7.7 Design Summary Report

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1
Introduction

The A417 Missing Link (the scheme) is a nationally significant road scheme that will considerably improve road safety, reduce traffic congestion and improve connectivity for road users and local communities, while unlocking economic growth in Gloucestershire and beyond.

The scheme sits in the Cotswolds Area of Outstanding Natural Beauty (AONB) and has been designed in consultation with stakeholders and members of the public. Throughout the design process, this designated landscape, its characteristics and special qualities, have been a primary consideration. In this section, we outline the key features of the scheme and why we have produced this report.

View from Barrow Wake

1.1

Scheme overview

The A417/A419 is a strategic route between Gloucester and Swindon that provides an important link between the Midlands/North and South of England. The route is an alternative to the M5/M4 route via Bristol. The section of the A417 near Birdlip, known as the Missing Link, forms the only section of single carriageway along the route and is located in the Cotswolds AONB.

In 2014, the Department for Transport (DfT) announced its five-year investment programme for making improvements to the strategic road network (SRN) across England. This scheme is one of more than 100 schemes identified as part of the first Road Investment Strategy (RIS1) 2015-2020.

This scheme will upgrade this section of the A417 to dual carriageway, in a way that is sensitive to the surrounding AONB, would help unlock Gloucestershire's potential for growth, support regional plans for more homes and jobs, and improve life in local communities.

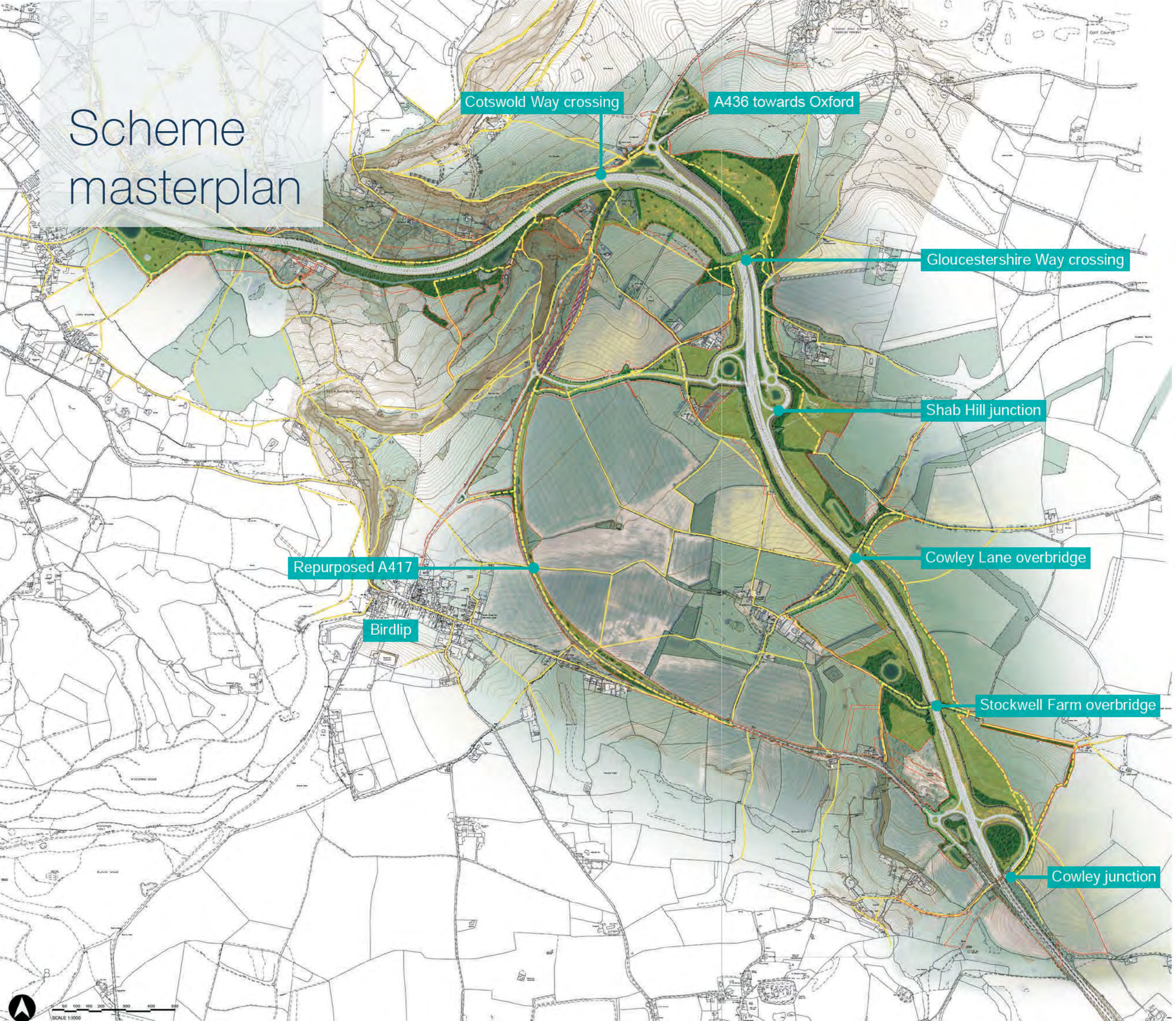
The proposed scheme passes through a designated landscape and as such its design has been landscape-led to respond and reflect the character of the landscape.

Key features of the scheme proposals include:

- 3.4 miles (5.5km) of dual carriageway between the existing A417 Brockworth bypass and the existing A417 dual carriageway south of Cowley
- The new dual carriageway will have a gentler gradient than the existing road and a crawler lane for slow vehicles climbing the hill
- A wider cutting through the Cotswold escarpment
- The Cotswold Way crossing, an overbridge crossing near Emma's Grove for walkers, cyclists and horse riders (WCH), including disabled users, which would accommodate the Cotswold Way National Trail
- The removal of the Air Balloon roundabout and introduction of the Ullenwood junction, a four-arm roundabout
- The A436 link road, which will be a single carriageway with an additional climbing lane
- The Gloucestershire Way crossing, a 37 metre wide multi-purpose crossing, with a 25 metre wide strip of calcareous grassland, hedgerows and WCH access (bridleway) accommodating the Gloucestershire Way long distance path
- A junction at Shab Hill, utilising a compact half-cloverleaf arrangement, with underbridge and roundabouts
- The realignment of the B4070 link to Birdlip, via Barrow Wake roundabout, to utilise part of the existing road infrastructure
- Cowley and Stockwell overbridges, with wide hedgerow verges
- The replacement of Cowley roundabout with a new free flow local grade separated junction
- A bat underpass
- Drainage basins, channels, and ditches
- Extensive landscape and acoustic bunding
- Extensive landscape, ecological and environmental features such as new woodland, large areas of calcareous grassland, hedgerows and Cotswold stone walling
- The Air Balloon Way, a repurposed section of the existing A417, which will be a 'purpose built' restricted byway route for WCH users including disabled users and carriages. It will be planted with species-rich calcareous grassland and native hedgerows and trees
- Car parking provision including for disabled people and horseboxes, seeking to redistribute WCH users away from ecologically sensitive areas.

Full details of the scheme are described in the Chapter 2 The project of the Environment Statement (ES) (Document Reference 6.2).

Scheme masterplan



This map illustrates the scheme design that was submitted as part of the Development Consent Order application (DCO Application).

KEY

- Scheme boundary
- Proposed public rights of way
- Existing public rights of way
- Proposed native woodland
- Proposed native scrub
- Proposed tree avenue
- Proposed hedgerow
- Proposed limestone grassland
- Proposed dry stone wall
- Rock face with planting
- Watercourse diversion
- Attenuation basin for water drainage
- Drainage ditch
- Contours
- Proposed embankment
- Proposed cutting
- Replacement Common Land
- Wooden post and rail fence
- Wooden post and rail fence (badger proof)

Sign to Gloucestershire Way long distance path

1.2

Purpose of this report

This Design Summary Report focuses on how the scheme is landscape-led and sets out how it will:

1. demonstrate good design, particularly in terms of siting and design, relative to existing landscape and historical character, function, landscape permeability, landform and vegetation
2. avoid or mitigate landscape and visual effects.

To achieve this, the report will:

a. demonstrate how landscape was the primary consideration in every decision we made from the outset

b. demonstrate how the design process was conducted and how the design of the scheme has evolved

c. set out the reasons why the proposed design has been selected, and where different designs were considered, explaining why they were discounted

d. explain the operational, safety and security requirements that the scheme design must satisfy.

This document provides a summary of our approach to designing the scheme. Full details of the design and an assessment of the scheme's effects on the environment can be found in the ES (Document Reference 6.2), whilst a detailed assessment of the scheme's compliance with national and local policy requirements is provided in the Case for the Scheme (Document Reference 7.1).

1.3

Structure of this report

The remainder of this report is set out as follows:

- Section 2 sets out the landscape-led approach – the scheme vision and objectives, the landscape strategy, our understanding of the Cotswolds AONB, stakeholder involvement in the design and the design review process
- Section 3 sets out the design response – it summarises the key features of the scheme: influencing factors; design rationale; and how they reflect the scheme's landscape vision, strategy, and objectives
- Section 4 summarises the benefits of a landscape-led approach and how the requirements of good design have been met

View of the Cotswolds

2 Landscape-led approach

2.1

Scheme vision

The scheme is entirely located within the Cotswolds AONB. An AONB is land designated by the Countryside and Rights of Way Act 2000, which protects the land to conserve and enhance its natural beauty. An AONB can be designated for its landscape quality (natural or man-made), its scenic quality, wildness and tranquillity, natural heritage and cultural heritage. The landscape of the Cotswolds AONB has several of these qualities which are highly valued and worth protecting.

In recognition of the high environmental quality of the Cotswolds AONB, we have taken a landscape-led approach to designing the A417 Missing Link scheme.

What do we mean by 'landscape-led'?

Landscape-led means that the landscape, its characteristics and special qualities, are a primary consideration in every design decision that we make. Our proposals have been designed to meet the character of the surrounding landscape, rather than changing the landscape to fit our proposals.

Highways England seeks to design in a way that is sensitive to the context of a road's surroundings and responsive to the needs of those who use it and the communities through which it passes. Our approach builds on the need to achieve good road design that follows the themes of people, places and processes, and goes further to respond to and reflect the character of the landscape. Our approach for this scheme puts landscape, biodiversity, cultural heritage and people at the heart of our proposals.

The principle behind this design approach is that the design team has a detailed understanding of the environmental factors that make the Cotswolds AONB special. It is this understanding that has influenced each design stage and every design decision, with the aim of protecting and conserving important assets, and enhancing the character and special qualities of the AONB.

This was achieved in a number of ways, from how the design team was structured with integration of landscape architects, environmental specialists and engineers to create a culture where everyone openly and freely contributed to the design process, through to stakeholder involvement in important decisions for key features of the scheme, such as the crossings.

In this section, we explain in detail our landscape vision and strategy, our understanding of the Cotswolds AONB, our consultation with stakeholders and the design review process.

We consider that working in collaboration with stakeholders is critical to the successful development of a landscape-led highways scheme.

With stakeholders such as Gloucestershire County Council, Natural England, Cotswolds Conservation Board (CCB), Gloucestershire Wildlife Trust (GWT) and the National Trust, we jointly created a vision statement for the scheme:

Our vision

"We want to create a landscape-led highways improvement scheme that will deliver a safe and resilient free-flowing road while conserving and enhancing the special character of the Cotswolds Area of Outstanding Natural Beauty; reconnecting landscape and ecology; bringing about landscape, wildlife and heritage benefits, including enhanced visitors' enjoyment of the area; improving local communities' quality of life; and contributing to the health of the economy and local businesses".

2.2

Scheme objectives

In order to measure the success of delivering a scheme with this joint vision, a series of scheme objectives were developed:

Safe, resilient and efficient network: to create a high-quality resilient route that helps to resolve traffic problems and achieves reliable journey times between the Thames Valley and West Midlands, as well as providing appropriate connections to the local road network.

Community and access: to enhance the quality of life for local residents and visitors by reducing traffic intrusion and pollution, discouraging rat-running through villages and substantially improving public access for the enjoyment of the countryside.

Improving the natural environment and heritage: to maximise opportunities for landscape, historic and natural environment enhancement within the Cotswolds AONB and to reduce negative impacts of the proposed scheme on the surrounding environment.

Supporting economic growth: to facilitate economic growth, benefit local businesses and improve prosperity by the provision of a free-flowing road giving people more reliable local and strategic journeys.

2.3

The landscape strategy

A landscape strategy and landscape-led design approach with appropriate landscape objectives was established at the beginning of the project. They reflect and build on the overall scheme vision. Over time, these early intentions have been refined and strengthened, and integrated into the wider design strategy for the scheme.

The landscape strategy has four main aims:

- To conserve and enhance the special qualities and characteristics of the Cotswolds AONB
- To reconnect landscape features and important ecological habitats
- To deliver landscape, wildlife and heritage benefits
- To enhance visitors' enjoyment of the area through improved recreational facilities.

Mature Oak tree in Crickley Hill Country Park

Landscape objectives

Landscape objectives that help expand on the aims of the landscape strategy are set out below. These objectives relate to the scheme as a whole and/or specific features:

Landscape

- Reflect the local landscape character and building vernacular in the design of the road, structures and environment
- Avoid environmental impacts, before reducing or offsetting effects
- Use the special qualities and landscape characteristics to influence and direct design development, conserving and enhancing the character of the AONB
- Design the scheme to meet the character of the surrounding area, rather than changing the landscape to fit the proposals
- Integrate the road into the landscape, improving on the existing situation by removing visually intrusive road infrastructure and set the scheme into the landscape, using landscape earthworks and planting to help integrate the scheme into its local environment
- Enhance the character of the AONB by providing more, better and joined up important habitats (woodland, trees, hedgerows and grassland) than currently exist
- Soften landscape earthworks by grading them out to allow agricultural land to be returned up to the highway boundary
- Strengthen field patterns by planting woodland, trees and hedgerows to create new field boundaries, with a significant increase in number, length and quality of local Cotswold dry stone walling to match existing boundaries
- Overbridges and underpasses to form a family of structures, through their design and careful selection of materials and finishes
- Overbridges to be set within the landscape, using landscape earthworks, grading out embankments to allow their return to agricultural use
- Junctions to be set within the landscape using a combination of woodland, hedgerow and landscape earthworks
- False cuttings topped with Cotswold stone walling to be used to create visual screening and help reduce the visual effect of traffic movements
- Detrunked section of the existing A417 to remove visually intrusive features and create a green corridor including a recreational route through the AONB. Topographic levels along the old alignment to be rationalised with infilling using excavated materials to restore land to original grades
- Provide screening where appropriate. Plant woodland, trees and hedgerows to create new field boundaries and landscape features that in time will provide visual screening of the road
- Where planting is not in keeping with the more open character of the high wolds, landscape earthworks will be provided. These will help integrate the scheme into the surrounding landscape using soft engineered slopes and utilising excavated materials.

Biodiversity

- Maximise biodiversity improvements within the land available and provide new areas of planting to connect existing woodland and hedgerows, helping to unify and link habitat and create additional wildlife habitats
- Existing woodland and trees (including ancient woodland and veteran trees) to be protected and retained where possible. Extensive woodland planting to be implemented across the scheme, including replacement planting to mitigate for lost woodland
- Design planting groups to match existing landscape character and merge with existing woodland and hedgerow features
- Protect and enhance nationally important rock exposures. Cutting slopes through the escarpment to be exposed rock. Facings to include areas for natural colonisation of local flora to provide important habitats for locally rare species and help visually break up the appearance of the rock faces
- Sow steep banks with calcareous grassland, including road verges and landscape bunds.

Cultural Heritage

- Protect and enhance known archaeological assets and features of cultural historical importance where possible
- Minimise impacts of the route alignment on the historic ridge and furrow field pattern
- Sensitively reduce and mitigate environmental impacts that reflect the local historic landscape character.

People

- Improve recreational opportunities across the scheme by reconnecting severed or fragmented routes like the Cotswold Way National Trail and Gloucestershire Way long distance path with new crossings of high architectural quality
- Provide additional parking for different user groups, including people with disabilities and local interest groups, to help reduce potential impacts of recreation on sites designated for important habitats.

The landscape objectives are reflected in the Environmental Masterplan for the scheme (ES Figure 7.11, Document Reference 6.3). The Environmental Masterplan is a set of plans that illustrate the scheme proposals, depicting key environmental features, such as areas of woodland, shrub or grassland planting or ecological intervention or how cultural heritage assets will be protected and improved.

See section 3 of this report to find out more about our proposals and how they respond to our landscape objectives.

View from Crickley Hill Country Park

2.4

Understanding the Cotswolds Area of Outstanding Natural Beauty

Landscape

Developing a landscape-led approach to road design needs a clear and thorough understanding of what makes a landscape like the Cotswolds AONB special and unique. To help with this, it is important to define what we mean by landscape.

Below are a number of widely accepted definitions of landscape, starting with the European Landscape Convention (ELC), which defines landscape as "... an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors."

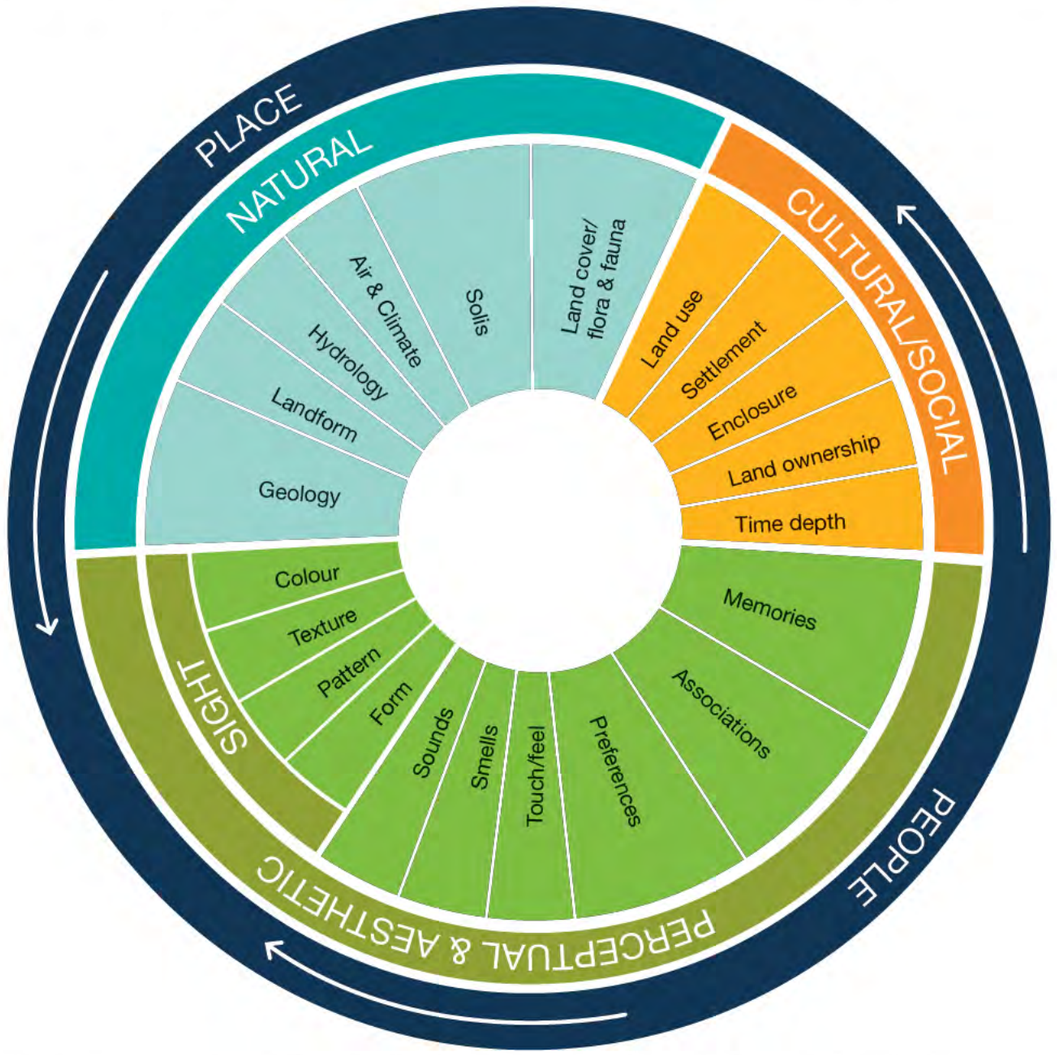
Building on the ELC's definition, Natural England[1] defines landscape character, as follows:

"Landscape character may be defined as a distinct and recognisable pattern of elements or characteristics, in the landscape that make one landscape different from another, rather than better or worse."

[1]Natural England, October 2014. An Approach to Landscape Character Assessment

Beech woodland

To add colour to this definition, they provide details of all the possible component parts that can contribute to a particular landscape, as illustrated in the landscape wheel diagram below.



Landscape Character wheel, replicated from Natural England's 'An Approach to Landscape Character Assessment', October 2014

The diagram illustrates that landscape is a series of complex interactions between different criteria such as natural, cultural and perceptual, and at a lower level between geology, landform, land use, associations and memories. The landscape setting of the scheme, within the Cotswolds AONB, is no different. It is formed by the dramatic change in topography across the flat low-lying Vale of Gloucestershire, to the steep slopes of the Cotswold escarpment and the undulating high wolds that are divided by the high wold valleys.

