

**A66 Northern Trans-Pennine Project  
TR010062**

**3.2 Environmental Statement  
Chapter 3 Assessment of Alternatives**

**APFP Regulations 5(2)(a)**

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**3.2 ENVIRONMENTAL STATEMENT  
CHAPTER 3 ASSESSMENT OF ALTERNATIVES**

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## CONTENTS

<b>3</b>	<b>Assessment for Alternatives .....</b>	<b>1</b>
3.1	Introduction .....	1
3.2	Project history .....	1
3.3	Overview of Option Selection process.....	1
3.4	Reasonable alternatives studied .....	2
3.5	Alternatives by scheme .....	6
3.6	References .....	36

## FIGURES (VOLUME 2)

None

## TECHNICAL APPENDICES (VOLUME 3)

None

# 1 Assessment for Alternatives

## 1.1 Introduction

1.1.1 This chapter describes the alternatives that have been considered throughout the Project development process (Plate 3-1: Options identifications and selection process) and how environmental impacts have been considered to inform the decision-making process. Further detail about the process, the alternatives considered, and the wider factors that have informed the decision-making is set out in the Project Development Overview Report (PDOR) (Application Document 4.1).

## 1.2 Project history

1.2.1 In 2014, the UK Government announced that it intended to examine the case for improving the connectivity across the Pennines in the north of England. In 2016, it was announced that the A66 had presented the strongest case for upgrade and that plans for full dualling between the M6 Junction 40 and the A1(M) at Scotch Corner would be developed for the next Road Investment Strategy.

## 1.3 Overview of Option Selection process

1.3.1 Plate 1-1: Options identification and selection process presents the overall process followed for the A66 during option identification and option selection stages, and the process most recently undertaken for the preliminary design (including the Environmental Impact Assessment (EIA) reported in this Environmental Statement (ES)).

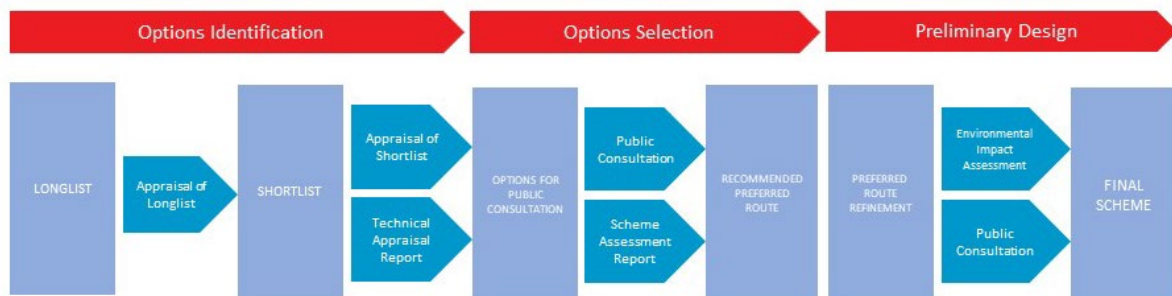


Plate 1-1: Options identification and selection process

1.3.2 A full explanation of the design process and history can be found in the Project Development Overview Report Section 3: Summary of previous route options assessments; Section 4: Design development process and Section 5: Design development of schemes (Application Document 4.1), a summary of which is provided below:

- Pre-Project - *Northern Trans-Pennine Routes (NTPR) Strategic Study* (Highways England, 2016)<sup>1</sup> identified two potential routes that could be improved to deliver economic growth for the Northern Region.
- Stage 1 - Options Identification involves identifying broad route options to be taken to consultation.

<sup>1</sup> Highways England (2016) Northern Trans-Pennine Routes Strategic Study

- Stage 2 - Options Selection wherein the options identified as part of Stage 1 go through further assessment in order to determine the Preferred Route.
- Stage 3 - Preliminary Design is the stage at which the Preferred Route is developed and the supporting assessment and documentation is prepared, culminating in the DCO application.

1.3.3 This process followed the Department for Transport and National Highways joint approach to managing major projects, referred to as the Project Control Framework. It is designed to support the development and delivery of major projects and comprises a standardised project life cycle, deliverables, project control processes and governance arrangements. For further detail see the Project Development Overview Report Section 3.2: About the Project Control Framework. The potential impact of each of the options on the environment has been an important consideration throughout the option identification and selection process and has been a key influence in decision-making.

## 1.4 Reasonable alternatives studied

1.4.1 At each of the stages of the Project there have been options considered and assessed in order to come to a decision on the most appropriate route.

### Identification of the need for the scheme

1.4.2 The *Strategic Study* focused on two routes in the Northern Region, the A69 between Carlisle and Newcastle, and the A66 between Penrith and Scotch Corner. Environmental factors were not considered to great detail, for further detail see PDOR: Section 3 (Application Document 4.1).

### Options identification

1.4.3 A number of broad options for dualling the A66 were considered, taking into account environmental impacts, traffic forecasts and economic benefits, to determine viable options. At this stage, the project was divided into a number of schemes with long list options which would combine to form two Routes, the longest and the shortest route. These were used for the traffic modelling and formed the basis on which the air quality, noise, and driver stress assessments could be undertaken.

1.4.4 The focus of the environmental assessment at this stage was to identify those issues that could potentially be a future 'blocker' to obtaining consent. Due to the number of European and national level constraints in the vicinity of the A66, a number of long list options were rejected on environmental grounds.

1.4.5 Environmental reasons for rejection of route options at this stage included: unacceptable land take within Scheduled Monuments; direct impacts on Listed Buildings and Listed Structures; damaging crossings of the River Eden Special Area of Conservation (SAC); loss of irreplaceable ancient woodland; unacceptable extent of direct landtake and loss of important features of the North Pennines Area of Outstanding Natural Beauty (AONB), loss of heritage way, and loss of heritage railway. Avoidance of

these impacts was a high priority in the options selection process, and where they were not possible to avoid completely, routes were selected that had the lowest possible impacts.

- 1.4.6 A summary of those options rejected and the contributing environmental factors can be found in Table 7-5 of the Technical Appraisal Report (Application Document 4.3) published in November 2018.

### Options selection

- 1.4.7 Options not ruled out through the review of the initial long list of options were taken forward for further design assessment. Environmental assessment of these options used a bespoke method developed in order to take account of the requirements of the *National Policy Statement for National Networks (NPSNN)* (Department for Transport, 2014)<sup>2</sup> and the Design Manual for Roads and Bridges (DMRB).
- 1.4.8 Assessment at this stage built on the assessments undertaken in the Options Identification Stage as well as:
- Results of public consultation undertaken
  - Results of ecological surveys at Temple Sowerby to Appleby, including Phase 1 Habitat Surveys of the River Eden
  - Preliminary flood risk modelling results at Temple Sowerby to Appleby
  - Additional baseline data for Materials and Waste
  - Further desk-based studies of the Roman Fort Scheduled Monument at Carkin Moor
  - Engagement with Natural England, Environment Agency, and Historic England.
- 1.4.9 Based on the further assessment from environmental, economic, traffic, and feasibility perspectives, the options were refined further. These options were presented to the public in Summer 2019 and summarised in the Scheme Appraisal Report (SAR) published in January 2020 (Application Document 4.2).
- 1.4.10 The preferred route was selected and reported in the SAR. It identified eight sections (referred to as schemes) of single carriageway for upgrade to dual carriageway along the A66.
- 1.4.11 Overall, the preferred route at this stage was assessed to have some likely significant effects in construction and operation, however they were considered equal or lesser impact than alternatives within each scheme. Exceptions to this were:
- Option E (Kirkby Thore Northern Bypass): Was considered to have a greater impact than Option F (Kirkby Thore Southern Bypass) in Cultural Heritage and in Population and Human Health. However, Historic England's preference was to accept a greater impact to the setting of heritage assets to avoid direct impact to archaeology. The Population impacts were considered mitigatable.

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<sup>2</sup> Department for Transport (2014) National Policy Statement for National Networks

- Option H (alignment following the Old Roman Road): Was considered to have a greater impact than Option G (alignment follows the disused Eden Valley railway) in Cultural Heritage and therefore, it was Historic England's preference for Option G. However, in further discussion, Natural England and the Environment Agency expressed a preference for Option H as it was further from the River Eden SAC and SSSI. When assessed overall, Option H was taken forward on balance of stakeholder preference and it was considered that Option H would have less of an impact on the residents of Crackenthorpe.
- Option N (online upgrade between Stephen Bank to Carkin Moor): Was considered to have greater impact on known archaeological assets than Option M, however as an 'online' option, Historic England expressed a preference for Option N over the potential impact on undiscovered archaeology in the vicinity as per Option M (online widening with requirement for offline section to the south of Mainsgill Farm Shop). Despite Option N having greater potential impact on priority river habitat than Option M or Option O, it was taken forward on the basis of stakeholder preference and public consultation feedback. Impacts to the river habitat were considered mitigatable.

## Preliminary design

- 1.4.12 Further to the *PRA*, further work and design refinement has been undertaken as part of the ongoing preliminary design stage. This has included further development of the design of the preferred route, as well as the identification of alternative routes and junction arrangements developed in response to further work undertaken to understand the baseline environment and having regard to responses received through consultation with local stakeholders, landowners, businesses, communities, and Statutory Environmental Bodies.
- 1.4.13 In addition, National Highways three priorities of Safety, Customer and Delivery were considered crucial to assessing the alternatives ahead of Statutory Consultation.
- 1.4.14 In parallel with the design refinements, alternative routes that deviate from the preferred route had also been developed and assessed for three of the schemes. This process, and the reasons for it, is described in detail in the Route Development Report, which is Appendix 3 to the Project Development Overview Report (Application Document 4.1) with the environmental assessment summarised further in this report.
- 1.4.15 The following alternatives were consulted upon as part of the Statutory Consultation that ran from September 2021 to November 2021:
- Three alternative routes at Temple Sowerby to Appleby - in order to avoid significant adverse impact on Trout Beck (a part of the River Eden SAC).
  - Four alternatives at Appleby to Brough - in order to avoid land take within the North Pennines AONB if possible and develop a route with least overall impact on the AONB.

