highways england

A1 in Northumberland
Morpeth to Felton scheme

Preliminary environmental information report

Volume 1 - June 2018

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1 INTRODUCTION

1.1.1. The A1 in Northumberland: Morpeth to Felton Scheme (the "Scheme") aims to increase capacity along an approximately 12.6 km section of the existing A1 between Morpeth and Felton in Northumberland, by widening the single carriageway to a dual carriageway. It includes approximately 6.5 km online widening and approximately 6.1 km of new offline highway. The aim is to improve journey times and safety along the route. Refer to **Section 2.3** of this Preliminary Environmental Information Report (PEIR) for further details of the Scheme.

1.1.2. This PEIR has been produced in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (**Ref 1.1**) hereafter referred to as "the EIA Regulations"). The aim of this document is to provide the public, stakeholders and consultees with sufficient understanding of the design and environmental issues to be able to develop a good understanding of the Scheme, so that they can give informed responses as part of the statutory consultation. A non-technical summary of this PEIR has also been produced.

1.1.3. This document should be read alongside the A1 Northumberland – Morpeth to Felton EIA Scoping Report (January 2018) (hereafter referred to as the "Scoping Report") which can be found online here: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010041/TR010041-000004-Scoping%20Report.pdf. The Scoping Report sets out the proposed scope of, and approach to, the EIA, and sets out the proposed structure of the Environmental Statement (ES).

1.1.4. The PEIR is presented as a Non-Technical Summary and two volumes: The Non-Technical Summary is a standalone document, the PEIR itself is contained within **Volume 1**, and the Scoping Report is presented in **Volume 2**. The A1 Northumberland – Morpeth to Felton Scoping Opinion is available online here: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010041/TR010041-000035-Scoping%20Opinion.pdf and in **Volume 2** of this PEIR. The Scoping Opinion presents feedback on the Scoping Report from the Planning Inspectorate (PINS) and any other stakeholders they have consulted with, and will be used to inform the ES.

1.2 ENVIRONMENTAL IMPACT ASSESSMENT

1.2.1. The Scheme is defined as a Nationally Significant Infrastructure Project (NSIP) under Section 14(1)(h) and Section 22 of the Planning Act 2008 (as amended by the Highway and Railway (Nationally Significant Infrastructure Project (Order 2013) as:

- It comprises the construction of a highway.
- The highway to be constructed is wholly within England.
- The Secretary of State is the highway authority for the highway.
- The speed limit is 50mph or greater and the Scheme Footprint is greater than the 12.5 hectares threshold. The current Scheme Footprint comprises an area of approximately 396 hectares. This is expected to reduce as the design progresses, although will remain above the threshold.

1.2.2. The Scheme is classified as an Annex I highway development (7(c))[1] of the EIA Directive (2014/52/EU) on the assessment of the effects of certain public and private projects on the environment (**Ref. 1.2**). EIA is required for "all projects listed in Annex I" as these are considered as having significant effects on the environment and require an EIA (e.g. motorways and express roads). The Scheme exceeds the relevant thresholds within Annex I and therefore EIA is mandatory and an ES needs to be prepared.

1.2.3. EIA is a process of evaluating the likely environmental impacts of a scheme, taking into account environmental and health impacts, both beneficial and adverse. EIAs for NSIPs are reported in the following stages:

- A Scoping Report is produced to consult on the scope of, and approach to, the EIA and ES.
- A PEIR is prepared to inform statutory consultation with the public and consultees about the Scheme.
- Following statutory consultation with the public and consultees, an ES is prepared to accompany the application for a Development Consent Order (DCO).

1.2.4. This PEIR, in combination with the Scoping Report and the Scoping Opinion, is the first stage of reporting on the likely environmental impacts of the Scheme.

1.2.5. The Scoping Report was submitted to PINS on 25 January 2018 with a request for a statutory Scoping Opinion. The Scoping Opinion was received on 7 March 2018 and has been taken into account when preparing this PEIR. The Scoping Opinion will also be used to inform what information is to be included in the ES.

[1] Construction of a new road of four or more lanes, or realignment and/or widening of an existing road of two lanes or less so as to provide four or more lanes, where such new road or realigned and/or widened section of road would be 10 km or more in a continuous length

Image 1 - The existing A1 in Northumberland

1.3 DOCUMENT PURPOSE

1.3.1. This PEIR presents the most up to date environmental assessment, and with the Scoping Report (refer to **Volume 2**) and Scoping Opinion (refer to **Volume 2**), forms the PEIR. Further information about the detailed proposals and assessment criteria to be used in the EIA process can be found in the Scoping Report. The PEIR provides the preliminary environmental information available for the Scheme, along with descriptions of the likely environmental effects and mitigation measures envisaged. This document is intended to help all consultees to develop an informed view of the likely significant environmental impacts of the Scheme.

1.3.2. Preliminary environmental information is defined in Regulation 12(2) of the EIA Regulations as information that is reasonably required to assess the environmental effects of the development. The PEIR is based on the design information available at the time of writing, along with the Scoping Report and Scoping Opinion, unless otherwise stated in each environmental topic section. Refer to the Scoping Report (**Volume 2**) for full details of the information, data and previous assessment work that this PEIR is based upon. Furthermore, the Scoping Report, together with the PINS Scoping Opinion, set out the detailed scope of assessment for each environmental topic including elements that will not be assessed through the EIA.

1.3.3. Further EIA work is currently being undertaken to confirm the potential significant effects as a result of the Scheme. The final EIA work will be reported within the ES, which will accompany the DCO application currently proposed to be submitted to PINS in spring 2019.

1.3.4. Since the submission of the Scoping Report, in addition to ongoing design development, the following progression relevant to each environmental topic has been made:

- A baseline noise survey was undertaken in March 2018, the findings of which have been incorporated into **Section 5.2 Noise and Vibration** of this PEIR.

- A bare ground Zone of Theoretical Visibility (ZTV) (refer to **paragraph 5.3.21** for explanation) has been produced and referred to in **Section 5.3 Landscape and Visual Effects** of this PEIR. Furthermore, the representative viewpoints from sensitive visual receptors (refer to **paragraph 4.1.10** for further explanation) have been further refined to reflect the revised ZTV.
- Updated Historic Environment Records (HER) have been obtained and reflected in **Section 5.4 Cultural Heritage**.
- The majority of ecological survey findings have been obtained and reviewed, the findings of which are presented within **Section 5.5 Biodiversity**.
- Proposed changes to Public Rights of Way (PRoW) have been further developed, as reported in **Section 5.8 People and Communities**.

1.4 DOCUMENT STRUCTURE

1.4.1. This PEIR is organised into several sections similar to that described in the Scoping Report and that which will be considered in the ES, and is in accordance with Regulations 12 and 14, and Schedule 4, of the EIA Regulations, which set out the information to be included in the PEIR. The bullet points below identify the content and structure of this PEIR:

- **Section 1 –** Introduction: sets out the context to the Scheme, the purpose of the PEIR, the structure of the PEIR, the EIA team that has prepared the PEIR and also the timings for the DCO submission and construction start.
- **Section 2 –** The Project: provides information on the need for the Scheme, a description of the Scheme, and the Scheme objectives that need to be met.
- **Section 3 –** Assessment of Alternatives: details the assessment of alternative options that have been considered so far in the development of the Scheme.
- **Section 4 –** Environmental Assessment Methodology: summarises the EIA process and explains the different elements of EIA, and also summarises limitations to this PEIR, consultation undertaken since the Scoping Report, and further work to be undertaken through the EIA.
- **Section 5 –** Assessments: summarises the current baseline knowledge for each environmental topic, together with an indication of potential mitigation and design measures and the likely significant effects as a result of the Scheme. Further work required through the EIA is also indicated. .
- **Section 6 –** Assessment of Cumulative Effects: provides information on the assessment of cumulative effects.
- **Section 7** – Summary: presents a summary of the assessment so far.

1.4.2. References are presented at the end of this PEIR, and a glossary of acronyms is presented in **Appendix A**. Figures are presented in **Appendix B**, and **Appendix C** contains a schedule of changes to the Scheme Footprint since the submission of the Scoping Report (refer to **Section 2.3** for further details of this).

1.5 THE EIA TEAM

1.5.1. The EIA Regulations require that the ES is prepared by 'competent experts'. On behalf of Highways England, the EIA is being undertaken by WSP.

1.5.2. WSP has been awarded the Institute of Environmental Management and Assessment (IEMA) EIA Quality Mark scheme, which demonstrates competency in undertaking EIAs and ES preparation.

1.5.3. On an individual assessment level, the EIA is being undertaken by competent experts whom have the appropriate qualifications and experience. Full details of competent experts will be included in the ES.

1.6 SCHEME PROGRAMME AND NEXT STEPS

1.6.1. The programme for the Scheme currently comprises the key project milestones indicated in **Insert 1-1** below:

Insert 1-1 – DCO Process

1.6.2. Before an application for a DCO is submitted, the local community and other stakeholders must be formally consulted on the Scheme. This PEIR will be used to inform this consultation. The responses to the consultation will inform the continuing design and development of the Scheme, and any comments received will be taken into consideration in the EIA.

1.6.3. If the DCO application for the Scheme is accepted by PINS, it will then be taken forward for examination, which is a process in which members of the public and interested parties can also participate. The examination period can last up to six months.

1.6.4. After the examination period, PINS has three months to make a recommendation to the Secretary of State for Transport, who then has a further three months to make a decision on whether or not to approve the Scheme.

1.6.5. If the application is approved, works will start on the Scheme in 2020 with the Scheme anticipated to be open to traffic in 2023.

2 THE PROJECT

2.1 BACKGROUND TO THE SCHEME

PRELIMINARY STUDIES

2.1.1. A number of environmental studies have been undertaken as part of the earlier design stages of the Scheme, as described in the Scoping Report (refer to **Volume 2, Section 2 Overview of the Project and Section 4 Assessment of Alternatives**). Further details on the assessment of Scheme options can be found in **Section 3** of this PEIR.

2.1.2. Following a Feasibility Study in 2014 (**Ref. 2.1**), together with traffic studies, it was considered that the Scheme should be taken forward into the Roads Investment Strategy (RIS) announced in December 2014, and was subsequently progressed in to the "Options Identification" stage.

OPTION IDENTIFICATION

2.1.3. Three route options for the Scheme were identified at the 'Option Identification' stage. All options included a new bridge over the River Coquet parallel to the existing bridge and new junctions at Highlaws, Fenrother and West Moor (with two options including an additional new junction at Earsdon).

2.1.4. The main difference between the options was the use of online widening (constructing the new carriageways alongside the A1's existing carriageways) and offline widening (constructing 'new' road which is separated from the existing A1).

2.1.5. These options were presented at public engagement exercises during May 2016 to obtain feedback.

OPTION SELECTION

2.1.6. Of the options considered, orange, blue and green options were progressed to the 'Option Selection' stage. Further details of these options can be found in **Section 3 Alternatives** of this PEIR.

2.1.7. Public consultation on the three options took place during November 2016. The consultation identified strong support for the Scheme, with the 'green' option receiving the most support from members of the public and landowners alike.

2.1.8. In September 2017 the 'green' option was announced as the Preferred Route. Details can be found at: http://roads.highways.gov.uk/projects/morpeth-to-ellingham-dualling.

2.2 OBJECTIVES OF THE SCHEME

2.2.1. The objectives of the Scheme are to:

- Support economic growth in the area.
- Improve safety for all users and improve journeys across the route.
- Provide a more consistent carriageway standard that aligns with the existing dualled sections of A1.
- Improve and provide more consistent junction layouts and traffic signage along the route to make it easier for drivers.
- Reduce the number of junctions and private accesses along this section of A1 to reduce traffic delay and improve safety.
- Better accommodate the high number of heavy goods and agricultural vehicles that use this section of the A1.

2.2.2. In addition, the design of the Scheme would be carried out in accordance with the Performance Specification set out for Highways England in the Department for Transport's (DfT) RIS, which identified targets and requirements relating to the environment, cyclists, walkers and other vulnerable users of the network (such as horse riders). Furthermore, the Scheme would seek to support no net loss of biodiversity.

Image 2 – An example of an existing at-grade junction on the A1

2.3 DESCRIPTION OF THE SCHEME

THE NEED FOR THE SCHEME

2.3.1. The A1 is one of the longest roads in the country; connecting London to Newcastle and Edinburgh, and consists of mainly motorway and dual carriageway. However, single carriageway sections running between Morpeth and Ellingham and north of Ellingham to Berwick remain, which have less capacity for efficient traffic flows.

2.3.2. The 2014 Feasibility Study (**Ref. 2.1**) identified that users of the A1 in Northumberland currently experience a number of problems, including:

- Varying carriageway standards on the route.
- Poor junction standards and layout.
- Lack of overtaking opportunities.
- A large number of junctions and private accesses resulting in delays.

2.3.3. Over the last decade there have been significant upgrades to the A1 south of Newcastle and there are further plans to improve sections of the A1 around Newcastle and Gateshead.

2.3.4. The Scheme is designed to address these issues and improve the safety and speed of journeys along the route.

Image 3 - Existing A1 at Tritlington Junction

SCHEME LOCATION

2.3.5. The Scheme is located in Northumberland, between Warreners House Interchange at Morpeth and the dual carriageway of the A1 west of Felton. The length of the Scheme is approximately 12.6 km.

SCHEME FOOTPRINT

2.3.6. The Scheme Footprint, as defined by the red line in **Figure 1 Scheme Location Plan in Appendix B,** comprises all land (both temporary and permanent) required to build and operate the Scheme. The Scheme Footprint has been developed to allow for some flexibility in the design process and the EIA will consider a worst case footprint. As the design of the Scheme is progressed, the red line boundary could be reduced further.

2.3.7. Since submission of the Scoping Report to PINS, changes to the Scheme Footprint have been made. A summary of the changes is presented as follows, and a full schedule in **Appendix C** of this PEIR:

- Widening of the Scheme Footprint where access layout and junction arrangements are not certain.
- Exclusion of areas where no temporary or permanent change to the land use would be generated, i.e. where the design has been refined and confirmed.

- Widening of the Scheme Footprint to allow for uncertainty in utilities diversions and the drainage strategy, including drainage attenuation ponds, and also for maintenance purposes.
- Widening of the Scheme Footprint in places where the vertical alignment of the Scheme has been amended.

2.3.8. These changes have been generated through Scheme design iterations, and also to ensure that the Scheme Footprint is considered as worst case for the EIA going forward. The changes have been considered when preparing this PEIR.

THE SCHEME

2.3.9. The Scheme includes approximately 6.5 km online widening and approximately 6.1 km of new offline highway to provide more lanes and increase capacity. The existing A1 to be replaced by the new offline section will become a local access road (de-trunked). The national speed would apply along the Scheme (70 mph) and the de-trunked A1 (60 mph).

2.3.10. A detailed description of the Scheme is provided in the following paragraphs and shown on the General Arrangement drawings presented in **Appendix B.**

Between Warreners House and Priests Bridge

2.3.11. Dualling of the existing single carriageway section of the A1 would begin where the A1 meets the A697 near Northgate Hospital and Warreners House.

Image 4 - The existing A1 carriageway near Espley

2.3.12. Between the A679 junction and Priests Bridge, which is a length of approximately 2.9 km, the existing A1 would be used as the southbound carriageway and a new northbound carriageway would be constructed to the west (i.e. widening would be online). Both carriageways would comprise two 3.65 m wide lanes with 1 m hard strips either side. Direct vehicular access from the A1 for residential properties at Warreners House would be stopped up, with alternative access provided from the south. A replacement private access road would be built to the southeast of Warreners House, which would join up with the

residential cul-de-sac, West View. To facilitate the additional vehicle movements, West View would be widened.

Image 5 - The existing A1, north of Morpeth

2.3.13. At Highlaws Junction, the existing at-grade staggered junction would be replaced by a new compact grade-separated junction with a new bridge over the A1, which would allow easier and safer crossing. New access tracks from the local side roads at Highlaws Junction would provide access for Strafford House, Low Espley residents and the surrounding fields, with all direct access from the A1 stopped up.

Between Priests Bridge and Burgham Park

2.3.14. At Priests Bridge, approximately 6.1 km of 7.3 m wide new dual carriageway (i.e. the offline section) would move away from the existing line of the A1 towards the west, bypassing to the west of Earsdon Moor, passing east of Fenrother and Causey Park and tying-back into the line of the existing A1 adjacent to Burgham Park on the west and Felmoor Park on the east.

2.3.15. A new compact grade-separated junction comprising a bridge over the A1 would be constructed where the Scheme crosses Fenrother Lane. This would allow easier and safer crossing for travellers in this area. In order to maintain road connectivity from Causey Park across the Scheme, a new overbridge would be constructed to carry Causey Park Lane over the offline section. An underbridge at Burgham would be constructed to enable Burgham Park Road from Longhorsley to pass under the Scheme to connect to the existing A1.

Between Burgham Park and Parkwood

2.3.16. Continuing north from Burgham Park to the northern end of the Scheme, which is approximately 3.6 km in length, the widening to dual carriageway would be online. A new compact grade-separated junction with a bridge over the new A1 would be constructed at West Moor, to replace the existing at-grade junction, which would allow easier and safer crossing.

Image 6 - Existing junction at West Moor

2.3.17. A new bridge over the River Coquet would be constructed alongside the existing bridge on the eastern side. The existing bridge will carry northbound traffic and the new bridge will carry southbound traffic. The new bridge would be of concrete and steel construction and comprise a continuous bridge deck with two upright supports (or 'piers').

Image 7 - Existing River Coquet Bridge (looking south towards Ancient Woodland)

De-Trunked A1

2.3.18. Between Priests Bridge and Felmoor Park, the existing A1 would be bypassed by the new offline section of the Scheme. The existing road in this area would cease to be a trunk road and would be used as a local access road for communities, properties and businesses in this area. This would be extended northwards between Felmoor Park and the new West Moor grade separated junction, by construction of a new section of local access road, parallel to the new A1. Access to the strategic road network for residents located along the de-trunked section would therefore be via West Moor Junction for those travelling north and Fenrother Junction for those travelling south. Some alterations to the existing bus stops along this section are proposed, including the removal and addition of some bus stops.

National Grid Diversion

2.3.19. In order to construct the Scheme, a National Grid gas pipeline needs to be diverted near Causey Park. In order to do this, a Northern Gas Networks pipeline and a Northern Powergrid overhead electricity line are also likely to need diverting. Ground moving activities are likely to be required as part of the works include the excavation of a gas pipe trench and the establishment of temporary compound areas, access roads and other work areas.

Drainage and Culverts

2.3.20. The Scheme would include a new surface water drainage system for both the online and offline sections. Development of the drainage design is still ongoing. However, filter drains, kerb and gully drainage and concrete surface water channels are generally proposed as the primary means of removing surface water runoff from the highway. These would be sited adjacent to the hard-strip at the edge of the carriageway. The runoff from the highway would be discharged into existing watercourses (this includes outfalls to the River Coquet and the River Lyne) via storage swales and attenuation ponds where required. In order to achieve the required greenfield discharge rates for the proposed network, flow control devices are proposed together with the ponds and swales.

2.3.21. There are a total of eight culverts along the Scheme. These comprise three new culverts (Priest Bridge, Burgham and Causey Park) and five existing culverts (Bockenfield, Glenshotton, Shieldhill, Parkwood culverts and Parkwood subway).

Other Scheme Elements

2.3.22. Existing traffic signage and technology would be used unless it does not meet current standards, in which case it would be replaced or decommissioned. No new lighting is proposed as part of the Scheme.

2.3.23. Statutory undertaker equipment would be diverted along the length of the Scheme as required.

2.3.24. Options for temporary construction compounds are included within the Scheme Footprint and are shown in **Figure 1 Scheme Location Plan in Appendix B**. However, the need and extent of them is still being considered.

2.3.25. The Scheme would require some demolition works. This includes the demolition of the residential property North Gate House (opposite Northgate Farm, on the western side of the A1 approximately 100m north of the A697 junction), small sections of some existing culverts in order to extend the structures and the existing wing walls (a small wall) at Parkwood subway underbridge (between the River Coquet and the B6345) on the side of the

extension. Other Scheme elements would include site remediation and preparation, and construction works. These activities are likely to produce waste, including broken out concrete, cut steel, road surface planings, hazardous or contaminated material found on or beneath the Scheme, vegetation, surplus topsoil or subsoil materials, timber formwork, bricks and aggregate.

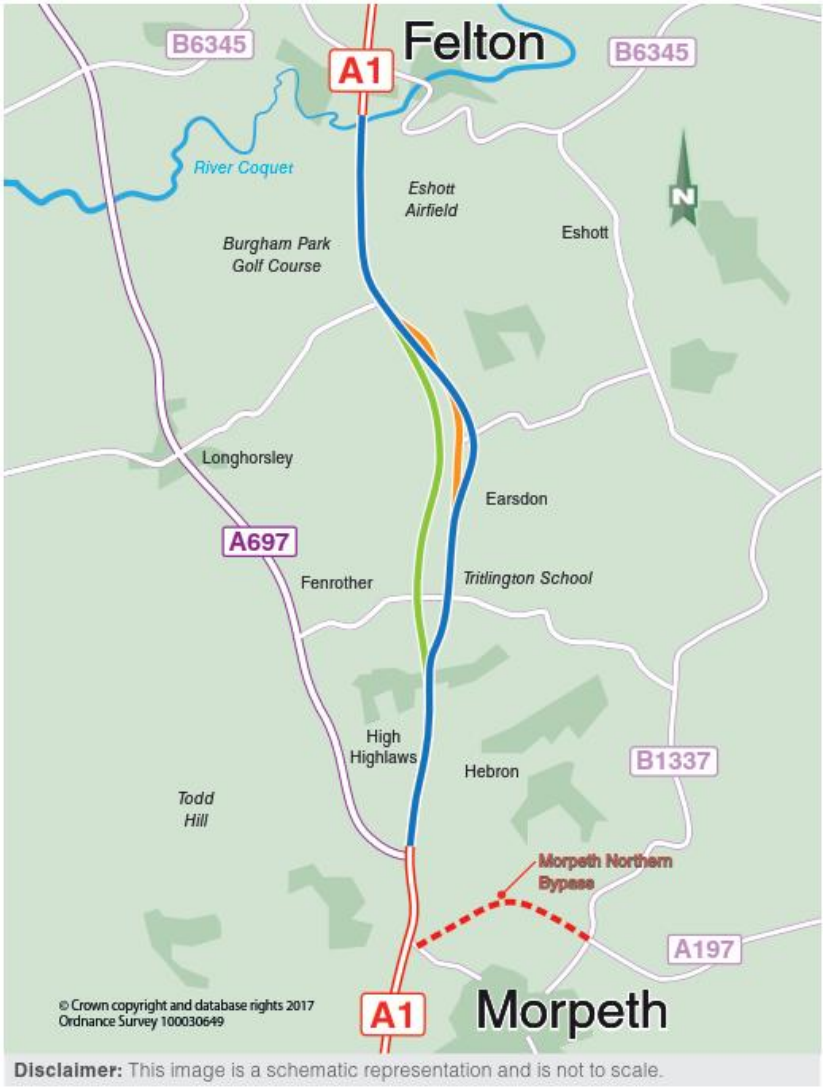
3 ASSESSMENT OF ALTERNATIVES

3.1.1. Various alternative Scheme options have been considered prior to determining that the 'Green Option' would be taken forward as the preferred route. The options are detailed in **Section 4** of the Scoping Report (refer to **Volume 2, Section 4 Assessment of Alternatives**) and illustrated on **Insert 3-1** below.

3.1.2. The EIA Regulations require a comparison of environmental effects of the reasonable alternatives that have been studied when providing an indication of the main reasons for selecting the chosen option.

3.1.3. The following three options were shortlisted at the "Option Selection" stage and presented during public consultation in November 2016:

- **Orange (online) –** Online widening of the existing A1, four new grade separated junctions at Highlaws, Fenrother, Earsdon and West Moor and construction of a new bridge of the River Coquet parallel to the existing bridge.
- **Blue (hybrid) –** Widening the existing A1, as with the 'orange' option, except for two bypass sections of new dual carriageway; one section to the east of the existing A1 near Causey Park Bridge and one to the west of the existing A1 between Helm and Felmoor Park. Four new grade separated junctions at Highlaws, Fenrother, Earsdon and West Moor and construction of a new bridge over the River Coquet parallel to the existing bridge.
- **Green (offline) –** As with the 'orange' option, the A1 would be widened on the existing alignment to Priest Bridge. From here, the new A1 would move west of the current road and pass west of Tindale Hill and Casey Park Bridge. Just north of Burgham Park it would re-join the existing A1 and widening would continue along the existing road northwards until it meets the existing dual carriageway north of Felton. Three grade separated junctions proposed at Highlaws, Fenrother and West Moor and a new bridge of the River Coquet parallel to the existing bridge.



Insert 3-1 – Scheme options considered during the Options Selection stage

3.1.4. **Table 3-1** below presents a summary of the options assessment, as extracted from the previous Environmental Appraisal Report (EAR) (**Ref. 3.1**) produced in 2017. Each option was also assessed against the Scheme objectives to ensure they could be achieved.

Table 3-1 - Summary of Options Assessment

Environmental Topic	Orange Option	Blue Option	Green Option
Air Quality	No significant impacts on local air quality. However, increase in emissions to regional air quality due to an increase in traffic flow.		
Noise and Vibration	Increase in noise in the largest number of properties.	Reduction in noise in the largest number of	Increase in noise in the smallest number of properties.

Environmental Topic	Orange Option	Blue Option	Green Option
	Reduction in noise in the smallest number of properties.	properties in the short-term.	Reduction in noise in the largest number of properties in the long-term.
Landscape and Visual	Larger numbers of adverse visual effects and fewer beneficial visual effects than the Green Option.		The offline section would have an initial adverse effect on landscape character, but would be reduced in the long-term as planting became mature. Offline section would run closer to the Area of High Landscape Value than other options. Adverse and beneficial visual effects.
Cultural Heritage	No impact on Scheduled Monuments. Potential removal of archaeological remains and impacts upon the historic landscape. Removal of two Grade II listed milestones.		No impact on Scheduled Monuments Potential removal of archaeological remains and impacts upon the historic landscape. The offline section has the potential to impact the potential buried site of Helm Chapel. Higher potential for adverse impact upon more unknown archaeological remains than the other options. Extensive surveys required. Removal of one Grade II listed milestone.
Biodiversity	Adverse effect upon the River Coquet and River Coquet Woodlands Site of Special Scientific Interest (SSSI), including Dukes Bank Wood Ancient Woodland. Extensive loss of trees and loss or compaction of woodland soils in the Ancient Woodland.		

Environmental Topic	Orange Option	Blue Option	Green Option
	Some loss of habitat including arable, improved grassland, pond habitat and hedgerows, and small-scale alteration to riparian habitats as a result of new or modified water crossings. Potential for effects on protected and notable species. Further surveys required.		
	Greatest habitat loss in terms of area and diversity of habitat types. Potentially worst impact upon great crested newt, badgers and bats.	-	Greatest habitat loss in terms of area and diversity of habitat types.
Road Drainage and the Water Environment	-	-	Larger surface area therefore greater dilution of pollutants (improving outcomes for water quality) but requiring more attenuation of flows to prevent increases in flood risk. The offline section would intercept more surface water bodies, creating more surface water flooding issues. However can be resolved through design.
	Risk of short-term adverse effects on water quality during construction. No adverse effects on water quality during operation. Short-term potential flood risk at three locations during construction. No long-term adverse effects in relation to flood risk, with the exception of one location, at the un-named tributary of Fenrother Burn. However, mitigation is likely to eliminate this risk. Potential effects at Back Burn, where the relocation of an outfall may eliminate an existing flooding problem. Potential impact upon channel geomorphology.		

Environmental Topic	Orange Option	Blue Option	Green Option
Geology and Soils	Uncertainty about risk associated with former mining areas, particularly in the area around Causey Park and the approaches to the River Coquet Bridge. Further geotechnical surveys are required.		
	Smaller area of Grade 3 agricultural land required than for the Green Option.		Less potential for disturbance of known contaminated land compared to the other options. Potential loss of 62 ha of Grade 3 agricultural land. Further investigation required.
People and Communities	For non-motorised users, loss of the footway that runs along some sections of the existing A1. PRoW diversions required. The provision of grade-separated crossings and the diversion of affected footpaths to these crossings would make crossing safer and easier, although there would be fewer places to cross. At all of the five locations most heavily used by NMUs, the effects of the Scheme would be significantly beneficial, or at worst neutral. For vehicle travellers, the segregation of local and agricultural traffic from strategic traffic, and the provision of a modern dual carriageway, would result in reductions in stress, and improvements in safety.		
	-		Additional benefit of providing a 6 km long local access road running north-south along the line of the bypassed section of the existing A1, forming a quiet, safe local connecting route.
Material Resources	No substantial materials and waste impacts. Most bulk materials required are available locally. Moderate volumes of manufactured materials would be required for import to the site, requiring transport and contributing to depletion of finite resources. Limited carbon footprint.		

3.1.5. **Table 3-1** above shows that, for some environmental topics, particularly ecology, landscape and heritage, the Green Option was identified as being the most adverse, albeit only slightly. For others, such as noise impacts on residents, the Green Option was identified as likely to be the best option. In particular, it would offer potential benefits, such as reduced visual impact compared to the other options.

3.1.6. In addition, the 'green' option was taken forward as the preferred option because it:

- Was the most popular option expressed through public consultation responses.

- Offers a greater level of safety due to the alignment and the retention of the A1 as an alternative route.
- Presents the greatest construction efficiency and worker safety benefits.
- Retains the existing A1 as a local road where the Scheme diverts offline, which offers an alternative route should closures be required, and also provides a north-south route for local traffic.
- It has the greatest compliance with geometric standards and offers a high quality alignment.
- Affects fewer landowners, although more agricultural land is affected by this option.

3.1.7. The reasons for discounting the Orange and Blue Options are presented in **Table 3-2**.

Table 3-2 - Reasons for discounting the Orange and Blue options

Option	Reason for discounting
Orange Option (online)	¡ New alignment is in close proximity to live traffic increasing safety risks to public and construction workers. ¡ Proximity to existing infrastructure complicates construction. ¡ Anticipated traffic management switches due to the weaving alignment of the new road would impact on journey time during construction. ¡ There could be issues with working adjacent to live traffic. Consequently more consideration would have to be given to off peak working, night working etc., all of which add safety risks. ¡ Potentially the worst effect on landowners as proposals may impact a number of dwellings along the new route. Would also create access problems for some properties when existing accesses are closed. ¡ Highway alignment would require the highest number of deviations from current standards.
Blue Option (hybrid)	¡ Disruption to a greater number of landowners and properties. ¡ Adverse effect on farms by the alignment of the junction at Chevington Moor and makes north-south non-motorised user (NMU) movements worse. ¡ No provision for north-south NMU journeys. ¡ There could be issues with working adjacent to live traffic. Consequently more consideration would have to be given to off peak working, night working etc., all of which add safety risks. ¡ Proximity to existing infrastructure complicates construction. ¡ Traffic Management switches due to the weaving alignment of the new road would impact on journey time reliability during construction.

3.1.8. Taking into account the above analysis, together with feedback from the public consultation, the ‘green’ option was announced as the Preferred Route in September 2017.

3.1.9. As part of the EIA, alternative design options will be considered and the findings reported in the ES. This would include consideration of technology, design, size, scale, demand, delivery, scheduling and mitigation, as appropriate.

4 ENVIRONMENTAL ASSESSMENT METHODOLOGY

4.1 EIA PROCESS

4.1.1. The development and design of major highway schemes is governed by guidance set out in the Design Manual for Roads and Bridges (DMRB). Volume 11 (see **Ref 4.1**) of DMRB provides guidance on producing an EIA that is specifically applicable to highway projects. Volume 10 of DMRB (see **Ref 4.2**) covers environmental mitigation. Relevant Interim Advice Notes (IANs) will also be used, where applicable.

4.1.2. An EIA will be undertaken in line with the most up-to-date relevant guidance in the DMRB and IANs, the EIA Regulations, and additional best practice guidance where appropriate.

4.1.3. The National Policy Statement for National Networks (NPS NN) sets out the need for NSIPs on the national road and rail networks in England, together with the policies to deliver them. The NPS NN is used by the Secretary of State as the primary basis for making decisions on DCO applications for NSIPs. As the Scheme is a road network NSIP, the EIA approach adopted is in accordance with the NPS NN.

SCREENING

4.1.4. An EIA Screening (Determination) aims to determine whether a project requires an EIA in line with the EIA Regulations.

4.1.5. As detailed in **Section 1** of this PEIR, a screening exercise was undertaken and it was identified that as the Scheme exceeds the relevant thresholds within Annex I of the EIA Directive, EIA is mandatory and an ES needs to be prepared.

SCOPING

4.1.6. The scoping process is used to determine which environmental topics should be assessed and the level of detail that should be included in the EIA. A Scoping Report, available in **Volume 2** of this PEIR, has been prepared and was submitted to PINS on 25 January 2018 with a request for a statutory Scoping Opinion, setting out the key potential impacts and the proposed approach to the assessment (refer to **Section 1**).

4.1.7. The Scoping Opinion, available in **Volume 2** of this PEIR (together with the consultation response from Northumberland Clinical Commissioning Group), was received on 7 March 2018 and has been taken into account when preparing the PEIR and will be used to inform which topics the ES should assess.

4.1.8. Northumberland County Council (NCC) comments will also be taken into account during the EIA and preparation of the ES. It should be noted that direct consultation is being undertaken at topic level with NCC specialists, on a continual basis.

STUDY AREAS

4.1.9. **Table 4-1** presents the current study areas for each environmental topic assessment. These study areas may be subject to change as the EIA progresses.

Table 4-1 Current Study Areas

Topic	Current Assessment Study Area	Justification / Commentary
Air Quality	Construction – within 200m of the Scheme Footprint. The study area	In accordance with DMRB HA207/07 (**Ref. 5.2**).

Topic	Current Assessment Study Area	Justification / Commentary
	for impacts associated with dust emissions during construction will be 200m either side of the affected roads. Operation – 200m corridor either side of all roads included in the Affected Road Network (refer to **paragraph 5.1.16** for further details).	
Noise and Vibration	Construction – Area beyond the extent of construction works within 300 m (including construction traffic and temporary diversion routes) for which noise and vibration levels at sensitive receptors has the potential to exceed the criteria provided in the relevant British Standard (BS 5228). This will be based upon identifying construction operations which could have a significant impact, such as heavy plant or works outside of standard hours. Vibration traffic nuisance is defined as being within 40m of any roads identified in the study area described above. Operation – a 600m calculation area around all roads within 1km study area of the start and end points of the Scheme. Additionally 50m from the affected routes included in the ARN	In accordance with DMRB HD 213/11 (**Ref. 5.5**) and BS5228. The study area for construction noise and vibration is expected to be a reduced area (compared to operational impacts) within the area defined for the operational noise effects. This is because at distances beyond 300m other factors, such as meteorological conditions, have increasing influence and construction noise level predictions are considered less robust. Nevertheless, where necessary (and where relevant details are available) the study area for construction phase effects will be widened to include other temporary sources such as construction traffic routes or diversion routes.
Landscape and Visual	The area from which the road, its structures or traffic on it can be seen, will be defined by computer modelling a Zone of Theoretical Visibility (refer to **paragraph 5.3.24** for further explanation). Based upon this, the following study areas have been identified to concentrate the assessment on identifying significant effects.	In accordance with IAN 135/10 (**Ref. 5.14**). The landscape study area is based on the visual study area but widened out to include the whole of distinct areas of landscape potentially affected, not just the parts of these areas from which there may be visibility.

Topic	Current Assessment Study Area	Justification / Commentary
	Visual assessment – 2km study area from the centreline of the Scheme for general representative viewpoint locations. 1km study area from the centreline of the Scheme for the Visual Effects Schedules on individual receptor groups (e.g. residential, commercial and PRoW) Landscape assessment – 5km study area from the centreline of the Scheme.	
Cultural Heritage	Non-designated assets – 500m from the Scheme Footprint. Statutory designated assets, conservation areas and historic landscapes – 1km from the Scheme Footprint.	In accordance with DMRB (**Ref. 5.16**) and agreed through consultation with NCC.
Biodiversity	Protected and noteworthy species (desk study) – 2km from the Scheme Footprint. Bat species (desk study) – 5km from the Scheme Footprint. Non-statutory designated sites and statutory designated sites of national importance (desk study) - 2km from the Scheme Footprint. Statutory designated sites of international and European importance (desk study) – 10km (and 30 km for bats in relation to Special Areas of Conservation (SAC)) from the Scheme Footprint. Survey area for the Phase 1 habitat survey (including priority and notable, and other, habitats) and the majority of the field surveys undertaken for protected and/or notable species - 500m from the Scheme Footprint.	In accordance with DMRB Vol 11, 4.1 (**Ref. 5.22**) and the Guidelines for Preliminary Ecological Appraisal (Chartered Institute of Ecology and Environmental Management (CIEEM), 2013) (**Ref. 5.20**). An Ecological Zone of Influence will be established for the EIA (once further assessment information is available in relation to air quality and hydrology) to determine significant effects.