Land use and settlement patterns also contribute to the unique character of the area, with steep ground typically kept under pasture and grazed by Cotswold sheep. The Cotswold sheep is a rare breed which is native to this part of Britain and has a long heritage and association with farming. It's bred for its good quality wool, making the Cotswolds the centre of the English wool trade in the middle ages. These associations, along with the use of traditional dry stone walling to enclose the land and the use of Cotswolds stone in the local architecture, all contribute to the scenic beauty and character of the area.

Cotswolds Conservation Board (CCB) has a number of documents that describe and summarise what makes this landscape a national treasure, worthy of being designated an AONB. CCB's Management Plan sets out the Cotswolds AONB's special qualities. These have played a key role in influencing the design of the scheme.

A list of the special qualities can be found in Appendix A of this document.

CCB has also published position statements, landscape strategy and guidelines, a local distinctiveness and landscape change report and a landscape character assessment for the area.

Those we have considered most carefully are:

- Cotswolds AONB Management Plan 2018-2023
- Cotswolds AONB Landscape Character Assessment
- Cotswolds AONB Landscape Strategy and Guidelines for LCT 2 Escarpment, LCT 7 High Wold, LCT 8 High Wold Valley, and LCT 18 Settled Unwooded Vale
- CCB Local Distinctiveness and Landscape Change Report (May 2005)
- Tranquillity Position Statement (June 2019)
- Cotswolds Dark Skies & Artificial Light Position Statement (Adopted March 2019)
- Tree Species and Provenance Position Statement (Adopted June 2017)
- Transport Position Statement (Revised 2013)
- Management of Roadside Verges Position Statement (Adopted October 2015).

All of these documents have helped to steer the design, providing important baseline information and guidance on what design solutions would be acceptable and how best to protect and enhance the special qualities of the AONB. ES Chapter 7 Landscape and Visual Effects (Document Reference 6.2) includes an appraisal of effects of the scheme on the special qualities of the AONB.

Biodiversity

The AONB has a rich and diverse range of internationally important ecological habitats like the flower-rich limestone grasslands and ancient broadleaved woodland and is home to a wide variety of rare species. These priority species include bats, dormice and skylark. The Cotswolds is important as it retains these habitats and species which are in decline in other places within England. The area's underlying geology and historic land management practices create a unique environment for wildlife to thrive, particularly species that are suited to limestone or calcareous soils.

The scheme is located within or adjacent to a number of internationally designated ecological sites, for example the Cotswold Beechwoods Special Area of Conservation (SAC), and Crickley Hill and Barrow Wake Site of Special Scientific Interest (SSSI). These sites are designated for important habitats, including calcareous grassland and broadleaved woodlands. Woodland within the Cotswold Beechwoods SAC is ancient woodland and Ullen Wood ancient woodland is also adjacent to the scheme.

Ecological specialists have played a key role in the design of the scheme, working closely with landscape architects to design suitable mitigation and maximise biodiversity improvements within the land available. As part of the scheme, it is proposed to plant new woodland, grassland, trees and hedgerows to help preserve and create additional habitats in the local area. These habitats will be in keeping with the AONB and have been carefully designed to improve habitat connectivity and biodiversity, in line with the nature recovery network strategy for the area.

This has helped identify important habitats and key ecological features for internationally protected species including all four UK bat species that have Special Areas of Conservation designated for them; Barbastelle, Greater horseshoe, Lesser horseshoe, and Bechstein's. Other notable species include badger, and birds like the barn owl, skylark, marsh tit, spotted flycatcher, and mistle thrush.

Great Witcombe Roman Villa (remains)

Cultural Heritage

Cultural heritage provides an extra layer of interest, reflecting more than 6,000 years of human activity interacting with the natural environments of the Cotswolds. The towns, villages and dispersed farmsteads reflect the settlement pattern and evolution over many centuries.

The AONB has a wealth of archaeological, prehistoric and historic features which are recognised for their importance as irreplaceable resources.

There are several known heritage assets located within close proximity to the scheme. These include ten scheduled monuments like Crickley Hill camp and Emma's Grove round barrows, 50 listed buildings, one Registered Park and Garden (the Grade II* Listed Cowley Manor) and two conservation areas at Cowley and Brimpsfield. In addition, there are over 200 non-designated heritage resources that date back as early as the Palaeolithic period.

Evident today is the area's association with the Roman period, with Roman villas scattered across the Gloucestershire and Cotswold landscapes, including the 3rd – 5th century villa at Great Witcombe.

Features of archaeological and cultural heritage interest, where known, have been avoided or protected by design interventions such as building above ground to avoid digging up or disturbing important assets.

The scheme celebrates the AONB's heritage by improving the setting and condition of Emma's Grove scheduled monument. We have done this by removing vegetation, as tree roots penetrate, and disturb or damage buried archaeological features.

People

The AONB is a desirable place to live with vibrant and proud communities. It is also an important tourist destination with key attractions and recreational opportunities, important for the local economy.

The Crickley Hill Country Park is enjoyed as an area for recreation, alongside other local areas of open space. The area is popular with WCH users who make use of the rich network of public rights of way (PRoW), including the Cotswold Way National Trail and Gloucestershire Way long distance path.

With the exception of Brockworth, the remaining settlements within the vicinity of the scheme are local in scale and primarily form village or rural settlements with some local facilities.

We have worked closely with local people and other stakeholders to help better understand the places and destinations that are valued in the area, including community facilities, services and places of employment. We have also engaged with landowners and aim to reduce or avoid impacts of the scheme on land and property where possible.

2.5

Engaging with stakeholders

In addition to the collaborative work to agree a landscape-led vision for the scheme, stakeholders have helped shape its design through two-way dialogue and an iterative design process. Through engagement and consultation activities, we have asked for feedback and carefully considered the needs and suggestions of local people and others who have an interest in the area.

Alongside statutory consultations, we committed to ongoing engagement with key stakeholders, to feedback on and help inform on our design development work. This involved sharing information and holding a series of Strategic Stakeholder Panels, Technical Working Groups, topic specialist design workshops, Collaborative Planning Sessions, and meetings to inform Statements of Common Ground. More information about these groups and how they helped inform the design is provided in Chapter 4 of the Consultation Report (Document Reference 5.1).

We have sought to involve stakeholders in our design process, for example WCH user groups have played a key role in the design of the scheme, working closely with us to identify and design suitable mitigation and PRoW improvements. This has helped us identify and address existing severance where possible, and create a better quality environment for people to enjoy. As part of the scheme, it is proposed to create new recreational routes and make it safer for people to move around the area.

We will continue to positively engage with stakeholders during the Examination and future detailed design stages.

2.6

Design review

The National Policy Statement for National Networks (NPSNN)2 sets out that applicants can use the Design Council. The Council provides support for and encourages design reviews for nationally significant schemes, and is represented on the Highways England Strategic Design Panel. The Panel was tasked with challenging and supporting Highways England to improve the quality of the strategic road network (SRN). The Panel includes members from across a range of disciplines and represents stakeholders who are committed to improving the design and quality of the SRN.

We have engaged the Panel and adopted this advice, to ensure external design influences have been considered and that good design principles have been embedded into the proposals.

The A417 design team attended three meetings of the Panel in April 2018, November 2019 and February 2021. Overall, the Panel welcomed the robust analysis of the route, its wider context, and our strong emphasis on integrating the scheme into the landscape.

Design Council – Design Review, April 2018 Summary

At the first meeting in April 2018, the Panel had the opportunity to discuss the scheme, but it was not possible for the Panel to comment in detail. As the scheme was at the options stage, it was recommended that it be referred to the Panel once further design work was undertaken.

See Appendix B for the Design Council – Design Review Letter, April 2018.

[2]Paragraph 4.33, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/387223/npsnn-web.pdf

Design Council – Design Review Letter, 20 November 2019 Summary

The Design Council commented that the design team had "achieved a high design standard for the scheme". Improvements made to the scheme included the decision to reduce the elevation of the scheme, bringing it down so it "sits more quietly within its setting". They considered that "the proposals demonstrate a sensitivity to topography and natural features", through the re-siting of Shab Hill junction into the head of the valley.

They supported the use of false cuttings as a "sound design move", using new landscape features to diminish the impact of the new road, and stated that the approach taken to connectivity was strong. They strongly supported the idea of a green bridge, advising that it needs to be brilliant in its execution.

The Panel "strongly support the use of UN Sustainable Development Goals to shape the approach to sustainability, as it demonstrates that the design team is not just thinking about this scheme from a detailed point of view but a global one as well."

Further suggestions included the need to establish design details within a broader design narrative, in a "sensitive and distinctive way that is locally appropriate" and one that "will deliver an interesting and even joyful experience for drivers and passengers using the road". They encouraged the team to consider the experience of different road users, for example WCH users. They wanted to see a greater emphasis placed on non-motorised users to support sustainable modes of transport, including the visual experience of using the route and views to and from bridges.

The Panel felt the project would benefit from an artist input, to provide advice on how the scheme could be interpreted within the local cultural context. They thought the design team should consider plant species selection in a strategic way, particularly in relation to changing landscape character and the effects of plant diseases like Ash dieback.

Highways England incorporated a number of the Design Council's recommendations such as increasing the overall gradient of the road on the escarpment from 7% to 8%.

See Appendix C for the Design Council – Design Review Letter, 20 November 2019.

Design Council – Design Review Letter, 19 February 2021 Summary

The Design Panel commented that they felt "significant progress" had been made since the previous review in 2019. They continued to support and welcome the landscape-led approach taken by Highways England, recognising the importance of stakeholder engagement on the design's evolution.

They suggested that a detailed design narrative was needed to support communication of the proposals and to ensure design quality is embedded through to delivery. This was one of the reasons that we have prepared this Design Summary Report as part of the DCO Application.

The Panel felt that changes to the road's gradient at Crickley Hill were successful, allowing for a "simpler cut through the landscape, creating a better driver experience and minimises the scheme's visual impact".

The Panel supported the decision not to light the scheme, reflecting its setting within the AONB and considered "replacing the green bridge with the lighter, lower Cotswold Way structure is a move in the right direction." They also saw the use of a lighter structure on the alignment of the Cotswold Way crossing as a benefit. The Panel commented that overall the approach taken to a family of structures is "largely successful", with a clear hierarchy of greenery on each bridge.

In relation to planting, the Panel recommended that no more than 30% of any family, 20% of any genera and 10% of any species should be used to establish resilient plant populations.

See Appendix D for the Design Council – Design Review Letter, 19 February 2021.

Highways England Strategic Design Panel Progress Report 4, 31 March 2021 Summary

The Panel's fourth progress report[3] makes key recommendations and looks ahead to the Road Investment Strategy 2 (RIS2) delivery period. The Panel made special mention of the A417 Missing Link proposals as an exemplar for landscape-led design.

It set out that:

> "A landscape-led approach was presented. Three key challenges identified through its development were: mitigation/enhancement, highway standards/landscape character and sufficient time for good design. The presenters asserted that placing landscape at the heart of the process could help reclaim a positive perception of roads.
>
> The Panel endorsed the approach, particularly for roads that pass through sensitive landscapes and sought to enhance the character of the place and user experience. The Panel commended the response to both the design principles and goals of sustainable development. The Panel agreed there was much value to be gained from a landscape-led approach and giving sufficient time for good design."

[3]https://www.gov.uk/government/publications/highways-england-strategic-design-panel-progress-report-4

View of The Peak from Barrow Wake

3
Design response

3.1

Design proposals

The preliminary design of the scheme, which is submitted as part of the DCO Application, has been designed in iterative stages. Every design decision we've made has had the unique and special landscapes of the Cotswold AONB, its biodiversity, cultural heritage and people, at its heart.

In this section, we summarise the key features of the scheme: influencing factors; design rationale; and how they reflect the scheme's landscape vision, strategy, and project objectives. We also outline the iterative design process that has been taken, and the key people involved.

To help you visualise particular areas or features, we will reference a chainage number (e.g. Ch4+735). These numbers can be cross-referenced with the General Arrangement Plans (Document Reference 2.6) submitted with the DCO Application.

This section considers the proposals as follows:

- Mainline alignment of the A417 defined as the online section (utilising the existing A417 corridor) and the offline section (new corridor remote from the existing A417)
- Junctions at Shab Hill, Cowley and Ullenwood
- Side roads of the A436 and the B4070
- Crossings: two underpasses south of Crickley Hill Ch 1+100 and Ch 1+725; two new overbridges at Cowley Lane (Ch 4+050) and Stockwell Farm (Ch 4+735)
- Crossings of the mainline for the Cotswold Way National Trail at Ch 2+000 and the Gloucestershire Way long distance path at Ch 2+690
- Public rights of way where they have been diverted or new routes provided, and how the scheme is converting the existing A417 to provide replacement common land and local access along Ermin Way and a purpose built restricted byway route for WCH (the latter referred to as the Air Balloon Way).

The term 'chainage' is used to refer to a distance, measured in meters, along an imaginary line, such as the centre line of a road or railway.

3.2

Mainline alignment

This section describes the online section between the Brockworth bypass and the existing Air Balloon roundabout, and then the offline section continuing south to Cowley junction.

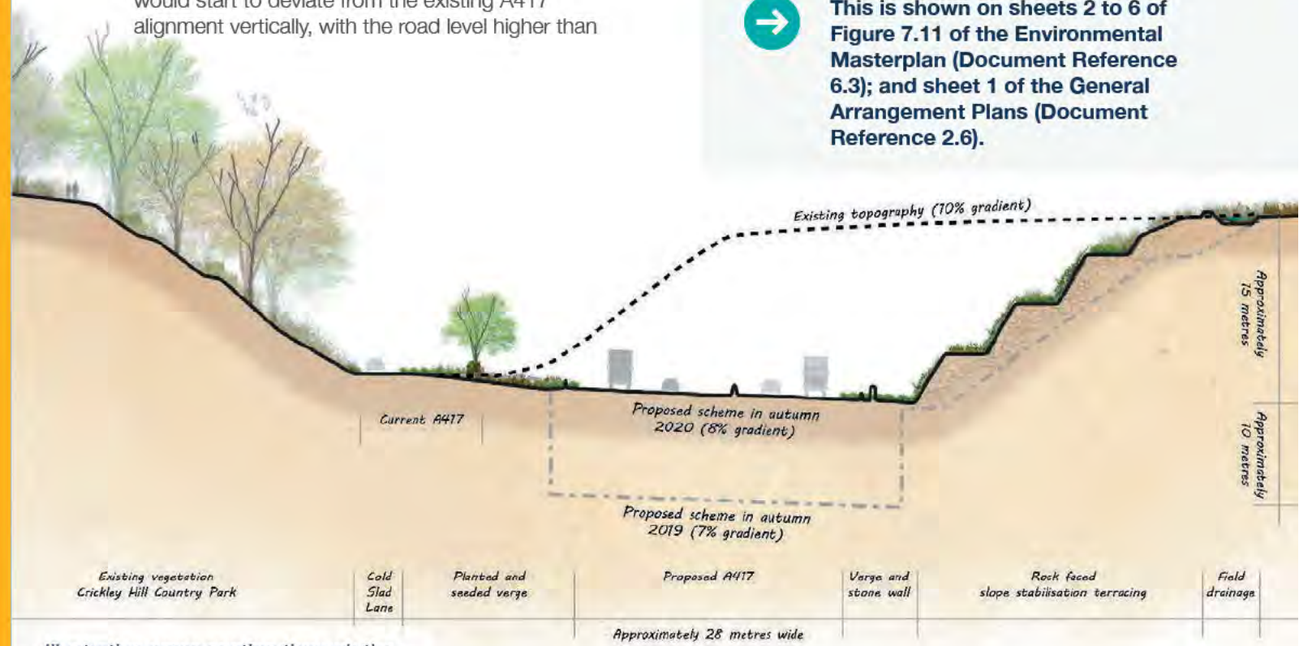
Online section

Description of the proposed design

At its western end, the proposed route would tie in to the existing Brockworth bypass, west of the existing Air Balloon roundabout. Two lanes in each direction would be provided with an additional crawler lane for Heavy Goods Vehicles (HGVs) climbing the escarpment.

The route would closely follow the existing road alignment, with widening proposed on the southern side. The gradient would be reduced from the existing 10% to a maximum of 8%. Near the existing Dog Lane junction, the route would start to deviate from the existing A417 alignment vertically, with the road level higher than the existing for a distance of around 800 metres, before transitioning to be lower than existing levels at approximately Ch 1+700. Between Ch 1+700 and Ch 3+000 the road would continue in cutting. The maximum depth of cut would be 17 metres measured at Ch 1+800, just past the end of the 8% uphill grade. The alignment would start its deviation from the existing A417 alignment at the existing Air Balloon roundabout.

This is shown on sheets 2 to 6 of Figure 7.11 of the Environmental Masterplan (Document Reference 6.3); and sheet 1 of the General Arrangement Plans (Document Reference 2.6).



Illustrative cross section through the escarpment south of Crickley Hill

Photomontage of previous design iteration (7%) and how it would look at opening year

Photomontage of the scheme (8%) and how it would look at opening year

Photomontage of previous design iteration (7%) and how it would look 15 years after opening year

Photomontage of the scheme (8%) and how it would look 15 years after opening year

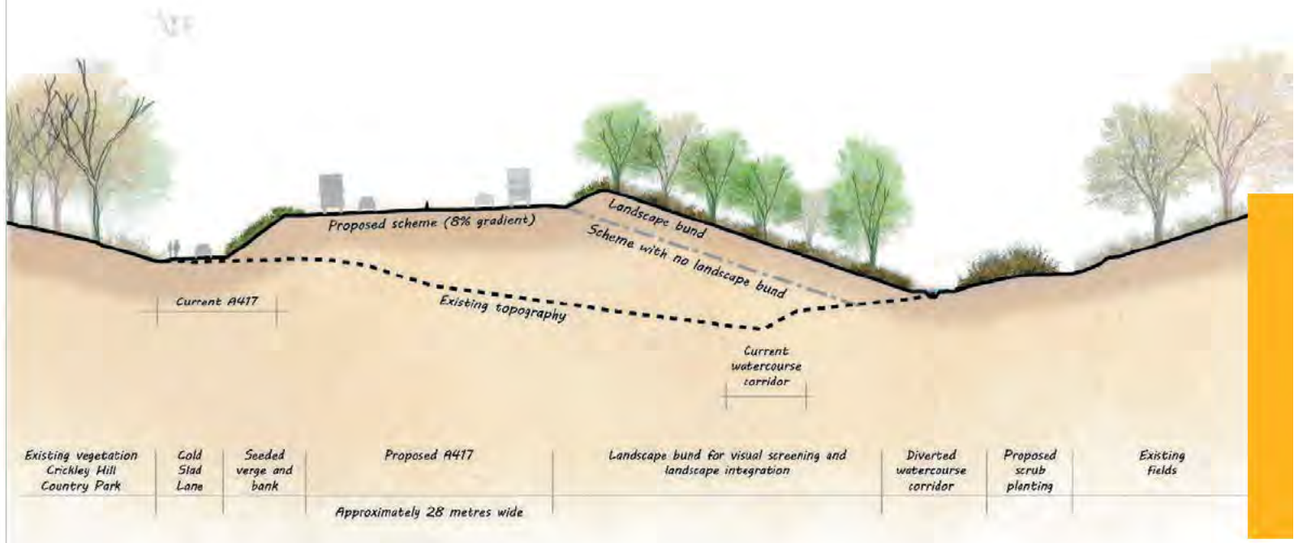
Design development and key considerations

The gradient of the A417 as it climbs the escarpment

Through the design process, we have considered alternative gradients for the online section. In the Autumn 2019 public consultation (see Consultation Report, Document Reference 5.1 for more information), we proposed to reduce the gradient from 10% to 7%. However, initial environmental assessments showed that a road with a 7% gradient would have significant effects on carbon as a result of the large number of vehicle movements that would be needed to remove approximately one million cubic metres of material offsite to dispose of it. A shallower gradient would also have greater landscape and visual effects and would require a greater area of Emma's Grove woodland to be lost, as outlined in ES Chapter 3 Assessment of Alternatives (Document Reference 6.2).

Taking into account consultation feedback, our landscape-led design approach allowed for the environmental disciplines to influence the design to reduce its effect on the environment. At a further public consultation in Autumn 2020, we proposed a maximum gradient of 8%, which would result in the following benefits:

- Elimination of several large retaining structures
- Removal of direct access to mainline for Grove Farm to create safer access
- Significant reduction of earthworks cut and fill volumes resulting in net earthworks balance
- Reduced visual impact of the proposed mainline
- Reduced impact on local woodland (Emma's Grove) and watercourses
- Reduced impact on groundwater
- Reduced volume of waste
- Significant reduction in construction traffic movements
- Reduced carbon footprint of the scheme
- Reduced construction time due to improved constructability.



Illustrative cross section south of Crickley Hill

To achieve the change in gradient, between Ch 0+800 and Ch 1+700, the road would be higher than the existing road. This would have short to medium term detrimental effects on landscape, visual, noise, and biodiversity. To mitigate this, the vertical alignment has been restrained and the earthworks along this section include bunds and extensive woodland planting to mitigate these impacts in the long-term. A key test for the effectiveness of this has been to ensure the views from Barrow Wake viewpoint and Cotswold Way National Trail are unchanged in the long-term i.e. the road is no more conspicuous in the landscape than at present. The photomontages in Chapter 7 ES (Document Reference 6.3) Figures 7.10 Photosheets and Visualisations demonstrate that this would be the case.

The design change has a positive impact on the scheme's carbon footprint, as well as the landscape, local people and the environment.

Figure 3-1 Existing Geology

Norman's Brook tributary

A key consideration when designing the scheme has been the impact on the tributary of Norman's Brook. With this in mind, the mainline earthworks have been designed to integrate sympathetically with the surrounding landscape by defining bund height, slope angle and shape to tie into the surrounding topography, but at the same time, we've ensured that the extent of the watercourse diversion is restrained.