- Two alternative junction arrangements at the Cross Lanes junction and two alternatives at the Rokeby Junction at Cross Lanes to Rokeby - in order to reduce impacts on traffic flows, safety, and heritage assets associated with Rokeby Park Registered Park and Garden (RPG).
- 1.4.16 Environmental assessment was undertaken to determine the likely significant impacts of each route based on the information that was available at the time. This assessment was presented in the Preliminary Environment Information (PEI) Report presented as part of the Statutory Consultation.
- 1.4.17 A number of further alternatives were developed, assessed from an environmental perspective and, where deemed appropriate, incorporated into the design. This refined design was presented at a supplementary consultation in February to March 2022 and included design changes:
- Junction location for Kirkby Thore on the selected Temple Sowerby to Appleby route
  - Junction layout for Long Marton and Appleby on the selected Temple Sowerby to Appleby route
  - The route alignment north of Sandford on the Appleby to Brough route
  - Design of the selected route at Warcop, to minimise impacts on watercourses north of Warcop following survey that demonstrated they are functionally linked to the River Eden SAC
  - Location of the replacement site for Brough Hill Fair
  - Closure of the existing central reserve gaps and upgrade the junction geometry at Hulands Quarry to address safety considerations raised by the operators and the public. The existing central reserve gap at Bowes Cross Farm would also be closed, along with the access onto the A66.
- 1.4.18 Full detail on the supplementary consultation can be found in the Consultation Report Section 7 (Application Document 4.4).
- 1.4.19 Design refinements to the preferred route and the works at all schemes were considered throughout the preliminary design stage for each scheme. In order to determine the potential environmental impacts, the PRA route was used as a baseline against which professional judgement was used to compare the impacts of these alternatives. Where the PRA baseline was determined to be unable to achieve the Project objectives alternatives were compared to each other to determine less or more preferable in terms of impacts to specific topic.
- 1.4.20 Each of the following sections go scheme by scheme and set out alternatives consulted on during both stages of consultation and route refinements that have occurred throughout the preliminary design process. The differentiating environmental reasons for the selection of the relevant alternative, taking into account the effects of the development on the environment and (where the options were consulted upon) the consultation feedback, are set out below. Where environmental considerations are set out in Table 1-1: M6 Junction 40 - Key environmental considerations of



design alternatives to Table 1-18: Stephen Bank to Carkin Moor - Key environmental considerations of design alternatives, only those environmental topics that were impacted by the design options are presented. Though each alternative was assessed for its potential impact on each of the environmental topics presented in this ES, those topics which were not impacted or for which there were no differences between the options are not referred to in the tables below.

- 1.4.21 It should be noted that while potential impacts to each of the environmental topics set out in this ES were assessed, in some cases they were not the deciding factor in which alternative was taken forward where, for example, an aspect of safety or policy compliance were prioritised.

## 1.5 Alternatives by scheme

### M6 Junction 40 to Kemplay Bank

- 1.5.1 The following section sets out the environmental considerations as they influenced decision making in the M6 Junction 40 to Kemplay Bank scheme. For further detail on the development of this scheme, refer to the Project Development Overview Report Section 5.2: M6 Junction 40 to Kemplay Bank (Application Document 4.1).

#### *M6 Junction 40*

- 1.5.2 M6 Junction 40 was not included within the PRA design, however it was identified that improvements might be required. This was confirmed through the updated traffic modelling undertaken as part of the preliminary design.
- 1.5.3 Amendments to the design considered included the potential to widen the overbridges of the roundabout to allow for greater traffic volume, and a combination of widening the slip roads and use of spiral road markings to better manage the existing traffic flow. Table 1-1: M6 Junction 40 - Key environmental considerations of design alternatives sets out the differentiating environmental considerations of the design alternatives and whether the potential impacts make it a more or less preferable alternative. As neither of these alternatives were considered in the PRA, they are being compared to each other to determine the more preferable alternative by topic.

Table 1-1: M6 Junction 40 - Key environmental considerations of design alternatives

Topic	Widening of junction overbridges	Alterations to road markings and works to the slip roads
Air Quality	<b>Less Preferable</b> as widening overbridges would require a greater construction effort, and higher levels of construction related emissions.	<b>More Preferable</b> as it avoids the construction effort associated with bridge widening.
Climate	<b>Less Preferable</b> as it would require additional structures and additional waste that would have inherent Greenhouse Gases (GHG) and the	<b>More Preferable</b> as it avoids the need for additional structures and has a reduced construction effort.

Topic	Widening of junction overbridges	Alterations to road markings and works to the slip roads
	greater construction effort would result in a higher emissions output.	
Noise	<b>Less Preferable</b> as the greater construction effort required would result in greater construction related noise.	<b>More Preferable</b> as it avoids the need for greater construction effort and thus avoids the greater construction noise level.
Population & Human Health	<b>Less Preferable</b> as work to the existing bridges to this extent would likely lead to greater disruption to traffic flow for the surrounding users, and local community would be impacted to a greater extent by the increased noise and air quality impacts as a result of the greater construction effort.	<b>More Preferable</b> as this would be less disruptive and less impact from noise and air quality during construction.

1.5.4 It was determined that improving the junction markings and widening the slip roads had a similar impact on traffic flows as widening the bridges, whilst being much less disruptive to traffic and local communities. The decision was made to take forward the improvements to the slip roads and roundabout markings.

*Emergency services access*

1.5.5 In the PRA design, the vertical alignment of the A66 as it passes beneath Kemplay Bank Roundabout meant that the existing Carleton Hall underpass that links Carleton Avenue to the emergency services compound beneath the existing A66 would be lost. Following engagement with the local emergency services, it was determined that the access is critical for police to access the site as the only other access is blue lights access to be kept clear at all times and so a replacement would be required as part of the design. Alternatives considered included a replacement underpass at a different location along Carleton Avenue, an overpass over the existing A66, and a reduction in the speed limit which would allow the vertical alignment of the A66 to be altered to the point the existing underpass could be retained.

1.5.6 Table 1-2: Kemplay Bank emergency services access - Key environmental considerations of design alternatives sets out the differentiating environmental considerations of the design alternatives and whether the potential impacts make it a more or less preferable alternative. It was determined that the PRA in this location was unacceptable to local stakeholders and so was not considered in the comparison of alternatives. Instead, a series of acceptable alternatives were compared to each other to determine the more preferable alternative by topic.

Table 1-2: Kemplay Bank emergency services access - Key environmental considerations of design alternatives

Topic	Replacement overbridge	Replacement underpass	Speed limit reduction and associated vertical alignment change
Air Quality	<b>Less Preferable</b> as an overbridge would require additional construction effort (and therefore more potential for construction dust and emissions).	<b>Less Preferable</b> as a new underbridge would require additional construction effort.	<b>More Preferable</b> as it has the least construction effort and the reduced speed limit would have the benefit of reducing operational air quality impacts.
Biodiversity	<b>Less Preferable</b> as there would be requirement for vegetation loss between Carleton Avenue and the A66 to accommodate a new structure and the working area.	<b>Less Preferable</b> for the same reasons as the replacement overbridge.	<b>More Preferable</b> as there would be no requirement for additional vegetation or habitat loss given existing infrastructure would be retained.
Climate	<b>Less Preferable</b> as it would require additional structures and additional waste that would have inherent GHG and the greater construction effort would result in a higher emissions output.	<b>Less Preferable</b> for the same reasons as a replacement overbridge.	<b>More Preferable</b> as it would retain the existing structure, avoiding the carbon inherent in the construction of a new one.
Landscape	<b>Less Preferable</b> as a new overbridge would result in a new overt feature on the landscape that is not currently there.	<b>Less Preferable</b> as although would be less overt on the landscape, the vegetation removal required to construct it would require replacement and there would be a greater construction related impact in comparison to retaining the existing structure.	<b>More Preferable</b> as retaining the existing structure retains more of the existing landscape than a new structure and/or new location.
Noise	<b>Less Preferable</b> as an overbridge would lift traffic and its operational noise higher which may result in it impacting a wider range of receptors.	<b>Less preferable</b> as operational noise would be altered and could require mitigation depending on the modelled impacts.	<b>More Preferable</b> as operational noise wouldn't be impacted.
Road Drainage and Water	<b>Less Preferable</b> as stopping up the existing underpass and not replacing may impact on water flows through the area, flood modelling would be required to ensure no impacts to surface water flows.	<b>Less Preferable</b> as an underpass in a different location may affect ground water and surface water flows.	<b>More Preferable</b> as this would maintain the existing groundwater flows.

1.5.7 Reduction of the speed limit to 50 miles per hour (mph) and retention of the existing underpass was determined to have the most benefit from an environmental, economic, stakeholder, and traffic modelling perspective. It was deemed acceptable from a safety and journey time perspective due to the proximity to the M6, where traffic is slowing anyway, and the more urban nature of the immediate surroundings, so this alternative has been taken forward.

### Penrith to Temple Sowerby

1.5.8 The following section sets out the environmental considerations as they influenced decision making in the Penrith to Temple Sowerby scheme. For further detail on the development of this scheme, refer to the Project Development Overview Report Section 5.3: Penrith to Temple Sowerby (Application Document 4.1).

#### *Local landowner accommodation structure*

1.5.9 In order to improve road safety, a design principle applied across the route has been to prevent right turns onto the dual carriageway. This requires the closing of a number of gaps in the central reservation that are used by local landowners to access land on both sides of the A66. In some cases, where engagement with local landowners identified the need to connect farming operations either side of the road, accommodation structures were considered for inclusion in the design, with both an overbridge and underpass considered at the eastern extent of the scheme, between the Countess Pillar and the B6262 junction.

1.5.10 Table 1-3: Penrith to Temple Sowerby local landowner accommodation structure - Key environmental considerations of design alternatives sets out the differentiating environmental considerations of the design alternatives and whether the potential impacts make it a more or less preferable alternative. There was no landowner accommodation provision as part of the PRA, therefore alternatives were compared to each other to determine the more preferable alternative by topic.

Table 1-3: Penrith to Temple Sowerby local landowner accommodation structure - Key environmental considerations of design alternatives

Topic	Accommodation underpass	Accommodation overbridge
Biodiversity	<b>Less Preferable</b> as the location of the underbridge would be closer to the River Eden, which is designated as an SAC and SSSI.	<b>More Preferable</b> as this can be situated further from the River Eden.
Climate	<b>More Preferable</b> as an underpass would require less in terms of material and the inherent GHG emissions.	<b>Less Preferable</b> as an overbridge would require a greater volume of material and therefore greater GHG emissions.
Cultural Heritage	<b>Less Preferable</b> as the structure and its working area would encroach into the Settlement 1/3 mile (540m) ENE of Brougham Castle Scheduled Monument (ref. 1007203). An	<b>More Preferable</b> as the construction of an overbridge would have less of a requirement to dig within the Settlement 1/3 mile (540m) ENE of

Topic	Accommodation underpass	Accommodation overbridge
	underpass would require digging deeper than an overbridge, therefore with greater risk of damage to archaeology within the SM.	Brougham Castle Scheduled Monument (ref. 1007203) area.
Landscape	<b>More Preferable</b> as an underpass would be less obvious in the local landscape.	<b>Less Preferable</b> as an overbridge structure would result in a greater change in local setting.