Topic	Current Assessment Study Area	Justification / Commentary
	Bat roost potential surveys and activity surveys, and reptile surveys - 100m from the Scheme Footprint. National Vegetation Classification (NVC) survey – 200m from the Scheme Footprint. Ancient Woodland that may be directly and/or indirectly impacted. Dukes Bank Ancient Woodland is the only Ancient Woodland within the Scheme Footprint. Refer to **paragraph 5.5.23** for further details.	
Road Drainage and the Water Environment	Surface water features – within 0.5km from the Scheme Footprint. Features that are in hydraulic connectivity with the study area (including surface water abstractions and downstream watercourses) – within 1km from the Scheme Footprint. Groundwater features – within 0.5km from the Scheme Footprint Groundwater abstractions – within 1km from the Scheme Footprint. If sensitive features located further than the above study areas are identified to be at risk, these features will also be considered within the assessment.	Based upon professional experience in line with DMRB Volume 11 Section 2 Part 5 (**Ref. 5.23**).
Geology and Soils	250m from the Scheme Footprint.	Based upon professional judgement.
People and Communities	Non-motorised users – 500m from the Scheme Footprint. Vehicle travellers – the existing A1 and the road links in close proximity to the Scheme Footprint	DMRB Volume 11, Section 3 (Part 6, Part 8 and Part 9) (**Ref. 5.26, 5.27 and 5.28**) do not specify a study area when considering the effects of a road project on all travellers, communities and people. Study areas have therefore been

Topic	Current Assessment Study Area	Justification / Commentary
	Community Amenity and Severance – facilities within the communities of Morpeth and Felton and any locally important community facilities further afield that could be impacted. Physical assets – Commercial and community assets within the immediate vicinity of the Scheme. Economy and Employment – the local authority of Northumberland. Recreational activities – 500m from the Scheme Footprint. Agricultural Land Classification (ALC) Survey – Scheme Footprint and other land affected.	selected based on professional experience and proportionality. The ALC study area focusses only on land that would be affected, in line with 'Agricultural Land Classification of England and Wales – revised guidelines and criteria for grading the quality of agricultural land', 1988'.
Material Resources	Primary study area (which encompassed the assessment of Scheme arisings) – area within the Scheme Footprint. Secondary study area (availability of construction materials and capacity of recycling and waste management infrastructure) – North East England.	In accordance with IAN 153/11 (**Ref. 5.34)** Environmental Assessment of Material Resources, and based upon professional judgement.
Climate	Greenhouse gas assessment - assessment is not restricted by geographical area but instead includes any increase or decrease in emissions as a result of the Scheme and the areas from which the construction materials are sourced. Climate resilience – area within the Scheme Footprint. The assessment will use UK Climate Projections information.	Based upon professional judgement in considering climate change as a global issue. Within the extent of the physical components of the Scheme.

BASELINE

4.1.10. The first step in the EIA is to determine the baseline conditions, to understand the existing environment that could be impacted by the Scheme. Baseline conditions are not necessarily the same as those that exist at the current time; they are the conditions that would exist in the absence of the Scheme either (a) at the time that construction is expected to start, for impacts arising from construction or (b) at the time that the Scheme is expected to open to traffic, for impacts arising from its operation. Therefore, the identification of the baseline conditions involves predicting changes that are likely to happen in the intervening period, for reasons unrelated to the Scheme. This PEIR presents the baseline conditions within and around the Scheme, and further detail can be found in the Scoping Report (refer to **Volume 2, Sections 7 to 16**).

4.1.11. As part of this step, sensitive receptors are identified. Sensitive receptors may be a physical resource or asset (e.g. a water body or a residence) or a user group (e.g. recreational users of an area or local residents).

4.1.12. This PEIR includes changes to the baseline or additional information made available since the Scoping Report was produced. A full update of the baseline will be undertaken as part of the EIA and incorporated in the ES.

PREDICTED ENVIRONMENTAL IMPACTS

4.1.13. The next stage of the EIA process is to predict the potential impacts that might arise as a result of the Scheme. Impacts are changes to the environment, compared with the baseline environment, attributable to the construction and operation of the Scheme and may be adverse or beneficial, direct or indirect, temporary or permanent. The methods of predicting impacts vary by topic. The assessment will be undertaken for the following years:

- Baseline Year (2015)
- Opening Year of the Scheme, i.e. when traffic can use it (2023)
- Future Year of the Scheme, i.e. 15 years after opening which is typically considered to be the time when the Scheme would be operating at its most efficient or mitigation measures would be fully effective by this time (2038)

SIGNIFICANCE

4.1.14. The EIA process then provides an evaluation of how significant the impacts as a result of the Scheme are likely to be. Residual effects are those that are likely to remain after mitigation and design measures have been implemented.

4.1.15. The significance of an impact is determined by taking account of the sensitivity of the environmental receptor, the magnitude of the impact (i.e. amount of change) and whether it can be mitigated through good design or management. The greater the environmental sensitivity of the receptor and the greater the magnitude of impact, the more significant the effect.

4.1.16. The approach to assessment will be based on the guidance in DMRB Volume 11 Section 2 Part 5 (HA205/08) (**Ref 4.3**) Assessment and Management of Environmental Effects. Tables 2.1, 2.2, 2.3 and 2.4 of this guidance provide specific advice on determining the significance of an impact, although professional judgement needs to be used. Some environmental topics use different guidance to ensure best practice.

MITIGATION AND ENHANCEMENT

4.1.17. Where adverse effects are identified, mitigation may be proposed to remove, reduce or offset the impacts. In some cases EIA professionals and stakeholders involved in the process may also identify and recommend enhancement opportunities for a scheme in order to achieve improved environmental outcomes. It is therefore important that the EIA process takes place alongside the development of the Scheme design in order to make the most of such opportunities.

4.2 LIMITATIONS

4.2.1. This PEIR is based on the latest design and construction information. As such, these findings may be subject to change as the design progresses. The assessment of the significance of effects will be undertaken as part of the EIA and reported in the ES. Refer to the **Scoping Report in Volume 2** for full details of limitations and assumptions relevant to each environmental topic.

4.2.2. **Table 4-2** summarises the main topic specific limitations that this PEIR is based upon.

Table 4-2 Limitations of this PEIR

Topic	PEIR Limitations
Air Quality	Scheme traffic data not yet available.
Noise	Scheme traffic data not yet available. Construction plant and machinery numbers, type and operation arrangements not yet confirmed.
Landscape and Visual	Summer landscape and visual assessment not yet completed. Landscape design not completed.
Cultural Heritage	Full geophysical survey results not yet available.
Biodiversity	Extent of mitigation and compensation land not yet confirmed. Full suite of ecological survey reports not yet received. Of those received, some discrepancies and data omissions have been identified, which will be addressed through the EIA following consultation and further assessment. Biodiversity No-Net-Loss condition surveys not yet completed.
Road Drainage and the Water Environment	Scheme traffic data not yet available. Topographic data of water courses, and therefore the hydrological model not yet available. Site visit (watercourse condition survey) not yet undertaken. Surface water drainage design not yet confirmed.
Geology and Soils	Results of Agricultural Land Classification survey not yet available. Results of Ground Investigation not yet available.

Topic	PEIR Limitations
	Results of Coal Mining Risk Assessment not yet available.
People and Communities	Results of Agricultural Land Classification survey (including farmer interviews) not yet available. Results of the Walking, Cycling and Horse riding Assessment and Review (WCHAR) not yet available.
Material Resources	Materials quantities not yet available.
Climate	Traffic data and related assessment information not yet available.
Cumulative Effects	The Affected Road Network is not yet available in order to determine a comprehensive list of other developments.

4.2.3. Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessment during the production of the ES.

4.3 CONSULTATION AND RESPONSES

4.3.1. At the time of writing, the following discussions were ongoing:

- Natural England, in relation to ecology surveys undertaken, ongoing assessment / methodology, potential impacts upon ecology and mitigation (including a Salvage Plan to address the potential impacts upon Ancient Woodland).
- Environment Agency in relation to ecology surveys undertaken, ongoing assessment / methodology, potential impacts upon the water environment and mitigation.

4.3.2. Further information on consultation undertaken to date can be found in the Scoping Report (**Volume 2, Section 5 Consultation**).

4.3.3. Scoping Opinion responses (refer to **Volume 2**) have been noted in this PEIR and will be taken into account in the ES.

4.4 FURTHER WORK FOR THE EIA

4.4.1. The following paragraphs provide information in response to comments received from PINS.

MAJOR ACCIDENTS AND HAZARDS

4.4.2. PINS states that the ES should include a description of the potential vulnerability of the Scheme to risks of major accidents and / or disasters, including a clear explanation of the scope and method of assessment.

4.4.3. Schedule 4 Part 5 of the EIA Regulations details the requirement for a description of the likely significant effects on the environment resulting from, amongst others, the risks to human health, cultural heritage or the environment (for example due to disasters).

4.4.4. An assessment of the vulnerability of the Scheme to major events identified will be undertaken. A qualitative assessment will be carried out and reported within the relevant

individual environment topics in the ES. **Appendix D** presents the methodology for this assessment.

HEALTH

4.4.5. Public Health England's recommends a number of considerations for the assessment of health, including the information to be reported in the ES and the method for assessment. Furthermore they recommend the consideration of Electric and Magnetic Fields (EMF), the methodology for which is presented in **Appendix D**.

4.4.6. Schedule 4 Part 5 of the EIA Regulations details the requirement for a description of the likely significant effects on the environment resulting from, amongst others, the risks to human health.

4.4.7. There is no consolidated methodology or practice for the assessment of health in EIA. However, the impact of the Scheme will be assessed in relation to the health policies set out in NPS NN and will adhere to existing Highways England methodology relating to human health for the following individual environmental topics:

- Air Quality
- Noise and Vibration
- Road Drainage and the Water Environment
- People and Communities

4.4.8. Potential impacts upon health as a result of the Scheme are yet to be determined and will be considered during the EIA. However, no significant effects upon human health are anticipated. The assessment will address health in the first instance by using individual guidance for the above environmental topic areas to enable overall health conclusions to be determined. Qualitative potential health effects associated with specific issues will be reported within the People and Communities section of the ES.

4.4.9. Consideration of possible health impacts relating to EMF will be considered. However, no significance effects relating to EMF are anticipated.

TRANSBOUNDARY EFFECTS

4.4.10. PINS initially recommended that the ES should identify whether the Scheme has the potential for significant transboundary impacts and if so, what these are and which EEA States would be affected.

4.4.11. Schedule 4 Part 5 of the EIA Regulations requires a description of the likely significant transboundary effects to be provided in an ES. However, the nearest European Economic Area (EEA) State to the Scheme is Ireland, located approximately 330 km to the west. It is therefore considered that the Scheme would not generate significant effects upon any other EEA States. Further information can be found in the Screening Matrix contained in **Appendix C** of the **Scoping Report** presented in **Volume 2**.

4.4.12. On 2 May 2018, PINS subsequently published transboundary screening based on information set out in the Scoping Report (for the purposes of Regulation 32 of the EIA Regulations). This concluded that the Scheme is unlikely to generate a significant effect either alone or cumulatively on the environment in relation to any EEA state. This screening can be found at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010041/TR010041-000040-TR010041%20-%20Regulation%2032%20Transboundary%20Screening.pdf .

4.4.13. Based on current information, a detailed transboundary screening is therefore not required as part of the ES.

5 ASSESSMENTS

5.1 AIR QUALITY

INTRODUCTION

5.1.1. This section considers the implications of the Scheme on local and regional air quality during the construction and operational phases and any likely significant effects. Air quality can affect human health, quality of life and the natural environment.

5.1.2. The principal sources of atmospheric pollutants considered within the assessment are construction dust, nitrogen dioxide (NO_2) and particulate matter (PM_{10}).

EXISTING BASELINE KNOWLEDGE

Local Authority Monitoring

5.1.3. Thresholds for the concentration of pollutants in ambient air to protect the environment (human health and ecosystems) are set in UK national legislation (referred to as air quality objectives) and in European Directives (referred to as limit values). For the NO_2, the limit values and objectives are numerically equivalent (refer to **Table 5-1**).

Table 5-1 Air Quality Thresholds

Pollutant	Air Quality Objective / Limit Value	
	Concentration	Averaging Period
Nitrogen Dioxide (NO_2)	40 µg/m^3	Annual Mean
	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour Mean
Nitrogen Oxides (NO_x)	30 µg/m^3	Annual Mean
Particles (PM_{10})	50 µg/m^3 not to be exceeded more than 35 times a year	24-hour Mean
	40 µg/m^3	Annual Mean
Particles ($PM_{2.5}$)	25 µg/m^3	Annual Mean

5.1.4. There are no Air Quality Management Areas (AQMAs) within NCC and therefore no part of the Scheme, nor any of the potential roads that may be affected by the Scheme, lie within an AQMA.

5.1.5. NCC operates one automatic monitor for nitrogen dioxide in Blyth, approximately 22 km southwest of the Scheme. The site shows no exceedances of the air quality objective and is not representative of exposure adjacent to the Scheme.

5.1.6. None of NCC's air quality diffusion tube monitoring locations have reported exceedances of the relevant objectives within the past five years. The closest of the 21 NCC administered NO_2 monitoring sites are located approximately 3.8 km southwest of the Scheme in Morpeth

(CM2, A192 Newgate St) and approximately 21.5 km north of the Scheme at Alnwick (8N Bondgate Without).

Background Air Quality Data

5.1.7. Background pollutant concentrations, i.e. those resulting from distant sources and pollutant transport, have been taken from the mapped data provided by the Department for Environment, Food and Rural Affairs (Defra)[2] on a 1 km x 1 km grid covering the UK, interpolated to the locations of the selected receptors.

5.1.8. Average annual mean background pollutant concentrations for the grid squares covering the Scheme are summarised in **Table 5-2** below, comprising background pollutant concentrations of nitrogen oxides (NO_x) (oxides of nitrogen), NO_2, PM_{10} and $PM_{2.5}$ for the baseline year (2015) and the Scheme opening year (2023).

Table 5-2 – Average annual mean background pollutant concentrations from Defra mapped data for 2015 and 2023

Year	Nitrogen Oxides NOx	Nitrogen Dioxide NO_2	Particulate Matter PM_{10}	Particulate Matter $PM_{2.5}$
Limit Value	30 µg/m^3	40 µg/m^3	40 µg/m^3	25 µg/m^3
Total Pollutant Concentrations (µg/m^3)				
2015	6.54	5.05	11.81	7.99
2023	5.28	4.16	9.79	6.19

5.1.9. Average concentrations of all pollutants are well below the relevant limit values.

2017 UK Air Quality Plan

5.1.10. Defra undertakes air quality modelling using their Pollution Climate Mapping (PCM) to inform when zones/agglomerations comply with the EU Limit Values. PCM data for 2015 are available from Defra's UK-Air website (**Ref 5.1**). The nearest PCM link to the Scheme is within Morpeth, where the maximum PCM modelled concentration is less than 30 µg/m3 for annual mean NO_2, which is well below the EU limit value. The Scheme is therefore unlikely to risk achievement of compliance with the EU Directive.

Highways England Monitoring

5.1.11. Scheme specific monitoring was undertaken by Highways England, using NO_2 diffusion tubes, between February and July 2017 at eight sites within or near to the Scheme.

5.1.12. Concentrations of NO_2 were reported at all sites to be well below the annual mean NO_2 air quality objective threshold. The maximum measured annual mean concentration was 28.8 µg/m3 at the monitoring point located at the roadside adjacent to the A1 near Earsdon Moor.

[2] https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

Sensitive Receptors

5.1.13. Receptors will be selected to represent locations where the duration of human exposure is consistent with the averaging period of the relevant air quality compliance measure, and are based on effects on human health. The air quality objectives have been set at concentrations that provide protection to all members of the public, including more vulnerable groups such as the very young, elderly or unwell who are more susceptible to poor air quality. The location of all sensitive receptors will be identified in the ES, but are likely to include residential properties, schools, hospitals and care homes if they are within 200m of an affected link

5.1.14. The River Coquet and Coquet Valley Woodlands SSSI, which is crossed by the Scheme, has been identified as an ecological receptor, due to the potential for air quality impacts as a result of the Scheme.

5.1.15. The Defra mapped background concentrations of NO_x at this location are 7.3 µg/m^3 which is well below the air quality limit value of 30 µg/m^3. Critical loads for nitrogen deposition levels are set for the protection of various ecological designations and are provided through the Air Pollution Information System (APIS)[3]. At the River Coquet and Coquet Valley Woodlands SSSI, background nitrogen deposition levels are 27.7 kgN/ha/yr, which exceeds the critical level of 10 kgN/ha/yr.

THE "AFFECTED ROAD NETWORK"

5.1.16. Pollutant concentrations from traffic emissions disperse rapidly away from a road, returning to background concentrations within 200 m. Relevant receptor locations are chosen based on where sensitive receptors may be present within 200 m of an 'affected road'. These receptors would be the worst affected, so an assessment based on them would represent a 'worst case scenario'. The area that will be considered in the assessment therefore consists of 200 m corridors either side of all roads in the Affected Road Network (ARN).

5.1.17. Therefore, the assessment of operational impacts on air quality in the ES will comprise land within 200 m of "affected roads" which will be determined by analysis of the traffic data. The criteria for defining affected roads as detailed in the Design Manual for Roads and Bridges (DMRB) are as follows:

- Road alignment will change by 5 m or more, or
- Daily traffic flows will change by 1,000 Annual Average Daily Traffic (AADT) or more, or
- Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more, or
- Daily average speed will change by 10 km/hr or more, or
- Peak hour speed will change by 20 km/hr or more

5.1.18. The local air quality impact assessment will also include nature conservation sites (known as designated sites) within 200m of affected roads. The designated sites considered are Special Areas of Conservation (SACs); Special Protection Area (SPA); SSSI and Ramsar sites which have designated features sensitive to air pollutants. Other sites may be added following consultation with Natural England.

[3] http://www.apis.ac.uk/

5.1.19. For impacts associated with dust emissions during construction, the assessment will comprise a 200m corridor either side of all construction activities.

POTENTIAL IMPACTS

Construction

5.1.20. Air Quality impacts due to construction would be temporary. Impacts would typically include an increase in emissions of dust from earthworks, general construction activity, construction compounds and a loss of amenity due to the presence of construction traffic. In addition, traffic management measures may result in both positive and adverse changes to emissions from vehicle exhausts and roadside pollution concentrations.

Operation

5.1.21. The Scheme is expected to result in both positive and adverse changes to emissions of oxides of nitrogen (NO_X) and nitrogen dioxide (NO_2) due to changes in exhaust emissions from road traffic along the A1 and linked roads. Although an increase in pollutants are anticipated along the offline section of the Scheme, with background concentrations well below the objective, the increase is unlikely to exceed the objective. Increased exhaust emissions could also generate a potential long-term increase in nitrogen deposition on nearby sensitive designated ecological sites, such as the River Coquet SSSI, as a result of increased traffic flows. The Scheme is expected to result in a decrease in pollutants as traffic moves away from the de-trunked sections of the Scheme.

DESIGN, MITIGATION AND ENHANCEMENT MEASURES

5.1.22. Should a significant adverse effect be identified, mitigation measures will be investigated during the EIA.

Construction

5.1.23. Best practice mitigation would be required to control dust and emissions from construction works and plant. These measures would be set out in the Scheme Construction Environmental Management Plan (CEMP) and would typically include the following:

- Minimisation of areas to be stripped of vegetation.
- Dampening down of dust generating activities and materials, including site roads, during dry weather, in addition to site monitoring.
- As far as possible temporary roads should be hard surfaced to reduce dust generation.
- Road sweeping to be carried out on access roads and local roads to remove any material tracked out of the site.
- Management of stockpiled materials with the potential to generate dust by rolling, covering and/or revegetating as soon as appropriate.

Operation

5.1.24. No specific mitigation or Air Quality Action Plans are likely to be required for the operation of the Scheme. However, should there be a requirement as a result of a significant air quality effects (as per Interim Advice Note (IAN) 174/13) or an EU Directive compliance risk (as per IAN 175/13), Scheme specific mitigations will be identified.

LIKELY SIGNIFICANT EFFECTS

5.1.25. Following implementation of appropriate mitigation measures, no significant residual air quality effects are anticipated during construction and operation of the Scheme, subject to an update of the revised traffic data and modelling which will be undertaken during 2018.

A summary of the preliminary likely significant effects is presented in **Table 5-3** below, based upon currently available information and professional judgement. These effects could change as the EIA progresses.

Table 5-3 – Summary of Preliminary Likely Significant Effects

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Properties within 200m of construction activities.	Construction	Construction effects would be temporary for the duration of the construction phase. Increased dust emissions from construction activities and traffic could lead to potential loss of amenity at sensitive receptors. Traffic management measures may result in both positive and adverse changes to emissions from vehicle exhausts and roadside pollution concentrations.	Best practice measures will be set out within the CEMP to control dust and emissions from construction works and plant.	Not anticipated.
Properties within 200m of the ARN River Coquet and Coquet Valley Woodlands SSSI and other designated ecological sites	Operation	Increased and decreased vehicular emissions as a result of changes to traffic flows along the Scheme, are likely to generate a change in pollutant concentrations (NOX, NO_2 and PM_{10}) at receptors close to affected roads. Increased exhaust emissions could also generate a potential long-term increase in nitrogen deposition on nearby sensitive designated ecological sites, such as the River	No specific mitigation or Air Quality Action Plans are likely to be required for the operation of the Scheme. However, should there be a requirement as a result of a significant air quality effects (as per Interim Advice Note (IAN) 174/13) or an EU Directive compliance risk (as per IAN 175/13), Scheme specific mitigations will be identified.	Not anticipated. Existing pollutant concentrations are well below the relevant objectives and the Scheme is unlikely to exceed the objective.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		Coquet SSSI, as a result of increased traffic flows.		

**The mitigation measures indicated are preliminary, based upon available information. These are subject to further design and assessment work during the EIA.*

FURTHER WORK FOR THE EIA

5.1.26. A simple level assessment on the air quality impacts during construction and operation of the Scheme will be undertaken in accordance with the methodology set out in the DMRB Volume 11, Section 3, HA207/07 "Air Quality" (**Ref. 5.2**), and in line with the requirements of the NPS NN (**Ref 5.3**).

5.1.27. In addition to the assessment detailed in the Scoping Report **(Volume 2, Section 7 Air Quality)** and in response to the Scoping Opinion (refer to **Volume 2, Section 4.1**), the following will be carried out for the EIA:

- Assessment of construction impacts, including construction traffic and dust and any proposed traffic management measures in place. Refer to **Appendix D** for details of the methodology.
- Assessment of particulate matter (PM_{10}) impacts as a result of operation of the Scheme, and an assessment of human health impacts associated with increased $PM_{2.5}$ from the Scheme with reference to the modelled impact on PM_{10}. Refer to **Appendix D** for details of the methodology.
- For impacts associated with dust emissions during construction, the study area will consist of a 200m corridor either side of all the affected roads.
- The assessment of air quality impacts upon designated nature conservation sites will consider additional ecological receptors beyond the standard designated sites set out in the DMRB HA207/07 methodology, following consultation with Natural England.
- Monitoring to measure the success of any mitigation and enhancement measures will be considered as part of the EIA.

5.2 NOISE AND VIBRATION

INTRODUCTION

5.2.1. This section considers the implications of the Scheme on noise and vibration during construction and operation and details any potentially significant effects.

5.2.2. Consultation was undertaken with NCC during November 2017 to agree the baseline survey and impact assessment methodologies.

EXISTING BASELINE KNOWLEDGE

Noise Environment

5.2.3. A baseline noise survey was undertaken in March 2018 at noise sensitive locations throughout the length of the Scheme. The survey findings confirmed the following:

- The Scheme is located within a rural area and has a relatively low existing baseline noise and vibration climate.
- Although the existing A1 road traffic noise dominates, other arterial roads in the area, such as the A697, B6345 and B1340, contribute to the existing noise and vibration environment for many sensitive receptors.
- Eshott Airfield operational noise was detectable on occasions over daytime periods (mainly small propeller planes and military helicopters) and other localised noise sources were audible, such as birdsong.
- The contribution of road traffic noise to existing baseline noise and vibration levels will be dependent on distance to roads, and the traffic flow, composition and speed on those roads.

5.2.4. The range of values of sound pressure over which the ear can hear is enormous and for convenience the decibel scale, which is logarithmic, is used as the resulting numbers correspond generally to the noise perceived. A change in noise level of 10dB (A) represents a halving or doubling in perceived loudness.

Noise Important Areas

5.2.5. The current Noise Action Plan for major roads (Defra, 2014 (**Ref 5.4**)) outlines a number of Noise Important Areas (NIAs) at round 2 of the UK noise mapping project. These NIAs were identified in accordance with the requirements of the EU Environmental Noise Directive (2002/49/EC), and comprise areas that have a greater level of exposure to road traffic noise.

5.2.6. There are two Highways England NIAs that will be assessed (refer to **Figure 2 Environmental Constraints Plan in Appendix B**), these being:

- IA_ID 10003, at Northgate Farm, adjacent to the southbound side of the A1 just north of Morpeth.
- IA_ID 10002, also adjacent to the southbound side of the A1, at Field View.

5.2.7. In each case, the noise climate at receptors within the NIA would typically be dominated by the primary road traffic route running through the NIA.

Sensitive Receptors

5.2.8. In accordance with the DMRB HD 213/11 Volume 11, Section 3, Part 7 “Noise and Vibration” (**Ref. 5.5**), examples of sensitive receptors include dwellings, hospitals, schools, community facilities, designated areas (e.g. Areas of Outstanding Natural Beauty (AONB), National Park, SAC, SPA, SSSI, Scheduled Monuments), and PRoW.

5.2.9. In addition to the NIAs, as the Scheme passes through a rural area, it is likely that the majority of sensitive receptors would comprise residential, educational and cultural heritage assets.

5.2.10. The following sensitive receptors are likely to experience a change in noise and vibration levels during both the construction phase and the operational phase (this list is not definitive and may be subject to change once the ARN is progressed):

- Gayton Ville
- Warreners Cottage
- Strafford House
- The Orchard
- Priestbridge House
- Earsdon Cottage
- New Houses Farm
- The Bungalow
- The Helm
- Blackwood Hall
- West Moor Cottage
- Longfield
- 2 – 4 Main Street
- Causey Park Hag
- Causey Park Lodge
- Causey Park Bridge

- Tindale Hill
- Portland House & Wellbeck House
- The Old School
- High Highlaws
- Northgate Farm
- West View

5.2.11. Once the ARN is developed, noise sensitive receptors will then be refined and will be confirmed within the ES. The criteria for defining affected roads as detailed in the DMRB HD 213/11 Volume 11, Section 3, Part 7 "Noise and Vibration" (**Ref. 5.5**) are roads that would experience a change in noise levels of 1dB or more in the short-term and 3 dB or more in the long-term.

POTENTIAL IMPACTS

Construction

5.2.12. Construction activities, such as piling, breaking and demolition can cause temporary high levels of noise and vibration. In the case of this Scheme, such works are anticipated to be required at specific locations, including the following key elements:

- General widening in verges.
- Construction of Highlaws Junction.
- Construction of Fenrother Junction.
- National Grid diversion and associated diversions at Causey Park.
- Construction of West Moor Junction.
- Widening of the River Coquet bridge would have noise impacts due to the pier extension (pilling) and construction of retaining walls.
- Installation of temporary sheet piles for excavations.
- Potential rotary drilling and the grout pump for the coal mining grouting throughout the Scheme.

5.2.13. The proximity of the above identified sensitive receptors to the Scheme (and those in the vicinity of any proposed construction compounds) allied to the scale and complexity of the works, means that there is potential for some disruption, albeit temporary, during the construction phase. Should any night-working be required, further impacts as a result of noise would be likely.

5.2.14. The potential impacts associated with the construction of the Scheme are likely to include:

- The generation of noise from on-site activities during the construction phase potentially causing a temporary disturbance to proximate sensitive receptors.
- An increase in noise emissions from road traffic and non-road mobile machinery (NRMM), which may potentially cause a temporary disturbance to proximate sensitive receptors.

Operation

5.2.15. The potential adverse and beneficial effects associated with the operation of the Scheme are likely to include:

- The generation of increased long-term operational road traffic noise, increased or new flows and associated effects on local sensitive receptors adjacent to the Scheme (both online and offline sections). Local sensitive receptors along the offline section of the Scheme that are likely to experience an increase in noise levels include New Houses

Farm, The Bungalow at Causey Park, Causey Park Hag, Causey Park Bridge and Tindale Hill.

- A long-term reduction of operational road traffic noise and associated beneficial effect on local receptors adjacent to the existing A1 alignment, which would be bypassed by the Scheme. These sensitive receptors are likely to include Priestbridge House, Earsdon Cottage, The Helm, Causey Park Lodge, Portland House and Wellbeck House, the Old School House (Tritlington Church of England (C of E) Aided First School), and West View.

DESIGN, MITIGATION AND ENHANCEMENT MEASURES

Construction

5.2.16. Mitigation for temporary construction phase effects will be identified during the EIA and following the detailed refining of sensitive receptors. Good practice measures would be used to control noise, and may include the following:

- The use of silenced or sound reduced plant and equipment fitted with acoustic enclosures.
- Pneumatic tools to be fitted with silencers or mufflers.
- Deliveries to the Scheme site to be programmed, as far as possible, to arrive during daytime hours only. Delivery vehicles to be routed so as to minimise disturbance to local residents.
- All plant items to be properly maintained and operated according to manufacturer's recommendations in such a manner as to avoid causing excessive noise.
- All plant to be sited so that the noise impact at nearby noise sensitive properties is minimised.
- Local hoarding, screens or barriers to be erected as appropriate to shield particularly noisy activities.
- The adoption of a considerate and neighbourly approach to relations with the local residents including works only taking place during given periods.
- Measurement of noise levels at sensitive receptor locations during construction works.

5.2.17. Further location specific mitigation measures may be required, and will be set out in the ES and included in the CEMP.

Operation

5.2.18. As part of the design low noise Thin Surface Course System (TSCS) would be incorporated where possible.

5.2.19. Other mitigation measures such as noise barriers and noise insulation works will be considered through the EIA.

LIKELY SIGNIFICANT EFFECTS

5.2.20. A summary of the preliminary likely significant effects is presented in **Table 5-4** below, based upon currently available information and professional judgement.

5.2.21. At this stage, no residual vibration effects are expected during construction and operation. However, this will be considered further during the EIA.

5.2.22. Potential significant effects will be explored in further detail through the EIA.

Table 5-4 – Summary of Preliminary Likely Significant Effects

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Gayton Ville Warreners Cottage Strafford House	Construction	The generation of noise from on-site activities, together with an increase in noise emissions from construction and road traffic, could cause a temporary adverse noise effect resulting in loss of amenity.	Good practice measures will be used to control noise, and will be incorporated into a CEMP.	Not anticipated.
The Orchard Blackwood Hall West Moor Cottage Longfield 2 – 4 Main Street High Highlaws Northgate Farm	Operation	No potential effects anticipated.	No significant effects anticipated therefore no mitigation measures likely to be required.	Not anticipated.
Priestbridge House Earsdon Cottage	Construction	The generation of noise from on-site activities, together with an increase in noise emissions from construction and road traffic, could	Good practice measures will be used to control noise, and will be incorporated into a CEMP.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
The Helm		cause a temporary adverse noise effect resulting in loss of amenity.		
Causey Park Lodge Portland House and Wellbeck House The Old School House West View	Operation	A long-term reduction of operational traffic flows and road traffic noise could benefit sensitive receptors adjacent to the existing A1 alignment, which would be bypassed by the Scheme.	No significant effects anticipated therefore no mitigation measures likely to be required.	Not anticipated.
New Houses Farm The Bungalow Causey Park Hag	Construction	The generation of noise from on-site activities, together with an increase in noise emissions from construction and road traffic, could cause a temporary adverse noise effect resulting in loss of amenity.	Good practice measures will be used to control noise, and will be incorporated into a CEMP.	Not anticipated.
Causey Park Bridge Tindall Hill	Operation	Increased long-term operational traffic flows and road traffic noise could generate adverse effects upon sensitive receptors (both online and offline sections).	Low noise surfacing (TSCS). Consideration of the need for environmental noise barrier or earthworks to screen properties.	Not anticipated.

**The mitigation measures indicated are preliminary, based upon available information. These are subject to further design and assessment work during the EIA.*

FURTHER WORK FOR THE EIA

5.2.23. A detailed level assessment of potential impacts on noise and vibration during the construction and operational phases of the Scheme will be undertaken in accordance with the methodology set out in DMRB HD 213/11 Volume 11, Section 3, Part 7 "Noise and Vibration" (**Ref 5.5**) and associated IAN 185/15 (**Ref 5.6**).

5.2.24. In addition to the assessment detailed in the Scoping Report (**Volume 2, Section 8 Noise and Vibration**), and in response to the Scoping Opinion (refer to **Volume 2, Section 4.2**), the following will be carried out for the EIA:

- The extent of any night-time working is currently unknown. Where night-time working is required, night-time noise and vibration impacts will be included in the assessment and the findings reported in the ES, as would any mitigation measures which may be required to avoid significant adverse effects.
- The study area and calculation area (as set out in the DMRB) will be defined in the ES, and illustrated on an accompanying figure.
- The baseline noise survey was undertaken at noise sensitive locations throughout the length of the Scheme. Together with professional judgment, the results of the survey will be used for model verification purposes, and also to confirm that the noise model accurately reflects the baseline conditions and will be reported as part of the EIA.
- In line with the Noise Policy Statement for England, both LOAEL[4] and SOAEL[5] will be considered for construction and operational noise and vibration.
- In accordance with DMRB HD 213/11, in order to determine the long-term noise level changes, a comparison will be undertaken between the 'do-minimum' opening year 2023 and the 'do-minimum' design year 2038' scenarios.
- Monitoring to measure the success of any mitigation and enhancement measures will be considered as part of the EIA.

5.3 LANDSCAPE AND VISUAL EFFECTS

INTRODUCTION

5.3.1. The Landscape and Visual Impact Assessment (LVIA) considers the two separate (but linked) topics of:

- **Landscapes:** an important component of the distinctiveness of any local area. Landscapes take their character from a combination of elements, including landform, land use and pattern, land cover/vegetation, open space and cultural heritage influences.
- **Visual amenity**: a view, its components and context can have a great effect on the quality of people's lives.

[4] Lowest Observed Adverse Effect Level – This is the level above which adverse effects on health and quality of life can be detected.

[5] Significant Observed Adverse Effect Level - This is the level above which significant adverse effects on health and quality of life occur.

EXISTING BASELINE KNOWLEDGE

5.3.2. When establishing the baseline conditions, for which to assess the impacts of the Scheme against, the following landscape features, character areas and visual receptors have been identified.

Landscape Baseline

Landscape designations

5.3.3. There are no statutory designated landscapes within 5km of the Scheme. However, the Northumberland National Park is located approximately 11 km away from the Scheme.

5.3.4. Statutory designations that contribute to sense of place, but do not directly relate to landscape, are shown on **Figure 2 Environmental Constraints Plan in Appendix B**, and include SSSI, Listed Buildings and a Scheduled Monument. These are discussed in detail within the relevant environmental topic of this PEIR (**Section 5.4 Cultural Heritage** and **Section 5.5 Biodiversity**).

5.3.5. Non statutory designations within 5km of the Scheme (which are covered by the Zone of Theoretical Visibility (ZTV), as discussed below) include the areas of High Landscape Value as identified under Policy RE17 within the Alnwick District Local Framework Development (1997) (**Ref 5.7**) and C3 within the Castle Morpeth District Local Plan (February 2003) (**Ref. 5.8**). These are shown on **Figure 2 Environmental Constraints Plan in Appendix B**.

5.3.6. In 2007, Policy RE17 was further supported by Policy S13 of the Alnwick District Local Development Framework, (Adopted October 2007) (**Ref 5.9**). The Northumberland Consolidated Planning Policy Framework, November 2017 report (**Ref 5.10**) states the 2007 Alnwick District Local Development Framework, Core Strategy Development Plan does not supersede the 'Saved Policies' but is in addition. Within the 2003 Castle Morpeth District Local Plan areas of High Landscape Value were defined under saved Policy C3.

5.3.7. In addition to the above, the Scheme falls within an area of 'proposed extension to the Green Belt' as identified within the Northumberland County and National Park Joint Structure Plan, Policy S5 – Extension to the Green Belt as shown on **Figure 3 Green Belt in Appendix B**.

Landscape Context

5.3.8. The Scheme location lies some 10 km from the Northumberland coast. The area is moderately elevated (generally between about 80 m and 150 m Above Ordnance Datum (AOD)) and gently rolling with the land generally falling towards the coast to the east.

5.3.9. There are numerous watercourses in the surrounding area to the Scheme, primarily the River Coquet and its tributaries, and the River Lyne and its tributaries. The River Coquet is noticeably incised with steep wooded banks creating local enclosure.

5.3.10. It is a generally open landscape of medium to large scale intensive farmland with arable and pasture fields enclosed by hedgerows, some tree-lined, and some stone walls. There are numerous small areas of woodlands both conifer plantations and broadleaf woodland. Some areas of woodland block have been identified as Ancient Woodland as shown on **Figure 2 Environmental Constraints Plan in Appendix B.**

5.3.11. The A1 from Newcastle to Berwick and A697 to Coldstream are the County's two major roads. These high-speed roads have a substantial influence on the landscape character due to visual and aural intrusion as well as through actual severance.