The watercourse has been diverted to reduce the requirement for culverting. This would have a positive impact on the carbon footprint of the scheme, and would reduce the impact of construction on the local environment and local people. It has also predominately been designed as a naturalised stream, to ensure it's in-keeping with local features and providing biodiversity value.

Traffic management

Traffic management has been a key consideration for this section of the mainline due to the nature of building alongside an existing carriageway. The mainline alignment has been shifted south to minimise the requirement for any retaining structures during the construction phase. This minimises impact on local roads and improves safety of the construction operations. The temporary construction works would be less prominent in the landscape due to the omission of temporary retaining structures.

Bat underpass

Bat monitoring data shows extensive bat presence in this area. Survey results show bats crossing the carriageway in this area. As a result, we're committed to providing bat mitigation in the form of a bat underpass. The provision and design of the bat underpass and the associated planting to the west and east, both on the south side of the mainline and adjacent to Cold Slad Lane, has been a key consideration. The proposed alignment of the bat underpass ensures we can provide appropriate flight path mitigation for the widening of the road corridor.

Cutting into the escarpment

Another key consideration has been the design of the cutting. We've carefully designed the earthworks, so they integrate and are in keeping with the escarpment. As per our landscape-led approach, and to minimise construction impact, we've designed the cutting to be as steep as possible, whilst at the same time ensuring it is at a safe angle of 35 degrees. Wherever possible, and in order to reflect the surrounding geology, the design would consist of 60 degree slope rock faces, with flat areas providing areas where scree can collect. Figure 3-1 shows the surrounding geology and Figure 3-2 shows how the design and construction would take account of the geology to provide a safe but sensitive cut slope.

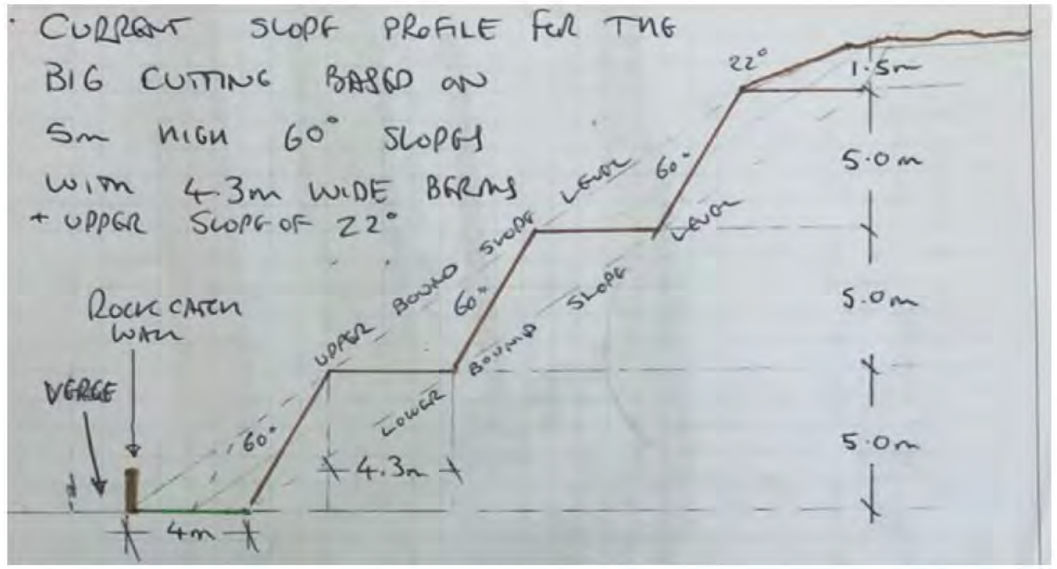


Figure 3-2 Proposed Cut Slope
Early sketch idea of cutting slope angle through the escarpment south of Crickley Hill

Illustrative cross section of the scheme set into the landscape, enclosed by landscape bunds

Offline section

Description of the proposed design

At approximately Ch 2+000 the alignment would leave the existing A417 corridor, following a right-hand curve between the existing Air Balloon roundabout and Emma's Grove woodland, initially in an easterly direction then crossing the existing A417 at grade. It would then turn southwards to pass to the east of Birdlip Radio Station where the new Shab Hill grade separated junction would be provided at Ch 3+200.

Shab Hill junction would provide a link from the A417 to the A436 (towards the A40 and Oxford via Ullenwood junction), and to the B4070 (for Birdlip and other local destinations).

Between Ch 3+600 and Ch 5+000 the route would continue in a south-easterly direction and would generally be at grade or in cut (up to six metres).

A new junction would be provided at the eastern end of the scheme, replacing the existing Cowley roundabout, and making use of the existing underbridge to provide access to local destinations such as Nettleton Bottom and Brimpsfield. The use of the existing underbridge would allow for all directions of travel to be made.

This is shown on sheets 5, 6, 9 and 10 of Figure 7.11 of the Environmental Masterplan (Document Reference 6.3); and sheets 1, 2, 4 and 6 of the General Arrangement Plans (Document Reference 2.6).

Design development and key considerations

The road in this section has been designed sympathetically to minimise the impact on the surrounding landscape, sites of historic interest, local people, and the environment.

Key considerations for the road alignment in this section were the potential impacts on Emma's Grove woodland and scheduled monument, Crickley Hill Country Park and Ullen Wood ancient woodland. The alignment of the mainline and the associated Cold Slad Lane and Ullenwood junction arrangement has therefore been significantly constrained in order to minimise impact on all these sensitive features. Adjacent to Emma's Grove, the horizonal and vertical alignment of the mainline would be at grade in order to minimise the potential impacts.

The mainline alignment has been chosen specifically so that Shab Hill junction can be set down in the existing valley with the aim of minimising the impact on the landscape. The vertical alignment would also minimise the impact on the surrounding landscape and where required, bunding and planting would be provided to screen the road. As further detailed, the design of Shab Hill junction is a constrained one with a compact layout designed to minimise impact on the landscape while ensuring safety of the road users.

An alternative mainline arrangement was considered at Shab Hill junction where the mainline would pass underneath the junction link road. Switching the arrangement of the junction would lead to a substantial increase in cutting depths either side of the junction requiring cuttings in the region of seven metres deeper than the proposed design. This change would have had a significant negative impact in terms of landscape and other environmental effects. It would also have increased the cost considerably, and had an adverse effect on neighbouring properties by requiring additional land and possible demolition of some buildings.

Earlier design iterations had the alignment higher through the wold, which was less sympathetic to the landscape. The alignment has since been lowered so that the road is in the cutting. This will provide some screening and will better accommodate the proposed Cowley and Stockwell overbridges. Landscape bunding has also been proposed in the form of false cuttings to provide additional screening of the road.

3.3

Junctions

There are three main junctions proposed in the scheme, at Ullenwood, Shab Hill and Cowley.

Ullenwood junction

Description of the proposed design

A roundabout would be provided at the existing A436 adjacent to Ullen Wood, connecting the A436 to the A417. It would also connect Leckhampton Hill and Cold Slad Lane to the local road network, and has been designed to ensure that projected traffic flows from all roads can be accommodated.

Ullenwood junction layout

This is shown on sheets 6 and 7 of Figure 7.11 of the Environmental Masterplan (Document Reference 6.3); and sheet 2 of the General Arrangement Plans (Document Reference 2.6).

Design development and key considerations

Ullenwood junction is constrained on all sides. To the east is Ullen Wood ancient woodland, to the west is the existing Ullenwood Bharat cricket club and Crickley Hill Country Park, and to the north and south movement is limited by drainage basins and the geometry of the approach roads.

Therefore, the proposed location of the Ullenwood junction has been refined to optimise the geometry of the approach arms. This improves visibility to/ from the junction as well as buildability at this location, while maintaining free-flowing traffic.

Ullen Wood ancient woodland has been a key consideration at this location.

We have sensitively designed the junction to minimising the impact on ancient woodland, as well as other mature trees at Crickley Hill Country Park.

In this location, access to the cricket club and the provision of PRoW links adjacent to Leckhampton Hill also constrains the design.

The location of the new cricket club access and the WCH route adjacent to Leckhampton Hill have been carefully positioned to minimise the impact on an existing mature tree line. By doing this, there will be more opportunities to avoid impacts on these trees during the construction phase.

An alternative segregated left turn lane was considered between the westbound direction of the existing A436 and the A436 link road, as an early iteration. However, this provision would have had an impact on Ullen Wood and would have resulted in the loss of some ancient woodland. Instead, the roundabout design has been refined to remove the requirement for this segregated lane and subsequent evaluation of the traffic performance of the roundabout confirmed that the roundabout design is adequate for projected traffic flows.

Shab Hill junction

Description of the proposed design

The proposed junction comprises a half clover leaf arrangement, which would provide a more compact layout than other junction forms considered during design development. The half clover leaf arrangement reduces the extent of the slip roads on the mainline, particularly in relation to the more curvilinear and steeper sections of the route at Crickley Hill. This minimises the footprint of the scheme and its impact on the landscape. It also means it connects better with the A436, avoiding impacts on Rushwood Kennels.

This is shown on sheet 10 of Figure 7.11 of the Environmental Masterplan (Document Reference 6.3); and sheet 4 of the General Arrangement Plans (Document Reference 2.6).

Design development and key considerations

The location of Shab Hill junction was selected because of its proximity to an existing valley to the east of Birdlip Radio Station. By siting the junction there, we were able to put the junction link beneath the mainline in this existing valley, integrating the whole junction into the landscape by lowering its elevation.

Shab Hill junction has been designed so it can accommodate predicted traffic flows, but its constrained and compact design would minimise the impact on the surrounding landscape, wooded valley slopes, local roads and the environment.

During design development, several layout options were considered including a diamond layout and switching the arrangement of the mainline to run below the junction link road. This layout would have led to the west facing slip roads starting and finishing on the tight horizontal radius approaching the junction. This would not be good practice and would present safety concerns during operation.

In addition, this layout would result in increased material waste, the disposal of which would negatively impact the local waste capacity and would have a significant impact on construction traffic movements, increasing the carbon output and impact on local roads. The footprint of the scheme would also be significantly increased affecting a wider area of landscape.

We worked closely with key stakeholders and further design options were considered such as alternative locations and junction designs. However, the proposed location has more landscape benefits due to it being situated in an existing valley, with a more compact design and smaller footprint.

Cowley junction

Description of the proposed design

The Cowley junction would provide access to the local road network via 'left-in left-out' junctions on the A417 and would serve local settlements including the villages of Brimpsfield, Caudle Green and Stockwell. The junction would also provide access to the repurposed A417 including the Golden Heart Inn along the narrowed Ermin Way, the proposed Air Balloon Way WCH route and the proposed new parking areas.

Cowley junction has been designed in accordance with our design standards and largely follows the principles of compact grade separation, utilising the existing underbridge to the south of the existing Cowley roundabout. The implementation of higher standards for the merge and diverge arrangements is proposed to improve the safe operation of the junction.

This is shown on sheet 15 of Figure 7.11 of the Environmental Masterplan, and sheet 6 of the General Arrangement Plans (Document Reference 2.6).

Design development and key considerations

Cowley junction has been designed to improve safety, reduce the impact on the environment, maintain local road connections, reduce rat running in the area and link with existing local infrastructure. Its design will enable us to minimise the impact of construction.

During early stages of the design process, consideration was given to whether a junction was needed in this location, however, a number of factors influenced its inclusion including the following:

- The presence of existing infrastructure such as the underbridge and associated roads
- Suitable routes for vehicles to access the re-purposed section of the A417
- Suitable and safe access to local settlements such as Stockwell, Nettleton Bottom, Caudle Green and Brimpsfield
- Construction staging requirements
- Construction compound access.

Previously, on the eastbound side of the junction we proposed a T-junction layout with the existing underbridge. This was then replaced with a loop style arrangement which would tie into the existing underbridge.

Following public consultation in 2019, we removed the connection to Cowley Wood Lane from the junction as local people were worried it would be used as a rat run.

As with the previous eastbound design iteration, we had proposed a loop and a T-junction layout for the westbound side of the junction. However, this was replaced with a new roundabout layout on the existing A417. This would enable better construction phasing and traffic management during the construction process. It would also provide a safer interface with the local road network compared to a simple junction. The roundabout would also reduce land take compared to the previous design.

3.4

Side roads

Two key side roads form part of the proposals including the A436 link road, which would link the existing A436 to Shab Hill junction, and the B4070 which would link Birdlip Village to Shab Hill junction via a new roundabout at Barrow Wake. Other minor road connections and accesses would also be provided to serve various properties and settlements.

A436

Description of the proposed design

A new single carriageway is proposed to connect the existing A436, just east of the existing Air Balloon roundabout, to the proposed Shab Hill junction. It would run parallel to the A417 mainline. At its northern end it would tie into the proposed Ullenwood junction providing access to Cheltenham via Leckhampton Hill or the existing A436. At its southern end it would tie into the proposed Shab Hill junction. This would provide direct access onto the A417 mainline and the B4070 Birdlip link to the west.

The proposed A436 link road would climb up to an 8% gradient from the existing A436. As such, a 3.5 metre wide climbing lane is proposed to accommodate slower moving vehicles travelling from the new Ullenwood junction to Shab Hill junction.

This is shown on sheets 7 to 10 of Figure 7.11 of the Environmental Masterplan (Document Reference 6.3); and sheet 2 of the General Arrangement Plans (Document Reference 2.6).

Design development and key considerations

The A436 slip road design seeks to minimise the impact on the local landscape, environment and local people, by aligning it alongside the proposed A417 section. This would reduce the overall footprint of the scheme, avoiding large areas of islanded land and reducing its impact on the landscape.

During design development, alternative routes for the A436 link road were considered. We considered utilising the existing A417 from Ullenwood junction by way of an overbridge over the A417 mainline. We also considered a route to the east of Ullen Wood. Both options were discarded in favour of the proposed design. The route east of Ullen Wood was rejected because of its greater environmental effect and loss of ancient woodland.

The proposed design minimises impacts on the landscape due to its constraints being within a single corridor with the mainline. It minimises the impact on Ullen Wood and the visual impact on the surrounding landscape. For further details on the alternatives considered refer to ES Chapter 3 Assessment of Alternatives (Document Reference 6.2).

The A436 link road alignment has been optimised to position it closer to the proposed mainline. This minimises the footprint of the development and moves the A436 further from Ullen Wood. This also mitigates the effects on Rushwood Kennels and Cuckoopen Barn Farm.

Equestrian holding area on realigned B4070

B4070

Description of the proposed design

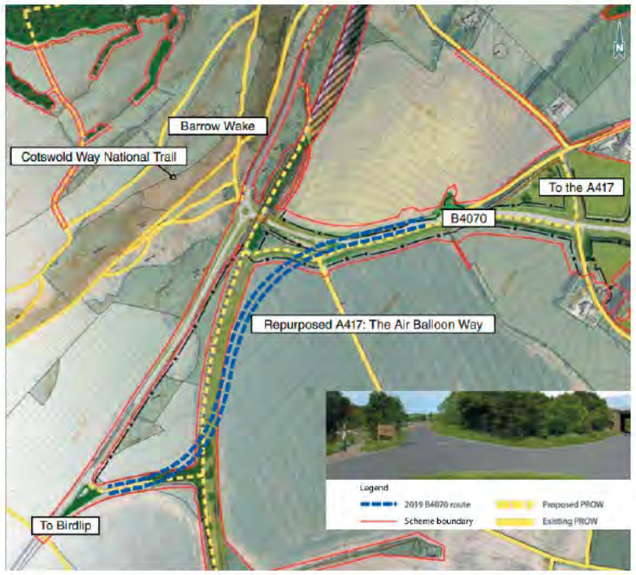
Access to Birdlip would be provided from the proposed Shab Hill junction via a new link that would utilise the existing lane, underbridge and junction on the existing Barrow Wake access road, to the B4070.

The link between Shab Hill junction and Barrow Wake would be a single carriageway with a segregated walking, cycling and horse riding route running parallel for much of its length before diverging, prior to the existing A417 underbridge, and connecting to the proposed Air Balloon Way.

The road from Barrow Wake to the existing B4070 junction near Birdlip, would utilise the existing infrastructure and retain existing levels. The road would be resurfaced and narrowed to provide a wider pedestrian and cycle provision on the western side. The verge would be narrowed 120 metres south of Barrow Wake to preserve mature trees.

The B4070 would also provide access to Birdlip Radio Station as well as Shab Hill Barn and Farm using an at-grade, staggered crossroad junction arrangement.

This is shown on sheets 22, 23 and 25 of Figure 7.11 of the Environmental Masterplan (Document Reference 6.3); and sheets 2 and 3 of the General Arrangement Plans (Document Reference 2.6).



Discounted option for realignment of B4070

Design development and key considerations

The realignment of the B4070 has been carefully designed to minimise the impact on local people, property and the landscape. By utilising the existing local road network, construction impacts would be also reduced. The new roundabout proposed would be safer and help deter anti-social behaviour in the area. It has been carefully designed to minimise the impact on the landscape and Crickley Hill and Barrow Wake Site of Special Scientific Interest (SSSI).

As a result of feedback received in response to the 2020 public consultation, the proposed B4070 link road and proposed Shab Hill junction western roundabout have been moved further north, to mitigate the effects of the scheme on local properties. This would place the roundabout and associated section of the B4070 in a cutting to screen the roundabout and traffic from the properties.

The proposed route of the B4070 link road would make use of the existing road between Barrow Wake and Birdlip, and the existing bridge under the A417. A small roundabout would be constructed in the current location of the T junction. This would have several benefits over the previous solution including:

- Eliminating parking on this section of the road
- Bringing through-traffic closer to Barrow Wake car park via the roundabout would act as a form of passive surveillance which would discourage anti-social behaviour
- Reducing the extent of construction in this location and make use of existing highway
- Reducing land take
- The roundabout would also act to calm traffic speeds on this section of road as well as deterring use of the road by large goods vehicles
- Retaining existing field patterns.

There were several factors that influenced the type of junction at Barrow Wake, however, the overriding reason was safety. A roundabout is safer as it is better at controlling speeds, facilitating a change in direction for the main traffic flow and provides an efficient method of access to Barrow Wake. To mitigate the effect of the roundabout on the landscape it would be constructed in a shallow cutting which would provide screening from the wider area.

The impact of light pollution has been considered here and as such, a stone wall has been provided, which will prevent light spill but in a way that is sensitive to the local landscape.

The location of the roundabout within the SSSI has also been considered and we have sought to avoid or reduce habitat loss within the SSSI by constraining the size of the roundabout and amending vertical alignments to minimise the scheme footprint. Road verge trees that will be unavoidably lost will be replaced with calcareous grassland habitat as discussed and agreed with environmental groups.

3.5

Crossings

There are six crossings of the A417 proposed along the scheme, comprising two underpasses and four overbridges.

A collaborative, multi-disciplinary approach has been adopted for the design of all structures proposed as part of the scheme. Several disciplines led by landscape specialists have been involved in the design process to make sure that all requirements have been taken into account. The section below includes a description of the proposed structure designs and all aspects that would affect their location, function, selected form, structure, appearance and aesthetic quality, such as their position in the landscape and impact on social, cultural and heritage sensitivities; and demonstrates how all these aspects have been considered throughout the design.

A key consideration was the consistency in the design and finish on all structures to create a family of structures, an approach welcomed by stakeholders during collaborative meetings. This will be achieved by using the same palette of materials and common design elements (i.e. parapets, abutments and beams).

Early illustrative cross section of the Gloucestershire Way crossing

Crickley Hill bat underpass (Ch 1+100)

Description of the proposed design

The underpass would provide essential mitigation in the form of a safe crossing for bats, linking habitats on either side of the scheme and mitigating habitat severance.

The underpass would be a precast concrete box of three metres by three metres and would not be lit. Access through the underpass for pedestrians would be prevented by grills at either end.

This is shown on sheet 3 of Figure 7.11 of the Environmental Masterplan (Document Reference 6.3); and sheet 1 of the General Arrangement Plans (Document Reference 2.6).

Design development and key considerations

The bat underpass has been designed in such a way to make construction quicker and easier, which will ultimately reduce its impact on the environment and bats.

The size of the underpass was dictated by the species of bats present in the area that are known to currently cross the road in this location. This includes some of the rarest bats in the country, which are particularly at risk of traffic collision as a result of habitat severance by the road interrupting their habitual flight patterns.

Ecological surveys in this area identified several species of bats crossing the existing A417 along a section of existing woodland bordering either side of the road. The bat flight paths would be disrupted by the widening of the proposed A417 mainline carriageway and the consequent significant loss of the southern woodland belt which currently provides a safe crossing. For this reason, a bat underpass would be required in this area as embedded mitigation, which would be unlit and sufficiently large for bats to be guided through. Landscape planting either side of the underpass would help guide bats to the entrances.

Bat species tend to be sensitive to light, and so to ensure the structure is appropriate and functional it will not be lit.

Significant earthworks will be required to construct the proposed A417 carriageway at this location, with embankments up to a maximum height of ten metres. The structure would lie at the start of Crickley Hill, with an increase in existing ground level of over five metres from west to east. The southern section of the underpass would be constructed entirely within the engineered embankment fill overlying the natural ground level, while the northern section would be close to the existing ground level and the proposed Cold Slad bridleway.

Due to the short single span, precast concrete construction is well suited for the Crickley Hill bat underpass. Precast construction allows for reduced construction time and labour cost due to speed of construction and removing temporary formwork. For this reason, cast-in-situ concrete options were not considered further. Precast concrete options were considered including, box, arch and pipe.

All three options have been compared qualitatively, and the box option was the preferred design. This option would provide the simplest solution most suited to all requirements.