1.5.11 It was determined on balance that an overbridge would have a lesser environmental impact, primarily due to its reduced impact on the Settlement 1/3 mile (540m) ENE of Brougham Castle Scheduled Monument (ref. 1007203). This, together with stakeholder engagement and buildability, led to the overbridge being selected to be taken forward.

*High Barn properties*

1.5.12 The PRA was routed south slightly to avoid the buildings referred to as High Barn. Engagement with the landowner however established a preference for altering the alignment to retain more land to the north, even if this resulted in loss of the buildings.

1.5.13 Table 1-4: High Barn properties - Key environmental considerations of design alternatives sets out the differentiating environmental considerations of the design alternatives and whether the potential impacts make it a more or less preferable alternative. In this case, there is a direct comparison between the PRA and an alternative.

Table 1-4: High Barn properties - Key environmental considerations of design alternatives

Topic	Maintain PRA alignment, retain High Barn buildings	Alter alignment to the south, impacting on High Barn properties
Air Quality	<b>More Preferable</b> as this would avoid the dust and air quality impacts associated with demolition works.	<b>Less Preferable</b> as there would dust and air quality impacts associated with the demolition works.
Geology and Soils	<b>Less Preferable</b> as this would result in the loss of a greater area of agricultural soil.	<b>More Preferable</b> as this would avoid loss of agricultural land.
Materials and Waste	<b>More Preferable</b> as, while this results in additional topsoil to be handled, this avoids the requirement to handle demolition waste.	<b>Less Preferable</b> as this results in additional demolition waste from High Barn to be disposed of.
Population & Human Health	<b>Less Preferable</b> as it would go against the wishes of the landowner.	<b>More Preferable</b> as this is the request of the landowner and would leave a greater area of usable land to the north of the A66.

1.5.14 Altering the alignment was determined to be feasible, and potential environmental impacts identified were considered easily mitigatable,. Given the ability to mitigate such impacts it was determined that the alignment

would be altered to the south which was in line with the preferences of the landowner.

### *Center Parcs Junction*

- 1.5.15 Following the decision to alter the alignment of the new A66 south, no longer avoiding High Barn, there was an opportunity to re-evaluate the grade-separated junction at the Center Parcs entrance. It was determined that the junction layout could be reorientated in such a way that would reduce the amount of land required.
- 1.5.16 Table 1-5: Center Parcs Junction - Key environmental considerations of design alternatives sets out the differentiating environmental considerations of the design alternatives and whether the potential impacts make it a more or less preferable alternative. In this case, there is a direct comparison between the PRA and an alternative.

Table 1-5: Center Parcs Junction - Key environmental considerations of design alternatives

Topic	Maintain the junction layout as in the PRA	Reorientate the junction
Biodiversity	<b>Less Preferable</b> as this layout requires a larger land take.	<b>More Preferable</b> as it reduces the amount of land take and less vegetation loss.
Geology and Soils	<b>Less Preferable</b> as this would result in the loss of a greater area of agricultural soil.	<b>More Preferable</b> as this would reduce loss of agricultural soils.
Population & Human Health	<b>Less Preferable</b> as it requires greater land take from local landowners.	<b>More Preferable</b> it reduces the land required to be purchased from local landowners.

- 1.5.17 Given the reorientation was feasible from an engineering perspective and reduced overall land take it making it more preferable from an environmental perspective was determined that the junction should be reoriented.

### *Winderwath Estate access*

- 1.5.18 Engagement with the Winderwath Estate identified the need to provide access across the dual carriageway. This could be achieved by either an overbridge or an underbridge.
- 1.5.19 Table 1-6: Winderwath Estate Access - Key environmental considerations of initial design alternatives sets out the differentiating environmental considerations of the design alternatives and whether the potential impacts make it a more or less preferable alternative. There was no landowner accommodation provision as part of the PRA, therefore alternatives were compared to each other to determine the more preferable alternative by topic.

Table 1-6: Winderwath Estate Access - Key environmental considerations of initial design alternatives

Topic	Accommodation underpass	Accommodation overbridge
Climate	<b>More Preferable</b> as an underpass would require less in terms of	<b>Less Preferable</b> as an overbridge would require a greater volume of

Topic	Accommodation underpass	Accommodation overbridge
	material and the inherent GHG emissions.	material with greater GHG emissions.
Cultural Heritage	<b>Less Preferable</b> as an underpass has a greater potential to impact on buried archaeology.	<b>More Preferable</b> as there is less likelihood to impact on buried archaeology.
Landscape	<b>More Preferable</b> as an underpass would be less intrusive in the local landscape.	<b>Less Preferable</b> as an overbridge structure would result in a greater change in local setting.
Road Drainage and Water Environment	<b>Less Preferable</b> as there may be impacts to groundwater by digging down.	<b>More Preferable</b> as this avoids the risk to groundwater.

1.5.20 Discussions with the local landowner determined that this access and associated tracks were necessary for continued operation of the land in the vicinity. It was determined that, on balance, an underpass would be less intrusive to local landscape character and would be more preferable in terms of its embedded GHG. Other potential impacts were determined to be easily mitigable.

### Temple Sowerby to Appleby

1.5.21 The following section sets out the environmental considerations as they influenced decision making in the Temple Sowerby to Appleby scheme. For further detail on the development of this scheme, refer to the Project Development Overview Report Section 5.4: Temple Sowerby to Appleby (Application Document 4.1).

1.5.22 Following an environmental and engineering design review of the PRA it was considered that the design posed a risk of significant impact to Trout Beck, a tributary of the River Eden and part of the River Eden and Tributaries SAC/SSSI, due to embankments constructed within its flood plain. Through the technical consultation process it was determined that an open span crossing spanning the floodplain was required to avoid this risk, however the route of the PRA would have resulted in a structure of 800m in length. Whilst feasible, such a structure would lead to challenges associated with buildability, cost, carbon, construction impacts, and impacts of watercourse shading. Alternatives were therefore considered in order to determine the most appropriate solution for crossing Trout Beck, taking into account project design principles, impacts on landowners, buildability and design safety.

1.5.23 With regard to the River Eden and Tributaries SAC, further data and analysis led the design team to test, check and challenge previous assumptions. 15 principal routes or route combinations were identified via this process, taking into account potential environmental impacts, project design principles, impacts on landowners, buildability and design safety.

1.5.24 The alternatives were subject to a multi-stage assessment, which included early discounting of alternatives based on the following:

- Routes to the south of the River Eden were unviable due to the number of watercourse crossings required, and the resultant routes were likely to be too long to be considered cost-effective.
- Routes through the area of gypsum mines were considered. The risk profile from Stage 2 Option Selection was explored and confirmed as being too significant to accept.

1.5.25 Following a reduction in viable options, the merits of the remaining alternatives were assessed, and it was concluded:

- Routes to the north of Kirkby Thore but principally south of the gypsum mines were considered viable as they could avoid the risk of building over the gypsum mines. This led to the short-listing of the Red Route and two variants of the Green Route (see below for detail).
- Online routes have the potential to provide a viable alternative crossing location of Trout Beck with the potential for a lower impact on the SAC, due to the existing A66 already posing a constraint on the watercourse. They have the potential for greater impacts on other receptors, including a number of Scheduled Monuments, and the location closer to the River Eden itself poses construction risks. It was determined that the potential for lower impacts on the SAC at this location meant that the options warranted further consideration despite the constraints. This led to the short-listing of two variants of the Orange Route and the Purple Route (see below for detail).

1.5.26 Further detail on this optioneering can be found in the PDOR Appendix 3: Route Development Report (Application Document 4.1).

1.5.27 A subsequent workshop was held in April 2021 attended by technical specialists from the integrated project team. The routes considered at this meeting are summarised in Table 1-7: Temple Sowerby to Appleby - Key environmental considerations of initial design alternatives.

Table 1-7: Temple Sowerby to Appleby - Key environmental considerations of initial design alternatives

Route	Description	Northern or southern routes
Black	This was the Preferred Route promoted at the end of Stage 2 that passes to the north of Kirkby Thore. This includes an 850m structure crossing of Trout Beck and its associated floodplain.	Northern
Blue	This is a development of the Preferred Route that seeks to minimise the crossing distance of Trout Beck and its associated floodplain by moving that section slightly eastwards. The structure crossing is approximately 400m.	Northern
Dark Green	This is a development of the Preferred Route that crosses Trout Beck and its associated floodplain through Flood Zone 2 flooding rather than Flood Zone 3. The route is closer to part of the village of Kirkby Thore, whilst both the Dark and the Light Green route (below) were developed to strike a balance between the encroachment into the gypsum mining area and a Scheduled	Northern



Route	Description	Northern or southern routes
	Monument to the south. The structure crossing Trout Beck and its associated floodplain is approximately 250m.	
Light Green	This route principally follows the line of the Dark Green route (above) to the point where it crosses the existing A66, then runs south of the Scheduled Monument whilst also improving the horizontal geometry. The structure crossing the Trout Beck and its associated floodplain is approximately 250m.	Northern
Red	This route principally follows the line of the Blue Route (above) to approximately Sleastonhowe Lane, where it diverges slightly north to enable a crossing of the Trout Beck and its associated floodplain as far upstream as possible. This has the result of tying into the old Roman Road (near Crackenthorpe) much further east. The structure crossing the Trout Beck and its associated floodplain is approximately 220m.	Northern
Dark Orange	The route principally follows the line of the existing A66 and crosses the Trout Beck immediately south of the existing road bridge. The route passes through the River Eden floodplain and designated area of Scheduled Monument south of Kirkby Thore. The structure crossing the Trout Beck and its associated floodplain was dependent on the detailed flood modelling but will range from 110 to 350m in length.	Southern
Light Orange	This route was developed as a variation of the Dark Orange Route (above) to avoid the designated area of the Scheduled Monument with a recognition that this moved the alignment closer to the River Eden. The structure crossing the Trout Beck and its associated floodplain was dependent on the detailed flood modelling but will range from 110 to 350m in length.	Southern
Purple	This route was developed as the closest representation of an online solution. To achieve this the route is designed to 40mph – all other alternatives are designed to 70mph. This route acquires up to eight residential/business properties and reduces the length of the route in the designated area of the Scheduled Monument.	Southern

1.5.28 A sifting matrix approach was used to assess the alternatives across several criteria including: environmental and landscape effects, safety, land take, demolition, geomorphology, impact on local businesses including farms and the economy, impact on communities and users, engineering, buildability and cost, carbon and conformity with the *NPSNN*.