Image 8 - Existing minor road between Hebron and Low Espley

5.3.12. Communities are concentrated at Felton, just east of the northern end of the Scheme and at Fair Moor, just south of the southern end. Through the rest of the surrounding area of the Scheme, there is relatively even and quite dense scatter of individual farms and farmhouses, steadings and small hamlets.

5.3.13. There is a dense network of minor roads and PRoWs connecting the hamlets and scattered settlements. St Oswald's Way, a long-distance path (156 km) from Lindisfarne to Hadrian's Wall follows the northern bank of the River Coquet.

5.3.14. Rows of individual trees are present along sections of the A1, known as Coronation Avenue (between National Grid Reference NZ182887 and NZ185909). Originally planted in1937 to celebrate the coronation of George VI, it was extended southwards to near Morpeth to commemorate the coronation of Elizabeth II in 1953. The avenue, which today comprises over 300 trees up to 80 years old, has a substantial value locally in both present-day landscape and in cultural/historic landscape terms. It provides a sense of formality along the A1 through the southern half of the Scheme area, as well as helping filter views of traffic from the surrounding area.

Landscape Character

5.3.15. "*Landscape character is the distinct, recognisable and consistent pattern of elements that makes one area of landscape different from another. Variations in geology, soils, landform, land use, vegetation, field boundaries, settlement patterns and building styles all help give rise to different landscapes, each with its own distinctive character and 'sense of place'. These differences are the product of both natural and human influences."* **(Ref 5.11).**

National Character Areas

5.3.16. At a National level the Scheme lies entirely in National Character Area (NCA) 12: Mid Northumberland.

5.3.17. At a broad scale the landscape is described as an "*intermediate plateau of gently undulating farmland which forms a transitional area between the Northumberland Sandstone Hills to the west and the Low-lying coastal plain to the east….Hadrian's Wall World Heritage Site forms the southern border of the NCA. This is a rural area of generally high tranquillity, with a great diversity of heritage assets, from the earthworks of prehistoric and medieval settlements to bastles, tower houses, farmsteads and designed parklands ……..the higher plateau areas to the west are relatively open and windswept, with large rectilinear fields of improved pasture enclosed by traditional stone walls or fragmented hedgerows. By contrast, the northern area is characterised by a series of ridges and intimate wooded valleys, creating a soft and varied landscape*".

Regional Character Areas

5.3.18. Landscape Character Areas (LCA) at a Regional Level have been derived from the Northumberland Landscape Character Assessment Part A Landscape Classification (August 2010) (**Ref 5.12**).

5.3.19. At a Regional level, the Scheme lies within Landscape Character Types (LCT) No.35 Broad Lowland Valley and No.38 Lowland Rolling Farmland. These are further sub-divided into LCAs. These are defined as *"geographically discrete examples of a particular LCT. Landscape character areas share the same elements as the landscape character type, but also have their own individual character and identity" (**Ref 5.13**)*. The LCAs that the Scheme falls within are 35a Coquet Valley and 38b Longhorsley. In addition, there are a number of LCAs located in the wider area surrounding the Scheme. These comprise:

- 2b Lower Coquet
- 35b Font and Wansbeck Valleys
- 37a Wingates Ridge
- 38a Longframlington
- 38c Whalton and Belsay
- 39a Coastal Coalfields
- 39c Stannington.

5.3.20. The 2010 Northumberland Landscape Assessment supersedes former landscape character area studies carried out at a District level. As the Alnwick Landscape Character Assessment Supplementary Planning Document (Adopted 2010) is still considered a material consideration, with respect to planning, this study has therefore been considered when compiling the baseline information. At this District level, the northern section of the Scheme area associated with Felton is considered to be located within LCA No.16 Coquet Valley. Whilst for the most part the assessment will concentrate on LCAs identified within the Northumberland Landscape Character Assessment Part A Landscape Classification (August 2010) (**Ref. 5.12**) for consistency, reference will also be made to LCA No.16 Coquet Valley. Further details on the LCAs can be found on **Figure 4 Landscape Character Areas in Appendix B**.

Visual Baseline

5.3.21. Since the publication of the Scoping Report a bare ground ZTV has been produced in line with IAN 135/10 (**Ref. 5.14**) to show the potential visibility of a high sided vehicle on the Scheme, as shown on **Figure 5 Zone of Theoretical Visibility in Appendix B**.

5.3.22. The ZTV shows the area from which there would (theoretically) be views of the Scheme. It is described as 'theoretical' because it is based on computer modelling, using a digital

terrain model. It is called 'bare ground' because it only considers the bare earth and does not allow for above-ground elements (woodland, hedges and individual trees, buildings, fences and walls) that may block or filter views.

5.3.23. Inclusion of an area within the ZTV is not an indicator that all potential receptors within the area will experience views of the Scheme, but rather establishes the area where there would be a view in the absence of any above-ground features. Many views from potential receptors within the ZTV will be screened or filtered by features such as buildings, walls, hedgerows, small copses or local variations in landform too small to appear in the digital terrain model.

5.3.24. The ZTV shows theoretical visibility and thus potential for visual influence over a wide area, including large areas more than 5 km from the Scheme. Experience from the assessment of similar schemes has shown that the road, traffic and structures are unlikely to be perceived except in exceptional circumstances beyond about 2 km. Furthermore, the significance of both landscape and visual effects generally reduces with distance and experience has shown that significant effects are unlikely beyond about 1 km for a scheme of this scale, except where traffic noise affects the perception of a tranquil landscape. However, in order to ensure a focus on potentially significant effects, the study area is based on the ZTV but cut off at a number of distance buffers. The study area for landscape designations potentially affected by the Scheme is the area covered by the ZTV cut off at 5 km from the highway centre-line. The visual study area is the area covered by the ZTV, cut off at 1 km from the highway boundary although viewpoints are included up to 2 km from the highway boundary in line with consultee requests (as indicated in paragraph 5.3.32 below). The study area is subject to change following the outcome of the winter assessment. Where potential significant impacts are identified beyond 2km, or 1km in respect to individual properties, the study area will need to be revised to a distance where by all likely significant effects are included.

Sensitive Receptors

5.3.25. For the purpose of the landscape and visual assessments the following receptors have been identified for evaluation when considering the potential impacts as a result of the Scheme:

Landscape

5.3.26. The following Landscape Character Areas:

- 2b Lower Coquet
- 35a Coquet Valley
- 37a Wingates Ridge
- 38b Longhorsley
- 35b Font and Wansbeck Valleys
- 38a Longframlington
- 38c Whalton and Belsay
- 39a Coastal Coalfields
- 39c Stannington
- 17 Coquet Valley (Alnwick District Supplementary Planning Document)

5.3.27. These landscape character areas are located within 5 km of the Scheme Footprint, and are all covered, at least in part, by the ZTV. The assessment will consider the areas as a whole, not just those parts from which the Scheme may be visible.

5.3.28. The following policy lead landscape designations:

- Green Belt
- Areas of High Landscape Value

Visual

5.3.29. For the purposes of assessment, whilst it is the people who live, work and take part in recreational activities in the area, along with those simply visiting the area for recreational purposes thus actively enjoying the visual amenity of a given area, it is the places they may occupy that are mapped and described as the 'visual receptors'.

- Residential receptors
- Recreational receptors
- Transport receptors
- Community and Commercial receptors

5.3.30. Viewpoints are selected to represent the nature and type of visual amenity from a given area or direction of view. It is not offered as the 'only view' but is used to inform a greater understanding of the extent of visibility and the nature of change.

5.3.31. The viewpoints proposed as representative of the range of visual receptor types are shown on **Figure 6 Representative Viewpoint Location Plan in Appendix B** and within **Table 5-5** below. In many cases the viewpoints selected are representative of more than one type of receptor. These elements will vary depending on whether the receptor is representative of residents, drivers or cyclists on local roads.

5.3.32. These viewpoints have been refined since the submission of the Scoping Report in order to reflect the findings of the ZTV and comments from NCC (landscape planners, and AONB officer), Historic England, Natural England and the Northumberland National Park Authority:

- NCC carried out an independent walkover of the Scheme on 21 March 2018, visiting a number of the proposed representative viewpoint locations. Following the walkover, NCC undertook a joint site visit to discuss viewpoint locations and the inclusion of photomontages. A number of changes to the viewpoints have therefore since been recommended.
- The NCC AONB officer indicated that the Scheme would not have any implications for the special qualities of the AONB, and so would not require particular consideration in the assessment.
- Historic England reiterated the importance of carrying out an assessment on Bockenfield Farm Grade II* Listed Building given its proximity to the Scheme.
- Natural England had no comments.
- No comments from the Northumberland National Park Authority have been received to date.

5.3.33. In addition, a landscape and visual winter survey has been undertaken in April 2018 to confirm the proposed study areas and identify the potential extent of significant impacts.

Table 5-5 – Proposed Viewpoint Locations

Viewpoint No	Nature of the Visual Receptors
Viewpoint 1: View looking north	Nearby residents

Viewpoint No	Nature of the Visual Receptors
Viewpoint 2: View looking west from PRoW (407/010)	Users of PRoW
Viewpoint 3: View looking north-west towards the start of Coronation Avenue from PRoW (407/010)	Users of PRoW
Viewpoint 4: View looking west from unnamed road within the vicinity of Church of St Cuthbert (Listed Building)	Road users / PRoW / Listed Building
Viewpoint 5: View looking south-west from PRoW (407/018) at Beacon Hill	PRoW users/ nearby residents
Viewpoint 6: View looking north-west from PRoW (407/018) at Beacon Hill	PRoW users/ nearby residents
Viewpoint 7: View looking north-west from Tritlington , illustrative of nearby properties, PRoW (423/002)	Users of PRoW
Viewpoint 8: View looking north-west along PRoW (423/001) at the northern extent of Coronation Avenue	PRoW users
Viewpoint 9: View looking west, at south bound bus stop along existing A1.	Footpath users/ road users/ Tritlington C of E Aided First School/nearby residents
Viewpoint 10: View looking south-west from The Farmhouse, PRoW (423/002)	Nearby resident/ User of PRoW
Viewpoint 11: View looking south-west from PRoW (423/009)	PRoW users
Viewpoint 12: View looking north-west along PRoW (423/008)	PRoW user
Viewpoint 13:View looking west at The Bungalow from unnamed road	Nearby residents / road user
Viewpoint 14: View looking south-west from PRoW (422/008)	PRoW users
Viewpoint 15: View looking north-west from PRoW (422/003)	PRoW users
Viewpoint 16: View looking north-west from PRoW 422/020	PRoW users / nearby residents
Viewpoint 17: View looking south-west from PRoW (422/020) adjacent to SSSI / Ancient Woodland	PRoW users
Viewpoint 18: View looking north-west from PRoW 422/020	PRoW users

Viewpoint No	Nature of the Visual Receptors
Viewpoint 19: View looking north from PROW 422/020	PRoW users / road users
Viewpoint 20: View looking south from PRoW 422/020	PRoW users/road users
Viewpoint 21: View looking south-west from St Oswalds Way	Users of Long Distance Path
Viewpoint 22: View looking west from PRoW (115/008), near proximity of Listed Buildings	PRoW users
Viewpoint 23: View looking north-east from PRoW (115/016)	PRoW user
Viewpoint 24: View looking south-east from St Oswald's Way	Users of Long Distance Path
Viewpoint 25: View looking south-east from junction of PRoW (422/002; 422/001; & 115/013)	PRoW users
Viewpoint 26: View looking east from PRoW (422/009)	PRoW users
Viewpoint 27: View looking north-east from Howdens Glebe Cottages, off unnamed road	Residents / users of unnamed road
Viewpoint 28:View looking east from PRoW (422/011) adjacent to Burgham Park Golf & Leisure Club	PRoW users/ Recreational user
Viewpoint 29: View looking north-east from PRoW (422/012)	PRoW users
Viewpoint 30: View looking south-east from PRoW (411/008)	PRoW users
Viewpoint 31: View looking east from Causey Park Hag/ unnamed road	Residents/ users of unnamed road
Viewpoint 32: View looking south-east from Causey Park Hag along PRoW 423/013	Users of PRoW
Viewpoint 33: View looking south-west from PRoW (423/006)	PRoW user
Viewpoint 34: View looking west from PRoW (411/016)	PRoW user
Viewpoint 35: View looking north-east from unnamed Road at Fenrother	Users of the unnamed road

Viewpoint No	Nature of the Visual Receptors
Viewpoint 36 View looking east from Fenrother from PRoW 423/001	Residents / users of PRoW
Viewpoint 37: View looking north from PRoW (423/001)	PRoW user
Viewpoint 38: View looking north-east from PRoW (407/001) in close proximity to Heighley Gate Garden Centre	PRoW user / visitor to garden centre
Viewpoint 39: View looking north-east, from within the Northgate Cemetery	Users of nearby PRoW / Visitor to the cemetery / users of the A1

5.3.34. A more detailed assessment of the potential impacts as a result of the Scheme on individual receptors within 1km of the highway centre line will be carried out in the form of Visual Effect Schedules (VES). These will be grouped into receptor type categories of residential properties, community facilities, commercial properties and PRoW. These are in addition to the more general representative viewpoint locations noted above.

5.3.35. Within 1 km of the centreline of the Scheme, all residential properties will be assessed and where properties have similar views, or where their impacts are identified as being the same, visual receptors will be grouped together.

5.3.36. Similarly, individual assessments along the length of those PRoW, identifying affected/unaffected sections for each of the three assessment scenarios (as identified within IAN 135/10) will only be carried out on those PRoW found within 1 km of the centreline. These are shown on **Figure 7 Visual Receptors (Public Rights of Way) in Appendix B**.

5.3.37. The assessment of nearby commercial properties and community facilities within 1 km of the centreline of the Scheme will only be carried out on those properties listed below as identified within the Scoping Report.

- Eshott Airfield
- Northgate Hospital
- The shooting ground at Bywell
- Northumberland County Zoo
- Tritlington C of E Aided First School
- Heighley gate Garden Centre
- Jackson J K and Sons garage

5.3.38. Residential receptors likely to be affected by the Scheme are presented within **Appendix E** of this PEIR. Since the submission of the Scoping Report, as the baseline and the ZTV have been progressed further, the visual receptors have been refined and will continue to be through the EIA.

POTENTIAL IMPACTS

Construction

5.3.39. The potential impact on landscape during construction could include:

- Direct loss of landscape features such as hedges, trees (including trees along Coronation Avenue) and woodlands (including loss of Ancient Woodland).

- Temporary adverse alteration to field boundaries.
- Temporary adverse alteration to natural or cultural heritage features of interest, including the setting of Listed Buildings including St Cuthbert Church and Bockenfield Farmhouse.
- Temporary localised adverse landscape impacts from the presence of construction compounds and temporary spoil heaps.

5.3.40. The potential adverse impacts on visual amenity during construction could include:

- The temporary erection of large construction compounds.
- The temporary movement and activity of large construction machinery and vehicles, usually with flashing hazard lights.
- Temporary views of cranes.
- Introduction of embankments (e.g. that cut across the Earlsdon Burn) and cuttings (e.g. the approaches to the bridge over the River Coquet).
- Temporary spoil heaps and potentially borrow pits and disposal areas.
- Temporary traffic management.
- Temporary artificial lighting of areas for night-time working.
- Structures that stand out in the view (i.e. raised), such as the Highlaws, Fenrother and West Moor junctions.
- Felling of trees that leads to the opening of new views.

Operation

5.3.41. The potential adverse impacts on landscape during operation could include:

- The introduction of a large linear feature within a rural setting (offline section of Scheme).
- The increase in scale of the online section of the existing A1 carriageway, increasing its prominence within the landscape.
- Alteration to existing landform, (cuttings and embankments).
- Alteration to existing landscape pattern through the addition of a strong linear feature that cuts across the ‘grain’ of the landscape.
- Alteration to field boundaries.
- Alteration to natural or cultural heritage features of interest.
- Reduction of tranquillity within those areas associated with the offline section of the Scheme through the introduction of movement and noise. However, there could be an increase in tranquillity along section of existing A1 to be de-trunked through the reduction of vehicle usage along effected section of the Scheme.
- Introduction of light pollution from vehicles at night into previously dark areas.

5.3.42. The potential impacts on visual amenity during operation could include:

- Adverse impact from the introduction of movement (of traffic) along the offline section of the Scheme into a comparatively tranquil area.
- Beneficial impact from the removal of movement (of traffic) from the de-trunked section.
- Adverse impact from the increased visual presence of the road.
- Adverse impact from vehicle lights changing the night-time view.

DESIGN, MITIGATION AND ENHANCEMENT MEASURES

5.3.43. Mitigation developed during the design may comprise the following measures, where appropriate:

- Minimise loss of existing vegetation.

- Replace existing woodland blocks, hedgerows and individual trees lost during the construction phase.
- Planting of native tree and shrub species in keeping with local landscape character.
- Introduce species-rich grassland to increase local biodiversity.
- Design to include landscape areas that provide habitat links between existing and proposed vegetation.
- Screen planting around significant road embankments and around junctions to break up the scale of the road and screen structures, traffic and lighting.
- Retain views to local landmarks to help create a sense of place for drivers, where this does not conflict with visual mitigation.
- Slacken and round off earthworks where possible to reduce their abruptness in the landscape.
- Consider the introduction of false cuttings to help provide screening where it is not practical or appropriate to use screen planting.

5.3.44. The key mitigation planting could include:

- Woodland and shrub planting, with a choice of species reflecting local conditions that, where possible, integrate into existing woodland areas and help to provide screening.
- Linear belts of trees and shrubs to recreate boundaries and to mitigate hedgerow losses as a result of construction.
- Replacement of avenue trees along Coronation Avenue.

5.3.45. In the case of the latter it is currently proposed to replace trees to be lost to the Scheme along Coronation Avenue with trees of at least 25-30cm girth at 1m above ground level and about 10-15m in height at the time of planting in order to better integrate the replacement plant stock with that of the existing.

5.3.46. In addition to the above, Ancient Woodland is an irreplaceable resource of great importance for its wildlife, biodiversity, soils, recreation, cultural value, and the contribution it makes to our diverse landscapes. Proposals for a Salvage Plan will be developed in more detail through the EIA in tandem with mitigation for potential significant ecological impacts. Detailed consultation with Natural England has been and will be undertaken to discuss potential site-specific bespoke mitigation proposals and obtain early agreement.

LIKELY SIGNIFICANT EFFECTS

Landscape

5.3.47. The Scheme has the potential to generate the following significant residual landscape effects:

- Loss of Ancient Woodland and loss and disturbance of a locally valued landscape at the crossing at the River Coquet.
- Partial loss of the Coronation Avenue trees.
- Landform changes with the introduction of three new raised junctions at Highlaws, Fenrother and West Moor).
- The offline section would be a new and visible intrusion in LCT38: Lowland Rolling Farmland.

5.3.48. Most of these effects would be greatest at completion, opening year, lessening over time as mitigation planting develops. However, for the Coronation Avenue mitigation planting would need to mature for at least 60 years to mitigate the effect.

5.3.49. The effects of disturbance to the landscape would be greater during construction because of the active nature of change.

Visual

5.3.50. The Scheme has the potential to generate the following significant residual visual effects:

- Adverse impacts on users of PRoWs.
- The offline section would have permanent adverse impacts on views from properties at Fenrother.
- From the east the Scheme would further degrade the quality of the views from properties located at Helm and Earsdon, where the offline section of the Scheme would be visible beyond the existing A1.
- Views from residential properties located directly adjacent to the existing A1, along the section of the road to be de-trunked, may experience potential beneficial impacts given the reduced level of traffic moving along this section of carriageway.
- Improved visual amenity from Tritlington C of E Aided First School, due to the reduced prominence of vehicle movement along the de-trunked section of the A1.
- Temporary loss of visual prominence of Coronation Avenue when viewed by users of the existing A1, at the southern end of the Scheme.
- Increased visual presence of road users to the west, given the reduced distance of separation between the former A1 and the nearest parallel road.

Summary

5.3.51. A summary of the above preliminary likely significant landscape and visual effects is presented in **Table 5-6** and **Table 5-7** below, based upon currently available information and professional judgement. These effects could change as the EIA progresses.

Table 5-6 – Summary of Preliminary Likely Significant Effects - Landscape

Receptor (Landscape Character Area)	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
2b Lower Coquet	Construction	Intervening features, combined with the distance of separation screen potential impacts from character area.	No specific mitigation identified.	Not anticipated.
	Operation	Intervening features screen impacts from character area.	No specific mitigation identified.	Not anticipated
35a Coquet Valley	Construction	Loss of Ancient Woodland and loss and disturbance of a locally valued landscape at the crossing at the River Coquet.	Ancient Woodland Salvage Plan. Loss to be kept to a minimum and new habitat created.	Yes.
	Operation	Ancient Woodland establishment extends beyond that of the 15yrs establishment phase, resulting in impacts associated with Ancient Woodland loss persisting beyond design year.	Plant establishment – New habitat to be created adjacent to existing area of Ancient Woodland to provide connectivity.	Yes.
35b Font and Wansbeck Valleys	Construction	Intervening features screen impacts from character area.	No specific mitigation identified.	Not anticipated.
	Operation	Intervening features screen impacts from character area.	No specific mitigation identified.	Not anticipated.
37a Wingates Ridge	Construction	Construction impacts associated with Fenrother Junction, loss of	Minimise loss of existing vegetation.	Not anticipated.

Receptor (Landscape Character Area)	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		screen planting along existing A1.		
	Operation	Filtered views of vehicles traveling along the Scheme.	Replace existing woodland blocks, hedgerows and individual trees lost during the construction phase. Screen planting around significant road embankments and around junctions to break up the scale of the road and screen structures.	Not anticipated.
38a Longframlington	Construction	Views of construction activities, along northern extent of Scheme experienced from areas of higher ground.	Minimise loss of existing vegetation.	Not anticipated.
	Operation	Impacts offset due to the presence of the existing A1. Proposed online widening at the northern end of the Scheme.	Replacement screen planting along either side of Proposed Scheme, providing landscape integration.	Not anticipated.
38b Longhorsley	Construction	Permanent land use change, along offline section of the route, permanent landform changes through the introduction of three raised junctions, Partial loss of Coronation Avenue.	Minimise loss of existing vegetation. Consider the introduction of false cuttings to help provide screening where it is not practical or appropriate to use screen planting.	Yes.

Receptor (Landscape Character Area)	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		Direct loss of landscape features such as hedges, trees and woodlands Temporary alteration to field boundaries. Temporary alteration to natural or cultural heritage features of interest. Temporary localised landscape impacts from the presence of construction compounds and temporary spoil heaps.		
	Operation	Permanent land use change, along off line section of the route alignment, permanent landform changes through the introduction of three raised junctions, Partial loss of Coronation Avenue. Reduced sense of tranquillity within the area associated with the off line section of the Scheme. Alteration to existing landscape pattern through the addition of a	Coronation Avenue mitigation planting would need to mature for at least 60 years to mitigate effect. Consider slackening and rounding off earthworks where possible to reduce their abruptness in the landscape. Replace existing woodland blocks, hedgerows and individual trees lost during the construction phase. Screen planting around significant road embankments and around junctions to	Yes.

Receptor (Landscape Character Area)	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		strong linear feature that cuts across the 'grain' of the landscape. Permanent alteration to field boundaries. Introduction of light pollution from vehicles at night into previously dark areas.	break up the scale of the road and screen structures.	
38c Whalton and Belsay	Construction	Intervening features, combined with the distance of separation screen potential impacts from character area.	No specific mitigation identified.	Not anticipated.
	Operation	Intervening features screen impacts from character area.	No specific mitigation identified.	Not anticipated.
39a Coastal Coalfields	Construction	Reduced sense of tranquillity within the adjoining character area. – localised views of construction activities from adjoining areas of higher ground	Minimise loss of existing vegetation. Replace existing woodland blocks, hedgerows and individual trees lost during the construction phase.	Not anticipated.
	Operation	Glimpsed views of permanent topographic change and features within adjoining character area, within the area of the three proposed junctions.	Proposed screen planting along junction embankments, resulting in landscape integration when viewed from this distance.	Not anticipated.

Receptor (Landscape Character Area)	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
39c Stannington	Construction	Intervening features, combined with the distance of separation screen potential impacts from character area.	No specific mitigation identified.	Not anticipated.
	Operation	Intervening features screen impacts from character area.	No specific mitigation identified.	Not anticipated.
17 Coquet Valley	Construction	As 35a	Ancient Woodland Salvage Plan. Loss to be kept to a minimum and new habitat created.	Yes.
	Operation	As 35a	Plant establishment – New habitat to be created adjacent to existing area of Ancient Woodland to provide connectivity.	Yes.
Green Belt	Construction	Scheme includes an offline section, in addition to three grade separated junctions, resulting in a direct loss of sense of openness and material land use change.	Existing vegetation to be retained where possible.	Not anticipated.
	Operation	Permanent land use change.	Mitigation planting, providing landscape integration. Similar in nature to other land use within the affected area (A697 and de-trunked section of A1).	Not anticipated.

Receptor (Landscape Character Area)	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Areas of High Landscape Value	Construction	Direct loss of landscape features such as hedges, trees and woodlands (including potential loss of Ancient Woodland). Temporary alteration to field boundaries. Temporary alteration to natural or cultural heritage features of interest. Temporary localised landscape impacts from the presence of construction compounds and temporary spoil heaps.	Minimise loss of existing vegetation. Replace existing woodland blocks, hedgerows and individual trees lost during the construction phase. Consider the introduction of false cuttings to help provide screening where it is not practical or appropriate to use screen planting.	Yes.
	Operation	Permanent land use change, along off line section of the route alignment, permanent landform changes through the introduction of three raised junctions, Partial loss of Coronation Avenue. Reduced sense of tranquillity within the area associated with the off line section of the Scheme.	Coronation Avenue mitigation planting would need to mature for at least 60 years to mitigate effect. Slacken and round off earthworks where possible to reduce their abruptness in the landscape. Screen planting around significant road embankments and around junctions to break up the scale of the road and screen structures.	Not anticipated.

Receptor (Landscape Character Area)	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		Alteration to existing landscape pattern through the addition of a strong linear feature that cuts across the 'grain' of the landscape. Permanent alteration to field boundaries. Introduction of light pollution from vehicles at night into previously dark areas.		

**The mitigation measures indicated are preliminary, based upon available information. These are subject to further design and assessment work during the EIA.*

5.3.52. **Table 5-6** above is based on all landscape character areas at this time being identified as having equal sensitivity. Following a more detailed review of those features that help define each of the landscape character areas, this is subject to change. As a result the likely significance of effect may also change.

5.3.53. For the purposes of **Table 5-6**, the potential effects during the operational phase has been considered at design year when mitigation and replacement planting is becoming fully effective, following 15 years of plant establishment. Potential mitigation stated above may change as the Scheme is developed.

5.3.54. Potential effects associated with the potential impacts upon the setting of cultural heritage features are discussed in **Section 5.4** of this PEIR, and will be considered further through the EIA where relevant to specific representative viewpoint locations.

5.3.55. Additional impacts may be identified during the EIA, following further design development.

5.3.56. The effects of disturbance to the landscape will be greatest during construction, given the nature of change resulting in loss of existing vegetation.

Table 5-7 – Summary of Preliminary Likely Significant Effects - Visual

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Residential Receptors				
Residential properties (Morpeth)	Construction	No view - screened from view by intervening features.	No specific mitigation required.	Not anticipated.
	Operation	No view - screened from view by intervening features.	No specific mitigation required.	Not anticipated.
Residential properties (Northgate)	Construction	Partial loss of narrow belt of linear screen planting along edge of existing A1, providing partial filtered views of vehicles along existing A1.	Minimise loss of existing vegetation where possible.	Yes.
	Operation	No change to existing view.	Replace existing woodland blocks, hedgerows and individual trees lost during the construction phase with linear belts of trees and shrubs to recreate boundaries.	Not anticipated.
Residential properties along online section of the A1	Construction	Filtered views of construction works, given that individual properties boundaries planting are located outside the Scheme Footprint. Temporary artificial lighting of areas for night-time working.	Minimise loss of existing vegetation where possible.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
	Operation	No change to nature of existing view.	Replace existing woodland blocks, hedgerows and individual trees lost during the construction phase with linear belts of trees and shrubs to recreate boundaries.	Not anticipated.
Residential properties along the offline section of the A1	Construction	Loss of vegetation, opening views. Change to the nature of the view through the introduction of structures, such as Highlaws, Fenrother and West Moor junctions. Temporary artificial lighting of areas for night-time working.	Minimise loss of existing vegetation where possible.	Yes.
	Operation	Increased visual presence of a road. Permanent alteration to the localised topography. The introduction of movement (of traffic) into a comparatively tranquil area. Vehicle lights changing the night-time view.	Screen planting around significant road embankments and around junctions to break up the scale of the road and screen structures, traffic and lighting. Retain views to local landmarks to help create a sense of place for drivers, where this does not conflict with visual mitigation.	Yes.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		Change to the nature of the view through the introduction of structures, such as Highlaws, Fenrother and West Moor junctions.	Slacken and round off earthworks where possible to reduce their abruptness in the landscape. Consider the introduction of false cuttings to help provide screening where it is not practical or appropriate to use screen planting.	
Residential properties along the de-trunked section of the A1	Construction	Filtered views of construction works, given that individual properties boundaries planting are located outside the Scheme Footprint. Temporary artificial lighting of areas for night-time working.	Minimise loss of existing vegetation where possible.	Not anticipated.
	Operation	Views from residential properties located directly adjacent to the existing A1, along the section of the road to be de-trunked, may experience potential beneficial impacts given the reduced level of traffic moving along this section of carriageway.	None required.	Yes (beneficial)

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Residential properties at Fenrother	Construction	Loss of vegetation, opening views along existing A1. Views of construction activities, practically associated with the construction of the offline section of the Scheme. Change to the nature of the view through the introduction of Fenrother Junction to the east. Alteration to existing topography. Temporary artificial lighting of areas for night-time working.	Minimise loss of existing vegetation where possible.	Yes.
	Operation	Increased visual presence of a road. Permanent alteration to the localised topography. The introduction of movement (of traffic) into a comparatively tranquil area. Vehicle lights changing the night-time view.	Screen planting around significant road embankments and around junctions. Slacken and round off earthworks where possible to reduce their abruptness in the landscape. Consider the introduction of false cuttings to help provide screening where it is not practical or appropriate to use screen planting.	Yes.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		Change to the nature of the view through the introduction Fenrother Junction.		
Residential properties at Hebron	Construction	Restricted views of construction activities associated with the construction of Highlaws Junction – general construction activities screened from view.	Minimise loss of existing vegetation where possible.	Not anticipated.
	Operation	Increased visual presence of a road due to proximity to Highlaws Junction. Permanent alteration to the localised topography.	Screen planting around significant road embankments and around junctions.	Not anticipated.
Residential properties at Felton	Construction	Loss of vegetation, opening views along the northern extent of existing A1.	Minimise loss of existing vegetation where possible.	Not anticipated.
	Operation	Shorter distance of separation between the receptor and live carriageway, thereby increasing the potential prominence of A1 within views.	Consider use of false cuttings to help provide screening where it is not practical or appropriate to use screen planting. Replace existing woodland blocks, hedgerows and individual trees lost during the construction phase with	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
			linear belts of trees and shrubs to recreate boundaries.	
Recreational Receptors				
PROW (407/018) (423/001) (423/002) (423/013) (423/008) (423/009) (115/016) (115/008) St Oswald's Way	Construction	Significant views of construction activities along sections of the PRoW. Temporary footpath closure / diversions.	Minimise loss of existing vegetation where possible.	Yes.
	Operation	Increased visual presence of a road. Permanent alteration to the localised topography.	Screen planting around significant road embankments and around junctions. Slacken and round off earthworks where possible to reduce their abruptness in the landscape. Use of false cuttings to help provide screening where it is not practical or appropriate to use screen planting. Replace existing woodland blocks, hedgerows and individual trees lost during the construction phase with linear belts of trees and shrubs to recreate boundaries.	Yes.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
PROW (407/010), (407/013), (407/023), (407/004) (407/005) (407/009) (411/016) (411/030) (423/011) (422/012) (422/011) (422/018) (422/003) (422/009) (422/002) (422/020)	Construction	Glimpsed views of construction activities, partially filtered by intervening features.	Minimise loss of existing vegetation where possible.	Not anticipated.
	Operation	Increased visual presence of a road. Permanent alteration to the localised topography.	Screen planting around significant road embankments and around junctions. Use of false cuttings to help provide screening where it is not practical or appropriate to use screen planting. Replace existing woodland blocks, hedgerows and individual trees lost during the construction phase.	Not anticipated.
PROW	Construction	No view – screened by intervening features.	No specific mitigation required.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
(407/001) (407/002) (407/019) (407/011) (416/001) (416/002) (407/020) (407/021) (411/017) (407/007) (411/031) (411/007) (411/008) (423/012) (423/010) (422/014) (422/008) (422/004)	Operation	No View – screened by intervening features.	No specific mitigation required.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
(422/005) (115/006) (422/006) (422/001) (115/013) (115/009) (115/010) (115/011)				
PROW Not Assessed (423/014) (407/003) (423/007) (423/006) (127/014) (115/004)	N/A	Restricted access / lack of way markers definitive route not discernible on site.	**PROW Not Assessed** **(423/014)** **(407/003)** **(423/007)** **(423/006)** **(127/014)** **(115/004)**	Not currently known, although likely significant effects.
Transport Receptors				
	Construction	Loss of hedgerow screen planting on either side of the existing A1,	Minimise loss of existing vegetation where possible.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Existing A1 road users (online widening)		opening up views to the east and west, including trees along Coronation Avenue at the southern end of the Scheme. Demolition of structures immediately adjacent to the existing A1, including Northgate House.		
	Operation	No change to view following plant establishment at design year.	Replace existing woodland blocks, hedgerows and individual trees lost during the construction phase with linear belts of trees and shrubs to recreate boundaries. Potential for extra heavy standards could be used to replace those trees lost along Coronation Avenue.	Not anticipated.
Existing A1 road users (de-trunked section)	Construction	Loss of hedgerow screen planting on either side of the existing A1, opening up views to the east and west.	Minimise loss of existing vegetation where possible.	Yes.
	Operation	Inclusion of bridge structures within views, at Fenrother, and Causey Park where the offline section of the Scheme ties in. Increased visual presence of road	Replace existing woodland blocks, hedgerows and individual trees lost during the construction phase with	Yes.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		users to the west, given the reduced distance of separation between the former A1 and the nearest parallel road.	linear belts of trees and shrubs to recreate boundaries. Screen planting around significant road embankments and junction to break up the scale of the road and screen structures.	
Community and Commercial Receptors				
Tritlington C of E Aided First School	Construction	Clearance of screen planting along existing A1, temporarily opening up views to the west, including construction impacts associated with Fenrother Junction.	Minimise loss of existing vegetation where possible.	Yes.
	Operation	Permanent alteration to localised topography to the west associated with Fenrother Junction, Permanent alteration to the nature of the view, however within the immediate foreground of all views the prominence of traffic will be reduced due to the existing A1 being de-trunked along this section of the Scheme.	Replace existing woodland blocks, hedgerows and individual tree loss during the construction phase with linear belts of trees and shrubs to recreate boundaries. Screen planting around significant road embankments and junction to break up the scale of the road and screen structures.	Yes (some beneficial)

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Eshott Airfield	Construction	Clearance of screen planting along existing A1, temporarily opening up views to the west, including construction impacts associated with West Moor Junction.	Minimise loss of existing vegetation where possible.	Not anticipated.
	Operation	Permanent alteration to localised topography to the west associated with West Moor Junction.	Replace existing woodland blocks, hedgerows and individual trees lost during the construction phase with linear belts of trees and shrubs to recreate boundaries. Screen planting around significant road embankments and junction to break up the scale of the road and screen structures.	Not anticipated.
Northgate Hospital The Shooting Ground at Bywell Northumberland County Zoo	Construction	No view - screened from view by intervening features.	No specific mitigation required.	Not anticipated.
	Operation	No view - screened from view by intervening features.	No specific mitigation required.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Heighley Gate Garden Centre				
Jackson J K & Son Garage	Construction	No view – screened behind perimeter boundary.	No specific mitigation required.	Not anticipated.
	Operation	No view – screened behind perimeter boundary.	No specific mitigation required.	Not anticipated.

**The mitigation measures indicated are preliminary, based upon available information. These are subject to further design and assessment work during the EIA.*

5.3.57. **Table 5-7** above is based on the Scheme design at time of writing. Potential effects associated with the location and siting of site compounds and temporary soil storage areas will be further assessed through the EIA. Similarly construction impacts associated with the demolition of Northgate House, existing culverts and the movement of material along internal haul roads are subject to change and thus have been excluded at this time. As such impacts relating from the following are also not included within the table above:

- The temporary erection of large construction compounds.
- The temporary movement and activity of large construction machinery and vehicles, usually with flashing hazard lights.
- Temporary views of cranes.
- Temporary spoil heaps and potentially borrow pits and disposal areas.
- Temporary traffic management.
- Temporary artificial lighting of areas for night-time working.

5.3.58. For the purposes of the table above, the potential operational effects have been assessed at design year, following plant establishment.

5.3.59. Additional impacts may be identified during the EIA, following further design development. A more detailed assessment on individual visual receptors will also be carried out during the EIA.

