therefore vehicle movements during construction are also reduced. The construction programme is also shortest for design development options c and d, as they both involve the construction of one large structure as opposed to two or three associated with development options a and b respectively.
- 3.5.36 In terms of maintenance requirements, design development Options c and d would require less inspection and maintenance visits each year. There are less structures required to be constructed over the proposed bypass to accommodate local access/traffic than compared with Options a and b.
- 3.5.37 Design development option d is considered better to design development option c because by shifting the alignment eastwards it means a shorter pedestrian diversion route is required.

Outcome of the design development option appraisal

- 3.5.38 Taking into account all the above factors in the design development option appraisal, the option taken forward for the Scheme is design development option d. Traffic on Binsted Lane would be moved further from existing sensitive receptors. It is also considered a good option compared with design development option a as it impacts fewer landowners, limits the loss of existing hedgerow habitat and provides an ecological link through the introduction of the green bridge. There are also fewer structures being proposed within this option, meaning that access would be easier to maintain during construction and less complex ongoing maintenance

requirements. Design development options c and d are similar, but design development option d is the better option because it shortens the required pedestrian diversion route, and the green bridge would also be closer to existing bat flight lines.

Tortington Rife crossing

Options considered in this location

- 3.5.39 Options have been considered in this location to appraise the best structural design solution for where the proposed bypass intersects Tortington Rife.
- 3.5.40 The following two structural options were considered:
- Single span underbridge (with a minimum length of 20 m, with wing walls at both ends of the bridge).
 - Viaduct (approximately 130 m in length).

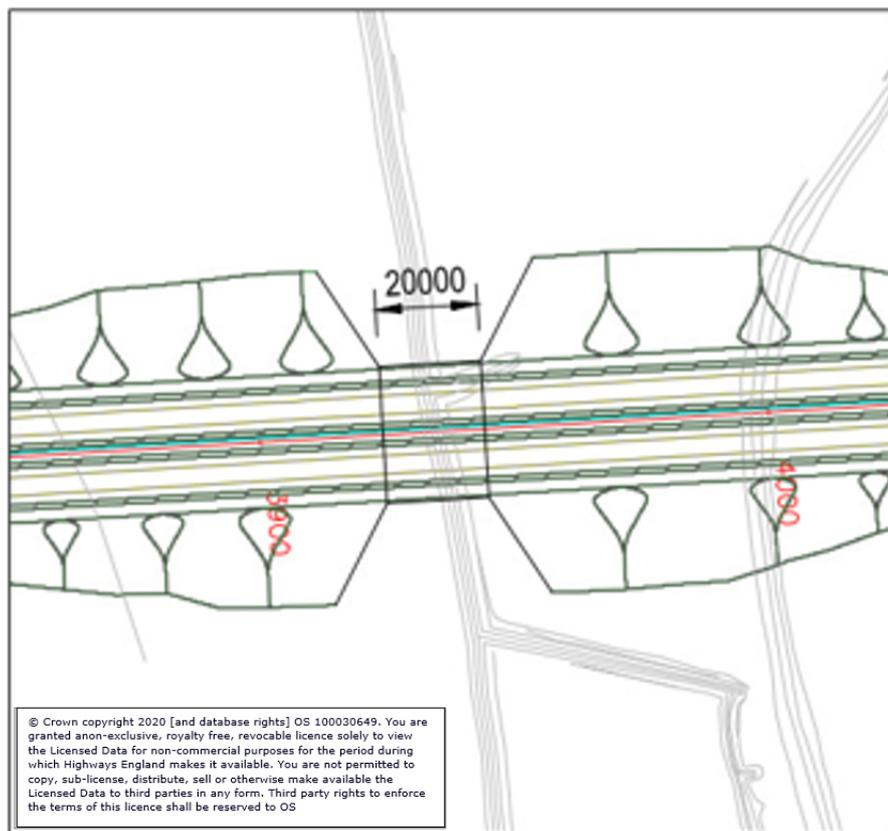


Plate 3-19: Design development option a – single span underbridge

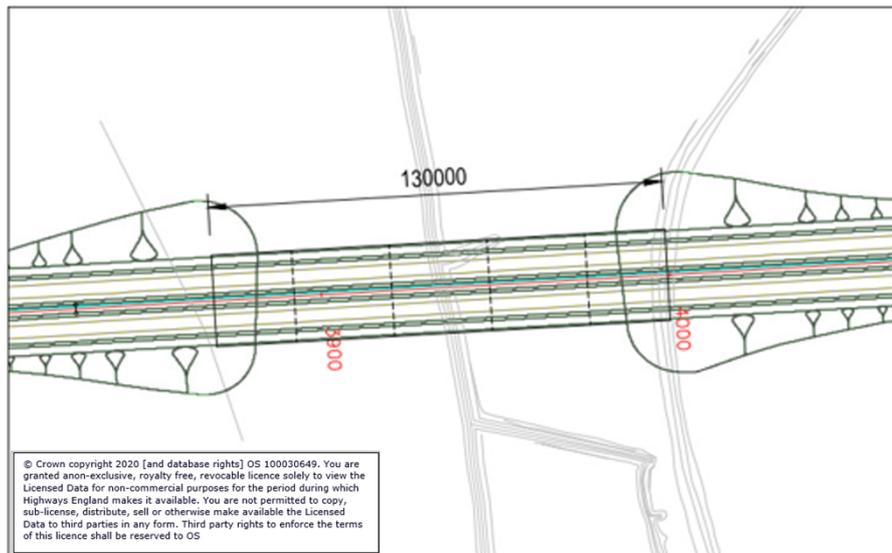


Plate 3-20: Design development option b – viaduct

Summary of the Design development option appraisal

- 3.5.41 The single span underbridge (design development option a) would allow the possibility of more habitat creation within the existing field boundaries. The viaduct (design development option b) would limit the chance for habitat creation within the existing field boundaries, although would potentially represent a slightly better feature for bat commuting.
- 3.5.42 In respect of flood risk and drainage, the single span underbridge (design development option a) would require more flood compensation when compared with the viaduct (design development option b). The design is also likely to result in flood conveyancing issues, whilst there would be a requirement to realign an existing drainage ditch. The viaduct (design development option b) would require minimal flood compensation and there would be less requirement for realignment of the existing drainage ditch.
- 3.5.43 In landscape and visual impact terms, the single span underbridge (design development option a) would block views across the existing landscape. However, with focused habitat creation within the existing field boundaries, the open character on the eastern bank would potentially be retained. The viaduct (design development option b) would be viewed as a more open feature within the existing landscape.
- 3.5.44 From the perspective of buildability, the single span underbridge (design development option a) requires a reduced number of lifting operations and fewer piles, as well as a reduced construction programme when compared with the viaduct (design development option b) which would require extensive temporary works.