1.5.29 As part of the sifting review, the Green Routes were discounted from further consideration primarily as it brought the route closer to the eastern edge of Kirkby Thore village and could therefore be expected to have more adverse noise and visual impact on residents and businesses. The design of the Green Routes also passed very close to the British Gypsum mine workings, and the geotechnical risk was deemed too great to be acceptable. In addition, it also had the potential to adversely impact the

Roman camp 350m east of Redlands Bank Scheduled Monument (ref.1007189).

- 1.5.30 Whilst the Black Route was deemed to be technically deliverable following the sifting meeting, subsequent considerations determined that it offered no significant benefit over the Blue Route. The potential for an 800m structure across the floodplain remained and comments made by Natural England and the Environment Agency led to the conclusion that the Blue Route was preferable to the Black Route. As a result, the Black Route was discounted.
- 1.5.31 The remaining three routes (Blue, Red, and Dark/Light Orange - later refined into a single Orange Route) were taken forward for further, more detailed assessment. Surveys were ongoing throughout Preliminary Design, this assessment was carried out using both survey data available at the time of its writing, and professional judgement where there were gaps or the design had not progressed to the level of detail required. A reasonable worst-case approach was taken in this assessment and its results were published in the Preliminary Environmental Information (PEI) Report published as part of the Statutory Consultation undertaken in Autumn 2021. Table 1-8: Temple Sowerby to Appleby - Key environmental considerations of final design alternatives provides a summary of the significant impacts identified at the time.

Table 1-8: Temple Sowerby to Appleby - Key environmental considerations of final design alternatives

Topic	Red Alternative	Blue Alternative (Evolved Preferred Route)	Orange Alternative
Biodiversity	<p>Would cross Trout Beck at the point of its narrowest floodplain, reduces risk of disconnecting the floodplain and would reduce the amount of shading over the watercourse itself.</p> <p>Crossing would be approximately 250m in length.</p> <p>There would be greater requirement for vegetation and habitat loss due to length of the route overall.</p>	<p>Crossing of Trout Beck would be approximately 400m at a point where the river is at a more perpendicular alignment, making the crossing a simpler design and reduces amount of shading.</p> <p>Would be a shorter overall route than red, less of an impact on surrounding habitats and slightly less vegetation loss.</p>	<p>Would cross the Trout Beck where the existing A66 already constrains the watercourse, avoids additional crossing of the river further upstream.</p> <p>This was the shortest of the alternatives and so would have the least impact on the surrounding habitats.</p>
Climate	<p>As the longest of the alternatives, this would result in greater Green House Gas impact than Blue or Orange.</p>	<p>This would have a greater Green House Gas impact than Orange as it is longer, but a lesser impact than Red as it is shorter.</p>	<p>As the shortest of the alternatives, this would be likely to result in lower Green House Gas impact than Red or Blue.</p>

Topic	Red Alternative	Blue Alternative (Evolved Preferred Route)	Orange Alternative
Cultural Heritage	Would avoid land take from Kirkby Thore Roman Fort and Associated Vicus Scheduled Monument (ref.1012183).	Would require land take in close proximity to the Roman camp 350m east of Redlands Bank Scheduled Monument (ref.1007189) which geophysical survey has identified as containing features associated with the Scheduled Monument.	Would be a likely significant effect on the Kirkby Thore Roman Fort and Associated Vicus Scheduled Monument (ref.1012183) south of the existing A66 through direct land take, and land take in proximity to the Roman camp 350m east of Redlands Bank Scheduled Monument (ref.1007189) which geophysical survey has identified as containing features associated with the Scheduled Monument.
Landscape	Would be constructed offline from the existing A66 on agricultural fields and likely be apparent to some residents of Kirkby Thore and potentially Long Marton.  The structure required to cross Trout Beck would be a tall as 18m, making it a potentially significant feature of hard engineering in the otherwise rural landscape.	Would be constructed offline from the existing A66 on otherwise unconstructed fields and would likely be apparent to some residents of Kirkby Thore and potentially Long Marton.	Would be construction close to the existing A66 which would reduce the landscape and visual amenity impact of the new road.
Noise and Vibration	All alternatives would result in differences in impact on noise and vibration due to their differences in length and differing alignments, however there would be no significant differentiating features that separate the three without further investigation.		
Population and Human Health	All traffic would be directed around and to the north of Kirkby Thore, including heavy goods vehicles (HGVs) related to the British Gypsum Plant, reducing the impacts of them driving on the narrow streets of Kirkby Thore. One residential property, Whinthorn House would	All traffic would be directed around and to the north of Kirkby Thore, including HGVs related to the British Gypsum Plant, reducing the impact of them driving on the narrow streets of Kirkby Thore  One residential property, Whinthorn House would require demolition to accommodate the route.	Existing alignment for the majority of traffic would be maintained past Kirkby Thore, though position of the new junctions allows HGVs related to the British Gypsum plant to be diverted north of Kirkby Thore to reduce the impact of them driving on the narrow streets of Kirkby Thore. There would be a

Topic	Red Alternative	Blue Alternative (Evolved Preferred Route)	Orange Alternative
	require demolition to accommodate the route. Alignment would be closer to the settlement of Long Marton which may potentially result in increased noise and air quality impacts to this settlement.		requirement for the demolition of a number of buildings at Bridge End Farm.
Road Drainage and Water Environment	Would cross Trout Beck on a multispan viaduct in order to minimise the level of impact related to the constraining of the watercourse, however there would still be impacts on the watercourse as a result of construction, and shading.	Would crossing Trout Beck on a multispan viaduct would reduce the level of impact related to the constraining of the watercourse, however there would still be increased impacts on the watercourse as a result of construction, and shading.	Building crossing over Trout Beck at an already constrained point would reduce the impacts on the watercourse compared to the Blue and Red Alternatives.

1.5.32 The Blue Route was taken forward into the final preliminary design. A range of factors informed the decision. The Orange Alternative would have had significant impact on the Kirkby Thore Roman Fort and Associated Vicus Scheduled Monument (ref.1012183) and to Roman camp 350m east of Redlands Bank Scheduled Monument (ref.1007189) and the online widening would have impacted on multiple residences and businesses to the south of Kirkby Thore. The Blue Alternative avoided the impact on the Kirkby Thore Roman Fort and Associated Vicus Scheduled Monument (ref.1012183), reduces impact on the Roman camp 350m east of Redlands Bank Scheduled Monument (ref.1007189) and avoids direct impact on properties and businesses along the existing A66. Between the Blue and the Red Alternatives, it was determined that the Blue Alternative would be preferable. Overall, the Blue Alternative would be the shorter, though the crossing of Trout Beck would be longer for the Blue Alternative than the Red. Despite it being the longer of the two crossings of Trout Beck, the Red Alternative would have had a more significant impact on the landscape given the substantial height of the structure required to cross the floodplain. Preliminary flood modelling which demonstrated that a crossing of Trout Beck at this location could be designed without impact on the SAC designation or its floodplain.

1.5.33 Selection of the Blue Route was consulted on as part of the Statutory Consultation carried out in Autumn 2021, and following analysis of the feedback, including that from Statutory Consultees and members of the public, this decision was confirmed and the Blue Route was retained in the preliminary design.

1.5.34 Following this decision, further design development was focused on the Blue Route. A number of design changes were considered through this design development, based on Statutory Consultation feedback and as part of the design development as further surveys and engineering work continued.

*Kirkby Thore North Junction*

1.5.35 Feedback from Statutory Consultation, discussion with landowners, and a further review of the local road network identified a preference to relocate the Kirkby Thore junction from Main Street to Fell Lane. Main Street has a narrow pinch point that may present a safety risk, and due to the proximity of residential properties to the road at the northern end, resolution of this would be difficult and impacts of additional traffic on those properties could be significant. Relocation of the junction onto Fell Lane was considered as an alternative.

1.5.36 Table 1-9: Kirkby Thore North Junction - Key environmental considerations of design alternatives sets out the differentiating environmental considerations of the design alternatives and whether the potential impacts make it a more or less preferable alternative. Though the junction on Main Street can be considered the first location of this junction, the PRA had not gone into the level of detail of junctions at this scale, so both of these alternatives are being directly compared to each other.

Table 1-9: Kirkby Thore North Junction - Key environmental considerations of design alternatives

Topic	Junction on Main Street	Junction on Fell Lane
Noise	<b>More Preferable</b> as this junction's location is situated further from the majority of the residential and community receptors of Kirkby Thore.	<b>Less Preferable</b> as this location brings the junction closer to residential receptors within Kirkby Thore, in particular around Sandersons Croft.
Air Quality	<b>More Preferable</b> for the same reason as outlined in Noise	<b>Less Preferable</b> for the same reason as outlined in Noise.
Biodiversity	<b>Less Preferable</b> as it impacts on a higher value non-agricultural habitats such as woodland.	<b>More Preferable</b> as it is situated predominantly on agricultural land within lower ecological value.
Cultural Heritage	<b>Less Preferable</b> as the layout of the junction may impact on a non-designated heritage asset.	<b>More Preferable</b> as the layout of this junction alternative avoids the non-designated asset.
Landscape	<b>Less Preferable</b> as the topography of the land surrounding this junction would make it difficult to mitigate for the change in landscape created by the junction arms.	<b>More Preferable</b> as, although it brings the junction closer to Sandersons Croft there is more opportunity for embankments and bunding that would be able screen the junction and headlights.
Population & Human Health	<b>More Preferable</b> as there are fewer residential receptors and community receptors being constructed close by and there wouldn't be a	<b>Less Preferable</b> as there would be a requirement for more construction in close proximity to Sandersons Croft which may give rise to increased noise

Topic	Junction on Main Street	Junction on Fell Lane
	requirement to demolish Green Barn to maintain connectivity.	and air quality impacts during construction and operation.