FURTHER WORK FOR THE EIA

5.3.60. A detailed level assessment on the potential changes in the existing views, taking into account the extent to which the Scheme would be visible from the surrounding residential properties, footpaths, open spaces, educational buildings and commercial and retail estates will be undertaken in accordance with the guidance provided in IAN 135/10 Landscape and Visual Effects Assessment (**Ref. 5.14**), supported and updated as appropriate by GLVIA3 Guidelines for Landscape and Visual Impact Assessment (Third Edition) (**Ref. 5.15**) (GLVIA), published by the Landscape Institute and IEMA (2013).

5.3.61. In addition to the assessment detailed in the Scoping Report (refer to **Volume 2, Section 9 Landscape and Visual**), and in response to the Scoping Opinion (refer to **Volume 2, Section 4.3**), the following will be carried out for the EIA:

- The inclusion of photomontages within the ES will be agreed in advance with NCC, Northumberland National Park Authority, Historic England and Natural England prior to the winter assessment taking place. At the time of writing, NCC has requested the inclusion of 8 photomontages associated with representative viewpoints No.4, 5a 7, 8, 15, 23, 27 and 24.
- The ZTV will be refined further during the course of the winter assessment taking into consideration intervening features to be retained that would provide effective screening. At the time of writing the winter assessment site work has been undertaken, although the assessment itself and data review is still ongoing and therefore the results are not yet available.
- The ES will confirm the study areas for the visual and landscape assessments, depending upon the outcome of the winter assessment, which will be extended as necessary if significant effects are found within the limits. Justification of the cut-off for the study areas will be clearly defined in the ES.

- The ES will consider potential impacts on non-statutory landscape designations and LCAs separately.
- The ES will consider all users of PRoW as receptors of equal sensitivity.
- Monitoring to measure the success of any mitigation and enhancement measures will be considered as part of the EIA.
- During the winter night-time survey undertaken in April 2018, conditions were not suitable for photography to show the view. As a result the proposed night-time assessment documented in the Scoping Report (**Volume 2, Section 9.**7) will be provided as written descriptions only, without night-time photography following consultation with NCC.

5.4 CULTURAL HERITAGE

INTRODUCTION

5.4.1. This section considers the implications of the Scheme on cultural heritage during the construction and operational phases and the potentially significant effects that may arise.

EXISTING BASELINE KNOWLEDGE

5.4.2. No World Heritage Sites or Registered Parks and Gardens have been identified within 1km of the Scheme Footprint.

5.4.3. A total of 100 archaeological assets and 10 historic landscape types are recorded within 500m of the Scheme Footprint. Within 1km of the Scheme Footprint there are:

- 65 historic buildings
- One Scheduled Monument
- Two conservation areas.

5.4.4. One asset, 'Old Felton Bridge over River Coquet' appears twice in the Historic England's database as a Grade II* Listed building and is also designated as a Scheduled Monument. Further information on these assets, along with their Historic England (List Entry [number]), NCC's Historic Environment Record (HER [number]) and National Monument Record (NMR [number]) references, where relevant, are provided below.

Archaeological Remains

5.4.5. A total of 21 non-designated assets are identified in the HER within the Scheme Footprint and consist of:

- Chapel or Hermitage at Helm (HER 12216/11347)
- Mesolithic Flints at West Moor Farm, Thirston (HER 12225/11356)
- Medieval pottery found at boundary of Bockenfield township (HER 12231/11362)
- Causey Park Hag rectilinear enclosure (HER 12236/11367)
- Causey Park Lodge wood enclosure (HER 12240/11371)
- Linear ditch cropmarks (HER 12276/11405)
- Cropmark- rectilinear enclosure (HER 12280/14409)
- Milepost at Earsdon Moor (HER 16470/16754)
- Building at Tile Kiln Rush (HER 16773/17065)
- Brick and Tile Yard at Causey Park Lodge (HER 16809/17100)
- Well near Causey Park Bridge (HER 17087/17379)
- Causey Park bridge (HER 17088/17380)
- The Ogle Arms Inn, Causey Park Bridge (HER 17089/17381)
- Well at Causey Park (HER 17090/17382)

- Earsdon Mill (HER 17096/17388)
- Well at Earsdon Moor (HER 17097/17389)
- Priests Bridge (HER 17105/17397)
- Milepost at Priests Bridge (HER 17106/17398)
- Well (HER 17934/18214)
- Morpeth North Turnpike (HER 17946/18226)
- Endowed School for Boys and Girls (HER 21475/21755)

5.4.6. In addition to the assets recorded in the HER, the following non-designated heritage assets have also been identified in the Scheme Footprint:

- RAF Military Camp at Eshott
- The site of St Cuthbert's Chapel
- Seven areas containing remains of ridge and furrow cultivation
- Hedgerows of potentially historic significance

5.4.7. Outside the Scheme Footprint, but within a 500m boundary, a number of assets believed to be of prehistoric date (pre-AD43) have been identified, including the earthwork remains associated with a burial mound (HER 11349/12218) and areas of cropmarks (HER 11095/11956, 11096/11957, 11113/11974, 11220/12082, 11405/12276, 11409/12280, 11367/12236 and NMR 1338137,) which although of uncertain date are likely to represent enclosures and other occupational activities. One set of cropmarks is located within the Scheme footprint (HER 11405/12276).

5.4.8. Cropmarks defining an enclosed settlement at Fenrother (HER 22693/22450) is the only identified asset believed to be of Romano-British date (AD43 to 410). It is likely to represent a native farmstead surrounded by defensive ditches.

5.4.9. Assets believed to be of medieval period (AD 1066 to 1540) have been identified and comprise largely of ridge and furrow earthworks. Further earthworks are believed to represent the traces of deserted or shrunken villages at Helm (HER 11353/12222), Bockenfield (11348/12217) and Burgham (11351/12220). The sites of four bridges or fords (HER 17400/17108, 17397/17105, 17399/17107 and 17380/17088)) have been identified and are located on or close to the existing A1 and are likely to have been disturbed during its construction.

5.4.10. The sites of St Cuthbert's Chapel (NMR 23468) and Helm Chapel (HER 11347/12216) are considered to be possible locations for demolished chapels built to commemorate a place where the monks carrying the body of St Cuthbert rested during their passage to Lindisfarne in 1069. A documentary source from 1240 records the existence of a chapel at Causey Park, and it is believed to have fallen into disuse in the 16th century. No obvious surface trace was observed at either location during a site inspection undertaken in October 2016, although worked stone in field boundaries near the Helm Chapel site may be evidence for a structure nearby; and surface finds of medieval pottery (HER Ref 11362/12231) close to the same location indicate activity during this time.

5.4.11. The majority of the assets associated with the Post-medieval period (AD1540 to1750) and Industrial period (1750 to 1901) have been and include; wells or springs (HER 18230/17950, 18214/17934, 11221/12083, 17394/17102, 17393/17101, 11413/12284, 17389/17097, 17383/17091, 17382/17090, 17379/17087, 17099/16808 and 17086 16795)), horse gins, mills, quarries and brick or tile works (HER 11419/12290, 17388/17096, 17100/16809, 17085/16794 and NMR. 1565397) the Cow Causey and Buckton Burn

Turnpike road; and bridges, inns, schools and farmsteads (HER 18226/17946, 17392/17100, 21755/21475, 11371/12240, 17082/16791 and 17065/16773).

5.4.12. The remains of the former RAF military base at Eshott is the only modern (AD1901 to the present) asset.

Scheduled Monument

5.4.13. There is one Scheduled Monument within 1km of the Scheme Footprint. Felton Old Bridge (List Entry 1020745) dates to the 15th or 16th century, although a bridge is recorded here from the 12th century, and is located 600m from the Scheme. This asset is also designated as a Grade II* Listed Building (see below).

Historic Buildings

5.4.14. Of the historic buildings identified, one is Grade I listed, and four are Grade II* listed (although two of these are Old Felton Bridge over River Coquet and are assumed to be duplicates). The remaining 60 are Grade II listed.

5.4.15. The Grade I and II* Listed Buildings include:

- Church of St Michael and All Angels, Felton, Grade I (List Entry 1041881)
- Bockenfield Farmhouse, Grade II* (List Entry 1371020)
- Greenhouse 120m east of Felton Park with Potting Shed at rear, Grade II* (1154561)
- Old Felton Bridge Over River Coquet Grade II* (List Entry 1041879 and 1302949)

5.4.16. Within the Scheme Footprint, the Grade II listed buildings include six mileposts along the route of the Cow Causey and Buckburn Turnpike road (List Entry 1371039, 1371021, 1370646, 1303996, 1153544, and 1042132).).

Conservation Areas

5.4.17. The Felton Conservation Area is located 650m east of the existing A1 at the northern end of the Scheme. It includes the historic core of Felton village and parts of the designed landscape of Felton Park, as well as encompassing a number of listed buildings.

5.4.18. Immediately south of the Felton, south of the River Coquet, is the West Thirston Conservation Area. This also includes a number of listed buildings.

Historic Landscapes

5.4.19. A review of the data from the Northumberland Historic Landscape Characterisation project has identified the following ten Historic Landscape Types (HLT) within 1km of the Scheme Footprint:

- HLT1 Historic Settlement: An area of housing which appears on the first edition Ordnance Survey.
- HLT2 Modern Settlement: An area of 20th century housing, or an area of land dedicated to a single use, e.g. hospital, prison, or civic buildings.
- HLT3 Post-Medieval Enclosure: Piecemeal Enclosure (fields created from the division of open fields and common pasture through private agreement between landowners); Reorganised Piecemeal Enclosure (fields with a regular pattern and traces of earlier phases of enclosure); Surveyed Enclosure (fields with a regular pattern, straight internal boundaries and erratic outer edge suggestive of framework of an earlier field system).
- HLT4 Modern Fieldscapes: Mainly the result of agricultural improvement after the Second World War.
- HLT5 Ornamental Designed Landscape: Felton Park

- HLT6 Woodland: An area of primary woodland which has had continuous woodland cover since at least AD1600 and retained its native tree and shrub cover, or an area of woodland (often coniferous) planted in the 20th century. This includes Dukes Bank Ancient Woodland near the River Coquet.
- HLT7 Airfield: RAF Eshott, south of Felton.
- HLT8 Modern Road: Developed from the network of 18th and 19th century turnpikes, some now widened.
- HLT9 Modern Recreation: A designed recreational landscape comprising a golf course.
- HLT10 Rivers: River Coquet and the Longdike Burn.

Sensitive Receptors

Within Scheme Footprint

5.4.20. As shown on **Figure 8 Designated Heritage Assets** in **Appendix B,** there are 6 designated heritage assets (Grade II mileposts) (list) and 21 non-designated assets located within the Scheme Footprint that have the potential to be directly impacted as a result of the Scheme. The 21 non-designated assets are listed in **paragraph 5.4.5** above, and the 6 designated assets comprise:

- 1042132: Milepost approximately 25 m north-west of Bockenfield Bridge.
- 1153544 Milepost at NGR NZ 18468998.
- 1303996 Milepost at NGR NZ 18929322.
- 1370646 Milepost at NGR NZ 19029485.
- 1371021 Milepost approximately 55 m south-west of Thurston New Houses farmhouse.
- 1371039 Milepost at NGR NZ 18569160.

5.4.21. Also within the Scheme Footprint lie the former RAF Military Camp at Eshott, the site of St Cuthbert's Chapel and seven areas containing remains of ridge and furrow cultivation. There is also a potential for historically important hedgerows.

Outside of Scheme Footprint

5.4.22. As shown on **Figure 9 Non-Designated Heritage Assets** in **Appendix B**, there are a further 79 non-designated heritage assets outside of the Scheme Footprint but within a 500 m boundary. These assets have the potential to be indirectly impacted as a result of the Scheme. .

5.4.23. In addition, potentially sensitive designated cultural heritage receptors within 1 km of the Scheme are outlined in **Table 5-8** below. These assets have the potential to be indirectly impacted as a result of the Scheme.

Table 5-8 - Cultural Heritage Sensitive Receptors within 1 km of the Scheme Footprint

Heritage Asset Type	Asset Name
Scheduled Monument	Felton Old Bridge (1020745)
Grade I Listed Buildings	Church of St. Michael and All Angels, Felton (1041881)
Grade II* Listed Buildings	Bockenfield Farmhouse (1371020) Greenhouse with Potting Shed at Rear (11547561)

Heritage Asset Type	Asset Name
	Old Felton Bridge Over River Coquet (1020745/1041879) (this entry appears twice in the Historic England database)
Grade II	54 Grade II Listed Buildings
Conservation Areas	Felton Conservation Area West Thirston Conservation Area

Unknown Archaeological Remains

5.4.24. Other sensitive receptors include currently unknown and potential buried or surface archaeological remains (particularly from the prehistoric, Roman, medieval and Post-Medieval periods) and Historic Landscape Types.

POTENTIAL IMPACTS

Construction

5.4.25. The potential impacts of construction on Cultural Heritage assets could include the following:

- Works such as ground levelling, removal of existing road surfaces, the proposed National Grid Diversion, construction of temporary compounds and the installation of infrastructure items such as lighting columns, drainage pipes etc. could have direct impacts of wholly or partially disturbing or destroying buried archaeological remains which would be permanent and irreversible. Known below-ground assets which may be impacted include the regionally important cropmark site of potential prehistoric date (HER 11405/12276) remains of an RAF military camp and the sites of four locally important assets that include the Helm Chapel (HER. 11347/12216); Causey Park Lodge wood enclosure (HER.11371/12240) and a well near Causey Park Bridge (HER.17379/17087).
- The route of the National Grid Diversion has the potential to permanently adversely impact on the site of St Cuthbert's Chapel (NMR. 23468) which is potentially of national importance, a rectilinear enclosure at Causey Park Hag (HER. 11367/12236) of potential regional importance which could date from the Prehistoric period. Furthermore there is the potential to adversely impact a Grade II listed milepost (List Entry No. 1370646). However, a site inspection in 2016 assessed the asset as missing. The locally important sites of a nineteenth-century brick and tile yard (HER. 17100/16809) and a post-medieval well (HER. 17379/17087) may be disturbed.
- Seven areas of ridge and furrow earthworks of local value have the potential to be permanently flattened or removed by the offline section of the Scheme.
- The permanent loss or disturbance to previously unknown remains associated with the Prehistoric period onwards to survive below the ploughed soil in undisturbed ground, as a result of the offline section of the Scheme.
- The removal of a Grade II listed milepost (List Entry No. 1153544), located on the grass verge east of the A1 at Low Espley.
- Temporary adverse impacts (damage or loss) to five Grade II listed mileposts and two non-designated mileposts due to their proximity to the construction works.

- Temporary adverse impact due to noise and visual disturbance from construction activities on the setting of Grade II* Bockenfield Farmhouse (HER. 1371020) and Grade II listed Causey Park House (List Entry No. 1370647); Longfield Cottage (List Entry No. 1041875, Roman Catholic Church of St Mary (List Entry No. 1371126) and Felton Park (List Entry No. 1303774), along with the non-designated Highlaws Farm and Newhouses Farm.
- The loss of a number of locally important field boundaries that are likely to be protected under the Hedgerows Regulations Act 1997 (the Hedgerow Regulations). These boundaries and associated land parcels are a strong characteristic of post-medieval enclosure (HLT3) and part of the historic landscape of Northumberland.
- The permanent loss or disturbance of historic landscapes within the Scheme Footprint and temporary adverse impact on the settings of historic landscape in the wider area.

Operation

5.4.26. Outlined below are potential impacts that could result from the operational phase of the Scheme:

- As the offline section of the Scheme would pass through existing farmland, this would introduce considerable noise and movement to the current rural scene, which is likely to generate permanent adverse impacts on the setting of the historic landscape which comprises historic settlement (HLT1), post-medieval enclosure field systems (HLT3) and areas of woodland (HLT6).
- The settings of the identified historic buildings and potentially some archaeological remains are likely to be permanently harmed by a combination visual intrusion resulting from the introduction of new structures, materials and movement and a degradation of tranquillity caused by increases in traffic noise.
- There could be potential permanent adverse impacts upon buried archaeological remains and built heritage assets through changes in hydrology resulting from a change in drainage and water levels in and around the Scheme.

DESIGN, MITIGATION AND ENHANCEMENT MEASURES

Construction

5.4.27. Potential mitigation for effects on cultural heritage during construction could include:

- Best practice measures to manage works around cultural heritage assets will be set out in a CEMP.
- Where the archaeological assets that are close to or within the Scheme Footprint (RAF military camp, Helm Chapel, Causey Park Lodge wood enclosure and a well near Causey Park Bridge) cannot be avoided, a programme of archaeological investigation would be implemented to determine the presence, extent and level of survival of the assets. If any unknown archaeological assets are encountered during construction, impacts will be mitigated either by leaving the asset in place wherever possible or by photographic record and removal in agreement with NCC.
- An assessment of the available historic mapping will be undertaken in order to identify any hedgerows which potentially meet the criteria to be classified as Historically Important. Consent for the removal of any sections of field boundaries protected under the Hedgerow Regulations will be sought through the DCO and any archaeological mitigation devised in consultation with NCC.
- It is proposed that the Grade II listed milepost which may be removed be subject to photographic recording prior to the start of construction to create a permanent record of

its existing setting. This would be followed by the careful removal of the asset and its safe storage during construction. On completion of construction, the milestone should be reinstated as close as possible to its original location to maintain its relationship with the road. Any mitigation will be devised in consultation with Historic England and the Milestone Society.

Operation

- Where possible, in the first instance, impacts upon the setting of a heritage asset (including historic landscapes) would be mitigated through avoidance or changes in design, in accordance with Historic England's guidelines (The Setting of Heritage Assets (2nd edition) 2017). Where design adjustments are not practicable, visual or acoustic screening (such as landscape planting or acoustic barriers) may be considered to reduce harm.
- A robust surface water drainage system would be provided.

LIKELY SIGNIFICANT EFFECTS

5.4.28. Potential direct impacts on above or below-ground archaeology and historic landscapes during the construction phase would be negated wherever possible through mitigation measures such as preservation by record or preservation in situ. However, it is anticipated that significant effects may remain.

5.4.29. During construction there is also potential for significant effects associated with the potential removal of the Grade II Listed Milepost at NGR NZ 18468998 (1153544) milepost, and potential significant residual effects as a result of partial or full loss of hedgerows of historic importance, if identified.

5.4.30. Potential significant residual effects are expected as a result of indirect and direct adverse impacts on the setting of designated heritage assets and historic landscapes during both the construction and operational phases. The significance of these effects, together with the assets that could be impacted, will be known following the completion of a setting assessment.

5.4.31. Following the implementation of mitigation measures such as good design, screening and enhancement, the adverse impact on the setting of assets may be reduced although not be removed completely. However, this will be determined through the detailed assessments as part of the EIA.

5.4.32. A summary of the preliminary likely significant effects on the known cultural heritage resource is presented in **Table 5-9** below, based upon currently available information and professional judgement.

Table 5-9 – Summary of Preliminary Likely Significant Effects

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Within Scheme Footprint				
Designated Assets				
Five Grade II Listed Mileposts (1042132, 1303996, 1370646, 1371021, and 1371039)	Construction	Potential for construction works to result in damage or loss of designated asset, and potential temporary adverse change to setting.	Best practice measures in a CEMP will manage working in proximity to designated assets.	Not anticipated.
	Operation	Setting could be permanently harmed by a combination of visual intrusion resulting from the introduction of new structures, materials and movement and a degradation of tranquillity caused by increases in traffic noise.	Unknown until further assessment has been completed, but likely to include landscape planting.	Yes, where settings contribute to the significance of asset and where there is a change to the setting. A settings assessment to be undertaken through the EIA.
Grade II Listed Milepost at NGR NZ 18468998 (1153544)	Construction	Potential for construction works to result in the removal of the milepost.	It is proposed that the asset be recorded prior to removal and following completion of works be reinstated in a nearby location.	Yes

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
			Any mitigation will be devised in consultation with Historic England and the Milestone Society.	
	Operation	Setting could be permanently harmed by a combination of visual intrusion resulting from the introduction of new structures, materials and movement and a degradation of tranquillity caused by increases in traffic noise.	Unknown until further assessment has been completed, but likely to include landscape planting.	Yes, where settings contribute to the significance of asset and where there is a change to the setting. A settings assessment to be undertaken through the EIA.
Non-Designated Assets				
Below-ground heritage assets: ¡ Chapel or Hermitage at Helm (HER 12216/11347) ¡ Mesolithic remains at West Moor Farm, Thirston (HER 12225/11356) ¡ Medieval pottery found at boundary of	Construction	Construction works could lead to ground disturbance resulting in full or partial loss of buried archaeological assets.	Preservation in-situ or preservation through record.	Yes, where remains are present.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Bockenfield township (HER 12231/11362) ¡ Causey Park Hag rectilinear enclosure (HER 12236/11367) ¡ Causey Park Lodge wood enclosure (HER 12240/11371) ¡ Linear ditch cropmarks (HER 12276/11405) ¡ Cropmark- rectilinear enclosure (HER 12280/14409) ¡ Building at Tile Kiln Rush (HER 16773/17065) ¡ Brick and Tile Yard at Causey Park Lodge (HER 16809/17100) ¡ Well near Causey Park Bridge (HER 17087/17379) ¡ Well at Causey Park (HER 17090/17382) ¡ Earsdon Mill (HER 17096/17388) ¡ Well at Earsdon Moor (HER 17097/17389)				

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
¡ Well (HER 17934/18214) ¡ Morpeth North Turnpike (HER 17946/18226) ¡ Endowed School for Boys and Girls (HER 21475/21755) ¡ St Cuthbert's Chapel (NMR 23468)				
Non-designated built heritage assets ¡ Milepost at Earsdon Moor (HER 16470/16754) ¡ Causey Park bridge (HER 17088/17380) ¡ The Ogle Arms Inn, Causey Park Bridge (HER 17088/17380) ¡ Priests Bridge (HER 17105/17397) ¡ Milepost at Priests Bridge (HER 17106/17398) ¡ RAF Military Camp	Construction	Potential for construction works to result in damage or loss of designated asset, and a temporary adverse change to setting.	Best practice measures in a CEMP will manage working in proximity to designated assets.	Not anticipated.
	Operation	Setting could be permanently harmed by a combination of visual intrusion resulting from the introduction of new structures, materials and movement and a degradation of tranquillity caused by increases in traffic noise.	Unknown until further assessment has been completed, but likely to include landscape planting.	Yes, where settings contribute to the significance of asset and where there is a change to the setting. A settings assessment to be undertaken through the EIA.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Seven areas Ridge and Furrow	Construction	Potential for ground disturbance to result in the asset to be permanently flattened or removed by the offline section of the Scheme.	Preservation in-situ or preservation through record.	Yes, where remains are present.
Hedgerows of Historic Importance	Construction	Potential for ground work to result in the full or partial loss of a number of locally important historic field boundaries that are likely to be protected under the Hedgerows Regulations Act 1997.	Preservation in-situ or reinstatement.	Yes. Where hedgerows of historic importance as defined under the Hedgerow Act are identified.
Historic Landscape	Construction	Potential for construction works to result in full or partial loss of historic landscape.	None appropriate.	Yes.
	Operation	Setting could be permanently harmed by a combination of visual intrusion resulting from the introduction of new structures, materials and movement and a degradation of tranquillity caused by increases in traffic noise.	Unknown until further assessment has been completed, but likely to include landscape planting.	Yes, where settings contribute to the significance of asset and where there is a change to the setting. A settings assessment to be undertaken through the EIA.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
All above receptors.	Operation	Potential permanent adverse impacts upon buried archaeological remains and built heritage assets through changes in hydrology resulting from a change in drainage and water levels in and around the Scheme.	A robust surface water drainage system would be provided.	Not anticipated.
Outside Scheme Footprint				
Designated Assets ¡ Felton Old Bridge (Scheduled Monument (1020745) and Grade II* Listed Building) (1020745/1041879) ¡ Felton and West Thirston Conservation Areas and Listed Buildings contained within them including Grade I Church of St. Michael and All Angels (1041881) ¡ Grade II* Bockenfield Farmhouse (1371020) ¡ Grade II Causey Park (1370647) ¡ Grade II Longfield Cottage (1041875)	Construction	Temporary adverse impact due to noise and visual disturbance from construction activities on the setting of these assets.	Unknown until further assessment has been completed, but likely to include landscape planting.	Yes, where settings contribute to the significance of asset and where there is a change to the setting. A settings assessment to be undertaken through the EIA.
	Operation	Setting could be permanently harmed by a combination of visual intrusion resulting from the introduction of new structures, materials and movement and a degradation of tranquillity caused by increases in traffic noise.	Unknown until further assessment has been completed, but likely to include landscape planting.	Yes, where settings contribute to the significance of asset and where there is a change to the setting. A settings assessment to be

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
¡ Grade II Roman Catholic Church of St Mary (1371126) ¡ Grade II Felton Park (1303774)				undertaken through the EIA.
Non-designated ¡ Highlaws Farm ¡ New Houses Farm	Construction	Temporary adverse impact due to noise and visual disturbance from construction activities on the setting of these assets.	Unknown until further assessment has been completed, but likely to include landscape planting.	Yes, where settings contribute to the significance of asset and where there is a change to the setting. A settings assessment to be undertaken through the EIA.
	Operation	Setting could be permanently harmed by a combination of visual intrusion resulting from the introduction of new structures, materials and movement and a degradation of tranquillity caused by increases in traffic noise.	Unknown until further assessment has been completed, but likely to include landscape planting.	Yes, where settings contribute to the significance of asset and where there is a change to the setting. A settings assessment to be undertaken through the EIA.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
All above receptors.	Operation	Potential permanent adverse impacts upon buried archaeological remains and built heritage assets through changes in hydrology resulting from a change in drainage and water levels in and around the Scheme.	A robust surface water drainage system would be provided.	Not anticipated.

**The mitigation measures indicated are preliminary, based upon available information. These are subject to further design and assessment work during the EIA.*

FURTHER WORK FOR THE EIA

5.4.33. A detailed level of assessment on the cultural heritage impacts during construction and operation of the Scheme will be undertaken in accordance with the methodology sets out in the DMRB Volume 11, Section 3, Part 2, HA208/07 "Cultural Heritage" (**Ref 5.16**). It will discuss the value of the heritage assets and their settings and their cultural heritage significance.

5.4.34. In addition to the assessment detailed in the Scoping Report (refer to **Volume 2, Section 10 Cultural Heritage**) and in response to the Scoping Opinion (refer to **Volume 2, Section 4.4**), the following will be carried out for the EIA:

- The study area for non-designated assets has been increased to a 500 m buffer area around the Scheme in line with guidance set out in DMRB Volume 11, Section 3, Part 2 HA 208/07 (**Ref. 5.16**) and following consultation with the NCC County Archaeologist and will be used to inform the assessment in the EIA. The wider study area for designated assets remains the same at 1km, as reported in the Scoping Report. The study area will be clearly explained in the ES, with reference to the visual zone of influence for the Scheme. These study areas are reflected in this PEIR Report.
- A geophysical survey within the Scheme footprint, including compound areas and any known utility diversions, is currently underway in order to identify any potential buried archaeological remains. The results will incorporated into the ES chapter and appropriate mitigation considered and recommended in consultation with NCC.
- A map regression exercise to identify potentially Historically Important Hedgerows will be undertaken.
- There will be consultation with Historic England and NCC's Conservation Team to ensure that all designated and non-designated assets surrounding the Scheme that constitutes a sensitive receptor have been identified and assessed.
- A review of photomontages and the ZTV models developed for the Landscape and Visual Assessment will be undertaken to assist in the assessment of effects on sensitive receptors.
- A programme of mitigation appropriate to the Scheme will be developed in consultation with NCC and Historic England to reduce harm and to provide enhancements.
- The ES will assess the potential impacts upon archaeological remains as a result of the operation of the Scheme. This will include consideration of the impact upon the setting of buried archaeological remains, and also as a result of alterations to drainage patterns on the survival of buried archaeological remains.
- Monitoring to measure the success of any mitigation and enhancement measures will be considered as part of the EIA.

5.5 BIODIVERSITY

INTRODUCTION

5.5.1. This section considers the implications of the Scheme on biodiversity during the construction and operational phases and any potentially significant effects.

EXISTING BASELINE KNOWLEDGE

5.5.2. The baseline for the Scheme has been determined and appraised through a combination of desk-based study and field surveys within select study and survey areas. The Scoping Report detailed the baseline that was derived from a review of the following survey effort, available at the time of writing:

- Options Selection Stage Environmental Assessment Report (EAR).
- Extended Phase 1 habitat survey.
- Badger survey.
- Bat roost potential survey and habitat suitability assessment.
- Great crested newt Habitat Suitability Index (HSI) assessment and environmental DNA (eDNA) analysis.
- Otter and Water Vole survey[6].
- Breeding bird survey.

Image 9 - Existing A1 north of Warreners House

5.5.3. Since the completion of the Scoping Report, further survey effort has been completed and the findings reviewed. A review of the information above and below has been undertaken to contribute to the baseline documented within this PEIR. The full survey information will be provided as part of the ES.

- Bat activity survey report (including activity transects, crossing points, static detectors and dusk emergence / dawn re-entry)
- Great crested newt survey
- Reptile survey
- Red squirrel survey

[6] Findings of an updated otter and water vole survey conducted in 2017 are pending. Therefore, this was a precautionary assessment based on the information made available at the time of writing.

- Barn owl survey
- Updated badger survey
- Badger bait marking survey
- National Vegetation Classification (NVC) survey
- Terrestrial invertebrate survey
- Aquatic and Fisheries survey

5.5.4. A full review of the updated otter and water vole survey data and the wintering bird survey data will be undertaken to inform the EIA.

5.5.5. The majority of the surveys above have been undertaken within a 500m buffer around the Scheme. Bat roost potential surveys and activity surveys for trees/ buildings and structures, and also reptile surveys, have been carried out within a 100 m buffer around the Scheme. The NVC survey was undertaken within a 200 m buffer around the Scheme. Further details of the study areas can be found in the Scoping Report in **Volume 2, Section 11.2**.

5.5.6. The survey areas are based on guidance from the DMRB, best practice guidelines and the Chartered Institute of Ecology and Environmental Management (CIEEM). Consideration has also been given to the likely Ecological Zone of Influence applicable to the anticipated impacts of the Scheme. A full justification for the study areas will be presented within the ES.

Designated Sites

5.5.7. The Ecological Zone of Influence will be used to determine the designated sites that are proportionate and appropriate to the Scheme, to be assessed through the EIA. Further information from other disciplines (for example relating to air quality, transport and hydrology) is required to establish the Ecological Zone of Influence and determine those designated sites to be included. In the interim, the set distances identified below have been adopted at this stage to identify designated sites to be considered within the impact assessment. These will be refined to establish the Ecological Zone of Influence within the EIA, once further information is available, although it is considered that the Ecological Zone of Influence is likely to be contained within these set distances.

5.5.8. No statutory European[7] or internationally designated sites have been identified within 10 km (30 km for European sites where bats are one of the qualifying interests). A Habitat Regulations Assessment (HRA) Screening Assessment is currently being reviewed and updated to take account of potential impacts to the Northumbrian Coast Ramsar / Special Protection Area (SPA), the North Northumberland Dunes Special Area of Conservation (SAC) and the amended boundary of the Northumberland Marine SPA, given the potential hydrological link between these sites and the Scheme by the River Coquet. However, potential impacts upon European Sites are not anticipated. The findings will be incorporated within the EIA.

5.5.9. UK statutory designated sites are those sites which are designated under UK domestic legislation such as the Wildlife and Countryside Act 1981 (as amended), which includes SSSI. UK non-statutory designated sites are those sites which are applied at the local level,

[7] Which are those designated under international Conventions and European Directives – principally Ramsar Sites, Special Areas of Conservation (SAC) and Special Protection Areas (SPA)

and are not underpinned by legislation. There are five statutory designated and five non-statutory designated sites within 2 km of the Scheme, as detailed in **Table 5-10** below as shown on **Figure 2 Environmental Constraints Plan in Appendix B**.

Image 10 - The River Coquet and Coquet Valley Woodlands SSSI

Table 5-10 - Statutory and non-statutory designated sites within 2 km of the Scheme Footprint

Site Name	Reason for Designation	Distance from the Scheme Footprint
Statutory designated sites		
Longhorsley Moor (SSSI)	Best example of lowland sub-Atlantic heath which remains in Northumberland.	1.8km west
River Coquet and Coquet Valley Woodlands (SSSI)	River Coquet is an unmodified fast-flowing upland river supporting characteristic wildlife. Woodlands near to the river are Ancient Woodland sites.	Within the Scheme Footprint.
Scotch Gill Wood Local Nature Reserve (LNR)	Mature broadleaved woodland site.	2 km south of the Scheme.
Davies Wood (LNR)	Mature broadleaved woodland with song birds, small mammals and ground plants.	1.3km south-east of the Scheme.
Bracken Bank (LNR)	Urban fringe site containing various wildlife including woodland trees.	1.3 km south-east of the Scheme.
Non-statutory designated sites		

Site Name	Reason for Designation	Distance from the Scheme Footprint
Coquet River Felton Park Local Wildlife Site (LWS)	Parkland site connecting with the River Coquet.	Within the Scheme Footprint.
Longhorsley Moor (LWS)	Mix of heathlands, scrub and woodland that adjoin Longhorsley Moor SSSI.	2 km west of the Scheme.
Coquet River Moldshaugh (LWS)	Parcel of land adjacent to right bank of the River Coquet at West Thirston.	1.9 km east of the Scheme.
Font River Woods (LWS)	Woodland lining the River Font between Mitford and Stanton.	1.7 km south west of the Scheme.
Cotting Woods (LWS)	Area of Ancient Woodland containing houses and associated gardens.	1.2 km south west of the Scheme.

5.5.10. In addition, the Dukes Bank Ancient Woodland is represented within the River Coquet and Coquet Valley Woodlands SSSI, which lies within the Scheme Footprint. This is the only Ancient Woodland within the Scheme Footprint and therefore the only area of Ancient Woodland subject to direct loss. An Ecological Zone of Influence will be established within the EIA (once further assessment information is available in relation to air quality and hydrology) to determine potential indirect impacts from changes in hydrological conditions and air quality as a result of the Scheme.

Habitats

5.5.11. An Extended Phase 1 Habitat survey was undertaken between April and June 2016 and identified baseline conditions and evaluated the importance of any ecological features present (or those that could be present) within 500 m of the Scheme Footprint. The following habitats identified as Habitats of Principal Importance (HPI) and/or listed within the Local Biodiversity Action Plan (LBAP) were identified:

- Broad leaved semi-natural woodland
- Broad leaved/mixed/coniferous plantation woodland
- Dense/continuous and scattered scrub
- Running water
- Standing water
- Scattered broad leaved trees
- Species-poor hedge with trees
- Species-poor intact hedge
- Species-poor defunct hedge
- Species-rich intact hedge

Image 11 - Existing arable fields and field boundaries near Priestbridge House

5.5.12. Other habitats recorded within the study area include the following:

- Amenity grassland
- Arable farmland
- Bare ground
- Continuous bracken
- Dry ditch
- Improved grassland
- Introduced shrub
- Marginal vegetation
- Marshy grassland
- Neutral and poor semi-improved grassland
- Recently felled broad leaved and coniferous woodland
- Semi-improved neutral grassland
- Spoil
- Tall Ruderal
- Walls

Protected and/or Notable Species

5.5.13. The desk study and initial surveys identified signs of, or potential for, the presence of protected and/or notable species within the relevant study areas:

- Badger *Meles meles*
- Bats
- Amphibians including great crested newt *Triturus cristatus*
- Riparian mammals: otter *Lutra lutra* and water vole *Arvicola amphibius*
- Breeding birds
- Barn owl
- Wintering birds

- Reptiles
- Red squirrel *Sciurus vulgaris*
- Terrestrial invertebrates
- Aquatic invertebrates, including white-clawed crayfish *Austropotamobius pallipes*
- Fish
- Brown hare *Lepus europaeus*
- Invasive species

5.5.14. Since the preparation of the Scoping Report the following protected species surveys have been undertaken and reported (surveys undertaken between spring and winter 2017):

- National Vegetation Classification (NVC)
- Badger
- Barn owl
- Bat
- Great crested newt
- Updated otter and water vole
- Wintering birds
- Red squirrels
- Reptiles
- Terrestrial invertebrates
- Aquatic ecology receptors

5.5.15. **Table 5-11** provides a summary of the protected species surveys undertaken to date to inform the ongoing environmental assessment work. The full impact assessment will be confirmed through the EIA and reported in the ES.

Table 5-11 - Summary of Protected Species Survey Effort to Date

Receptor/Survey	Baseline Summary
Extended Phase 1 Habitat Survey	A Biological Desk Study was undertaken along with a Phase 1 Habitat Survey between April and June 2016. A total of 35 different habitats were recorded, including seven priority habitats (listed under Section 41 of the NERC Act 2006) (**Ref. 5.17**).
National Vegetation Classification	The desk study identified unit 13 (Duke's Bank Wood) River Coquet and Coquet Valley Woodlands SSSI within the footprint of the Scheme. The SSSI woodland was the only area considered to require further study under the NVC methodology due to its sensitive nature (Ancient Woodland). The woodland feature has been assessed as in "favourable" condition (Natural England). The April 2017 field survey concluded that the surveyed woodland, both north and south of the River Coquet, were found to be a good fit to W9 *Fraxinus excelsior - Sorbus aucuparia - Mercurialis perennis* woodland, typical sub-community. A total of 19 ancient woodland indicator species were recorded in the survey area, with greater numbers recorded to the north of the river.