- 3.5.45 From a cost perspective, the single span underbridge (design development option a) is the most economical solution as fill material can be utilised from the site to assist with the overall cut/fill balance. Ongoing maintenance is also reduced with this single span structure, whereas the viaduct (design development option b) involves multiple larger spans which would require more effort to inspect and maintain bearings and movement joints.

Outcome of the design development option appraisal

- 3.5.46 Taking into account all the above factors in the design development option appraisal, the option taken forward for the Scheme is the single span underbridge (design development option a). It was determined to be the better design solution with regard to buildability, particularly in terms of construction programme, cost and maintenance requirements. Although it is recognised the viaduct (design development option b) is the better option from an environmental perspective, as described above, design development option a does also allow the opportunity for creating more habitat.

Tortington Lane

Options considered in this location

- 3.5.47 Options have been considered where the proposed bypass crosses the existing Tortington Lane, in order to determine the best alignment for the Scheme in this location.
- 3.5.48 The following four alignment options were considered:
- a. Proposed bypass in cutting and the existing Tortington Lane alignment maintained.
 - b. Proposed bypass in cutting and the existing Tortington Lane realigned to the east on a green bridge over the bypass.
 - c. Proposed bypass at grade with the existing Tortington Lane realigned to the east on a green bridge over the bypass.
 - d. Proposed bypass at grade with the existing Tortington Lane realigned to the east in an underpass beneath the bypass.