1.5.37 On the grounds of road safety and feedback from the local community during the Statutory Consultation, it was determined that moving the junction from Main Street to Fell Lane would be desirable. The alternative location for the junction is considered positive from a landscape, ecological and heritage perspective. Whilst more properties would potentially experience air quality and noise effects as a result of this alternative there is the room to implement mitigation into the scheme to minimise these. Whereas, with the option on Main Street there are fewer impacts however there would be less opportunity to mitigate these.

1.5.38 The alternative junction at Fell Lane has therefore been incorporated into the Preliminary Design. This was subject of further targeted consultation in February/March 2022. No changes to this design were identified as a result of this consultation. For further detail, see Consultation Report (Application Document 4.4): Chapter 7.

#### *Long Marton Junction*

1.5.39 In the PRA design, there was a junction included where the A66 crosses Long Marton Junction. In preliminary design, it was determined that the vertical alignment would lead to visibility problems that could give rise to safety issues and it was therefore removed prior to Statutory Consultation in Autumn 2021. Feedback received through Statutory Consultation indicated a strong sentiment for this junction to be brought back into the design. Geophysical analysis also demonstrated that the Redland Bank Scheduled Monument (ref.1007189) extends further to the north than previously understood, therefore the design was reviewed to determine whether the new A66 mainline alignment could be moved further to the north to avoid this area. Options for a junction at Long Marton were developed and narrowed down through engineering review to a design that relocated the junction further to the east of the Stage 2 location.

1.5.40 Table 1-10: Long Marton Junction - Key environmental considerations of design alternatives sets out the differentiating environmental considerations of the design alternatives and whether the potential impacts make it more or less preferable. In this case, the PRA design included this junction but as it was discounted early in the preliminary design, the alternative being compared here is not the PRA itself, rather a revised design of it. This is being compared to the preliminary design in which this junction was considered unfeasible.

Table 1-10: Long Marton Junction - Key environmental considerations of design alternatives

Topic	Long Marton Road passing over the new A66, no junction arrangement	New junction arrangement on Long Marton Road
Air Quality	<b>Less Preferable</b> as this alignment is closer to the property of Powis House, meaning construction	<b>More Preferable</b> as this alignment is further from Powis House. Construction

Topic	Long Marton Road passing over the new A66, no junction arrangement	New junction arrangement on Long Marton Road
	related air quality impacts would be greater.	related air quality impacts would be less at this distance.
Biodiversity	<b>More Preferable</b> is the arrangement is more compact, requiring less land to be constructed.	<b>Less Preferable</b> as this would require more land for construction, impacting on a larger area of agricultural land.
Cultural Heritage	<b>Less Preferable</b> as the road arrangement would impact on the northern extent of the Roman camp 350m east of Redlands Bank Scheduled Monument (ref.1007189).	<b>More Preferable</b> as this arrangement moves the road further from the Roman camp 350m east of Redlands Bank Scheduled Monument (ref.1007189) and does not require construction within the designated area.
Noise	<b>Less Preferable</b> as this junction's location is situated closer from the receptors associated with Powis House.	<b>More Preferable</b> as this arrangement move construction works and the junction arrangement further from the receptor of Powis House.
Population & Human Health	<b>Less Preferable</b> as there are multiple villages in the surrounding area that utilise the existing A66 Long Marton Junction. By not including a replacement junction, there is a requirement for residents of these settlements to divert via Appleby or Kirkby Thore, increasing journey times and severance from the A66.	<b>More Preferable</b> as this maintains the current junction connectivity off Long Marton road which is used by various villages and settlements in the surrounding area.

1.5.41 The decision was made to reintroduce this junction given it could be done safely and would be of benefit to the surrounding communities to allow easy access to the A66, improving connectivity. Whilst the land take is greater for this option, therefore some environmental impacts would be greater, effective mitigation is possible at this location. The new junction arrangement allows the road to be moved north to avoid significant effects on the Roman camp 350m east of Redlands Bank Scheduled Monument (ref.1007189).

1.5.42 The new junction arrangement at Long Marton has therefore been incorporated into the Preliminary Design. This was subject of further targeted consultation in February/March 2022. No changes to this design were identified as a result of this consultation. For further detail, see Consultation Report (Application Document 4.4): Chapter 7.

### *Appleby Junction*

1.5.43 As part of the PRA a junction was to be provided at the east to improve access onto the A66 at the Appleby extent of the scheme. However, this junction cannot be implemented without affecting the entrance area to the Appleby Horse Fairground. If the junction at Long Marton is reinstated as indicated above, then there is a lesser need for the junction at Appleby (as

the situation would return to the same as currently, where drivers from Appleby join the A66 at the Long Marton Junction or to the East of Appleby) and the impact on the Appleby Horse Fairground could be avoided. This was therefore reviewed in parallel to the Long Marton Junction alternatives.

1.5.44 Table 1-11: Appleby Junction - Key environmental considerations of design alternatives sets out the differentiating environmental considerations of the design alternatives and whether the potential impacts make it more or less preferable. This is a comparison between the PRA design and a preliminary design that reflects updated junction locations elsewhere on the route.

Table 1-11: Appleby Junction - Key environmental considerations of design alternatives

Topic	New junction at Appleby	Removal of junction at Appleby
Air Quality	<b>Less Preferable</b> as inclusion of the junction would result in a greater construction effort in the area resulting in greater construction related emissions.	<b>More Preferable</b> as this would avoid the construction requirement in the area and the related air quality impacts.
Biodiversity	<b>Less Preferable</b> as this alternative has overall more construction requirement, impacting on additional land, existing habitat and vegetation. Would also require greater construction within the vicinity of the River Eden SAC, giving rise to risk of impacts from run off and contamination.	<b>More Preferable</b> as avoiding construction reduces the overall impact to existing vegetation and habitats. Reduces extent of construction within the vicinity of the River Eden in this location.
Climate	<b>Less Preferable</b> as inclusion of the junction would result in a greater construction effort in the area resulting in greater construction related emissions. There would also be a greater area of hardstanding and greater volume of construction materials required.	<b>More Preferable</b> as this reduces construction and materials related climate impacts.
Geology & Soils	<b>Less Preferable</b> as greater land take would result in greater loss of viable agricultural land.	<b>More Preferable</b> as this avoids loss of agricultural land to construction.
Landscape	<b>Less Preferable</b> as new road associated with the junction would result in changes to local landscape character.	<b>More Preferable</b> as this maintains the existing landscape and visual amenity of the local area.
Materials & Waste	<b>Less Preferable</b> as construction of a new road would require further material and generate more waste.	<b>More Preferable</b> as this removes the construction related material and waste.



Topic	New junction at Appleby	Removal of junction at Appleby
Noise & Vibration	<b>Less Preferable</b> as new junction would result in construction related noise and vibration which may impact on the local area.	<b>More Preferable</b> as this would remove the construction related noise and vibration.
Population & Human Health	<b>Less Preferable</b> as there would be impact on the Appleby Horse Fair Ground required in order to construct the eastbound junction arm.	<b>More Preferable</b> as this avoids the Appleby Horse Fair Ground.
Road Drainage & Water Environment	<b>Less Preferable</b> as the construction would be located not far from the River Eden which would give rise to risk of construction run-off entering the watercourse.	<b>More Preferable</b> as this avoids the risks that might have arisen from construction near to the River Eden.

1.5.45 Based on assessment of local traffic, balanced against the impacts and replacement requirement of taking land associated with the Appleby Horse Fair Ground, it was determined that there was limited justification for Appleby Junction and it was therefore removed from the design.

1.5.46 The removal of the new Appleby Junction was subject of further targeted consultation in February/March 2022.

### Appleby to Brough

1.5.47 The following section sets out the environmental considerations as they influenced decision making in the Appleby to Brough scheme. For further detail on the development of this scheme, refer to the Project Development Overview Report Section 5.5: Appleby to Brough (Application Document 4.1).

1.5.48 Throughout Options Selection and Options Identification, a core principle adopted for the Appleby to Brough scheme was the aim to develop a route that could be constructed outside of the North Pennines AONB, in accordance with the *NPSNN* paragraphs 5.151, 5.152, 5.154, and 5.155. Following a design review from both an environmental and engineering perspective at the beginning of the Preliminary Design stage, it was determined that the PRA for Appleby to Brough scheme could not be constructed without land take within the North Pennines AONB. Work was undertaken to determine whether there was an alternative route that could avoid land take within the designated area.

1.5.49 The scheme was sub-divided into three sections (western, central, and eastern) with an alternative identified within the central section, and an alternative identified at the eastern section. No alternative was identified for the western section at this stage of the design as it is outwith the AONB.

1.5.50 The eastern section was the first to be identified as requiring an alternative due to the direct land take required to connect the local road access for Brough, and to provide accommodation access for the landowner at this

location. An alternative route to the south of the existing A66 which reconnected to the A66 south of the AONB was identified, referred to as the Orange alternative.

- 1.5.51 The height of the embankment required for the new road through the central section was substantial and may lead to a significant impact on the AONB despite not requiring land take within the area. In this location, alternatives were considered and through consultation with stakeholders, including Statutory Environmental Bodies, it was determined that there was an alternative route alignment that would result in an embankment predominantly at-grade. This alternative would require minor encroachment into the AONB in order to maintain the local access road, though the overall impact on the AONB is potentially lower as the road infrastructure is all broadly within the existing road corridor. This was referred to as the Blue alternative.
- 1.5.52 Several other alternatives were developed and subsequently discounted on engineering and safety grounds or due to the impact on the AONB or other environmental receptors. Further detail on these is set out in the PDOR Appendix 3: Route Development Report (Application Document 4.1).
- 1.5.53 The Black (PRA) route and the Blue and Orange alternatives were taken forward for further assessment, with scheme-wide routes made up of any combination of section alternatives, giving rise to four possible routes through the scheme shown in Plate 3-2: Appleby to Brough – design alternatives.