Grove Farm underpass (Ch 1+725)

Description of the proposed design

Grove Farm underpass would provide a link under the A417 between Cold Slad Lane and Grove Farm. It could be accessed by agricultural vehicles and would provide maintenance access to and from the telecommunications masts. It would also provide connectivity for WCH as it would be designated a PRoW. This would help address existing severance that acts as a barrier to WCH movements in this area.

Grove Farm underpass would be a prestressed beam solution. The structure would have a width of eight metres with a headroom of four metres to allow passage for emergency and refuse vehicles as well as horse riders, and a total deck width equal to approximately 32 metres. This would include a 3.5 metre wide carriageway, which is considered typical for an accommodation access track. The remaining width would accommodate WCH, including disabled users, drainage and utilities.

Low lux, directional, demand sensitive lighting would be required. The demand sensitive lighting would be available half an hour after dawn until half an hour before sunset between 1 April and 31 October. From 1st November to 31st March, the demand sensitive lighting would be available 24-hours a day.

This is shown on sheet 5 of Figure 7.11 of the Environmental Masterplan; and sheet 2 of the General Arrangement Plans (Document Reference 2.6).

Design development and key considerations

Grove Farm underpass has been carefully designed to minimise the impact on local landscape, the environment, the operation of the A417 and private access during construction.

The Grove Farm underpass is constrained by steep topography on the Cotswolds escarpment at Crickley Hill and Barrow Wake. Both areas are part of the SSSI and therefore have been avoided. In addition, the landscape around the proposed Grove Farm underpass is heavily wooded. Therefore, any encroachment should be avoided and vegetation clearance on either side of the underpass would need to be kept to a minimum.

Significant earthworks would be required to construct the proposed A417 carriageway at this location with embankments up to a maximum height of approximately 10 metres. The structure would be constructed within the embankment fill above existing ground level. The geometry of Grove Farm underpass is well suited to precast concrete construction. Precast construction allows for reduced construction time and labour cost due to speed of construction and removing temporary formwork. For this reason, cast-in-situ concrete options were not considered further. A steel composite solution was also discounted, as the span is not long enough to make steel a cost-effective solution.

Several superstructures options were considered, including a precast concrete box, an integral prestressed concrete beam bridge, and a TYE-beam typical deck section. Options were compared qualitatively, and the prestressed concrete beam option was preferred as it would provide the most flexibility to accommodate the preferred construction phasing.

Visualisation of Cotswold Way crossing

Visualisation of Cotswold Way crossing

Cotswold Way crossing (Ch 2+000)

Description of the proposed design

The new crossing would reconnect the severed Cotswold Way National Trail, providing an enhanced user experience for WCH. The crossing would accommodate a five metre wide path, acting as a continuation of the proposed Air Balloon Way, and link into the wider network of PRoW.

The structure would be a single span crossing approximately 55 metres long with an approach ramp with a gradient of approximately 5% to allow access for all users. The ramp span between the new A417 carriageway and the proposed Cold Slad Lane would depend on the structural form and would range from approximately 40 metres up to 80 metres.

The structure would be elegant, slender and be set as low as possible within the landscape. This way, it would become a point of visual interest to road users and successfully integrate with the surrounding landscape. The selected structural form has the added benefit of utilising a through structure geometry, which compared to other typical beam solutions would result in a lower deck level, and therefore a shorter ramp. In addition, the structure would appear more slender as the longitudinal girders would form the solid infill section of the parapets.

This is shown on sheet 6 of Figure 7.11 of the Environmental Masterplan; and sheet 2 of the General Arrangement Plans (Document Reference 2.6).

Design development and key considerations

Situated within the Cotswolds AONB, the structure needs to be designed as a high quality and distinctive structure of pleasing architectural form and materials, appropriate for its setting. Being a landscape-led scheme, the aesthetics of the structure are particularly important. Therefore, the decision was made to design an asymmetric box girder solution as this was considered to be the most elegant solution. Weathering steel is proposed, which has benefits for maintenance, aesthetic appeal and sustainability, reducing the whole life cost of the structure compared to painted steel.

The crossing has been sensitively designed in collaboration with stakeholders. The chosen design will integrate well into the landscape and will minimise its visual impact and impact on local habitats and Emma's Grove woodland. The option taken forward avoids impacts on local properties and reduces the impact of construction. It will reconnect the Cotswold Way National Trail and will be accessible to all users, enhancing people's recreational enjoyment of the area.

Various options have been considered at this location including a green bridge. This option was considered in close collaboration with stakeholders but discounted due to the impacts on ecology and landscape.

Various alignments were considered for the Cotswold Way crossing. The aim was to reduce the material usage by utilising the local topography, but also avoiding the local cottages near the landing to retain privacy for their residents and also avoiding priority habitat and Emma's Grove woodland.

The design of the Cotswold Way crossing has been influenced by stakeholders with modifications made through consultation and stakeholder workshops. There were a number of different structural options considered including weathering steel box girders, steel beam with composite concrete deck, prestressed precast concrete beam with concrete deck and steel truss.

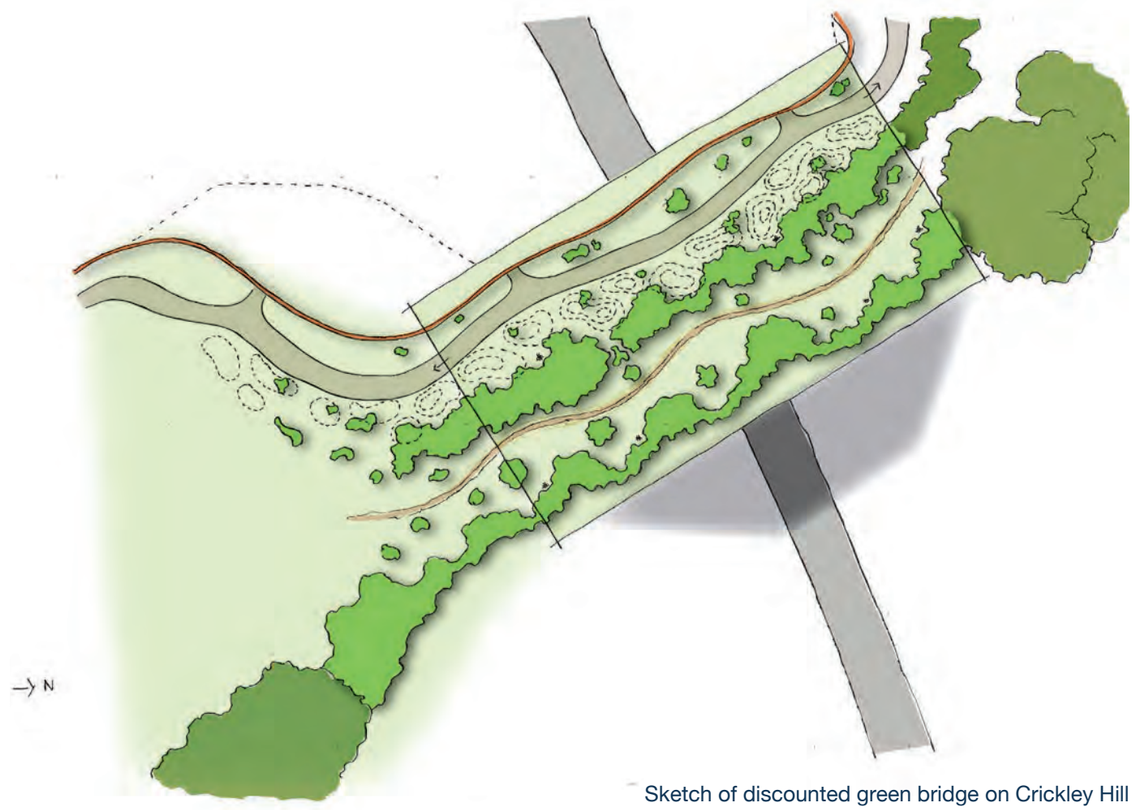
The location of the structure is heavily constrained by existing landscape features, being located adjacent to Emma's Grove woodland within which is a scheduled monument comprising three round barrows. The design of the crossing is further constrained by the required safety distances and maintenance aspects of the proposed Cold Slad Lane, meaning the crossing would need to land between the new A417 mainline and Cold Slad Lane, to the west of Ullenwood junction.

In addition, the structure is also constrained by the local topography, with a significant level change from south to north, and spanning five lanes of the new A417 carriageway. The bridge would launch from a high point (approximately 240 metres Above Ordnance Datum) from the edge of Emma's Grove woodland, cross the new A417 carriageway and reach a pier support between the new A417 and the existing A417 (proposed Cold Slad Lane realignment). The bridge would then curve round to form a ramp that would land between the two roads further towards to the west of the new Ullenwood junction (approximately 233 metres), utilising the highway gradient to reduce the length of the ramp.

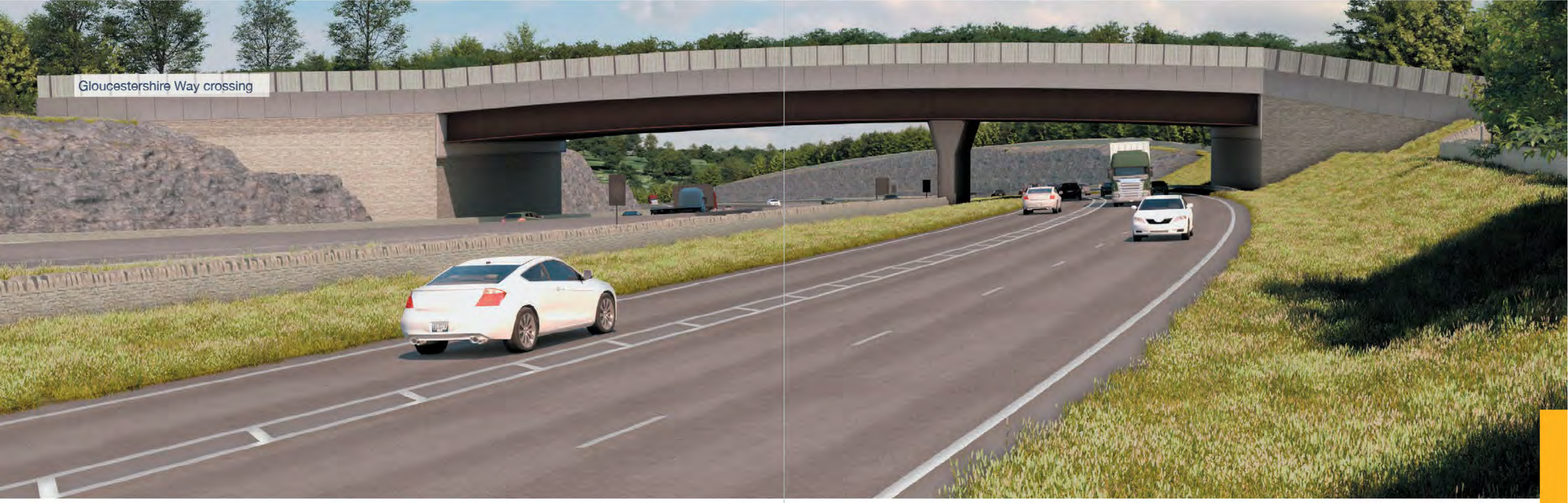
In addition, land on the northern side of the crossing is declared as inalienable National Trust land. For this reason, the structure would avoid the National Trust's land being located between the proposed Cold Slad Lane and the new A417 carriageway.

These factors have a significant impact on the plan alignment and design of the structure, which have contributed to the selection of the proposed crossing.

Sketch of discounted green bridge on Crickley Hill



Sketch of discounted green bridge on Crickley Hill



Gloucestershire Way crossing (Ch 2+690)

Description of the proposed design

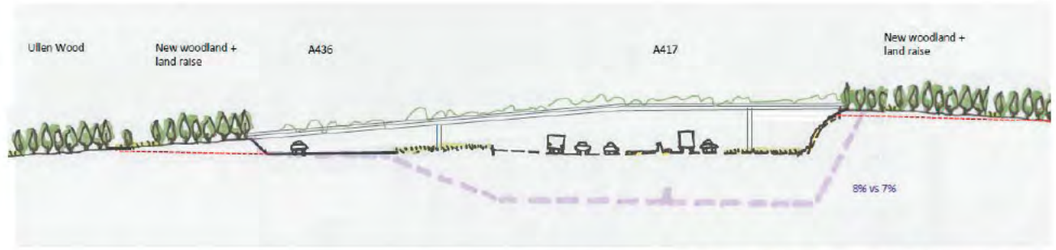
The structure would carry a multi-purpose crossing over the proposed A417 carriageway and the proposed A436. It would provide ecological habitat connectivity as its main function, but would also connect landscape features and provide access for WCH with a new PRoW that would reconnect the Gloucestershire Way long distance path.

The location for this crossing at Ch 2+690 has been selected responding to landscape and ecological survey data. It will help address severance of the landscape and considers field pattern and field boundary features.

For protected species, principally bats, it would link a network of bat roosts, commuting routes and feeding areas that would be severed and fragmented by the scheme. The crossing provides landscape integration and would ensure bats and other wildlife (such as badgers and barn owls) can travel between Ullen Wood and existing feeding and resting areas on the other side of the proposed highway. It would also improve access to places of historical interest, such as Emma's Grove and Barrow Wake, thereby providing cultural heritage benefits.

The structure would be a two span steel composite beam structure approximately 66 metres long. The crossing would be integral with the abutments and piers. The crossing would be wide enough to accommodate and separate wildlife and people and would be 37 metres wide, to include the following:

- 3.5 metres provision for walkers, cyclists, and horse riders, including disabled users
- 25 metres wildlife area comprising calcareous grassland (as essential mitigation and enhancement for biodiversity and landscape)
- 1.5 metres maintenance strip (health and safety requirement)
- 2 x 3 metres native species-rich hedgerows (essential mitigation for bats and to separate wildlife from the walking, cycling and horse riding route)
- 2 x 0.5 metre parapet beams.



Horizontal profile at Gloucestershire Way crossing

At the proposed location of the structure, the mainline would be in a cutting, approximately four metres below existing ground level at the east and approximately nine metres below existing ground level at the west. An approach embankment would need to be constructed from engineered fill at the east considering the minimum headroom requirements and the total depth of the structure.

This is shown on sheet 9 of Figure 7.11 of the Environmental Masterplan; and sheet 2 of the General Arrangement Plans (Document Reference 2.6).

Design development and key considerations

Ecological surveys in this area identified several species of bat using the existing tree lines as foraging corridors. The bat flight paths would be disrupted by the proposed A417 mainline carriageway and the A436. For this reason, a bat crossing would be required in this area. We've identified other species that would need of a crossing including badgers, and barn owls. As the structure would maintain the existing commuting routes for the bat species that were identified, the parapets will have solid infill for their entire height in order to maintain a dark, sheltered corridor over the bridge.

This crossing has been designed collaboratively with stakeholders, giving careful consideration to minimise the impact on the landscape and address severance. It would help enhance local habitat connectivity and reconnect the Gloucestershire Way and be accessible to all users, enhancing people's enjoyment of the local area.

Key considerations for the design of the structure were to contain an open grass area which will be a minimum width of 25 metres to provide habitat connectivity. The following will also be required for protected species:

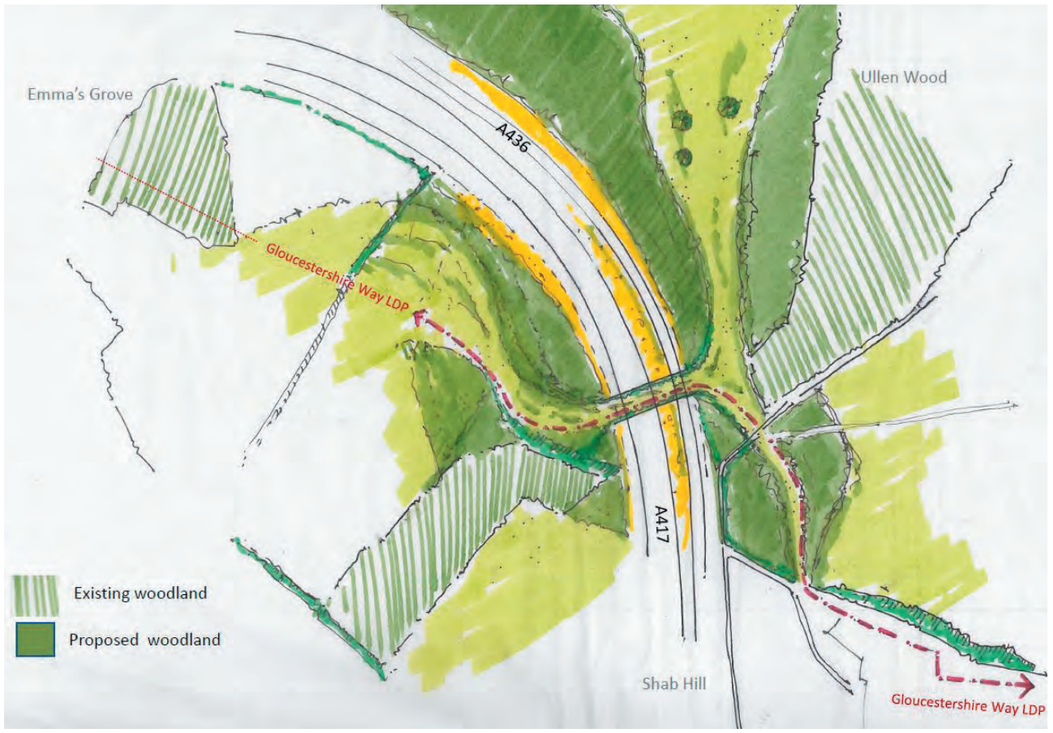
- Hedgerow or tree line of at least two metres high to steer flight paths across the structure (particularly important for horseshoe bats)
- Twin hedgerows to create shelter from wind across the crossing area, and to separate the WCH provision from the wildlife corridor
- Parapets of the structure to be solid in form to a height of 2.5 metres to maintain a dark, sheltered corridor over the bridge shielded from the wind and glare from headlights of vehicles passing on the A417 and A436 below
- An area of land or ground wide enough for bats to follow next to hedge or tree lines
- Hedgerows for barn owls to follow. They would also act as a wind break and provide cover for badgers
- Connections between grassland and hedgerow habitat on the bridge structure to grassland, hedgerow and woodland habitat either side which will help lead species to the crossing.

The high wold and high wold valley landscape in the area around the proposed Gloucestershire Way crossing have areas of ancient woodland, mature tree lined field boundaries and woodland copse. The structure could be large and prominent in the landscape and for this reason it has been designed with a low profile to match existing topography and integrate well with the sensitive surroundings.

The architecture of the crossing is important, and it needs to reflect its setting within the AONB, complement the area's landscape character and fit in with its context. This structure could become immediately recognisable as the A417's multi-purpose crossing.

There is an opportunity to create a wooded setting around the crossing to integrate it successfully into the AONB landscape. The structure would sit at a high point in the high wold landscape here but can be successfully integrated by the addition of two additional woodland blocks that would work to also provide the essential ecological connectivity with existing woodland areas of Emma's Grove and Ullen Wood ancient woodland.

The crossing contributes to the delivery of the scheme vision by seeking to conserve and enhance the special character of the Cotswolds AONB, providing safe recreational access away from the busy road and providing landscape and habitat connectivity.



Early sketch of Gloucestershire Way crossing, discounted

The scheme and the Gloucestershire Way crossing

Discounted Gloucestershire Way crossing option - three span concrete arches

Discounted Gloucestershire Way crossing option - three span steel composite beam

The crossing reconnects the Gloucestershire Way long distance path and links key landscape features in the areas, including Ullen Wood, Emma's Grove and the proposed Air Balloon Way.

Technical factors that we have had to consider include the fact that the self-weight of the soil and the planting needed for the ecological environment would be a significant structural constraint. Considering the relatively long span of the bridge and the loading requirements, no single span options were investigated. It is noted that a single span structure would have a significant structural depth, which is against the design intention (i.e. a structure sitting as low as possible within the landscape). For this reason, two span and three span options were considered to reduce the maximum span. Despite three span options splitting the total span of the bridge in three approximately equal spans, they were discounted for the following reasons:

- At this location the A417 would be on a tight curve and siting a wide pier, or a series of columns, in the central reserve would impact the visibility splay and would require the two carriageways to be moved further apart
- The health and safety implications arising from future inspection and maintenance within the central reservation would best be avoided.

The structure would therefore consist of two spans. The span over the new A417 mainline would be approximately 42 metres while the span over the new A436 would be approximately 24 metres. Two different structural forms were considered for the structure:

- **Option 1:** Two span cast-in-situ concrete arched profile beam integral bridge with reinforced concrete abutments and piers
- **Option 2:** Two span steel-concrete composite integral bridge with reinforced concrete abutments and piers.

Both options were compared qualitatively, and Option 2 was the preferred option as this would allow a low-lying structure, reducing the impact on the surrounding landscape while at the same time being a simpler and more cost-effective solution. As explained earlier, a key consideration for the scheme is to create a family of structures. Therefore, the selected option for the crossing is even more suitable considering that weathering steel girders are proposed for the Cotswold Way crossing and the Cowley and Stockwell overbridges.

Cowley overbridge (Ch 4+050)

Description of the proposed design

The overbridge would carry a single-carriageway access track connecting Cowley Village with Birdlip. One soft verge would provide ecological and landscape connectivity and one hard verge would provide connectivity for WCH.

The existing Cowley Lane between Stockwell Farm and Cowley is severed by the proposed A417 mainline. The lane is reconnected by the Cowley overbridge at Ch 4+050. Cowley Lane would consist of a 3.5 metre wide carriageway, widened to four metres across the overbridge. The structure would maintain the existing commuting routes for the bat species that were identified, therefore the parapets would need to have solid infill for their entire height in order to maintain a dark, sheltered corridor over the bridge.