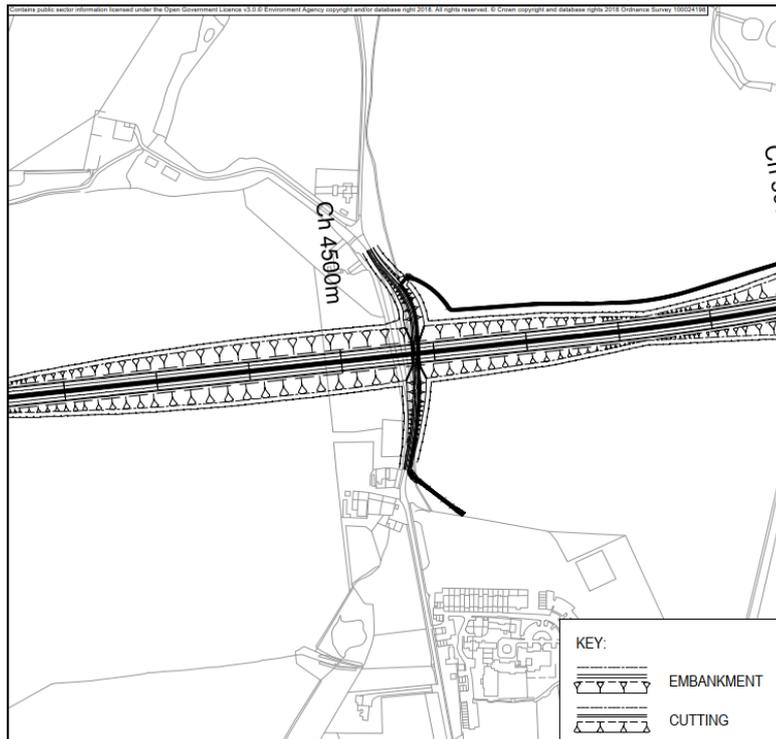


Plate 3-21: Design development option a – Tortington Lane maintained

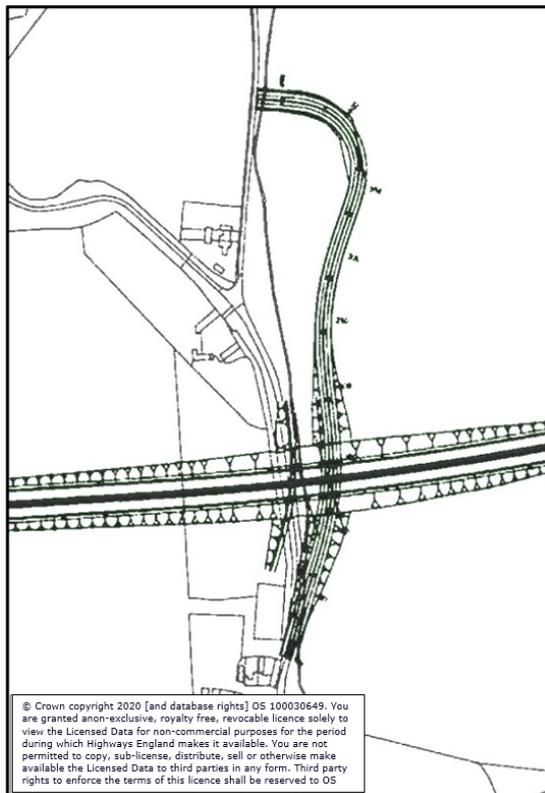


Plate 3-22: Design development option b – realigned green bridge over cutting

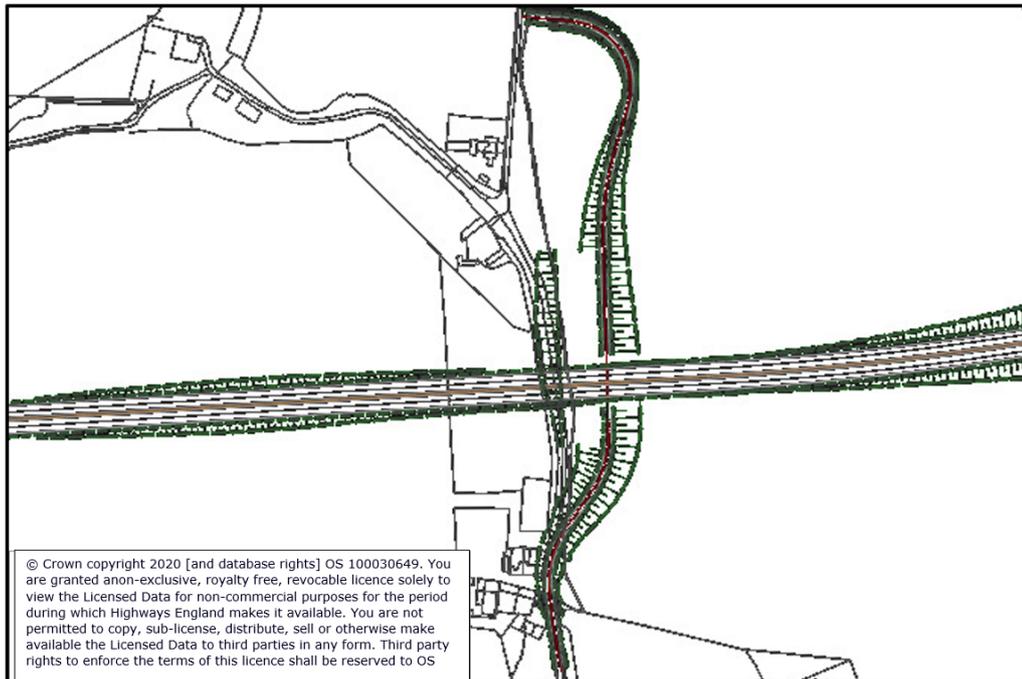


Plate 3-23: Design development option c – realigned green bridge at grade

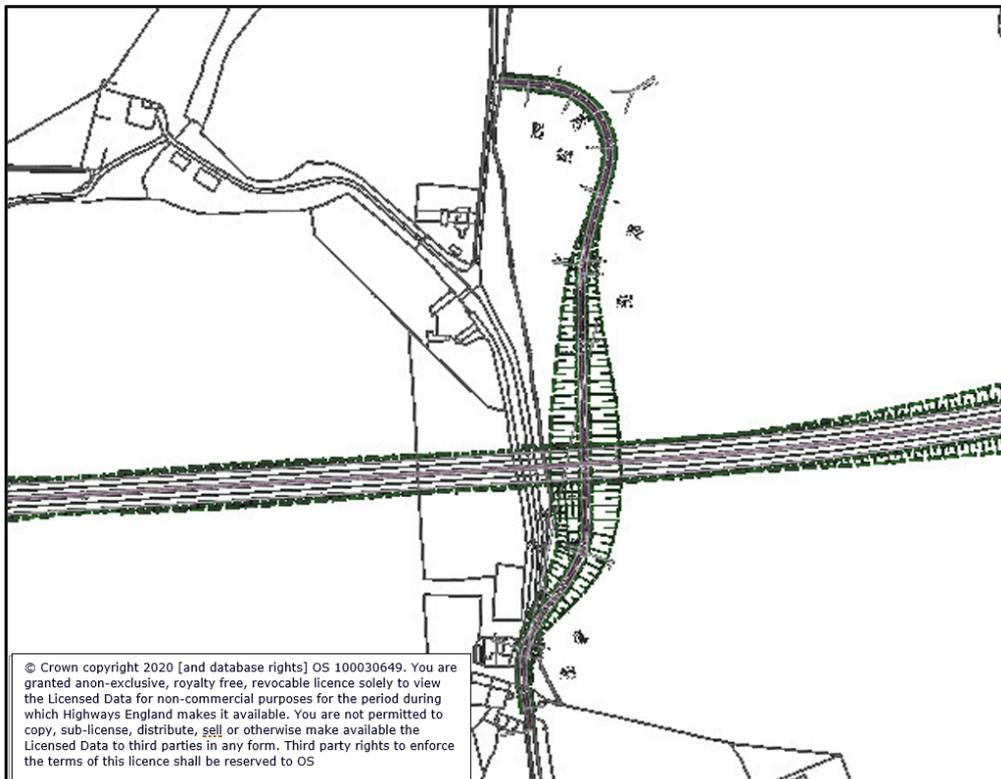


Plate 3-24: Design development option d – realigned underpass at grade

Summary of the design development option appraisal

- 3.5.49 From a biodiversity perspective, all options would result in the loss of mature trees, hedgerow and arable habitat. However, maintaining the existing Tortington Lane alignment (design development option a) would not allow for compensation of habitat severance in this location, which could impact on the integrity of nearby bat roosts. Therefore, a realigned road with a green bridge structure (design development options b and c) would be the better solution as it would allow space for replacement habitat to be restored close to its existing position which would keep habitat interconnected.
- 3.5.50 From a noise perspective, the better performing options are those where the operational traffic would be in a cutting (design development options a and b), which would help shield nearby residential receptors from traffic noise. From an air quality and noise perspective, realigning Tortington Lane to the east (design development options b, c and d) has the benefit of moving traffic further from existing sensitive receptors such as residential properties.
- 3.5.51 From a landscape and visual and built heritage perspective, whilst it represents an engineered change in landform, the options with the bypass in cutting (design development options a and b) would be less intrusive visually and there would be less requirement for additional landscaping and noise mitigation. A green bridge structure (design development options b and c) would also reduce any perceived north-south severance by retaining a green link. Although options where Tortington Lane is realigned to the east (design development options b, c and d) would have more impact on the historical setting of the Tortington Priory scheduled monument, it is determined that the difference in distance would only result in a marginal increased impact and that the significance of effect would not change between options.
- 3.5.52 In terms of water resources, constructing the bypass at grade (design development options c and d) means a minor watercourse could be culverted rather than diverted, and it would have less of an impact on groundwater movement since there would be no cutting.
- 3.5.53 From the perspective of planning policy, the best option is considered to be design development option b as it would result in less permanent land take when compared with design development options c and d. Design development option b, along with design development option c, is also considered positively in planning policy terms given the proposed green bridge which provides habitat interconnectivity as well as helping to reduce perceived north-south severance.

- 3.5.54 In respect of buildability, design development option d is considered to be the best design development option as it is likely to have the shortest construction duration and is less disruptive to existing roads and accesses during the construction works with fewer construction vehicle movements required. From a health and safety perspective, design development option b is the better option in that the works can be safely executed without introducing interfaces between people and construction plant.

Outcome of the design development option appraisal

- 3.5.55 Taking into account all the above factors in the design development option appraisal, the option taken forward for the Scheme is for the proposed bypass to be constructed in shallow cutting, with the existing Tortington Lane realigned to the east on a green bridge (a modified version of design development option b, where the vertical alignment was raised to improve surface water drainage, reduce the impact on ground water and remove the need for a pumping station). Whilst design development option b, c and d each have their merits, design development option b is regarded as the better option from a biodiversity perspective due to the habitat connectivity provided by the green bridge and putting the proposed bypass in cutting is likely to be the best solution from a noise perspective with respect to operational traffic. Whilst design development option c also provides a green bridge, it does not put the proposed bypass in cutting.

Floodplain crossing

Options considered in this location

- 3.5.56 Options have been considered in this location to appraise the best structural design solution for the crossing of the River Arun floodplain by the Scheme. There are several considerations required within the floodplain, including views along the Arun Valley, impacts on biodiversity and flood risk management.
- 3.5.57 The following three structural options were considered:
- Full embankment
 - Full viaduct
 - Hybrid

Summary of the design development option appraisal

- 3.5.58 In terms of flood risk, the embankment option (design development option a) is considered more likely to result in flood conveyancing issues than design development options b and c, and much larger floodplain compensation areas would also be required.