Receptor/Survey	Baseline Summary
Badgers	The desk study returned 72 records of badger within the study area. The December 2016 and 2017 field surveys recorded 30 setts consisting of nine main, five annexe, five subsidiary and eleven outlier badger setts. Three outlier setts may be at risk of destruction/ disturbance due to their proximity to the Scheme (within 100 m). The badger bait marking surveys (April 2017) identified one definitive badger territory between three of the setts recorded.
Bats	The desk study returned 186 bat roosts of eight known species within the study area. A total of four woodlands, 195 trees and 99 buildings / structures were identified on or within 100 m of the Scheme. Following the scoping out of trees/ woodlands, buildings and structures due to their bat roost potential and proximity to the Scheme, 28 trees and 10 buildings were identified requiring further survey. Initial surveys in 2016 and subsequent emergence/ re-entry surveys in 2017 identified four roosts within trees (soprano pipistrelle roosts) and the presence of bat roosts in four of the buildings/ structures (common pipistrelle, soprano pipistrelle, brown long-eared bat and unconfirmed species (droppings)). Bat activity surveys (2017) recorded the highest bat activity along the River Coquet corridor at the northern end of the Scheme. Several crossing points along the existing A1 carriageway were identified. Of particular importance is the crossing point where the A1 intersects Park Wood at the northern end of the Scheme (proposed widening).
Amphibians	A desk study identified 80 records of great crested newts. A HSI assessment in 2016 identified 22 ponds suitable for great crested newts, of which eDNA testing returned a positive result for a single pond, negative results for 14 ponds and 7 ponds were not surveyed due to access restrictions. Subsequent pond surveys in 2017 identified the presence of great crested newts within four ponds, three of which contain a ‘small’ population size and one containing a ‘medium’ population size class.

Receptor/Survey	Baseline Summary
	The 2017 pond surveys included a survey of five of the seven ponds that could not be accessed during the initial Habitat Suitability Index (HSI) / eDNA assessment. The remaining two ponds where access restrictions prevented a survey in 2016 / 2017 are currently being surveyed in 2018. Survey findings and the potential impacts to great crested newts will be presented and discussed in the ES.
Otter, Water Voles	35 records of otter field signs were returned in the desk study. No records of water vole were returned. In total, 31 watercourses were surveyed during 2016 and 2017. During the 2016 / 2017 surveys, evidence of otter was recorded along three of the watercourses. Four holts were recorded during the course of the survey effort. Two holt locations fall within the Scheme Footprint and therefore may be lost. During these surveys evidence of water vole was recorded along four of the watercourses during 2016, although no water vole field signs were recorded in 2017. A single burrow was recorded, outside the Scheme footprint, and would therefore not be lost.
Breeding Birds	Records of 115 species were obtained through the desk study, of which 69 were of conservation concern. Two designated sites are also partly designated for breeding birds (the River Coquet and Coquet Valley Woodlands SSSI and Longhorsley Moor SSSI). A total of 90 bird species were recorded during the 2016 survey period, including 50 Species of Conservation Concern. Of the 90 species, 32 species were confirmed breeding, 30 probably breeding and 14 possibly breeding (in accordance with BTO's Bird Atlas 2007 – 2011 (**Ref. 5.18**)). These numbers include three Schedule 1 (Wildlife and Countryside Act 1981) species; barn owl (probable breeding), common crossbill *Loxia curvirostra* (probable breeding) and kingfisher *Alcedo atthis* (possible breeding).
Barn Owl	The desk study identified six records of barn owl, A total of 69 trees, buildings or structures were identified as having potential to support nesting/roosting barn owl within 500m of the Scheme. Following the investigative field survey in 2017, 12 trees/ buildings/ structures were identified as supporting, or having the potential to support, barn owl. Of these, three were active breeding sites, three were active roosting sites (one with potential breeding), five were occasional roosting sites and one was a potential roost site.

Receptor/Survey	Baseline Summary
	Much of the survey area comprised unsuitable foraging habitat for barn owl. Optimal and sub-optimal grassland habitats comprised 1.70 and 6.65% of the total area respectively.
Wintering Birds	Records of 100 species from the winter season were obtained through the desk study, of which 57 were of conservation concern. The Northumbria Coast SPA and Ramsar site, located approximately 10 km northeast of the Scheme, is designated for its wintering populations of purple sandpiper *Calidris maritima* and turnstone *Arenaria interpres*. It also supports nationally important populations of wintering sanderling *Calidris alba*, eider *Somateria mollissima*, ringed plover *Charadrius hiaticula* and redshank *Tringa totanus*. Golden plover *Pluvialis apricaria* are also a notable species (although below the 1% qualifying level). There are no statutory designated sites of national importance or greater within 5 km of the Scheme, which are designated for wintering birds. A total of 80 bird species were recorded during the winter 2016/ 2017 survey period, including 46 species of Conservation Concern. Arable farmland, hedgerows and habitat mosaics (particularly where these were associate with the former habitats) recorded higher concentrations of species of conservation concern. One bird species associated with the designated SPA/ Ramsar, golden plover, was recorded within the survey area. The peak count represented a small proportion of the populations supported by the SPA/ Ramsar. As a whole, the wintering bird assemblage within the survey area is considered to be of County Importance. No species occurred in numbers greater than 1% of their national populations. Although the wintering bird surveys were completed in 2016/17, the report has only recently been made available for review. A full review of the baseline will be undertaken and likely significant effects determined during the EIA.
Reptiles	Nine records of adder *Vipera berus* and 37 records of common lizard *Zootoca vivipara* were returned in the desk study. None of the records were located within the survey area. There were no reptiles identified during the 2017 survey (and therefore not considered as a sensitive receptor).
Red Squirrel	338 records for red squirrel have been identified from the desk study within 2 km of the Scheme. Red squirrel are noted on the citation of one designated site within the Scheme (River Coquet and Coquet Valley Woodlands SSSI).

Receptor/Survey	Baseline Summary
	In total, 96 woodlands within 500 m of the Scheme were assessed for their potential carrying capacity to support red squirrel. Of these 58 had low suitability, 35 had moderate and three high suitability. 21 woodlands met the criteria for further survey. Red squirrel were positively identified in the 2017 survey within three woodlands, although grey squirrel were also recorded at these locations.
Terrestrial Invertebrates	The desk study included 22 designated terrestrial invertebrate species records (one beetle, one butterfly and 20 moth). Three accessible survey areas were identified within 500m of the Scheme due to their potential to support a diverse and abundant range of terrestrial invertebrate species. A fourth site was also identified, however, access restrictions excluded this from the survey effort. A review is underway to determine the need for further survey work, however the Phase 1 habitat survey results show this area to be species poor, semi-improved grassland. As a result, the terrestrial invertebrate's assemblages supported by this habitat are currently not considered to be sensitive. The River Coquet and Coquet Valley Woodlands SSSI riverine habitat contained the highest quality invertebrate species assemblage of the three 2017 survey areas examined, including two nationally scarce species of mayfly and the cinnabar moth *Tyria jacobaeae* (all species of conservation importance). A site east of Burgham Park Golf Course held a relatively diverse number of species, particularly within its grassland areas where three Species of Conservation Importance were present. Causey Park Farm held the lowest species diversity of the three survey areas and no Species of Conservation Importance were recorded.
Aquatic invertebrates (including White-clawed Crayfish)	Desk study identified that the habitats in the study area are suitable for a range of aquatic invertebrate species, and records of several such species have been identified from the desk study. Seventeen watercourses and minor tributaries were identified as being crossed by the proposed route and were subject to assessment in 2017. However, many provided poor habitat for aquatic ecology features, being ephemeral and heavily overgrown or shaded. Seven of the watercourses were not suitable for further survey. The River Coquet is an important river in Northumberland as it provides habitat for Atlantic salmon *Salmo salar*, confirmed by the

Receptor/Survey	Baseline Summary
	incidental capture of a juvenile salmon during crayfish surveys. The invertebrate samples were found to contain a community of 'good' ecological value (Water Framework Directive (WFD) classification). Although the macrophyte community and level of modification of the areas surveyed on Longdike Burn are considered potentially poor, the burn supports a diverse community of fish and aquatic macroinvertebrates. Four species of conservation interest were recorded during the macroinvertebrate survey, including *Baetis buceratus* (Back Burn Tributary), *Ecdyonurus insignis* (River Coquet), *Athripsodes billineatus* (Longdike Burns 1 and 2) and *Beraeodes minutus* (Earsdon Burn). White-clawed crayfish were not recorded within any of the surveyed watercourses. The surveyed watercourses were also found to range from obviously to severely modified.
Fish	Desk study identified records of the following species: ¡ Atlantic salmon *Salmo salar* ¡ Brown/sea trout *Salmo trutta* ¡ European eel *Anguilla anguilla* ¡ Bullhead *Cottus gobio* ¡ Sea lamprey *Petromyzon marinus* ¡ River lamprey *Lampetra fluviatilis* ¡ Brook lamprey *Lampretra planeri* Of the four 2017 surveyed watercourses (Longdike Burn 1 and 2, River Lyne and Floodgate Burn), the sites on Longdike Burn contained greater numbers and diversity of fish species, including lamprey ammocoetes (juveniles) and European eel recorded within both watercourses. The fish populations recorded within the River Lyne and Floodgate Burn were relatively low (in comparison to the other watercourses surveyed) and less diverse to the other surveyed watercourses, with the latter recording the comparatively low numbers of three-spined stickleback *Gasterosteus aculeatus* only. The River Lyne recorded comparatively low numbers of stickleback and also presence of bullhead, with this species not recorded in any other watercourse. No salmon were recorded at any of the sites. However, an incidental capture of a juvenile salmon was recorded during crayfish surveys on the River Coquet.
Invasive species	The Phase 1 habitat survey during June 2016 recorded evidence of invasive species, including Japanese knotweed *Fallopia japonica*

Receptor/Survey	Baseline Summary
	and rhododendron *Rhododendron sp.* However, neither is in close proximity to the Scheme. Species surveys also recorded the presence of grey squirrel, American mink and signal crayfish.
Brown hare	The desk study identified 14 records of brown hare. Farmland throughout the study area has the potential to support brown hare.

POTENTIAL IMPACTS

Construction

5.5.16. The potential impacts of construction on ecological features may include the following:

- Direct habitat loss, fragmentation and loss of biodiversity. The extent and location of habitat loss is yet to be quantified although will be fully outlined within the EIA and is likely to include:
  - Direct loss of Ancient Woodland ((broad-leaved semi-natural) approximately 3,000m^2) associated with the River Coquet and Coquet Valley Woodlands SSSI as a result of the proposed new bridge and outfall pipe to the eastern side.
  - Direct loss of broadleaved semi-natural woodland associated with the Coquet River Felton Park (LWS) to the north of the River Coquet as a result of the proposed new bridge and outfall pipe.
  - Direct loss of HPI including hedgerows, arable field margins and woodland.
  - Direct loss of other habitat, including (but not limited to) arable, improved and semi-improved grassland and scrub.
  - Permanent fragmentation as a result of the new off-line section.
- Temporary and permanent damage to retained habitats as a result of, for example, accidental pollution, discharge of materials or hydrological effects. This may include temporary reduction in water quality in relation to the installation of new culverts and extension of existing culvert structures. This may also include indirect impacts to the Ancient Woodland through soil compaction, dust and storage of materials.
- Permanent direct loss of resting and sheltering places for protected and/or priority species may occur, including:
  - Loss of two otter holts; one on the southern bank of the River Coquet due to the construction of the new bridge crossing and outfall pipe and one along Longdike Burn due to the construction of a junction.
  - Loss of great crested newt terrestrial habitat (shelter) within proximity of confirmed great crested newt ponds.
  - Potential loss of three bat roosts; found within a building (single common pipistrelle *Pipistrellus pipistrellus*) and two within bat boxes attached to trees (single soprano pipistrelle *Pipistrellus pygmaeus* in each).
  - Loss of two active outlier badger setts.
- Potential for accidental mortality/injury of protected and/or priority species as a result of construction activities, including:

- Entrapment in voids or trenches.
- Direct conflict with machinery during earth works and excavation.
- Vegetation clearance works.
- General construction activities.

- Temporary direct and indirect adverse effects on legally protected and/or priority species may occur due to general construction site activities through severance, fragmentation and reduction in biodiversity. Disturbance and displacement may also occur.
- Temporary indirect disturbance to species and retained habitats. Noise, light, dust and vibration pollution would impact the habitats and further increase disturbance to surrounding habitats.
- Temporary indirect disturbance impact to species through additional road lighting during the construction phase of the Scheme (e.g. lighting in close proximity to suitable habitat for bats such as the trees adjacent to the roadside or in close proximity to watercourses used by migratory fish).
- Temporary disruption of local watercourses and drainage patterns.
- Permanent dispersal of invasive species during site clearance.
- Habitat improvement as a result of compensatory planting or enhancement measures (beneficial impact).

Image 12 - The area near to the proposed Fenrother Junction

Operation

5.5.17. The effects on ecological receptors, which would potentially occur as a result of the operation of the Scheme include:

- Permanent severance, by dividing habitats or wildlife corridors such as:
  - Badger commuting routes
  - Bat commuting routes
  - Barn owl foraging territory
  - Breeding and wintering bird territories

- Otter and water vole commuting and foraging routes
- Amphibian dispersal routes

- Permanent indirect disturbance to species (e.g. bats) from increased levels of light, noise and pollution.
- Permanent fragmentation of existing roadside habitat as a result of the construction of the Scheme.
- Direct mortality of birds and mammals (including bats) through traffic collision.
- Permanent polluted road runoff affecting the water environment of roadside stream and drains. This may also extend to hydrological effects to watercourses crossed by the Scheme, importantly the River Coquet and Coquet Valley Woodlands SSSI.
- Permanent indirect adverse impacts on bats and birds through potential changes in lighting dynamics, e.g. from road users along the offline section of the Scheme, in close proximity to suitable habitat for bats such as the trees adjacent to the roadside or in close proximity to watercourses used by migratory fish.
- Permanent indirect adverse impacts on vegetation adjacent to the A1 from polluted spray from road traffic.

DESIGN, MITIGATION AND ENHANCEMENT MEASURES

5.5.18. Avoidance and mitigation measures will be further investigated during the EIA. However, based upon current knowledge of the ecological baseline and potential impacts as a result of the Scheme, design and enhancement measures may comprise the following, where appropriate:

- The Scheme would seek to reduce net loss of biodiversity in line with Highways England objectives and as promoted under the National Planning Policy Framework (NPPF) (2012) and the Biodiversity Plan (**Ref. 5.19**). A Biodiversity No Net Loss assessment will be undertaken. Compensatory habitat will be created with the aim to achieve no net loss.
- Enhancement of existing habitat through native species planting and planting designed to connect habitat and improve wildlife movement through the landscape.
- Replacement of lost habitat to ensure no net loss of biodiversity.
- Reinstatement of damaged habitats and using native species.
- Provision of locally sourced native tree species to ensure that the planting is suitable for local wildlife.
- Provision of alternative habitats for protected/ notable species (including as part of licence requirements).
- Design considerations to improve and maintain connectivity and reduce mortality, such as underpasses or overpasses at known crossing points or use of wildlife-friendly infrastructure to prevent entrapment or risk of collision with vehicles. This will also include consideration of culvert design to maintain fish passage.
- Development of a ‘Salvage Plan’ to address the loss of Ancient Woodland, which may include soil translocation and native planting. The Salvage Plan will consider:
  - The potential impacts to Ancient Woodland. This will include direct loss and also consideration of indirect impacts such as soil compaction, dust and storage of materials.
  - Minimise land take through iterative design.
  - Construction mitigation requirements, such as the CEMP, stand-off distances, fencing, machine movements, biosecurity and access design.

- Location of a donor site for new Ancient Woodland and reasons for selection (currently proposed to the southeast and southwest of the existing bridge over the River Coquet due to the proximity to the existing woodland).
- Donor site preparation, which may include testing and preparation of soils and remediation of a temporary site compound proposed in the donor area.
- Salvage effort, which may include soil translocation, seed bank collection, tree sapling and ground flora translocation and timber collection.
- Improvements to the existing woodland through removal of non-native species and appropriate management.
- Donor site woodland establishment, including a planting plan and description of temporal and spatial establishment.
- Monitoring and management, which may include replacement of dead or dying specimens, additional salvage planting, weed removal and management of invasive species.
- Timeframes for the implementation of the Salvage Plan.

Construction

5.5.19. Mitigation during construction would be likely to include the following measures:

- Appropriate working methodologies would be implemented, such as working under protected species mitigation licences (for example bats, badger, great crested newts, otter and water vole) or precautionary working methods for species not protected directly but considered priority species and/or where licensing is not required.
- The above licensing would include details of compensatory features to be provided to address the loss of breeding/ resting/ sheltering features to the Scheme. For example, the provision of compensatory roosting habitat for bats.
- Implementation of a CEMP to include measures to avoid or reduce impacts during the construction works. This would include details regarding prevention of impacts to watercourses. Of particular importance is the River Coquet and Coquet Valley Woodlands SSSI, which is designated for its aquatic habitat and ecology. Measures would include stand-off distances, designated areas for material storage and refuelling (pollution prevention mitigation), silt traps to reduce run-off. The CEMP would also include information on biosecurity to prevent the spread of invasive species, such as implementation of cleaning stations for plant / machinery and site workers (clothing and boots) when leaving the works area. The CEMP would also include mitigation measures to reduce the impact to wildlife, such as the covering of voids and trenches overnight to avoid entrapment or the provision of a suitable means of escape.
- Implementation of mitigation measures to maintain commuting routes for protected species during the construction period, such as maintenance of existing underpasses for bats crossing the carriageway.
- Buffer zone around invasive species areas to avoid spreading.
- Vegetation removal would be programmed outside the bird breeding season (approximately March to September). Any vegetation removal undertaken outside these times would be checked by a suitably qualified ecologist prior to works commencing.
- Directional lighting would be used to reduce adverse effects on fauna for example foraging and commuting bats.

Operation

5.5.20. Design and enhancement measures detailed above, would seek to minimise and, where possible, enhance biodiversity during operation.

LIKELY SIGNIFICANT EFFECTS

5.5.21. A summary of the preliminary likely significant effects upon biodiversity is presented in **Table 5-12** below, based upon currently available information and professional judgement.

Table 5-12 – Summary of Preliminary Likely Significant Effects

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Ancient Woodland - River Coquet and Coquet Valley Woodlands SSSI	Construction	The installation of the new bridge over the River Coquet and adjacent drainage outfall would result in permanent direct loss of ancient woodland, temporary damage to retained Ancient Woodland from construction activities and temporary indirect impacts (noise, dust, light, vibration, storage of materials). Habitat improvement as a result of new planting or enhancement measures to the existing woodland.	Implementation of an Ancient Woodland Salvage Plan to address the impacts through loss and damage of ancient woodland. Implementation of CEMP to address indirect impacts.	Yes (beneficial and adverse), ancient woodland is an irreplaceable habitat.
	Operation	Increased traffic pollution and spray, run-off and emissions from the road may result in damage to woodland habitat through changes in pollutant/ nutrient deposition levels.	Best practice drainage design will be used to reduce pollution.	Possible. Dependent on air quality and water assessments.
River course - River Coquet and Coquet Valley Woodlands SSSI	Construction	The installation of the new bridge over the River Coquet and adjacent outfall pipe are located over the watercourse and therefore may result in a reduction in water quality due to accidental pollution or increased sedimentation from run-off.	Implementation of a CEMP to detail measures to avoid or reduce the level of impacts.	Unlikely.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
	Operation	Increased traffic pollution and spray, run-off and emissions from the road may result in damage to aquatic habitat through changes in pollutant/ nutrient deposition levels.	Best practice drainage design will be used to reduce pollution.	Unlikely. Dependent on air quality and water assessments.
Coquet River Felton Park LWS	Construction	The installation of the new bridge crossing the River Coquet would result in the permanent direct loss of broad-leaved woodland habitat with a local designation (Local Wildlife Site). The installation of the new bridge may also result in temporary damage to retained woodland from construction activities, including soil compaction and accidental damage and temporary indirect impacts through increased noise, dust, light and vibration.	Compensation for the loss of habitat. This should be connected to the existing LWS woodland. Implementation of CEMP to outline measures to reduce damage to the wider woodland, such as buffer areas and stand-off distances, and reduce in-direct impacts.	Possible. Dependent on the proximity of the compensatory habitat to the LWS.
	Operation	Increased traffic pollution and spray, run-off and emissions from the road may result in damage to woodland habitat through changes in pollutant/ nutrient deposition levels.	Best practice drainage design will be used to reduce pollution.	Unlikely. Dependent on air quality and water assessments.
Habitats of Principle Importance	Construction	Temporary and permanent loss of habitat within the footprint of the Scheme as a result of construction	Compensatory habitat for the loss of habitat.	None, once the compensatory habitats are

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
(HPI) and other habitats (excluding aquatic environments)		activities. Largely comprises arable farmland and improved grassland, however, also includes habitats of greater importance, such as woodland, hedgerows and semi-improved grasslands. Habitat improvement as a result of compensatory planting or enhancement measures.	Implementation of a CEMP to detail timing of works to avoid sensitive ecological periods such as bird nesting (depending on location), stand-off distances (for woodland and trees) and measures to avoid accidental pollution.	established and matured.
	Operation	Increased traffic pollution and spray, run-off and emissions from the road may result in possibly permanent modification of floral community through changes in pollutant/ nutrient deposition levels.	Best practice drainage design will be used to reduce pollution.	Possible. Dependent on air quality and water assessments.
Watercourses (aquatic environments)	Construction	The Scheme would include the installation and extension of culverts where the Scheme crosses watercourses. Construction of the culverts would result in the permanent loss and damage of habitat and temporary disruption of local watercourses and drainage patterns.	Culvert design to allow inclusion of natural bed, to maintain a substrate that may support aquatic invertebrates and thus supporting species further up the food chain. Compensatory habitat to address permanent or temporary loss of habitat. This may also involve improvements to existing aquatic habitats through	Unlikely.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		Construction activities in close proximity to water may also result in the spread of invasive species. Accidental pollution and discharge of materials into watercourses may result in a reduction in water quality, negatively impacting aquatic ecology decreasing biodiversity.	clearance of channels to improve passage and native planting. Implementation of a CEMP to detail measures to avoid and reduce impacts to watercourses from construction activities.	
	Operation	Increased traffic pollution and spray, run-off and emissions from the road may result in possibly permanent changes in aquatic community and reduction in water quality.	Best practice drainage design will be used to reduce pollution.	Unlikely. Dependent on air quality and water assessments.
Badger	Construction	The footprint of the Scheme and general construction activities may result in: ¡ Permanent loss of two active outlier setts. ¡ Temporary risk of mortality/ injury of badger during work around setts. ¡ Permanent loss of foraging habitat, such as scrub and grassland that is found across the Scheme and within known badger territories.	Obtaining development licences from Natural England which would include measures to protect badgers during construction and potentially compensatory setts where appropriate. Implementation of a CEMP to ensure protection measures which may include exclusion zones to construction activity, covering of trenches/ voids overnight, installation of crossing points to maintain connectivity and reduce mortality risk.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		¡ Severance of territory (fragmentation) due to the construction of the new offline section forming a new barrier within the landscape.		
	Operation	The use of the road upon completion may result in the permanent risk of mortality or injury as a result of traffic collision.	Installation of crossing points (where required) to improve connectivity and reduce mortality risk. In addition, improvements to the existing underpass west of Felton Park through directional fencing and planting, to encourage and channel movement through the underpass.	Not anticipated.
Bats	Construction	The Scheme and general construction activities would result in permanent loss of three bat roosts associated with trees or buildings lost. There is potential for accidental damage of roosts leading to mortality, injury of bats during the works. There is potential for temporary disturbance of roosting bats and potential for permanent functional loss of roost due to proximity to construction	Compensatory roosting features, which may include the installation of bat boxes within trees or the creation of stand-alone roost features close to the original roost. Licence from Natural England, which would detail mitigation and compensation. Compensatory habitat to address the loss of commuting and foraging habitat. CEMP to detail timing of works and use of a low-level lighting scheme, which	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		area as a result of increased noise, light and vibration. Likely permanent loss of foraging (woodland, grasslands, watercourses) and commuting habitat (primarily in relation to linear habitats, such as hedgerows). Permanent severance of flight paths through removal of linear habitats (hedgerows and tree lines).	include information on directional lighting and measures to reduce light spill (such as shields or guards).	
	Operation	The use of the road upon completion may result in the permanent risk of mortality or injury as a result of traffic collision.	Installation of mitigation at crossing points (where required) and habitat to encourage use, including the existing underpass to the west of Felton Park, which is known to be heavily used by bats.	Not anticipated.
Great crested newts	Construction	The Scheme and general construction activities within 500 m of known great crested newt ponds would result in permanent loss of terrestrial habitat and temporary damage to habitats within the construction footprint, for example as a result of vegetation clearance to provide access.	Licence from Natural England or precautionary working method statement (PWMS). A licence may require trapping and removal of newts from a works area prior to commencement of construction, with translocation to an agreed receptor site. A PWMS may include the provision of a toolbox talk to contractors, to make them aware of	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		Construction activities may also result in the temporary risk to the mortality/ injury of newts.	their legal obligations regarding great crested newts (and other wildlife). There is potentially a need for compensatory habitat creation in close proximity to known great crested newt ponds and, where possible, improving connectivity between ponds. CEMP to detail timing considerations of work and reference actions in the PWMS.	
	Operation	The use of the road upon completion may result in the permanent risk of mortality or injury as a result of traffic collision. There is also a potential risk of entrapment within drains or other drainage features.	If required the installation of fencing, escape ladders and modified openings to reduce risk of entrapment in the drainage system.	Not anticipated.
Otter	Construction	The installation of the new bridge over the River Coquet and culvert extension crossing Longdike Burn would result in the permanent loss of two otter holts. The above structures and other construction activity around watercourses may result in the temporary and permanent loss of habitat (installation of culverts) and	A licence from Natural England would detail the timing of the proposed works, ecological monitoring prior to the removal of any holt locations and the creation of compensatory holt features in close proximity to those lost (prior to removal of existing holts). Culvert design to maintain passage with installation of mammal shelves.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		permanent severance of movement (fragmentation) due to an unsuitable design of culverts.	CEMP to detail timing considerations of work and buffers.	
	Operation	The use of the road upon completion may result in the permanent risk of mortality or injury as a result of traffic collision.	Culvert design to maintain passage. Use of mammal shelves and/ or underpasses as stated above and fencing to channel otters to the underpasses where required.	Not anticipated.
Water vole	Construction	The installation of the new bridge over the River Coquet and culvert extension crossing Longdike Burn would result in the permanent loss of habitat used by water vole. The installation of culverts may also result in the permanent severance of movement (fragmentation) due to inappropriate design. Construction activities may also result in temporary disturbance during the construction period.	Potentially compensatory habitat through improvements to watercourses crossed by the Scheme and design of SUDS features for use by water vole (providing connectivity and suitable planting). Culvert design to maintain passage with installation of mammal shelves. CEMP to detail timing considerations of work and buffers.	Not anticipated.
	Operation	The use of the road upon completion may result in the permanent risk of mortality or injury as a result of traffic collision.	Culvert design to maintain passage. Use of mammal shelves and/ or underpasses as stated above. Planting to encourage use of mitigation features and discourage crossing the road.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Breeding birds	Construction	The Scheme and general construction activities would result in: ¡ Permanent loss of nesting and foraging habitat during site clearance works, including hedgerows, scrub, woodlands, trees and grassland. ¡ Severance of territories (fragmentation and dispersal) as a result of the new section of the Scheme.	Potential for the need to provide compensatory habitat creation to provide nesting habitat for birds. CEMP to detail timing of site clearance works to avoid the bird nesting season.	Not anticipated.
	Operation	Traffic, particularly along the new section of the Scheme, would introduce disturbance from road traffic long-term disturbance. This may discourage birds to nest in habitats close to the road network (functional loss of nesting habitat) due to increased traffic noise and light.	Use of screen planting to reduce the disturbance impacts. Potential for the need for compensatory habitat creation depending on the species impacted and the level of impact.	Not anticipated.
Wintering birds	Construction	The Scheme and general construction activities would result in: ¡ Permanent loss of foraging habitat used by wintering birds. Of particular consideration is the loss of habitat of value to golden plover	Potential for compensatory habitat creation. The type and quantity of compensatory habitat would be dependent on the impacts to wintering birds (to be determined within the EIA).	Currently considered unlikely

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		Pluvialis apricaria, a non-qualifying species of interest for the Northumbria Coast SPA and Ramsar site. The impact to other wintering bird species is to be determined. ¡ Temporary loss or damage of habitat that falls within a construction compound. ¡ Severance of territories (fragmentation and dispersal) as a result of the new section of the Scheme.	CEMP to detail timing of works within areas of importance for wintering birds.	
	Operation	Traffic, particularly along the new section of the Scheme, would introduce disturbance from road traffic long-term. This may discourage birds to nest in habitats close to the road network (functional loss of nesting habitat) due to increased traffic noise and light.	Use of screen planting to reduce the disturbance impacts. Potential for compensatory habitat creation depending on the species impacted and the level of impact.	Currently considered unlikely
Barn owl	Construction	The Scheme and general construction activities would result in: ¡ Permanent loss and damage of habitat used for foraging; temporary disturbance due to increase noise and light.	Requirements for compensatory habitat to be discussed with Natural England. CEMP to detail timing of works and use of directional lighting to avoid or reduce in-direct impacts.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		¡ Temporary disturbance of nesting/ roosting site due to proximity to active works.		
	Operation	Traffic along the Scheme, particularly the new section, would introduce disturbance from road traffic and their lights. This presents a permanent risk of mortality or injury as a result of traffic collision.	Landscape design to shield, where possible, habitats of value to foraging barn owl adjacent to the road network through creation of hedgerows and tree lines, or use of fencing where appropriate.	Not anticipated.
Red squirrel	Construction	The Scheme would result in the permanent loss and damage of habitat used or with potential for use by red squirrels. In particular linkage of woodlands of the River Coquet (northern bank) to the woodland of Felton Park to the north. This may result in the permanent loss of connectivity (fragmentation).	Potential for compensatory habitat creation and landscaping to improve connectivity between woodlands. This would include replacement of the connective woodland between the River Coquet and Felton Park.	Not anticipated.
	Operation	The use of the road upon completion may result in the permanent risk of mortality or injury as a result of traffic collision.	Landscape design to improve connectivity of woodlands and discourage crossing of roads. This may be achieved through woodland planting, tree lines and linear corridors away from the road network.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Terrestrial and aquatic invertebrates	Construction	The Scheme would result in the permanent loss and damage of habitat for invertebrates, including watercourses, woodland and grasslands. This includes habitat used by several Species of Conservation Concern comprising the ghost moth and cinnabar moth, which are both Species of Principal Importance (SPI) within Section 41 of the NERC Act 2006 (**Ref. 5.17**) and small heath butterfly, which is 'Near Threatened' on the International Union for Conservation of Nature (IUCN) Red List Category. Construction activities may result in the temporary accidental pollution of watercourses and temporary discharge of materials into watercourses. During construction, aquatic invertebrates may be directly impacted by proposed culvert construction and existing culvert extension. This would result in permanent loss of habitat and a potential temporary reduction in water quality, incurring adverse effects. Other impacts may include direct mortality,	Potential for compensatory habitat creation, including species-rich grasslands with larval and adult food resources and egg-laying opportunities. Impacts to aquatic habitats may be addressed through enhancements and improvements to watercourses. Implementation of a CEMP to outline measures to prevent or avoid impacts to watercourses from run-off or discharge and accidental damage of terrestrial habitats.	Unlikely. Dependent on air quality and water assessments.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		disturbance (visual, acoustic and physical) and changes in hydrology.		
	Operation	The use of the road upon completion may result in changes in terrestrial and aquatic floral community and reduction in water quality from increased pollution/ nutrient deposition. Drainage may also modify water quality through introduction of pollutants.	Best practice drainage design will be used to reduce pollution.	Unlikely. Dependent on air quality and water assessments.
Fish	Construction	The installation of the new bridge over the River Coquet and culverts along watercourses, importantly the River Lyne and Longdike Burn, may result in temporary and permanent loss and damage of habitat and permanent severance of movement (fragmentation). Construction activities may also result in a reduction in water quality from run-off, pollution or disturbance from lighting vibration and noise.	Potential for culvert design to allow inclusion of natural beds to encourage fish use. Where low water levels are expected, potential installation of baffles or similar features to aid fish passage. Implementation of a CEMP to address impacts to water quality.	Not anticipated.
	Operation	The use of the road upon completion may result in changes to the aquatic floral community and reduction in water	Best practice drainage design will be used to reduce pollution.	Unlikely. Dependent on air quality and water assessments.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		quality from increased pollution/ nutrient deposition.		
Brown hare	Construction	The Scheme may result in the permanent loss and damage of habitat used by brown hare. There is also potential temporary indirect impacts from entrapment in voids	Implementation of CEMP to detail efforts to avoid entrapment, including covering securely overnight or the installation of an escape ramp.	Not anticipated.
	Operation	The use of the road upon completion may result in the permanent risk of mortality or injury as a result of traffic collision.	Targeted landscape design to discourage crossing of roads within selected areas.	Not anticipated.
Invasive species	Construction	Construction activities may result in the spread of invasive species. Permanent beneficial effect through removal of invasive species within works area.	Identification of invasive species, buffer zones around invasive species areas, treatment or clearance of invasive species prior to commencement and timing of activities. Biosecurity requirements within CEMP to avoid the spread or introduction of invasive species.	Not anticipated.

**The mitigation measures indicated are preliminary, based upon available information. These are subject to further design and assessment work during the EIA.*

FURTHER WORK FOR THE EIA

5.5.22. An assessment of potential impacts on biodiversity during the construction and operational phases will be undertaken in accordance with the methodology set out in the Guidelines for Ecological Impact Assessment (**Ref. 5.20)** and IAN 130/10 Ecology and nature Conservation: Criteria for Impact Assessment (**Ref. 5.21**), which supplements the DMRB Volume 11, Section 3, Part 4 "Ecology and Nature Conservation" (**Ref. 5.22**).

5.5.23. In addition to the assessment detailed in the Scoping Report (refer to **Volume 2, Section 11 Biodiversity**), and in response to the Scoping Opinion (refer to **Volume 2, Section 4.5**), the following will be carried out for the EIA:

- Establish the Ecological Zone of Influences to be adopted within the impact assessment.
- The potential impacts upon brown hare will be assessed as part of the EIA.
- In order to ensure the Scheme would support Highways England's target of reducing the net loss in biodiversity by 2020 and achieving no net loss by 2025, a Biodiversity No Net Loss assessment will be undertaken.
- An updated desk study of publicly accessible sources is to be undertaken as part of the EIA to confirm that all receptors that require assessment are captured within the relevant study areas. An assessment will also be made to confirm if the desk study needs to be extended in any areas.
- Confirmation will be sought from relevant consultees (including Natural England and the Forestry Commission) regarding the potential impacts upon Ancient Woodland as a result of the Scheme. A justification for the Zone of Influence will be provided within the ES to assess direct impacts and if required, this will be extended to assess indirect effects on ancient woodland. Zones of Influence and justifications will be fully addressed within the ES.
- Further review of baseline information presented by the original surveyors and those reports pending (updated water vole and otter, and wintering birds).
- Further review of several ponds for great crested newt presence that were not surveyed or were scoped out of further assessment will be undertaken through the EIA, and justification provided.
- Monitoring to measure the success of any mitigation and enhancement measures will be considered as part of the EIA.

5.6 ROAD DRAINAGE AND THE WATER ENVIRONMENT

INTRODUCTION

5.6.1. This section considers the implications of the Scheme on water and drainage during construction and operation and details any potentially significant effects.

EXISTING BASELINE KNOWLEDGE

Surface Water Features

5.6.2. A review of OS mapping indicates that the Scheme alignment crosses or is located in close proximity to approximately 31 watercourses within 0.5 km, of which the River Coquet and the Longdike Burn, are classified as a main river and therefore under the jurisdiction of the Environment Agency. All of the other watercourses are classified as ordinary watercourses and are therefore under the jurisdiction of NCC as the Lead Local Flood Authority (LLFA). All of the watercourses flow in an approximate west to east direction.

5.6.3. All watercourses within the 0.5 km of the Scheme alignment form part of the Northumbria River Basin District.

5.6.4. The ecological, chemical and hydromorphological quality of a number of the watercourses and tributaries within 0.5km is assessed by the Environment Agency in accordance with the objectives of the Water Framework Directive (WFD). The overall objective of the WFD is to ensure the effective co-ordination of water environment policy and regulation across Europe. The main aims of the legislation are to ensure that all surface water and groundwater reaches 'good' status (in terms of ecological and chemical quality and water quantity, as appropriate), promote sustainable water use, reduce pollution and contribute to the mitigation of flood and droughts. **Table 5-13** shows the WFD classifications (as assessed in 2016) for the watercourses within 0.5km, or that receive flow from watercourses within this area.