Cowley overbridge would span the proposed A417 at a skew of 15 degrees relative to the carriageway. The crossing would provide connectivity to the local road network and includes the planting of a continuous native species-rich hedgerow, to provide continuity from the tree lines already proposed leading up to the bridge, which replace the existing treeline features in the landscape. The hedgerow provides essential mitigation for bats and landscape integration.

The structure would be a single span, integral composite steel girder and concrete deck highway overbridge. The bridge deck would be 11 metres wide in total, carrying a single lane four metre wide carriageway with a three metre wide verge either side of the carriageway and two edge beams. The deck would be square to the abutments with a clear span of 48 metres. The steel girders would have variable depth along the span, reducing towards midspan. The span is connected integrally to the part-height reinforced concrete abutments and founded on piled foundations.

At the proposed location of Cowley overbridge, the mainline would be in a shallow cutting, approximately one to two metres below existing ground level, with approach embankments to the overbridge constructed from engineered fill. The embankments have been designed to provide extra visual and acoustic screening.

This is shown on sheets 12 and 13 of Figure 7.11 of the Environmental Masterplan; and sheet 5 of the General Arrangement Plans (Document Reference 2.6).

Design development and key considerations

The overbridge has been carefully designed to integrate into the local landscape. Its design will minimise the impact on local trees and maintain connectivity for local people and wildlife, including bats.

The overbridge would be located within the high wold area which is characterised by gently rolling hills and field parcels often defined by dry stone walls. The overbridge design would not detract from the character of this area and complement the rolling topography of the high wold. Cowley Lane has an established avenue of mixed lime and sycamore running along its length. To protect as many of the trees as possible and to save time during the construction of the structure, it will be built offline. New tree planting will be implemented along the edge of the road on the approach to the overbridge with a single 3 metre wide hedgerow proposed to provide continuity over the structure.

Horseshoe bats have been recorded in the area and therefore the planting of hedgerows would be required to steer flight paths of bats across the structure and maintain existing commuting routes. Hedgerows would also provide cover for badgers to cross the structure. Hedgerows would be planted either side of the overbridge to connect habitats and to help lead species to the crossing.

Visualisation of Cowley overbridge

Stockwell overbridge (Ch 4+735)

Description of the proposed design

The overbridge would carry a single-carriageway gravel access track, providing access to Stockwell Farm and help connect WCH routes. Two soft verges would provide ecological and landscape connectivity.

Stockwell overbridge would span the proposed A417 at a skew of 11 degrees relative to the carriageway. The crossing would provide a private means of access with two verges consisting of continuous native species-rich hedgerows. They would provide continuity from the tree lines already proposed leading up to the bridge, which would replace the existing treeline features in the landscape. The hedgerows provide essential mitigation for bats and landscape integration.

The structure would be a single span, integral composite steel girder and concrete deck highway overbridge. The bridge deck would be 11 metres wide in total, carrying a single lane 3.5 metre wide gravel track carriageway with a 2 metre wide verge either side of the carriageway and two edge beams.

The road on the crossing would be widened to 4m and the verges would be three metres wide. The deck would be square to the abutments with a clear span of 48 metres. The steel girders would have variable depth along the span, reducing towards midspan. The span is connected integrally to the part-height reinforced concrete abutments and founded on piled foundations. At the proposed location of Stockwell overbridge, the mainline would be on gently sloping sidelong ground with a small embankment approximately one to two metres in height on the west side, with approach embankments to the overbridge constructed from engineered fill.

This is shown on sheet 14 of Figure 7.11 of the Environmental Masterplan; and sheet 5 and 6 of the General Arrangement Plans (Document Reference 2.6).

Visualisation of Stockwell overbridge

Design development and key considerations

The overbridge has been carefully designed to integrate into the local landscape. Its design will minimise the impact on the environment and maintain property access and connectivity for wildlife, including bats.

Two different structural forms were considered for the overbridges:

- **Option 1:** Single span steel-concrete composite integral bridge with full height abutments
- **Option 2:** Single span precast prestressed concrete beam integral bridge with full height abutments.

Both options were compared qualitatively, and Option 1 was selected as the preferred option. Weathering steel has an aesthetically pleasing finish that can integrate well in natural surroundings and the use of variable depth steel girders will help to reduce visual impact. Option 2 was discarded because the precast prestressed concrete beams would be deeper than their steel counterparts and cannot accommodate curved alignment profiles, causing headroom issues and increasing the amount of earthworks at bridge approaches. It is noted that a cast-in-situ concrete deck option was considered but it was found to be unlikely to be economical given the span length of the bridges. An arch arrangement was also considered but was discarded as it would raise the side road alignments over the bridges, significantly increasing the size of the approach embankments and therefore the visual impact on the landscape. In addition, this solution would cause issues with the vertical alignment of the side roads as steeper gradients would be required.

A key consideration for the scheme is to create a family of structures. Therefore, the selected option for the overbridges is even more suitable considering that weathering steel girders are proposed for the Cotswold Way and Gloucestershire Way crossings.

Sign to Gloucestershire Way long distance path

3.6

Public rights of way

General principles behind the design

In taking a landscape-led approach to the scheme, we have sought to improve accessibility for all groups of people through an enhanced PRoW network and address existing barriers to WCH in the local area where possible and appropriate.

The AONB attracts lots of recreational visitors and surveys undertaken of the numbers of users show that the area is popular and frequently busy with people using the PRoW network.

The relatively high number of people require an extensive PRoW network to help disperse people, reducing the likelihood of potential adverse environmental impacts due to overuse of paths or trampling of vegetation off the main path network. Specifically, environmental groups have asked us to consider how our proposals could help avoid increasing pressure on Crickley Hill and the Cotswold Beechwood SAC by dispersing WCH along the proposed Air Balloon Way and then onto to Stockwell and the Golden Heart Inn with new areas of car parking.

Some of our stakeholders have expressed the importance of unclassified roads, such as local tracks or paths, as part of their frequently enjoyed WCH routes. We have considered them carefully in WCH connectivity, recognising their importance in helping connect the PRoW network and also respecting the types of routes, surface finishes and features that people enjoy in the area.

Some of our stakeholders have also expressed the importance of trying to keep routes that need to be diverted, such as the Cotswold Way National Trail and Gloucestershire Way, as close to their authored alignment as possible. We have sought to achieve that through our approach to balancing the interests of people, landscape and the environment.

The design of WCH routes associated with the scheme is unusual for a number of reasons. The AONB, Cotswold Way National Trail, Gloucestershire Way long distance path and extensive PRoW network in the area presented a series of constraints and opportunities for the scheme design.

We considered it important to try to maintain connectivity across the routes and avoid severance whilst seeking to overcome existing barriers to people moving around the area safely.

Working closely with stakeholders including user groups, all but one of the existing PRoW affected by the new road will be diverted or replaced, with the aim of increasing or improving connectivity in the area. Only one PRoW has to be permanently removed without a direct replacement. We also plan to make the local PRoW network even better connected by creating new WCH routes.

Safety has been an important consideration to our proposals, for example, where existing routes are considered to pose public safety risks and would be affected by the scheme we have sought to provide alternative routes or safe crossing points.

The local area benefits from an extensive network of footpaths that connect into other PRoW and local roads. For diverted and new PRoW, classifications seek to help ensure improved connectivity and public safety for walkers, as well as considering the needs of cyclists and horse riders where appropriate.

PRoW that intersect with the scheme are shown in ES Figure 12.2 Public Rights of Way and Local Routes (Document Reference 6.3). Figure 3-4 shows the site wide PRoW connectivity provided by the scheme for the affected PRoWs. Solid yellow lines represent the existing PRoW network and dashed yellow lines represent the PRoW proposals.

Horse riding is a popular activity in this area, with many members of this community keen to promote horses and carriages as a user group. This has led to designating routes as restricted byways; both new PRoW and changes in designations of existing PRoW. Design guidance for carriages is lacking but the restricted byways are wider with a shallower gradient than bridleways intended for horse riders.

Some of our stakeholders have also expressed the importance of trying to keep routes that need to be diverted, such as the Cotswold Way National Trail and Gloucestershire Way, as close to their authored alignment as possible. We have sought to achieve that through our approach to balancing the interests of people, landscape and the environment.

Any surface finishes, enclosures or signage would be developed at the detailed design stage. However, the proposals have been subject to discussion with user groups to help ensure they are fit for purpose and would help improve access for all throughout the local area in a way that is sympathetic to the existing landscape. For example, the views from Shab Hill are important to people who travel through the area, and so we have helped ensure people can continue to enjoy them from the Gloucestershire Way crossing.

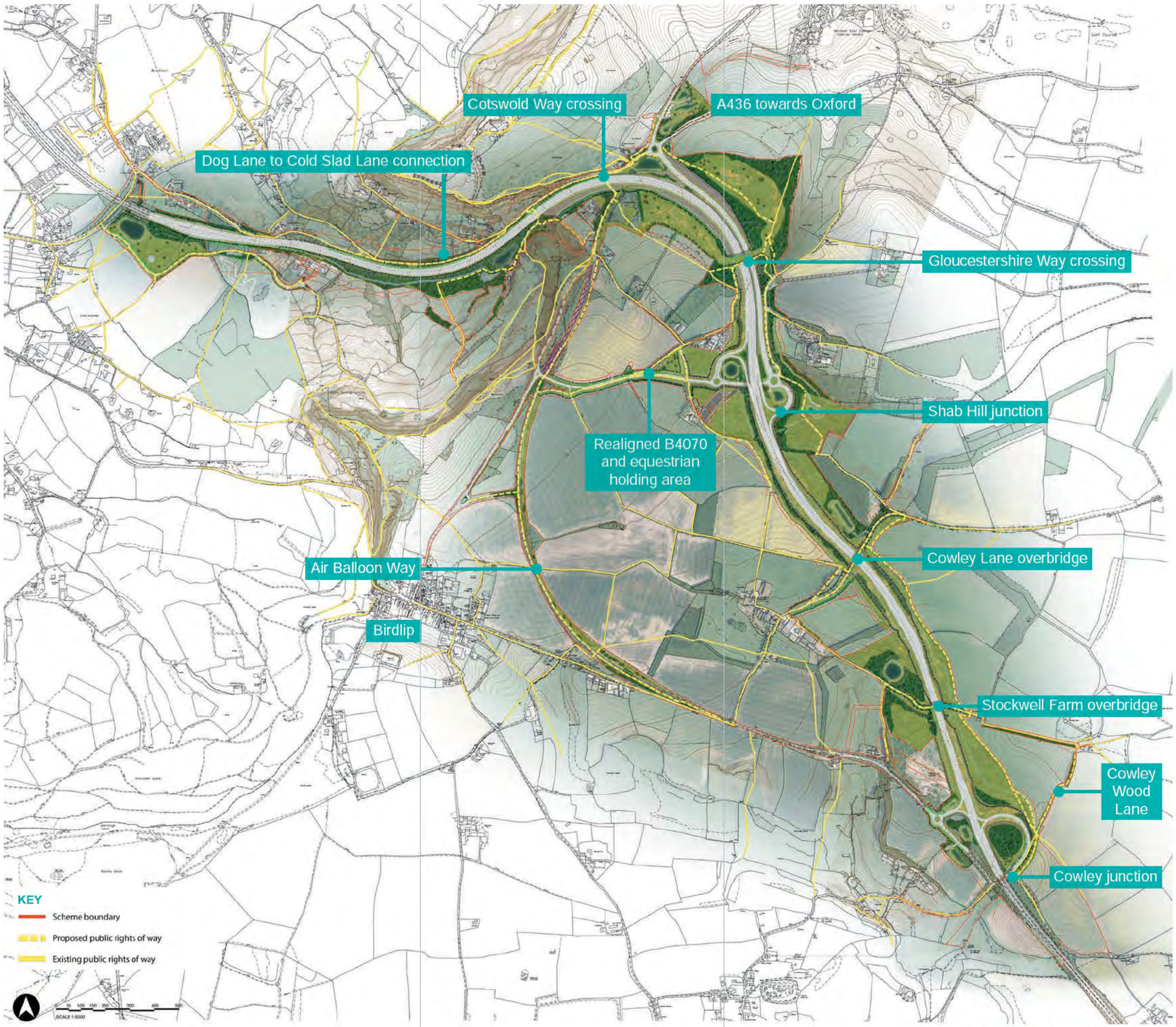


Figure 3-4 PRoW Connectivity
Existing and proposed Public Rights of Way

Online

Description of the proposed design

Currently people have to cross the busy A417 road, which is dangerous. To improve the situation, we're proposing to build safer crossings of the A417. The Cotswold Way crossing and the Grove Farm underpass are vital additions. They have been carefully designed and will take walkers, cyclists and horse riders away from high levels of traffic.

In seeking to bring about positive changes to the PRoW network, the following measures are proposed as part of the online section of the scheme:

- The Cotswold Way crossing to provide an attractive and safe grade separated route for the diversion of the National Trail
- An underpass at Grove Farm to provide safe north-south connectivity of the existing A417 for WCH users
- A new bridleway between Dog Lane and Cold Slad Lane to improve connectivity to the Cotswold Way, Crickley Hill Country Park, and beyond, helping reduce the need for residents in Brockworth and its planned developments to travel by car
- Pedestrian provision at Ullenwood roundabout to provide safe access across and around the junction and connecting routes.

Design development and key considerations

The topography of the Cotswold escarpment poses a challenge, particularly for disabled users. Route designs are inclusive wherever possible but, in some locations, the paths are steep and more suitable for horse riders or are stepped.

We have carefully considered PRoW connection across the mainline at the western end of the online section. Historic routes are already severed by the existing A417 with no safe crossing points.

North-south crossings of the existing A417 will benefit from the Grove Farm underpass. Further improved connectivity via an additional bridge or underpass has been considered to the west of the Grove Farm underpass but this has not been provided due to the impacts on the landscape, ecology, land and property.

East-west connectivity for PRoW users on the southern side of the A417 mainline was considered, but discounted due to impacts on land and property as well as the existing topography resulting in steep gradients or a significant impact on the landscape to obtain a reasonable design. Connectivity via Dog Lane and Cold Slad Lane on the northern side of the A417 has been provided to ensure east-west connectivity, which would also connect into the Grove Farm underpass.

PRoW connectivity has been provided between Crickley Hill Country Park access and Cold Slad Lane. This connectivity provides safe access for users by avoiding the Ullenwood junction. The provision of this PRoW and consideration of the existing tree line adjacent to the cricket ground, has resulted in steepened earthworks along Leckhampton Hill. This provides space for the PRoW while minimising impact on existing vegetation.

Offline

Description of the proposed design

In seeking to bring about positive changes to the PRoW network, the following measures are proposed as part of the offline section of the scheme:

- A Gloucestershire Way crossing to provide a multi-purpose grade separated route for the diversion of the long-distance path and other routes
- Planted overbridges at Stockwell and Cowley to provide grade separated routes for the diversion of multiple routes
- WCH provision and mitigation for the severance of unclassified roads with routes to Shab Hill junction and along the realigned Birdlip Link Road (B4070)
- Reduced movements at Cowley junction to help reduce rat running and impacts of traffic on residents in Cowley and Brimpsfield, with traffic prevented from using Cowley Lane
- Re-aligned B4070 connection with a roundabout to help address anti-social behaviour including in the Barrow Wake area, with increased WCH surveillance.

Design development and key considerations

The unclassified road severance around Shab Hill junction has been a concern of local WCH users and a design solution involves new connections on the western and eastern side of the proposed A417. The provision of Byways Open to All Traffic (BOAT) has been the result of extensive engagement with stakeholders, seeking to maintain connectivity in a way that respects the types of routes people currently enjoy. An unclassified road link to the attenuation basin access track at Shab Hill was considered but discounted due to safety concerns of vehicles utilising the road to gain access to Shab Hill junction. The provision of a BOAT minimises this risk due to the lack of bound surfacing.

There are a number of PRoW in the vicinity of Crickley Hill and Barrow Wake SSSI. The potential pedestrian impact on this area was considered taking into account feedback from environmental groups, and an existing PRoW has been stopped up and a new PRoW provided which runs alongside the SSSI which maintains the original connectivity. We have also removed a proposed PRoW that was planned adjacent to the SSSI to connect Barrow Wake to the proposed Air Balloon Way.

Connectivity between the Gloucestershire Way crossing and the Air Balloon Way was a key consideration of the PRoW design. The design utilises existing infrastructure footprints wherever possible, rather than introducing new infrastructure, such as along Birdlip Radio Station Lane, the proposed B4040 Barrow Wake Road and the Air Balloon Way. This connectivity is critical and has been achieved while minimising new infrastructure in the landscape.

South of the proposed Cowley lane overbridge, the PRoW design has been developed to minimise the amount of interaction with existing or proposed hedgerows, and a continuous route has been provided alongside these features. This minimises disruption to the hedgerow alignment and ecology.

Following the 2019 consultation and engagement with local residents, Cowley Wood Lane has been stopped up to traffic and now provides private means of access for local residents and a safe, quiet route for PRoW users. Connectivity between the repurposed A417 and Cowley Wood Lane is provided via adjacent segregated WCH provision and crossing facilities.

The repurposed A417 and the Air Balloon Way

Description of the proposed design

The existing A417 between the existing Air Balloon roundabout and Cowley roundabout would be detrunked and repurposed. Vehicular access would be retained between the proposed Cowley junction and Stockwell Farm junction, providing local access along Ermin Way and Cowley Lane.

This provides a significant opportunity to create a unique feature in this part of the Cotswolds AONB and one that would benefit the landscape, biodiversity and local communities.

Between Cowley junction and Stockwell junction, the existing road would be retained for local access. The road would be narrowed to reflect a local rural lane, with the remaining road surface broken out and removed to provide space for planting.

Between the Stockwell farm junction and the Cotswold Way crossing, a five metre wide corridor along approximately 1.68 miles (2.7 kilometres) of the current A417 would be converted into a purpose built restricted byway route for WCH including disabled users and carriages (referred to as the Air Balloon Way).

For the length of the Air Balloon Way, the majority of the remaining existing road would be broken out and removed replaced with species-rich calcareous grassland, native hedgerow and trees to enhance the existing verges. This would enhance the landscape and create a wildlife corridor. As part of the five metre wide Air Balloon Way, three metres of paved surface would be retained with another two metres of soft surface to be installed, to help accommodate different user groups.

Subject to approval by the local authority, we're proposing to call the repurposed A417 the Air Balloon Way.

Before: existing A417 between Birdlip and Air Balloon roundabout

After: visualisation of the repurposed A417 including Air Balloon Way

Disabled parking off Stockwell Lane and the existing A417

Disabled car parking bays would be provided at the south-eastern end of the Air Balloon Way, near the Stockwell Farm / A417 junction, with further parking provision for car and horseboxes provided in the vicinity of the Golden Heart Inn. This would provide parking for users of the Air Balloon Way and improve the provision and recreational experience for visitors to the AONB, with pedestrian connections to and from the new Cowley junction area where several rights of way and local routes connect. In doing so, it would help to address recreational pressure on areas of ecological value such as at Crickley Hill and Barrow Wake SSSI and the Crickley Hill Country Park.

This is shown on sheets 6, 19 to 24 of Figure 7.11 of the Environmental Masterplan (Document Reference 6.3); and sheets 2, 3, 5 and 6 of the General Arrangement Plans (Document Reference 2.6).

A section of the existing A417 would be demolished and landscaped to provide replacement Common Land. This would be adjacent to the area of Common Land at Barrow Wake. It would be separate but adjacent to the Air Balloon Way, providing opportunities for recreation for walkers.

This is shown on sheets 2 and 3 of the Special Category Land Plans (Document Reference 2.3).

Design development and key considerations

Typically, detrunked roads are declassified from a trunk road to a local road for access. However, we intend to remove highway infrastructure and repurpose the existing A417 between the Cotswold Way crossing and Stockwell farm junction, to include a purpose built multi-user recreational route.

This would enhance the landscape character and special qualities of the Cotswolds AONB, improve recreational links and provide biodiversity connectivity.

The existing road cuts through the high wold, sitting prominently in the open landscape. This introduces visual and noise disturbance to the AONB, affecting the area's perceived level of tranquillity and effects the area's dark skies at night. Removing the road from this part of the landscape will improve local tranquillity and dark skies.

Repurposing part of the existing A417 to include a purpose built multi-user recreational route and green corridor would provide benefits for local communities, visitors and wildlife.

These opportunities were realised early on in the design process, helping to maximise potential beneficial outcomes for the area. Stakeholders were consulted, with interested parties providing detailed feedback on matters such as road surfacing requirements, plant species and planting design and parking facilities.

The design of the Air Balloon Way and its connectivity with other routes such as the Gloucestershire Way and Cotswold Way will help people access local features of interest such as Emma's Grove and the Peak.

Repurposing the existing road infrastructure also allows for wider benefits, such as providing replacement Common Land that links to existing Common Land at Barrow Wake.

When added together the potential benefits of these opportunities for WCH is greater than the sum of the individual parts, with the ability to provide significant benefits to this part of the AONB.

Parking including horse box spaces near but separate to the Golden Heart Inn

4
Design Summary

This section of the report sets out in summary the benefits of the landscape-led approach to design, identifying how the scheme differs to that of a more typical highways design. It also provides a summary of how the scheme meets each of Highways England's principles of good road design and the policy tests contained in the NPSNN for good design.

4.1

The benefits of the landscape-led approach

The landscape-led approach to highways design has proved rewarding in a number of ways; benefiting designated landscapes, assets of cultural importance, rare and important flora and fauna, whilst improving safety and access for the local community.