- 3.5.59 In terms of biodiversity, the embankment option (design development option a) would require more land take when compared with design development options b and c and would create a barrier to the movement of protected or notable species. However, there would be the opportunity to create new habitats along the embankments. The viaduct option (design development option b) has the advantage of maintaining existing levels of habitat connectivity across the floodplain.
- 3.5.60 From a landscape and visual impact perspective, an embankment (design development option a) would likely create more disruption and severance in the landscape when compared with design development options b and c. There would be disruption to the continuity of views from ground level, including those of Arundel Castle and the South Downs. Whilst the viaduct structure (design development option b) would be highly visible, it would at least retain the open character of the floodplain and reduce the severance of the landscape when compared with the embankment option.
- 3.5.61 From an air quality perspective, the embankment option (design development option a) would require more vehicle movements during construction when compared with the viaduct option (design development option b), so greater associated emissions and an increased risk of localised dust impacts during the construction phase.
- 3.5.62 The hybrid option (design development option c) would have similar advantages and disadvantages to the viaduct and embankment options listed above, but may not provide all the benefits of the full viaduct option in terms of flood risk, maintaining habitat connectivity and minimising severance on the landscape which are important considerations in this location.
- 3.5.63 From a planning policy and consenting perspective, the viaduct option (design development option b) is considered the best design development option in this location to mitigate potential impacts on hydrology, biodiversity, landscape and cultural heritage. These potential impacts have been consistently highlighted statutory environmental bodies. This design development option also results in less land becoming permanently unusable due to land take, when compared with the embankment option (design development option a).
- 3.5.64 From a buildability perspective, the viaduct option (design development option b) has a shorter construction programme than the embankment option (design development option a), although it is longer than the hybrid option (design development option c). There is also less fill material required to be imported to construct the viaduct option (design development option b), compared with the other options

Outcome of the design development option appraisal

- 3.5.65 Taking into account all the above factors in the design development option appraisal, the option taken forward for the Scheme is the full viaduct (design development option b). It is regarded as the best solution from a flood risk, biodiversity, landscape and air quality perspective as described above. It is also the best solution from a buildability and planning policy perspective.

Floodplain crossing alignment

Options considered in this location

- 3.5.66 Options have been considered in this location to determine the best alignment for the proposed bypass across the River Arun floodplain

- 3.5.67 The following five alignment options were considered:

- a. 'Grey route' alignment.
- b. Alignment approximately 20 m north of the 'Grey route' alignment.
- c. Alignment approximately 45 m north of the 'Grey route' alignment.
- d. Northern alignment (further north still on the eastern floodplain).
- e. Southern alignment.