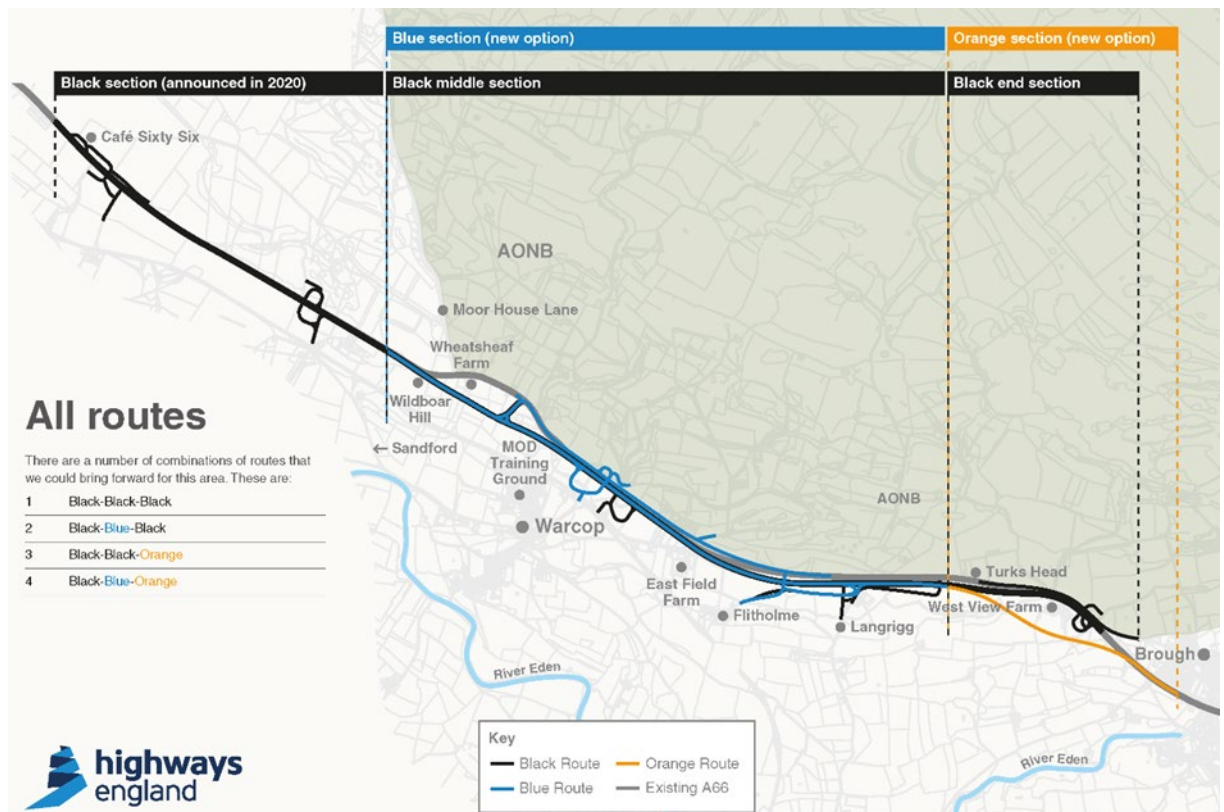


Plate 1-2: Appleby to Brough - design alternatives

1.5.54 The PRA route was referred to as the Black-Black-Black. Assessment of these sections, and the route combinations where appropriate, was undertaken and the results presented as part of Statutory Consultation, along with these alternatives. This assessment was carried out using both survey data obtained at the time of writing, and professional judgement where there were gaps or the design had not progressed to the level of detail required. A reasonable worst-case approach was taken in this assessment and its results were published in the PEI Report published as part of the Statutory Consultation undertaken in Autumn 2021. Significant differences assessed within the PEI report are set out in Table 1-12: Appleby to Brough - Key environmental considerations of design alternatives.

Table 1-12: Appleby to Brough - Key environmental considerations of design alternatives

Topic	Black-Black-Black (Evolved Preferred Route)	Blue Alternative	Orange Alternative
Air Quality	Would be closer to the village of Warcop compared to Blue in the central section of the route.	Situated further from the village of Warcop compared to the PRA route in the central section.	Works would be required closer to Brough in order to tie-in to existing A66.
Landscape	Would require land take within the AONB for construction. The eastern section encroaches into the designation, though infrastructure constructed within the AONB is limited to local access and private access. The central section requires the construction of an embankment which reaches 8m at its highest point which potentially impacts on the setting of the AONB.	Would require construction within the AONB, and the local access road will remain within the boundary for operation. However, road is retained within its current corridor and the embankment required is significantly lower than the Black-Black-Black alternative within the central, therefore overall lower landscape and visual effects.	Would avoid the requirement for a land take within the AONB designated area, however requires construction offline from the existing alignment with a substantial feature cutting across an open valley. Potential for greater landscape and visual effects overall as a result of changes to landscape and visual amenity and potential impacts on the setting of the AONB.
Population and Human Health	Would be some land take required within agricultural land, may impact on operational capacity.	Would be additional land take required compared to the Black-Black-Black, including the requirement to relocate the existing Ministry of Defence site to the east of its current location.	Would be additional agricultural land take would be required to facilitate offline construction compared to the Black-Black-Black. Alignment of this road will bring it close to the buildings of this farm, including its farmhouse

Topic	Black-Black-Black (Evolved Preferred Route)	Blue Alternative	Orange Alternative
			potentially leading to increased impacts on residents as a result of changes to noise and air quality.
Road Drainage and Water Environment	Differing junction arrangement requires some different watercourse crossings.	Differing junction arrangement requires some different watercourse crossings.	Would require an additional watercourse crossing of Lowgill Beck offline of the A66's existing alignment.

1.5.55 A full sift of the alternatives was undertaken and a number of workshops held to determine the preferred route. Taking this into consideration alongside the results of initial engagement with the Statutory Environmental Bodies and the AONB Partnership, the Blue alternative for the central section was taken forward into the final preliminary design, and the Black alternative at the eastern extent. The route selected to be taken forward though the preliminary design was therefore Black-Blue-Black.

1.5.56 This was set out as part of the Statutory Consultation in Autumn 2021 and was confirmed following feedback from Statutory Consultees and the public.

1.5.57 The Black-Blue-Black route has had a variety of design amendments since the Statutory Consultation.

*Western section re-alignment*

1.5.58 The PRA design in the western section proposed use of the existing A66 as the eastbound carriageway with the westbound carriageway constructed to the south. Engagement with local landowners to the south of the existing A66 raised the possibility of the existing A66 forming the westbound carriageway and a new eastbound carriageway being constructed to the north.

1.5.59 Table 1-13: Western Section road widening - Key environmental considerations of design alternatives sets out the differentiating environmental considerations of the design alternatives and whether the potential impacts make it more or less preferable. This is a direct comparison between the PRA and an alternative.

Table 1-13: Western Section road widening - Key environmental considerations of design alternatives

Topic	Utilise the existing A66 as the eastbound carriageway with new construction to the south	Utilise the existing A66 as the westbound carriageway with new construction to the north
Air Quality	<b>Less Preferable</b> as the construction would be closer to the receptors associated with Dyke Nook Cottages to the south of the existing A66. In operation the new A66 will be closer to these properties.	<b>More Preferable</b> as the construction would be further from the receptors associated with Dyke Nook Cottages to the south of the existing A66. In operation the new A66 will be further from this property.
Biodiversity	<b>More Preferable</b> as the land required for construction to the south is mainly agricultural with low ecological value.	<b>Less Preferable</b> as the land required for construction to the north is currently an established woodland and the junction arrangement impacts on an area of priority of fen that will require mitigation.
Noise	<b>Less Preferable</b> for the same reasons set out in Air Quality.	<b>More Preferable</b> for the same reasons set out in Air Quality.
Population & Human Health	<b>Less Preferable</b> as the construction to the south of the existing A66 would bring the road closer to residential receptors on the south and would result in the loss of existing vegetation that currently serves as screening for Dyke Nook, opening up views onto the new dual carriageway.	<b>More Preferable</b> as this would maintain the current distance from the A66 and allow for the retention of the screening vegetation between Dyke Nook and the road.

- 1.5.60 Given the feasibility of the construction of the new carriageway to the north of the existing A66, it was deemed to be a benefit for the local community to alter the design to accommodate this. There would be increased tree loss as a result but this could be factored into the environmental mitigation design.
- 1.5.61 Whilst not a differentiating factor, it should be noted that in the preliminary design, both options have the potential to impact on Warcop Roman Camp Scheduled Monument (ref. 1019208). However, it is anticipated that the preferred option can be delivered in such a way as to avoid this impact while, the previous design would have had to have its impact mitigated.
- 1.5.62 The realignment of the Western Section to the north of the existing A66 has therefore been incorporated into the Preliminary Design. This was subject of further supplementary consultation in February/March 2022. No changes to this design were identified as a result of this consultation. For further detail, see Consultation Report (Application Document 4.4): Chapter 7.

*Central section embankment*

- 1.5.63 Ongoing environmental surveys through the Preliminary Design phase identified that the watercourses known as Moor Beck, Eastfield Sike, and Cringle Beck were functionally linked to the River Eden and Tributaries SAC, having identified several of the priority species for which it is designated utilising the watercourses. Consideration of how best to reduce

impact to these watercourses determined the need to include a series of structures to span these watercourses and their floodplains.

- 1.5.64 Whilst this change can be implemented within the existing alignment for the central section, it results in the finished level of the structures being higher than anticipated at Statutory Consultation. This was therefore assessed as an alternative design.
- 1.5.65 Table 1-14: Central section embankment - Key environmental considerations of design alternatives sets out the differentiating environmental considerations of the design alternatives and whether the potential impacts make it more or less preferable. Following Statutory Consultation, the PRA was no longer considered within the central section, this is a comparison between a refined iteration of the Blue Alternative and an alternative to it.

Table 1-14: Central section embankment - Key environmental considerations of design alternatives

Topic	Central section of road remains at 0.5m above existing at its highest point	Central section is raised to approx. 3m above existing at its highest point
Air Quality	<b>Less Preferable</b> as the road would be closer vertically to local receptors.	<b>More Preferable</b> as raising the level of the road away from local receptors allows emissions and particulate matter to dissipate to a greater extent before affecting the local receptors.
Biodiversity	<b>Less Preferable</b> as maintaining the road at this level would make spanning Moor Beck and Cringle Beck more difficult and may have a greater impact on its integrity.	<b>More Preferable</b> as raising the road allows the proposed route to span the flood plains of Moor Beck, and Cringle Beck which are functionally linked to the River Eden and Tributaries SAC, reducing impact on its integrity.
Landscape	<b>More Preferable</b> as maintaining the road at the level currently proposed would make it less intrusive in the local landscape and have a lesser impact on the North Pennines AONB.	<b>Less Preferable</b> as raising the proposed route would make it more of an obvious feature on the landscape, requiring more construction within the designated area of the North Pennines AONB.
Noise	<b>More Preferable</b> as a lower road level would reduce the extent to which noise can travel through local topography.	<b>Less Preferable</b> as raising the level of the proposed road would lift the noise generating traffic higher in the landscape and potentially result in greater impacts.
Population & Human Health	Impacts to population and human health are a reflection of those outlined in noise and air quality. No additional comments.	