Our collaborative approach has positively engaged with the local community and key stakeholders to develop a deeper understanding of what they value so that this could inform the scheme proposals and their benefits:

- The landscape characteristics and special qualities of the AONB will benefit from a better integrated and sensitively designed scheme
- Locally important biodiversity will benefit from a focus on bigger, better and more joined up internationally important habitats and appropriate mitigation for protected species
- New archaeological finds will positively contribute to a better understanding of the area's cultural heritage
- Local communities will benefit from a free-flowing, safe, more reliable road network, whilst providing residents and visitors greater recreational opportunities from an improved, better connected network of public rights of way.

Table 4-1 demonstrates how the landscape-led approach to the design of the scheme has differed from a typical design approach. It highlights how the features of the scheme have been designed taking into account the special qualities of the Cotswolds AONB.

Visualisation of Cotswold Way crossing

Table 4-1 Comparison of typical and landscape-led approach

Issue	Typical approach	Landscape-led approach	Special qualities of the Cotswolds AONB
Scheme wide			
Earthworks and false cuttings	Hard engineered slopes	Landscape earthworks to supplement the basic engineering slopes required to support the vertical and horizontal alignment. Landscape earthworks are carefully designed to gently tie the road into existing AONB topography. These features (between Shab Hill and Cowley junctions) build in false cuttings to create immediate visual screening and noise mitigation to the west and east of the scheme. The landscape earthworks are sustainably constructed from excavated materials. Slopes are planted (on highway side) with locally important habitat. The intention would be to return the back slopes by agreement to the landowner to maximise agricultural use and reduce maintenance liabilities.	• The unifying character of the limestone geology – its visible presence in the landscape and use as a building material. • Variations in the colour of the stone from one part of the AONB to another which add a vital element of local distinctiveness. • The Cotswold escarpment, including views from and to the AONB. • The High Wolds – a large open, elevated predominately arable landscape with commons, 'big' skies and long-distance views.
Noise mitigation	Noise fencing	Noise mitigation integrated into landscape earthworks bunds and dry stone walls wherever possible.	• The tranquillity of the area, away from major sources of inappropriate noise, development, visual clutter and pollution. • Distinctive dry stone walls.
Drainage design	Drainage ponds	Drainage basins have been integrated within the landscape topography and have been designed so as not to retain water. The decision to have seasonally dry basins for drainage is to protect the landscape character type in this area as permanent ponds are not typical of this part of the AONB. Naturalise Norman's Brook tributary rather than culvert it (general policy to avoid culverts and keep water features on the surface is a landscape-led decision).	• River valleys, the majority forming the headwaters of the Thames, with high-quality water.
Field boundaries	Standard timber highway fence	Combination of new Cotswold dry stone walling and hedgerows to field boundaries affected by the road infrastructure in place of standard highways timber fences to ensure better fit with landscape character.	• The High Wolds – a large open, elevated predominately arable landscape with commons, 'big' skies and long-distance views. • Distinctive dry stone walls.
Road detailing	Standard highway details	The road carriageway would be sunk into the landscape reducing noise pollution, light spill and skyglow as a result. This would also remove the visual disturbance of moving vehicles across this part of the AONB. No permanent lighting as part of the scheme in order to avoid detrimental impacts on local amenity and the AONB landscape. Where possible, road edges for side roads will not have kerbs or they will be flush to the new road - this is to better fit with the rural character of the local landscape.	• The tranquillity of the area, away from major sources of inappropriate noise, development, visual clutter and pollution. • Extensive dark sky areas. • Internationally important flower-rich grasslands, particularly limestone grasslands.

Issue	Typical approach	Landscape-led approach	Special qualities of the Cotswolds AONB
Materials and finishes	Standard highway materials and finishes	Materials and finishes will be appropriate to local character including restoring and introducing local landscape features such as dry-stone walls as an integral part of the scheme.	• Distinctive dry stone walls. • Variations in the colour of the stone from one part of the AONB to another which add a vital element of local distinctiveness.
Treatment of rock cuttings	Standard highway approach	Project is looking to achieve the steepest angle technically possible for the cutting through the escarpment. This depends on geotechnical survey findings. It is proposed that there will be no netting on the rock slopes in order to create a more natural looking cutting (with ecological potential).	• The unifying character of the limestone geology – its visible presence in the landscape and use as a building material. • The Cotswold escarpment, including views from and to the AONB. • Variations in the colour of the stone from one part of the AONB to another which add a vital element of local distinctiveness.
Mainline			
Cut slopes	35 degree uniform slopes	35 degree overall slope but rather than being uniform, this includes 60 degree benched cuttings and slope faces to match geological features and reduce the scar on the landscape.	• The unifying character of the limestone geology – its visible presence in the landscape and use as a building material. • Variations in the colour of the stone from one part of the AONB to another which add a vital element of local distinctiveness.
Junctions			
Shab Hill junction	Standard junction design	The integration of the junction into the landscape, using the levels of the existing valley effectively 'moving the head of the valley' further east to create a logical resolution of the landscape in this area. A combination of woodland planting with significant volume of landscape earthworks are designed to help integrate and visually screen the road infrastructure into the AONB landscape.	• The Cotswold escarpment, including views from and to the AONB. • The High Wolds – a large open, elevated predominately arable landscape with commons, 'big' skies and long-distance views. • Internationally important ancient broadleaved woodland, particularly along the crest of the escarpment.
Cowley junction	Standard junction design	The integration of the junction into the landscape using a combination of woodland planting with landscape earthworks to help visually screen the road infrastructure.	• The Cotswold escarpment, including views from and to the AONB. • The High Wolds – a large open, elevated predominately arable landscape with commons, 'big' skies and long-distance views. • Internationally important ancient broadleaved woodland, particularly along the crest of the escarpment.

Issue	Typical approach	Landscape-led approach	Special qualities of the Cotswolds AONB
Crossings			
Severance of Cotswold Way National Trail (CWNT)	Footbridge	Circa 5m wide bridge providing a crossing with restricted byway status and carrying the CWNT, to provide the following features: • Crossing for WCH (including disabled users). • Accommodate cattle movements to remove them from the road network. • Provision of a resting area on the bridge to accommodate disabled usage and provide a safe place to stop. • The crossing will connect from CWNT with repurposed A417 (Air Balloon Way) and new local walking/ cycling/ links e.g. to Golden Heart Inn and beyond offering new walking links and opportunities. • The bridge will be of a high quality architectural design and will use materials suited to the landscape.	• An accessible landscape for quiet recreation for both rural and urban users, with numerous walking and riding routes, including the Cotswolds Way National Trail. • The Cotswold escarpment, including views from and to the AONB.
Gloucestershire Way crossing	Standard bat mitigation structure	A 37m wide multi-use crossing to provide bat mitigation beyond what is necessary as well as additional habitat connectivity and enhancement to the Gloucestershire Way crossing. The bridge has been designed with the following features: • A mosaic of habitats including calcareous grassland, groundcover shrub and small tree / scrub to support wildlife movement between Crickley Hill and Barrow Wake SSSIs'. • High quality architectural design which will tie in with the Stockwell and Cowley overbridges to form a cohesive 'set' of bridges. • Have sought to follow the historical alignment of the Gloucestershire Way. • Would link key landscape features in the area including Ullen Wood, Emma's Grove and the new Air Balloon Way.	• Internationally important flower-rich grasslands, particularly limestone grasslands. • Internationally important ancient broadleaved woodland, particularly along the crest of the escarpment.
Stockley Lane and Cowley Lane overbridges	Standard bridge design.	The approach to the design of the bridges has included: • Columns are designed to be as wide as possible to allow views out from the bridge to the surrounding landscape. • Landscape earthworks have been designed to gently tie the road crossings into the surrounding AONB landscape. The intention would be to return the back slopes by agreement to the landowner to maximise agricultural use and reduce HE maintenance liabilities. • Both bridges will feature new tree avenues on their approaches to tie into historic avenue planting in the area. • Bridges will incorporate ecological grassland and hedges to create wildlife connections across the A417.	• The High Wolds – a large open, elevated predominately arable landscape with commons, 'big' skies and long-distance views. • Internationally important flower-rich grasslands, particularly limestone grasslands.

Issue	Typical approach	Landscape-led approach	Special qualities of the Cotswolds AONB
Bridges and structures	Standard Design Manual for Roads and Bridges (DMRB) design	High architectural quality, finished in locally sourced material and other materials which complement the local vernacular.	• The unifying character of the limestone geology – its visible presence in the landscape and use as a building material. • Distinctive dry-stone walls. • Variations in the colour of the stone from one part of the AONB to another which add a vital element of local distinctiveness.
The repurposed A417 / Air Balloon Way			
De-trunk existing A417	Stop up and leave in-situ	The existing A417 would be purposed to provide: a) A 'purpose-designed' width for footpath, bridleway and cycle access to provide recreational route. b) Replacement Common Land, to provide a type of open space for people to enjoy. c) Ecological connectivity and landscape integration with appropriate planting. It would include the following features: • Former road to be resurfaced with locally appropriate toppings, such as crushed stone. • Links into other public rights of way to provide circular routes. • Levels of the old A417 alignment are to be rationalised in places through infilling using excavated materials to restore land to original grades. • New car park facilities at Golden Heart Inn to encourage visitors to the Inn and to use the repurposed walking/ cycle /horse riding route. Regrading routes north from the Inn to meet the repurposed WCH route along the detrunked A417. • New disabled parking and horse box parking facility at the start of the repurposed section. This takes advantage of the flatter topography northwards for these users. • Significant new planting of tree belts and hedgerow along the 6.14km repurposed section utilising space created by narrowing down the A417 road a purpose designed right of way for walkers/ cyclists/ horse riders. • Area of replacement Common Land which connects to the existing Common in the vicinity of Barrow Wake and includes restoration of the landscape occupied by the former A417.	• An accessible landscape for quiet recreation for both rural and urban users, with numerous walking and riding routes, including the Cotswolds Way National Trail. • The High Wolds – a large open, elevated predominately arable landscape with commons, 'big' skies and long-distance views. • Internationally important ancient broadleaved woodland, particularly along the crest of the escarpment. • Internationally important flower-rich grasslands, particularly limestone grasslands. • Variations in the colour of the stone from one part of the AONB to another which add a vital element of local distinctiveness.
Barrow Wake car park	No action	• Upgrade to the environment of the car park, including improvement to habitats, visitor interpretation boards and better visibility.	• An accessible landscape for quiet recreation for both rural and urban users, with numerous walking and riding routes, including the Cotswold Way National Trail.

4.2

How the scheme responds to the principles of good road design

The road to good design

The design approach seeks to deliver sustainable benefits across the scheme, and promote sustainable development in design through concepts of good road design. But what is good road design?

As part of the design process, our understanding of good design has been informed by relevant national policy and guidance, including the Design Manual for Roads and Bridges (DMRB), the principles set out in Highways England's 'The road to good design[4]', and the NPSNN. This has been key in shaping the design of the scheme.

For this scheme, this ethos has been incorporated into all stages of the design process by constantly challenging standard assumptions of road design to focus on what makes this part of the Cotswolds AONB special and how best to design the scheme in response to it. It was clear at the outset of the project that the scheme design would need to deliver not just a safe operational road but one that would enhance the AONB's natural, built and historic environment.

'The road to good design' identifies 10 principles of good road design. What follows is a summary of how the scheme meets each one of the 10 principles of good road design.

The DMRB sets out that:

"Good road design aims to put people at its heart by designing an inclusive, resilient and sustainable road network; appreciated for its usefulness but also its elegance, reflecting in its design the beauty of the natural, built and historic environment through which it passes, and enhancing it where possible."

DMRB GG103[5]

[4] Highways England (2018) 'The road to good design' https://highwaysengland.co.uk/media/l4ihgawx/strategic-design-panel-the-road-to-good-design.pdf

[5] Design Manual for Roads and Bridges GG 103 Introduction and general requirements for sustainable development and design, Rev 0. July 2019

Existing crossing near the Air Balloon Public House

Principle One:
Good road design makes roads safe and useful

The casualty rates observed on the single carriageway section of the A417 are significantly higher than the national average for single carriageway roads, particularly for fatal and serious casualties. The current highway alignment provides just one lane in each direction, except for a section on the escarpment which has an additional climbing lane in the eastbound direction. There are several side road junctions and direct accesses onto a steep vertical gradient. These features combine to create a driving environment which is likely to be a significant contributing factor in the particularly poor safety record.

The scheme would upgrade the road to a dual carriageway, with two lanes in each direction as well as an additional climbing lane for eastbound traffic on the escarpment. It would provide more and safer overtaking opportunities and would remove the side roads and direct accesses to the main carriageway. Replacing the Air Balloon roundabout with a grade separated junction at Shab Hill will provide connections to the local major side road network whilst maintaining uninterrupted traffic flow on the mainline A417.

These are all measures that are likely to improve road user safety, and are examples of how the scheme will provide a safe and useful road network. The proposed alignment either removes completely or substantially mitigates all the existing issues outlined.

Furthermore, the new road is useful in that it would leave a positive legacy for local communities and visitors to the area. The scheme would provide long-lasting benefits and will not only improve the long-term safety and reliability of the A417, but it will also boost the local economy by making it a more attractive area to live, work, explore and visit. The new road would also make local journeys easier, reduce rat running through local villages, create new open spaces. This will help improve local people's quality of life.

Principle Two:
Good road design is inclusive

An interdisciplinary design team ensured that users' and communities' needs were placed at the heart of the scheme. The public, statutory consultees, landowners, seldom heard groups, and other organisations have all had the opportunity, through consultation and engagement activities, to express their views and preferences, and to indicate how they would interact with the scheme. This information has in turn influenced the design.

Our inclusive approach to developing the design is reflected in the changes we have made to the scheme in response to feedback. For example, we decided to omit access to Cowley from the Cowley junction in response to concerns raised about the suitability of the route and potential for rat running. Another example that demonstrates the success of the open collaborative approach with stakeholder is the design development of the Gloucestershire Way crossing, in which stakeholders helped to choose the location of the crossing, the purpose and width, and the required planting proposals. Chapters 7, 10 and 11 of the Consultation Report (Document Reference 5.1) provide full detail on how changes to the scheme were made as a result of engagement with stakeholders.

We have also sought to provide a design which is inclusive for different members of the community. There is an extensive PRoW network in the vicinity of the scheme which have the opportunity to be improved, including the Cotswold Way National Trail and Gloucestershire Way long distance path. These connect into wider recreational resources such as the Crickley Hill Country Park.

We have sought to improve PRoW and recreational routes for all user groups, including walkers, cyclists, horse riders and disabled users. This includes providing a safe and fully accessible traffic-free Air Balloon Way, with improved provision for disabled parking and horsebox parking nearby.

Principle Three:
Good road design makes roads understandable

The scheme has been designed to modern highways standards under DMRB, which ensures that the road will be safe to use and understandable for drivers. For example, appropriate alignments, visibility splays and signage will be provided.

We have designed a traffic sign strategy which is compliant with the relevant regulations[6] whilst also focused on reducing unnecessary repetition of signs. All signs were reviewed by the local highways authority (Gloucestershire County Council) to ensure all necessary information will be displayed in a safe, understandable and intuitive way.

In addition, interpretation boards would be provided as part of the scheme, adjacent to the Cotswold Way crossing. These would explain the scheme, and the important landscape character, geology, heritage, and ecology of the Cotswolds AONB. They would also educate visitors on the sensitivity of woodlands and the importance of calcareous grassland.

[6]Traffic Signs Regulations and General Directions 2016, Traffic Signs Manual (Guidance for traffic authorities on the use of traffic signs and road markings) and LTN 1/94

Walkers at Crickley Hill Country Park

Principle Four:
Good road design fits in context

As evidenced in this document, our landscape-led approach to the design has put the local context – the Cotswolds AONB landscape and its special qualities – at the forefront of decision-making. The scheme has been positioned to minimise landscape and visual effects, to avoid sites of ecological value, where possible, and to enhance the location of heritage assets by improving the context and setting of multiple designated sites.

As set out in section 3 of this document, and the beginning of this chapter, we have sought to ensure that features such as structures, earthworks and planting are designed to fit into the Cotswolds AONB landscape and respond to its existing context, including its topography, landscape character and special qualities such as tranquillity and dark skies.

Principle Five:
Good road design is restrained

We have sought to minimise the impacts of the scheme through the design, including by reducing its footprint and land take where possible. Where structures such as bridges are required, we have designed them to form a simple and coherent family, reflecting the local character by using a limited palette of materials, including Cotswold stone.

Tree planting has been restricted on the high wold to tie in with the existing more open character, compared to the escarpment and high wold valleys. Instead, the road has been set down within the landscape and enclosed by landscape and acoustic bunding that is contoured to reflect the undulating character of the high wold.

Our decision not to provide road lighting on the scheme also demonstrates the restraint in our approach, in which we have opted not to include a typical highways feature which would be incongruous and potentially harmful to the dark skies special quality of the AONB.


Visualisation of Gloucestershire Way crossing

Principle Six:
Good road design is environmentally sustainable

The following section identifies design and construction measures which are integrated into the scheme to avoid, prevent or reduce adverse environmental effects both during construction and operation of the scheme.

- The landscape earthworks re-use a significant amount of excavated material to integrate for landscape and acoustic bunding to better integrate the scheme into the undulating character of the landscape, reducing visual and acoustic effects, improving tranquillity and to achieve an earthworks balance to minimise material transport and impact on local waste infrastructure
- Compounds and other construction facilities have been sited sympathetically within the landscape, via a comprehensive site selection process, to avoid impacts to ancient woodland and known sites of archaeological interest, and located on arable fields, where possible, to aid restoration of the landscape post construction
- Efforts has been made to avoid, protect and retain existing trees (including ancient woodland and veteran trees) where practicable. Features of the scheme, such as drainage channels and basins have been relocated or redesigned to avoid or minimise effects on valued trees and woodland
- Careful placement of structures within the landscape has been considered to reduce their effect on topography, visual amenity and character of the area, while meeting their access and biodiversity purposes
- Cowley and Shab Hill junctions have been designed to integrate them in the landscape using a combination of woodland planting with landscape earthworks to help visually screen the road infrastructure
- Earthworks and false cuttings are a sympathetic design to the AONB character using gently engineered slopes to tie into existing topography, sustainably constructed from excavated materials. Embankments have been graded out to allow the adjacent land to be returned to agricultural use
- The scheme design provides a sustainable drainage system. Attenuation basins and drainage features have been integrated into the landscape by designing the shape of each basin to reflect the surrounding topography
- Construction processes and operational activities have been designed to minimise the effect on surface water to suitably treat and maintain flows
- The design of the scheme aims to primarily avoid or reduce the impacts of habitat loss, habitat degradation, habitat fragmentation and species mortality
- The scheme footprint has been reduced and designed to avoid best and most versatile (BMV) land and to reduce impacts on soil resources.

Principle Seven:
Good road design is thorough

We have developed the scheme in an iterative, staged approach informed by both technical and environmental assessment, and in collaboration with stakeholders. As the assessment results or stakeholder feedback highlighted effects that could be removed, reduced or mitigated, we were able, through our iterative approach, to respond to this through changes to the design. This created a continuous cycle of improvement within the design process, resulting in a scheme with few or reduced effects.

The likely impacts of the scheme have been thoroughly assessed as part of the Environmental Impact Assessment (EIA) with the results presented in the Environmental Statement (Document Reference 6.2). ES Chapter 3 Assessment of Alternatives (Document Reference 6.2) in particular provides detail on the how we have implemented significant changes to the scheme design where necessary to achieve to the landscape-led vision of the scheme, whilst still also delivering the required road safety improvements and value for money.

Principle Eight:
Good road design is innovative

This project has taken an innovative approach by being landscape-led, which builds on the need to achieve good road design that follows the themes of people, places and processes, and goes further than a typical approach to respond to and reflect the character of the landscape.

The Gloucestershire Way multi-purpose crossing has been developed through collaboration with environmental groups and WCH users to help provide essential mitigation and enhancement measures in a holistic way. The advantages of this innovative approach have allowed us to achieve all of the following benefits:

- Creating a safe crossing point for ecology
- Linking landscape features of the AONB
- Providing grassland connection through ‘stepping stones’
- Creating a crossing point for walkers, cyclists and horse riders (WCH).

All bridges and structures would be of high architectural quality and finished in locally sourced material and other materials which complement the local vernacular.

Our design approach has also sought to utilise geological exposures which are of particular interest in the AONB. Our approach to the design of cuttings will replicate existing geology and tie the slopes into the existing geology sensitively.

Instead of typical approaches to noise and landscape mitigation, our approach uses landscaped acoustic bunding to reduce the effect of the road on the landscape beyond residential properties, improving the levels of tranquillity and enhancing the special qualities of the AONB.

The scheme has been designed to minimise the requirement for energy consuming operational equipment such as street lighting or intelligent transport systems wherever possible. Where lighting may be potentially required, for example at Grove Farm underpass, low lux demand sensitive lighting is proposed to reduce greenhouse gas emissions associated with operating the scheme.

Principle Nine:
Good road design is collaborative

The design approach taken for the scheme is different from other more typical highways projects in that landscape architects took a key role in the design team, alongside highways engineers. Both disciplines worked collaboratively across all stages of the design process, together with other engineering and environmental disciplines to carefully consider how the design should respond to the landscapes of the Cotswolds AONB.

Throughout the pre-application stage, we have also worked collaboratively with stakeholders including through Strategic Stakeholder Panels, Technical Working Groups, Collaborative Planning Groups, Statements of Common Ground and focused technical meetings.