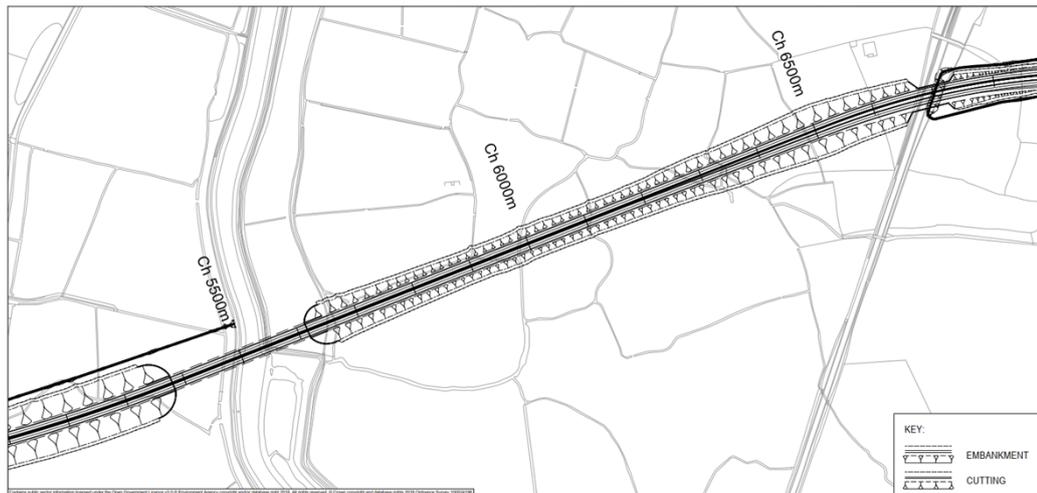


Plate 3-25: Design development option a – 'Grey route' alignment

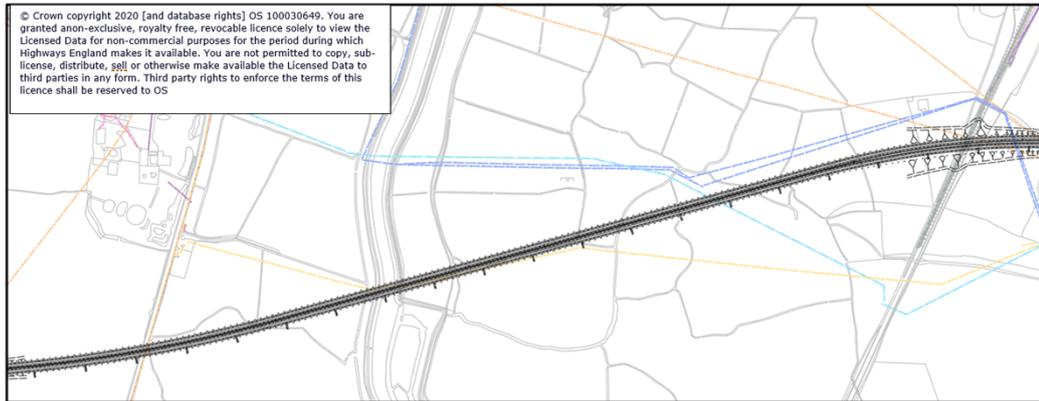


Plate 3-26: Design development option b – 20 m north of ‘grey route’ alignment

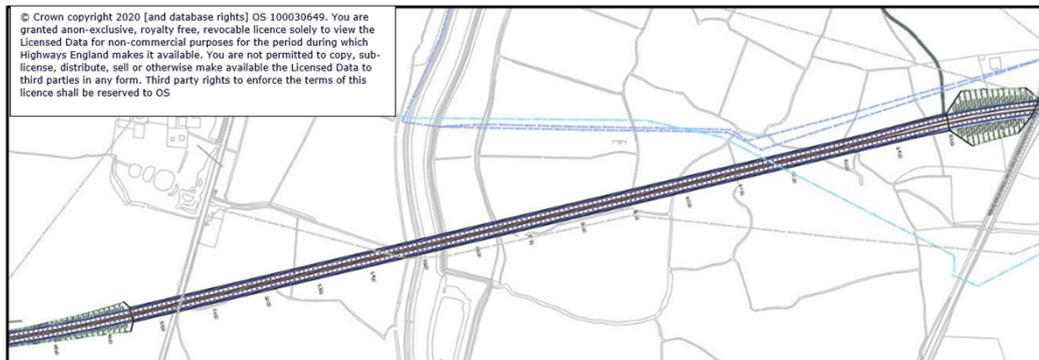


Plate 3-27: Design development option c – 45 m north of ‘grey route’ alignment

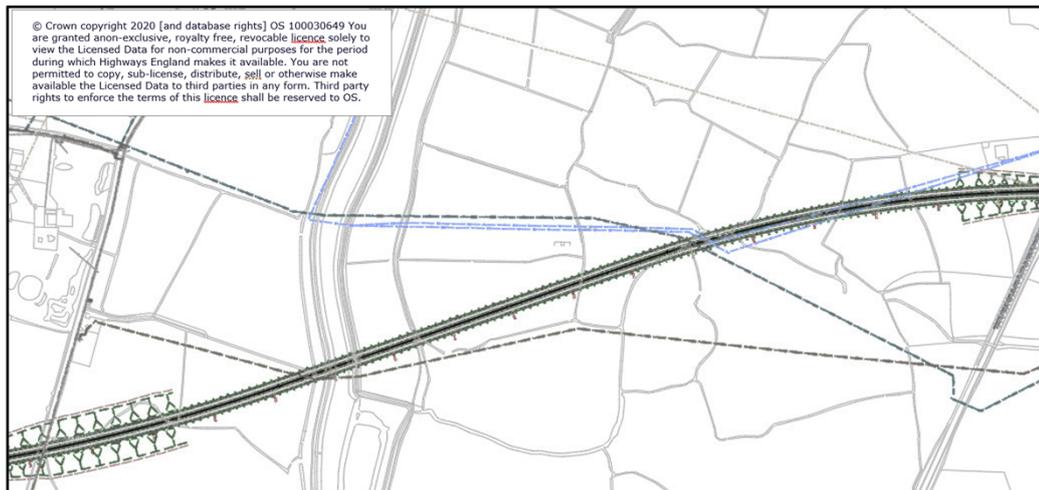


Plate 3-28: Design development option d – northern alignment



Plate 3-29: Design development option e – southern alignment

Summary of the Design development option appraisal

- 3.5.68 From a biodiversity perspective, most options are similar with the exception of the southern alignment (design development option e) which would result in the loss of reed bed habitat. Reed bed habitat is located along the margins of the River Arun and represents a habitat of Principal Importance. There is potential for any over-shading of the habitat to limit growth of this stand through a reduction in light availability. This would likely reduce the coverage of this habitat, adversely affecting its conservation status which may be considered significant at a Local level and which would likely require compensation.
- 3.5.69 From a noise perspective, there is a slight benefit for the southern alignment (design development option e) compared with other options, given that it is furthest from the residential areas on the southern edge of Arundel and from Tortington Priory. The northern alignment (design development option d) would be closest to these sensitive receptors, but at this stage there is considered to be little difference between the options.
- 3.5.70 In terms of cultural heritage, the proximity of the alignment to Tortington Priory, a scheduled monument, is not considered to have any tangible difference between the alignments and the impact on the setting of Tortington Priory.
- 3.5.71 From a buildability perspective, design development options a and b would require extensive gas main diversion works which could result in considerable disruption to existing land uses. The southern alignment (design development option e) also has more constraints than design development options c and d because construction in the location of the salt marsh would be more complex and sensitive. A more complex curved structure with increased spans over the River Arun would also be required for the southern alignment (design development option e), making this option less favourable from a buildability and maintenance perspective.

- 3.5.72 Comparing design development options c and d, it is considered that design development option d is the better option because it results in the shortest crossing of the River Arun and least disruption in terms of requirements to divert the gas main, thus reducing programme risk. It also crosses Ford Road further south from Tortington Priory, although it is acknowledged the difference between options is minimal when considering the impact on setting.

Outcome of the design development option appraisal

- 3.5.73 Taking into account all the above factors in the design development option appraisal, the option taken forward and being developed for the Scheme is design development option c, 45 m north of the 'Grey route'. It is regarded as the best solution as it does not result in the loss of reed bed habitat (as is the case with design development option e), and also would result in considerably less disruption caused by the extensive gas main diversion works that would be required for both design development options a and b. Along with design development option d, it is considered the better option from the perspective of buildability and maintenance, with design development option c considered to be slightly better given the shorter crossing of the River Arun and reduced disruption in terms of requirements to divert the gas main.

Summary

- 3.5.74 The options outlined above and taken forward form the Scheme that is described in *Chapter 2: The Scheme* and which is assessed in each of the technical chapters of this PEI Report. The final design to be assessed and reported in the ES will take account of the outcomes of the statutory consultation. Any changes to the design and the reasons for these will be described in the assessment of alternatives chapter within the ES.

4. Environmental Assessment Methodology

4.1 General approach

National Policy Statement for National Networks (NPSNN)

- 4.1.1 The *NPSNN* (Ref 1-7) sets out the need for and the Government's policies to deliver NSIPs on the national road and rail networks in England. The *NPSNN* is used by the Secretary of State as the primary basis for making decisions on applications for road and rail NSIPs.
- 4.1.2 Given the Scheme is a road network NSIP, the EIA approach adopted is in accordance with the *NPSNN*. In particular, the EIA adheres to all the methodology requirements cited within *NPSNN Section 5: Generic Impacts*. Mitigation measures are being developed in accordance with the mitigation requirements also set out in Section 5 of the *NPSNN*.

The Design Manual for Roads and Bridges (DMRB)

- 4.1.3 Standards published by National Highways for the preparation of environmental assessments of proposed road schemes are contained in the *DMRB LA 104* (Ref 4-1). *LA 104* sets out the general process and the methods for environmental assessments. Individual environmental topic guidance is provided in *DMRB LA 105* through to *LA 116* (Ref 4-2).
- 4.1.4 *DMRB LA 105 – LA 116* provide guidance on the environmental topics to be included in an EIA for highways schemes, and the methods to be used in the assessment for each of those topics. The topics identified in Sections 5 to 14 of this PEI Report are those required by DMRB and by the *EIA Regulations* (Ref 4-3).
- 4.1.5 The EIA will be undertaken in accordance with the EIA Regulations and adhere to the most up to date, relevant standards contained in DMRB as applicable. The methodologies used for the preliminary assessments for individual topics in this PEI Report are based on those provided in the *EIA Scoping Report* (Appendix 1-A) and take on board relevant comments from the *EIA Scoping Opinion* (Appendix 1-B), having regard to the current stage of the assessment. Should any revisions to the DMRB be issued between scoping and reporting of the EIA, they will be adopted where appropriate, provided that it is reasonable to do so within the programme and governance for the project. Any changes in environmental legislation, such as for example the EIA Regulations, will be mandatory, and therefore accommodated within the ES as relevant.
- 4.1.6 As mentioned above, the EIA will be undertaken in accordance with the relevant standards contained in DMRB as applicable. Where departures

Ref 4-1 Standards for Highways (2020), Design Manual for Roads and Bridges, LA 104 – Environmental Assessment and Monitoring.