Table 5-13 - Water Framework Directive classifications

Watercourses	Chemical	Ecological	Hydromorphological
Cotting Burn and Shieldhill Burn	Good	Moderate	Heavily modified
Floodgate Burn, River Lyne, Fenrother Burn and Earsdon Burn	Good	Poor	Not designated artificial or heavily modified
Longdike Burn and tributary of Thirston Burn	Good	Moderate	Not designated artificial or heavily modified
River Coquet and Bradley Brook	Good	Good	Not designated artificial or heavily modified

5.6.5. A review of OS mapping indicates that 9 other surface water features are located within 0.5 km of the Scheme Footprint as shown on **Figure 2 Environmental Constraints Plan in Appendix B**. They have no known designations, and the use, quality and ecological value of these features are currently unclear. The ponds are located within predominantly rural areas and have no known significant recreational value or value to the economy. These features will be investigated further through the EIA.

Image 13 - Agricultural field and boundary surface water course, near Earsdon Moor

5.6.6. A review of OS mapping indicates that there are two covered reservoirs within 1 km of the Scheme. The Hebron Reservoir is located to the north of Hebron, approximately 1 km to the east of the existing A1. An unnamed covered reservoir is located to the north-east of Helm, approximately 0.9 km to the east of the existing A1.

5.6.7. The River Coquet forms part of the River Coquet and Coquet Valley Woodlands SSSI. The SSSI has been divided into 16 units by Natural England. Unit 5 ‘Swarland Burn to Coquet Mouth’ is located within 0.5 km of the Scheme. Natural England undertook an assessment of this area in 2010, which determined this unit to be 'Unfavourable - Recovering.’ As a result of the assessment, a Diffuse Water Pollution (DWP) plan was agreed with the Environment Agency to tackle sources of diffuse pollution throughout the catchment. The SSSI, along with the aquatic surveys which have been undertaken including fish, aquatic invertebrates, otter and amphibians, are discussed in more detail in **Section 5.5 Biodiversity** of this PEIR.

5.6.8. Two priority outfalls (identified by Highways England as being at risk of polluting the watercourses they flow in to) have been identified from Highways England Drainage Data Management System (HADDMS) within 0.5km of the Scheme alignment with an overall status of ‘X’ (Risk Addressed) and ‘Not determined’. The reasons for this classification will considered further through the EIA. No Priority A or B outfalls (high priority) were identified.

5.6.9. Analysis of the existing highway drainage system indicates there are existing highway drains that discharge to local watercourses along the A1 and local access roads. Further information will be obtained during the course of the EIA.

Groundwater Features

5.6.10. A review of the British Geological Survey (BGS) mapping indicates that the Scheme is underlain by bedrock geology of the Yoredale group comprising limestone, sandstone, siltstone and mudstone. BGS mapping further indicates that the superficial deposits are mostly glacial till with small areas of glacial sands and gravels.

5.6.11. A review of the Environment Agency Groundwater map indicates that:

- The majority of the bedrock geology is classified as 'Secondary A Aquifer', described as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. A very small line of 'Secondary B Aquifer' is located to the north of Causey Park Bridge, described as predominantly lower permeability layers which may store and yield amounts of groundwater.
- The majority of the superficial deposits are classified as Secondary (Undifferentiated) Aquifer. A small section of superficial deposits classified as 'Secondary A Aquifer' is located along the River Coquet and Longdike Burn.
- The southern section of the Scheme, just to the north of Morpeth, is located within a total catchment (Zone 3) groundwater Source Protection Zone (SPZ) as shown on **Figure 2 Environmental Constraints Plan in Appendix B**. Total catchment (Zone 3) is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. SPZs are typically used to protect abstractions for public water supply. Certain land uses will be restricted in order to protect groundwater quality within the area.

5.6.12. A high-level review of historic borehole scans indicates groundwater depths of between two and eight metres.

Flood Risk

5.6.13. A review of the Environment Agency Flood Map for Planning (Rivers and Sea) indicates that the majority of the Scheme alignment is located in the low-risk Flood Zone 1. However, the Scheme does include sections located in the medium risk Flood Zone 2, and the high-risk Flood Zone 3, as shown on **Figure 2 Environmental Constraints Plan in Appendix B**. The identified fluvial flood risk is associated with the following watercourses: the River Coquet, Longdike Burn (and the Poxtondean Burn that discharges into the Longdike Burn), Earsdon Burn, the River Lyne and Floodgate Burn.

5.6.14. Historic flood incidents were identified during the November 2016 public consultation. An existing outfall from the A1 surface water drainage system is understood to discharge into the Back Burn via a settlement pond but without any attenuation. Anecdotal evidence suggests that the discharge has contributed to flooding at nearby properties. Another historic flooding issue was highlighted to have occurred approximately 500m to the west of the existing A1. Anecdotal reports suggest that this flooding event occurred along the length of the field north from Fenrother Lane and was associated with the unnamed tributary of Fenrother Burn. The LLFA and Environment Agency will be consulted during the EIA and FRA to verify this information and identify any other historic flood events.

5.6.15. Consultation with NCC has highlighted a number of issues regarding fluvial flooding from ordinary watercourses that will be considered further during the course of the EIA and Flood Risk Assessment (FRA):

- Flooding issues in Morpeth relating to the Cotting Burn, Benbridge Burn and Wansbeck.
- Flooding issues in Felton relating to the Bradley Brook, Back Burn and other watercourses.
- Performance of attenuation features associated with the existing alignment of the A1 near Felton.

5.6.16. The NCC Level 1 Strategic Flood Risk Assessment indicates significant flooding within the North East Northumberland river catchments from fluvial and pluvial sources since 1744. A

number of significant flood events are attributed to the River Coquet and impacted settlements and roads within 0.5km.

5.6.17. A review of the Environment Agency Flood Risk from Surface Water map indicates that sections of the Scheme are at high, medium and low risk of flooding from surface water sources. Flooding from surface water is typically associated with natural overland flow paths and local depressions in topography where surface water runoff can accumulate during or following heavy rainfall events.

5.6.18. The HADDMS indicates that the Morpeth to Felton section of the existing A1 has eight documented historical flood events of which 2 are detailed as high severity events resulting in the total closure of the carriageway.

5.6.19. A review of the Environment Agency Flood Risk from Reservoirs map indicates that the River Coquet is located at the downstream extent of the area identified to be at risk of flooding from the potential failure of Rayburn Lake located approximately 9.3 km to the south-west of where the existing A1 crosses the River Coquet. As the Scheme is located a significant distance from the reservoir, and the likelihood of reservoir failure is considered to be very small, the risk to the Scheme is not deemed to be significant. The Environment Agency Flood Risk from Reservoirs map does not show any areas within 0.5 km identified as being at risk of flooding from potential failure from the two covered reservoirs identified above in **paragraph 5.6.6.**

Sensitive Receptors

5.6.20. The following road drainage and water environment sensitive receptors have been identified:

- Watercourses, particularly the River Coquet which is designated a SSSI. A number of watercourses within 0.5km of the Scheme alignment are monitored against the objectives of the WFD and form part of wider catchments assessed to have good and moderate ecological quality.
- Groundwater resources. The Scheme alignment to the south around Morpeth is located within Zone 3 of a SPZ.
- Flood risk receptors including the proposed highway, residential receptors and agricultural land.

POTENTIAL IMPACTS

Construction

5.6.21. The construction of the Scheme may result in the following impacts upon surface water features, groundwater features and flood risk:

- Temporary increased pollution risks from spillage of fuels or other harmful substances that may migrate to local surface water and groundwater receptors.
- Temporary increased sedimentation within watercourses caused by surface water runoff from areas of bare earth, construction materials such as aggregate and stockpiles of topsoil.
- Temporary adverse impacts to the hydromorphological, chemical and ecological quality of watercourses associated with works within or in close proximity to watercourses such as the installation and alteration of culverts, bridges and outfalls as well as realignment of watercourses, including longer-term changes associated with sediment deposition.

- Increased flood risk associated with temporary works within areas of fluvial flood storage, works to existing watercourse alignments and culverts, and associated with changes to catchment permeability and hydrology.

Operation

5.6.22. The operation of the Scheme may result in the following impacts upon surface water features, groundwater features and flood risk:

- Permanent polluted surface water runoff containing silts and hydrocarbons that may migrate or be discharged to surface water features or groundwater resources via the proposed highway drainage system.
- Permanent adverse impact to the hydromorphological and ecological quality of water features associated with works within or in close proximity to water features such as the installation and alteration of culverts, bridges and outfalls as well as realignment of watercourses.
- Permanent adverse impacts to catchment hydrology caused by the introduction of a barrier to natural overland flow and changes to natural catchment dynamics associated with the proposed highway drainage system and proposed watercourse diversions.
- Increased rates and volumes of surface water runoff from an increase in impermeable area or changes to the existing drainage regime leading to a potential permanent increase in flood risk.
- Permanent increased flood risk to the Scheme and to people and property elsewhere caused by displacement of flood water storage or crossing of watercourses thus impacting flood flow conveyance.

DESIGN, MITIGATION AND ENHANCEMENT MEASURES

Construction

5.6.23. A CEMP would be prepared for the Scheme, and would include method statements for the proposed works, details of materials to be used, and an emergency response plan. The CEMP would contain measures to protect both surface and groundwater quality, and other water resource aspects.

5.6.24. During the construction phase, consideration would be given to potential impacts to catchment hydrology and flow within existing watercourses. Temporary diversions may need to be established prior to undertaking the works to maintain existing catchments and flow regimes. Temporary drainage systems may also be required to capture, manage and attenuate flow prior to discharge to prevent increased flood risk.

Operation

5.6.25. The following design, mitigation and enhancement measures will be developed further during the EIA process:

- A robust surface water drainage system will be provided as part of the Scheme design, to ensure discharge from the Scheme does not increase flood risk elsewhere up to and including the 1 in 100 (1%) annual probability rainfall event, allowing for climate change effects. The current surface water drainage system along the existing A1 is designed to 20% climate change allowance. An assessment of the Scheme surface water drainage design requirements for 40% climate change allowance is currently being undertaken. Further consultation with NCC as the LLFA will be undertaken regarding which allowance the proposed surface water drainage system will be designed to.

- In sections of the Scheme where online improvements are proposed, consideration will also be given to the ability of the existing drainage systems to receive any additional flows. In sections where offline improvements are proposed, consideration will be given to the provision of new drainage systems that provide sufficient attenuation and restrict the rate and volume of discharge to a rate agreed with NCC as the LLFA.
- The proposed drainage strategy for the offline sections would comprise filter drains and grassed swales located adjacent to the highway with attenuation ponds prior to discharging to local watercourses at a controlled rate.
- As part of the Scheme design, surface water runoff from the existing highway that would become part of the local road network would be stored in attenuation ponds and other Sustainable Drainage Systems (SUDS) features prior to discharging into local watercourses at a controlled rate.
- Surface water runoff is likely to contain high levels of sediment and hydrocarbons that can pollute surface water and groundwater features through direct migration or via the surface water drainage system. A robust treatment system will be required as part of the Scheme design. Existing drainage arrangements and water treatment provision is currently being investigated. The works may provide an opportunity to provide betterment. Multi-stage proposals that maximise passive treatment through the use of SUDS would be considered. This will be assessed further during the EIA.
- The Scheme design may offer an opportunity for betterment, for example if attenuation can be introduced in areas where it is not currently provided prior to discharge. This will be clarified as the design progresses and within the EIA in line with further consultation with NCC and the Environment Agency.
- Isolated sections of the Scheme are identified to be at risk of surface water flooding. This is due to natural depressions in topography and overland flow paths, typically associated with the watercourses that are crossed by the Scheme. In order to protect the Scheme, consideration will be given in the design to maintaining these overland flow paths and localised raising of ground levels to mitigate the potential impact of surface water flooding on the highway and to its users. The works also present an opportunity to reduce existing surface water flood risk to the highway alignment through enhancement of the existing drainage system. This will be clarified as the design progresses.
- Widening of existing highway culverts and bridge crossings and watercourse diversions as part of the Scheme design would maintain hydraulic capacity and, where possible, explore opportunities to provide betterment. New crossings of watercourses and new watercourse channels would maintain the capacity of the channel, ensure no increased flood risk up to the 1 in 100-year event considering the potential effects of climate change (plus 20-25% as agreed with the Environment Agency), be designed in accordance with DMRB guidance, and be sensitive to ecological requirements.
- Parts of the Scheme are located within the high-risk Flood Zone 3. Any loss of fluvial flood storage would be compensated on a like-for-like basis, as part of the Scheme design, to ensure no increased risk of flooding to the Scheme or elsewhere up to the 1 in 100-year event considering the potential effects of climate change.

LIKELY SIGNIFICANT EFFECTS

5.6.26. It is unlikely that all potential impacts during the construction phase can be fully mitigated due to the proximity of the works to the identified surface water features. However potential impacts during construction are likely to be temporary with no permanent adverse effect, and not likely to be significant.

5.6.27. With the implementation of mitigation measures during the operation phase, some of which will be integrated into the Scheme design, residual effects as a result of operation are not likely to be significant.

5.6.28. A summary of the preliminary likely significant effects is presented in **Table 5-14** below, based upon currently available information and professional judgement.

Table 5-14 – Summary of Preliminary Likely Significant Effects

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Watercourses (particularly the River Coquet which is designated a SSSI)	Construction	Temporary pollution risks from spillage of fuels or other harmful substances that may migrate to local surface water receptors.	Measures would be included in the CEMP to protect surface, groundwater and other water resources	Not anticipated.
		Temporary increased sedimentation within watercourses caused by surface water runoff from areas of bare earth, construction materials such as aggregate and stockpiles of topsoil.	Measures would be included in the CEMP to protect surface, groundwater and other water resources	Not anticipated.
		Temporary adverse impacts to the hydromorphological, chemical and ecological quality of watercourses associated with works within or in close proximity to watercourses such as the installation and alteration of culverts, bridges and outfalls as well as realignment of watercourses, including longer-term changes associated with sediment deposition.	Temporary diversions may need to be established prior to the works to maintain existing catchments and flow regimes.	Not anticipated.
	Operation	Permanent polluted surface water runoff containing silts and hydrocarbons may migrate or be discharged to	A robust treatment system will be included as part of the surface water drainage system.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		surface water features via the proposed highway drainage system.		
		Permanent adverse impact to the hydromorphological and ecological quality of water features associated with works within or in close proximity to water features such as the installation and alteration of culverts, bridges and outfalls as well as realignment of watercourses.	The culverts, bridges, outfalls and watercourse realignments would be designed to be sensitive to ecological requirements.	Not anticipated.
Groundwater resources	Construction	Temporary pollution risks from spillage of fuels or other harmful substances that may migrate to local groundwater receptors.	Measures would be included in the CEMP to protect surface, groundwater and other water resources	Not anticipated.
	Operation	Permanent polluted surface water runoff containing silts and hydrocarbons that may migrate or be discharged to groundwater resources via the proposed highway drainage system.	A robust treatment system will be included as part of the surface water drainage system.	Not anticipated.
Flood risk receptors (including the proposed	Construction	Increased flood risk associated with temporary works within areas of fluvial flood storage, works to existing watercourse alignments and culverts,	Temporary drainage systems may also be required to capture, manage and attenuate flow prior to discharge to prevent increased flood risk.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
highway, residential receptors and agricultural land)		and associated with changes to catchment permeability and hydrology.		
	Operation	Increased flood risk to the Scheme and to people and property elsewhere caused by displacement of flood water storage or crossing of watercourses thus impacting flood flow conveyance.	New watercourse crossings and new watercourse channels would maintain the capacity of the channel, ensure no increased flood risk up to the 1 in 100-year event considering the potential effects of climate change. Any loss of fluvial flood storage would be compensated on a like-for-like basis to ensure no increased risk of flooding up to the 1 in 100-year event considering the potential effects of climate change.	Not anticipated.
		Permanent adverse impacts to catchment hydrology caused by the introduction of a barrier to natural overland flow and changes to natural catchment dynamics associated with the proposed highway drainage system and proposed watercourse diversions.	New watercourse channels would maintain the capacity of the channel; and ensure no increased flood risk up to the 1 in 100-year event considering the potential effects of climate change. A robust surface water drainage system would be provided to ensure discharge from the Scheme does not increase flood risk elsewhere up to and including the 1 in 100 (1%) annual probability	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
			rainfall event, allowing for climate change effects.	
		Increased rates and volumes of surface water runoff from an increase in impermeable area or changes to the existing drainage regime leading to a potential permanent increase in flood risk.	A robust surface water drainage system would be provided to ensure discharge from the Scheme does not increase flood risk elsewhere up to and including the 1 in 100 (1%) annual probability rainfall event, allowing for climate change effects.	Not anticipated.

**The mitigation measures indicated are preliminary, based upon available information. These are subject to further design and assessment work during the EIA.*

FURTHER WORK FOR THE EIA

5.6.29. A detailed level assessment of potential impacts to road drainage and the water environment during the construction and operational phases of the Scheme will be undertaken in accordance with the methodology set out in DMRB HD45/09 Volume 11, Section 3, Part 10 "Road Drainage and the Water Environment" (**Ref. 5.23**).

5.6.30. In addition to the methodology stated in the Scoping Report (refer to **Volume 3, Section 12 Road Drainage and the Water Environment**), and in response to the Scoping Opinion (refer to **Volume 2, Section 4.6**), the following will be carried out for the EIA:

- The ES will clarify the study area for the assessment, and how it has been defined.
- Further consultation will be undertaken with the Environment Agency and NCC to ensure appropriate mitigation and potential enhancement measures are recommended.
- The carriageway drainage would be directed into balancing ponds and runoff would be attenuated to reduce the potential impact upon water quality. Such features would be appropriate to the landscape and support native flora and fauna where possible. This will be investigated further through the EIA. In addition, further consideration of the use of wetland filter systems will be undertaken.
- If possible, fish passage on new culverts would be incorporated into the Scheme. This will be investigated further through the EIA. Fish passage improvement will also be investigated and considered within the existing culverts.
- Where any stabilisation to banks is required, the use of soft engineering (for example planting and geotextiles[8]) would be used before hard engineering techniques (for example retaining walls made from concrete or gabions[9]). This will be investigated further through the EIA.
- Monitoring to measure the success of any mitigation and enhancement measures will be considered as part of the EIA. Monitoring of water quality during the construction phase may be required for ecologically sensitive sites.

5.7 GEOLOGY AND SOILS

INTRODUCTION

5.7.1. This section considers the implications of the Scheme on geology and soils during the construction and operational phases and any potentially significant effects.

EXISTING BASELINE KNOWLEDGE

Soil Quality

5.7.2. No sensitive soils (e.g. peats, heath) have been reported to have been observed at the surface of the Scheme Footprint. Given the agricultural nature of the Scheme location, they are considered unlikely to be present at shallow depth.

5.7.3. The soils associated with the Scheme and surrounding agricultural land are primarily described as slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils, classified as Grade 3 Moderate quality. An Agricultural Land Classification Survey will

[8] Permeable fabrics which, when used in association with soil, can separate, filter, reinforce, protect, or drain.
[9] A container filled with earth, stones, or other material and used in construction works.

be carried out to inform the assessment and to further subdivide agricultural land into distinct grades.

Geology

5.7.4. British Geological Survey (BGS) mapping and available historical ground investigations records for the area show Made Ground at shallow depths within the Scheme Footprint, which is described as dark grey/black clayey sand and gravel and dark grey-brown slightly sandy gravelly clay. Significant thicknesses were identified at Causey Park area. Potentially deeper deposits may be encountered associated with infilled ponds/quarries along the Scheme.

5.7.5. Superficial deposits are shown to include Alluvium (localised deposits adjacent to watercourses crossing the Scheme, and described as very soft dark grey very sandy clay), Glaciofluvial Deposits directly below alluvium, or at depth interlayered with glacial till and laminated glacial clay. Glaciolacustrine Deposits located between an upper and lower glacial till, and Glacial Till.

5.7.6. The bedrock comprises the Pennine Lower Coal Measures Formation which overlies the Stainmore Formation, cropping into the base of the glacial till to the east of the route. This is typically identified as a sequence of mudstone, shales, siltstones, sandstones and coal. Coal seams up to 0.5m thick occur between 13m – 17 m below ground level at Causey Park. Thin coal seams are observed between 30-35 m below ground level south of Felton. Stainmore Formation and Upper Limestone series of the Yoredale Formation is encountered as interbedded sandstone, siltstone, mudstone, shale, coal and fireclay across the Scheme Footprint.

Mining

5.7.7. Coal Authority records state that there are two areas of coal workings, one at Causey Park Hag and the other adjacent to the airfield at the northern end of the Scheme, both within the Scheme Footprint. A Mine Plan was obtained for the coal workings at Causey Park Hag, and a geophysical survey was undertaken and the findings presented in Preliminary Sources Study Report (PSSR) (Jacobs, 2017) (**Ref. 5.24**). There are nine mine entries within 500m of the Scheme Footprint as shown on **Figure 2 Environmental Constraints Plan in Appendix B**. Unrecorded mine entries may occur in addition to these. Proposed bridge structures will be treated as areas where possible unrecorded workings would pose an unacceptable risk. The potential risk of this will be further investigated.

Hydrogeology

5.7.8. The underlying Alluvium and Glaciofluvial Deposits are classified by the Environment Agency as Secondary A Aquifers. Glacial Till has been defined as a Secondary Undifferentiated Aquifer.

5.7.9. The Stainmore Formation, Pennine Lower Coal Measures Formation and Corbridge Limestone are classified as Secondary A aquifers. The Northern England Carboniferous Tholeiitic Dyke Swarm is classified as a Secondary B Aquifer.

5.7.10. The far southern extent of the Scheme is within a Groundwater Source Protection Zone (SPZ) 3.

5.7.11. Information relating to private groundwater abstraction has been requested from NCC.

Hydrology

5.7.12. Fifteen surface watercourses either cross or are located adjacent to the Scheme. These are summarised in **Table 5-15** below.

Table 5-15 - Surface Watercourses Crossing or Adjacent to the Site

Name	Existing A1 carriageway crossing type	Tributary of
Unnamed	Culvert	Benridge Burn
Cotting Burn	N/A	Shieldhill Burn
Shieldhill Burn	Culvert	Cotting Burn
Floodgate Burn	Culvert	River Lyne
River Lyne	Bridge	N/A
Fenrother Burn	N/A	Earsdon Burn
Earsdon Burn	Bridge	River Lyne
Unnamed	N/A	Earsdon Burn
Longdike Burn	Bridge	Thirston Burn
Bywell Letch	N/A	Longdike Burn
Unnamed	Culvert	Unknown
Unnamed	Culvert	Thirston Burn
River Coquet	Bridge	N/A
Unnamed	Culvert	Back Burn
Minto's Dean	Culvert	Back Burn

5.7.13. The area to the north of Causey Park Bridge is in a Surface Water Safeguard Zone for metaldehyde, which is a pesticide.

Unexploded Ordnance (UXO)

5.7.14. A desk based unexploded ordnance (UXO) assessment estimated the potential for up to six unexploded bombs, six incendiary bombs and seven high explosive bombs to have been dropped within 250 m of the Scheme between 1940 and 1941. The UXO hazard plan contained in the PSSR considers the site to be low risk of encountering below ground UXO.

Designated Sites

5.7.15. No geological related designations have been identified within 250m of the Scheme Footprint.

5.7.16. The River Coquet and Coquet Valley Woodlands SSSI intersects the Scheme in the north. It is designated due to it being a relatively unmodified fast flowing river that supports a wide range of flora and fauna.

Potential sources of Contamination

5.7.17. The following potential sources of contamination have been identified within 500m of the Scheme Footprint:

- Existing road network (A1), embankment fill materials (potentially pulverised fuel ash), oils and fuels.
- Agriculture – slurry, pesticides, herbicides, fertilisers.
- WW2 airfield and associated buildings – asbestos, aviation fuel, gasoline, diesel, antifreeze, radium-226 dials, solvents, fire-fighting agents, PCBs (polychlorinated biphenyl), hydraulic fluid, heavy metals (5m northeast).
- Garage and historical filling station – oils/fuels (located immediately adjacent to the existing carriageway in the south of the Scheme).
- Infilled ponds and quarries – filled with unknown Made Ground (various located within 250m of existing carriageway).
- Historical landfills, (Eshott 90m northeast) – industrial, commercial, household and liquids/sludge wastes and The Helm, Felton 0-20m northeast - inert wastes).
- Foot and mouth burial pits within the Scheme Footprint.
- Above ground storage tank, (1973-1996).
- Shallow Mine Workings at Causey Park Hagg.
- Hazardous mine gases.
- Hazardous ground gas associated with areas of infilled ground.
- General Made Ground.

Potential Contaminant Pathways

5.7.18. Potential pathways include:

Human Health

- Direct contact, soil ingestion and inhalation.
- Migration and accumulation of ground gas in excavations and inhalation/asphyxiation by site preparation, earthworks, and construction and maintenance workers.

Controlled Waters

- Infiltration of rainwater and leaching of contamination to shallow groundwater.
- Migration from groundwater into surface water bodies (main drains, network drains, ponds).
- Lateral and vertical leaching of contaminants into the underlying Secondary A Aquifer.

Sensitive Receptors

5.7.19. The following geology and soils sensitive receptors have been identified:

- Human Health: Construction workers, adjacent site users (visitors/workers), future site users and below ground maintenance workers.
- Controlled Waters: Surface watercourses and groundwater (Secondary A Aquifer).
- Soil: Agricultural Land Classification (ALC) Grade 3 undifferentiated.
- River Coquet and Coquet Valley Woodlands SSSI.

POTENTIAL IMPACTS

5.7.20. The impacts on the Geology and Soils are considered likely to be most significant during the construction phase of the Scheme. Potential impacts are summarised below:

Construction

- Loss of permanent and temporary agricultural land and soil as a result of land take.
- Temporary and permanent reduction in soil quality due to compaction by construction plant and workers.
- Adverse health related impacts to human receptors (e.g. construction workers and third parties) caused by exposure to contaminated ground, mine gas and buried UXO.
- Adverse health related impacts to humans associated with ground instability (e.g. shallow mine working collapses or collapse of the sides of any excavations).
- Temporary adverse impacts to controlled water bodies (including River Coquet and Coquet Woodlands SSSI) from the release of physical and chemical contaminants, resulting in reduced water quality and loss of aquatic organisms.

Operation

- Adverse heath related impacts to humans caused by exposure to contamination on any grass verges (e.g. inhalation of asbestos or contaminated dust).
- Permanent adverse impacts to controlled water from the release of uncontrolled spillages from vehicles, resulting in reduced water quality and loss of aquatic organisms.

DESIGN, MITIGATION AND ENHANCEMENT MEASURES

5.7.21. The following design, mitigation and enhancement measures may be implemented and would be developed further during the EIA process:

- A CEMP would be produced including measures to mitigate geology and soils risks associated with the construction phase. The CEMP would include measures associated with dust suppression, chemical storage, surface run-off, soil handling, storage and excavating potentially contaminated soils, waste generation and materials management.
- UXO mitigation measures, either (for zero risk tolerance) obtain a clearance certificate or (where risk tolerance is higher) train construction workers relating to risks and possible on site indicators and implement a scheme for actions to take if UXO is encountered.
- Earthworks being completed in accordance with a CL:AIRE compliant Materials Management Plan (MMP) to ensure re-used material does not present a risk to human health or the Environment.
- Ensuring construction workers wear appropriate Personal Protective Equipment (PPE) and use monitoring equipment where appropriate. Respiratory Protective Equipment (RPE) would be utilised where required to mitigate the potential risk of exposure to hazardous gas/vapour and/or depleted oxygen.
- A capping layer to be placed over any soft landscaped areas if contamination is identified in any Made Ground deposits.
- Incorporating a temporary drainage strategy during the construction phase as part of the design solution which would include pollution control measures.
- Temporary shoring associated with loose or unstable ground.
- Pollution control measures incorporated within the Scheme drainage system, as part of the design.
- In accordance with the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra / Department for Business Innovation and Skills), a Soil Management Plan would be devised as part of the CEMP and / or Site Waste Management Plan (SWMP). The Soil Management Plan would include measures to ensure careful management of the soil resources during construction, careful restoration of the land and subsequent agricultural aftercare including any necessary land drainage.

- Soil Management operations to be undertaken in general accordance with DEFRA's Good Practice Guide for Handling Soils.
- Coal Mining Risk Assessment to be undertaken setting out any mitigation measures to stabilise the ground, if required.

LIKELY SIGNIFICANT EFFECTS

5.7.22. It is anticipated that permanent mitigation and environmental enhancement measures are to be incorporated into the design of the Scheme and temporary mitigation measures would be implemented during the construction phase. As such the residual effects are not considered to be significant, subject to the findings of the Ground Investigation (GI).

5.7.23. A summary of the preliminary likely significant effects upon geology and soils is presented in **Table 5-16** below, based upon currently available information and professional judgement.

Table 5-16 – Summary of Preliminary Likely Significant Effects

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Agricultural Soil	Construction	Temporary and permanent loss of agricultural land and soil as a result of land take.	Soil management operations to be in accordance with Defra's Good Practice Guide for Handling Soils and the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites. Soil Management Plan to be implemented.	Not anticipated.
	Construction	Temporary and permanent reduction in soil quality due to compaction by construction plant and workers.		Not anticipated.
Human health (construction workers, maintenance workers, surrounding occupants)	Construction	Adverse health related impacts to human receptors (e.g. construction workers and third parties) caused by exposure to contaminated ground, mine gas and buried UXO.	Works to be undertaken in accordance with suitable CEMP. Appropriate health and safety procedures and remedial measures to be in place.	Not anticipated.
		Adverse health related impacts to humans associated with ground instability (e.g. shallow mine working collapses or failure of the sides of any granular excavations during construction resulting in collapse).	Coal mining risks assessment to be undertaken to assess risks and set out suitable mitigation measures (e.g. capping shafts, and grouting voids), if required. Temporary shoring associated with loose or unstable ground.	Not anticipated.
	Operation	Adverse heath related impacts to humans caused by exposure to	A capping layer to be placed over any soft landscaped areas if	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		contamination on any grass verges (e.g. inhalation of asbestos contaminated dust).	contamination is identified in any Made Ground deposits.	
Controlled water bodies (including Secondary A Aquifer, surface water courses River Coquet and Coquet Woodlands SSSI))	Construction	Temporary adverse impacts to from the release of physical and chemical contaminants, resulting in reduced water quality and loss of aquatic organisms.	Works to be undertaken in accordance with suitable CEMP. Temporary drainage strategy which would include pollution control measures.	Not anticipated.
	Operation	Permanent adverse impacts to controlled water from the release of uncontrolled spillages from vehicles impacting water quality and resulting in the loss of aquatic organisms.	Pollution control measures incorporated within the Scheme drainage system, as part of the design.	Not anticipated.

**The mitigation measures indicated are preliminary, based upon available information. These are subject to further design and assessment work during the EIA.*

FURTHER WORK FOR THE EIA

5.7.24. A detailed level assessment of potential impacts on geology and soil during construction and operation will be undertaken in accordance with the methodology set out in the DMRB Volume 11, Section 3, Part 11 "Geology and Soils" (**Ref. 5.25**).

5.7.25. A GI is currently being undertaken which will enable the refinement of the baseline conditions and characterisation of potential risks, to further inform mitigation recommendations. In addition, GI is proposed around the River Coquet in 2018 to assess and characterise the ground conditions in that area.

5.7.26. In addition to the assessment detailed in the Scoping Report (refer to **Volume 2, Section 13 Geology and Soils**), and in response to the Scoping Opinion (refer to **Volume 2, Section 4.7**), the following will be carried out for the EIA:

- An Agricultural Land Classification Survey will be carried out to inform the assessment and to further subdivide agricultural land into distinct grades.
- The River Coquet and Coquet Valley Woodlands SSSI will be considered as a potential environmental receptor within the ES, and potential impacts assessed.
- A Coal Mining Risk Assessment (or equivalent) will be produced to consider the risks from past mining activity and potential remedial measures.
- Monitoring to measure the success of any mitigation and enhancement measures will be considered as part of the EIA.

5.8 PEOPLE AND COMMUNITIES

INTRODUCTION

5.8.1. This section considers the implications of the Scheme on people and communities during the construction and operational phases and any potentially significant effects.

EXISTING BASELINE KNOWLEDGE

5.8.2. Further details on the health baseline can be found in the Scoping Report, **Volume 2, Section 14 People and Communities**.

Community Amenity and Severance

5.8.3. The Scheme is located within nine ward boundaries (according to the 2011 Census), the largest of which (approximately 50% of the route) is Longhorsley.

5.8.4. There are a number of communities on either side of the Scheme, accessed by the local road network and PRoWs. The following section lists the local communities within the vicinity of the Scheme Footprint.

5.8.5. Local communities near the Scheme include, but are not limited to:

- Northgate
- Hebron
- Fenrother
- Earsdon
- Causey Park
- Helm
- Burgham Park
- West Moor
- Felton

5.8.6. Morpeth, Felton and Longhorsley are the communities closest to the Scheme. Community receptors within these main population hubs predominantly comprise schools, churches, medical facilities and Royal Mail facilities, and are summarised in **Table 5-17**.

Table 5-17 – Community Facilities in Morpeth, Felton and Longhorsley

Community	Facilities
Morpeth	Morpeth NHS Centre
	Newminster Middle School
	Morpeth Rugby Football Club
	St Mary Magdalene Mitford
	St George's Hospital
	The King Edward VI School
	Chantry Middle School
	All Saint C of E First School
	Northumberland Head Injuries Unit
Felton	St Michael & All Angels Church
	Felton URC Church
	Felton First School
	Post Office
	Felton Park
	Blackwood Hall
Longhorsley	Longhorsley Village Hall
	Longhorsley Mission Free Church
	St Helen's Church
	St Thomas of Canterbury Roman Catholic Church
	Longhorsley First School

5.8.7. In addition to the community facilities in **Table 5-17**, the Tritlington C of E Aided First School is located adjacent to the Scheme, with access from an unnamed road between the A1 and Tritlington.

Physical Assets

5.8.8. The residential properties of Strafford House, Portland House, Welbeck House, Blackwood Hall and Earsdon Moor Farm as well as a number of residential properties in Northgate are located adjacent to the A1. None of these residential properties currently have direct access to the A1. A number of other properties lie very close to the A1 but not directly adjacent.

5.8.9. The following businesses are located directly on the east side of the existing A1:

- Jackson G K & Sons, garage services and vehicle recovery; with both direct access to the A1 and also access via a separate access road.
- Felmoor Park, holiday accommodation; accessed via a road leading between the A1 and Eshott Heugh Animal Park.
- Coquet Cottages, holiday cottages; accessed via a road leading between the A1 and Eshott Heugh Animal Park.
- Bockenfield Holiday Park; accessed via a road off of the A1.
- Eshott Airfield.

5.8.10. The following businesses are located directly on the west side of the existing A1:

- The Oak Inn, a country pub; accessed via a loop road off of the A1.
- Burgham Park Golf & Leisure Club, accessed via Burgham Park Road, itself accessed via a road off of the A1.

Local Economy

Population

5.8.11. According to the 2011 Census data, the resident population of Northumberland was 316,028. Northumberland is sparsely populated with 0.6 people per hectare. 51% of the population live in the 3% of urban land based mainly in the south east of the county. The three Morpeth wards that the Scheme lies within have a high population density in comparison to low population densities in the other wards (Morpeth Kirkhill has a density of 17.1 people per hectare, Morpeth North of 12.3 and Morpeth Stobhill of 17.9). Inward and outward migration to Northumberland is relatively stable.

Employment

5.8.12. NOMIS[10] data shows that in 2011 for Northumberland 67.9% of 16-74 year olds were economically active. This indicates that in comparison to the national average of 69.9%, a smaller percentage of the population of Northumberland are in employment. On a ward basis, Pegswood and Ponteland North have higher rates of economic activity than the national average. Three wards have a significantly higher proportion of economically inactive people than the national average: Amble West with Warkworth, Morpeth North and Longhorsley.

5.8.13. Although the most popular industries of employment vary by ward, the main industries of employment in the Scheme area are:

- Human health and social work activities
- Professional, scientific and technical activities
- Public administration and defence, compulsory social security
- Agriculture

Agricultural Land

5.8.14. The Scheme would lead to the temporary and permanent loss of agricultural land and potential severance of farm landholdings. The Agricultural Land Classification (ALC) for the Scheme is predominantly Grade 3. An ALC survey, including information on farm

[10] Nomis provides the most detailed and up-to-date UK labour market statistics from official sources.

landholdings, will be undertaken and used to inform the EIA, in order to determine the potential impact upon farmers / landholdings. The potential impacts upon physical attributes associated with soil will be considered through the Geology and Soils assessment, as indicated in **Section 5.7** of this PEIR.

Recreational Activities

5.8.15. A variety of recreational activities are known to be undertaken within the vicinity of the Scheme Footprint, in particular in and around the River Coquet. Such activities include angling, canoeing and boating on the River Coquet, picnicking and camping near to the River Coquet at Felton Park (which also includes outdoor sports facilities) and walking utilising the PRoW network.

All Travellers

Motorised Users: Driver Stress

5.8.16. The existing A1 currently experiences slight delays which causes driver stress. Delays are more problematic along the minor roads that join the A1 due to drivers having to wait for a gap in the traffic to join the A1.