Formal engagement and consultation with the local community has also been carried out at key stages, as summarised below:

- Non-statutory consultation on route options: February 2018 - March 2018 on two surface route options: Option 12 and Option 30. This led to the selection of Option 30 as the preferred route
- 2019 statutory consultation: September 2019 - November 2019 on the draft proposals and Preliminary Environmental Information Report (PEI Report), which provided a preliminary view of the likely significant environmental effects of the scheme
- 2020 supplementary statutory consultation: October 2020 – November 2020 on the proposed changes to the scheme design and an updated assessment of the likely environmental effects of the scheme based on the revised design (2020 PEI Report)
- Five targeted statutory consultations were held with land interests to seek feedback on aspects of the scheme design that had been amended as a result of design development in response to comments received during statutory consultations.

The Consultation Report (Document Reference 5.1) sets out in detail how we carried out these consultations, the feedback received in response to the consultations and how we had regard to the feedback in developing the scheme design and assessment. It also provides a summary of the engagement we have undertaken outside of those formal periods of consultation.

We have entered into Statements of Common Ground with a number of key stakeholders, with whom we have worked collaboratively on the scheme. These are submitted in draft with the DCO Application in the Statement of Commonality (Document Reference 7.3) and they provide a summary of our position with Cotswolds Conservation Board, the Joint Councils, Environment Agency, Natural England, National Trust, Gloucestershire Wildlife Trust, Historic England and the WCH Technical Working Group.

Principle Ten:
Good road design is long lasting

The landscape led design has been developed to provide long lasting benefits, improving over its life to effectively mitigate and improve the character of the area. The use of resilient plant species also anticipates changes as a result of climate change and/or future pest and disease outbreaks.

The working life of all structures is 120 years, outlining our commitment to ensure that the design brings long lasting value. Designs will use precast concrete where possible, requiring minimal maintenance.

The scheme design has been developed with extensive engagement with the Highways England Maintenance and Operations team, the A417 design, build, finance and operate (DBFO) contractor and the local highways authority, Gloucestershire County Council.

Some of the key features that have been provided to assist in the long lasting safe operation and maintenance of the new scheme include:

- Rigid concrete barrier to reduce maintenance activities in the central reserve
- New CCTV camera stations to provide over 60% coverage of the scheme
- Designed out significant departures wherever possible and implemented alternative mitigations where required such as the provision of over-widened verges and central reserve to improve visibility at low radius curves
- Landscape proposals have been developed to include appropriate planting and grass species for how the areas will be maintained.

104 Typical Cotswold rural lane

4.3

How the scheme meets the requirement for good design in the NPSNN

The primary basis for deciding whether to grant a DCO for a road scheme is the NPSNN, which sets out policies to guide how DCO applications should be decided and how the effects of national infrastructure networks should be considered. The Case for the Scheme (Document Reference 7.1) considers in detail the how the scheme complies with the policy requirements of the NPSNN. However, this section sets out specially how the NPSNN requirements relating to good design have been met.

Paragraphs 4.28 to 4.35 of the NPSNN set out the requirements for good design, with Paragraph 4.28 stating that design should be an integral consideration from the outset of a scheme. Whilst the NPSNN recognises in Paragraph 4.30 that there are often limitations on the extent to which national network infrastructure can enhance the quality of an area due to the nature of the development, it states in Paragraph 4.29 that design qualities such as visual appearance, functionality, fitness for purpose, sustainability and cost should nonetheless be key factors considered.

Section 2 of this report summarises how a landscape-led vision, scheme objectives and a landscape vision and objectives were defined early in the development of the scheme design, which have subsequently informed it. Section 3 of this report identifies the key considerations in developing the design of different aspects of the scheme. This evidences that qualities such as visual appearance, functionality, fitness for purpose, sustainability and cost have been considered both as fundamental considerations of the overall scheme and in relation to specific features such as alignment, junctions or crossings.

For example, the design of the Gloucestershire Way crossing has carefully balanced design constraints and opportunities to provide a structure that is visually attractive and helps integrate the existing and proposed landscape features, alongside its need to be a functional ecological connection and separate bridleway route as a multi-purpose crossing. The associated location, scale and form of the crossing has then also responded to sustainability and cost drivers, such as avoiding impacts on ancient woodland, helping connect key wildlife corridors, and being an affordable and maintainable asset.

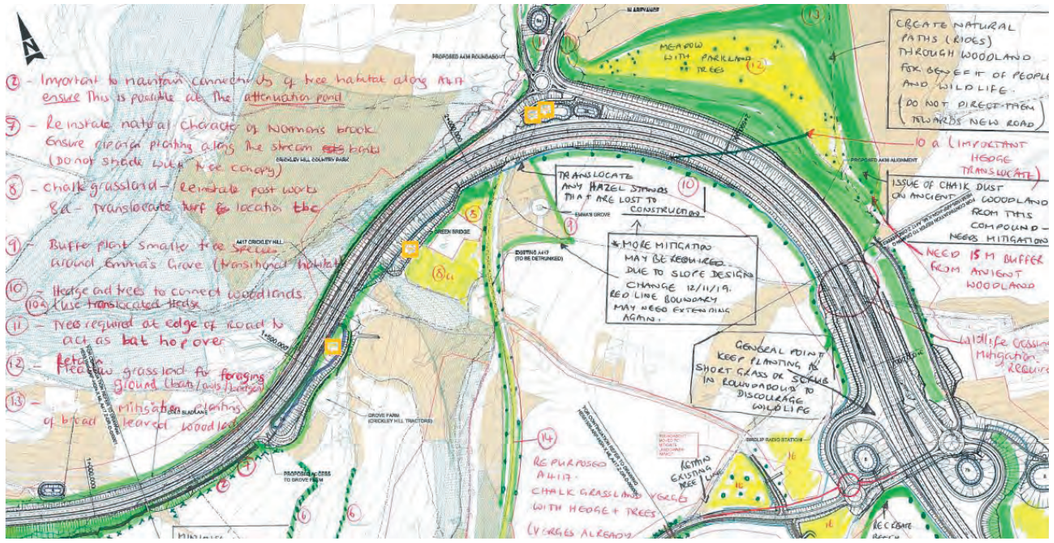
Paragraph 4.31 of the NPSNN states that good design should meet the principal objectives of the scheme by eliminating or substantially mitigating the identified problems by improving operational conditions and simultaneously minimising adverse impacts. It should mitigate any adverse impacts wherever possible and should also be a design which sustains the improvements to operational efficiency for as many years as practicable taking into account other factors such as cost, economics and environmental impacts.

As set out in Section 2 of this report, the vision and objectives of the scheme relate both to improving operational performance of the highway network and conserving and enhancing the environment, as well as providing economic and community benefits. We have adopted a landscape-led design approach to ensure that the scheme achieves this range of objectives.

The scheme is considered to be the most appropriate, feasible and affordable solution to the identified transport related problems. It would provide a long term solution to the traffic congestion and safety problems that are currently experienced, and which are expected to worsen in the future. A summary of the economic and transport benefits of the scheme is provided in the Case for the Scheme (Document Reference 7.1), where it is demonstrated that there would be substantial benefits in terms of road safety and reduced congestion, whilst delivering good value for money.

The ES (Document Reference 6.2) assesses the effects of the scheme on the environment and identifies how adverse effects have been minimised wherever possible, whilst still enabling the operational improvements to be delivered. As a result, it is considered the scheme will deliver a safe and resilient free-flowing road while conserving and enhancing the special character of the Cotswolds AONB. It will reconnect landscape and ecology, bring about landscape, wildlife and heritage benefits, including enhanced visitors' enjoyment of the area, improve local communities' quality of life, and contribute to the health of the economy and local businesses.

Paragraph 4.32 of the NPSNN states that scheme design will be a material consideration in decision making and that the Secretary of State (SoS) will need to be satisfied that the scheme is sustainable, and as aesthetically sensitive, durable, adaptable and resilient as it can reasonably be.



Early ecology sketched mark up of scheme during design development

As set out in Section 2.6 of this report, we have attended three meetings with the Design Panel (including the Design Council) as the scheme has developed and the feedback received has been taken into account in further progressing the design. The Design Panel has recently identified the scheme as an exemplar of landscape-led design.

Paragraph 4.33 of the NPSNN states that the applicant should consider the role of technology in delivering national network projects and that the use of professional, independent advice on the design aspects of a proposal should be considered to ensure good design principles are embedded into the proposals. It cites the Design Council as an organisation that can provide support and design review for NSIPs.

The scheme has embraced the role of technology, particularly in providing energy efficiency. For example, it has been designed to minimise the requirement for energy consuming operational equipment such as street lighting or intelligent transport systems wherever possible. Where lighting may be potentially required, for example at Grove Farm underpass, we have proposed low lux demand sensitive lighting to reduce greenhouse gas emissions associated with operating the scheme.

Paragraph 4.34 of the NPSNN notes that while applicants may have limited choice in the physical appearance of some national networks infrastructure, good design may be able to be demonstrated in terms of siting and design measures relative to existing landscape and historical character and function, landscape permeability, landform and vegetation.

As set out in Section 2.3 and Section 3 of this report, the scheme has responded to the landscape, biodiversity, cultural heritage and population of the local area. For example, the design of the proposed crossings of the A417 seeks to respond to the existing landscape through appropriate choice of siting and design measures such as choice of materials and structural form. Furthermore, they seek to not only provide connectivity for people, but also connect wildlife and integrate the landscape through appropriate earthworks and planting.

Paragraph 4.35 of the NPSNN states that the applicant should demonstrate how the design process was conducted and how the proposed design evolved. If a number of different designs were considered, the reasons for the favoured choice should be set out.

This report demonstrates how a landscape-led approach to designing the scheme has been developed and then implemented, including how this has resulted in evolution of the design. ES Chapter 3 Assessment of Alternatives (Document Reference 6.2) also provides a detailed account of changes made to the scheme design as it was developed, including how different options for the scheme were considered.

Section 3 of this report makes it clear how this approach has led to the proposed scheme as the preferred solution, and why alternative designs have been discarded on the basis that they would not help address the problems or achieve the objectives of the scheme.

4.4

Conclusion

This report has summarised how the landscape-led design of the scheme has resulted in beneficial outcomes which align with the vision and objectives of the scheme, as well as responding to the special qualities of the Cotswolds AONB. It has demonstrated that the design approach reflects and responds to the 10 principles of good road design, and that the scheme meets the requirements of the NPSNN with regard to good design.

Further assessment of the scheme in relation to other policy requirements of the NPSNN, as well as other national and local policies, is provided in the Case for the Scheme (Document Reference 7.1).

View from Crickley Hill Country Park

Appendix A

The Special Qualities of the Cotswolds AONB – Statement of Significance

- The Cotswolds are a rich mosaic of historical, social, economic, cultural, geological, geomorphological and ecological features. The special qualities of the Cotswolds AONB are:
- the unifying character of the limestone geology – its visible presence in the landscape and use as a building material;
- the Cotswold escarpment, including views from and to the AONB;
- the high wolds – a large open, elevated predominately arable landscape with commons, ‘big’ skies and long-distance views;
- river valleys, the majority forming the headwaters of the Thames, with high-quality water;
- distinctive dry stone walls;
- internationally important flower-rich grasslands, particularly limestone grasslands;
- internationally important ancient broadleaved woodland, particularly along the crest of the escarpment;
- variations in the colour of the stone from one part of the AONB to another which add a vital element of local distinctiveness;
- the tranquillity of the area, away from major sources of inappropriate noise, development, visual clutter and pollution;
- extensive dark sky areas;
- distinctive settlements, developed in the Cotswold vernacular, high architectural quality and integrity;
- an accessible landscape for quiet recreation for both rural and urban users, with numerous walking and riding routes, including the Cotswolds Way National Trail;
- significant archaeological, prehistoric and historic associations dating back 6,000 years, including Neolithic stone monuments, ancient drove roads, Iron Age forts, Roman villas, ridge and furrow fields, medieval wool churches and country estates and parks;
- a vibrant heritage of cultural associations, including the Arts and Crafts movement of the 19th and 20th centuries, famous composers and authors and traditional events such as the Cotswolds Olympicks, cheese rolling and woolsack races.

Appendix B

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[redacted]

08 May 2018

Our reference: DCC/0910

Highways England: A417 Missing Link

Dear [redacted],

Thank you for providing the Highways England Design Review Panel with the opportunity to advise on this scheme at the Design Review meeting on 23 April 2018. It is of particular benefit for the panel to see this scheme at this early stage of the process.

The *A417 Missing Link* project provides the opportunity to improve safety and to reduce congestion and delays on this route. It also provides the opportunity to make the experience of travelling through this route, whether as a driver, passenger, cyclist or pedestrian, a pleasurable and even exciting one, while also improving connectivity locally.

The vision statement for this project is sound, but it is important that Highways England delivers on it. The vision is for a landscape-led scheme yet we are concerned that this is not evident as yet. We urge Highways England to appoint architects and artists to work with the landscape architect to develop a scheme that fulfils the vision. At this stage such design input should address both routes, option 12 and option 30. This approach will allow for the design potential of both schemes to be fully developed before the final route selection is taken and then after that point the chosen scheme to be developed further to match the vision statement.

We encourage boldness on this project; while addressing how the scheme integrates and addresses issues on the route we believe there is scope to achieve something beautiful and exciting here. We challenge the project team to be brave enough to produce a scheme that will be a landmark and may even make this section of the A417 a memorable place in its own right.

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Option 12 and Option 30 comparison

The panel recognise there are significant differences between the two options provided. Option 12 is a route that is sympathetic to the existing topography and sits gently in the landscape. It also makes a characteristic of the escarpment. Option 30 goes in a new direction and is more demanding of the landscape. It runs across a minor valley and makes the route corridor a potentially difficult element in an open and rural landscape, making it a challenging route. It is critical that these challenges are recognised and addressed.

While Option 12 is clearly easier to integrate, we do not think that integration has to be the governing consideration for this project. This route can stand out as a positive feature in the area, and enhance the user experience, if it is made to be beautiful. Beauty therefore, should be a priority in this scheme.

We suggest that a route which requires a change in the speed limit could be an asset, as it will emphasise a new character area as you drive along this section of the A417.

We are concerned that Option 30 makes it harder to find the route (A436/A40) from Gloucester to Oxford. We recommend that this is addressed as this is a historic route.

We advise that, whichever route is chosen, the landscape should drive the development of both options.

Landscape

The project requires a greater understanding of the landscape and how the road will be used and responded to by the local and wider community. It is critical to have a detailed landscape character assessment and we also recommend that work is carried out to understand the history of human interactions with the site, how settlements have developed nearby and how those settlements have been connected by routes over time. In this area there are key parts of the Cotswold landscape of vale, scarp and wold that the scheme moves through and each has distinct characteristics that should underpin the design response.

The scheme will be affected by ancillary elements, such as lighting and speed cameras on the route. We advise that these ancillary elements are considered and the effect on travelling through the landscape is understood.

This project will leave the area with two redundant roads; the previous carriageway and the current A417 route. We urge the project team to address the legacy of these unused roads and make a decision about what will be done with the remnant land, so they can be

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turned into assets. We also urge Highways England to incorporate provision in guidance documents to clear the clutter on these remnant roads.

Option 12 shows a split in the carriageway at the western end of the scheme. If the ash trees are the sole reason for the split, we would suggest that it is an unnecessary accommodation as ash dieback presents a threat to the trees. We recommend that any new tree species selected for this scheme are chosen with respect to the local area and to respond to climate change.

Structures and artistic elements

This route is a significant one. It is the gateway to the Cotswolds Area of Outstanding Natural Beauty (AONB), it may become a gateway to a National Park in the future and it is part of a whole movement corridor from Gloucester to Swindon. We encourage the team to consider how the experience of the users of the scheme changes as you move along it. This visual sequencing of the scheme in terms of the user experience, views and sense of place along the route will help to develop the scheme's character and identity. As part of this it is key to the project that an artist is part of the team to help identify potential landmarks that can add to the generation of distinctive character. This is especially important given that the Air Balloon pub, which has given this section of the road its name and identity so far, is being demolished.

The new route will incorporate transverses, particularly on Option 30, and it is necessary to produce drawings that show where intersections, viaducts and bridges are planned and to explore and develop the design of these individual elements. We recommend that the route is punctuated so that it works for both pedestrians and motorists and that a consistent theme and language is developed of controlled quality. This ensures that design decisions made at road level work well when viewed from a distance or from higher ground.

Footbridges have been planned on both routes and will make a significant contribution to the pedestrian experience. This is an opportunity to create an attractive and therefore well-used resource by taking advantage of the natural assets of the area. We would encourage the team to consider the form of the bridges and use precedents in the design process for these elements as well as locating the footbridges at the points at which the views from the bridges can be highlighted to best effect.

Both routes will require excavation on site and we encourage Highways England to plan to use the surface spoil. Additionally, the cuttings in the landscape present significant opportunities to work with the rock faces to craft something that is dramatic and even artistic. However, it is also important to balance this with being mindful of not creating too much of a visual distraction for drivers, especially at sliproads.

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We fully support the decision to integrate a green bridge along the road. This will have the added benefit of creating interconnectedness along the scarp. We advise that, when Highways England is deciding the location of the bridge, consideration is given to the driver experience and when and where they see the expanse view across the vale.

The materials that are chosen for this site must be chosen with care and we encourage Highways England to use natural materials and local stone.

Sustainability

The approach to sustainability should be considered from a local and global perspective and it is critical that the project team creates a strategy which incorporates detailed information on both perspectives for effective assessment.

The global scale perspective must especially include a policy for future-proofing in terms of climate change. The local sustainability perspective requires comprehensive plans for linking people and places and providing access to new places. This must be considered for pedestrians and cyclists, as well as motorists.

Connectivity

This project could be a means of connecting cycling and walking infrastructure plans in the area and this is a vision that we recommend the team aspire to. We recommend that Highways England engage in discussions with the local authority and explore the ways in which this project can create opportunities for cyclists and pedestrians that extend beyond the scheme and existing rights of way, and also that connectivity is established across the valley.

Conclusion

The *A417 Missing Link* is a scheme that risks being engineering driven, at the expense of design and artistry. As the plans progress, we strongly urge the project team to produce drawings that create a narrative and explore the scheme as a progression along the route. The narrative must demonstrate the experiences of diverse users and identify what they may see and hear and smell at different points during their journey through each section of the road. It is crucial that this information is then used in conjunction with engineering considerations when the design is finalised.

We support the overall course that the project team has taken to this project and suggest that Highways England maintain robustness on commitment to design and artistry. Option

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30 in particular does present fresh landscape challenges to the scheme and needs an architectural, landscape and artistic response that maximises the opportunity. The project has a significant budget and this can be put to effective use to be really innovative for drivers, pedestrians and cyclists. We encourage that this vision is preserved to take the project into its next stage, where a range of exploratory sketches would help to explain and excite at key locations.

We also strongly suggest that this project is brought back to Design Review so we can assess the scheme when sketch design options have been produced.

Thank you for consulting us and please keep us informed of the progress of the scheme. If there is any point that requires clarification, please contact us.

[redacted]

Review process
Following a site visit, (and) discussions with the design team and Highways England and a pre-application review, the scheme was reviewed on 23 April 2018 by [redacted] These comments supersede any views we may have expressed previously.

Confidentiality
Since the scheme is not yet the subject of a planning application, the advice contained in this letter is offered in confidence, on condition that we are kept informed of the progress of the project, including when it becomes the subject of a planning application. We reserve the right to make our views known should the views contained in this letter be made public in whole or in part (either accurately or inaccurately). If you do not require our views to be kept confidential, please write to [redacted]

cc (by email only)

[redacted]

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Appendix C

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[redacted]

20 November 2019

Our reference: DC5061

Highways England: A417 Missing Link

Dear [redacted],

Thank you for providing the Highways England Design Review Panel with the opportunity to advise on the *A417 Missing Link* on 7 November 2019. We thank the design team for a productive and helpful site visit and presentation and for the constructive and open way in which they approached the review.

Highways England's (HE) intention is that the 'missing link' will complete the route upgrade for the A417 between the M4 and M5 motorways, removing the last remaining single carriageway element, and thereby improving safety and reducing congestion. We previously reviewed this scheme on 23 April 2018. Since then Option 30 has been determined as the preferred route, the design team has changed appointed, and the scheme has moved on to Project Control Framework Stage 3 (PCF 3).

The scheme is located within the Cotswold Area of Outstanding Natural Beauty and is particularly challenging as the road climbs a steep scarp before running along a flat plateau. Highways England has chosen to take a landscape-led approach to the scheme, and we strongly support the meaningful way in which the design team has delivered on this approach. We note that the design team has challenged the way in which highways scheme briefs are traditionally delivered and we think this has been beneficial as their approach genuinely gives equal emphasis to all those who come into contact with the A417. As part of this, they have emphasised improvements to landscape and biodiversity, rather than simply prioritising the driver experience. We strongly support this approach as being pivotal to the quality of the final scheme and urge the project team to ensure these aspirations are not compromised in the next stages of design and delivery. We also think this approach has strengthened the scheme through careful analysis of the wider local context and linking aspirations to a global context, such as consideration of the UN's Sustainable Development Goals.

Landscape-led approach

We welcome the robust analysis of the route and wider context undertaken by the design team and the strong emphasis on fitting the scheme into the landscape. One of the impacts of this approach has resulted in some changes to the initial design of the Option 30 route, which we think have improved the scheme. For example, the initial design of

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Option 30 had the route sitting at a higher elevation in the landscape, but the current proposals bring it down, so it sits more quietly within its setting. We think that the next step is to detail it in a sensitive and distinctive way that is locally appropriate. This may require the design team to continue to challenge highways-focused design moves, such as the inclusion of minor roundabouts which do not complement a rural landscape and interrupt cycle routes.