Ref 4-2 Standards for Highways (2019), Design Manual for Roads and Bridges, Sustainability and Environment.

Ref 4-3 The Stationary Office, The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

from the DMRB methodology are taken, they have been outlined in Table 4-1.

Table 4-1 DMRB methodology departures

Environmental Discipline	Departures from DMRB methodology
Air Quality	<p>The methodology for the air quality assessment is derived from the <i>DMRB LA 105 - Air Quality</i> (Ref 4-4). <i>Chapter 5: Air Quality</i> outlines the application of this methodology in the context of the Scheme.</p> <p>On the basis of the current status of the traffic data available for the PEI Report, a proportionate approach to the reporting of air quality effects has been adopted which differs from DMRB methodology, whereby increases and decreases in concentrations are described in relation to exceedances of air quality objective values. However, full results will be presented for air quality predictions in the ES in accordance with DMRB methodology with total concentrations and changes in concentrations presented to 1 decimal place. The discussion of results in the PEI Report focuses on receptors where there is a change in traffic that would result in a deterioration of air quality, or where a beneficial change in traffic has been identified which could lead to a significant beneficial impact where existing air quality is poor. In the ES air quality effects for all routes within the affected road network for the Scheme will be discussed. Refer to <i>Chapter 5: Air Quality</i> for further details.</p>
Landscape and Visual	<p>The methodology for the Landscape and Visual Impact Assessment (LVIA) is derived from <i>DMRB LA 107 Landscape and visual effects</i> (Ref 4-5). In accordance with <i>DMRB LA 107</i> Figure 3.17N and Figure 3.38, the LVIA methodology uses professional judgement to determine the sensitivity of landscape and visual receptors to the Scheme. The 'typical descriptors' for the sensitivity of landscape and visual receptors have been expanded to provide criteria to guide the assessment of landscape value, the value attached to views and susceptibility to change. These criteria have been defined so as to be representative and proportionate to the Scheme and its context. The</p>

Ref 4-4 Standards for Highways (2019), Design Manual for Roads and Bridges, LA 105 - Air quality.
Ref 4-5 Standards for Highways (2020), Design Manual for Roads and Bridges, LA 107 - Landscape and visual effects.

Environmental Discipline	Departures from DMRB methodology
	methodology has been discussed and agreed with various stakeholders during the environment focus groups for the Scheme and National Highways Landscape Policy Advisors.

Other environmental topic specific guidance

- 4.1.7 In addition to the DMRB standards mentioned above, there are other environmental topic specific standards and guidance which have been and will continue to be followed, as set out where relevant within each specific discipline chapter of the *EIA Scoping Report* (Appendix 1-A).

Other studies

Habitats Regulations Assessment

- 4.1.8 In accordance with *DMRB LA 115 Habitats Regulations Assessment* (Ref 4-6), a Habitat Regulations Assessment (HRA) Screening has been undertaken for each site designated at an International or European level (Special Area of Conservation (SAC), candidate SACs, Special Protection Area (SPA), candidate SPAs and Ramsar sites) that could be affected by the Scheme.
- 4.1.9 The HRA Screening and any subsequent Appropriate Assessments will define any requirements for mitigation that are necessary to ensure there is no adverse effect on the integrity of these sites, alone or in combination with other plans and projects. Any required mitigation would then be incorporated into the Scheme design. Details of these assessments will be included within the ES and a shadow HRA Report will accompany the DCO application, which will include both a Likely Significant Effects section and an analysis to inform the Secretary of State’s Appropriate Assessment.
- 4.1.10 A shadow HRA Screening (Likely Significant Effects) Report has been included as a technical appendix (Appendix 8-A) to the Biodiversity section, contained within Volume 4 of this PEI Report. As reported in Appendix 8-A, it is not possible to rule out potentially significant effects at this time due to the potential relationship with respect to bat activity between habitat impacted by the Scheme and the Singleton and Cocking Tunnels Special Area of Conservation.

Water Framework Directive Compliance Assessment

- 4.1.11 A scoping level Water Framework Directive (WFD) assessment (Ref 4-7) has been completed to inform the assessment in this PEI Report. This is provided in PEI Report Volume 4: Appendix 13-A. A full WFD compliance assessment report will be produced alongside the ES. This will consider the

Ref 4-6 Standards for Highways (2020), Design Manual for Roads and Bridges, LA 115 - Habitat Regulations Assessment.

Ref 4-7 European Parliament (2000), Water Framework Directive, DIRECTIVE 2000/60/EC.

potential effects of the Scheme on WFD objectives of identified WFD waterbodies. For surface waterbodies this will assess biological, hydromorphological and/or physio-chemical quality elements. For groundwater bodies this will assess quantitative and chemical quality elements. Where potential adverse effects are identified, an assessment of these will inform the mitigation measures required to be incorporated into the Scheme design and the Scheme construction methods to be used that would remove or minimise the effects on the aquatic environment.

Flood Risk Assessment

- 4.1.12 To inform Scheme design and the assessment presented in this report, a preliminary level flood risk assessment including preliminary flood modelling has been conducted. The preliminary modelling has been undertaken using a model which is being developed in agreement with the Environment Agency, using precautionary parameters to inform the scheme design and option selection in key areas including the River Arun floodplain, and the crossings of Binsted Rife and Tortington Rife. The modelling has driven design solutions to reduce the impacts of the scheme on flood risk, including the development of mitigation measures such as improved flow conveyance and floodplain storage compensation
- 4.1.13 A detailed Flood Risk Assessment (FRA) is being undertaken, which considers all sources of flood risk, both to the Scheme and to third party property and land. It will consider all local sources of flood risk information, including the local flood risk management strategy, and strategic flood risk assessment when assessing sources of flood risk. It will also consider the vulnerability of the Scheme and its users to the impacts of climate change, confirming the measures required to ensure flood risk to the scheme and elsewhere can be managed. The final findings of the FRA will be presented in support of the ES and DCO application. In addition to assessing all sources of flooding, a key component of the detailed FRA will be detailed flood modelling using models approved by the Environment Agency to define the risk of flooding impacts and to inform the design of the flood mitigation required.