Non-Motorised Users: Journey Length and Amenity

5.8.17. There are no national cycle routes in close proximity to the Scheme.

5.8.18. A network of PRoWs surrounds the existing A1 and the Scheme, as shown on **Figure 2 Environmental Constraints Plan in Appendix B**, a number of which provide access between residential properties and residential areas. In particular, to the west of the existing A1, where the offline section of the Scheme is proposed, PRoWs link several residential properties. Overall, PRoWs in the area do not form a coherent network, but there are sections where PRoWs may form peripheral parts of a coherent network lying further to the east or west, or where PRoWs link up (sometimes with local roads) to form a localised network of community or recreational importance..

5.8.19. **Table 5-18** provides a summary of the PRoWs within 500 m of the Scheme Footprint. Key routes have been determined by professional judgement based on the location of the PRoWs.

Table 5-18 – Summary of PRoWs within 500m of the Scheme Boundary

PRoW Ref.	PRoW Type	Description
407/010	Bridleway	Connects Northgate Farm and A697 with Northgate and the local road network.
407/013	Footpath	Connects Fair Moor with PRoW 407/012 (bridleway) and Heighley Wood, which jointly form a potential circuit with a minor local road.
407/012	Bridleway	Forms a potential circuit with PRoW 407/013 and a minor local road.
407/018	Footpath	Leads from the existing A1 to Hebron via The Bungalows.
407/001	Footpath	The PRoW does not seem to link any communities. However, part of the footpath runs parallel to Floodgate Burn and could

PRoW Ref.	PRoW Type	Description
		be used for recreational purposes. Appears to have some relationship with features of a remnant designed landscape associated with Espley Hall.
407/002	Footpath	Connects with PRoW 407/001.
423/001	Footpath	Connects Fenrother to the A1, near The Old School.
423/002	Footpath	Runs along a track from near residential properties adjacent to A1 to a farm at Tritlington Broom and on to the village of Tritlington. This is potentially an important community route.
423/006	Footpath	Leads from the bend in footpath 423/007 (below) westwards to agricultural land to the west of the existing A1, terminating at a track running south to a local road (Fenrother Lane) which links the A1, Fenrother and the A697.
423/007	Footpath	Leads from the A1, including Earsdon Moor Farm, westwards before turning north to New Houses Farm, where it also links with a track that leads west into agricultural land and north-east to the A1 near Causey Park Bridge.
423/008	Footpath	The footpath runs in the valley of the Earsdon Burn, linking the A1 near Causey Park Bridge with a minor road near Earsdon West Farm/Earsdon. Via a potential at-grade crossing of the A1, it continues the same line as footpaths 423/017 and 423/013. Together with local roads/tracks and footpath 423/009, it could form part of a wider network linking up a dispersed community and providing opportunities for circular walks.
423/013	Footpath	Connects Causey Park Bridge with Causey Park. Additionally, the footpath seems to form part of a wider PRoWs network and part of the same line as 423/008 and 423/017.
423/017	Footpath	Very short path through Causey Park Bridge, forming a short section of a single continuous line with 423/008 (east of the A1) and 423/013 (west of Causey Park Bridge).
422/018	Byway	Runs from the A1 south of Felmoor Park to and across Thirston Airfield, on a sinuous route to the east of the A1. Links with several minor roads and tracks and with another footpath (outside 500 of the Scheme) that runs on to West Thirston and Felton.
422/011	Footpath	Connects A1, Burgham Park and a local road to the west of the existing A1, which then provides further links on to other footpaths and bridleways outside 500 m of the Scheme.
422/002	Footpath	Runs westwards from the A1 along the upper edge of the wooded River Coquet gorge on its south side, linking with other

PRoW Ref.	PRoW Type	Description
		footpaths and tracks further west. Also links to 422/020 running eastwards from the A1 via an A1 crossing. Walking groups are known to use the footpaths in the River gorge.
422/020	Footpath	Runs eastwards from the A1 to Felton, along the upper edge of the wooded River Coquet gorge on its south side, linking with 422/002 (see above). Possibly an important recreational route. Walking groups are known to use the footpaths in the River gorge. However, the A1 crossing can be considered dangerous.
115/009	Footpath	Connects Felton westwards to a wider PRoWs network passing below the north end of the existing A1 bridge over the River Coquet gorge. The PRoW runs along the top of the north side of the River Coquet gorge through a wooded area. It also forms part of the following long distance routes: St Oswald's way, Tops of the North (Carlisle and Cheviot to Cat and Fiddle) and Inn Way to Northumberland. Therefore, this PRoW has been considered as a key recreational route. Walking groups are known to use the footpaths in the River gorge. However, the A1 crossing can be considered dangerous.
115/008	Footpath	Runs westwards from Felton through woodland to the A1, where it is severed by a cutting from 115/016, which would otherwise provide an onward connection to Park Wood and the continuation of 115/009, which forms part of several long-distance trails. There is a subway just to the north passing beneath the A1 which is not a public right of way, but which is reported to be used by walkers (feedback from public awareness event).
115/016	Footpath	Runs westwards from the A1 past the south side of Park Wood to provide a link with the continuation of 115/009, which forms part of several long-distance trails.
115/013	Footpath (St Oswald's Way)	Runs under the A1 bridge over the River Coquet
N/A	On road cycle path/ pavement	Approximately 2.5km road cycle path/ pavement on the east side of the A1 between the junction with the A192 and the junction turning to Hebron in Lower Espley
N/A	On road cycle path/ pavement	Approximately 3km on the east side of the A1 between the Shield Green/ Tritlington Road junction with the A1, and the west road junction north of Causey Park.

5.8.20. In addition to the PRoWs, there are footways along several sections of the existing A1, including much of the southern third of the section, around Tritlington and Causey Park Bridge and on the bridge over the River Coquet.

5.8.21. Side road junctions with the A1 provide crossroads or staggered junctions with the potential to link recreational networks one side of the A1 with networks on the other side. While some of these locations may, in principle, be attractive to NMUs, there is a high potential for suppressed demand due to the volume and speed of traffic making crossing difficult.

5.8.22. Non-motorised User (NMU) surveys carried out between July and September 2016 suggest that the most popular PRoWs were the Byway 422/011 (Felmoor Park) and Footpath 115/009 (north side of River Coquet). The majority of users were concentrated at five locations:

- Highlaws Junction
- Causey Park Bridge (off the line of the A1)
- Byway north of Helm
- West Moor Junction
- St Oswald's Way, in the River Coquet Valley

5.8.23. Whilst busy pedestrian movements on non-PRoWs were recorded on West Moor junction and Causey Park Bridge South, the most popular cycling routes were at Highlaws/Hebron junction and West Moor junction. There was very limited movement by equestrians during the surveys with only two recorded on the existing A1 between Morpeth to Felton (one at the Highlaws/Hebron junction and one at the southern end of the section). In both cases, the equestrians were noted to be moving away from the A1.

5.8.24. A further set of surveys are to be undertaken in 2018 to inform the Walking, Cycling and Horse Riding Assessment (WCHRA). The results of these surveys will be used to further inform the baseline within the ES.

Sensitive Receptors

5.8.25. The following people and communities sensitive receptors have been identified.

Community Amenity and Severance

- The users of community facilities within Morpeth, Felton and Longhorsley.
- Tritlington C of E Aided First School is located adjacent to the Scheme, accessed via an unnamed road between the A1 and Tritlington.

Physical Assets

5.8.26. Those who live in the residential properties of Strafford House, Portland House, Welbeck House and Blackwood Hall as well as a number of residential properties in Northgate which are located next to the A1, including North Gate House.

5.8.27. The following businesses, which are located within the vicinity of the Scheme:

- Jackson G K & Sons, garage services and vehicle recovery; with both direct access to the A1 and access via a separate access road.
- Felmoor Park, holiday accommodation; accessed via a road leading between the A1 and Eshott Heugh Animal Park.
- Coquet Cottages, holiday cottages; accessed via a road leading between the A1 and Eshott Heugh Animal Park.
- Bockenfield Holiday Park; accessed via the road off the A1.

- The Oak Inn, a country pub; accessed via a loop road off the A1.
- Burgham Park Golf & Leisure Club, accessed via Burgham Park Road, itself accessed via a road off the A1.
- Eshott Airfield.

Local Economy

- Economic receptors (i.e. individuals of working age within the local (Northumberland) or regional area (North East of England).
- Economic receptors (such as food stores or accommodation providers) at a local level (Northumberland) and at a regional level (North East of England).

Agricultural Land

- Best and Most Versatile (BVM) agricultural land
- Farm landholdings

Recreational Activities

- Users of the River Coquet for recreational and leisure activities (including individuals from the local area and wider).

Motorised Users

- Users of the A1 and the main routes connecting to the A1 in the vicinity of the Scheme.

Non-Motorised Users

- Users of the PRoW and non-designated footpaths within the Scheme Footprint or in its immediate vicinity as shown on **Figure 2 Environmental Constraints Plan in Appendix B**.

POTENTIAL IMPACTS

Construction

5.8.28. The construction of the Scheme may result in the following temporary impacts upon people and communities:

- Potential for an adverse change in users' amenity value in terms of noise, dust and disruption to views within the community and along PRoW.
- During construction, physical assets (including commercial assets such as holiday accommodation, a car repair garage, a country pub, a golf club and Eshott Airfield and community facilities (e.g. the Tritlington C of E Aided First School)) could experience adverse impacts in relation to disruption in access and amenity value.
- As part of the construction works, the residential property North Gate House would be demolished.
- Potential temporary loss of private land for construction compounds and/or diversions.
- There is potential for a beneficial impact during construction on the local economy as expenditure within the local supply chain is likely to increase during the construction works. Furthermore, construction could generate direct employment opportunities.
- Potential changes to availability of recreational resources and access may include disruption to routes and facilities due to construction activities / vehicles.
- Potential for an adverse change in amenity value and disruption to recreational activities, such as angling, in terms of noise, dust and disruption to views.
- Temporary and permanent severance / disruption to farm landholdings and effects on viability of farm businesses.

- Eight PRoWs would be directly affected by the Scheme and would be temporarily closed or diverted during construction. Users of six other PRoWs within the 500m study area could experience loss or reduction of amenity due to noise and air quality effects, particularly for any that pass within 100m of the Scheme. Refer to **Figure 10: Proposed Changes to Non-Motorised User Access** in **Appendix B**.

Table 5-19 – Summary of Potential Impacts on PRoWs within 500m of the Scheme boundary

PRoW Ref.	PRoW Type	Description
407/001	Footpath	Currently, as this footpath is not easily accessible from the western side of the A1, it is proposed that the PRoW is linked south to PRoW 407/018 on the eastern side of the A1, to increase connectivity. It is also proposed to be extended north to tie in with the de-trunked section of the A1 by Priests Bridge.
423/001	Footpath	Scheme would sever this route with no provision for NMUs. Adverse effects because of diversion to the north to Fenrother Junction (on both east and west side), thereby increasing journey times. Footway would be provided on the southern bound side of the carriageway at Fenrother Junction to allow a safe crossing.
423/002	Footpath	Footpath would be locally diverted on the eastern side to tie into the proposed grade separated crossing leading to slightly positive effects.
423/006	Footpath	Adverse effect as footpath would be severed by the offline section of the Scheme, but these footpaths do not tie into a wider network and are relatively short, therefore would be stopped-up.
423/007	Footpath	Adverse impact as footpath would be severed by the offline section of the Scheme, but these footpaths do not tie into a wider network and are relatively short, therefore would be stopped-up on the western side of the A1. The PRoW would remain on the eastern side.
423/013	Footpath	This footpath would be severed by the A1. However it would be diverted on the eastern side of the Scheme to Causey Park overbridge. A footway would be provided over the A1 on the southern side of Causey Park overbridge and would tie-in with PRoW 423/013 where it starts on Causey Park Road.
422/011	Footpath	There is no grade separated NMU route at this location and users would face a diversion to the North to tie-in with proposed access track which links to West Moor Junction.
115/013	Footpath (St	Route to be maintained under new bridge.

PRoW Ref.	PRoW Type	Description
	Oswald's Way)	
422/002	Footpath	Adverse impacts: The footpaths to the southern side of the River Coquet cross the A1 at-grade with no proposed grade separated option. This grade separation is currently provided via an underpass on the northern side. The Scheme would sever this already dangerous crossing point. However, the route of the footpath would be maintained although how this would be achieved is not yet finalised.
422/020	Footpath	Adverse impacts: The footpaths to the southern side of the River Coquet cross the A1 at-grade with no proposed grade separated option. This is currently provided on the northern side with an underpass. The Scheme would severe this already dangerous crossing point. However, the route of the footpath would be maintained although how this would be achieved is not yet finalised.
115/008	Footpath	There is an underpass in close proximity to the route and, whilst it is not a designated PRoW, it is used by NMUs. Upgrading this route to a recognised PRoW would assist NMUs in crossing the A1 at this point. The footpath would be diverted to pass through the underpass to maintain the connectivity of the routes crossing the A1 north of the River Coquet.
115/016	Footpath	There is an underpass in close proximity to the route and, whilst it is not a designated PRoW, it is used by NMUs. Upgrading this route to a recognised PRoW would assist NMUs in crossing the A1 at this point. The footpath would be diverted to pass through the underpass to maintain the connectivity of the routes crossing the A1 north of the River Coquet.
407/010	Bridleway	Bridleway between a farm and adjacent road network could be affected by proposed access roads, which could lead to an increase in traffic, increasing the risk of collision with NMU's, particularly equestrians.
422/018	Byway	A busy NMU cross route junction located on the eastern side of the A1, which could link to an adjacent western side road junction further north, primarily for pedestrians based on the NMU survey data. Felmoor camp/lodge site is located on the eastern side of the A1 and would be an attractor for some NMUs.
422/011	Byway	A staggered crossroad junction with a footpath on the western side. Recorded NMU movements could be related to Felmoor

PRoW Ref.	PRoW Type	Description
		campsite to the south. There is no grade separated NMU route at this location and users would face a diversion of approximately 1km to access a grade separated crossing point, increasing journey times and thus leading to adverse effects.
N/A	On road cycle path/ pavement	Approximately 2.5km road cycle path/ pavement on the east side of the A1 between the junction with the A192 and the junction turning to Hebron in Lower Espley.
N/A	On road cycle path/ pavement	Approximately 3km on the east side of the A1 between the Shield Green/ Tritlington Road junction with the A1, and the west road junction north of Causey Park.

- There may be some temporary disruption to motorised travellers on the A1 and the surrounding local road network, due to traffic management and construction works. This is likely to cause a temporary increase in driver stress.
- There is potential that traffic management measures could cause short-term disruption to commuters and business travel on the local road network, in particular the A697, which could increase driver stress.
- Some alterations to existing bus stops are proposed, including removal and addition.

Operation

5.8.29. The operation of the Scheme may result in the following impacts upon people and communities:

- Certain properties, such as Earsdon Moor Farm, would no longer be accessed directly from the new A1 during operation. New access would be provided via the proposed grade-separated junctions, thus allowing for safer access to and from the A1 for these residents.
- The de-trunked section of the A1 would separate the strategic, long-distance traffic along the Scheme from local traffic, therefore permanently reducing driver stress for local journeys and making local journeys safer.
- Potential changes to the amenity and access of recreational resources. This may increase amenity value for some areas, particularly those in the vicinity of the A697, but also reduce amenity value for routes closer to the Scheme. However, overall during operation, traffic would be attracted off other, unsuitable local roads onto the Scheme. This would relieve community severance along these local routes in the long-term, resulting in an overall beneficial effect.
- During operation, physical assets (including commercial assets holiday accommodation, a car repair garage, a country pub, a golf club and Eshott Airfield) and community facilities (e.g. the Tritlington C of E Aided First School)) could experience an improvement or disruption in access.

Local Community

Community Amenity and Severance

5.8.30. Traffic management systems and, potentially, diversion routes would be put in place as part of the Scheme design to maintain access to the identified community facilities, residential properties and communities, businesses and private land holdings.

Physical Assets

5.8.31. Direct access on to the A1 is considered to be less safe for motorists and residents and more disruptive to traffic than alternative access, and has therefore been avoided wherever possible in the design of the Scheme, whilst also maintaining connectivity of residents and businesses. For example, the Scheme design specifically includes direct access to Warreners House, an access track to Northgate Farm, an access track for Stafford House, an access track for New House Farm and an access track at Felmoor Park. These were all identified as places where access needed to be considered specifically as part of the Scheme design.

5.8.32. Landowners would be compensated for land required either temporarily during construction or permanently for the operation of the Scheme. Compensation has been agreed for the loss of North Gate House.

5.8.33. Only land required for temporary works would be reinstated to its former use following the completion of construction, in discussion with the relevant landowner.

Local Economy

5.8.34. Measures would be put in place, where possible, to maximise the potential for the workforce and project supply chain, to be sourced locally.

Recreational Activities

5.8.35. It is anticipated that any disturbance would be mitigated through careful timing of works and the implementation of a CEMP.

Agricultural Land

5.8.36. Although agricultural land required within the footprint of the route would be lost permanently, the following measures could be implemented during construction:

- Wherever possible, land required in addition for construction, for example for site compounds, would be returned to agricultural use.
- Severance during construction to be minimised through careful siting of construction compounds and lay down areas, and careful planning of construction activities through consultation with landowners.
- Crop loss can be reduced by giving advanced warning to enable farmers to plan ahead.
- Consideration of field drainage impacts during the design phase.
- Noise and dust to be kept to a minimum and within acceptable working limits, using best practice methods to be outlined in the CEMP.

All Travellers

Motorised and Non-Motorised Users

5.8.37. The following mitigation and enhancement measures would contribute to an improved experience for motorised and non-motorised users:

- Signage and layout would be clear to understand and avoid creating route uncertainty. Any diversions or closures undertaken during construction would be clearly advertised, and any diversionary routes (including PRoWs) would be clearly signposted and not lead to uncertainty. Details of traffic management measures would be set out within a Traffic Management Plan (TMP).

5.8.38. The Scheme design will include the following considerations:

- NMU facilities would be provided for at the proposed Highlaws/Hebron, Fenrother, West Moor compact grade separated crossings. They would also provide suitable links into the side roads and to the replacements for the current bus-stops, and have clear intervisibility through the tight road curves. The facilities from the side roads and across the bridge would be designed to accommodate pedestrians, cyclists and equestrians without the need to dismount.
- Footpath 423/001 would be diverted northwards to meet the side road immediately western and eastern side of the new Fenrother compact grade separated junction. Footway would be provided on the southern bound side of the carriageway at Fenrother Junction to allow a safe crossing.
- The proposed Causey Park overbridge would be designed to cater safely for pedestrians, cyclists and horse riders as well as vehicular traffic, including through the provision of equestrian parapets.
- The proposed Burgham underbridge would be designed to cater safely for pedestrians, cyclists and horse riders as well as vehicular traffic, with clear visibility for all users.
- The existing St Oswald's Way path (PRoW 115/013, as identified in **Table 5-18 and 5-19** above) passing under the A1 Bridge over the River Coquet would be extended so that it also passes under the new bridge, maintaining the connectivity of this long-distance route.
- Replacements for bus stops to be lost will be incorporated into the design wherever appropriate.

5.8.39. There are additional opportunities to reduce impacts on NMUs or to enhance facilities for them in association with the Scheme design, which are being considered at this stage:

- Bridleway 407/010, south of Warreners House, is affected by the Scheme at its extreme southern/eastern end, where it is a dead end with no connectivity. There is the opportunity to provide rights on the new access road to Warreners House, thereby mitigating the severance and enhancing the bridleway by providing connectivity.
- Maintain access between footpaths either side of the River Coquet.
- Works would be timed to ensure that the underpass is never closed at the same time as St Oswald's Way, so that there is always a route with a grade-separated crossing by which users can cross the A1 west of Felton and north of the River Coquet.
- Use of best practice design with regards to the safety of NMUs would improve the amenity of users of the footpaths in the surrounding areas. Additionally, landscaping that can provide screening of the road where possible and reduce noise level for the wider network of PRoW would also improve amenity for users.

LIKELY SIGNIFICANT EFFECTS

5.8.40. Although a best practice approach would be adopted to maximise enhancement and minimise adverse effects through mitigation, residual effects may still occur.

5.8.41. A summary of the preliminary likely significant effects is presented in **Table 5-20** below, based upon currently available information and professional judgement.

Table 5-20 – Summary of Preliminary Likely Significant Effects

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Local Community				
Community facilities and recreational resources within Morpeth, Felton and Longhorsley.	Construction	Potential severance due to construction activities. Potential for an adverse change in users' amenity value in terms of noise, dust and disruption to views within the community.	Traffic Management Systems/Plan, including diversion routes, to maintain access.	Yes
	Operation	Potential for disruption or improvement in access. Potential changes to the amenity and access of recreational resources. This may increase amenity value for some areas, particularly those in the vicinity of the A697, but also reduce amenity value for routes closer to the Scheme.	Ongoing liaison with communities to resolve issues.	Yes (beneficial and adverse)
		Potential relief in community severance and improvements in connectivity in the long-term due to a reduction in traffic along local routes.	None required.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Tritlington C of E Aided First School	Construction	Disruption due to changes in access and construction activities, and amenity value (noise, vibration, dust etc.).	Traffic Management Systems/Plan, including diversion routes, to maintain access.	Yes
	Operation	Potentially safer access associated with the de-trunking of the existing A1 in this area.	None required.	Not anticipated.
Businesses				
Businesses located within the vicinity of the scheme (as noted in **paragraph 5.8.28**).	Construction	Disruption due to changes in access and construction activities, and amenity value (noise, vibration, dust etc.).	Traffic Management Systems/Plan, including diversion routes, to maintain access.	Yes, depending upon level of access that can be maintained.
	Operation	Potential for disruption or improvement in access.	Ongoing liaison with communities to resolve issues.	Yes (beneficial and adverse)
Physical Assets				
North Gate House	Construction	Loss of private property.	Monetary compensation for permanent loss of property.	Not anticipated due to agreed compensation.
Private properties adjacent to the A1.	Construction	Temporary disruption and changes in amenity due to change in access to the A1.	Traffic Management Systems/Plan, including diversion routes, to maintain access.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		Temporary loss of land for temporary construction compounds and/or diversions.	Landowners would be compensated for land required either temporarily during construction or permanently for the operation of the Scheme. Land required for temporary works would be reinstated to its former use following the completion of construction.	Not anticipated.
	Operation	Change in direct access for some properties to create safer access.	None required.	Not anticipated.
Economic Receptors				
Individuals of working age within the local (Northumberland) or regional area (North East of England)	Construction	Generation of direct employment opportunities.	Measures, where possible, to maximise the potential for the workforce to be sourced locally.	Not anticipated.
Economic receptors (such as food stores or accommodation providers) at a local level (Northumberland) Economic receptors at a regional level (North East of England)	Construction	Potential benefit as expenditure within the local supply chain is likely to increase during the construction works.	Measures, where possible, to maximise project supply chain to be sourced locally.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Recreational				
Users of the River Coquet and recreational activities undertaken around the River Coquet.	Construction	Potential for an adverse change in amenity value and temporary disruption due to construction activities (potentially in terms of noise, dust and disruption to views).	Careful timing of works and the implementation of a CEMP.	Yes
All Travellers – Motorised Users				
Users of the A1	Construction	Increase in driver stress due to traffic management and construction works and associated increased journey times.	Signage and layout would be clear to understand and avoid creating route uncertainty. Any diversions or closures undertaken during construction would be clearly advertised, and any diversionary routes would be clearly signposted and not lead to uncertainty. Details of traffic management measures would be set out within a Traffic Management Plan.	Yes
	Operation	The de-trunked section of the A1 would separate the strategic, long-distance traffic along the Scheme from local traffic, therefore permanently reducing driver stress	None required.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		for local journeys and making local journeys safer.		
Users of main routes connecting to the A1 in vicinity of the scheme	Construction	There is potential that traffic management measures could cause short-term disruption to commuters and business travel on the local road network, in particular the A697. This has the potential to increase driver stress.	Signage and layout would be clear to understand and avoid creating route uncertainty. Any diversions or closures undertaken during construction would be clearly advertised, and any diversionary routes would be clearly signposted and not lead to uncertainty. Details of traffic management measures would be set out within a Traffic Management Plan.	Yes

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
All Travellers – Non-Motorised Users				
Users of the PRoW and non-designated footpaths within the Scheme Footprint or in its immediate vicinity	Construction	Potential for an adverse change in users' amenity value in terms of noise, dust and disruption to views. Potential changes to availability of recreational resources may include disruption to access and facilities due to construction activities / vehicles. Increase in journey length. Permanent severance of some PRoW. Potential enhancements to PRoW.	Clear signage to communicate diversions. Careful timing of works and the implementation of a CEMP. A number of design, mitigation and enhancement measures outlined in **paragraphs 5.8.39 and 5.8.40**. For example, additional landscaping to provide screening of the road, reducing noise levels.	Yes (beneficial and adverse)
Bus users	Construction	Some alterations to existing bus stops, including removal and addition.	Replacements for bus stops to be lost will be incorporated into the design wherever appropriate.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Agricultural Land				
Farm Holdings	Construction	Temporary and permanent severance / disruption to farm landholdings and effects on viability of farm businesses.	Reinstatement of land, where possible, to its former use following the completion of construction and additional measures outlined in **paragraph 5.8.37.**	Yes

**The mitigation measures indicated are preliminary, based upon available information. These are subject to further design and assessment work during the EIA.*

FURTHER WORK FOR THE EIA

5.8.42. A simple level assessment of potential impacts on people and communities during the construction and operational phases of the Scheme will be undertaken in accordance with methodologies set out in DMRB Volume 11, Section 3, Parts 6 "Land Use" (**Ref. 5.26**), Part 8 "Pedestrians, Cyclists, Equestrians and Community Effects" (**Ref. 5.27**) and Part 9 "Vehicle Travellers" (**Ref. 5.28**) into one assessment of People and Communities.

5.8.43. In addition to the assessment detailed in the Scoping Report (refer to **Volume 2, Section 14 People and Communities**), and in response to the Scoping Opinion (refer to **Volume 2, Section 4.8),** the following will be carried out for the EIA:

- A further set of surveys are to be undertaken in 2018 to inform the Walking, Cycling and Horse Riding Assessment. The results of these surveys will be used to further inform the baseline within the ES.
- An Agricultural Land Classification (ALC) Survey, including farmer interviews, will be carried out to inform the assessment and to further subdivide agricultural land into distinct grades.
- Further justification for the scoping out of potential impacts upon driver views will be presented in the ES.
- Further assessment of the loss of the residential property North Gate House will be undertaken and presented in the ES.
- As the overall design of the Scheme progresses consideration will be given for the potential to include components which would enhance the environment for walkers, cyclists and vulnerable users, and encourage active lifestyles.
- Monitoring to measure the success of any mitigation and enhancement measures will be considered as part of the EIA.

5.9 MATERIAL RESOURCES

INTRODUCTION

5.9.1. This section considers the implications of the Scheme on the consumption of materials resources and the generation, recovery and disposal of waste, which includes the recovery of site arisings, and their diversion from landfill.

EXISTING BASELINE KNOWLEDGE

Material Resources

5.9.2. The operation and maintenance of the current A1 requires the consumption of small volumes of materials including specialist components (for example, light bulbs, signage, steelwork for replacement barriers) as well as some bulk material (asphalt for minor re-surfacing) for routine works and repairs of the highway and ancillary infrastructure.

UK and Regional Perspective: Availably of Construction Materials

5.9.3. The North East has, in general, a lower availability of construction materials by comparison with other regions in England. However, the stocks / production / sales of construction materials typically required for highways construction schemes in the North East of England and across the UK remain buoyant.

5.9.4. **Table 5-21** provides a summary of the availability of the main construction materials in the North East and the UK, as required for delivery of typical highways schemes (**Ref.5.29**, **Ref. 5.30** and **Ref. 5.31**).

Table 5.21 - Construction materials availability in the North East of England and the UK

Material type	Availability (2015 unless otherwise stated)	
	North East	UK
Sand and gravel +	1.2Mt	52.5Mt
Permitted crushed rock *	3.1Mt	99.3Mt
Concrete blocks #	241,000m^3 (2014)	5.4Mm^3 (2014)
Primary aggregate *	6.0Mt	183Mt
Recycled and secondary aggregate *	1.25Mt (2013)	63Mt
Ready-mix concrete +	0.6Mm^3	25.2Mm^3
Steel +	(no data)	7.6Mt
Asphalt *	0.9Mt	26.3Mt

stocks
+ production
* sales

National and Regional Perspective: Transfer, Recovery and Recycling

National

5.9.5. Defra data (**Ref. 5.32**), as presented in **Table 5-22** shows that within England, the recovery rate for non-hazardous construction and demolition arisings have remained above 90% since 2010. This exceeds the EU target of 70%, which the UK must meet by 2020.

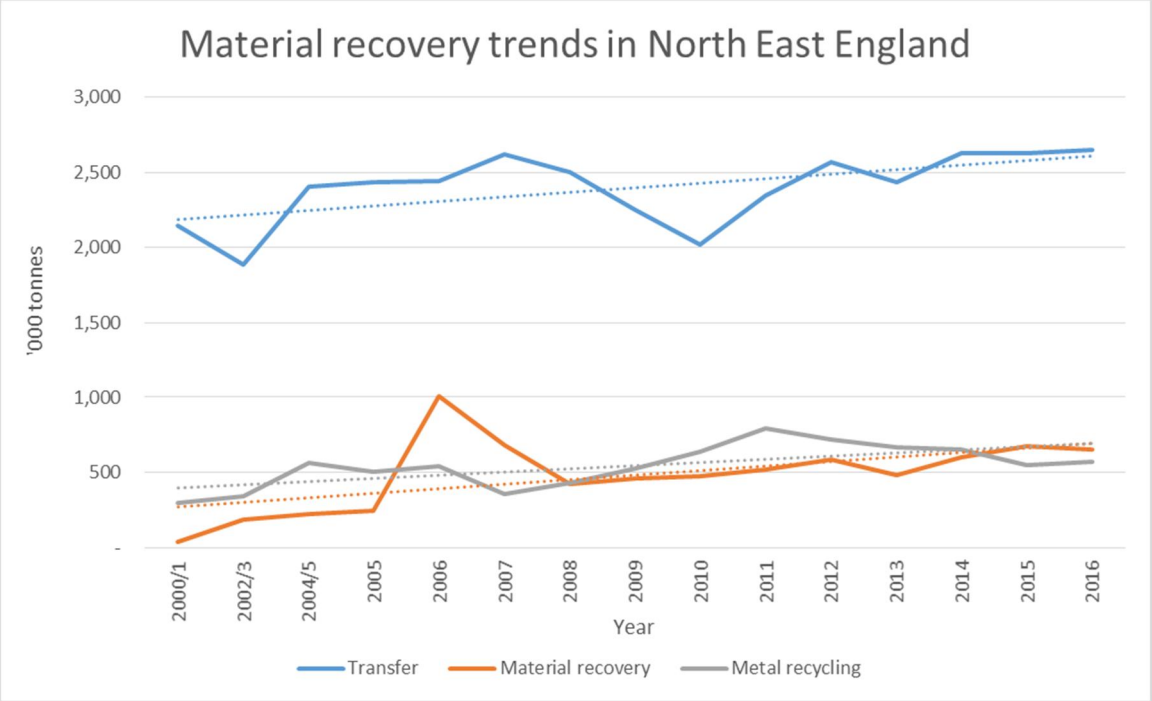
Table 5-22 – Non-hazardous Construction and Demolition Arisings Recovery in England

Year	Generation (mt)	Recovery (mt)	Recovery Rate (%)
2010	43.9	39.7	90.5%
2011	44.1	39.9	90.6%
2012	45.3	41.3	91.1%
2013	46.3	42.1	91.1%
2014	49.1	44.9	91.4%

Regional

5.9.6. **Insert 5-1** shows that rates of material transfer (non-civic), recovery and metal recycling within the north east of England have risen steadily over the 16 years. Data provided reflect

the recovery of all potential waste types in the region and hence will include, but are not specific to, construction, demolition and excavation arisings.



Insert 5-1 - Transfer, material recovery and metal recycling in the North East of England

5.9.7. Available data demonstrates that transfer, recovery and metal recycling trends generally remain consistent within the North East. This data also shows that there is likely to be regional infrastructure and capacity for the transfer and recovery for construction, demolition and excavation arisings from the Scheme. Construction and demolition recovery trends across England (**Table 5-22**) demonstrate further capacity in this context.

5.9.8. The availability of materials recovery infrastructure in the North East, and across England, suggests that there is strong potential to divert from landfill site arisings generated by the Scheme.

Waste Generation and Disposal

5.9.9. The operation and maintenance of the existing A1 currently generates small volumes of waste from routine maintenance, in combination with littering, light replacement, signage replacement, replacement of reflective road studs (cats' eyes), vegetation from verge clearance and minor barrier refurbishments.

5.9.10. Environment Agency data (**Ref. 5.33**) confirm that at the end of 2016, 26 permitted landfill sites were available in the north east. Capacity across these sites was:

- 10.2Mm^3 for inert (0.6Mt down from 2015)
- 15.2Mm^3 for non-hazardous (2Mt down from 2015)
- 7.0Mm^3 for hazardous waste (0.2Mt up from 2015)

Sensitive Receptors

5.9.11. The following sensitive receptors have been identified:

- Construction materials and their availability in the North East England and the UK.
- Landfill capacity in North East England.

POTENTIAL IMPACTS

Construction

5.9.12. The Scheme has the potential to generate adverse impacts from material resources during the construction phase as follows:

- During construction of the carriageway and supporting infrastructure, permanent adverse impacts from consuming primary and other materials are expected. These impacts would be the result of consuming resources such as aggregates, concrete, bitumen, steel and timber.
- During construction, permanent impact from wastes that would be expected to be generated from sources including, but not limited to, excavated arisings that cannot be reused or recycled (particularly during the breaking out of highway surfaces and concrete barriers), surplus cabling and timber from formwork.

5.9.13. The associated potential environmental impacts (both direct and indirect) would occur principally during construction, but also (though to a lesser degree) in the first year of operation and potentially beyond.

5.9.14. The effects associated with the described impacts include those associated with the production, processing, consumption and disposal of material resources. Associated adverse effects include: depletion of natural resources and reduction in landfill void capacity. Beneficial effects would be realised where primary material consumption can be reduced and where site arisings can be successfully diverted from landfill, and re-used or recycled.

5.9.15. The effects of the Scheme from material resources (including recovered site arisings) and waste generation and disposal, are likely to occur on-site, off-site within the UK and, potentially, internationally.

Operation

5.9.16. In the first year of operation, minor amendments and changes to the Scheme assets may be required. Depending on the extent of these changes, the potential to consume material resources (including the reuse of excavated and other arisings), and produce and discard waste may be permanently required. However, based upon professional judgement, it is considered there are unlikely to be significant effects in both the first year of operation, or beyond.

DESIGN, MITIGATION AND ENHANCEMENT MEASURES

5.9.17. Design and construction measures may comprise the following, where appropriate (refer to Scoping Report in **Volume 2** for further details):

- As far as possible, principles of material resource efficiency and waste minimisation would be incorporated into the Scheme design.
- Engage early with contractors to identify possible enhancement and mitigation measures, and to identify opportunities to reduce waste through collaboration and regional synergies.

- As far as possible, arisings from demolition and excavation would be re-used in the construction of the new roads and associated infrastructure.
- Identify opportunities to minimise the export and import of materials.
- Ensure arisings generated are handled, stored, managed and re-used or recycled as close as possible to the point of origin.
- A CEMP, incorporating a Site Waste Management Plan (SWMP) and Materials Management Plan (MMP) would be implemented in order to identify, monitor and manage material resources and waste arisings on site.

LIKELY SIGNIFICANT EFFECTS

5.9.18. It is anticipated that, with the implementation of effective mitigation measures, including designing out waste and the implementation of a CEMP, SWMP and MMP, there would be no significant residual effects associated with material resources. However, this assertion will be tested fully through the EIA.

5.9.19. A summary of the preliminary likely significant effects is presented in **Table 5-23** below, based upon currently available information and professional judgement.

Table 5-23 – Summary of Preliminary Likely Significant Effects

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Construction materials and their availability and in the North East England and the UK	Construction	Depletion of irreplaceable natural resources through the consumption of resources such as aggregates, concrete, bitumen, steel and timber. Beneficial effects would be realised where primary material consumption can be reduced.	¡ Incorporate the principles of material resource efficiency into design. ¡ Practicably minimise the export and import of materials. ¡ Re-use arisings from demolition and excavation in the construction of the new roads and associated infrastructure. ¡ Handle, store, manage and re-use or recycle site arisings as close as possible to their point of origin. ¡ Develop and implement a CEMP, incorporating a SWMP and MMP to identify, monitor and manage material resources and waste arisings on site.	Not anticipated.
	Operation	In the first year of operation, minor amendments and changes to the Scheme assets	None required.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		may be required, which could have the potential to consume material resources. However, such effects are anticipated to be negligible.		
Landfill capacity in North East England	Construction	Reduction in landfill capacity due to the generation and disposal to landfill of inert and non-inert (non-hazardous and hazardous) waste. Beneficial effects would be realised where site arisings can be successfully diverted from landfill, and re-used or recycled.	¡ Incorporate the principles of designing out waste into the design. ¡ Engage early with contractors to identify possible enhancement and mitigation measures, and to identify opportunities to reduce waste through collaboration and regional synergies. ¡ Develop and implement a CEMP, incorporating a SWMP and MMP to identify, monitor and manage material resources and waste arisings on site.	Not anticipated.
	Operation	In the first year of operation, minor amendments and changes to the Scheme assets	None required.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		may be required, which could have the potential to produce and discard waste. However, such effects are anticipated to be negligible.		