The proposals demonstrate a sensitivity to topography and natural features that have led to considerable improvements to the route, such as through the re-siting of the Shab Hill junction into the head of the valley. We support the false cutting as a sound design move with a clear rationale as it makes use of new landscape features to diminish the impact of the new road. We also particularly support the back slopes being usable for agriculture. The materials proposed across the landscape will be important to the overall success of the scheme and we think those that have been chosen, such as stone walls, sit well with the landscape context.

The design team have achieved a high design standard for the scheme, and it is important that this is not compromised at the procurement stage and in delivery. We encourage the project team to establish the design details within a broader design narrative that clearly explains to decision makers, and design / delivery teams that may take over in later stages, the specific design principles for the scheme. We suggest detailing how it responds to the AONB and SSSI context and the experience desired for road users, non-motorised users and neighbours, as well as the purpose and criteria for each of the materials which have been specified and the reasons for the selection, and why substitutions will not work. We recommend that the design narrative should describe how the proposals will deliver an interesting and even joyful experience for drivers and passengers using the road. Additionally, we suggest detailing this information in the DCO application process. These measures will help to ensure that the current level of quality is safeguarded and preserved throughout the delivery and maintenance of the scheme. Highways England's Lower Thames Crossing scheme has produced a design narrative, and this may provide a useful precedent for reference.

Bridges and highways structures

There are three overbridges proposed and they are key features of the scheme not just in terms of improving connectivity, but also in contributing to the overall visual experience of the A417. We think the quality of the proposals is strong, but encourage further development of the designs to ensure they achieve their potential in terms of the visual experience of the A417. There is scope for greater elegance, and we suggest that a more stripped back and simplified approach, such as through reducing the number of materials, may work well for the bridges at Shab Hill and Stockley Farm. We advise that the three overbridges do not have to act as a family, and that the green bridge could act as a showstopper while the other two take a more understated approach. We suggest developing a design guide, so the quality of the bridges is futureproofed.

The green bridge is a strategic and visible intervention in this location and the proposals to bring the retaining wall up and the concept of the benched wall reflecting the geology and

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providing a steeper slope work well. While we value the approach of integrating visual and materials quality with engineering requirements, we think more work is needed to deliver visual excellence in this unique and special location. We suggest that addressing the following aspects could be of particular benefit:

+ While the idea of a green bridge is strongly supported, we advise it needs to be brilliant in its execution to be a success. Especially as we think it could act as a statement about design achievement in this period of time, which will complement it as a heritage asset in an area that includes a number of archaeological features. As part of this we recommend creating a narrative for the bridge through carefully working out each of the decisions behind the design, which will help its development.
+ We appreciate the intention to reflect the geology in the bridge design when it is viewed A417 eastbound but think the current proposals appear incoherent, which creates a confusing effect. We advise that the deck, soffits, column supports, and retaining walls need to work as an integrated visual package. The columns sitting on the retaining walls appear particularly awkward. We recommend including an artist within the design team, as they could be instrumental in shaping the visuals and use and deployment of materials to produce an excellent visual experience.
+ The westbound view of the bridge comes after a curve in the road and it presents a reveal of the Severn Vale as the road starts a steep descent, making it a landmark in the journey for road users. We are concerned that the current bridge design acts as an element that interrupts this view and think that further work is required to create an effect that complements the overall experience.
+ The view from the pedestrian bridge looking west will show two walls – the safety / boundary barrier at the edge of the structure and the dry-stone wall at the edge of the publicly accessible area. We do not think this is coherent and we are concerned it creates an awkward strip between the two barriers. We suggest that this approach be revisited. As part of this, we also suggest that the significant separation of bridge and road-users could be softened to enhance the experience for both. For example, the view of the road from the vantage point of the bridge could create a unique experience and, rather than protecting people from it, we think there is potential to make it a feature. Similarly, there is potential for the road-user to be given a greater sense of the bridge's green character and encourage exploring this in the design.
+ We recommend making the structure more coherent in terms of visual impression. For example, we think the proposed catenary shape is undermined by the columns, which indicate a beam structure, and we suggest this needs continued work.

The design team is considering whether to propose making the overall gradient on the scarp slightly steeper or retaining the originally proposed gradient. The former option reduces the height of the green bridge, reduces the quantity of excavation required and reduces the amount of retaining wall required in a more difficult geology – a clay layer. In

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addition, it can add to the driver experience by reducing monotony in travelling this route. We encourage the design team to explore this option further as there appeared to be clear benefits in both cost and quality.

Connectivity

We note that the design team have a diagram showing the broader connectivity strategy for the non-Strategic Road Network and non-motorised users, however this was not available at the review so the panel's responses are based on the drawings, maps and verbal descriptions given on the day. Overall, we thought the approach to connectivity was strong. We do encourage the design team to bear in mind, however, the experience different road users have of locations varies in duration. For example, a pedestrian takes considerably longer to pass through a junction than a motorist or cyclist or horserider. This journey is longer still for those with mobility impairments or young children. We suggest this affects their experience and that it should inform the design of the route so diverse users each have special experiences along it.

The walking / cycling underpass at Shab Hill presents a particular challenge as we think an underpass is not a typical rural feature and is at odds with the open rural landscape, is not instinctive and is not attractive to users and we question its incorporation here. Additionally, there is potential for safety issues between different modes and for antisocial behaviour. We also think further detail is required about how the proposed junction will be designed and finished. Should the underpass be retained, we advise that the most important users in this location will be pedestrians and cyclists. We recommend considering this junction from non-motorised users' perspective and how to help them navigate instinctively to the right route in a safe and pleasant environment.

We recommend that greater emphasis is placed on non-motorised users in general as the scheme develops, to support and encourage sustainable modes of transport. For example, it is currently unclear how a cyclist would travel from the location of the current Air Balloon pub to Cirencester, and this needs to be clarified. With regard to cycle routes, we recommend referring to the document CD195 of the DMRB as it gives guidance on how to design these effectively.

Traffic modelling appears to predict rat running if the Birdlip – Golden Heart – Cowley Junction route is open to motorised vehicles. However, we are concerned that with the current proposals the Golden Heart will lose the benefit of passing trade, and those living and working in Birdlip have to take a circuitous route to travel eastbound. We encourage the project team to revisit this issue in consultation with Gloucestershire County Council who will be responsible for the road.

We think there is potential to remove the roundabout at the Birdlip quarry/Cowley Junction, as there may not be sufficient traffic to justify it if the road between Cowley Junction and the Golden Heart is to remain closed at the pub. We recommend that this is given consideration.

The rationale behind repurposing the current A417 between Birdlip and the Golden Heart is not clear. We are concerned it will not work as a cycle path as it does not provide a

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through route, so cyclists are unlikely to use it. Additionally, there will be no point of destination for walkers at the site of the former Air Balloon pub and we think the green bridge (or views of it) is a more attractive destination, so a route to this location would seem a more appropriate intervention. We recommend continuing to explore the potential for this route, and even returning the unneeded land to agricultural use and recreating historic field patterns. As part of this we note that it is important to consider a variety of interests, such as those of farm owners, cyclists and tourist journeys. We advise that the route should have a purpose, and this should be evident in the proposals. Additionally, each user's experience of it should be worked out rigorously, especially as this may help inform the design. We also advise that it is equally important to produce a management and maintenance strategy for the route to ensure its long-term success.

We note that Cowley Lane overbridge and Stockwell Farm overbridge are needed for agricultural connectivity and we strongly support the Design Team's intent that the reprovided lanes and new overbridges should retain a rural character. With this in mind we suggest that the engineered curve to the north of Cowley Lane bridge should be replaced with a T junction.

Sustainability

We strongly support the use of the UN Sustainable Development Goals to shape the approach to sustainability, as it demonstrates that the design team is not just thinking about this scheme from a detailed point of view but a global one as well.

We think that the approach could be strengthened further by greater consideration of, or providing more information on, climate change resilience. We think it will be of particular value to understand how the scheme will deal with increased heat and rainfall and how run off and draining will be managed.

Planting

The planting requires a strategic approach in terms of species selection, particularly with regard to trees. We support the decision to incorporate trees in strategic locations along the route, as it demonstrates an understanding of the changing landscape character areas along the route.

Ash dieback is likely to affect the Cotswolds, and we recommend deciding whether to plant native species that may die, or an alternative solution – perhaps an introduced species that fulfils the same function, feel and look, or different native trees. We understand the AONB Board have a strategy for this situation and advise liaising with them to inform the decision being made.

The proposal of a green bridge is a significant part of this scheme and we anticipate it will become an attraction in its own right. To ensure its success we think it requires an exemplar design and a planting scheme which caters for future climatic conditions. While this detail was not available at the time of the review, we encourage the design team to take a robust approach to this. We also suggest exploring the potential for collaborating with relevant local organisations focused on biodiversity and landscape.

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Aesthetic experience

The visual experience of travelling this route, as well as the views to and from the bridges, will make a significant contribution to its success and we do not think the full potential for a fantastic experience is being realised as yet. We also suggest that the remainder of the upgraded route to the M4 does present an interesting and varied experience, and we encourage continuing to develop the designs so that experience is matched here.

One way in which to achieve the above recommendation is through the inclusion of an artist within the design team, which we advocated at the previous review. We advise that an artist's viewpoint can be unconstrained by the views of the landscape architect, architect and engineer and they can provide a response that is more holistic in terms of how all of the elements of the route can come together. We think it is particularly important to note that we are not stipulating that a piece(s) of public art should be incorporated on the route, though this may also be an option the team may wish to highlight to partners for them to pursue in strategic locations. Instead, we advise that an artist's expertise could be sought to enhance this section of the A417 for all who come in contact with it. For example, they could look at the experience of the route as a whole as well as looking at how the visual appeal of structures (bridges, false cuttings and revetments / retaining walls) can be improved, additional points of assertion and interest that could be introduced for the road user and how the natural environment could be enhanced.

We suggest that an artist could be helpful to enhance the experience of non-motorised users, particularly around the area of the repurposed A417 from Birdlip to the Air Balloon and at the Shab Hill junction. The perspective of an artist to help articulate and enhance the visual experience could also be useful in terms of helping to write the design narrative we recommended earlier in this letter. We encourage considering hosting a competition, which could be a useful process for harnessing creative ideas to make the experience of this route distinctive.

The beauty and joy of the AONB, and the boundaries, embankments and bridges will play an important part in enhancing the road users' experience of the *Missing Link*. Punctuation points along the route are similarly significant elements along the way. Examples of punctuation points include various landscape character areas along its length, the transition between two character areas marked at Shab Hill junction, the Garden Bridge and the transition between scarp and plateau. However, some of these existing visual punctuation points, such as the Air Balloon pub, the hint of the view over Birdlip and the attractive Golden Heart pub, will be lost to the road user. In addition, when placed into false cuttings road users will also have reduced views of the plateau. We urge the design team not to minimise, or overlook, the road user and to actively seek ways in which their current joyful experience can be equalled on the new route.

Futureproofing

We think it is important to futureproof this route in terms of changes in technology and future travel trends and recommend that this is given consideration now. For example, we are concerned that future technology requirements may lead to the installation of intrusive vertical infrastructure and suggest this is anticipated and an appropriate response, in

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design terms or otherwise, developed. We also note that there may be a change in demand for private and public travel and suggest considering the adaptability of this route and the preservation of the design narrative if this becomes a reality.

Thank you for consulting us and please keep us informed of the progress of the scheme. If there is any point that requires clarification, please do not hesitate to contact us

Yours sincerely,

[redacted]

[redacted]

Review process

Following a site visit, (and) discussions with the design team and Highways England, the scheme was reviewed on 07 November 2019 by [redacted] supersede any views we may have expressed previously.

Confidentiality

The advice contained in this letter is offered in confidence for Highways England and the attendees of the design review in accordance with the terms and conditions of appointment stated in the SPaTS Agreement. The Client shall be free to adopt or implement findings or contents expressed in this letter at their discretion.

cc (by email only)

Attendees

[redacted]

Design Council

[redacted]

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Appendix D

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[redacted]

19 February 2021

Our reference: DC5405

Highways England: A417 Missing Link

Dear [redacted]

Thank you for providing the Highways England Design Review Panel with the opportunity to advise on the *A417 Missing Link* on 01 February 2021.

Context
Highways England's (HE) intention is that the 'missing link' will complete the route upgrade for the A417 between the M4 and M5 motorways, removing the last remaining single carriageway element, and thereby improving safety and reducing congestion. We have reviewed this scheme twice previously; on 23 April 2018 and 07 November 2019. Since the last review the project team has made significant changes to the proposals, including changing the gradient of the A417 as it climbs Crickley Hill to 8% (from 7%) and increasing the number of crossings, from three to four. These crossing are the Cotswold Way bridge, Gloucestershire Way Bridge, Stockwell overbridge and Cowley overbridge. While the planned green bridge was due to be built in the location of the Cotswold Way Bridge, it will now be in the location of the newly-proposed Gloucestershire Way bridge instead. This review primarily focused on the design of the bridges.

Summary
There has been significant progress since we last reviewed this scheme and we continue to welcome the landscape-led approach and that the aspirations remains strong, with each iteration being more responsible and respectful of the project's context. We also welcome the engagement with stakeholders, which is clearly strong and has positively affected the design's evolution.

We advise that a detailed design narrative is required to support with communication of the proposals and to ensure design quality is embedded through to delivery. While we acknowledge that the rationale for the decisions underpinning the designs may have been worked out, it is not being adequately justified, which hinders understanding of the approach.

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The design team's decision to change the gradient at Crickley Hill is successful, as we think it allows for a simpler cut through the landscape, creates a better driver experience and minimises the scheme's visual impact.

Design narrative
The Development Consent Order (DCO) application for this scheme is scheduled to be submitted in May this year. To ensure the scheme's design and impact can be assessed effectively, the principles behind the scheme and each design decision, from the way in which the crossings sit within the landscape through to the materiality, must be documented and the rationale behind it justified. We are concerned that this work does not appear to have been carried out as yet. We urge the design team to develop the accompanying narrative to explain the team's thinking and approaches as a matter of priority.

User experience
We question the treatment of walkers, cyclists and horse-riders (WCH) as a homogeneous group. We recognise this is a categorisation used by Highways England but we advise that these are three distinct modes of transport and its travellers have very different needs and treating them as one undermines this difference and does not cater for the nuances in needs and experiences. This is a particular issue for cyclists and horses, and we recommend segregating these pathways. We also recommend that maps show the routes for each these groups separately and particularly suggest following the advice given in CD195 of the Design Manual for Roads and Bridges (DMRB) for cyclists.

The B4070 appears unnecessarily engineered and we question whether a country lane has to conform strictly with DMRB standards. We encourage a design that is more sensitive to its context, as this will enhance the experience for those travelling here.

The previous route of the A417 has been re-purposed for public access, including walkers. Whilst we welcome this change, we note that this road was originally designed for vehicles moving at speed and therefore predominantly consists of gentle curves. We suggest that the route should be designed to create the best experience for those who are intended to use it and recommend continuing to explore how to achieve this.

We support the decision not to light the A417 route along this scheme's length and encourage this approach on local roads. We recommend not illuminating other highway features, such as signage.

Bridges
The location of the original green bridge has changed, which has resulted in the loss of the reveal when looking across the lowland landscape from the middle of the gorge. However, the bridge as originally designed was a weighty structure and we think that changing its location, and replacing it with the lighter, lower Cotswold Way structure, is a move in the right direction.

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The panel had diverse views on the design of the bridges as presented, and we advise that resolving the design in detail, and developing the narrative behind these choices, could help in terms of building more united support for the proposals. When considering materials, we advise bearing in mind the sound absorption qualities of wood over that of weathering steel and concrete.

This is a scheme that traverses a significant landscape with dramatic changes, including a gorge that could afford a very particular experience to all those who travel here. However, the visuals did not demonstrate how the bridges sit within their landscape context, nor did they show the experience of crossing them. Instead, the images presented showed the bridges as experienced from above or as a driver. We recommend demonstrating how the bridges work as a connector and what the views might be on different locations of the bridge. For the Cowley Way crossing in particular, it is key to have a sense of the experience of travelling between two wooded, steeply sloping landscapes.

The way in which the bridges are emphasised as a family and their subtle variations is largely successful. There is a clear hierarchy of greenery on each bridge which, as a concept, represents progress from when this scheme was last reviewed. However, we think the complete lack of greenery on the Cotswold Way bridge may represent a missed opportunity. We encourage further analysis on whether this is the right approach here and, if the incorporation of greenery is shown to create a better outcome to meet the project's objectives, we suggest revisiting this decision. The planting is being sourced from locations such as Cornwall and Brittany to accommodate changing climate conditions and we advise that a plant family and species mix is equally important to biosecurity. We recommend that you should have no more than 30% of any family, 20% of any genera and 10% of any species to establish resilience. The proposals make clear the careful provision made for bats and we recommend being equally detailed about the considerations being given to other species, so the ecological plan's robustness is also made apparent.

We note that the height of the parapets is partly influenced by the need to protect horses from the sight of traffic on the road beneath, but this prevents drivers from experiencing the green bridges, which is a missed opportunity. We recommend consulting the British Horse Society whether an alternative approach could work. The design also places the horse-riders' path by the parapet, whereas we think that this might be a more suitable location for pedestrians and cyclists who may enjoy the view over the bridge while horses may be less disturbed by vehicles on a path away from the edge.

Further feedback on the individual bridges is given below.

Cotswold Way crossing

+ **Impact** – Given its location, this bridge must sit lightly within its context and we suggest a floating effect would be appropriate in terms of impact. Each element, such as the supporting column, the ramp and the parapets play a role in achieving this effect and we do not think it is successful as yet. In terms of the parapet, weathering steel can create a weighty effect. While the Knight Architects bridge on the A465 Heads of the Valleys Road shown as a precedent at the review appeared successful, we suggest the solid parapets proposed for the Cotswold Way crossing may be too heavy. We recommend exploring a perforated or castellated treatment instead, which will allow for the play of light to break it down and improve the driver experience.
+ **Opportunity** - The Cotswold Way bridge presents a great structural opportunity for this scheme, turning it into a destination location, and we encourage the design team to strive to achieve this level of ambition. As part of this, the inclusion of eccentricities, such as a hairpin bend, are features that can be built upon to create a sculptural element that stands out in the landscape. We suggest that this can be achieved most effectively through a team made of up architects, engineers and artists. There is also an opportunity to capitalise on the sunset and shadows on this bridge. Similarly, the ramp's proximity to the road could create a hostile experience for pedestrians and recommend exploring how to improve it.
+ **Character** – the aforementioned lack of a green character to this bridge is confusing, as it is unclear why this location does not have the same biodiversity and wildlife connectivity need as the other bridge locations. We recommend carrying out further analysis on whether this bridge could make a biodiversity contribution and responding accordingly. Greenery is also a key characteristic that will reinforce its membership within the family of bridges within this scheme.
+ **Connection to escarpment** – this bridge does not connect directly to the escarpment and we think it should do so to integrate better into the environment and we also think it will enhance the visual and experiential impact. We recommend continuing to engage with stakeholders to really explore what can be done to improve this connection.
+ **Surface** – the combination of solidity and lightness works well. We advise that the location of the lookout, where the bridge turns into the ramp, will need special attention. The way in which the materials round this corner is key to achieving the elegance aimed for in the design and we are concerned that if the quality of materials or delivery is compromised it will undermine the design and potential impact. To avoid this possibility, we recommend ensuring that the materiality and expression is carefully developed and carried through to detailed design.

Gloucestershire Way crossing

This bridge's design has clearly been influenced by strong stakeholder engagement and we welcome this approach. It is at right angles to the road, which we think works well and the design team's work to develop connectivity in this location is successful.

There is further work that needs to be done in terms of the detailed elements of the design, which we do not think are working coherently as yet, such as with the proposal of a steel beam under the bridge and a connector above. We note that the integration within the landscape is one of the project's objectives, which has informed some of the design decisions here. However, we advise that the landscape-led approach must still deliver

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the benefits from a standard approach and we suggest further refinement is needed to achieve this.

Stockwell overbridge and Cowley overbridge
These bridges have progressed and become more elegant in their design since the last review, due to the way in which they are setback, their abutments and clear span. While we welcome the greenery that has been introduced to these crossings since the last review, we are concerned that the planting appears tokenistic. To ensure that this is not the case we recommend thinking through the ecological value of the planting being incorporated here and ensure it is making a genuine contribution.

We are not convinced by the visuals showing planting under the bridges and recommend that this is tested and, if not deliverable, the images are updated to be more accurate.

Artist input
At the previous review we strongly encouraged engaging an artist and we continue to advocate for an artist being included as part of the design team. We welcome that a competition is being set up for artists to influence and contribute to how the design develops but we encourage expanding the eligibility to those located outside of the region as well. We recommend that artists are given the opportunity to contribute to the design's development in terms of suitable locations for structures, materials, functionality, history, structure and even environment.

Thank you for consulting us and please keep us informed of the progress of the scheme. If there is any point that requires clarification, please do not hesitate to contact us

Yours sincerely,

[redacted]

[redacted]

Review process
Following discussions with the design team and Highways England, the scheme was reviewed via Microsoft Teams on 01 February 2021 by Fred Manson (chair), Jessica Bryne-Daniel, Peter Clash, Phil Jones, Maria Kheirkhah and Paula Vandergert. These comments supersede any views we may have expressed previously.

Confidentiality
The advice contained in this letter is offered in confidence for Highways England and the attendees of the design review in accordance with the terms and conditions of appointment stated in the SPaTS Agreement. The Client shall be free to adopt or implement findings or contents expressed in this letter at their discretion.

cc (by email only)

[redacted]

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