4.2 Study area and the draft Order Limits

- 4.2.1 The study areas assessed for the PEI Report for each environmental topic are described in the relevant topic chapter (refer to Chapters 5 to 14 of this report). The study areas for each topic have generally been based on the Scheme corridor and draft Order Limits as presented in Figure 1-1, unless stated within specific topic chapters. These study areas have been developed in accordance with relevant legislation, guidance and best practice, as described in each chapter.
- 4.2.2 Since completing the *EIA Scoping Report*, the design of the Scheme has continued to be developed and the land envisaged to be required to construct and operate the Scheme has been reviewed and refined as appropriate, to reflect the latest Scheme requirements at the time of statutory consultation. This land is referred to as the 'the draft Order Limits'

and has been based on the land anticipated to be potentially required temporarily and/or permanently for the construction, operation and maintenance of the Scheme. The draft Order Limits are shown on Figure 1-1.

- 4.2.3 Given that the draft Order Limits are a worst-case for land take, it can therefore be determined that any changes that occur to the draft Order Limits as the Scheme design progresses would likely result in a decrease in size of the draft Order Limits. Therefore, the study areas used in this PEI Report have been developed to encompass all the relevant receptors potentially significantly affected by the Scheme.
- 4.2.4 At this stage, an informed approach has been taken to define the draft Order Limits such that they are only expected to decrease as the design is developed in terms of the utility connections required for the construction and operation of the Scheme, based on the experience of the utility specialists and their engagement with statutory undertakers to date. Further information will be provided by the utility companies in advance of the DCO application and will be accounted for within the final Order Limits. The environmental implications of the utility connections that form part of the DCO application will be considered within each topic chapter within the ES.
- 4.2.5 Further assessment undertaken as part of the EIA and reported in the ES will be based on the draft Order Limits that will be presented in the DCO application.

4.3 Existing baseline and future conditions

- 4.3.1 In order to identify the impacts and likely significant environmental effects of the Scheme, it is important to understand the environment that would be affected by the Scheme (the 'baseline conditions'). Understanding the baseline allows the value of the environment (the 'sensitivity of receptors') and measurement of changes (the 'magnitude of impacts') that would be caused by the Scheme, to be fully appreciated.
- 4.3.2 Baseline conditions are not necessarily the same as those that exist at the current time; they are the conditions that would exist in the absence of the Scheme either:
- at the time that Scheme construction is expected to start, for impacts arising from construction; or
 - at the time that the Scheme is expected to open to traffic, for impacts arising from the operation of the Scheme.
- 4.3.3 Therefore, the identification of the baseline conditions involves predicting changes that are likely to happen in the intervening period, for reasons unrelated to the Scheme (this is hereafter referred to as the 'future baseline'). This will entail taking current conditions and committed development into consideration and using experience and professional judgment to predict what the baseline conditions might look like prior to start of Scheme construction and operation.

4.3.4 This PEI Report presents baseline information representing the understanding of the baseline at the time of writing. This baseline will be further developed as additional surveys are undertaken and data obtained, with a supplemented baseline being reported in the ES. Nevertheless, assessments reported within this PEI Report are considered a worst case as a precautionary approach has been taken to the baseline where further surveys are still to be undertaken. Limitations and assumptions are provided within each chapter of the specialist topics presented in Chapters 5 to 14 of this PEI Report in a section titled “Assessment assumptions and limitations”.

4.4 Potential significant effects and mitigation

Defining assessment years and scenarios

4.4.1 The assessment of effects involves comparing a scenario with the Scheme against one without the Scheme over time. The absence and presence of the Scheme are referred to as the ‘Do Minimum’ and ‘Do Something’ scenarios respectively. The ‘Do Minimum’ scenario represents the future baseline with minimal interventions and without new infrastructure.

4.4.2 Depending on the topic, the effects reported in this PEI Report (and in the ES) are assessed for the ‘Do Minimum’ and ‘Do Something’ scenarios in the future baseline year (assumed to be the year of Scheme opening, 2027 for the purposes of the ES) and a future design year (assumed to be 15 years after Scheme opening).

4.4.3 Construction of the Scheme will be assessed in detail in the ES in terms of the peak construction period, which will be identified based on the type and duration of concurrent construction activity when these details are known. The preliminary assessments relating to construction included within this PEI Report have identified potential construction impacts relating to the specific aspects of the Scheme as reported within *Chapter 2: The Scheme*. Demolition of the Scheme has been scoped out of the EIA, as detailed in the *EIA Scoping Report* (Ref 1-5) on the basis that the road would become an integral part of national infrastructure and would not be decommissioned.

Identifying potential environmental effects

4.4.4 The EIA Regulations require “*The description of the likely significant effects*” of the Scheme on the environment, covering “*the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development*” (Ref 4-8). The PEI Report provides an initial view on likely significant environmental effects, which will be reviewed during the ongoing and iterative EIA and design process and ultimately reported within the ES.

Assessing significance

- 4.4.5 The significance of an environmental effect is typically a relationship between the ‘value’ or ‘sensitivity’ of the receptor and the ‘magnitude’ or ‘scale’ of the impact.
- 4.4.6 Section 3 ‘Environmental assessment methodology’ of *DMRB LA 104* (Ref 4-1) provides advice on typical descriptors of environmental value, magnitude of impact and significance of effects. Table 4-2, Table 4-3 and
- 4.4.7 Table 4-4 of this PEI Report reproduce these descriptors and demonstrate how the significance of effect category can be derived. Classifications against these criteria have been made on the basis of professional judgement.

Table 4-2 Environmental value (sensitivity) and descriptors

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

Table 4-3 Magnitude of impact and typical descriptors

Magnitude of impact (change)		Typical description
Major	Adverse	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements.
	Beneficial	Large scale or major improvement of resource quality; extensive restoration; major improvement of attribute quality.
Moderate	Adverse	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.

Magnitude of impact (change)		Typical description
	Beneficial	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Minor	Adverse	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.
	Beneficial	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	Adverse	Very minor loss or detrimental alteration to one or more characteristics, features or elements.
	Beneficial	Very minor benefit to or positive addition of one or more characteristics, features or elements.
No Change		No loss or alteration of characteristics, features or elements; no observable impact in either direction.

4.4.8 Table 4-4 demonstrates how combining the environmental value of the resource or receptor (Table 4-1) with the magnitude of impact (Table 4-2) can be used to define a significance of effect category.

Table 4-4 Significance of effect matrix

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

4.4.9 The DMRB recognises that:

“Where relevant, individual environmental factors can set out variations in significance description requirements.”

“The approach to assigning significance of effect relies on reasoned argument, the professional judgement of competent experts and using effective consultation to ensure the advice and views of relevant stakeholders are taken into account”.

“Significant effects typically comprise residual effects that are within the moderate, large or very large categories.”

4.4.10 Table 4-5 illustrates how the DMRB describes the significance of effect categories. In arriving at the significance of effect, the assessor also needs to consider whether effects are direct, indirect, secondary, cumulative, short, medium or long-term, permanent or temporary, positive or negative.