**The mitigation measures indicated are preliminary, based upon available information. These are subject to further design and assessment work during the EIA.*

FURTHER WORK FOR THE EIA

5.9.20. A detailed assessment of potential impacts on material resources during the construction and operational phases of the Scheme will be undertaken in accordance with the methodology set out in IAN 153/11 (Highways Agency, 2011) Environmental Assessment of Material Resources (**Ref. 5.34**).

5.9.21. In addition to the assessment detailed in the Scoping Report (refer to **Volume 2, Section 15 Material Resources**), and in response to the Scoping Opinion (refer to **Volume 2, Section 4.8** (duplication of numbering)), the following will be carried out for the EIA:

- Consideration of the potential emissions of transporting material resources and waste to and from site will be considered thorough the Climate Change assessment in the ES.
- Undertake consultation with NCC to determine whether there are recovered materials from treatment / processing facilities, or donor sites, which could be used to minimise potential impacts as a result of the Scheme.
- Monitoring to measure the success of any mitigation and enhancement measures will be considered as part of the EIA.

5.10 CLIMATE

INTRODUCTION

5.10.1. This section considers the implications of the Scheme on climate throughout the lifecycle of the Scheme and any potentially significant effects having applied appropriate enhancement and mitigation measures.

5.10.2. There are two components to the climate assessment - greenhouse gas (GHG) emissions and climate resilience.

- The GHG assessment will consider the contribution of the Scheme to climate change.
- The climate resilience assessment will consider the impact of projected climate changes on the Scheme itself, in terms of construction and operation and its ability to function, and upon human receptors within the Scheme area (e.g. operators and end-users of the Scheme).

EXISTING BASELINE KNOWLEDGE

Greenhouse Gases

5.10.3. The operation and management of the existing A1 is likely to require a small number of specialist components (for example, light bulbs and signage) as well as some bulk material (cement, concrete, sand and gravel) for minor works and repairs of the highway and ancillary infrastructure. These materials will have embodied emissions associated with them.

5.10.4. In relation to operation of the existing road infrastructure, the main emissions source is from end-users (i.e. road vehicles). At present an estimate of these emissions is not available.

Climate Resilience

5.10.5. The baseline for the climate resilience assessment comprises the recent historical (1961 to 1990) as well as the future projections for key climate parameters. The following figures are taken from the UK Climate Projections 2009 (**Ref. 5.35**):

- The mean daily minimum winter temperature between 1961 and 1990 is 0.8°C with a projected range of temperatures of 1.3 to 3.0 °C between 2010 and 2039 and 3.7 to 6.7 °C between 2070 and 2099.

- The mean daily maximum summer temperature between 1961 and 1990 is 19.2 °C with a projected range of temperatures of 18.1 to 20.5 °C between 2010 and 2039 and 18.5 to 26.6 °C between 2070 and 2099.
- The mean daily winter rainfall between 1961 and 1990 is 2.1 mm/day with a projected range of 1.8 to 2.7 mm/day between 2010 and 2039 and 2.0 to 3.2 mm/day between 2070 and 2099.
- The mean daily maximum summer rainfall between 1961 and 1990 is 1.9 mm with a projected range of 1.4 to 2.0 mm/day between 2010 and 2039 between 2070 and 2099.

POTENTIAL IMPACTS

Greenhouse Gases (GHG)

5.10.6. During construction, large sources of emissions are anticipated to be embedded carbon in raw material supply and manufacture including those associated with the pavement for road widening and the new dual carriageway and junctions (i.e. asphalt and aggregate) and also the new bridges (i.e. structural and reinforced steel and concrete). Emissions would also be generated through the construction process including transport and installation processes and land use change.

5.10.7. During operation, the main impact would be emissions from end-users (i.e. road vehicles) which may increase or decrease in comparison to the baseline. Emissions from the repair and refurbishment would also be generated.

Climate Resilience

5.10.8. There is potential for the effects of climate change to impact upon the Scheme during construction and operation, for example from increased temperatures, prolonged periods of hot weather and increased precipitation (especially during winter), and intense periods of rainfall and temperature extremes, which could lead to prolonged periods of hot weather resulting in warm and dry conditions. This may affect various infrastructure, assets and Scheme end users (i.e. road vehicles) through the generation and dispersion of dust which may impact on health risks to construction workers; flooding causing soil erosion, water scour causing structural damage, weakening or wash out of structural soils and increase risk of contamination of waterbodies; disruption to supply of materials and goods; stress on structure and surfaces and challenges for maintenance regimes.

DESIGN, MITIGATION AND ENHANCEMENT MEASURES

5.10.9. It is expected that a number of design, mitigation and enhancement measures will be considered as the Scheme progresses. These will be considered in the EIA and could include:

- Selecting construction methods which require less materials and construction activity (but not where this is at the expense of greater emissions at other lifecycle stages).
- Maximising the use of construction materials and products with recycled or secondary and low carbon content, from renewable sources, and offering sustainability benefit.
- Using locally-sourced materials where available and practicable to minimise the distance materials are transported from source to site.
- Using more efficient construction plant and delivery vehicles, and/or those powered by electricity of alternative/lower carbon fuels.
- Ensuring a Scheme design which reduces regional end user (traffic) emissions by improving the efficiency and flow of traffic movements in the area of the Scheme and the surrounding road network (e.g. due to the layout, profile or construction/materials used).

- Designing, specifying and constructing the Scheme with a view to maximising the operational lifespan and minimising the need for maintenance and refurbishment (with all the emissions that come with it).
- Designing, specifying and constructing the Scheme with a view to maximising the potential for reuse and recycling of materials/elements at the end-of-life stage.
- Specifying high efficiency mechanical and electrical equipment such as lighting and telecoms.
- Operating, maintaining and refurbishing the scheme using best-practice efficient approaches and equipment.

5.10.10. In terms of climate resilience, there are a variety of means to minimise the potential impacts which could include the following:

- Ensure the scheme design (in particular the drainage system) provides for climate change allowance relating to peak rainfall (i.e. prevents flooding as a result of heavy rainfall).
- Design and specification of Scheme elements such as pavement construction and expansion joints and other elements which are resilient to anticipated increases in peak summer temperatures.
- Wind restraints/baffles and/or monitoring and alert systems, for any locations which are particularly susceptible to risks of increasing wind intensity.
- Design and specification of Scheme elements such as pavement construction, drainage systems and embankments with a view to anticipated increases in peak rainfall as well as increased variability of ground conditions (wetting and drying).

LIKELY SIGNIFICANT EFFECTS

5.10.11. As 'climate' is a new topic, an assessment of residual effects was not undertaken during the previous development stages of the Scheme. Residual effects will, therefore, be identified through the EIA. However a summary of the preliminary likely significant effects is presented in the tables below. **Table 5-24** identifies the preliminary likely significant effects of the Scheme on climate change in relation to Greenhouse gas emissions. **Table 5-25** identifies the preliminary likely significant effects of climate change in relation to the Scheme.

Table 5-24 – Summary of Preliminary Likely Significant Effects

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
Global Climate	Construction	Increased GHG emissions during construction from: ¡ Raw material supply, transport and manufacture. ¡ Construction processes including transport, installation processes (fuel / energy consumption). ¡ Land use change and forestry.	¡ Maximising materials with recycled / secondary and low carbon content. ¡ Using locally sourced materials. ¡ Using efficient construction plant and delivery vehicles.	Not anticipated.
	Operation	GHG emissions generated through: ¡ Change in end-user traffic emission and GHG concentrations. ¡ Increased GHG emissions during operation (maintenance, repair and refurbishment).	¡ Through design, maximise operational lifespan; minimise maintenance / refurbishment need; and maximise reuse / recycling at end of life stage. ¡ Through design, improve the efficiency and flow of traffic movements in the area of the Scheme and surrounding road network. ¡ Specify high efficient mechanical and electrical equipment.	Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
			¡ Utilise best practice and efficient processes and equipment for maintenance.	

Table 5-25 – Summary of Preliminary Likely Significant Effects

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
The Scheme infrastructure, workers and users	Construction	Increased temperatures, prolonged periods of hot weather resulting in warm and dry conditions which exacerbate dust generation and dispersion and impact on health risks to construction workers.	Scheme design to be resilient to impacts arising from current weather events and climatic conditions, and designed in accordance with current planning, design and engineering practice and codes.	Not anticipated.
		Increased precipitation, and intense periods of rainfall resulting in: ¡ Flooding of works and soil erosion. ¡ Increased risk of contamination of waterbodies. ¡ Disruption to supply of materials and goods.		Not anticipated.
	Operation	Increased precipitation, especially in winter causing potential:		Not anticipated.

Receptor	Stage	Potential Impacts and Effects	Design and Mitigation	Likely Significant (Residual) Effects
		¡ Flooding. ¡ Water scour causing structural damage. ¡ Weakening or wash-out of structural soils. ¡ Change in ground water level and soil moisture.		
		Temperature extremes causing: ¡ Stress on structures. ¡ Stress on surfaces e.g. difficulties with maintaining required texture depth during construction and operation. ¡ Challenges for maintenance regimes.		Not anticipated.

**The mitigation measures indicated are preliminary, based upon available information. These are subject to further design and assessment work during the EIA.*

FURTHER WORK FOR THE EIA

5.10.12. An assessment of potential impacts on climate during the construction and operational phases of the Scheme will be undertaken in line with the NPS NN (2014) (**Ref. 5.36**).

5.10.13. In addition to the assessment detailed in the Scoping Report (refer to **Volume 2, Section 16 Climate**), and in response to the Scoping Opinion (refer to **Volume 2, Section 4.9**), the following will be carried out for the EIA:

- The HE Carbon Assessment Tool (an industry recognised carbon calculation tool) will be used to determine the quantity of emissions associated with the Scheme. However, there is currently no specific guidance on the carbon emission threshold, which if exceeded, is considered to be significant. The ES will set out how the significance of effects will be reported.
- The UK Climate Projections released in 2009 (UKCP09) remain the official source of information on how the climate of the UK may change over the rest of this century, and it is therefore proposed the assessment will use these. However, UKCP18 projections will be used if released and can be reasonably accommodated before the ES is finalised.
- Monitoring to measure the success of any mitigation and enhancement measures will be considered as part of the EIA.

6 ASSESSMENT OF CUMULATIVE EFFECTS

6.1 INTRODUCTION

6.1.1. This section considers the cumulative effects of the Scheme during construction and operation and details any potentially significant effects both as a result of "combined effects" and "cumulative effects" defined as follows:

- "Combined effects" are defined as cumulative impacts from a single project (for example the Scheme may result in noise and visual impacts upon the same receptor).
- "Cumulative effects" are from different projects (in combination with the project being assessed).

6.1.2. The assessment for cumulative effects is reliant on other topic assessments being well progressed and data relating to other developments in the vicinity being confirmed and as up to date as possible. As such, although this section presents the current understanding on likely cumulative effects it is not possible to identify likely significant effects with confidence at this stage.

6.1.3. Refer to the **Scoping Report in Volume 2** for full details of the methodology for the assessment.

6.2 EXISTING BASELINE KNOWLEDGE

6.2.1. Planning applications will be considered within a study area based upon the Affected Road Network (ARN) for traffic. If the ARN is not suitable, i.e. encompasses an area that is too extensive, the landscape ZTV will be used. The planning applications will be identified once the 'affected road network' has been defined, as the EIA progresses, and will include those submitted to NCC together with Highways England schemes likely to be constructed in the same time period as the Scheme. At the time of preparation of this PEIR, the following planning applications based upon an initial 500m study area, are likely to be considered in the assessment as they are considered to have the potential to result in cumulative effects. This will be reviewed and updated through the EIA.

Table 6-1 –Preliminary List of Applications for Consideration of Cumulative Effects

Application Ref	Site Description	Application Description	Decision Issue Date	Approx. Distance from Scheme Footprint	EIA required (y/n)
14/02477/FUL*	Land West of Burgham Park, Burgham Park, Felton	Change of use to residential (C3) by way of erecting an enabling development of 14. Detached executive homes	05 Jan 2016	500m west	N
13/02105/OUT**	Land South West of Northgate	Outline Planning Application for the proposed	23 Jul 2014	200m south east	N

Application Ref	Site Description	Application Description	Decision Issue Date	Approx. Distance from Scheme Footprint	EIA required (y/n)
	Hospital A192 District Boundary to Northgate Roundabout	development of approximately 255 residential dwellings with associated access			
14/02318/REM ***	Northgate Hospital, Northgate	Reserved matters application for outline application for planning permission 11/01439/FUL for the access, appearance, landscaping, layout and scale for residential dwellings and respective associated landscaping, parking, amenity space and waste recycling.	17 Oct 2014	Adjacent, east	N
N/A****	A1 Alnwick to Ellingham improvement scheme***	On-line dualling of the existing A1 between Alnwick and Elingham	N/A	12km	Y

* https://publicaccess.northumberland.gov.uk/online-applications/simpleSearchResults.do?action=firstPage
**https://publicaccess.northumberland.gov.uk/online-applications/applicationDetails.do?keyVal=MQ0OTUQS2L000&activeTab=summary
***https://publicaccess.northumberland.gov.uk/online-applications/applicationDetails.do?keyVal=N8P940QS0FV00&activeTab=summary
****http://roads.highways.gov.uk/projects/morpeth-to-ellingham-dualling/

Sensitive Receptors

6.2.2. The following sensitive receptors have been identified as having potential to be affected by the Scheme by more than one potential environmental impact:

- PRoW
- River Coquet and Coquet Valley Woodlands SSSI

- Dukes Bank Wood Ancient Woodland
- Local residential receptors, businesses and community facilities
- Cultural heritage assets
- Road users
- Controlled Waters: Surface watercourses and groundwater (Secondary A Aquifer)
- Protected species and habitats
- Flood Risk

6.3 POTENTIAL IMPACTS

6.3.1. The EIA will assess the potential impacts based upon results of baseline surveys and data collection, the information available about the key developments identified and the Scheme design.

6.3.2. Based upon the preliminary assessment, the following potential combined effects are anticipated:

- During construction and operation, a number of PRoW, road users, residential receptors, businesses and community facilities within the vicinity of the Scheme could experience adverse impacts as a result of increased noise levels and visual intrusion.
- The River Coquet and Coquet Valley Woodlands SSSI and the Dukes Bank Wood Ancient Woodland have the potential to experience significant adverse effects relating to a change in the landscape character, habitat loss and noise during construction.
- Watercourses such as the River Coquet, together with groundwater resources, could experience potential accidental pollution/discharge of materials during construction, which would adversely impact water quality and ecological attributes.
- Cultural heritage assets could experience temporary noise and visual impacts during construction.

6.3.3. Based upon other developments listed in **Table 6-1** above and the preliminary assessment, **Table 6-2** indicates the anticipated potential cumulative effects.

Table 6-2 –Preliminary Assessment of Potential Cumulative Effects

Application	Anticipated Cumulative Effects	Justification and Commentary
14/02477/FUL*	No significant cumulative effects predicted.	Due to the scale of the development (14 residential homes) and that it is adjacent to an area of existing residential dwellings and the distance of the development from the Scheme.
13/02105/OUT** and 14/02318/REM***	Air quality	Dust and emissions from vehicles upon nearby residents and other receptors during construction.
	Noise	Construction plant and activities causing increased noise levels to nearby residents and other sensitive receptors.
	Landscape and visual	Visual impacts during construction from compounds, moving vehicles and any lighting.

Application	Anticipated Cumulative Effects	Justification and Commentary
		Additional built features introduced into the landscape, which may obstruct views for nearby receptors.
	Biodiversity	Loss of habitat from land take or construction clearance works and impacts upon any protected or noteworthy species in the area during construction.
	Materials	Consumption of raw materials and the production of waste during construction.
	People and communities	Increased driver stress or journey time upon vehicle or non-motorised users during construction from any temporary diversions. Local economic benefits and employment opportunities through construction works. Physical assets (such as private dwellings, commercial or community assets) may experience a change in amenity during construction, as a result of nuisance.
A1 Alnwick to Ellingham (A1 A2E) Improvement Scheme	Air quality	Increased emissions from road traffic once operational due to increased demand.
	Noise and vibration	Increased noise level as a result of road traffic once operational due to increased demand.
	People and communities	Changes in driver stress and journey times from temporary diversions during construction. Beneficial effect to road traveller journey times once operational.
	Materials	Consumption of raw materials and generation of waste during construction.
	Climate	Increase in greenhouse gas emissions from construction traffic and vehicles once operational.

6.3.4. The list of applications will be updated and a full assessment of the potential cumulative effects will be undertaken as part of the EIA and reported in the ES.

DESIGN, MITIGATION AND ENHANCEMENT MEASURES

6.3.5. Where significant cumulative effects are identified during the EIA, mitigation will be specified to avoid, reduce or offset such effects.

LIKELY SIGNIFICANT EFFECTS

6.3.6. Based upon the current findings of the preliminary assessments, the following potentially significant combined effects are anticipated:

- Adjacent and/or nearby residential properties, other physical assets (e.g. businesses or community facilities e.g. Tritlington C of E Aided First School) – adverse noise, visual and access disruption effects during construction.
- Loss of Ancient Woodland (Dukes Bank Wood) during construction, resulting in a loss of habitat and landscape feature.
- Residential receptors adjacent or near to the new section of the Scheme – adverse noise and visual effects once the Scheme is operational, due to the introduction of road traffic in close proximity.
- River Coquet and Coquet Woodlands SSSI – Construction works and activities may cause adverse impacts from the risk from spillage of fuels or other harmful substances release of physical and chemical contaminants, increased sedimentation caused by surface water runoff and direct habitat loss, fragmentation and loss of biodiversity.

6.3.7. Based upon the preliminary list of other development applications and their potential impacts identified in **Table 6-1** and **Table 6-2**, likely significant cumulative effects include noise and vibration disturbance and disruption to travellers as a result of temporary diversions or road closures. However, this is considered indicative at this stage, as the cumulative assessment which will be undertaken for the EIA will be based upon a different study area (as discussed in **Section 6.2**) and an updated list of developments.

6.4 FURTHER WORK FOR THE EIA

6.4.1. A detailed assessment of the cumulative effects during construction and operation will be reported in the ES. This will follow the guidance contained in DMRB HA 205/08 Volume 11, Section 2, Part 5 “Assessment and Management of Environmental Effects” (**Ref 5.37**).

6.4.2. In addition to the methodology stated in the Scoping Report (refer to **Volume 2, Section 17 Assessment of Cumulative Effects**), and in response to the Scoping Opinion (refer to **Volume 2, Section 4.10**), the following will be carried out for the EIA:

- Planning applications within a study area based upon the ‘affected road network’ for traffic or the ZTV will be considered. These planning applications will be identified once the ‘affected road network’ has been defined, as the EIA progresses, and will include those submitted to NCC together with Highways England schemes likely to be constructed in the same time period as the Scheme.
- The sensitive receptors considered will include those that are likely to experience potential residual effects of ‘slight’ significance or above (i.e. negligible impacts will not be considered in the assessment of combined effects). This will ensure that all possible significant interactions are assessed.

7 SUMMARY

7.1.1. This PEIR informs the public about the EIA process and the likely environmental effects of the Scheme as part of the statutory consultation. The report precedes the EIA and as such is “preliminary” and is based on the most up to date information available at the time of writing. This PEIR has been informed by the Scoping Report and Scoping Opinion received from PINS. Any comments received during the consultation, where relevant, will be taken into consideration in both the design of the Scheme and the EIA. The assessments carried out for the EIA will be reported within the ES, which will be submitted as part of the DCO application in spring 2019.

7.1.2. The Scheme is classified within Annex I of the EIA Directive (**Ref. 1.2**). EIA is mandatory for the Scheme, in line with the EIA Directive and the EIA Regulations. The Scheme is likely to result in significant environmental effects.

7.1.3. EIA will be undertaken in line with the Design Manual for Roads and Bridges known as DMRB, the EIA Regulations and some environmental disciplines following additional best practice guidance.

7.1.4. Three options for the Scheme were shortlisted at the ‘Option Selection’ stage and presented during the non-statutory public consultation period in November 2016.

7.1.5. The Preferred Route for the Scheme (which was announced in September 2017 and can be viewed at: http://roads.highways.gov.uk/projects/morpeth-to-ellingham-dualling) comprises approximately 6.5 km of online widening, and approximately 6.1 km of ‘new’ offline dual carriageway between Priests Bridge and Burgham Park. Three new grade separated junctions, a new bridge over the River Coquet and associated works to culverts, drainage and signage are included.

7.1.6. The following is a summary of the potential impacts and likely significant effects for each technical topic:

7.2 AIR QUALITY

7.2.1. During construction, there is potential for temporary adverse impacts upon air quality due to emissions of dust from earthworks and general construction activity, and also loss of amenity due to the presence of construction traffic. In addition, traffic management measures may result in both positive and adverse changes to emissions from vehicle exhausts and roadside pollution concentrations.

7.2.2. Once operational, the Scheme is expected to result in both positive and adverse changes to emissions of oxides of nitrogen and nitrogen dioxide due to exhaust emissions from road traffic along the A1 and linked roads. A decrease in pollutants is expected as traffic moves away from the de-trunked sections of the Scheme and an increase in pollutants is anticipated along the new section of the Scheme. A potential long-term increase in nitrogen deposition could be generated on nearby sensitive designated ecological sites, such as the River Coquet and Coquet Valley Woodlands SSSI, as a result of increased traffic flows.

7.2.3. Best practice mitigation would be required to control dust and emissions during construction, and would be set out in a CEMP.

7.2.4. Following the implementation of mitigation measures, no significant residual air quality impacts are anticipated during construction or operation of the Scheme.

7.3 NOISE AND VIBRATION

7.3.1. Construction activities such as piling, breaking and demolition could result in temporary high levels of noise and vibration, causing disturbance to nearby receptors. Such works are anticipated for the construction of the grade-separated junctions, widening in verges, National Grid works and associated diversions and construction of the new bridge over the River Coquet. Should any night-working be required, further impacts as a result of noise would be likely. In addition, an increase in noise emissions from construction traffic and non-road mobile machinery could cause a temporary disturbance to proximate sensitive receptors.

7.3.2. During operation the Scheme could cause both permanent adverse and beneficial impacts. The generation of increased operational road traffic noise from increased flows may increase noise levels for sensitive receptors adjacent to the online section of the Scheme, and the offline section would introduce a new noise source for sensitive receptors. These could include Causey Park Hag, New Houses Farm, the Bungalow, Causey Park Bridge and Tindale Hill. A reduction in road traffic noise along the de-trunked section of the A1 would benefit adjacent sensitive receptors. These could include Priestbridge House, Earsdon Cottage, The Helm, Causey Park Lodge, Portland House and Wellbeck House, The Old School House and West View.

7.3.3. The CEMP would include measures to mitigate temporary noise and vibration impacts during construction. Such measures may include measuring noise levels at sensitive receptors during works, hoarding, screens or barriers to shield noisy activities, careful timing of works and deliveries, ensuring silence or sound reduced machinery and equipment is used and the adoption of a considerate and neighbourly approach to relations with the local residents. It is anticipated that a low noise TSCS would be incorporated where possible. The need for additional design measures such as noise barriers and noise insulation works will be assessed through the EIA.

7.3.4. Following the implementation of design considerations and mitigation and enhancement measures, no significant residual noise and vibration impacts are anticipated during construction or operation of the Scheme.

7.4 LANDSCAPE AND VISUAL

7.4.1. Potential impacts upon the landscape during construction are likely to include the direct loss or alteration of landscape features (including trees along Coronation Avenue) such as hedges, field boundaries, trees and woodland (including Ancient Woodland), temporary alteration to natural or cultural heritage features of interest and localised landscape impacts from the presence of temporary Scheme elements such as compounds and spoil heaps. Furthermore, temporary adverse impacts upon visual amenity could be generated from such construction works.

7.4.2. Once in operation, the Scheme would introduce a new large linear feature in the rural setting, which would alter the existing landscape and its features, and also adversely impact upon visual amenity. However, benefits would be realised in the area of the de-trunked section of the A1 (for example for residents directly next to the road and Tritlington C of E Aided First School), where a reduction in traffic would improve the tranquillity of the area.

7.4.3. Mitigation through the landscape design will aim to integrate the Scheme into existing surroundings and seek to enhance the local environment where possible. Measures could include, but are not limited to, minimising the loss of existing vegetation, replacement or

mitigation planting of native species (for example along Coronation Avenue), and screen planting around embankments and junctions. A specific Salvage Plan for the loss of Ancient Woodland will be developed through the EIA.

7.4.4. Following the implementation of design considerations and mitigation and enhancement measures, significant residual effects upon the landscape are anticipated in relation to the loss of Ancient Woodland, partial loss of the Coronation Avenue trees and landform changes with the Scheme's presence. Significant adverse residual visual impacts are anticipated on views from some residential properties in Northgate, Fenrother and along the offline section of the Scheme. In addition, a number of PRoW could experience significant effects with the presence of the Scheme. Views from residential properties along the de-trunked A1 and Tritlington C of E Aided First School may experience potential beneficial impacts given the anticipated reduced level of traffic.

7.5 CULTURAL HERITAGE

7.5.1. During construction there is the potential for whole or partial loss and disturbance of designated and non-designated heritage assets, both above and below ground. A Grade II listed milepost, near Low Espley would be removed. In addition, temporary adverse impacts upon the setting of some heritage assets are anticipated as a result of noise and visual disturbance. Construction may also result in the permanent loss or disturbance of historic landscapes within the Scheme Footprint and temporary adverse impact on the settings of historic landscape. Furthermore, locally important field boundaries could be lost, together with areas of ridge and furrow earthworks, which would impact upon the historic landscape character.

7.5.2. During operation, the offline section of the Scheme would permanently adversely impact the setting of the historic landscape, due to the introduction of noise and movement of traffic. In addition, the setting of some historic buildings and archaeological remains are likely to be permanently harmed due to visual intrusion and increased traffic noise. Changes in the drainage and water levels within the Scheme area may also adversely impact upon buried archaeological remains and built heritage assets in the long-term.

7.5.3. Best practice measures to manage works around cultural heritage assets will be set out in a CEMP. Where impacts upon known archaeological assets cannot be avoided in the first instance, archaeological investigation would be undertaken to determine the presence, extent and level of survival of the assets. The Grade II milepost which may be removed would be subject to photographic recording, careful removal and storage and reinstatement. Any historically important hedgerows would be identified and appropriate consent obtained for works as required. Potential impacts upon the setting of historic assets and the historic landscape would be avoided through design, and where not practicable, visual or acoustic screening considered. If any unknown archaeological assets are encountered during construction, impacts will be mitigated either by firstly leaving the asset in place wherever possible or by photographic record and removal in agreement with NCC.

7.5.4. Following the implementation of design considerations and mitigation and enhancement measures, significant adverse residual effects are expected as a result of direct and indirect impacts on the setting of designated heritage assets and historic landscapes during the construction and operational phase and there is also potential for significant effects associated with the potential removal of the Grade II Listed Milepost. In addition, significant adverse residual impacts on above or below-ground archaeology are anticipated during the construction phase.

7.6 BIODIVERSITY

7.6.1. Potential impacts during construction may include direct habitat loss, fragmentation, damage and loss of biodiversity (including loss of Ancient Woodland, SSSI and the Coquet River Felton Park LWS, and other habitats), and disturbance or direct effects on protected or notable species (such as bats) and their habitats, for example through habitat severance or fragmentation, accidental mortality / injury and increased levels of noise, light and dust pollution. Furthermore, construction activities may also disrupt local watercourses and drainage patterns and may spread invasive species.

7.6.2. Permanent potential impacts on biodiversity during operation are likely to include severance of habitats, disturbance to species (e.g. bats, from increased light, noise and pollution levels), direct mortality of birds and mammals (including bats) through traffic collision and polluted road runoff affecting the water environment (including the River Coquet) and roadside vegetation.

7.6.3. Scheme design considerations, together with mitigation and enhancement measures, could include habitat replacement and enhancement, planting of native species, working method statements to address potential impacts on species and, where appropriate, Natural England licences would be sought. A CEMP would be implemented to include measures to avoid or reduce impacts during the construction works and would include, but not be limited to, careful programming of vegetation removal to avoid the bird breeding season, the use of buffer zones around invasive species areas to avoid spreading, and directional lighting. In addition, a 'Salvage Plan' will be developed to address the loss of Ancient Woodland, which may include soil translocation and native planting. Compensatory habitat will be created in order to achieve no net loss of biodiversity.

7.6.4. Following the implementation of design considerations and mitigation and enhancement measures, likely significant residual effects are predicted during construction and operation. During construction, significant effects are anticipated as a result of the loss of Ancient Woodland, and habitat loss associated with the SSSI and LWS. During operation, significant effects are anticipated as a result of polluted road runoff affecting the water environment, including the Ancient Woodland and River Coquet and Coquet Valley Woodlands SSSI, Habitats of Principal Importance and other habitats.

7.7 ROAD DRAINAGE AND THE WATER ENVIRONMENT

7.7.1. Potential temporary impacts from the construction on the Scheme may include increased sedimentation and pollution risk from spillages which may impact surface and groundwater resources, changes to the hydromorphological, chemical and ecological quality of watercourses and increased flood risk.

7.7.2. Potential permanent impacts during the operation of the Scheme may include polluted surface water runoff reaching surface or groundwater features, changes to the hydromorphological and ecological quality of watercourses, changes to catchment hydrology due to the introduction of a barrier to natural overland flow and increased flood risk.

7.7.3. A CEMP will be produced which would incorporate measures to protect both surface and groundwater quality during construction, and would include method statements for the proposed works, details of materials to be used, and an emergency response plan. In addition, a temporary surface water drainage strategy may be required, together with temporary watercourse diversions.

7.7.4. During operation, design considerations, together with mitigation and enhancement measures would be implemented. Such measures would likely include a robust surface water drainage system (allowing for climate change effects), sustainable drainage considerations, maintaining overland flow paths and hydraulic capacity, and flood storage compensation. Where possible opportunities for betterment will be sought.

7.7.5. Following the implementation of design considerations and mitigation and enhancement measures, significant residual effects are not anticipated.

7.8 GEOLOGY AND SOILS

7.8.1. Potential construction impacts include the permanent and temporary loss of agricultural land and reduced soil quality. Adverse impacts to human health could be caused by exposure to contaminated ground, mine gas and buried UXO, and also from ground instability. In addition, the potential release of contaminants to surface or groundwater could reduce water quality and cause loss of aquatic organisms.

7.8.2. Potential operational impacts include permanent adverse impacts to surface or groundwater resources from spillages from vehicles, which could generate reduced water quality and loss of aquatic organisms. In addition, human health could be adversely impacted by exposure to contamination on grass verges.

7.8.3. The results of historical ground investigations along with any available current GI data will be used to inform the EIA and the identification of appropriate mitigation. However, mitigation during the construction phase would include a CEMP containing measures to mitigate geology and soils risks, a Materials Management Plan, a Soils Management Plan and incorporation of a temporary drainage strategy. A Coal Mining Risk Assessment will be undertaken setting out any mitigation measures to stabilise the ground, if required. Pollution control measures would be incorporated into the Scheme design, including within the permanent drainage system.

7.8.4. Following the implementation of design considerations and mitigation and enhancement measures, significant residual effects are not anticipated, subject to the findings of the GI.

7.9 PEOPLE AND COMMUNITIES

7.9.1. Construction activities may adversely impact the amenity value for people and communities around the Scheme, including users of PRoW and recreational activities, due to disturbance from noise, dust and disruption to views. Physical assets could also experience disruption in access and amenity value, and North Gate House would be demolished. There may also be disruption to access and for those participating in recreational activities in the area, such as angling, and eight PRoW would be temporarily closed or diverted during construction. In addition, the Scheme could also result in the temporary loss of private land and temporarily or permanently sever or disrupt farm landholdings and impact the viability of the farm business. A potential beneficial impact may be realised on the local economy, through expenditure within the local supply chain.

7.9.2. Once the Scheme is operational, new access would be provided via the new junctions to some properties which would allow safer access. The de-trunked section of the A1 would separate long-distance traffic along the Scheme from local traffic, therefore permanently reducing driver stress for local journeys and making local journeys safer. There could also be potential beneficial and adverse impacts to the amenity of, and access to, recreational

resources and some physical assets. Some alterations to existing bus stops are proposed, including removal and addition.

7.9.3. Construction mitigation would include traffic management systems and diversions of routes, including PRoW, to maintain connectivity. Land required for temporary works would be reinstated upon completion and landowners would be compensated for any temporary or permanent land required. Measures would be put in place, where possible, to maximise the potential for the workforce and project supply chain, to be sourced locally. Impacts to agricultural land during construction would be mitigated by, for example, careful siting of construction compounds to reduce severance, careful planning of construction activities through consultation with landowners, consideration of field drainage in the design and implementing best practice measures as detailed in a CEMP. Furthermore, the Scheme would aim to accommodate non-motorised users, and seek to either retain or improve the existing access arrangements where possible. Replacements for bus stops to be lost will be incorporated into the design wherever appropriate.

7.9.4. Following the implementation of design considerations and mitigation and enhancement measures, significant residual effects are anticipated for motorised users during construction (for example due to traffic management), users of PRoW, community facilities, recreational resources and local businesses (adverse and beneficial) as a result of changes in amenity and access, and agricultural landowners due to temporary and permanent land severance and disruption.

7.10 MATERIAL RESOURCES

7.10.1. Potential impacts from the Scheme during construction include the consumption of primary and other materials and the production of wastes requiring disposal. Impacts are also associated with the production and processing of material resources which include depletion of natural resources, degradation of the environment and reduction in landfill void capacity. Beneficial effects would be realised however where site arisings can be successfully diverted from landfill, and re-used or recycled.

7.10.2. During operation, adverse impacts could result from minor amendments and changes to the Scheme's assets, e.g. for maintenance. However, such impacts would not be significant.

7.10.3. The Scheme design will seek to incorporate material resource efficiency and waste minimisation. Mitigation during construction could include the re-use and re-cycling of materials (e.g. from demolition) where possible to minimise export and import of materials. In addition, a CEMP, Site Waste Management Plan, and MMP would be implemented to identify, monitor and manage material resources and waste arisings on site. Waste would be diverted from landfill wherever possible.

7.10.4. Following the implementation of design considerations and mitigation and enhancement measures, significant residual effects are not anticipated.

7.11 CLIMATE

7.11.1. During construction, large sources of emissions of embedded carbon are likely to be found in materials including those associated with pavement materials, the new carriageways and junctions (i.e. asphalt and aggregate), and also associated with new bridges (i.e. structural and reinforced steel and concrete). Emissions would also be generated through the construction process including transport and installation processes and land use change.

During operation, the main emissions source would be from road vehicles. Emissions from the repair and refurbishment of the Scheme would also be generated.

7.11.2. There is potential for the effects of climate change to impact upon the Scheme during the construction and operation, for example as a result of increased temperatures, prolonged periods of hot weather and increased precipitation, and intense periods of rainfall. This may affect various infrastructure, assets and road vehicles through the generation of dust, flooding, structural damage and increased risk of contamination of waterbodies.

7.11.3. In order to reduce potential emission impacts, design, mitigation and enhancement measures will be considered including, but not limited to, minimising the requirement for materials and construction activity, maximising the use of low carbon, locally sourced and/or recycled material, and using more efficient plant and machinery.

7.11.4. Measures to reduce impacts as a result of climate extremes may include ensuring the Scheme's design and specification provide for climate change allowance, pavements, drainage systems and embankments are designed to take into account anticipated increases in peak rainfall, and increased variability of ground conditions, and the design of pavement, expansion joints and other elements will consider resilience to anticipated increases in peak summer temperatures.

7.11.5. Following the implementation of design considerations and mitigation and enhancement measures, significant residual effects are not anticipated.

7.12 ASSESSMENT OF CUMULATIVE EFFECTS

7.12.1. The assessment of cumulative effects considers the following:

- "Combined effects" which are defined as cumulative impacts from a single project (for example the Scheme may result in noise and visual impacts upon the same receptor).
- "Cumulative effects" which are from different projects (in combination with the project being assessed).

7.12.2. At this stage only the potential impacts from combined effects can be indicated. During construction and operation, the Scheme could generate adverse impacts upon a number of PRoW, road users, residential receptors, businesses and community facilities as a result of increased noise levels and visual intrusion; adverse impacts upon cultural heritage assets, the River Coquet and Coquet Valley Woodlands SSSI and the Dukes Bank Wood Ancient Woodland from landscape changes, habitat loss and noise; and adverse impacts upon surface and groundwater from pollution.

7.12.3. Based upon the preliminary list of other development applications, likely significant cumulative effects include noise and vibration disturbance and disruption to travellers as a result of temporary diversions or road closures. However, this is indicative at this stage, as the cumulative assessment for the EIA will be based upon a revised study area and an updated list of developments.

7.12.4. Where significant cumulative effects are identified during the EIA, mitigation will be specified to avoid, reduce or offset such effects. Likely significant effects will be explored in detail and reported in the ES.

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