- 1.5.66 Despite potential impact on the AONB, it was determined that maintaining natural functioning of the SAC-related watercourses would be considered an exceptional circumstance for justification of encroachment into the AONB.
- 1.5.67 Given that the height of the new structures was one of the factors in the selection of the Blue alternative over Black at this section, the previous

decision was then revisited. Given that the Black alternative passed further to the south of the existing A66 on embankment through the valley, it would have resulted in a greater number of and size of crossings, therefore the impact of spanning the SAC watercourses would be greater on this alternative. Despite the increase in vertical alignment, overall the impact on the AONB is deemed to be lower for the Blue alternative compared to the Black.

- 1.5.68 The change to the nature of the structures and the vertical alignment at this location was subject of further targeted consultation in February/March 2022. No changes to this design were identified as a result of this consultation. For further detail, see Consultation Report (Application Document 4.4): Chapter 7.

#### *Brough Hill Fair*

- 1.5.69 The central section of the scheme will pass through the existing Brough Hill Fair Ground and this will need to be replaced. There are two potential replacement locations that have been identified. One of these is located to the west of the existing location, between the A66 and Heron Farm on a piece of land owned by the MOD, referred to as the 'Bivvy Site'. The other is situated to the very east of the scheme to the south of the new Brough junction within land associated with Mains House.
- 1.5.70 Although this is considered as mitigation, environmental factors were considered. It was considered that there was little environmental differentiation between the sites as both sites are currently modified grassland, with low numbers of local receptors, and the Brough Hill Fair is a short-term, temporary event that is considered unlikely to have a substantial impact on the local environment.
- 1.5.71 Consultation on both of these sites was undertaken in Spring 2022 and at time of writing, the results of which can be found in the Consultation Report (Application Document 4.4) and the Equality Impact Assessment (Application Document 3.10).

#### *Bowes Bypass*

- 1.5.72 The following section sets out the environmental considerations as they influenced decision making in the Bowes Bypass scheme. For further detail on the development of this scheme, refer to the Project Development Overview Report Section 5.6: Bowes Bypass (Application Document 4.1).
- 1.5.73 The PRA identified a minor encroachment into the North Pennines AONB. A core principle adopted for the Project was to develop a route that could be constructed outside of the AONB, in accordance with the *NPSNN*. Following a detailed design review from both an environmental and engineering perspective however, it was determined that the preferred route could not be constructed without land take within the AONB along a length of 80m, encroaching into the AONB by a maximum of 1.8m at the western tie-in. Hence it was determined that further work was required to identify whether there was a suitable alternative to this alignment completely outside the AONB.

1.5.74 Table 1-15: Bowes Bypass - Key environmental considerations of design alternatives sets out the differentiating environmental considerations of the design alternatives and whether the potential impacts make it more or less preferable. This is a direct comparison between the PRA and an alternative.

Table 1-15: Bowes Bypass - Key environmental considerations of design alternatives

Topic	Design remains as PRA, with a minor encroachment into the AONB.	Movement of alignment approximately 4m to the north at its maximum between Clint Lane Bridge and the western scheme extent so that the southern kerb line matches the existing kerbline over the extent of the AONB
Biodiversity	<b>More Preferable</b> due to a lesser impact upon deciduous woodland and agricultural land.	<b>Less Preferable</b> due to increased land take increasing impacts upon deciduous woodland and agricultural land.
Geology and Soils	<b>More Preferable</b> due to a lesser impact upon agricultural land.	<b>Less Preferable</b> due to an increased impact upon agricultural land.
Landscape	<b>Less Preferable.</b> The encroachment would be of small scale unable to affect the key qualities of the AONB. With reference to the <i>NPSNN</i> , the alignment encroaches the AONB boundary, a nationally designated area. There would therefore be a strong presumption against any significant road widening unless an exceptional circumstances case can be put forward to support the incursion.	<b>More Preferable.</b> The design would be too small to affect key qualities of the AONB. With reference to the <i>NPSNN</i> , this design does not impact the AONB boundary, a nationally designated area. This design is therefore preferable from this perspective.
Population & Human Health	<b>More Preferable</b> as less agricultural land would be required.	<b>Less Preferable</b> as more agricultural land would be required.

1.5.75 The environmental factors were taken into consideration alongside engineering and buildability factors and on balance the assessment concluded that the PRA route should be progressed, as the additional work required to avoid widening into the AONB would be disproportionate, and the broader environmental effects greater, compared to the minor road widening and verge works required of the PRA. Based on design assessments and feedback from Natural England and AONB Partnership an exceptional circumstances case has been included within the DCO documentation to provide justification for the incursion.

### *Hulands Quarry*

1.5.76 Following the Statutory Consultation the decision was taken to close the existing central reserve gaps and upgrade the junction geometry at Hulands Quarry to address safety considerations raised by the operators



and the public. The existing central reserve gap at Bowes Cross Farm will be closed, along with the access onto the A66. Access is maintained by the aforementioned junction upgrade. Alternatives were not considered at this location as these changes were driven by a need to address safety at both central reserve gap locations. Environmental impacts that could arise from this change were considered prior to the change being adopted and no significant effects are anticipated as a result of this change.

### Cross Lanes to Rokeby

- 1.5.77 The following section sets out the environmental considerations as they influenced decision making in the Cross Lanes to Rokeby scheme. For further detail on the development of this scheme, refer to the Project Development Overview Report Section 5.7: Cross Lanes to Rokeby (Application Document 4.1).
- 1.5.78 A sifting exercise was carried out to compare a proposed alternative against the baseline evolved PRA route for each of Cross Lanes and Rokeby junctions. They were compared using engineering, environmental, traffic, economic, and stakeholder principles with commentary on policy conformity. The environmental considerations for both the Cross Lanes and Rokeby alternatives are set out in Table 1-16: Cross Lanes - Key environmental considerations of design alternatives and Table 1-17: Rokeby - Key environmental considerations of design alternatives below.
- 1.5.79 Two junction proposals for Cross Lanes emerged as a result of more detailed traffic modelling. The PRA junction was developed to the east of the existing Cross Lanes junction, whereas the alternative junction was developed to the west.
- 1.5.80 The western Cross Lanes junction proposal provided a more direct link between Rutherford Lane and the B6277 Moorhouse Lane. It was proposed that this all movement junction would include a structure over the A66 to serve this busy route, removing an existing right-left stagger across the A66 for local traffic.
- 1.5.81 The eastern Cross Lanes junction proposal was for an all-movement junction and the B6277 Moorhouse Lane would be realigned to connect to the junction overbridge.

### Cross Lanes

Table 1-16: Cross Lanes - Key environmental considerations of design alternatives

Topic	Black (Evolved version of the PRA)	Blue (Cross Lanes) Alternative
Biodiversity	<b>More Preferable.</b> Impacts upon habitats and species will be similar for both the black route and blue alternative though black has smaller land take.	<b>Less Preferable.</b> Impacts upon habitats and species will be similar for both the black route and blue alternative however a larger area of land take is required for the blue alternative which includes additional watercourses. A reduction in land take paired with appropriate mitigation would reduce potential impacts.

Topic	Black (Evolved version of the PRA)	Blue (Cross Lanes) Alternative
Cultural Heritage	<b>More Preferable.</b> Impacts upon heritage assets would be similar for both the black route and blue alternative, though black has smaller area of disturbance.	<b>Less preferable.</b> The impacts would be similar for both the black route and blue alternative with the exception of Dent House Farmhouse, where there would be an additional effect resulting from the increased amount of traffic visible in views from the building.
Geology and Soils	<b>More Preferable.</b> Loss of agricultural land.	<b>Less Preferable.</b> Larger road footprint, potential for an increase in loss of agricultural land.
Landscape	<b>More Preferable.</b> Impacts upon landscape character and views are likely to be similar for both options.	<b>Less Preferable.</b> Impacts upon landscape character and views are likely to be similar for both options however a larger area of land is required for the blue alternative which may alter slightly more of the existing landscape pattern. A reduction in land take paired with appropriate mitigation would reduce potential impacts.
Noise	Due to the nature of noise effects, noise was modelled across the four potential route combinations (rather than specific comparison of each junction). When you compare route combinations involving black and blue Cross Lanes junctions (i.e. Black-Black vs Blue-Black or Black-Red vs Blue-Red) there are a similar number of receptors affected by noise positively and adversely. The Cross Lanes alternatives are therefore not considered to be materially different in noise terms.	
Population & Human Health	<b>More Preferable.</b> Smaller area of agricultural land take proposed for black option. All other effects would be similar for both the black route and blue alternative.	<b>Less Preferable.</b> Larger area of agricultural land take for alternative. All other effects would be similar for both the black route and blue alternative. Opportunity for an improved north-south connection for walkers, cyclists and horse-riders, but overall remains less preferable.
Road Drainage and Water	<b>More Preferable.</b> Effects upon watercourse crossings would be similar for both the black route and blue alternative.	<b>Less Preferable.</b> Effects upon watercourse crossings would be similar for both the black route and blue alternative however a greater number of watercourse crossings would be required for the Blue alternative. A reduction in watercourse crossings paired with appropriate mitigation would reduce potential impacts.

1.5.82 In summary, the blue alternative junction was favoured primarily for the significant safety improvements, traffic movement and WCH improvements it offers (more detail can be found in the Further detail on these is set out in the PDOR Appendix 3: Route Development Report (Application Document 4.1). It was acknowledged that some of the adverse environmental impacts of the Blue alternative are greater than for the Black evolved version of the PRA, however there was a high probability that these would be reduced through refinement of the design footprint and there were no potential

significant effects identified for the Blue alternative that could not be avoided or improved through mitigation. The alternative junction complied more favourably with National Highways priorities of Safety, Customer and Delivery. As such, the Blue alternative was presented at Statutory Consultation in Autumn 2021 as the preference for Cross Lanes junction.

- 1.5.83 Following Statutory Consultation the junction was confirmed as being the selected junction, and was further refined to reduce the environmental impacts noted in Table 1-16: Cross Lanes - Key environmental considerations of design alternatives. The road spanning over the widened A66 and connecting Rutherford Lane to the B6277 was realigned to better suit existing land boundaries, reduce impact on Tutta Beck and reduce separation of farmed land, whilst reducing overall land take. The link road connecting the junction to the south of the A66 has also been relocated to the north of Cross Lanes Farm shop, in response to feedback received during Statutory Consultation. Further detail regarding the final design of the junction at Cross Lanes is provided in Chapter 2: The Project.