Table 4-5 Effect significance categories and typical descriptions

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

4.4.11 In accordance with *DMRB LA 104* (Ref 4-1), effects that are moderate, large or very large are deemed to be significant. Effects determined to be slight or neutral are not deemed to be significant, and as such are unlikely to require specific mitigation. The exception to this is where the combination of multiple slight effects has the potential to lead to a significant (moderate or above) cumulative effect.

4.4.12 Not all the environmental topics use the above criteria, or the matrix approach detailed in Table 4-3. For example, some topics do not use a matrix-based approach, but instead use numerical values to identify impacts (such as noise and vibration), whilst some topics do not have agreed methods of assessment or scales of measurement for either value or sensitivity (such as geology and soils). Therefore, each environmental

topic specialist uses the information provided above, their topic specific guidance, as well as their professional judgement to assess the significance of effects. However, irrespective of the criteria or approach that a topic requires, the descriptors of significance listed in Table 4-5 have been used.

- 4.4.13 Further topic-specific details of the methodology for determining significance are presented in Chapters 6 to 15 of the *EIA Scoping Report* (Ref 1-5).

Mitigation measures, enhancements and residual effects

- 4.4.14 The EIA takes into account any design measures that have been incorporated into the Scheme design to mitigate its effects, which are known as embedded mitigation measures. In addition, any standard construction management activities that the Scheme would implement through the EMP, and in accordance with the NPSNN, have been incorporated into the assessment as standard control measures.
- 4.4.15 National Highways is committed to including mitigation measures as necessary to address potentially significant adverse environmental effects identified during the EIA process as far as reasonably practicable. The Scheme mitigation measures (including those needed for construction) will be set out in the register of environmental actions and commitments in the first iteration EMP, which will be subject to a DCO requirement. Mitigation of potentially significant adverse environmental effects (including, where appropriate, any proposed monitoring arrangements) is an iterative part of the Scheme development following the hierarchy below:
- a. Avoidance – incorporate measures to avoid the effect, for example, alternative design options or modifying the Scheme programme to avoid environmentally sensitive periods.
 - b. Reduction – incorporate measures to lessen the effect, for example, fencing off sensitive areas during construction and implementing an EMP to reduce the potential effects from construction activities.
 - c. Compensation/Remediation – where it is not possible to avoid or reduce a significant effect, then offsetting measures should be considered, for example the provision of replacement of habitat to replace that lost to the Scheme or remediation such as the clean-up of contaminated soils.
 - d. Enhancement – where possible enhancement measures will be incorporated into the Scheme design. Enhancement measures are considered to be measures which are over and above any essential avoidance, mitigation and compensation measures required to remove or reduce the adverse effects of the Scheme or compensate for its impacts.
- 4.4.16 The Environment Act 2021 was passed into law at the end of 2021 serves as enabling legislation for future regulations and policy making in respect of environmental protection. A key aspect of the Environment Act is that

biodiversity net gain (BNG) provisions now apply to nationally significant infrastructure projects. This means that promoters are no longer simply required to mitigate their biodiversity impacts but are also required to deliver a BNG compared against the pre-development biodiversity value. The BNG to be achieved must be at least 10% (subject to regulations) and be achieved in accordance with a “biodiversity gain statement” published by the Secretary of State. Although regulations in respect of the BNG requirement for NSIPs are not yet in force, National Highways are already instilling the concept of BNG into its design for the Scheme. For the Scheme, a minimum target of 10% biodiversity net gain has been set to be delivered as part of the DCO, with an additional 14% being targeted by National Highways, either through the Scheme or through off-site delivery with local partners.

- 4.4.17 Within this PEI Report, the individual technical chapters identify the possible measures required to mitigate any potentially significant adverse effects that have been identified and which have been incorporated into the Scheme design to date. Effects that remain after mitigation are referred to as residual effects. The assessment of the significance of the residual effects after mitigation and/or enhancement is the key outcome of the EIA and will be reported in the ES.

Construction and operational effects

- 4.4.18 The EIA considers effects during the construction and operation of the Scheme. The construction phase assessment addresses both the temporary activities involved in building the Scheme and the subsequent permanent presence of the Scheme (the existence effects) once constructed; where relevant, these temporary and permanent effects are described separately herein. The operational assessment considers the situation when the Scheme is being used by traffic.

Assessment of cumulative effects

- 4.4.19 Cumulative effects are the result of multiple individual effects on a specific environmental receptor or resource. There are principally two types of cumulative effects:
- a. The combined action of a number of different schemes, cumulatively with the project being assessed, on a single resource/receptor (cumulative); and
 - b. The combined action of a number of different environmental topic specific effects due to the Scheme on a single resource/receptor (in-combination).
- 4.4.20 Further details on the scope of the cumulative effects assessment is provided in *Chapter 15: Cumulative, In-combination and Project-wide Effects*.

4.5 Major events

Background

4.5.1 The 2017 EIA Regulations introduced a requirement to consider major accidents and disasters. The general scope of the requisite assessment covers:

- a. Vulnerability of the Scheme to risks of major accidents and/or disasters that are relevant to the Scheme (subsequently referred to as major events); and
- b. Any consequential significant environmental effects from those major events.

Methodology

4.5.2 The assessment:

- a. Applies professional judgement in consultation with National Highways to develop project specific definitions of major events.
- b. Identifies any major events that are relevant to and can affect the Scheme.
- c. Where major events are identified, describes the expected significant effects arising from the vulnerability of the Scheme to major accidents or disasters that are relevant to the project.
- d. Reports the conclusions of the assessment within the individual environmental topics.
- e. Clearly describes any assumed mitigation measures and details of the preparedness for and proposed response to such emergencies, to provide an evidence base to support the conclusions and demonstrate that likely effects have been mitigated/managed to an acceptable level.

4.5.3 The methodology adopted for the assessment is described in the *EIA Scoping Report* (Appendix 1-A).

Preliminary assessment

4.5.4 A preliminary assessment for the PEI Report has been undertaken which identified that it is highly likely that, for all major event types, the design of the Scheme will ensure there is no risk or serious possibility of the event interacting with the Scheme. It is therefore considered at this stage that there are unlikely to be any significant environmental effects associated with major events. This will be confirmed within the ES.

4.6 Transboundary Assessment

4.6.1 A transboundary screening matrix was prepared and presented within Appendix A of the *EIA Scoping Report* (Ref 1-5), which is presented in Appendix 1-A of Volume 4A. The closest European Economic Area (EEA) States to the Scheme are France (approximately 135 km south) and Belgium (approximately 218 km east). It has been assessed that no

significant environmental effects are likely to extend beyond the jurisdiction of the UK.