### *Rokeby*

- 1.5.84 As Preliminary Design of the Cross Lanes junctions developed, alternatives were developed for Rokeby in parallel. This was necessary given the interdependency of the junctions on this scheme and the transfer of traffic between the two, along the A66 between them and on to nearby towns and villages.
- 1.5.85 The PRA Rokeby junction proposal was for an all-movement junction to the west of St Mary's Church and the Old Rectory, avoiding any direct impact on the Registered Park and Garden and the Old Rectory. It was proposed that this junction would be an underpass arrangement, providing access to Barnard Castle Road for all westbound traffic and diverging eastbound traffic via the old A66. This junction will provide access to Barnard Castle Road for all westbound traffic and diverging eastbound traffic via the old A66, which will form part of the local road network. Eastbound merging traffic will join the A66 via a slip road at the existing Rokeby Junction with the C165 Barnard Castle Road. This junction will maintain HGV access to Barnard Castle.
- 1.5.86 The eastern Rokeby junction proposal was for an all-movement junction to the east of St Mary's Church but west of the existing Rokeby junction. The proposed compact connector road would directly impact the Registered Park and Garden and as such did not conform with national policy. It was recognised, however, that this alternative junction could bring benefits to the local community and responded to concerns raised by Durham County Council, the landowner and the local community regarding the nature of the PRA Rokeby junction proposal. This alternative was therefore developed further and assessed as an alternative design. The PRA Rokeby junction was named the Black alternative, and the new eastern option was named the Red alternative.

Table 1-17: Rokeby - Key environmental considerations of design alternatives

Topic	Black (Evolved version of the PRA)	Red (Rokeby) Alternative
Biodiversity	<p><b>More Preferable.</b> Impacts upon habitats and species will be similar for both the black (evolved version of the PRA) and Red (Rokeby) alternative. Some notable trees may be impacted. Impacts upon hedgerow. Mitigation would be explored to mitigate and minimise potential impacts.</p>	<p><b>Less Preferable.</b> Impacts upon habitats and species will be similar for both the black route and Red alternative. Direct impact upon Church Plantation by the junction (which may include notable trees and important habitats) which would present a greater impact in comparison with the Black evolved version of the PRA. Design of the underpass could be of benefit if suitable for use for safe passage of species under the A66. There are also opportunities of creating habitat linkages/connectivity between Church Plantation to the north and Jack Wood to the south (e.g. via additional hedgerow/woodland planting).</p>
Cultural Heritage	<p><b>More Preferable.</b> Detrunking the current A66 between Rokeby Park and St Mary's Church, may lead to a reduction in traffic along this section of the road, although traffic would still be required to use the detrunked section to access the Barnard Castle Road. This would restore the historic links between the Old Rectory and St Mary's Church. However there would be setting changes to Rokeby Park and Gardens (a Grade II* registered park and garden), St Mary's Church, the Old Rectory and the Grove associated with new junction and alignment to the south.</p>	<p><b>Less Preferable.</b> This option would result in fragmentation of and introduction of traffic to a nationally designated heritage asset (Rokeby Park and Gardens), potentially leading to harm of that asset. Temporary severing of the historic 'Church Walk' from the main estate to the church. Non-compliance with <i>NPSNN</i> due to direct impacts upon the Registered Park and Gardens (5.130, 5.131, 5.132). With appropriate mitigation it is considered that setting impacts related to this option could be reduced however the direct loss and fragmentation of the Registered Park and Gardens cannot be mitigated.</p>
Landscape	<p><b>More Preferable.</b> Partial impacts upon notable trees to the north of the proposed junction and fringe trees associated with Church Plantation, there would also be an alteration of field pattern in this area which would be less preferable from a landscape perspective.</p>	<p><b>Less Preferable.</b> Permanent loss of woodland (likely including notable trees) at Rokeby RPG, junction impinges upon the setting of the RPG and contribution to landscape character. Opportunities for mitigation such as the planting and grading of the underpass would integrate the underpass with the landform, ecologically connecting with the Church Plantation and restoring a woodland element of the Rokeby Park RPG.</p>
Noise	<p>This topic assessed this scheme as the four potential route options only. Initial modelling and the preliminary assessment shows similar numbers of receptors having improved or negative impacts for all options. When you compare route combinations involving black and red Rokeby junctions (i.e. Black-Black vs Black-</p>	

Topic	Black (Evolved version of the PRA)	Red (Rokeby) Alternative
	Red or Blue-Black vs Blue-Red) substantially more receptors are affected from the red junction alternative than the black alternative. However, it should be noted that similar number of receptors are positively affected than adversely (and in the case of the Blue-Black more receptors benefit than are adversely affected). This is due to changes in traffic movements on the local road network changing the noise environment within the ARN (both positively and adversely).	
Road Drainage and Water	<b>Less Preferable.</b> Impacts upon road drainage and water environment are likely to be similar for both the black evolved preferred route and the red alternative. Black route is located slightly closer to a watercourse and therefore the impact would be slightly greater.	<b>More Preferable.</b> Impacts upon road drainage and water environment are likely to be similar for both the black evolved preferred route and the Red alternative is located at a larger distance from the watercourse.

1.5.87 At Rokeby, the Black evolved version of the PRA was presented at Statutory Consultation in Autumn 2021 as the preferred alternative as part of the Black Route.

1.5.88 Following consultation the junction was further refined to reduce the environmental impacts noted in Table 1-17: Rokeby - Key environmental considerations of design alternatives. The layout has been optimised to reduce the overall footprint and shifted to the east to reduce land take north of the existing A66 and impacts upon veteran trees where possible. Further detail regarding the final design of the junction at Rokeby is provided in Chapter 2: The Project.

### Stephen Bank to Carkin Moor

1.5.89 The following section sets out the environmental considerations as they influenced decision making in the Stephen Bank to Carkin Moor scheme. For further detail on the development of this scheme, refer to the Project Development Overview Report Section 5.8: Stephen Bank to Carkin Moor (Application Document 4.1).

1.5.90 Following feedback from the local parish council concerning the use of Moor Lane for through traffic and safety concerns following a design review regarding the junction being located opposite Mainsgill farm. Table 1-18: Stephen Bank to Carkin Moor - Key environmental considerations of design alternatives sets out the results of the high level assessment to determine which was more or less preferable from an environmental perspective. As the PRA was discounted as a result of the safety concerns outlined above, the alternatives were compared to each other.

Table 1-18: Stephen Bank to Carkin Moor - Key environmental considerations of design alternatives

Topic	Blue route: Provision of a new grade-separated all movement junction to the west of Moor Lane, providing connectivity between the de-trunked A66 and the proposed mainline.	Green route: Provision of a new grade-separated all movement junction to the western boundary of the existing alignment of Moor Lane, providing connectivity between the de trunked A66 and the proposed mainline.	Orange route: West facing slip roads at Collier Lane and east facing slip roads at Moor Lane.
Biodiversity	<b>Less Preferable.</b> Impacts upon woodland, hedgerows and watercourse crossings	<b>More Preferable.</b> Potential improvements in terms of biodiversity	<b>Less Preferable.</b> Impacts upon woodland, hedgerows and agricultural land
Cultural Heritage	<b>More Preferable</b> in terms of setting impacts upon the roman fort due to the junction being in cutting and at a distance from the fort. Potential impacts upon unknown buried archaeological remains (as with all options)	<b>More Preferable</b> in terms of setting impacts upon the roman fort due to the junction being in cutting and at a distance from the fort. Potential impacts upon unknown buried archaeological remains (as with all options)	<b>Less Preferable</b> as the east facing slip road would join the road in proximity to Carkin Moor Roman Fort, potentially resulting in setting impacts upon the fort. The west facing slip would also slightly increase the visual impact upon the Grade II listed Hay Barn.
Landscape	<b>Less preferable</b> due to a slight increase in visual effects given the additional infrastructure elements visible from sensitive local receptors	<b>More Preferable</b> in terms of landscape, effects across the wider Broad Landscape Character Area would be limited	<b>More Preferable</b> in terms of landscape, effects across the wider Broad Landscape Character Area would be limited
Noise	<b>Less Preferable</b> overpass road will be located closer to receptors	<b>More Preferable.</b> Road traffic closer to Foxwell Farm and Foxgrove Farm. However, the traffic using this Connection is not anticipated to result in a significant effect due to the dominance of road traffic noise from the A66 Mainline.	<b>Less Preferable,</b> new carriageway near receptors at Monks Rest Farm and north and south of the scheme where operational impacts would be anticipated

1.5.91 The environmental factors were taken into consideration alongside stakeholder engagement, safety engineering and buildability factors and on balance it was determined that the Green route would be taken forward, this being the preferred alternative from an engineering and environmental perspective.

### A1 (M) Junction 53 Scotch Corner

1.5.92 The following section sets out the environmental considerations as they influenced decision making in the A1(M) Junction 53 Scotch Corner scheme. For further detail on the development of this scheme, refer to the Project Development Overview Report Section 5.9: A1(M) Junction 53 Scotch Corner (Application Document 4.1).

1.5.93 The PRA recognised that improvements might be required to Junction 53 of the M1. Further traffic modelling was undertaken which identified the need to upgrade this junction.

1.5.94 High-level capacity assessments had been carried out that confirmed the existing junction would not provide adequate capacity in its current form once the upgraded A66 is in operation. The initial proposal assumed works would be required across all arms of the junction. Further traffic modelling was then carried out to verify the extent of change which would be required, including sensitivity testing relating to new developments. Following the modelling the scheme was refined to focus on the accessibility of the junction from the Middleton Tyas arm, including from the existing motorway services.

1.5.95 Based on the traffic modelling, the widening of the Middleton Tyas Lane approach to the A1(M) Junction 53 at Scotch Corner roundabout, from one lane to two lanes was taken forward.

1.5.96 Alternatives were not considered at this location as these changes were influenced by traffic modelling. Environmental factors were however considered, and no significant effects are anticipated as a result of this change.

## 1.6 References

Highways England (2016) Northern Trans-Pennine Routes Strategic Study

Department for Transport (2014) National Policy Statement for National Networks

Highways England (2020) A66 Northern Trans-Pennine Project Preferred Route Announcement